No.

Ex-Post Evaluation Report of Japanese ODA Loan Projects 2009 (Vietnam II・China II)

June 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

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Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2007. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

June 2010

Atsuro KURODA

Vice President

Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA.

Minor amendments may be made when the volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

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Ex-post Evaluation of Japanese ODA Loan Project

National Highway No. 10 Improvement Project (I) (II)

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1. Project Description

Project Site

National Highway No.10

1.1 Background

National Highway No.10 is an arterial road in Northern Vietnam, extending approximately 150 kilometers, with two-lane on each way. It links via National Highway No.18 in part Hai Phong Port, the international port in Northern Vietnam, and Hai Phong City, where the port is situated, with Ninh Binh City, the key city in the southern part of the Red River Delta, stretching across the delta.

Above all, it runs through Quang Ning Province and Hai Phong City, which are located inside the economic triangle in the northern area, formed by Capital Hanoi, Hai Phong and Ha Long. This area is a logistics base with the international port serving as an entrance to the country. Furthermore, it is positioned as a second center for the development of the northern area following Hanoi, as its economic activities include active attraction of foreign investment needed for industrial development. On the other end of the highway, the areas around Ninh Binh are increasingly urbanized along National Highway No.1. Nevertheless, the coastal area sandwiched by the two areas remains as an agricultural belt relatively underdeveloped in terms of commercialization and industrialization, because the area is isolated by the Red River's tributaries and is not very accessible accordingly. That being the case, the improvement of National Highway No.10 was expected to lead to better accessibility

for the downstream area of the Red River Delta to the urban area and markets, thereby cultivating the agriculture, commerce and industry and raising the income levels in the region. It was also expected to significantly improve access for logistics from Nam Dinh and the areas south of Ninh Binh to Hai Phong Port, by providing a bypass instead of passing through Hanoi.

1.2 Project Outline

The objective of the project is to enhance road transportation and to facilitate smooth logistics by rehabilitating and/or replacing the existing road and bridges, and constructing bridges at ferry crossing points and bypasses in the urban areas on the National Highway No.10, thereby contributing to the promotion of industry and trade and the enhancement of the living standard in the northern part of Vietnam.

	Phase I	Phase II
Approved Amount / Disbursed Amount	17,742 million Yen / 16,083 million Yen	12,719 million Yen / 10,793 million Yen
Exchange of Notes Date / Loan Agreement Signing Date	March, 1998 / March, 1998	March, 2000 / March, 2000
Terms and Conditions	Interest Rate: 1.8% p.a. (Goods & Services) 0.75% p.a. (Consulting Services) Repayment Period/Grace period: 30years/10years (Goods & Services) 40years/10years (Consulting Services) Conditions for Procurement General Untied (Goods & Services) Partially Untied (Consulting Services)	Interest Rate: 1.8% p.a. (Goods & Services) Repayment Period/Grace period : 30years/10years (Goods & Services) Conditions for Procurement General Untied (Goods & Services)
Borrower / Executing Agency	The Government of Socialist Republic of Vietnam / Ministry of Transport (MOT), Project Management Unit 2 (PMU2)[1]	
Final Disbursement Date	January, 2008	

[1] The name at the time of the evaluation. The executing agency was called Project Management Unit 18 at the time of project implementation and was later renamed on July 15, 2008.

Main Contractor (Over 1 billion yen)	【B3 Package】Civil Engineering Construction Corporation No.5 (Vietnam)・Civil Engineering Construction Corporation No.1(Vietnam)・Keang Nam Enterprises Ltd.(Korea)（JV）/ 【B4 Package】Civil Engineering Construction Corporation No.6(Vietnam)・Civil Engineering Construction Corporation No.8(Vietnam)（JV）/ 【B5 Package】Sumitomo Construction Co., Ltd. (Japan)・Thang Long Construction Corporation(Vietnam)（JV）/【R3 Package】Civil Engineering Construction Corporation No.1(Vietnam)・Song Da Construction Corporation(Vietnam)・Vietnam Waterway Construction Corporation(Vietnam)（JV）/ 【R4 Package】Civil Engineering Construction Corporation No.8(Vietnam)・Vinaconex(Vietnam)（JV）/ 【R5 Package】Civil Engineering Construction Corporation No.5(Vietnam)・Civil Engineering Construction Corporation No.4(Vietnam)・Thang Long Construction Corporation(Vietnam)（JV）/ 【S1 Package】Civil Engineering Construction Corporation No.5(Vietnam)・Civil Engineering Construction Corporation No.1(Vietnam)（JV）/ 【S2 Package】Civil Engineering Construction Corporation No.4(Vietnam) / 【S4 Package】Thang Long Construction Corporation(Vietnam)・Truong Son Construction Corporation(Vietnam)（JV）
Main Consultant (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan)・Transport Engineering Design Corporation(Vietnam)（JV）
Feasibility Study etc.	1994 JICA Northern Vietnam Traffic Master Plan 1996 Government of Vietnam 1997 JICA SAPROF Team

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura (Mitsubishi UFJ Research and Consulting Co., Ltd.)

2.2 Duration of Evaluation Study

Duration of the Study: September, 2009-June, 2010

Duration of the Field Study: 7-19, December, 2009, 22-27 March, 2010

2.3 Constraints during the Evaluation Study

None.

3. Results of Evaluation (Overall Rating: B)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Policies of Vietnam

At the times of appraisal, the Government of Vietnam had set high priority to the transport sector, based on its Socio-Economic Development Plan 1996-2000 (so called the Sixth Five-year Plan), which aims at "attaining smooth traffic on trunk routes" as one of the primary development goals in its effort to create a setting effective for socio-economic development. At the sectoral level, the Government of Vietnam was committed to embark on the development of road networks to accommodate future traffic demand, while placing priority to the repair of existing roads.

At the time of the ex-post evaluation, the Government had attached utmost importance to "rapid and sustainable economic growth" in its Socio-Economic Development Plan 2006-2010, or the Eighth Five-year Plan. More specifically, it had identified as one of the key development goals in the transport sector the rehabilitation of arterial roads that link major cities and gave high priority to the development of arterial road networks. Meanwhile, the Government stated, "Economic growth provoked by economic growth stimulus initiatives, such as large-scale infrastructure development projects, will contribute to poverty reduction" in the Comprehensive Poverty Reduction and Growth Strategy (CPRGS), the Vietnamese version of Poverty Reduction Strategy Paper (PRSP) formulated in 2002 as an action plan for the Socio-Economic Development Plan 2001-2005 (Seventh Five-year Plan). The CPRGS was then integrated into the Eighth Five-year Plan; hence, the development of transport infrastructure, which contributes to poverty reduction through economic growth, has remained as a priority issue. At the sectoral level, the Government of Vietnam has prescribed the promotion of development and maintenance of traffic infrastructure in the northern economic areas by 2020, with a resolution adopted by the Politburo in 2003 and a cabinet resolution in 2004. Thus, the development of traffic infrastructure in Northern Vietnam is still positioned as a priority issue.

3.1.2 Relevance with the Development Needs of Vietnam

At the times of appraisal, the movement of freight and passengers in Vietnam depended heavily on the road sector−64.9% for freight on the weight basis and 78.6% for passengers in terms of the number of persons (actual records for 1997) (See Table 1.) The roads in the country, however, were not well maintained due to the past conflicts and budgetary constraints, and did not suffice the due role in mid- and long-distance transportation. As far as National Highway No.10 is concerned, the road condition was extremely poor, as seen in damaged road surface and decrepit bridges, and hence the highway was not favorable for vehicles. Besides, the width and hard shoulders were not sufficient for both vehicles and pedestrians in many sections. There were some sections where ferry boats were needed to cross the river or the port, which severely hinder smooth traffic.

At the time of the ex-post evaluation, likewise, the domestic transport of goods and people hinged heavily on the road infrastructure; the dependency was still on the rise. As for the shares of passenger and cargo transport volumes by transport mode in 2009, the road accounted for 73.2% of cargo (on the weight basis) and 90.4% of passengers (in terms of the number of persons). The total traffic volume on National Highway No.10 was also on the rise; thus, the need for improving the highway was as high at the time of the ex-post evaluation. The traffic volume measured at the three measuring points along the highway roughly doubled from 2003 to 2009[2]. Concretely, the actual average daily traffic volume by year for sections along the National Highway No.10 are: 4,107, 7,492, and 4,112 in 2009, which are more than double the traffic in the respective sections in 2003 (2,080, 3,301, and 2,057, respectively).

Table 1: Share of Volume of Passenger and Cargo Transport by Mode of Transport

Mode of Transport/ Share	1997		1999		2009	
	Volume Share (%)	Volume･km Share (%)	Volume Share (%)	Volume･km Share (%)	Volume Share (%)	Volume･km Share (%)
Passengers						
Rail	1.4	8.9	1.3	8.9	0.6	4.6
Road	**78.6**	**68.7**	**80.6**	**69.7**	**90.4**	**72.2**
Others	20.0	22.4	18.1	21.4	9.0	23.2
Cargo						
Rail	2.7	3.4	2.5	2.9	1.3	2.1
Road	**64.9**	**13.7**	**64.2**	**14.1**	**73.2**	**12.7**
Others	32.4	82.9	33.3	83.0	25.5	85.2

Source: General Statistics Office of Vietnam

* "Others" include inland waterways, maritime transport and air

* Data for 2009 cover up to November 2009

3.1.3 Relevance with Japan's ODA Policy

Japan's Country Assistance Program to Vietnam (2004) specified the area covered by the project under review as one of the priority areas and matters in the transport sector as it is a focal area for economic growth in Northern Vietnam. Japan International Cooperation

[2] See more detailed traffic volume data on National Highway No. 10 provided in 3.3.1.1 (Effectiveness).

Agency (JICA) (former Japan Bank of International Cooperation (JBIC)) has been providing assistance mainly in infrastructure development since the restart of ODA loan projects in fiscal year 1993. The road sector, among others, was positioned as one of the most important sectors for assistance along with the power sector. The Study on the National Transport Development Strategy in the Socialist Republic of Vietnam (VITRANSS), conducted by JICA between 1999 and 2001, built the foundation for "promoting the development and maintenance of traffic infrastructure in the northern economic areas by 2020" advocated by the Government. The project under review is aimed to contribute to the economic development in the said area through improvement of road transport and realization of smooth logistics in Northern Vietnam. Thus, it is highly consistent with Japan's assistance strategy.

This project has been highly relevant with the country's 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

3.2.1.1 Civil Works

Table 2 compares the planned and actual outputs on civil works. All the works were completed nearly as planned.

Table 2: Comparison of Planned and Actual Project Outputs (Original Packages)

(i) Improvement of Roads and Bridges from Bi Cho to Ninh Binh

Package	Section	Plan	Actual	Difference
R1	North Hai Phong	12.4 km	12.4 km	Same as planned
R2	South Hai Phong	20.8 km	18.0 km	Nearly same as planned
R3	Thai Binh	39.7 km	38.8 km	Nearly same as planned
R4[3]	Nam DInh	32.6 km	32.4 km	Nearly same as planned

(ii) Construction of Bypass in Hai Phong Urban Areas

Package	Section	Plan	Actual	Difference
R5	Hai Phong Bypass	19.3 km	20.5 km	Nearly same as planned
R6	Hai Phong Urban	21.6 km	20.7 km	Widening of the road width in a section[4]

(iii) Construction of Bridges and Bypass at Ferry Crossing Points

Package	Section	Plan	Actual	Difference
B1	Da Bac Bridge	505 m	505 m	Same as planned
B2	Quy Cao Bridge	504 m	504 m	Same as planned
B3	Tan De Bridge	1,065 m	1,065 m	Same as planned
B5	Kien Bridge	1,136 m	1,186 m	Nearly same as planned

[3] The construction of a flyover, which was deemed appropriate from the technical perspective as well as from the standpoints of traffic congestion, safety and so forth at the time of the second phase appraisal was added to the R4 package and is completed nearly as planned.

[4] Based on the geographical features, the scope of the package was expanded from an 8-meter embankment and a 7-meter paved road to a 12-meter embankment and an 11-meter road.

(iv) Construction of Bridges and Bypass at the Bridge Utilized for both Road and Rail Road

Package	Section	Plan	Actual	Difference
B4[5]	Non Nuoc Bridge Bypass	app. 7 km	7.1 km	Same as planned

Source: JICA's internal documents and results from questionnaire surveys and interviews during the on-site surveys.

In addition to the above, the project included the planning and completion of additional outputs using the residual project fund. Based on the experience in implementing additional works using the residual project fund in "National Highway No.5 Improvement Project", another yen loan project, the provincial and municipal governments along the roads covered by the project had requested the Ministry of Transport (MOT) for additional outputs. All the additional works requested were consistent with the Vietnam Transport Development Strategy 2020 and positioned as priority road development projects by the provincial and municipal governments. The completed outputs have expanded road networks and hence realized smooth logistics. Thus, the addition of these outputs is deemed as relevant.

Table 3 outlines the additional outputs implemented in the project.

Table 3: Additional Outputs on Civil Works

(i) Supplementary Works for Phase I Packages

Additional Packages	Section	Description	Distance/Length (Actual)
P1	Bo Bridge	Replacing the poorly-conditioned bridge connecting National Highway No.10 to the Thai Binh and city center and improving its approach roads.	1.6km
P2	Nui Deo - Pha Rung Section + Provincial Road 355	Connecting newly-constructed National Highway No.10 (Hai Phong Bypass) and old National Highway No.10 that runs through the Hai Phong city center and developing a provincial road leading to the Pha Rung ferry terminal.	8.6km + 9.5km
P3	Provincial Roads 351 and 357	Developing two provincial roads that connect to new National Highway No.10 (Hai Phong Bypass)	10.8km + 5.0km
P4	National Highway No.1 - National Highway No.10 Connection Road	Developing a road connecting National Highway No.10 and National Highway No.1 in Ninh Binh Province.	6.4km

(ii) Supplementary Works for Phase II Packages

Additional Packages	Section	Description	Distance/Length (Actual)
S1	Construction of Thai Binh Bypass	Constructing a bypass which links two points in Thai Binh Province on National Highway No.10.	11.5km
S2	Construction of section from Loc An to National Highway No. 21	Constructing a road section that detours the Thai Binh city center and connects National Highway No.10 and National Highway No. 21.	6.9km
S3	Upgrading of sections from Goi to Binh Luc	Upgrading a road section with bridges that links Goi (in Nam Dinh Province) on National Highway No.10 with National Highway No. 21.	A 14-km-long road and three small bridges
S4	Construction of Provincial Road 191	Constructing a provincial road section with bridges that extends from neighboring Hai Duong Province to National Highway No.10 in Hai Phong City.	A 25.7-km-long road section and two bridges

[5] The construction of a flyover, which was deemed appropriate from the technical perspective as well as from the standpoints of traffic congestion, safety and so forth at the time of the second phase appraisal was added to the B4 package and is completed nearly as planned.

S5	Construction of Quan Toan Interchange	Constructing an interchange (flyover) that connects National Highway No.10 and National Highway No. 5 in Hai Phong City.	210-m-long flyover

Source: JICA's internal documents and results from questionnaire surveys and interviews during the on-site surveys.

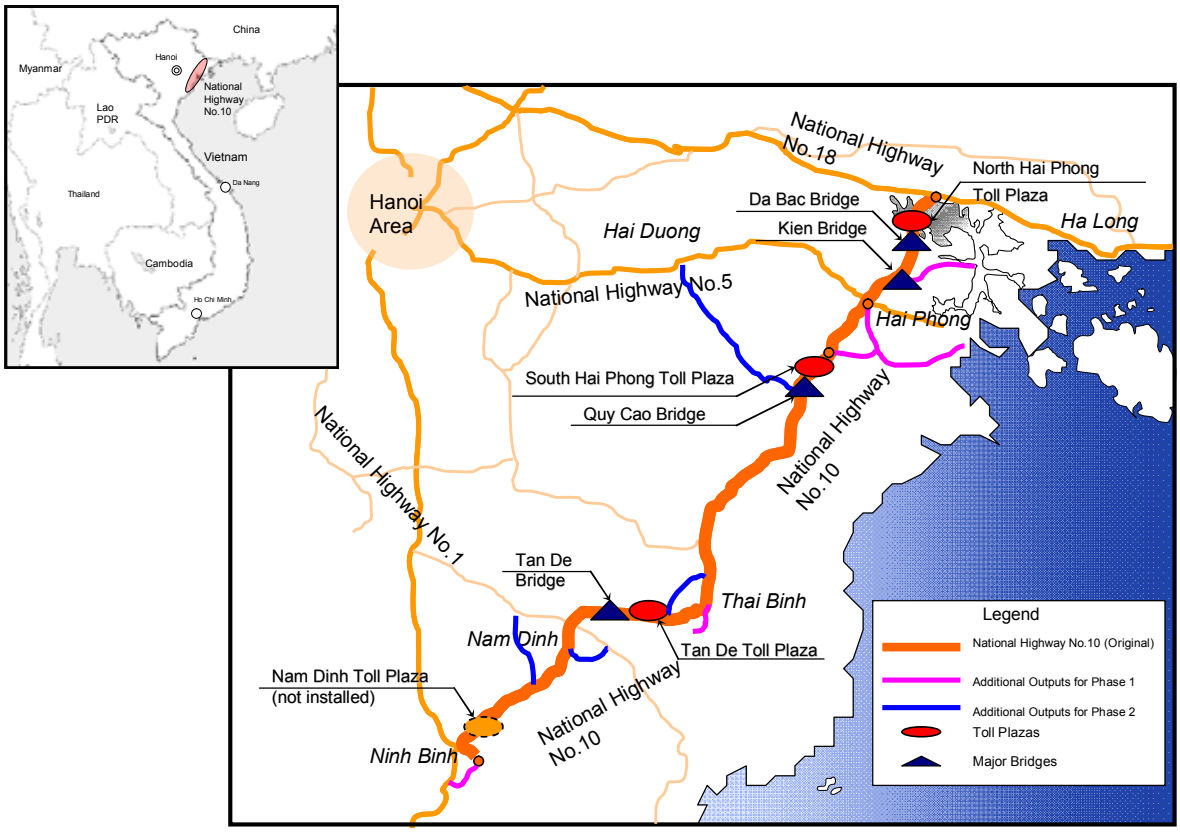


Figure 1: Location of the Project Site

3.2.1.2 Operation and Maintenance Equipments

As for the procurement of operation and maintenance equipment, namely maintenance equipment, transporters and inspection and monitoring apparatus, there was no significant change to the plan, in principle, but minor changes were made in part to reflect the executing agency's technical level improved and the change in demand for equipment during the period between the planning and the actual procurement.

3.2.1.3 Toll Plaza

Initially, four toll plazas were planned to be provided in the project, but only three were installed in the end. Of these, one location (North Hai Phong Toll Plaza) has not been used since its completion (see Table 4.)

Table 4: Installation and Utilization of Toll Plazas

Name of toll plaza (from north to south)	Plan	Actual	Utilization	Distance
1. North Hai Phong Toll Plaza	○	○	×	
2. South Hai Phong Toll Plaza (so-called Tien Cuu Toll Plaza)	○	○	○	Approx. 33km
3. Tan De Toll Plaza	○	○	○	Approx. 55km
4. Nam Dinh Toll Plaza	○	×	—	Approx. 30km

Source: Results from site visits and interviews during the on-site surveys.

Tan De Toll Plaza

This is because the Ministry of Finance (MOF) ordained Circular 90, which requires any two toll plazas to be 70 kilometers apart at the minimum, in 2004 immediately after North Hai Phong Toll Plaza was put in place. The plaza in question happens to be too close to South Hai Phong Toll Plaza on National Highway No.10, which was provided by an ODA loan project, to secure this distance. Thus, it has been put into disuse. Considering that the loan contract of this project was signed in 1998 whereas the MOF enacted Circular 90 in 2004, it was inevitably impossible to know or predict the situation at the times of appraisal. (Distance between South Hai Phong and Tan De Toll Plazas is less than 70km, however, MOT has decided to install and operate them.) As for Nam Dinh Toll Plaza, the MOT had decided to withdraw the construction prior to the start of the tender process, due to several factors including its location that is too close to a toll plaza on adjacent National Highway No.1.

3.2.1.4 Consulting Services

With respect to consulting services, there were more inputs, both foreign and Vietnamese (local) consultants, than originally planned (see Table 5.) This primarily results from (i) the additional works (construction of flyovers) in the R4 and B4 packages, (ii) the widening of the road width in the R6 package and (iii) the extended construction period needed for implementing additional inputs using the residual project fund.

Table 5: Comparison Between the Planned and Actual Consulting Service Inputs (M/M)

	Contents of Work	Plan	Actual
Foreign	Engineering Services	262	287
	Supervision	335	399
	Total	597	686
Local	Engineering Services	285	554
	Supervision	926	1,843
	Total	1,211	2,397

Source: JICA's internal documents and results from questionnaire surveys and interviews during the on-site surveys.

3.2.2 Project Inputs

3.2.2.1 Project Period

The project period was longer than planned.

The project under review was scheduled for 54 months from March 1998 to August 2002 at the times of appraisal. In actuality, it took 79 months, 146% of the planned period, from March 1998 to September 2004, just to complete the originally-planned outputs. Furthermore, the additional outputs were finally completed in September 2007 (see Tables 6 and 7.)

The main reason for the delay in schedule was the extra time needed for local contractors to deal with environmental considerations and safety measures, particularly in the packages to construct road running through urban areas. As is explained later, the amounts of construction costs, lowered as a result of competitive biddings, were not sufficient for implementing measures necessary during construction: adequate management of surplus soil, air and water pollution control, and noise and vibration control for environmental considerations as well as observance with the truck loadage, speed and time restrictions, training and supervision of truck drivers and installation of traffic signs for safety concerns. Consequently, a longer time was needed for coordination and arrangements necessary for securing the fund for these measures.[6] The lack of fund was complemented at the expense of local (provincial and municipal) governments. (Source: Results from interviews with PMU2.)

Other causes of delay include (i) additional work was necessary for soft soil treatment in some sections because the project site was near the sea and (ii) approval process by the Government of Vietnam as to the implementation of the project. (Source: Same as above.)

Table 6: Comparison of Planned and Actual Project Period

	Phase I (Plan)	Phase II (Plan)	Phase I and II (Actual)
Detailed Design	February 1998 － December 2000	November 1998 － December 1999	November 1998 － December 1999
P/Q ・ Bidding ・ Contract	February 1998 － December 2000	February 1999 － September 2000	January 1999－September 2000
Land Acquisition ・ resettlement	January 1998 － December 2000	May 1999 －July 2001	N.A.
Civil Works	January 1999－February 2002	November 1999－August 2002	November 1999 － September 2004
Procurement of O&M Equipments	January 2000－December 2000, May 2001－March 2002	December 1999 － December 2001	December 2001 － December 2002, June 2002－June 2003
Consulting Services	February 1998－February 2002	November 1998－August 2002	November 1998－August 2002

6 According to PMU2, sufficient environmental and safety measures have taken place despite longer time was necessary.

Source: JICA's internal documents and results from questionnaire surveys to PMU2 and interviews during the on-site surveys.

Note 1) The project consists of the first and second phases, but the scope of project is considered as one. Thus, the overall implementation schedule, which was drawn up at the time of the appraisal for Phase I, was reexamined at the time of the appraisal for Phase II.

Note 2) The bidding and contracting periods and the civil works periods appear to overlap in the above table because the project includes multiple procurement packages. These periods do not overlap on a single package basis.

Table 7: Project Period for Additional Outputs

	Additional Outputs for Phases I and II (Actual)
Detailed Design	September 2002－October 2006
P/Q, Bidding, Contract	May 2003－March 2005
Land Acquisition, Resettlement	N.A.
Civil Works	December 2003－September 2007
Consulting Services	September 2002－February 2005

Source: Results from questionnaire surveys to PMU2 and interviews during the on-site surveys.

3.2.2.2 Project Cost

Total project cost was lower than planned.

The total cost of the project was originally 36,523 million yen (the Japanese ODA loan share was 30,461 million yen, including 17,742 million yen for Phase I and 12,719 million yen for Phase II.) The actual project cost, including that for additional works[7], was 27,759 million yen (the Japanese ODA loan share was 26,876 million yen). Thus, the project cost was kept lower than planned (76% of the planned amount.)

The main reasons for cost-under run were as follows: (i) the severe competition at the times of biddings reduced the bid prices to below the estimated prices and eventually saved the costs incurred in the project significantly (the successful bid price for each package is around 50-60% of the estimated price), and (ii) the local currency, Vietnam dong (VND) depreciated against JPY.

Although the project period was longer than planned (146% of the original plan), the project cost was lower than planned (76% of the original plan), therefore efficiency of the project is fair.

3.3 Effectiveness (Rating: a)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators

Table 8 shows actual and projected traffic volumes on National Highway No.10 at the time

7 The total project cost for additional works was approximately 10,724 million yen (excluding interest during construction).

of the evaluation.[8] Because the traffic projection data for these sections at the times of appraisal are not available, it is hard to compare the actual data with traffic projection at the times of appraisal. Nevertheless, a comparison of the traffic volume between 2003, before the project, and 2009, after the project outputs were put in service, has revealed that it increased more than two-fold on all three sections. In addition, it is forecast to further double from 2009 to 2020 and traffic demand is projected to continue to grow at high levels.

Table 8: Annual Average Daily Traffic

Location	Actual							Projection		
	2003	2004	2005	2006	2007	2008	2009	2010	2015	2020
Km19+780 (in service from 2003) Near Da Bac Bridge	2,080	2,622	2,678	2,873	3,101	3,404	4,107	4,353	5,832	7,803
Km74+800 (in service from 2003) South of Quy Cao Bridge	3,301	3,367	2,451	3,147	3,760	6,273	7,492	7,941	10,638	14,234
Km114+800 (in service from 2002) Near Tan De Bridge	2,057	2,033	2,336	2,783	2,904	3,163	4,112	4,358	5,839	7,812

Source: Regional Road Maintenance Units 2 (RRMU2) under Vietnam Road Administration (VRA)
Note): The above figures are averages of traffic volumes measured for three days on the 5th, 6th and 7th day of each month.

In terms of cost-saving for ferry operation, Table 9 presents the expenses spent for Tan De Ferry.[9] The ferry has no longer been operated since the project provided the bridge. Thus, all the operating costs in the table have been saved as a result of the implementation of the project.

Table 9: Expenses for Tan De Ferry (Unit: million VND)

Expenses for operating Tan De Ferry (2000)	3,755.2
Expenses for operating Tan De Ferry (2001)	4,700.0

Source: Results from questionnaire surveys to VRA

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

Due to the fact that data needed for quantitative analysis was not available, analysis for the internal rate of return was not possible[10].

[8] Due to the fact that the actual and projected traffic data for the same sections and the same measuring method at the times of appraisal was not available, traffic data obtained at the time of evaluation is presented.

[9] The main users of the ferry were pedestrians, motorbike and bicycle passengers.

[10] VRA does not have data on the travel time in the project site at the time of project planning; thus there is no data available on time saving before and after the project (no OD survey has been conducted.) Likewise, VRA does not have data on increases of travel speeds (no OD survey has been conducted.) For cost saving on ferry operating expenses, data other than those for Tan De Ferry was not available.

3.3.2 Qualitative Effects

Realizing smooth logistics in Northern Vietnam

A beneficiary survey[11] was conducted targeting on residents, farmers and companies situated along National Highway No. 10, with respect to the travel time and cost after the completion of the project. The survey results are summarized in Table 10. More than 90% of the respondents expressed that their travel time and cost had reduced. This implies that the implementation of the project has brought about time efficiency and cost reduction effects.

Table 10: Comparison of Travel Time and Cost Before and After the Project (N=365)

Question	Decreased		Did Not Decrease		No Idea	
	Count	%	Count	%	Count	%
Current situation of Travel Time	339	92.9	13	3.6	13	3.6
Current situation of Travel Cost	341	93.4	6	1.6	18	4.9

Source: Results from the beneficiary survey
Note): The above figures are half-adjusted (rounded) numbers; the sum may not necessarily become 100.

Concerning the logistics on National Highway No.10 after the project, the beneficiary survey (of companies) found the following results in Table 11. According to the survey, more than 90% of the corporate respondents expressed that it became easier to purchase and transport raw materials and ship and deliver their products and services after the completion of the project. It is deemed that the implementation of the project has contributed to facilitate smooth logistics in this area.

Table 11: Logistics on National Highway No.10 After the Project Completion (N=52)

Question	Easier		No change		Unclear/unknown	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
Purchasing and transporting raw materials	50	96.2	-	-	2	3.8
Transporting and delivering products and services	48	92.3	1	1.9	3	5.8

Source: Results from the beneficiary survey

Moreover, interview surveys were conducted targeting on parties concerned, as part of the on-site survey to learn changes in the travel time on National Highway No.10 before and after the completion of the project. All the respondents acknowledged shortened travel times and improved logistics between provinces and regions. In particular, the development of river-crossing bridges significantly reduced time for crossing the rivers, which had been possible only by using ferries. Table 12 exhibits the results of the survey.

[11] A beneficiary survey was conducted in the form of face-to-face hearing surveys with 365 interviewees including 313 local inhabitants and farmers and personnel from 52 companies in the neighborhood of National Highway No. 10 (Thai Binh Province, Nam Dinh Province, Ninh Binh Province, Hai Phong City.)

In addition, PMU2 pointed out the following qualitative effects.

- Thai Binh Province benefited most from the project, in terms of smooth logistics. (Before the project, one had to cross both Hong River and Van Phuc River with the ferry in order to travel from the province to another.)
- The second largest beneficiary is Quang Ning Province. (One had to use the ferry to travel from the province to Hai Phong. Da Bac Bridge provided in the project made it smoother and facilitated logistics.)

Table 12: Reduction in Travel Time Before and After the Project

Before	After	Source
Quang Ninh to Ninh Binh: 10 hours	3 hours	PMU2
Hai Phong Central Area to Bin Bao (45km): 3 hours(Using two Ferries)	50-60 minutes	Hai Phong Department of Transport
Thai Binh Province to Ha Noi: 4 hours (Via NH1)	2 hours	Thai Binh Department of Transport
Thai Binh Province to Hai Phong (70km): 3-4 hours	1.5 hours	
Thai Binh Province to Quang Ninh Province (40km): 6-7 hours (Via NH18)	2.5hours	
River crossing by Tan De ferry: 30 minutes one way (half-day at maximum during rush hours, no operation during night time)	Utilization of bridge (1minute by car and motorbike)	
Kien Bridge to Hai Phong City: 3 hours (by using bicycle and a ferry)	1 hour by bicycle, 30 minutes by motor bike (Via Kien Bridge and Binh Bridge)	Resident near Kien Bridge

This project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Impact

3.4.1 Intended Impact

3.4.1.1 Promotion of Industry and Trade in Northern Vietnam

Trend of GRDP in target region

Table 13 summarizes the trend of gross regional domestic product (GRDP) of each province or city along National Highway No.10. Of the districts, Quang Ning Province is most developed with an average GRDP growth per annum being 12.2 to 16.4%. The other provinces and Hai Phong City as well have achieved high growth since around 2005. The growth rates in Ninh Binh Province are most outstanding, as it was least developed among the provinces and the city.

Table 13: GRDP Data for Provinces/City Along National Highway No. 10

Province City	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Quang Ninh			3433.0	3996.1	4506.2	5092.5	5715.5	6451.3	7336.0	8347.0	9488.0	10723.0
				16.4	12.8	13.0	12.2	12.9	13.7	13.8	13.7	13.0
Thai Binh	4031.0	4187.0	4420.1	4557.9	4778.5	5137.1	5431.0	5988.0	6464.0	7136.0	7966.0	8919.0
	4.1	3.9	5.5	3.1	4.8	7.5	5.7	10.3	7.9	10.4	11.6	12.0
Nam Dinh	3739.1	4012.2	4235.0	4500.4	4688.0	5125.6	5521.3	5976.9	6396.6	7133.4	7954.3	8831.6
	11.8	7.3	5.6	6.3	6.4	7.1	7.7	8.2	7.0	11.5	11.5	11.0
Ninh Binh	1417.3	1523.6	1616.6	1736.7	1968.9	2135.8	2387.0	2820.1	3397.3	3825.4	4395.5	5224.3
	13.1	7.5	6.1	7.4	13.4	8.5	11.8	12.0	20.5	12.6	14.9	18.9
Hai Phong			7339.5	8313.7	9176.5	10153.8	11241.6	12536.0	14043.1	15801.4	17814.6	20133.2
				13.3	10.4	10.7	10.7	11.5	12.0	12.5	12.7	13.0

Source: General Statistics Office of Vietnam
Note 1): The upper rows indicate the respective GRDPs (Unit: billion US dollars (USD)), whereas the lower rows show the year-on-year growth rates (Unit: %).
Note 2): GRDP is calculated based on the prices in 1994.

The above growth records largely outnumber the GDP growth rate nationwide during the same period (6.8-8.5%, based on the prices in 1994, according to the General Statistics Office of Vietnam). Although direct causality between the project and the GRDP growth should not be very strong, the project seems to have indirectly contributed to the growth and expansion of the local economies by increasing the industrial produce and enhancing foreign direct investment (FDI) through improvement in the logistics (to be discussed in more detail later.)

Trend of industrial production volume and FDI in target region

Table 14 suggests that the amounts of industrial production in the provinces and the city along National Highway No.10 are conspicuously on the rise. Thai Binh Province and Nam Dinh Province, in particular, have recorded growth rates exceeding 20% since 2005. Moreover, new FDI projects and registered capital in the northern region started to swell in 2005, in terms of the number of projects and the amount of capital, in Hai Phong City. New investments have constantly been made also in Quang Ning Province and other provinces (Table 15).

Similarly to the GRDP, growths in industrial outputs and FDI are linked with not only traffic networks but various other factors, thus the growths do not exclusively denote impacts brought about by the project. Still, the project seems to have contributed partially to creating an investment climate through road development, which upgraded accessibility from the region along National Highway No.10 to other areas.

Also, industrial parks were built in Thai Binh Province concurrently with the development of National Highway No.10[12]. The project also appears to have contributed to the progress

[12] According to the Department of Transport of Thai Binh Province, two industrial parks were developed in

in industrial development in the province.

Table 14: Industrial Production Data for Provinces/City Along National Highway No. 10

Province City	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Quang Ninh	2666.2	2910.0	3139.5	3788.8	4358.9	5038.1	5982.5	6421.2	8066.9	9307.9	10859.5	11986.9
	16.1	9.1	7.9	20.7	15.0	15.6	18.7	7.3	25.6	15.4	16.7	10.4
Thai Binh	1160.8	1238.3	1307.2	1397.0	1588.8	1796.7	2026.1	2424.1	2917.5	3596.2	4476.4	5479.1
	9.3	6.7	5.6	6.9	13.7	13.1	12.8	19.6	20.4	23.3	24.5	22.4
Nam Dinh	1079.7	1228.0	1327.4	1462.7	1673.0	1951.7	2301.0	2790.0	3424.1	4254.6	5249.5	6304.5
	9.0	13.7	8.1	10.2	14.4	16.7	17.9	21.3	22.7	24.3	23.4	20.1
Ninh Binh	357.5	425.9	440.3	513.4	563.9	631.8	1003.7	1244.0	1971.6	2456.9	2856.1	3744.2
	14.3	19.1	3.4	16.6	9.8	12.0	58.9	23.9	58.5	24.6	16.2	31.1
Hai Phong	4945.3	5681.5	6685.1	7995.2	9526	11172.4	12927	14920.1	17625.3	20776.4	24323.1	28336.4
	30.1	14.9	17.7	19.6	19.1	17.3	15.7	15.4	18.1	17.9	17.1	16.5

Source: General Statistics Office of Vietnam
* The upper rows indicate the industrial production (Unit: billion VND), whereas the lower rows show the growth rates (Unit: %)
* Industrial production based on the prices in 1994.

Table 15: Trend of FDI Projects in Northern Vietnam

Province City	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Quang Ninh	6	6	8	5	7	12	18	13	13	10	12	11
	290.8	61.7	16.2	5.5	7.6	39.3	71.0	97.3	98.5	40.2	200.6	180.6
Thai Binh				2		1		4		4	2	
				2.4		13.6		5.7		9.4	45.9	
Nam Dinh	2					5	3				4	3
	5.9					4.7	53.3				5.6	22.2
Ninh Binh	3		1					3			6	4
	15.8		1.3					2.5			404.3	39.3
Hai Phong	20	7	13	2	10	22	32	19	25	34	55	31
	330.4	11.0	40.3	2.5	13.1	36.7	130.3	277.9	289.8	168.9	540.0	310.9

Source: General Statistics Office of Vietnam (different from the data compiled by the Department of Planning and Investment, People's Committee of Hai Phong City)
* The upper rows indicate the number of investment projects and the lower rows show the amounts of registered capital (Unit: million USD)

Trend of the volume of cargo handled at Hai Phong Port

The annual volume of cargo handled at Hai Phong Port jumped three-fold from 4.6 million tons in 1997 to 13.9 million tons in 2008. The volume of exports has been increasing notably rapidly since 2005 (Table 16).

Although direct causality between the project and the increase in the volume of cargo handled at Hai Phong Port could not be identified as it involves various other factors, the project seems to have contributed to the facilitation of logistics through improvement in road transport.

Container yard at Hai Phong Port

the province after the completion of the project (original outputs), and another park and a university were constructed after the completion of the additional works. (Currently, there are eight industrial parks altogether in the province.)

Table 16: Volume of Cargo Handled at Hai Phong Port

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	4,600	5,460	6,500	7,645	8,575	10,350	10,518	10,500	10,511	11,151	12,301	13,900
Export	1,702	3,813	945	1,234	1,336	1,400	1,758	1,800	1,911	2,825	2,684	3,231
Import	2,898	1,647	3,155	3,586	4,358	5,370	5,401	5,370	5,370	5,199	6,218	7,635
Domestic			2,400	2,825	2,881	3,580	3,359	3,330	3,230	3,127	3,399	3,034

Source: General Statistics Office of Vietnam (Unit: 1,000 ton)

Others (Beneficiary survey results)

A beneficiary survey was conducted on the status of industrial development along National Highway No.10 after the completion of the project. Table 17 provides the results of the survey.

Table 17: Industrial Development along National Highway No.10 after the Completion of the Project (N=365)

Question	Yes		No		Unclear/unknown	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
Industrial development has been facilitated as a result of implementing the project.	332	91.0	6	1.6	27	7.4

Source: Results from the beneficiary survey

More than 90% of the respondents expressed that the industrial development in the areas along National Highway No.10 was facilitated as a result of implementing the project. Although direct causality between the project and the industrial development in the areas could not be identified as it involves various other factors than the expansion of the traffic network, it is deemed that the project has contributed to the enhancement of industrial development through improvement in the logistics across the area.

In the beneficiary survey, private companies that opened offices in the area or moved from other areas quoted the following as a reason for their entry: "The development of National Highway No.10 was one of the essential factors for our business expansion. Without the improvement of the highway, our business would not have expanded as it has today." This statement proves that the development of the traffic network has contributed to the improvement in the business environment and thus the business expansion of these companies.

3.4.1.2 Improvement in the Standard of Living in Northern Vietnam

As shown in Table 18, the GRDP per capita in the provinces and the city along National Highway No.10 has been rising sharply. It started to upsurge around 2005 when the original outputs were completed. This trend is particularly notable in Ninh Binh Province, which had been less developed than the other provinces.

Based on the GRDP figures, it is deemed that the project has indirectly contributed to the enhanced standards of living in Northern Vietnam, through capital inflow and expanded industrial production.

Table 18: Trend of GRDP Per Capita

Province City	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Quang Ninh	3842.6	4213.9	4625.9	5338.3	6179.2	7189.8	8441.6	9763.0	11705.9	14542.5	17218.4	20188.4
		9.7	9.8	15.4	15.8	16.4	17.4	15.7	19.9	24.2	18.4	17.2
Thai Binh	2601.3	3053.1	3083.6	3243.3	3448.6	3765.7	4054.6	4871.7	5857.0	6754.3	7988.1	10301.7
		17.4	1.0	5.2	6.3	9.2	7.7	20.2	20.2	15.3	18.3	29.0
Nam Dinh	2286.9	2594.6	2734.1	2855.6	3116.8	3450.5	3899.0	4499.7	5213.9	6207.8	7450.0	9751.7
		13.5	5.4	4.4	9.1	10.7	13.0	15.4	15.9	19.1	20.0	30.9
Ninh Binh	1828.8	2139.6	2137.5	2695.7	2974.3	3335.0	3679.1	4443.3	5437.3	6347.6	7870.7	11349.6
		17.0	-0.1	26.1	10.3	12.1	10.3	20.8	22.4	16.7	24.0	44.2
Hai Phong			5468.6	6189.3	6967.7	7914.1	8889.7	10403.8	11973.4	14134.9	17599.9	23346.9
				13.2	12.6	13.6	12.3	17.0	14.7	18.4	24.5	32.7

Source: General Statistics Office of Vietnam
Note 1): The upper rows indicate the GRDP per capita (Unit: 1,000 VDN), whereas the lower rows show the year-on-year growth rates (Unit: %)
Note 2): The GRDP per capita is based on current prices in respective year.

A beneficiary survey was conducted on economic activities of farmers residing along National Highway No.10 after the completion of the project. The results from the survey are provided in Table 19. Around 90% of the respondents acknowledged that their economic activities were encouraged as a result of implementing the project. Also, it has become easier for farmers to change the job to industrial fields, which means more work options apart from agriculture. Thus, it is deemed that the project has brought about positive effects on farmers' livelihood.

Interview with residents along National Highway No.10

Table 19: Economic Activities of Farmers along National Highway No.10 after the Completion of the Project (N=313)

Question	Yes		No		Unclear/unknown	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
It became easier to procure fertilizers and other supplies necessary for agricultural activities after the completion of the project.	291	93.0	5	1.6	17	5.4
It became easier to sell agricultural products after the completion of the project.	279	89.1	15	4.8	19	6.1
It became easier for the family to change the job from agriculture to industry after the completion of the project.	270	86.3	20	6.4	23	7.3

Source: Results from the beneficiary survey

3.4.2 Other Impacts

3.4.2.1 Impact on Traffic Accidents

As shown in Table 20, the number of traffic accidents on National Highway No.10 has been at about the same level before and after the completion of the project. There is no statistically significant change seen after 2005[13]. However, the beneficiary survey focused on the traffic accident status on National Highway No.10 after the completion of the project found, as shown in Table 21, that 60% of the respondents feel that the number of accidents increased after the completion of the project.

Table 20: Number of Traffic Accidents along National Highway No.10

Year	No. of accidents (growth %)	No. of accidents involving deaths (growth %)	No. of accidents involving injury (growth %)
2003	126	45	90
2004	215 (70.6)	75 (66.7)	199 (121.1)
2005	91 (-57.7)	22 (-70.7)	125 (-37.2)
2006	212 (133.0)	57 (159.1)	222 (77.6)
2007	203 (-4.2)	72 (26.3)	210 (-5.4)
2008	215 (5.9)	54 (-25.0)	239 (13.8)

Source: Results from the questionnaire survey of RRMU2

[13] According to RRMU2, there was no specific reason for the drop in 2005.

Table 21: People's Perception on Traffic Accidents along National Highway No.10(N=365)

Question	Yes		No		Unclear/unknown	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
There are more accidents after the completion of the project than before.	219	60.0	81	22.2	65	17.8

Source: Results from the beneficiary survey

The respondents raised the following factors as major causes of accidents: (i) the volume of traffic and driving speeds have increased, (ii) both automobiles and motorbikes use the same lanes, (iii) the development of infrastructure for traffic safety, such as installation of the center divider, is not sufficient, and (iv) the awareness of traffic safety is lacking.

Traffic accident continues to be a serious problem in Vietnam. In 1997, the Government established a National Traffic Safety Committee (NTSC), which formulates and implements traffic safety programs at the national level[14]. For example, the Road Traffic Law was revised in February 2009 to make the use of helmets compulsory, prohibit drink-driving, and so forth. The measures have been so effective that the degree of damage in traffic accidents has been alleviated on National Highway No.10, according to an interview survey of RRMU2. In the meantime, JICA has been assisting in preparing Vietnam's traffic safety measures through yen loan project: "Northern Vietnam National Roads Traffic Safety Improvement Project", which also covers National Highway No.10 in its scope.

The following measures are still needed for ensuring traffic safety.

- Put in place the central divider between the opposite bound lanes and other physical measures necessary for upgrading the infrastructure for traffic safety.
- Push forward more activities to raise drivers' and residents' awareness of traffic safety.
- Secure a budget necessary for establishing the traffic safety corridor[15], including costs for removing illegal structures.

3.4.2.2 Impacts on the natural environment

No significant negative impact on the natural environment has been observed during or after the implementation of the project.

[14] For instance, the NTSC carries out activities for raising awareness of drivers and local residents on traffic safety in collaboration with the Traffic Safety Committee of each provincial government, General Police Office, and the Ministry of Education and Training.

[15] Decision 1856 (2007), an administrative instruction of Decree 186, prohibits the placement of any structure within the 15-m distance from the edge of national highways. In urban areas, however, a significant number of illegal structures and private houses exist, which poses a concern over safety, environment and sanitation. In order to realize a traffic safety corridor, it is imperative to secure a budget for removing and relocating these structures.

The environmental impact assessment (EIA) for this project was completed in March 1999. As for environmental considerations to be given during the construction works, the contractors have submitted to PMU2 monthly reports on the status of implementing and monitoring environmental practices in line with the EIA, such as adequate management of surplus soil, air and water pollution control, and noise and vibration reduction measures. More specifically, (i) air pollution was evaluated by measuring the TSP concentration on a monthly basis; and (ii) water pollution was evaluated by measuring the suspended substance (SS), bio-chemical oxygen demand (BOD), dissolved oxygen (DO) and other parameters. All measurements have proved to be below the required levels, according to the hearing survey of PMU2. The environmental monitoring performed during the construction works is deemed as adequate in terms of frequency and contents. No particular environmental measures have been put in place after the completion of the project.

A beneficiary survey was conducted on the status of air and water pollution, and noise levels in relation to the increased volume of traffic after the completion of the project. Table 22 provides the results of the survey.

Table 22: Impacts on the Environment around National Highway No.10 after the Completion of the Project (N=365)

Question	Yes		No		Unclear/unknown	
	No. of respondents	%	No. of respondents	%	No. of respondents	%
Air pollution increased after the completion of the project.	193	52.9	121	33.2	51	14.0
Water pollution increased after the completion of the project.	108	29.6	169	46.3	88	24.1
Noise level increased after the completion of the project.	198	54.2	112	30.7	55	15.1

Source: Results from the beneficiary survey

Note): The above figures are half-adjusted (rounded). The sum may not necessarily become 100.

According to the above results, more than 50% of the residents in the vicinity think "air pollution increased" and "the noise level increased" after the completion of the project, while those replying "water pollution increased" accounted for less than 30% of the respondents. Although the possibility of the presence of other external factors cannot be eliminated, there is a certain level of causality between the project and the increases in air pollution and noise level. Therefore, monitoring after the project completion and implementation of alleviation measures are necessary in accordance with the results of monitoring. On the contrary, causality between the project and water pollution is deemed as minimal. Significant impact on safe water access and drainage for residents along the project sites has not been found. Incidentally, the beneficiary survey did not include questions focusing solely on the

environmental impacts during the implementation of the project.

An interview survey[16] targeted at residents in the vicinity of Kien Bridge has identified that some feel that there is more dust than before in accordance with the increase in the traffic volume as a result of implementing the project. In addition, they mentioned that the level of noise caused by container trucks passing during the nighttime between 20 o'clock and 3 o'clock was acceptable.

3.4.2.3 Land Acquisition and Resettlement

The project involved the resettlement of residents and acquisition of land in preparation for carrying out the construction works. JICA's preliminary study (SAPROF) estimated that around 360 households would be subject to resettlement. The actual numbers of households involved is given in Table 23. The central part of the action was to compensate land owners for their land, because the project basically focused on improving the existing road. (The right columns of Table 23 describe the processes of land acquisition and resettlement and the roles of parties concerned.)

Table 23: Results of Resettlement, and Land Acquisition and Resettlement Processes

Province City	No. of households relocated	Land acquisition and resettlement processes	Role-sharing among parties concerned
Thai Binh	38	(i) Formulation of a Resettlement Action Plan (RAP) →(ii) Selection of a resettlement site →(iii) Public hearings on resettlement →(iv) Calculation of the amounts of compensation and negotiation with the residents →(v) Agreement on the RAP →(vi) Development of the resettlement site →(vii) Resettling	PMU2: 1. Coordination with the provinces and the city along the highway, 2. Formulation of an RAP, 3. Identification of a resettlement site Provincial and municipal governments along the highway: 1. Organization of public hearings on resettlement, 2. Calculation of the amounts of compensation and negotiation with the residents, 3. Development of the resettlement site (access road, electricity, water supply) MOT: Secure budgets necessary for acquiring land and resettling residents.
Nam Dinh	116		
Ninh Binh	57		
Hai Phong	105		
Total	316		

Source: Results from the questionnaire survey and interviews with PMU2 in the on-site survey.

A beneficiary survey was conducted on the status of resettlement and the level of satisfaction about the resettlement site. The results of the survey are provided below (in Tables 24 and 25.) No specific issue was raised in the beneficiary survey targeted at the residents. Furthermore, the interview survey focusing on the residents in the vicinity of Kien Bridge revealed that the residents subject to resettlement attended public hearings and were generally satisfied with the details of compensation.

[16] Interview survey was conducted to the shopkeeper (resident) along the Kien Bridge approach road during site investigation.

34 residents, equivalent to approximately 10% of the respondents to the beneficiary survey, were subject to the resettlement in conjunction with land acquisition. 23 of the resettled people were resettled in the new site while the other 11 opted for other places. They explained the reasons why not moving to the resettlement site as the narrowness of land compared to their original land and change in life. Some contributed a part of their land and moved their houses to the remaining part of the land (Thai Binh Province, Hai Phong City).

Table 24: Status of Resettlement by the Local Residents

Province City	Resettled (count)	Did not resettle (count)	Total (count)
Thai Binh	20	44	64
Nam Dinh	4	56	60
Ninh Binh	3	16	19
Hai Phong	7	163	170
Total	34	279	313

Source: Results from the beneficiary survey
Note) 23 out of the 34 respondents who were subject to resettlement moved to the resettlement site.

Of the 23 resettled people, two respondents were not satisfied with the new site because of geographical inconvenience (Hai Phong City).

The number of samples is too limited to conduct a statistically significant analysis, but no dissatisfaction or major issue was found with regard to the resettlement of residents and the resettlement site.

Table 25: Degree of Satisfaction with the Resettlement Site (N=23)

Question	Yes		No		No Idea	
	count	%	count	%	count	%
Are you satisfied with the resettlement site?	17	73.9	2	8.7	4	17.4

Source: Results from the beneficiary survey

3.4.2.4 Capacity Building of Personnel Engaged in the Project (PMU2 Staff and Local Contractors)

The capacity building of personnel engaged in the project, i.e., PMU2 staff and local contractors, was achieved in the course of implementing the project, basically through on-the-job training (OJT.) Concrete outputs include (i) the ability to manage contracts in conformity to the FIDIC standards and (ii) the ability to adopt international standards for technical specifications, such as the ASTM and Japanese standards.

In the case of Kien Bridge, provided as part of the B5 package, the workers acquired techniques and skills in constructing long span cable-stayed bridges, a new technology in Vietnam, and enhanced technical implementation capacities. More specifically, training aimed at technical transfer was included in the project component: a total of approximately 150 local contractors were given technical guidance regarding designing, construction supervision, construction works and maintenance through OJT, seminars held in Hanoi and study tours to Japan.

According to PMU2, a local contractor who served as a technical assistant in the construction of Kien Bridge became the chief in the project to construct Rach Mieu Bridge in Tien Giang Province, Southern Vietnam, after the implementation of the project. Rach Mieu Bridge is of the cable-stayed structure, the same as Kien Bridge, and was funded fully by Vietnamese capital and built solely by Vietnamese construction companies. This is a good practice case that Vietnamese human resources were cultivated through technical transfer in the course of implementing the project and tapped in projects carried out by Vietnam itself.

Therefore, it is deemed that the project has brought about numerous positive impacts.

3.5 Sustainability (Rating: b)

3.5.1 Structural Aspects of Operation and Maintenance

Before the implementation of the project, National Highway No. 10 was maintained by the Department of Transport of each local government in the five provinces and the city along the road, namely Quang Ninh Province, Hai Phong City, Thai Binh Province, Nam Dinh Province and Ninh Binh Province.

After the completion of the project, the responsibility for the maintenance work was transferred to the Vietnam Road Administration (VRA), under the MOT. The VRA has four Regional Road Maintenance Units (RRMU). RRMU2 is in charge of the maintenance work of National Highway No.10, as the area falls under the jurisdiction of RRMU2. Since June 2006, the unit has been outsourcing actual service delivery to Road Management and Construction Joint Stock Co. (Co.234) and assuming the supervision (contract management, progress management etc.) over the work rendered by the company. The maintenance work of the provincial roads provided as additional outputs is assumed by the Department of Transport of each respective local government. The toll collection task was, in the case of Tan De Toll Plaza, transferred from Co.234 to a private company called TASCO in May 2009. The operation at South Hai Phong Toll Plaza is still performed by Co.234.

No specific issue was observed in terms of operation and maintenance of the roads. As stated above, RRMU2 outsources the maintenance work of National Highway No.10 to Co.234, and both organizations consider the current number of maintenance staff members as sufficient. The maintenance work is performed in accordance with the road maintenance guidelines that are set forth by the MOT and applied to national highways and provincial roads across the country. There is no particular issue in this respect.

Co.234 was founded by equitizing a state-owned enterprise under the umbrella of RRMU2. Since the staff members have now access to stock options, "There is an incentive for employees to improve the performance of the company" (according to the results from the interview survey targeted at Co.234 employees.)

Information concerning the staff of RRMU2 and Co.234 is as given below.

Table 26: Information on the Staff of RRMU2

Year	No. of staff members engaged in the maintenance work of National Highway No.10	Of these, no. of members in charge of O&M (technical staff)	Of these, no. of administrative staff
2006	85	77	8
2007	85	77	8
2008	85	77	8
2009	85	77	8

Source: Answers to the questionnaires from RRMU2

Table 27: Information on the Staff of Co.234

Year	Total no. of staff members	No. of staff members in charge of O&M of National Highway No.10 (technical staff)	Average working years of personnel responsible for O&M
2006	653	136	18
2007	658	129	19
2008	594	125	20
2009	452	132	21

Source: Answers to the questionnaires from Co.234

Currently, the VRA is being restructured. It is promoted to a higher-level organization and is now granted authority over construction works in addition to maintenance work (based on the Prime Minister's Decision proclaimed in October 2009.) While the restructuring of VRA is expected to realize a comprehensive management scheme covering from construction management to maintenance, it is vital to strengthen the organizational capacity for achieving enhanced collaboration within the organization and performing the extra roles to be assumed, in order to accomplish the initial goals set out.

3.5.2 Technical Aspects of Operation and Maintenance

Technical capacity of engineers and technical staff

Approximately 90% of the RRMU2 staff engaged in and all Co. 234 personnel responsible for the maintenance work for National Highway No.10 are technical staff. At the moment, no specific issue has been observed in terms of their technical capacity of fulfilling due tasks, such as planning, bidding, supervision and actual service delivery. The following table presents the academic backgrounds of the staff responsible for the maintenance work at both RRMU2 and Co.234.

Table 28: Academic Background of the RRMU2 Personnel (including Administrative Staff) Responsible for Maintenance Work

University graduates or higher	High school graduates	Secondary school graduates
82%	8%	10%

Source: Answers to the questionnaires from RRMU2

Table 29: Academic Background of the Co.234 Personnel (Technical Staff) Responsible for Maintenance Work

University graduates or higher	High school graduates	Secondary school graduates
7%	50%	43%

Source: Answers to the questionnaires from Co.234

Provision of training

As far as Kien Bridge is concerned, guidelines for maintenance work were developed as part of the project and also technical instructions have been provided by contractors. The maintenance work for long span cable-stayed bridges, however, is not yet rooted in Vietnam. The know-how on planning and bidding for large-scale repair is considered not sufficient at this point in time.

The VRA runs five technical and vocational education and training (TVET) schools at which training sessions for strengthening basic technical skills are conducted for the technical staff of Co.234 on a regular basis. These training sessions have been provided without any trouble. Thus, there is no particular issue in the aspect of training.

3.5.3 Financial Aspects of Operation and Maintenance

The budget for operation and maintenance costs are not adequately secured: "The budget allocated is approximately a half of what was requested as maintenance expenses. It is difficult to fulfill all road maintenance guidelines set forth by the MOT within such limited budgets" (according to hearing surveys of RRMU2, Co.234, and the Department of Transport

of Hai Phong City.) The consequence of the budgetary deficiency are pointed out as (i) the low levels of salaries of the RRMU2 staff, (ii) the lack of equipment needed for removing wrecked vehicles after accidents, and so forth.

Table 30 shows the amounts of tolls collected and expenses spent on maintenance work of National Highway No.10. The maintenance budget is allocated to the MOT by the MOF, and the MOT distributes it to its sub-organizations, including the VRA. The VRA will then determine budget allocation with consideration given to the requests submitted by RRMUs under its jurisdiction and the Departments of Transport of individual local governments based on their road maintenance plans. The maintenance costs necessary for the provincial roads and the bridges developed in the project are covered by the provincial governments' budgets.

The maintenance budgets come from revenues from tolls as well as the national budgets. The Circular 90 provisions prepared by the MOF require that the revenue from toll collection come into the national treasury; more specifically, 15% of the revenue is secured for the toll collection work, 5% is managed by the VRA as a modernization fund, and 80% enters the national treasury (MOF). Not all the revenues from toll collection in the national treasury are necessarily allocated for the maintenance budget. Table 31 presents the allocation of road maintenance budget by the MOF to the VRA. Despite the lack of data in part, the table clearly suggests that the amount of budget allocated is far less than the amount of budget requested.

Table 30: Toll Fee Revenue and O&M Expenditures Related to National Highway No.10

(Unit: million VND)

	2006	2007	2008
Toll fee collected from National Highway No.10	30,603	31,720	35,256
Contributed to Government budget	23,721	25,417	28,231
O&M expenditures for National Highway No.10	10,267	12,398	20,665
Management and regular repair	7,859	7,950	9,258
Daily maintenance*	2,408	4,448	11,407

Source: Answers to the questionnaires from RRMU2

Note) The daily maintenance work includes markings on roads, greenery keeping along the center divider, etc.

Table 31: Budget Allocation by the MOF to VRA for Road Maintenance

(Unit: billion VND)

	2005	2006	2007	2008	2009
Amount of budget requested	2,200	N.A.	N.A.	N.A.	2,962
Amount of budget allocated	1,002	944	1,575	2,101	2,199

Source: VRA

In Vietnam, the investment budget and the recurrent budget are controlled by the Ministry of Planning and Investment (MPI) and the MOF, respectively. The investment fund for infrastructure projects is provided mainly by donors. Thus, it is urgent to coordinate and achieve consistency.

In addition, establishing a Road Maintenance Fund has been discussed and planned as a financial source dedicated to road maintenance[17]; but little progress has been made in creating a concrete framework of the fund. It is important to push forward the preparation for establishing the fund.

3.5.4 Current Status of Operation and Maintenance

In general, no specific issue was observed in terms of operation and maintenance. The operation and maintenance are deemed as in good state.

The roads and bridges included in the project are maintained in good condition on the whole; no specific issue has been observed. The maintenance equipment and Kien Bridge are also maintained without any particular problem. Overloaded trucks have been identified as one of the factors that will deteriorate the road pavement and bridges.

As a matter of fact, an overloaded truck was witnessed stranded on the approach road to Kien Bridge, during the on-site survey; it had failed to climb up the approach and was causing traffic congestion. The Department of Transport of each local government, which is responsible for traffic control, is now implementing various measures, including restraining illegal trucks, penalizing the drivers, and fining the truck owners. Each Department of Transport should continue to tighten the control.

An overloaded truck, which failed to move up the approach to Kien Bridge, was stranded

Some problems have been observed in terms of financial aspects of operation and maintenance; therefore sustainability of the project is fair.

[17] The plan for the Road Maintenance Fund has already been approved by The Parliament within the Road Traffic Law 2008.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

While the project has been found as to have taken a longer implementation period than the original plan and some financial issues have been identified in operation and maintenance, the contents of the project are highly consistent with the country's policies and the project has brought about many positive impacts. In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendation to Executing Agencies

<To Improve Traffic Safety>

(Recommendations to VRA, NTSC and local governments) To reduce the number of traffic accidents, further development of infrastructure, such as setting up a center divider between the opposite bound lanes, is needed. It is also important to facilitate awareness-raising activities, such as traffic safety sessions at primary and secondary schools, safety activities in local communities, and safety promotion campaigns via mass media.

(Recommendations to local governments) All local governments along National Highway No.10 should identify all illegal structures along the highway (within the 15-meter distance on each side) and estimate a budget necessary for removing the structures. Just as importantly, they should urge the VRA and the MOT on the need for favorable budget allocation and other viable measures, in order to take a step forward to a traffic safety corridor. In urban areas, in particular, there are some old privately-owned structures; since the budget for compensating for the relocation of these property owners comes short, the removal of illegal structures is not easy. It is vital to facilitate necessary preparation and coordination for resolving such bottlenecks.

(Recommendations to local governments) Traffic control, including the overloading issue, is undertaken by the Department of Transport of each local government. While the departments are executing a number of traffic control measures, such as restraining illegal trucks (for up to 20 days), penalizing the drivers and fining the truck owners, the control measures should further be bolstered by, for example, increasing the number of personnel, in order to assure both the maintenance of and safety on the road.

<To Enhance O&M>

(Recommendations to VRA and RRMU2) The maintenance work for long span cable-stayed bridges is new in Vietnam. Although some training on the maintenance was

included in the project components, the know-how on planning and bidding for large-scale repair projects is still lacking. Thus, the authorities should list up all possible technical challenges, with the aid of university professors, experts and other relevant external resources, and continuously strive to build technical capacity of the staff. It is advisable to study examples of long span cable-stayed bridge construction in Japan and other countries that are advanced in constructing this structure.

(Recommendations to VRA, MOF and MOT) In pursuit of the realization of a Road Maintenance Fund, which is currently being discussed as a means to attain an adequate budget for road maintenance, the VRA should thoroughly examine a design of the fund mechanism, based on instructions given by the MOT, and submit a proposal to the MOT. In the process of the examination, the MOT should discuss the fund mechanism closely with the MOF.

(Recommendations to VRA) In principle, the construction and supervision of transport infrastructure in Vietnam is undertaken by PMUs, whereas its maintenance lies in the hands of the VRA. This context has been pointed at as a cause of difficulty in assuring sustainability after the completion of the project. The restructuring of the VRA, currently in progress, is expected to lead to an integrated road management covering from construction management and supervision to maintenance. To achieve the initial objective, however, the VRA should fortify collaboration within the organization−by, for example, installing sections and human resources dedicated to enhancing coordination and information sharing with PMUs, to be regrouped into the VRA's jurisdiction, at project implementation stage−and build the organizational capacity for fulfilling the roles to be added (construction management and supervision) through training and the like. Moreover, with the fact that Decree 12 [18] proclaimed on February 12, 2009 stipulates "PMUs should employ personnel in charge of maintenance in advance", compliance with the decree is also desired.

<To improve Project Management>

(Recommendations to PMU2) In order to make sure that sufficient environmental and safety measures to be taken place during construction, PMU2 should reconsider selection criteria and method for contractors in order to secure necessary man-month and capacity, in accordance with the relevant TOR, when preparing bid documents and selecting contractors.

4.2.2 Recommendation to JICA

<To Improve Traffic Safety>

[18] Decree on Management of Investment Projects on the Construction of Works

JICA should play a leading role in the bilateral initiatives with the Government of Vietnam and in the donor community in the field of road safety, by undertaking not only initiatives between Vietnam and Japan based on specific projects but also multi-lateral frameworks, including Transport Partnership, Poverty Reduction Support Credit (PRSC) and the Joint Portfolio Performance Review Meeting composed of six banks and the Vietnamese government, in tackling traffic safety issues in a complementary and multi-tiered manner at the project, program and policy levels.

4.3 Lessons Learned

Kien Bridge constructed in the project is the very first long span cable-stayed bridge in Vietnam. It involves new techniques unique to the structure. The pertinent package included the "training and technical transfer" component, which provided programs for transferring technology to local contractors. More specifically, training, OJT-based technical transfer, study tours to Japan, seminars in Hanoi and other well-defined programs were conducted with respect to designing, construction supervision, construction works and maintenance. These efforts have resulted in higher levels of knowledge and skills related to the construction of long span cable-stayed bridges in the country. One of the visible effects is that Vietnam has replicated the technology transferred through the project in its own construction project. It is a good practice representing that the technology has spread out in the country. (See 3.4.2.4 "Capacity Building of Personnel Engaged in the Project (PMU2 Staff and Local Contractors.)")

In this way, an introduction of a new technology should be accompanied by technical assistance in the project components, in order to transfer and spread out knowledge and skills to local contractors.

End

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs Improvement of roads and bridges on National Highway No.10	・ Improvement of roads and bridges from Bi Cho to Ninh Binh ・ Construction of bypass in Hai Phong urban areas ・ Construction of bridges and bypass at ferry crossing points and at the bridge utilized for both road and rail road	Same as planned Same as planned Same as planned <u>Additional Outputs:</u> ・ Improvement of Provincial roads, bypass and bridges connecting to National Highway No.10
Procurement of O&M Equipments	・ O&M Equipments ・ Toll plazas (4)	・ O&M Equipments: Nearly same as planned ・ Toll plazas (3)
Consulting Services	・ Foreign engineers: 597M/M ・ Local engineers: 1,211M/M	・ Foreign engineers: 686M/M ・ Local engineers: 2,397M/M
2. Project Period	March 1998 – August 2002 （54 months）	<u>For original outputs:</u> March 1998 – September 2004 （79 months） <u>For additional outputs:</u> March 1998 – September 2007 （115 months）
3. Project Cost Amount paid in Foreign currency	18,186 Million Yen	26,876 Million Yen
Amount paid in Local currency	18,337 Million Yen （1,833,700 Million VND）	883 Million Yen （883,568 Million VND）
Total	36,523 Million Yen	27,759 Million Yen
Japanese ODA loan portion	30,461 Million Yen	26,876 Million Yen
Exchange Rate	1VND＝0.01Yen （As of October, 1999） Note: Planned project cost is based on the appraisal of Phase II (VNVII-5) in 2000.	1VND＝0.001Yen （Average for 2000）

Vietnam

Ex-post Evaluation Report on ODA Loan Projects

Binh Bridge Construction Project

External Evaluator: Hajime Onishi

Mitsubishi UFJ Research & Consulting Co., Ltd.

1. Project Description

Map of Project Area

The Binh Bridge (Photo taken from the approach road at the southern side of the Cam River)

1.1. Background

Hai Phong is the third biggest city in Vietnam next to Ho Chi Minh and Hanoi with a population of 1.85 million as of 2008[1]. With Hai Phong Port that serves as an international gateway to the north, the city is a center of economy and physical distribution in the northern part of the country. It has long prospered as a port town where shipping industry, fisheries and marine product processing industry have developed as major industries. Since the 1990s, it has drawn attention from foreign firms as a promising investment destination under the market economy policy of the national government and foreign companies mainly in manufacturing have set up their business in the city at an accelerated rate.

The city has mainly developed on the south side of the Cam River (a tributary of the Red River that runs through northern Vietnam) that runs across the city. However, traffic conditions deteriorated severely due to an increase of flow of people and goods as a result of economic development and development of road infrastructure became an urgent need. The ferry was the only means of crossing the Cam River between the north side that has newly developed and the south side where the city center is located. This was the biggest bottleneck in city traffic.

Of ferry services for crossing the river, the Binh Ferry in the city center and that connects to National Highway No.10 had the heaviest traffic. The traffic increased year after year and

[1] Source: Statistical Yearbook of Vietnam 2008

seriously blocked smooth transportation. In rush hours, for example, people had to wait for around one hour.

Against the backdrop, Hai Phong had an urgent need to construct a bridge across the river as an alternative to the ferry early for smooth flow of the traffic of crossing the river and to develop city traffic network to connect the north and south sides of the river.

1.2. Project Outline

The objective of this project is to improve the traffic network and increase efficiency of physical distribution in Hai Phong and northern Vietnam by constructing a new bridge near a ferry point to cross the Cam River in Hai Phong, thereby contributing to the economic development in the region.

Loan Amount / Disbursed Amount	8,020million yen / 7,308million yen
Exchange of Notes / Loan Agreement Signing Date	March, 2000 / March, 2000
Terms and Conditions	Interest Rate:1.0% (0.75% for Consulting Services and Auditing Services) Repayment Period:40 years (Grace Period:10 years) Conditions for Procurement: Tied (Main Contracts), Bilateral Tied (Consulting Services), General Untied (Auditing Services)
Borrower / Executing Agencies	Guarantor: The Government of Socialist Republic of Vietnam / Hai Hai Phong People's Committee
Final Disbursement Date	July, 2007
Main Contractors (over 1 billion yen)	IHI (Japan)・Shimizu Corporation (Japan)・Sumitomo Construction (Japan) (JV)
Main Consultant (over 100 million yen)	Chodai (Japan)・Japan Overseas Consultants (Japan) (JV)
Feasibility Studies, etc.	1994: Feasibility Study (by The Government of Finland) 1999: Procurement Support Study (Dispatching specialists)

2. Outline of the Evaluation Study

2.1. External Evaluator

Hajime Onishi (Mitsubishi UFJ Research & Consulting)

2.2. Duration of Evaluation Study

Duration of the Study: September, 2009-June, 2010

Duration of the Field Study: December, 2009 / March, 2010

2.3. Constraints to the Evaluation

None.

3. Result of the Evaluation (Overall Rating: A)

3.1. Relevance (Rating: a)

3.1.1. Relevance with the Development Plan of Vietnam

In 1999 when the project appraisal was carried out, the Socio-Economic Development Plan 1996-2000 (commonly called 6th Five-Year Plan), which was a top-level national plan, included the realization of smooth traffic of major routes and supply of transportation infrastructure that meets regional demand as two of main development goals for the facilitation of socio-economic development, granting priority to the transport sector. As related policies in the transport sector in Hai Phong, the overall master plan for Hai Phong city to 2020 that was formulated around the same time included industry development through foreign investment as a purpose of the plan and infrastructure development of port and harbors and industrial parks as well as upgrading of national routes were planned. It is notable that the master plan included a plan to build a bridge over the Cam River to connect the newly developed north-bank side and the city center on the south-bank side to improve the traffic flow over the river. Thus it is fair to conclude that the project to construct a new bridge in order to improve the traffic over the Cam River and develop city traffic network is highly consistent with the upstream policy as a measure to resolve development issues and assist the development plan of Hai Phong in 1999.

In the national 10-Year Socio-Economic Development Strategy 2001-2010[2] (formulated in 2001) and the Socio-Economic Development Plan 2006-2010 (commonly called 8th Five-Year Plan) that are the highest-level national plans currently in place have designated acceleration of infrastructure development as a major issue. In particular, transport infrastructure development as well as social infrastructure development is regarded as a priority policy. A Politburo decision in 2003 and a Cabinet decision in 2004 provide the promotion of transport

[2] The Government of Vietnam has formulated the 10-Year Socio-Economic Development Strategy as the topmost document that summarizes the national development vision and Five-Year Socio-Economic Development Plans based on the strategy since 2001. Based on the strategy and plan, it formulates a Five-Year Public Investment Plan (PIP) and annual plan and budget allocation. In collaboration with donors, it formulated the Comprehensive Poverty Reduction and Growth Strategy (CPRGS) in 2002 in parallel with the 10-year strategy and five-year plans. Although the Government of Vietnam regarded the CPRGS as an action plan to implement the 10-year strategy and five-year plans, donors continued to point out confusion and adverse effects of multiple national strategies. As a result, the 8th Five-Year Socio-Economic Development Plan 2006-2010 was integrated with the CPRGS in real terms to consolidate the national development strategy.

infrastructure development and improvement in the northern economic region in Vietnam (target year: 2020). The development of the infrastructure continues to be placed as a priority issue[3]. The Comprehensive Poverty Reduction and Growth Strategy (CPRGS) that was formulated in 2002 recognized that large-scale infrastructure development contributes to poverty reduction and that transport infrastructure development helps poverty reduction through economic growth. In relation to the transport sector policy of Hai Phong, the overall master plan for Hai Phong city to 2020 continues to be valid. In its 2001 revision, relocation of city administrative organ to the north side of the Cam River is added as a new long-term policy goal in addition to the urban development in the north side of the city that was originally in the plan as a policy goal. Besides, two more bridges are planned to be constructed other than the Binh Bridge for further improvement of traffic flow over the river[4].

This shows that transport infrastructure development in northern Vietnam is still a priority issue in the national policy and improvement of the traffic over the Cam River has been a critical policy goal in the master plan of city development of Hai Phong. The project is a most efficient option (discontinuation of ferry operation and construction of bridges) to achieve the policy goal and it was highly consistent with the city development plan and sector policy.

3.1.2. Relevance with the Development Needs of Vietnam

In 1999, the ferry was the only means of transportation to cross the Cam River. This divided the city traffic and blocked smooth flow of traffic. The traffic of the Binh Ferry that was the heaviest among a number of ferries continued to increase year after year and people had to wait as long as one hour during rush hours.

The demand for crossing the Cam River has been growing even after the completion of the project[5]. The project to construct a new bridge over the river as an alternative to the ferry to make the traffic flow smooth has been highly relevant.

3.1.3. Relevance with Japan's ODA Policy

In 1999, JICA (former JBIC) placed infrastructure development as a focal field of assistance for Vietnam and the transport sector as a top priority sector together with the electric power sector. As described earlier, the Study on the National Transport Development Strategy in the Socialist Republic of Vietnam (VITRANSS) that was formulated under the leadership of JICA serves as a logical basis of the decision of transport

[3] The Study on the National Transport Development Strategy in the Socialist Republic of Vietnam (VITRANSS) that was formulated under the leadership of JICA served as a logical basis of the decision.
[4] The bridge construction plan is also specified in the Hai Phong City Construction Plan to 2025 that was formulated in 2009.
[5] See 2.3 Effectiveness (1) Traffic Volume of the Binh Bridge for details.

infrastructure development policies and plans in Vietnam. Furthermore, the Government of Japan extended a yen-loan to the rehabilitation project of Hai Phong Port (that is a gateway in northern Vietnam) around the same time and thus northern Vietnam including Hai Phong was a focal area of Japan's ODA projects in Vietnam.

This project has been highly relevant with the country's 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

The table below presents a comparison of the planned output and the actual output. A semi-automatic toll collection system that is capable of identifying three types of vehicle was originally delivered. Later, it was changed to a system that is able to identify seven types of vehicle in response to the demand of Vietnam (Ministry of Transport) and the system was delivered. The differences between the planned and actual figures for the bridge width and the approach road length are due to the result of the detailed design (D/D).

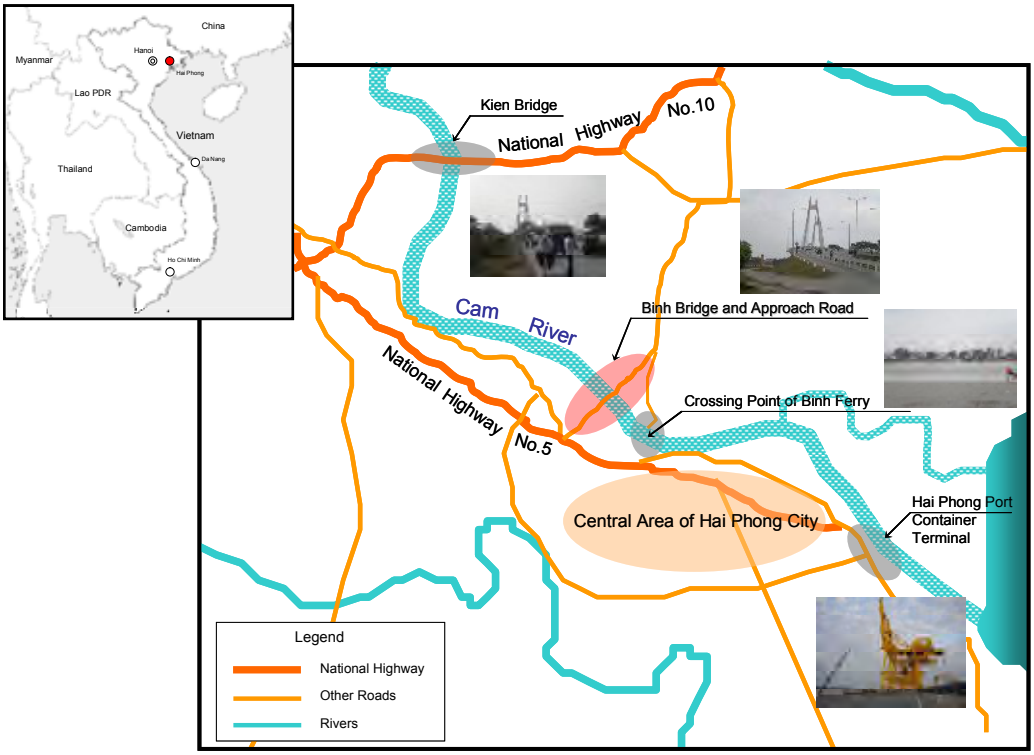


Figure-1: Location of the Project Site (Magnified View of Hai Phong City)

Table1: Changes in Output

Project Components	Original	Actual	Differences
1. Bridge Construction 1.1 Length	17 spans continuous steel composite concrete girder, including 3 spans cable stayed bridge (Main span: 260m)	The same	As planned
1.2 Width	23.5m (3.75m x 4 lanes, sidewalk, etc.)	22.5m (3.75m x 4 lanes, sidewalk, etc.)	Mostly as planned
1.3 Approach Road	South side: 600m, North side: 900m (including intersection construction at south side)	South side: 594m, North side: 888m (including intersection construction at south side)	Mostly as planned
1.4 Toll Plaza, Toll Collection System	Toll plaza construction at north side, Installation of toll collection system	Toll plaza construction at north side, Revision of toll collection system and reinstallation	Revision of toll collection system
2. Consulting Services (C/S)	839.0M/M	723.4M/M	Reduction of 115.6M/M

Source: JICA internal documents and results of interviews

As for consulting service, the number of consultants turned out much smaller than originally projected, in construction supervision in particular[6]. These figures were probably overestimated in the first place because this was the first construction of a long span cable-stayed bridge in Vietnam.

3.2.2. Project Inputs

3.2.2.1. Project Period

The project period was longer than planned.

The project was scheduled from March 2000 to February 2004, a period of 48 months, but it extended to 63 months, from March 2000[7] to May 2005[8], which was equivalent to 131% of the original plan.

[6] The original and actual consulting service man-month (M/M) of design services were almost the same (original: 84 M/M, actual: 85.9 M/M), whereas the actual M/M of construction supervision services was decreased more than 100 M/M compared with the original one (original: 755 M/M, actual: 637.5 M/M). Note that the actual consulting service cost was decreased 68 million yen compared with the original plan (original: 819 million yen, actual: 751 million yen).

[7] There were three options of the beginning of the project: (i) when the L/A was signed (March 2000), (ii) when construction of the south-side approach road was launched with Vietnamese fund (May 1998) and (iii) when the selection of consultants began (October 1999). They are milestones of the project and all the events can be considered as the beginning of the project. Because the executing agency, HP Bridge, considers (i) signing of L/A as the beginning, we chose it as the beginning date.

[8] Loan extension of the project was completed in July 2007. According to the executing agency, HP Bridge, all the project tasks were completed in May 2007 (completion of installation of toll collection system). However, because the Binh Bridge opened and began services on May 13, 2005, it is fair to consider this date as the date of completion.

The major causes of the delay are the delay of the approval of the selection of consultants (critical path) in the first half of the project and the significant delay due to the change of the toll collection system in the latter half. Details of the delay are explained below.

- It took time to have the final decision by the Government of Vietnam (approval by the Ministry of Planning and Investment, in particular) in the selection of the consultants. (Sources: Answers to the questionnaire to HP Bridge and results of interviews)
- After the approval of the investment decision of the project (May 1997), the funding source changed from the U.K., Finland and the Netherlands to Japan. This required a series of re-approvals of investment decision, design and cost estimation. The bidding for construction work was not allowed to be begun until after the re-approval. As a result, the bidding for the bridge construction package began about 1.5 years later than original schedule. (Source: JICA internal documents and results of interviews)

Table-2: Comparative Table of Project Periods

Task	Original Schedule (months)	Actual (months)	Differences (months)
Selection of Consultants[1)]	Aug. 1999 – Nov. 1999 (4.0)	Dec. 1999 – Sep. 2000 (10.0)	6.0
Review of Detailed Design	Jan. 2000 – Jun. 2000 (6.0)	Nov. 2000 – Apr. 2001 (6.0)	0.0
Tender / Contract	Jan. 2000 – Feb. 2001 (14.0)	Dec. 2001 – Jul. 2002 (8.0)	- 6.0
Civil Works (incl. Toll Plaza)[2)]	Feb. 2001 – Feb. 2004 (37.0)	Sep. 2002 – Sep. 2005 (37.0)	0.0
Consulting Services	Dec. 1999 – Feb. 2004 (51.0)	Oct. 2000 – May 2005 (56.0)	5.0
Construction of Toll Plaza and Installation of Toll Collection System	Dec. 2003 – Feb. 2004 (3.0)	Completed in May 2007	N/A
Total	Mar. 2000 – Feb. 2004 (48.0)	Mar. 2000 – May 2005 (63.0)	15.0

Source: JICA Internal documents, answers to the questionnaire to HP Bridge and results of interviews
Note-1): The selection of consultants began before the signing of L/A (March 2000).
Note-2): The construction of the south-side approach road began in May 1998 with the funds of the Vietnam side.

3.2.2.2. Project Cost

Total project cost was lower than planned (99% of the original plan).

The total cost of the project was originally 9,435 million yen (the Japanese ODA loan share was 8,020 million yen) but the actual project cost was 8,406 million yen (the Japanese ODA loan share was 7,308 million yen), which was equivalent to 89% of the original plan.

As a result of efficient order placement through the international competitive bidding, the total project cost decreased. The amount of the domestic currency decreased drastically as shown in the Comparison of Original and Actual Scope at the end of the report, because of (i) a decrease in the payment of import taxes (257 million yen, mainly on steel products), (ii) surplus of contingency (44 million yen), and (iii) depreciation of local currency of Vietnamese dong against Japanese yen (especially that of construction cost in dong, 617

million yen)[9].

Although the project period was much longer than planned (131% of the original plan), the project cost was lower than planned (99% of the original plan), therefore efficiency of the project is fair.

3.3. Effectiveness (Rating: a)

The traffic volume of certain types of vehicles is slightly smaller than the projection at the time of appraisal, probably because the demand was overestimated. A clear reduction of traveling time and various positive impacts are recognized.

3.3.1. Quantitative Effects

3.3.1.1. Results from Operation and Effect Indicators

(1) Traffic Volume of the Binh Bridge

As presented in Table 3 below, the traffic volume of three types of vehicle—car, bus and truck—in 2009 was slightly below the projection at the time of appraisal (projection of traffic four years after the opening). On the other hand, the volume of motor bikes is 1.8 times as much as the projection. As analyzed later, the demand of cars and buses was probably overestimated.

Table-3: Traffic Volume of the Binh Bridge

Unit: Vehicle/day or PCU/day

Vehicle type	2005 (before beginning of toll collection)			2005 (after toll collection began)	2006 1 year after opening	2007 2 years after opening	2008 3 years after opening	2009 4 years after opening	*Projection for 4 years after opening* [1]
	Projection for 1 year after opening [1]	Actual result 1 (Average of May 31-June 1)	Actual result 2 (average of July 19 to 25)						
Car [2]	*1,018*	1,261	1,337	1,664	1,790	1,939	2,648	2,946	*3,407*
Bus [2]	*350*	599	1,026	67	98	196	192	206	*675*
Truck	*676*	692	672	569	544	684	862	891	*1,091*
Motor Bike [3]	*12,480*	31,667	20,234	20,608	24,317	29,424	36,192	45,240	*25,334*
Passenger Car Unit [7]	*7,071*	13,493	11,060	9,628	10,931	13,180	16,468	19,659	*14,981*

Source: The projections are those in Project Appraisal Documents 2.1.4 Transport Volume of Binh Ferry and its Forecast. The actual results are based on midterm review report and answers to the questionnaire to HP Bridge.

Note-1): The projection in the appraisal is a total of the traffic of the ferry passengers (Binh Ferry and Kien Ferry) and the traffic caused by Hai Phong city development. Because the Binh Bridge opened one year later than originally planned, it is taken into consideration in the projection in the table.

Note-2): The number of buses after the beginning of toll collection in 2005 is the number of city buses. Private buses are included in the car.

Note-3): No toll has been imposed on motor bikes since July 2006 by a government announcement.

Note-4): Under a decision of the Ministry of Transport, the toll plaza on National Highway No.10 in Hai

9 Source: Results of interview with HP Bridge

Phong was removed in November 2005, which means that crossing the Kien Bridge (15 kilometers inland from the Binh Bridge) of the route 10 became toll free.

Note-5): The opening of the Binh Bridge was May 13, 2005, the manual toll collection began on September 15, 2005, and the semiautomatic collection system began operation in May 2007.

Note-6): 2009 data is the actual total of 11 months up to November.

Note-7): Passenger Car Unit (PCU) is a converted value showing a homogeneous equivalent of all vehicles of heterogeneous traffic stream.

Table-4 below compiled based on Table-3 shows an annual increase of 9% to 33% of combined traffic of cars and buses, which is almost the same as or higher than the increase rate of GRDP in Hai Phong during the same period. It is reasonable to estimate that the growth rate of traffic volume during a rapid economic growth period is similar rate to the expansion speed of the local economy (local economic growth rate). As shown in Table-3, the projection of 2005 when the Binh Bridge opened (beginning of the projection) was below the actual result. When this is taken into consideration, it is fair to conclude that the projection after 2005 was slightly overestimated.

Table-4: Total Traffic of Car and Bus over the Binh River and its Increase Rate

Item	2005	2006	2007	2008	2009
Car and Bus (Vehicle/day)	1,731	1,888	2,135	2,840	3,152
Growth Rate (year-on-year)	-	9.1%	13.1%	33.0%	11.0%
GRDP growth rate in Hai Phong	12.0%	12.5%	12.7%	13.0%	N/A

Source: The GRDP growth rate is from General Statistics Office of Vietnam and other data is calculated based on Table-3.

Note): 2005 data is that of after the introduction of toll collection

As for the truck, the shift of traffic to the Kien Bridge had a major impact in addition to the overestimate. Interviews with logistics companies revealed that those around Hai Phong tend to use the Kien Bridge rather than the Binh Bridge to transport heavy cargo to northern Vietnam and southern China. (See 3.3.2 Qualitative Effects for details.)

The Kien Bridge was built as part of National Highway No.10 rehabilitation project that was implemented with a yen loan. Development of multiple routes to cross the Cam River generated such synergy effects as (i) dispersion of traffic and (ii) security of an alternative route in case of disasters. However, it created a competitive relationship in truck transportation (especially large container trucks) with the project.

(2) Average Crossing Time over the Cam River after the Completion of the Binh Bridge

As shown in Table-5 below, it currently takes only two to three minutes to cross the river (time to go through the bridge). Compared with one hour during rush hours in the morning and evening at the time of appraisal, the time has been significantly shortened.

Table-5: Average Crossing Time over the Cam River after the Completion of the Binh Bridge Construction[1)]

Means of River Crossing	1998 (appraisal)	2005 (Opening of the Binh Bridge)	2009
Binh Ferry	30 mins (90 mins at max.)[2)]	N/A[3)]	N/A[3)]
Other ferries	30-60 mins	30-60 mins	N/A
The Binh Bridge	N/A	Approx. 2-3 mins	Approx. 2-3 mins

Source: Answers to the questionnaire to HP Bridge and actual measurement in site survey

Note-1): The time required for crossing the river by ferry includes the waiting time. The crossing time for the Binh Bridge represents the time to go through the bridge (approx. 1.3km).

Note-2): People had to wait for about an hour in morning and evening rush hours. (Source: JICA internal documents)

Note-3): Although the Binh Ferry is still operated in a smaller scale after the opening of the Binh Bridge, it does not carry vehicles as described later. Thus, there is no comparison of crossing time of the Binh Ferry as a means of transporting vehicles. (Currently, the Binh Ferry carries only bicycles and pedestrians and the average crossing time is about 10 minutes.)

(3) Changes of Transportation Volume of Binh Ferry

The Binh Ferry is still operated with two passenger boats to carry bicycles and pedestrians even after the opening of the Binh Bridge. As shown in Table-6 below, the daily average transportation volume of bicycles and pedestrians in 2008 was 1,700 persons, which is 30 percent and 10 percent of that in 2005 immediately before the opening of the bridge and that in 1998 at the appraisal, respectively.

According the interviews with the HP Bridge and local residents, bikers and pedestrians tend to dislike the slope of the approach of the Binh Bridge. The residents living near the Binh Ferry boarding point tend to prefer the ferry rather than the bridge with a detour to get to central Hai Phong.

Table-6: Changes of Transportation Volume of Binh Ferry

Unit: Vehicle/day or Passenger/day

Type of Vehicle	1994[1)]	1998[1)] (At the time of the appraisal)	2005[2)] (Immediately before opening of the Binh Bridge)	2005[3)] (After opening of the Binh Bridge)	2008[3)]
Car	391	278	168	N/A	N/A
Bus	68	145			
Truck	85	181	43		
Motor Bike	2,743	3,254	4,065		
Bicycle	6,879	9,383	2,654	1,819	1,677
Pedestrian	6,625	6,342	3,463		

Note-1):Source: Project Appraisal Documents "2.1.4 Transport Volume of Binh Ferry and its Forecast"

Note-2):Source: JICA Mid-Term Review Report

Note-3):Source: Results of interview with Department of Transport, Hai Phong People's Committee

As shown in the table above, the number of ferry users is on a decline trend. However, there was still a certain level of demand even three years after the opening of the bridge in 2008 for reasons described above. A group of residents ongoingly use the ferry as a means of

daily transportation; the ferry and the bridge have been clearly differentiated while coexisting.

3.3.1.2 Results of Calculation of Internal Rates of Return (IRR)

(1) Economic Internal rate of Return

Table-7 below shows the recalculation result of EIRR. The figures are slightly bigger than those at the time of appraisal, mainly because vehicle operation cost savings and travel time savings turned out to be larger than estimated, by virtue of the fact that vehicle operation costs and travel time costs were much smaller than estimated. (although the actual traffic is smaller than the demand projection at the time of appraisal.)

Table-7: Recalculation of EIRR

Timing	Preconditions and Assumptions for Recalculation (Project Life: 30 years after the completion of the Project)		EIRR
At the time of Appraisal (in 1999)	Economic Costs:	Economic cost was recalculated based on such financial costs as construction, consulting service, operation & maintenance and ferry operation.	18.0%
	Economic Benefit:	Travel time savings, vehicle operation cost savings, and ferry operation cost savings	
At the time of ex-post evaluation (in 2010)	Economic Costs:	Same as at the time of appraisal. Standard conversion factor (SCF) of 0.835 is used to convert financial cost into economic cost.	20.6%
	Economic Benefit:	Same as at the time of appraisal	

(2) Financial Internal Rate of Return

FIRR figures were recalculated with several conditions described in the table below as the base scenario. With the toll revenues as the parameter, two cases were assumed: a slightly more optimistic case than the base scenario (Scenario 1) and a pessimistic case (Scenario 2) to conduct sensitivity analysis of the recalculated FIRR. Table-8 below shows the recalculation results.

Table-8: Recalculation of FIRR

Timing	Preconditions and Assumptions for Recalculation (Project Life: 30 years after the completion of the Project for each case)	FIRR
At the time of appraisal (in 1999)	FIRR was not calculated at that time.	N/A
At the time of ex-post evaluation (in 2010)	**Base Scenario** Costs: Construction cost, consulting service cost, operation & maintenance cost, ferry operation cost (assuming that two passenger boats will continue to be in operation) Revenue: Toll revenue (assuming 10% increase every five years after 2005, refer to "3.5 Sustainability" for the existing toll table)	Minus 2.2%
	Scenario-2 (optimistic than base scenario) Costs: The same with base scenario Revenue: Toll Revenue (assuming 20% increase every five years after 2005)	Minus 0.5%
	Scenario-2 (pessimistic than base scenario) Costs: The same with base scenario Revenue: Toll Revenue (assuming no increase after 2005)	Minus 4.2%

The recalculation resulted in minus figures (minus 2.2% in the base scenario). FIRR figures are definitely low in public transportation projects because the toll is kept low due to its public nature and the project is also the case. The sensitivity analysis results were minus 0.5% in Scenario 1 (more optimistic than the base scenario) and minus 4.2% in Scenario 2 (more pessimistic than base scenario).

3.3.2. Qualitative Effects

Improvement of convenience for residential people and private firms through opening of bridge

Table-9 below shows the results of beneficiary survey[10] that was conducted to find out how the bridge improved convenience of residential people in terms of crossing time and cost of the Cam River. More than 90% of respondents said that both crossing time was shortened and cost was reduced. Thus, it is fair to conclude that the project helped improve their convenience.

Table-9: Time and Cost to Cross the Cam River after Project Implementation (N=185)

Question	Decreased		Not decreased		Unknown	
	No. of Respondents	%	No. of Respondents	%	No. of Respondents	%
Time to cross the Cam River	177	95.7	3	1.6	5	2.7
Cost to cross the Cam River	175	94.6	3	1.6	7	3.8

Source: Results of beneficiary survey

During the site survey, we conducted in-depth interviews with seven private companies in Hai Phong (3 manufacturers, 1 transportation and tourism company, and 3 logistics companies[11]) in order to find out how the bridge improved their convenience. Respondents expressed their opinions that were introduced in Table-10 below as direct impacts of the opening of the Binh Bridge. The bridge improved their convenience in terms of commuting of employees and transportation of their products. A company on the north side of the Cam River (cement manufacturer) pointed out the improvement of access to Hai Phong Port. This shows that the upgrading of traffic network has contributed to the improvement of business environment and the effect has become, if partially, apparent.

On the other hand, three logistics companies near Hai Phong Port on the south side of the Cam River responded that the project has had no impact on their business. According to

[10] Summary of beneficiary survey procedures: In-person interviews with a total of 185 local residents and firms were conducted--113 common residential people and a total of 57 farmers, both living near the Binh Bridge in Hai Phong, as well as 15 private firms located in the city.

[11] More specifically, three manufacturers are one cement manufacturer, one cable manufacturer and one steel company. The transportation and tourism company operates bus services and tourist agency, and the three logistics companies are (cargo) forwarder truck companies. (Only the cement company is located on the north side of the Cam River; the other six firms are on the south.)

them, they take the Kien Bridge on National Highway No.10 when they transport heavy cargos and containers to Quang Ninh Province and southern China from Hai Phong Port, because of (i) no toll to cross the Kien Bridge and (ii) loading weight limit of small bridges (Heavy trainers cannot cross them.) in central Hai Phong before the Binh Bridge. The project has had a limited effect on the logistics companies that handle large cargos and are located on the south side of the Cam River.

Table-10: Results of Interviews with Private Firms in Hai Phong (Multiple Answers)

Responses (Direct impact of Opening of the Binh Bridge only)	Number of Respondents
Employees' commuting has become more convenient.	6
Opening of the bridge encouraged decision-making on investment (plant construction, enhancement of production capacity, and purchase of business vehicles, etc.).	4
Product transportation to central Hai Phong has become more convenient.	1
Land prices around the approach road have risen and assets value of their premises has increased.	1
Traveling time to Ha Long Bay has been shortened significantly and tourists from Hai Phong to the bay have increased.	1
Importation of materials and equipment via Hai Phong Port has been facilitated.	1
Opening of the Binh Bridge has had no impact on our business. (response by logistics companies)	3

Effects of technical transfer to local consultants, contractors and related PMU, etc.

After the construction of the Binh Bridge, five long span cable-stayed bridges have been constructed or planned: Bai Chai Bridge, Rach Mieu Bridge, Can Tho Bridge, Phu My Bridge, and Nhat Tan Bridge (under construction). Local consultants and contractors that engaged in the construction of the Binh Bridge also participated in planning and construction of four of the five bridges excluding the Phu My Bridge. In addition, two former members of HP Bridge moved to PMU that supervises long span cable-stayed bridge projects[12].

PMU workers, consultants and contractors involved in the Binh Bridge project have participated in similar projects. Thus, it is fair to say that this shows that technical transfer has had impacts on (i) design skills of cable-stayed bridges, (ii) construction skills of such bridges, and (iii) management skills for cable-stayed bridge construction projects.

This project has largely achieved its objectives; therefore its effectiveness is high.

3.4 Impact

3.4.1 Intended Impacts

Trend of GRDP in target region

As shown in Table-11 below, GRDP in Hai Phong has grown at an annual rate of 10% since 2000. In particular, the average growth rate since 2005 after the opening of the Binh Bridge

[12] For example, one of them moved to PMU85, which is currently in charge of construction management of Nhat Tan Bridge.

is over 12%. Similar trends are shown in Quang Ninh Province (located on the north of Hai Phong) and Thai Binh Province (on the south of Hai Phong) in northern Vietnam.

Table-11: GRDP of Hai Phong City and Provinces in the Vicinity

City/Province	2000	2001	2002	2003	2004	2005	2006	2007	2008
Hai Phong	8313.7	9176.5	10153.8	11241.6	12536.0	14043.1	15801.4	17814.6	20133.2
	13.3	10.4	10.7	10.7	11.5	12.0	12.5	12.7	13.0
Quang Ninh	3996.1	4506.2	5092.5	5715.5	6451.3	7336.0	8347.0	9488.0	10723.0
	16.4	12.8	13.0	12.2	12.9	13.7	13.8	13.7	13.0
Thai Binh	4557.9	4778.5	5137.1	5431.0	5988.0	6464.0	7136.0	7966.0	8919.0
	3.1	4.8	7.5	5.7	10.3	7.9	10.4	11.6	12.0

Source: Department of Planning & Investment of Hai Phong People's Committee, and General Statistics Office of Vietnam

Note-1): The upper figures show GRDP (unit: 1 billion USD) and lower figures show the increase rate (year-on-year) (unit: %) of each city and province.

Note-2): This table indicates GRDP data at 1994 constant prices.

The growth rate shown above significantly exceeds that of whole Vietnam in the same period (6.8% to 8.5%, 1994 price, source: General Statistics Office of Vietnam). Although there is not likely to be a direct relationship between the project and GRDP growth, there is an indirect relationship—the project has contributed to the development and expansion of regional economy through promotion of FDI and an increase in industrial production that have been caused by improvement of physical distribution. (These facts are described later in details.)

Trend of industrial production volume and FDI in target region

Tables 12 and 13 below show an increase of industrial production in Hai Phong at a higher rate than the GRDP growth rate since 2000. The production in 2008 grew by 60% from the level immediately after the opening of the Binh Bridge (2005). Similar trends are shown in Quang Ninh Province and Thai Binh Province. FDI in Hai Phong has significantly increased in the number of cases and value since around 2005.

Table-12: Industrial Production of Hai Phong City and Provinces in the Vicinity

City/Province	2000	2001	2002	2003	2004	2005	2006	2007	2008
Hai Phong	7995.2	9526.0	11172.4	12927.0	14920.1	17625.3	20776.4	24323.1	28336.4
	19.6	19.1	17.3	15.7	15.4	18.1	17.9	17.1	16.5
Quang Ninh	3788.8	4358.9	5038.1	5982.5	6421.2	8066.9	9307.9	10859.5	11986.9
	20.7	15.0	15.6	18.7	7.3	25.6	15.4	16.7	10.4
Thai Binh	1397.0	1588.8	1796.7	2026.1	2424.1	2917.5	3596.2	4476.4	5479.1
	6.9	13.7	13.1	12.8	19.6	20.4	23.3	24.5	22.4

Source: Department of Planning & Investment of Hai Phong People's Committee, and General Statistics Office of Vietnam

Note-1): The upper figures show industrial production (unit: 1 billion VND) and lower figures show the increase rate (year-on-year) (unit: %) of each city and province.

Note-2): Industrial production is presented at 1994 prices.

Similarly to GRDP growth, there are a number of factors other than the improvement of traffic network and improved efficiency of physical distribution behind the growth of industrial production and FDI, the increase does not solely depend on the impact of the project. However, it is fair to say that the project has helped improve business and investment environments in Hai Phong and contributed to bringing in businesses and investments through the bridge development at the bottleneck of physical distribution.

Table-13: FDI to Hai Phong City

Item	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
New FDI	6	14	24	42	18	34	37	43	46	15
	6.9	30.7	40.9	148.6	88.8	251.1	156.2	297.6	915.5	38.0
Additional investment	6	6	4	12	17	18	33	25	23	8
of existing firms	12.8	29.2	20.9	21.7	187.9	71.3	41.6	133.7	699.9	76.0

Source: Department of Planning & Investment of Hai Phong People's Committee

Note-1): Upper figures show the number of cases of investment and the lower figures show FDI values (unit: million USD).

Note-2): The sharp decline in 2009 is likely to be the result of the impact of the global financial crisis in late 2008.

Trend of Industrial Location around the Binh Bridge

The results of the beneficiary survey on the trend of industrial location around the Binh Bridge after the completion of the project are shown below. A majority of businesses consider that the inflow of industries accelerated after the completion of the bridge. It is fair to conclude that the project has partially helped to attract industrial operations to the area surrounding the Binh Bridge.

Table-14: Industrial Location around the Binh Bridge after Project Completion (N=185)

Response	Number of Respondents	%
Inflow of industries accelerated after project completion.	161	87.0
No change in industrial location trends after project completion	3	1.6
Do not know.	21	11.4
Total	185	100.0

Source: Results of beneficiary survey

The origin of the north approach road of the Binh Bridge is a four-street intersection. However, there is no traffic light or roundabout there and the number of traffic accidents has increased in accordance with the increase in traffic of the Binh Bridge[13]. Traffic lights or a roundabout should be built immediately to ensure orderly flow of traffic.

[13] Source: Interview results with firms and local residents

3.4.2. Other Impacts

3.4.2.1. Impact on Natural and Social Environment

(1) Environmental Impact

There has appeared no serious negative environmental impact.

As described in detail in the sections on the project effectiveness, traffic of the approach road has increased since the opening of the bridge. In the beneficiary survey, however, 40 percent of respondents in the neighborhood said that noise increased after the completion of the project. The percentage is smaller than that of respondents who said that there is no change or they cannot tell whether the noise increased or not. (See Table-15 below.) Although the correlation between the project and noise increase is still unclear, it is fair to say that no serious problems of noise have been found.

Table-15: Noise after Project Implementation (N=185)

Response	Number of respondents	%
Noise increased after project completion.	75	40.5
No change.	69	37.3
Do not know.	41	22.2
Total	185	100.0

Source: Results of beneficiary survey

(2) Implementation status of Environmental Impact Assessments (EIA) and Environmental Monitoring

As scheduled, the environmental impact assessment (EIA) was completed in March 1997 and approved by the Vietnamese supervising agency, Ministry of Science, Technology and Environment. During the construction period, the following environmental monitoring was conducted: (i) surface water contamination test (total of 9 times, once almost every four months), (ii) groundwater contamination test (same as (i)), and (iii) social environmental survey on north and south sides of the bridge (once). It is fair to conclude that the frequency (once every four months for some items during the three-year construction period) and the coverage (water contamination test, groundwater contamination test, and social environmental survey) of environmental monitoring were sufficient.

The social environmental survey confirmed that the noise and vibration caused by the pile foundation work during the construction was below the standard. However, a total of 3 billion VND was paid to 30 households by the contractor through an insurance company as compensation in response to complaints from the local residents[14]. Although there was no obligation to pay the compensation because the noise and vibration levels were below the standard, the payment by the executing agency can be respected as a decision aiming for smooth implementation of the project.

[14] This payment was made after the consultation between HP Bridge and the contractors.

(3) Implementation Status of Resettlement and Land Acquisition

The project involved resettlement of local residents and land acquisition. Table-16 below shows the scale and process of the resettlement.

Table-16: Status of Resettlement and Land Acquisition of the Project

Item	Original Plan (in 1999)	Actual (in 2010)
Scale of Resettlement	184 households	184 households
Resettlement Action Plan (RAP) and its process, etc.	Of 184 households, 113 have resettled. The remaining 71 agreed to resettle by December 1999.	(1) Formulation of resettlement plan (resettlement of 184 households) →(2) briefing about resettlement (15 sessions)→(3) social infrastructure development of the new sites (total of 19 ha in So Dau and Tang Dong districts) →(4) compensation payment note), land transfer to target group
Scale of Land Acquisition	19 ha.	19 ha.
Completion of Resettlement	December 1999	2001

Source: Hai Phong People's Committee and results of interview with HP Bridge

Note): Of 184 households, 96 moved to the new address (free land plus compensation). The remaining 88 households purchased land with compensation and moved by themselves. The compensation totaled approx. 25 billion VND.

There is no problem with the special resettlement process and 184 households completed resettlement as originally scheduled[15]. It took some time to complete the resettlement (2 years behind the schedule), mainly because of the delay of social infrastructure development of the new site in Tang Dong.

(4) Support for Reemployment of Workers who Lost Jobs in Ferry Operation

Hai Phong People's Committee planned to introduce jobs to workers who would lose jobs in ferry operation. After the opening of the Binh Bridge in 2005, 150 of 170 employees (then) of publicly-operated Binh-Ferry[16] resigned and they were introduced some jobs[17] for reemployment[18]. Thus, it is fair to conclude that there is no problem with the reemployment introduction process.

[15] Interviews with those who moved to So Dau revealed that the social infrastructure is more developed than the former area and they have no apparent complaints about the compensation.

[16] Before the opening of the Binh Bridge, there were six ferry operators: public Binh Ferry (operated by Hai Phong Road Company) and five private companies. Only the Binh Ferry transported vehicles.

[17] The remaining 20 employees continued to work for Hai Phong Road Company that currently operates passenger boats only. Of the retired 150 employees, 30 got a job at the Binh Bridge toll plaza (HP Bridge toll plaza section) and 50 got a job at the public bus company with the assistance of the Hai Phong people's committee. Another 50 people were transferred to the operation and maintenance section of the Hai Phong Road Company. The remaining 20 retired voluntarily with extra retirement money.

[18] Three people who got a job at the Binh Bridge toll plaza were interviewed in the site survey. They responded that they were satisfied with their new job and that their salary and other benefits improved significantly. Although details for other 27 people are unknown, both the executing agency of HP Bridge and Hai Phong Rod Company that supervises the Binh Ferry responded in the interview that the support for reemployment went smooth.

On the other land, all private ferry operators were dissolved (Details of reemployment of the workers are unknown) and the number of small retailers around the boarding point on the north bank has reduced from 12 to two. There was no briefing to the retailers and salesclerks before the project and no official compensation was paid[19,20]. Although Binh Ferry workers who were public employees received good compensation, there was little consideration for private ferry operators and small retailers. It would have been possible to provide some measures or options within the limited budget.

3.5. Sustainability (Rating: a)

3.5.1 Structural Aspect of Operation and Maintenance

The executing agency of the project, HP Bridge[21], is responsible for operation and maintenance (O&M) of the bridge and approach road that were built in the project[22]. The agency is also responsible for O&M of the toll plaza facility and toll collection.

HP Bridge consists of six departments: Engineering, Planning, Accounting, Administration, Operation and Maintenance, and Toll plaza[23]. The operation and maintenance department is responsible for O&M of the Binh Bridge. (The toll department is in charge of toll collection[24].) Details of their duties and operation system are shown in Table-17 below.

There is no particular problem with the operation and maintenance system. The Road Agency of the Ministry of Transport (VRA) that is responsible for O&M of national routes, etc., or other organizations are not involved in operation and maintenance of the bridge. HP Bridge is responsible for O&M of all facilities related to the Binh Bridge project.

As shown in the table below, maintenance work of the Binh Bridge is mainly outsourced. Consultants of the project compiled an O&M manual and there is no particular problem with the operation of HP Bridge in planning, bidding and contractor supervision related to maintenance work. There has not been any major repair work (It is recommended in 2015,

[19] Source: Interview results with HP Bridge and owners of retailers that continue to operate their business.
[20] HP Bridge explained that no action was taken because the legal status of the retailers and salesclerks were unclear at that time.
[21] Binh Bridge Projects Management Unit (BPMU) that was responsible for the project was renamed Hai Phong Bridge Projects Management Unit in November 2003 and again renamed Hai Phong Bridge Projects Management Department (HP Bridge) after the completion of the project. There is no major change in the organization in accordance with the renaming. HP Bridge is responsible for O&M of other bridges in Hai Phong as well as the Binh Bridge.
[22] Binh Bridge Operation and Management Cooperation Agency (BBOMCA) that was to be newly organized was originally planned to be responsible for O&M at the time of appraisal in 1999. However, it was not set up and HP Bridge is in charge of O&M.
[23] HP Bridge now has a total of 138 employees (73 in the toll department, 30 in the O&M department, and 35 in other departments). The workforce before the opening of the bridge was around 30 to 35. It was increased gradually (35 to 138) between May and September in 2005 immediately after the opening of the Binh Bridge in response to the more sophisticated and increased duties required for the new bridge. HP Bridge considers that the current workforce is sufficient. (Source: Results of interview with HP Bridge)
[24] Of 73 employees in the toll plaza department, 30 are from the Binh Ferry. They have received necessary training to perform their duties and are accepted smoothly. (Source: responses to interviews with HP Bridge and those who found employment there)

10 years after the opening of the bridge, in the O&M manual.) and attention needs to be paid to future formation of the system for repair work[25].

Table-17: Operation and Maintenance System of the Binh Bridge

Stage/Category of Maintenance Activities	Planning	Preparation of Tender Documents	Implementation	Supervision
Daily Maintenance	HP Bridge	HP Bridge	Contractors	HP Bridge
Periodical Maintenance	HP Bridge	HP Bridge	Contractors	HP Bridge
Large Scale Maintenance	HP Bridge	HP Bridge	Contractors	Consultant

Source: Answers to the questionnaire to HP Bridge
Note): HP Bridge refers to the operation and management department.

3.5.2 Technical Aspects of Operation and Maintenance

Technical skills of engineers and workers

There are a total of 30 engineers in the O&M department of HP Bridge as of 2009. Ten of them hold a bachelor's or higher degree and remaining 20 are high school graduates. They have two to six years of experiences in maintenance work of cable-stayed bridges. All employees in the O&M department are engineers and there is no special problem with their skills to perform their duties (planning, bidding and supervision).

Maintenance work of long cable-stayed bridges in Vietnam has just begun and thus it is not clear whether they will be able to handle technical issues (preparation of tender documents and estimation for hiring consultants) related to planning and bidding of large-scale repair work that was mentioned in the previous section. They should work to secure funding for maintenance (Details are described later.) and utilize such outside resources as university professors and special consultants to improve the skills of their employees.

Training programs provided by contractors of the Project

Of engineers responsible for maintenance work, 10 employees in management were given training on maintenance skills of the cable-stayed bridge by the contractor of the project. Ten engineers in the O&M department were given overseas training in Japan (visit to long cable-stayed bridges and lectures on bridge engineering). Training by the contractor was provided smoothly and participants highly evaluated the training[26].

3.5.3 Financial Aspects of Operation and Maintenance

As shown in the tables below, annual O&M expenditure of HP Bridge has increased sharply since 2005. (The spending in 2009 was 4.4 times as much as that in 2005.) Major items of

[25] HP Bridge commissions experts in the Hanoi University of Transportation to conduct periodic technical inspection of the Binh Bridge every year. Annual inspection results are used in formulating repair plans for the next year.
[26] Source: Results of interview with participants in training

spending are (i) labor cost, (ii) various expenses associated with researches and inspections, and (iii) outsourcing cost. Increase in labor cost due to annual pay raise and increase in outsourcing cost due to diversification of activities account for a large portion of the increase[27].

Since the opening of the bridge in May 2005, the maintenance cost for the bridge has also increased sharply. The spending in 2009 was 19 times as much as that in 2005 immediately after the opening of the bridge. The ratio in all maintenance cost of HP Bridge has also risen year after year (6% in 2005 to 25% in 2009).

Table-18:O&M Expenditure and Toll Revenue of HP Bridge

Unit: Mil. VND

Year	O&M expenditure (total)	O&M expenditure (for the Binh Bridge)	Toll revenue of the Binh Bridge
2005	1,628	95	3,144
2006	4,128	222	8,300
2007	4,846	917	8,982
2008	6,226	1,468	11,399
2009	7,089	1,801	11,780

Source: Answers to the questionnaire to HP Bridge
Note-1): 2009 data is the total of 11 months up to the end of November.
Note-2): Toll collection began on September 15, 2005 and toll on motor bikes was abolished in July 2006.

Table-19:Toll Fare of the Binh Bridge

Unit:1,000VND

Category of Vehicle	One-way	Monthly toll	3-month toll
Motor bike (2 or 3 wheels)[1)]	1	10	-
Taxi, simple truck, small tractor	4	120	300
Vehicle (with less than 12 seats), truck (less than 2 tons), bus	10	300	800
Vehicle (12 to 30 seats), truck (2 to 4 tons)	15	450	1,200
Vehicle (more than 31 seats), truck (4 to 10 tons)	22	660	1,800
Truck (10 to 18 tons), container truck (20 feet)	40	1,200	3,200
Truck (more than 18 tons), container truck (more than 40 feet)	80	2,400	6,500

Source: Ministry of Finance - Circular 90
Note): Toll on motor bikes was abolished in July 2006.

Although there is a gap between the projected and actual traffic volume mentioned earlier in the section on the effectiveness, toll revenue[28] of the Binh Bridge has increased steadily as shown in the left-side table[29] and the revenue significantly exceeds the maintenance cost of the Binh Bridge. Although the ratio of toll revenue to maintenance cost has been on a decline trend, there still remains a sufficient amount of income in form[30].

Concerning financial resources for the major repair work expected in 2015, HP Bridge said that it has agreed with the Hai Phong People's Committee that HP Bridge estimate necessary costs for the repair work through conducting an extensive technical inspection in advance and

[27] Source: Results of interview with HP Bridge
[28] The toll plaza department is responsible for toll collection as mentioned earlier. Toll is collected with the semiautomatic toll collection system (It identifies vehicle types automatically and indicates the toll) at the toll plaza on the north approach road of the Binh Bridge.
[29] Toll revenue has risen steadily and that in 2009 was 3.7 times as much as that in 2005. Because the toll of motor bikes was abolished in July 2006 by a government announcement, the income decreased temporarily. However, the impact is minor.
[30] Toll revenue is given to the national treasury and then redistributed to local governments as subsidies from the national budget. It is not the case in which surplus of the toll revenue is distributed internally as a budget.

then ask the committee for an additional budget for the repair.

3.5.4 Current Status of Operation and Maintenance

Generally speaking, there seems to be no problem with the operation and maintenance status, thereby, they can be judged as extremely good.

There is no particular problem with the use and O&M of the facilities (bridge, toll plaza and approach road) that were constructed in the project. As for maintenance of the main body of the bridge, pavement and cable conditions were good when observed in the site survey.

According to the residents around the north approach road, there is no fence or similar installations around the restricted zone (site below the bridge pier) on the north side of the bridge and children, etc., sometimes enter the site illegally. Some measures should be taken in order to ensure safety.

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

The components of the project are highly relevant to the related national policies and there seems to be no problem with the operation and maintenance systems. In addition, a clear reduction of traveling time was recognized and a certain number of positive impacts have been developed through the implementation of the project. Although the project period was longer than planned, the project cost was lower than planned. In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations for Executing Agency

Recommendation-1

Maintenance work of long span cable-stayed bridges in Vietnam has just begun and they are not equipped with skills of planning and running tender process for major repair work. In preparation for the major repair work that is scheduled in 2015, it is recommended that outside resources including university professors and special consultants be utilized to sort out envisioned technical problems and technical capacity of employees continue to be improved. They should study examples in Japan and other countries that have sufficient experiences in long span cable-stayed bridge construction.

Recommendation-2

The origin of the north approach road is a four-street intersection. However, there is no traffic light or roundabout. There is a concern over a further increase in traffic accidents in accordance with increasing traffic of the Binh Bridge. Traffic lights or a roundabout should be built immediately to ensure orderly flow of traffic.

Recommendation-3

There is no fence or similar installations around the restricted zone (site below the bridge pier of the approach road) on the north side of the bridge and children, etc., sometimes enter the site illegally. Some measure (installation of fence or allocation of guards) should be taken in order to ensure safety.

4.3 Lessons Learned

One single agency is responsible for construction and maintenance of the project (although the name of the agency changed). This assured the sustainability of maintenance knowledge and skills of human resources (HP Bridge employees) who supervise maintenance activities because employees who received a variety of training continued to be employed after the completion of the project. Because construction and maintenance of transport and traffic projects are performed by separate organizations in Vietnam in general, it is difficult to ensure sustainability after the completion of the construction. Human resources who participate in the project should be employed continuingly as much as possible. The Decree 12[31] issued on February 12, 2009, states that the human resources responsible for maintenance work should participate in PMU (that is the executing agency of construction). The decree should be observed in the future. Even if the decree is not observed for practical reasons, information should be shared actively in the project implementation stage between PMU that is responsible for construction and VRA that is responsible for maintenance.

Binh Ferry employees who were semi-public workers were given good compensation, whereas there was little consideration for the unemployed who used to work for private ferry companies and small retailers around the boarding point. When a project to construct a bridge involves the discontinuation of ferry operation, briefing sessions to those involved in business around the site (the poor in particular) in addition to ferry companies should be held in the project planning stage and thereafter and compensation in accordance with legal rules of the subject country should be considered.

[31] Decree on management of investment projects on the construction of works

Column

1. Project Management System in Transport and Traffic Sector in Vietnam (responsible body of construction and maintenance)

"It is difficult to ensure sustainability after the completion of the project. (There are separate responsible bodies for construction and maintenance.)" "It is difficult to secure financial resources for maintenance. (There is a problem with consistency between investment and ordinary budgets[32].)" These points have been discussed not only in individual projects including the bridge construction project but in multinational frameworks that include local transportation partnership (JICA is the joint chair with the Ministry of Transport.), Poverty Reduction Support Credit, Joint Portfolio Performance Review Meetings of 5 Banks (5 loan providers[33] of JICA (former JBIC), World Bank, ADB, KfW (Germany), and AFD (France)) and Vietnamese government organizations. Complementary and multilayered measures in various levels have been taken.

Meanwhile, the project ensured continued employment of workers because one single body was responsible for both construction and maintenance. It is a good exceptional example in which sustainability was secured. There appear to be abundant financial resources for maintenance because of a steady increase in toll revenue. It may be good to introduce this case in joint portfolio meetings and conduct case study as best practice of transport and traffic projects in Vietnam.

2. Views of Recipient Executing Agency on Use of Special Yen Loan

The Special Yen Loan Facility was applied to the project. The Facility was formulated when the Asian economic crisis occurred in 1997. The executing agency of HP Bridge commented that the payment period of the loan (40 years) and interest rate (1.0%) were very good conditions for the borrower, although the tender process of contractors was extended due to the use of the Facility. (They explained that it is mainly because of a large number of check items for bidding.) We also received a comment that it was extremely significant in terms of technical transfer in addition to the contribution to prompt and ensured project implementation because the skills of Japanese contractors with abundant experiences in long span cable-stayed bridges and that the executing agency were able to procure high quality Japanese products (steel products in particular) and avoid product risks, because contractors and materials and equipment were procured only from Japan.

[32] It is often pointed out that: Investment budget, which is the main source for the construction of infrastructure projects, is in an increasing trend whereas ordinary budget, that should cover the operation and maintenance costs of infrastructure constructed, is relatively small.

[33] It has become a 6-Bank structure including EDCF (South Korea).

Comparison of the Original and Actual Scope of the project

Item	Original	Actual
1) Projects Output 1. Bridge Construction 1.1 Length	17 spans continuous steel composite concrete girder, including 3 spans cable stayed bridge (Main span: 260m)	The same
1.2 Width	23.5m (3.75m x 4 lanes, sidewalk, etc.)	22.5m (3.75m x 4 lanes, sidewalk, etc.)
1.3 Approach Road	South side: 600m, North side: 900m (including intersection construction at south side)	South side: 594m, North side: 888m (including intersection construction at south side)
1.4 Toll Plaza and Toll Collection System	Toll plaza construction at north side, Installation of toll collection system	Toll plaza construction at north side, Revision of toll collection system and reinstallation
2. Consulting Services (C/S)	839.0M/M	723.4M/M
2) Project Period	March 2000 – February 2004 (48 months)	March 2000 – May 2005 (63 months)
3) Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 6,143 million yen 3,292 million yen (329,200 million VND) 9,435 million yen 8,020 million yen 1 VND＝0.0100 yen (as of March 1999)	 5,994 million yen 2,412 million yen (313,560 million VND) 8,406 million yen 7,308 million yen 1 VND＝0.0077 yen (Average between 1999 and 2007)

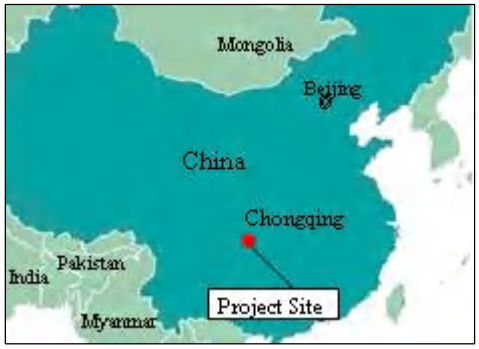
China

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 areas[1], 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	Interest Rate : 0.75% Repayment Period : 40 years (Grace Period: 10 years) Condition for Procurement: Bilateral tied
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.	F/S prepared by the Second Design Department of the Ministry of Railways (2000)
	JICA Special Assistance for Project Formation (SAPROF) prepared by Japan Railway Technical Service (JARTS) and Pacific Consultants International (PCI) (1998)

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 loop[2]" 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 then[3]. 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 forward[5]. 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 day[6] 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 plan[7]. 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/M[8] 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 figures[11]. 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 earlier[12], (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 Fortuguan 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 inspections[13] 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 atmosphere[14]". 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 Level[15]

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 times[16] 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 levels[17].

(Determination of the Effectiveness Rating[18] 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 functions[19]. 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/m^2 but in 2009 this had risen substantially to 4,000 CNY/m^2.

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 think so: 11	I think so: 26	I think so: 17
	I don't think so: 3	I don't think so: 9	I don't think so: 4	I don't think so: 3
	Not clear/ No answer: 0	Not clear/ No answer: 0	Not clear/ No answer: 0	Not clear/ No answer: 0
2) Your reason for "I think so" in 1) (multiple answers allowed)	Attraction of enterprises advanced: 6	Attraction of enterprises advanced: 5	Attraction of enterprises advanced: 17	Attraction of enterprises advanced: 6
	New residential areas were constructed: 13	New residential areas were constructed: 6	New residential areas were constructed: 13	New residential areas were constructed: 13
	New factories were constructed: 5	New factories were constructed: 0	New factories were constructed:3	New factories were constructed: 0
	Construction of commercial buildings, etc advanced: 16	Construction of commercial buildings, etc advanced: 7	Construction of commercial buildings, etc advanced: 17	Construction of commercial buildings, etc advanced: 7
	Construction of life infrastructure (hospital and school, etc) advanced: 12	Construction of life infrastructure (hospital and school, etc) advanced: 5	Construction of life infrastructure (hospital and school, etc) advanced: 12	Construction of life infrastructure (hospital and school, etc) advanced: 6
	Population grew: 9	Population grew: 2	Population grew: 7	Population grew: 3
	Others: 1	Others: 0	Others: 0	Others: 0
3) Have there been any changes to (your own) life due to the opening of the monorail?	Yes: 30	Yes: 15	Yes: 29	Yes: 20
	No: 0	No: 5	No: 1	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 infrastructure[20], and took measures such as reducing the driving speed limit of the monorail[21],; 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 first[22].

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 project[23]. 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 occurred[24]. 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 participated[25].

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 business[29] 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)

China

Ex-Post Evaluation of Japanese ODA Loan Project

Hainan Development Project (Yangpu Port)

External Evaluator: Kenichi Inazawa, Office Mikage LLC

1. Project Description

Map of the Project Area

Container Berth in Yangpu Port

1.1 Background

In 1988, Hainan Province,[1] located at the southernmost tip of China, was separated from Guangzhou Province and elevated to the status of province. It was designated as the fifth special economic zone in China. Hainan Province, through foreign open-door strategy, promoted policies on foreign capital inflows and attracted business to the province, while at the same time aimed to build up urgently its social and economic infrastructure. Prior to the project commencement, the province did not have remarkable progress of building infrastructure such as sea ports, roads, airports and communications. With regards to sea ports, the planned cargo handling capacity of ports throughout Hainan Province was a total of 10.67 million tons. But actual total cargoes in 1993 totaled 13.56 million tons, and that in 1994 15.11 million tons, exceeding planned capacity and thus necessitating much larger port facilities.

Main ports in Hainan Province are Haikou Port in the provincial capital of Haikou; Sanya Port on the southern part of the island; Basuo Port, specializing in ore shipping, on the western part of the island; and Yangpu Port on the northern part of the island. Yangpu Port opened in 1990.[2] It was expected to increase cargo handling volume in the future, primarily for containers

[1] It has an area of roughly 34,000 km^2, about the same as the Japanese island of Kyushu. Its coastline stretches for about 1,570 km.

[2] Two 20,000-ton multipurpose berths were constructed to open the port (constructed with Chain's own funds).

and general cargoes, in accordance with the economic development of the Yangpu Economic Development Zone[3] and the Danzhou Economic Zone (Danzhou, Lingao and Baisha) further inland. In order to respond to increased demand of cargo volume at Yangpu Port, new berths and other construction were required to expand the port facilities quickly.

1.2 Project Outline

The objective of this project is to expand the cargo-handling capacity in Yangpu port, which the hinterland is Dangzhou Economic Zone, located on the north-west part of Hainan Province, by constructing one multi-purpose berth (for 20,000DWT general cargo ship) and two general cargo berths (for 20,000DWT general cargo ship) and developing port facilities; thereby contributing to promote the economic development in Hainan Province.

Approved Amount/ Disbursed Amount	4,300 million yen / 3,372 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	October 1995 / November 1995
Terms and Conditions	Interest Rate: 2.3% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower / Executing Agency(ies)	Government of the People's Republic of China / People's Government of Hainan Province (Project Implementation Unit: State Development Investment Company Yangpu Port (SDIC Yangpu Port))
Final Disbursement Date	December 2002
Main Contractor (Over 1 billion yen)	N/A
Main Consultant (Over 100 million yen)	N/A
Feasibility Studies, etc.	F/S prepared by China Ministry of Transport, Second Harbor Consultants Co., Ltd. (1991) F/S approved by the National Plan Committee (1994)
Related Projects (if any)	Study for Comprehensive Development Plan of Hainan Island conducted by JICA (1988)

2. Outline of Evaluation Study

2.1 External Evaluator

[3] Approved as a National Development Zone in 1992 by the State Council. It has an area of roughly 30 km^2 and is an economic development zone centered around the port.

Kenichi Inazawa, Evaluation Consultant, Office Mikage LLC

2.2 Duration of Evaluation Study

Duration of the Study: September 14, 2009 – July 12, 2010

Duration of the Field Study: December 7-19, 2009 (1st study)

March 8-13, 2010 (2nd study)

2.3 Constraints during the Evaluation Study

N/A

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

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plan of China

At the time of the appraisal, the Chinese government's Eighth Five-Year Plan (1991-95) aimed to promote the construction of berths and increase cargo handling volume in order to respond to increasing demand of cargo volume at Chinese ports as the economy grew. This project was incorporated into this Five-Year Plan with construction of other major Chinese ports. In addition, in 1988, prior to this Five-Year Plan, JICA formulated "Comprehensive Development Plan of Hainan Island" as a plan to advance the island's industrialization and urbanization by infrastructure development such as upgrading maritime transport and improving cargo handling efficiency at port facilities.[4] Moreover, Hainan, which elevated to a province in 1988, formulated the Strategic Development Plan for Transportation. It set building infrastructure including sea ports, roads, airports, communications and etc as a priority issue and aimed for economic growth through promoting direct investment as well as foreign capital inflows. In particular, development of port facilities was recognized as important infrastructure which could lead the island's economic growth together with development of highway networks.

At the time of the ex-post evaluation, the Chinese government also aims to promote coastal port development and improve cargo handling capacity in the Eleventh Five-Year Plan (2006-10), the national development plan. The Eleventh Five-Year Plan for Hainan Province National Economic and Social Development Outline, established at the Third Meeting of the Hainan Province People's Committee in 2006, also includes important infrastructure projects

[4] This project was described in the development plan.

such as roads, sea ports, water and sewage services, electricity and environmental protection measures with the intention of Hainan Province's economic growth. Moreover, in 2008 Department of Transportation of the People's Government of Hainan Province formulated the Hainan Province Port Development Plan, prescribing strategies for the province's entire port sector until 2020. With these policies underway, Yangpu Port was recognized as China's fourth bonded port area in 2007. When Chinese President Hu Jintao made an inspection in Hainan Province in 2008, he stated, "Hainan Province should actively participate in economic cooperation with the ports of other countries and relationship-building between China and the ASEAN Free Trade Area. The Yangpu Economic Development Zone should take the lead to be a hub port for shipping, distribution and export in Southeast Asia," directing Hainan Province and Yangpu Port to take leadership and play an important role in international maritime operations. Based on this statement, the People's Government of Hainan and other related agencies are now promoting policies to expand Yangpu Port's function as an international port.

3.1.2 Relevance with the Development Needs of China

At the time of the appraisal, Yangpu Port, which opened in 1990, expected cargo handling volume, primarily for containers and general cargoes, increasing from 3.4 million tons by 2000 to 4.6 million tons by 2005 through economic growth in the hinterland economic areas, the Yangpu Economic Development Zone, Danzhou, Lingao Baisha and elsewhere. At the time of the appraisal, Yangpu Port had an annual cargo capacity of 1 million tons (with two 20,000-ton multipurpose berths) and was predicted to face severe shortage in its cargo handling capacity in the future.

Annual cargo volume has been approx. 4.2 million tons (average between 2005 and 2008) after the project completion. However the hinterland economic areas, the Yangpu Economic Development Zone, Danzhou, Lingao and Baisha, have also achieved further economic growth (13-14% average annual growth) and total cargo handling volume tends to increase. Under such circumstances, the third phase project has been implemented at Yangpu Port to keep up with the growing cargo demand.[5]

3.1.3 Relevance with Japan's ODA Policy

In the Official Development Assistance Charter, approved by the Japan's Cabinet in 1992,

[5] Construction began in December 2005 and was completed in September 2009. Three berths for 20,000DWT general cargo ship were constructed with China's own funds. Planned annual cargo handling volume is 4.1 million tons. The fourth project is currently in the planning stages.

trade and investment, which have a significant impact on the Japan's ODA and growth of the developing countries, could have been promoted with meaningful coordination links and were deemed as one of the important issues, in order to promote the growth of developing countries. In particular the Asian region, which has a close relationship with Japan and has a great impact on Japan's security and prosperity, was recognized as an essential area. Since this project aims to promote trade and investment in the region, by taking full consideration of strengthening economic links with the region, it is considered relevant to Japan's foreign aid policy.

This project has been highly relevant with the China's 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 cancelled, this project was implemented almost as planned. The following table compares and explains the differences between planned and actual major outputs.

Table 1: Comparison of Planned and Actual Major Outputs

Outputs	Planned at the Time of the Appraisal	Actual at the Time of the Ex-post Evaluation
1. Civil Works	1) Wharf Structure (Total length is 700m) a) Multi-purpose Berth x 1 (for 20,000DWT General Cargo Ship) b) General Cargo Berth x 2 (for 20,000DWT General Cargo Ship) (Total Annual Handling Capacity: 1.2 million tons) 2) Stockyard (47,000 ㎡)	1) Wharf Structure (However the total length is 577m) Almost as planned (Total Annual Handling Capacity: 1.774 million tons) 2) Stockyard (47,000 ㎡) As planned
2. Procurement of Handling Equipments	1) Crane Set 2) Tank Truck (8,000-liters) for Supplying Oil to Machinery and Cars x 1 3) Carriage Trailer between Berths and Yard, Trailer Chassis x Total 79 4) Other Machinery and Equipments (Loaders, Heavy	1)2)4) As planned 3) Almost as planned (Trailer x 38, Trailer Chassis x 34: Total 72)

	Machinery, Forklifts, etc.)	
3. Construction of Handling Facility Building, Operation and Management Building and Residential Houses for Port Workers (Living Environment Buildings), etc	1) General Warehouse x 2 2) Container Freight Station (CFS) 3) Yard and Handling Administration Building 4) Port Company Building 5) School and Education Building 6) Training Building 7) Others: Substation, Houses for Port Workers, etc	Only 1) and 4) were constructed. (However, only one warehouse was constructed, regarding 1) General Warehouse.) 2)3)5)6)7) were cancelled.
4. Development of Water and Power Supply, etc	1) Water Supply and Drainage, Power Supply, Environmental Work Boat (120-ton boat x 1), Environmental Protection Measures, etc	1) As planned
5. Procurement and Installation of Communication and Navigation Support System	1) Communication and Navigation Support System (Buoys x 7)	1) Almost as planned (However, the number of the procured buoys was four.)
6. Procurement of Port Boat and Patrol Vehicle	1) Port Boat (Tug Boat x 1), Patrol Vehicle x 3	1) Almost as planned (However, the number of the procured vehicles was two.)
7. Construction of Product (Cargo) Inspection Facilities, Procurement and Installation of Equipments, etc	1) Product (Cargo) Inspection Facilities, Equipments, etc	1) Cancelled (However, the facilities and equipments were constructed and procured by China's own funds.)
8. Technical Cooperation (Dispatch of Training Group)	1) Study of Land Improvement Method on Reclaimed Land (Measures for Soft Ground at Construction Site) 2) Study of Terminal Operation Techniques (Computer Management Which Responds to Sudden Increases in Cargo Volume, Measures for Personnel/Organization Rationalization/Efficiency)	1) Cancelled 2) Cancelled (However, it was implemented by China's own funds)
9. Consulting Services	1) No Plan for Hiring Foreign Consultants	1) As planned However, Shenghua, Guangzhou Province Transport and Construction Company, a local consultant, was hired. (From November 1996 to April 1997: Total 5M/M)
Additional Outputs	Construction of Stockyard Extension: approx. 290,000 m^2 (Expansion of Container Cargo and Transport Area: it was	

	constructed with China's own funds. It is adjacent to the 47,000 m^2 stockyard area constructed by this project.)

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

The followings are the brief explanations of the main points of difference between the planned and actual. It is believed the differences were relevant modifications.

1. Civil Works

The main reason for shortening the total extension from 700 meters to 577 meters is as a result of re-examining the project scope. At the project commencement, the economy in Hainan Province, including the Yangpu Economic Development Zone, was sluggish. There were no large industrial projects and annual cargo handling volume at Yangpu Port was around 550,000 tons until 1997. The Executing Agency estimated the economic effects and market needs after the project completion, and revised the berth extension. As a result, the Agency judged that construction with 577 meters was appropriate.[6]

The difference between 1.2 million tons and 1.774 million tons in annual handling capacity is due to a difference in the calculation methods. It is because there is a difference about the calculation methods used at the time of the appraisal and at the project completion, not because actual annual handling capacity changed. According to the Executing Agency, the figure at the time of the appraisal was calculated with the then current method, while the figure at the time of the ex-post evaluation was calculated using the present method,[7] and there was no change in conditions that would have altered actual annual handling capacity.

2. Construction of Handling Facility Building, Operation and Management Building and Residential Houses for Port Workers (Living Environment Buildings), etc

The reason that only one general warehouse was constructed and that the container freight station and the yard and handling administration building were cancelled is that a review of the project scope was conducted after the project commencement, and it was judged that the warehouse and administration building constructed in the first phase project (completed in 1990) would function sufficiently.[8]

[6] The Agency had an agreement of JICA.
[7] As both figures are calculated estimates (theoretical figures), a difference occurs on the figures when the method is changed. Note that shortening the length of wharf structure and the increase in annual handling capacity are not related each other.
[8] At present the general warehouse is mainly used for storage of sugar.

The reason for cancelling the construction of school and education building, the training building and other related facilities, such as the substation and houses for port workers, is that as China was transitioning to a market economy, the necessity of the employee welfare program in place prior to the project commencement was re-examined. As a result, it was cancelled.

3. Procurement and Installation of Communication and Navigation Support System

The reason for decreasing the number of procured buoys is that the Executing Agency re-examined the quality and amount of equipment and machinery at Yangpu Port at the procurement phase. As a result, it was judged that four would be sufficient.

4. Procurement of Port Boat and Patrol Vehicle

The reason for the reduction is as above in 3. The Executing Agency re-examined the quality and amount of equipment and machinery at Yangpu Port at the procurement phase. As a result, it was judged that two would be sufficient.

5. Construction of Product (Cargo) Inspection Facilities[9], Procurement and Installation of Equipments, etc

Under the order of China's State Council, the Department of Inspection and Quarantine Clearance undertook this work and it was cancelled as part of this project.

6. Technical Cooperation (Dispatch of Training Group)

According to the Executing Agency, the reason for cancelling the Study of Land Improvement on Reclaimed Land is that necessary measures such as training conducted with China's own funds were taken, after the project commencement, therefore it was not implemented. On the other hand, the reason for cancelling the Study of Terminal Operation Techniques is that this was also conducted with China's own funds and trainees took technical training related to operating machinery in other Chinese cities, therefore it was not implemented as part of this project.

[9] Total area is approx. 12,000 ㎡.

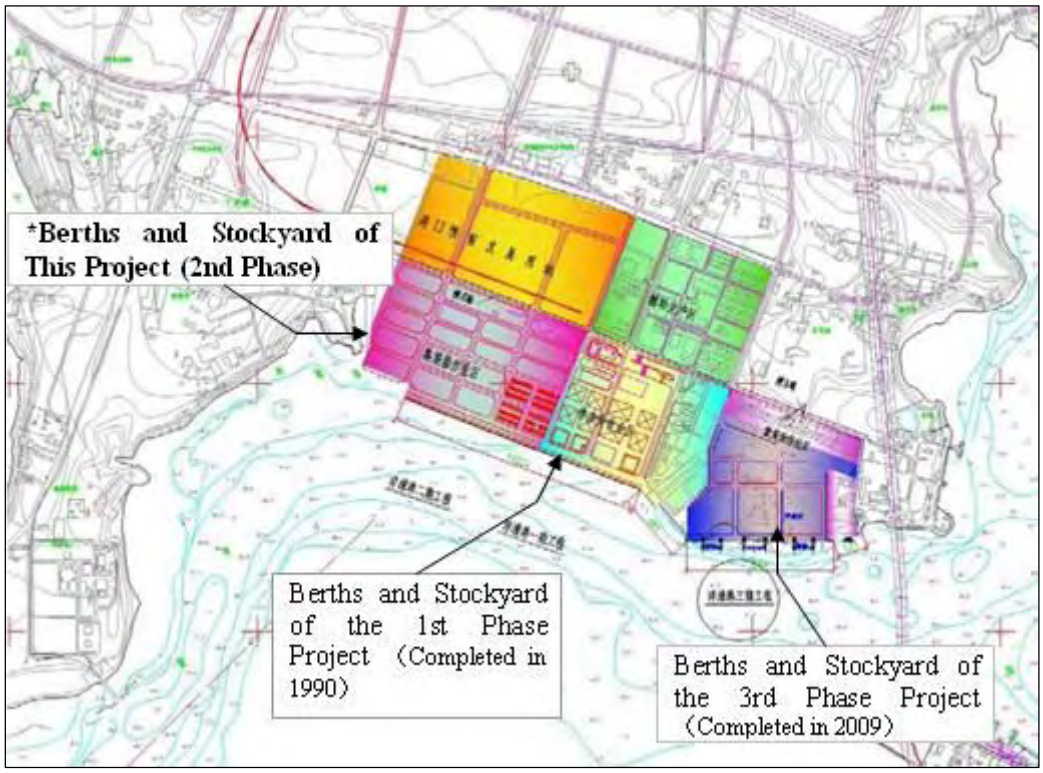


Figure 1: Project Site (Map of the Entire Yangpu Port)

3.2.2 Project Inputs

3.2.2.1 Project Period

The planned project period was 3 years and 8 months (44 months) from November 1995 to June 1999; however it actually took 9 years and 11 months (119 months), from November 1995 to September 2005, 270% significantly longer than planned. The biggest reason for the delay is that the Chinese side decided to postpone the commencement period of civil works, in response to the economic situation at the time, and as a result the project completion period was delayed. At the project commencement, the economy in Hainan Province, including the hinterland, Yangpu Economic Development Zone, was sluggish. There were no large industrial projects and annual cargo handling volume at Yangpu Port, which did not exceed 550,000 tons until 1997. Under these circumstances, the Executing Agency judged that it was inappropriate, from the perspective of achieving economic effects, to continue with the civil works and procurement as per the initial plan,[10] so the commencement period of civil works and the project completion period were postponed.[11]

[10] This is because consideration was given to the fact that large profits cannot be gained if cargo handling work is sluggish.
[11] Regarding the change of the commencement period, the Executing Agency had an agreement of JICA.

Table 2: Comparison of Planned and Actual Project Period

Outputs	Planned	Actual
(The whole project)	November 1995 to June 1999 (44 months)	November 1995 to September 2005 (119 months)
1. Civil Works	November 1995 to June 1999	November 1998 to September 2005
2. Procurement of Handling Equipments	January 1997 to June 1999	January 1998 to June 2003
3. Construction of Handling Facility Building, Operation and Management Building and Residential Houses for Port Workers (Living Environment Buildings), etc	July 1996 to June 1999	November 2000 to January 2005
4. Development of Water and Power Supply	July 1996 to June 1999	December 1998 to July 2005
5. Procurement and Installation of Communication and Navigation Support System	July 1996 to December 1997, January to June 1999 (Procurement in two installments)	January 2002 to March 2004 (Procurement in only one time)
6. Procurement of Port Boat and Patrol Vehicle	January 1997 to March 1998	October 1998 to November 1999
7. Land Acquisition and Resettlement	November 1995 to March 1996	November 1995 to December 1997
8. Consulting Services	No Establishment of Planned M/M	November 1996 to April 1997

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

3.3.2.2 Project Cost

The planned cost was 9,378 million yen (Japan's ODA loan amount was 4,300 million yen), and the actual cost was 6,819 million yen (Japan's ODA loan amount was 3,372 million yen). It is lower than planned (about 73% of the plan). The reasons the project cost was less than planned are: 1) cancellation of facilities such as the warehouse, the administration, operation and the school buildings, cancellation of "product (cargo) inspection facility construction, procurement and installation of machineries, etc." and cancellation of "technical cooperation"; 2) project funds were saved by thoroughly controlling funds related to biddings, procurements and contracts; 3) fluctuations in exchange rates, etc.

Thus, although the project period was significantly longer than planned, the project cost was lower than planned, therefore efficiency of the project is fair.

Figure 2: Berth and Cranes of this Project

Figure 3: Trailer Chassises of this Project

3.3 Effectiveness (Rating: a)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators

With regards to evaluating the project effectiveness, total cargo handling volume, berth occupation ratio, number of vessels arriving in port and total gross tonnage, average waiting time of vessels arriving in port and operating ratio per crane at Yangpu Port were reviewed and analyzed[12]. Actual figures at the time of the appraisal and the ex-post evaluation, and estimated figures after the project completion are shown below in Table 3.[13]

Table 3: Quantitative Data

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

Quantitative Indicators	At the Time of the Appraisal (Actual)				At the Time of the Appraisal (Estimation)		At the Time of Ex-post Evaluation (Actual)			
	1991	1992	1993	1994	2000	2005	2005	2006	2007	2008
1) Total Cargo Handling Volume (thousand ton/year)	170	260	510	520	3,400	4,600	4,126	4,262	4,279	4,205
Cargo Handling Volume of this Project (thousand ton/year)	N/A				N/A	N/A	N/A	N/A	2,446	2,237

[12] At the time of the appraisal, only data for total cargo handling volume was verified. However data which the Executing Agency and the O&M unit were monitoring was confirmed, and other quantitative indicators such as berth occupation ratio, number of vessels arriving in port and total gross tonnage, average waiting time for vessels arriving in port and operating ratio per crane were also referred.

[13] Data in the table show the whole figures at Yangpu Port including this project.

2) Berth Occupation Ratio (%) *Note 1	18.2	22.5	50.3	50.6	N/A	N/A	57.0	51.0	56.7	51.5
3) Number of Vessels Arriving in Port	39	59	139	144	N/A	N/A	1,429	1,105	1,219	1,199
4) Total Gross Tonnage of Vessels Arriving in Port (thousand ton/year)	1,450 (Total Gross Tonnage between 1991 and 1994) *There is no data for each year.				N/A	N/A	5,291	5,378	4,813	4,924
5) Average Waiting Time of Vessels Arriving in Port * Note 2	36.4	34.8	57.4	49.2	N/A	N/A	13.7	10.2	3.18	5.81
6) Operating Ratio per Crane (%) *Note 3	N/A	N/A	N/A	N/A	N/A	N/A	1.90 (10)	1.91 (10)	1.29 (14)	0.66 (21)

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

Note 1) Berth Occupation Ratio＝Duration that berth was occupied (Hours) / Duration that berth was operated (Hours)

Note 2) Average Waiting Time of Vessels Arriving in Port＝Demurrage time / Number of vessels arriving in port

Note 3) Crane Operating Ratio =(Total operating hours of year / (365 days ×24 hours)) ×100. Operating ratio calculations were made based only on wharf container cranes and portal cranes for multi-purpose and general cargo berths (not including container and forklift cranes far from the area alongside which vessels arrive). Note that the figures at the bottom of the 6) operating ratio per crane in parentheses represent number of cranes.

With regards to each quantitative data, below is the analysis result of the performance. The actual total cargo handling volume was almost as estimated at the time of the appraisal, berth occupancy ratio and number of vessels arriving in port exceeded the actual figures of the appraisal, and average waiting time for vessels arriving in port improved greatly, so the data on quantitative indicators show that effect of this project is high.

1) Total Cargo Handling Volume

Since 2005, total cargo handling volume have nearly achieved those estimated at the time of the appraisal. Moreover, since the third phase project completed in September 2009, the volume is expected to increase significantly in the near future. The decline regarding the volume of this project from 2007 to 2008 (from 2.446 million to 2.237 million tons) was due to the influences of the global financial crisis. However in 2009 the volume has recovered to roughly 2007 levels.

2） Berth Occupation Ratio

The occupation ratio of the five berths (three built in this project and two built in the first phase project) is 51.0% to 57.0% (2005-08). A target of 50% to 60% is often used at ports managed by public agencies in Japan, so this range is believed to be without problem.

3） Number of Vessels Arriving in Port, 4） Total Gross Tonnage of Vessels Arriving in Port

After the project completion, over 1,000 ships have arrived in the port annually. The number of vessels arriving in port has significantly increased, compared to the time of the appraisal. The reason that a large number of ships arrived in 2005 is that there were relatively high numbers of small, 1,000-ton vessels carrying raw lumber and coal. Total gross tonnage of vessels arriving in port after the project completion has reached about 5 million annually, a remarkable increase compared to the time of the appraisal.

5） Average Waiting Time of Vessels Arriving in Port

Since 2005, average waiting time of vessels arriving in port has largely reduced, compared to the time of the appraisal. Efficient crane works, operation and service after the project completion have also had a large impact on the reduction. The reason that average waiting times increased somewhat from 2007 to 2008 is that there were many vessels shipping cement in 2008. In other words, as loading works for cement are relatively laborious, the loading efficiency lowers. As a result, average waiting time of vessels arriving in port increased somewhat.

6） Operating Ratio per Crane

Targets of operating ratio are basically set according to total cargo handling volume and strategic targets. However since such figures could not be verified for this project, it is not possible to judge the project effectiveness directly from these indicators. Therefore, the following explanation has been verified purely from what is known about current circumstances.

As a result of calculating crane operating ratio with a formula of “(Annual total operating hours of multi-purpose/general cargo berth crane at Yangpu Port ÷ (365 days x 24 hours)) x 100),” it was under 20% for each year. This means that annual average crane operating hours is 20 to 30 minutes per hour. Note that these calculations include cranes procured in the first and third phase projects (implemented through China’s own funds). At Yangpu Port sufficient cranes

have now been secured and deployed relative to the number of vessels arriving in port. Under this formula, the average crane operating hours have been short. In addition, the reason that the year-on-year operating ratio for 2007-08 is relatively low is that the Executing Agency commenced the third phase project and procured new cranes. This means that just after the Agency increased the number of cranes, the crane operating ratio is temporarily low unless the number of vessels arriving in port rises drastically. However, the number of vessels arriving in port is forecast to rise in the future, so it is believed that the operating ratio will also increase.

Figure 4: Container Forklift of this Project


Figure 5: Port Boat of this Project

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

Financial Internal Rate of Return:

Recalculating the financial internal rate of return with the fare revenues (port revenues) as the benefits and project construction costs, operational and maintenance expenses, and taxes as the costs, and assumed a project life of 20 years, the result was 6.43%. It is near to the 6.60% estimation figure at the time of the appraisal.

Economic Internal Rate of Return:

Recalculating the economic internal rate of return with 1) reduction of waiting time of vessels staying in port, 2) cargo transportation costs exit to other ports minus the costs enter to Yangpu port as the benefits and project construction costs and operational and maintenance expenses as the costs, and assumed a project life of 20 years, the result was 23.62%. It is a higher figure than the 15.60% estimation figure at the time of the appraisal. This result is a larger figure than the appraisal's because 1) the initial investment (construction costs) was reduced and 2) benefits increased more than the estimated figures (total cargoes increased more than estimated and reduction of waiting time of vessels staying in port came true.[14])

[14] Refer to table 3 in this report

3.3.2 Qualitative Effects

3.3.2.1 Results of Beneficiary Survey on Improvement of Utilization in Yangpu Port

Questionnaire interviews were conducted to companies using Yangpu Port since 2005 (before the project completion) and those that began using the port after the project completion. The overall positive results were obtained as shown below.[15] It can be assumed that the Executing Agency has had an effort to the efficient operation and service for facilities, and the results were positive.

Table 4: Questions for All Companies Using Yangpu Port

(Beneficiary Survey Conducted in this Study) (Unit: People)

Questions	Answers	
1）Changes in Total Cargo Handling Volume since 2005 at Yangpu Port	Significantly Increased: 16	(50%)
	Increased: 15	(47%)
	Not Changed: 0	(0%)
	Decreased: 1	(3%)
	Not Certain: 0	(0%)
2）Future Perspective of Yangpu Port	Will Expand and Develop: 31	(97%)
	Will Not Change: 1	(3%)
	Not Certain: 0	(0%)

Source: Results of beneficiary survey (The total sample size is 32.)

Table 5: Questions for Companies Using Yangpu Port Before the Project Completion (Left) and After the Project Completion (Right)

(Unit: People)

Questions	Answers (Companies Using Yangpu Port Before the Project Completion)		Answers (Companies Using Yangpu Port After the Project Completion)	
1）Waiting Time of Vessels Arriving in Port	Significantly Improved: 1	(65%)	Very Satisfied: 3	(25%)
	Improved: 7	(35%)	Generally Satisfied: 9	(45%)
	Not Changed: 0	(0%)	Fair: 0	(0%)
	Deteriorated: 0	(0%)	Not Satisfied: 0	(0%)
	Not Certain: 0	(0%)	Not Certain: 0	(0%)
2）Velocity of Cargo Handling Operation	Significantly Improved: 9	(45%)	Very Satisfied: 6	(50%)
	Improved: 10	(50%)	Generally Satisfied: 6	(50%)
	Not Changed: 0	(0%)	Fair: 0	(0%)

[15] There are currently about 600 companies using Yangpu Port. Most are trading, manufacturing, distribution and insurance companies, however many of them have businesses based outside of Hainan. The fixed sample for this beneficiary survey was to be 50 companies. However the sample was 32 companies due to time constraints, because contacting companies and collecting questionnaires were difficult. In addition, a random sampling of the roughly 600 companies using Yangpu Port was not possible for this beneficiary survey and an analysis of the characteristics of companies for whom responses could and could not be collected was difficult, so precise assumption of the entire population (of companies) was not possible. Accordingly, it is necessary to pay attention to the possibility that the trends observed in this beneficiary survey are not those of companies using Yangpu Port in general.

	Deteriorated: 0	(0%)	Not Satisfied: 0	(0%)
	Not Certain: 1	(5%)	Not Certain: 0	(0%)
3） Handling Quality (Damaged/Lost Cargo, etc.)	Significantly Improved: 10	(50%)	Very Satisfied: 8	(67%)
	Improved: 7	(35%)	Generally Satisfied: 4	(33%)
	Not Changed: 2	(10%)	Fair: 0	(0%)
	Deteriorated: 0	(0%)	Not Satisfied: 0	(0%)
	Not Certain: 1	(5%)	Not Certain: 0	(0%)
4） Safety of Cargo Handling Operation	Significantly Improved: 13	(65%)	Very Satisfied: 10	(84%)
	Improved: 7	(35%)	Generally Satisfied: 1	(8%)
	Not Changed: 0	(0%)	Fair: 1	(8%)
	Deteriorated: 0	(0%)	Not Satisfied: 0	(0%)
	Not Certain: 0	(0%)	Not Certain: 0	(0%)
5） Yangpu Port's Service Level (Overall Facility Service Quality)	Significantly Improved: 11	(55%)	Very Satisfied: 9	(75%)
	Improved: 8	(40%)	Generally Satisfied: 2	(17%)
	Not Changed: 1	(5%)	Fair: 1	(8%)
	Deteriorated: 0	(0%)	Not Satisfied: 0	(0%)
	Not Certain: 0	(0%)	Not Certain: 0	(0%)

Source: Results of beneficiary survey (The sample size is 20 of which are companies using the port before the project completion and 12 of which are companies using the port after the project completion.)

3.3.2.2 Alleviation of the Overload of Total Cargo Handling at Haikou Port[16]

At the time of the appraisal, alleviation of the overload of total cargo handling at Haikou Port through the project implementation was also cited as the effect of this project. However, at the time of the ex-post evaluation there were no concrete policies or plans to alleviate the overload at Haikou Port through Yangpu Port and it could not be verified whether the overload of total cargo handling volume at Haikou Port is being directly or indirectly alleviated. Nevertheless, considering that total cargo handling volume at both ports have increased, if cargo handling capacity at Yangpu Port had not been strengthened, it is imagined that vessels would have been encouraged to direct their cargo to other ports, including Haikou Port, thus causing overloads.

Regarding the above, this project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Impact

[16] The port operates passenger ferries to the mainland in addition to handling cargo. The distance between Yangpu Port and Haikou Port is roughly 130 km.

3.4.1 Intended Impacts

3.4.1.1 Economic Development in Yangpu Economic Development Zone and the Hinterland such as Dangzhou, Lingao, Baisha, and Development of Investment Environment

The following table explains the GRDP in Yangpu Economic Development Zone and the Hinterland such as Dangzhou, Lingao and Baisha. The GRDP in these areas has been growing since 2000.

Table 6: GRDP in Yangpu Economic Development Zone and the Hinterland

Year	GRDP in Yangpu Economic Development Zone (100 million CNY)	GRDP in Direct Hinterland *Note (100 million CNY)	Increasing Rate (%)
2000	3.0	47.76	-
2001	4.7	52.53	9.98
2002	7.2	60.14	14.49
2003	9.6	68.55	13.98
2004	14.0	77.59	13.19
2005	22.0	89.75	15.67
2006	30.0	103.59	15.42

Source: Joint research report by the National Development and Reform Commission General Transportation Research Institute and the Yangpu Economic Development Zone Economic Development Bureau
Note: "Direct Hinterland" indicates Yangpu Economic Development Zone, Dangzhou, Lingao and Baisha.

Yangpu Port features "deep waters, weak winds, few silt deposits and a long coastline" and has the best natural conditions in Hainan Island. It also has an advantageous geographical position adjacent to the ASEAN (Association of Southeast Asian Nations) Free Trade Area and has lucrative conditions to attract foreign capital. As a result of developing port facilities of this project, it is believed that there is a great possibility that the rapid increase in total cargo handling volume contributed to development of investment environment in the Yangpu Economic Development Zone. Since 2004, large companies (mainly manufacturers) such as paper and metal casting companies have come to the Yangpu Economic Development Zone. As the zone was approved as a bonded port area by the central government in 2007, it has been one of the zones with the most favorable tax policies in China. As a result, more companies have come to the zone[17]. Companies coming to the hinterlands such as Danzhou, Baisha and Lingao have also increased, just as the case of the Yangpu Economic Development Zone, and GRDP tends to increase.

[17] A large new project such as construction of a base for storing oil is being implemented.

3.4.1.2 Economic Development for the Whole of Hainan Province

Table 7 below shows the change in GRDP for the whole of Hainan Province since 2000. Economic growth at an annual pace of roughly 10% has been achieved. It is not easy to grasp how much of an effect that the project has had on the overall economic growth of Hainan Province, however as stated previously, it can be assumed that the increase in total cargo handling volume and the development of investment condition have had positive impacts on economic and social activity among residents and businesses.

Table 7: GRDP in the Whole Hainan Province

Year	Total GRDP (100 million CNY)	Average GRDP per Person (CNY)
2000	526.82	6,798
2001	579.17	7,315
2002	642.73	8,041
2003	713.96	8,849
2004	819.66	10,067
2005	905.03	10,998
2006	1,031.85	12,403
2007	1,223.28	14,555

Source: Hainan Statistical Yearbook 2008

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

There is no significantly negative impact on the environment as a result of constructing multi-purpose and general cargo berths and stockyards or installing handling machinery and equipment. In addition, environmental protection measures have been taken concerning water sprinklers, sewage management facilities, sewage collection boats, planting trees in the port, environmental monitoring stations, etc. In October 2005, just after the project completion, the Environment and Resources Department of the People's Government of Hainan Province verified that these measures have been implemented.

The environment impact assessment (EIA) for this project was implemented in May 1992.

3.4.2.2 Land Acquisition and Resettlement

Along with the project implementation, resettlement of 138 families (800 people) and land acquisition of approx. 986 ho[18] (approx. 65.7ha) were planed. The actual figures were the resettlement of 144 families and the land acquisition of 988.67 ho (approx. 65.9ha), largely as in

[18] 1 ho consists of 1/15 ha.

the initial plan, and no particular problems occurred. The Yangpu Economic Development Zone (administrative agency), which is the main agency implementing the resettlement and land acquisition, followed the procedures based on the "Yangpu Economic Development Zone Resident Relocation Ordinance", which acted as the plan for resettlement. Subsidies to resettled residents were fully paid. Meanwhile, the Executing Agency employed applicants to the Agency from among the resettled residents to help address employment. It is said that appropriate measures were taken.

Table 8: Planned and Actual of Resettlement and Land Acquisition

	Planned	Actual
Resettlement	138 families (approx. 800 people)	144 families (approx. 800 people)
Land Acquisition	986 ho (about 65.7ha)	988.67 ho (65.9ha)

Source: JICA documents, Answers on questionnaires

3.5 Sustainability (Rating: a)

3.5.1 Structural Aspects of Operation and Maintenance

The Executing Agency (the State Development Investment Company Yangpu Port; SDIC Yangpu Port) is a state-owned enterprise created in a joint investment by the People's Government of Hainan Province and the State Development Investment Corporation in June 1997. [19]

Under the General Director, who controls the whole Agency, are the Deputy Executive Director (primarily overseeing the Department of General Affairs, Administrative and Commercial Affairs), the Deputy Director (primarily overseeing the Department of Techniques and Operation and Maintenance), the Human Resources Inspector General (primarily overseeing the Department of the Human Resources) and the General Accountant (primarily overseeing the Department of Finances and Procurement). These directors are recognized as the pillars of the organization's management. As of December 2009 there are 698 employees. According to the Executing Agency, an appropriate number of workers have been secured for the project and the current number of employees is appropriate. In addition, through the field study it was confirmed and judged that the secured employees and their assignments to departments are efficient and appropriate. Based on the above, it can be judged that there are no

[19] SDIC Communications Co., a wholly-owned subsidiary of the State Development Investment Corporation, holds 75% of the stock, and the Hainan Province Yangpu Development and Construction Holdings Corporation, a company in Hainan Province financed solely by the state, holds 25% of the stock.

problems with the structural aspects of operation and maintenance.

The following departments in SDIC Yangpu Port are in charge of the operation and maintenance.

1）Department of Techniques (8 employees)

This department is mainly in charge of procuring equipment of port facilities, general management, technical improvements and management of operating boats, etc.

2）Mechanic Group (153 employees)

This group is mainly in charge of crane equipment operation and management, maintenance work, etc.

3）Mechanic and Repairing Factory (93 employees)

This factory is mainly in charge of repairing equipment and machinery of the whole port facility.

3.5.2 Technical Aspects of Operation and Maintenance

Department of Human Resources Department at the Executing Agency is mainly in charge of conducting personnel courses and training programs for employees. The department also conducts training for mid-level management and technical staff. 78 people participated in training held for general employees in 2009, and 29 people participated in training held for mid-level management. Training on operation and maintenance of machinery and equipment was held in 2008, which 128 people participated. There are also many employees with ample work experience and on-the-job training is occasionally conducted. Each department in charge of the operation and maintenance works (those listed previously in 3.5.1) has many sufficiently qualified personnel assigned (e.g. operator licenses about handling machinery, etc). Based on the above, it can be judged that the technical level of the Executing Agency with regards to operation and maintenance has been secured.

3.5.3 Financial Aspects of Operation and Maintenance

Table 9 below shows operation and maintenance costs of Yangpu Port in recent years.[20] As previously mentioned in Quantitative Effects (Effectiveness section), while the annual total cargo handling volume did not greatly increase during 2005-08, it can be inferred that the net increase in operation and maintenance costs as in the table below show that the sufficient

[20] The Executing Agency did not calculate the operation and maintenance costs from this project (the second phase project) alone. Rather, the data in the table also consist of costs both from the first and the second phase project.

budgets have been obtained, the port services have been improving, and the operation and maintenance works have been conducted satisfactorily. The Executing Agency also stated that sufficient operation and maintenance budgets are being obtained every year. Note that major financial resources are through revenues gained via fees for using the port facilities.[21]

Table 9: O&M Costs of Yangpu Port (Unit:10,000 CNY)

	2005	2006	2007	2008
Operation Cost	744.70	916.02	1,030.38	1,066.66
Maintenance Cost	318.41	379.87	421.12	451.28
Total	1,093.11	1,295.89	1,459.50	1,517.94

Source: Executing Agency documents

Table 10 below is the profit/loss sheet of the Executing Agency, showing a net profit for the past three years. The main reasons for the drop in net profit from 2007 to 2008 are 1) currency exchange losses due to fluctuating exchange rates, 2) higher expenses due to the sharp jump in oil prices and 3) decrease of operating income due to the global financial crisis.

Furthermore, with regards to the financial data such as current ratio, return on asset, capital adequacy ratio and fixed assets ratio, it can be assumed that there are no problems with the financial level[22].

Table 10: Profit/Loss Sheet and Financial Data of the Executing Agency (Unit: CNY)

	2006	2007	2008
1) Operating Income	116,914,019.37	115,639,046.27	108,647,875.83
2) Operating Cost	(56,154,478.96)	(65,437,860.90)	(64,296,968.79)
3) Operating Taxes and Additional Costs	(3,660,590.97)	(3,416,804.04)	(3,452,300.96)
Gross Profit on Sales	57,098,949.44	46,784,381.33	40,898,606.08
4) Selling Expenses	(333,937.69)	(171,356.74)	(886,756.51)
5) Administrative Costs	(20,559,651.03)	(20,192,462.56)	(22,935,200.40)
6) Finance Costs	2,775,166.07	14,027,430.90	5,093,819.37
7) Asset Evaluation Loss	0	222,123.94	1,467,238.37
8) Investment Income	2,411,239.62	448,558.37	522,434.84
Operating Profit	41,391,766.41	41,118,675.24	24,160,141.75
9) Non-Operating Income	114,192.13	429,257.75	59,737.82
10) Non-Operating Expenditure	(1,958,728.97)	(3,808,720.87)	(2,930,195.19)
Current Net Profits	39,547,229.57	37,739,212.12	21,289,684.38

	2006	2007	2008
1) Current Assets	159,014,453.47	183,330,164.82	186,550,327.19

[21] Adopted an independent profit system (self-sponsored funds)

[22] However, due to factors such as differing accounting standards between Japan and China, it may not be appropriate to analyze the data with Japanese perspective/standards, so it cannot be concluded from the data alone.

2) Current Liabilities	117,758,731.16	181,080,702.15	171,197,360.21
3) Current Ratio	135.0%	101.2%	109.0%
4) Return on Asset	4.9%	2.4%	1.8%
5) Capital Adequacy Ratio	65.1%	48.2%	48.3%
6) Fixed Assets Ratio	149.59%	114.72%	99.72%

Source: Executing Agency documents

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 about financial level of the Executing Agency.

3.5.4 Current Status of Operation and Maintenance

The status of operation and maintenance for this project are as follows. Periodical maintenance manuals are being distributed appropriately in the following organization, so there are no problems with the status of operation and maintenance.

1. Department of Techniques (in charge of procuring equipment of port facilities, general management, technical improvements and management of operating boats, etc)

The department is formulating annual maintenance plans for each output while working on operation and maintenance for all facilities at Yangpu Port. The department is also preparing maintenance manuals about the use of each equipment. With regards to spare parts, the department also has close links with the suppliers and ordinary procurement routes are being secured.

2） Mechanic Group (in charge of crane equipment operation and management, maintenance work, etc)

This group is in charge of operating handling equipment (cranes). Various types of maintenance are being conducted on cranes according to accumulated operating hours. Maintenance manuals are also being distributed.

3） Mechanic and Repairing Factory (in charge of repairing equipment and machinery of the whole port facility)

This factory is mainly in charge of repairing equipment and machinery such as cranes. In addition to regular maintenance, the factory also keeps emergency teams on regular standby. A certain amount of spare parts is also being kept on hand. Staffs work in three shifts (24-hour system).

Figure 6: Mechanic and Repairing Factory

Figure 7: Transportation Work in Stockyard

Regarding 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

It can be seen that the project conforms to the national policy and the development needs. Although the period of the project implementation took longer than initially planned, outputs were generally constructed according to plan. Total cargo handling volume has been secured as per the appraisal and no problems have been observed with operation and maintenance. Furthermore, it is assumed that the project has had an economic impact on the hinterland. In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

None

4.3 Lessons Learned

At the project commencement, the economy in Hainan Province was sluggish, there were no large industrial projects and cargo handling capacity volume at Yangpu Port was also sluggish. As a result, if civil works and procurement of equipment had proceeded on schedule as per the plan, influence of the targeted economic effects based on the demand estimates of the initial plan and revenues allocating for the O&M costs would not have been achieved, in a short-term period. Therefore, necessity of postponing the commencement of the civil works was re-examined. The postponement decided by the Executing Agency had an influence on the

efficiency evaluation, however the project effects such as total cargo handling volume have appeared as per the plan and it is believed that revenues which are necessary for maintenance work have been obtained. It is said that the decision was appropriate from the perspective of effectiveness and sustainability. Therefore, going forward with construction and procurement according to the initial plan is basically preferable. However if unexpected changes occur with regards to external conditions upon which the project effects are premised (such as economic and social conditions that involve the project), going back to the project's purpose and reviewing the project plan will also be one of the effective choices.

Comparison of the Original and Actual Scope of the Project

Items	Original	Actual
1.Project Outputs	1. Civil Works 1) Wharf Structure (Total length is 700m) a) Multi-purpose Berth x 1 (for 20,000DWT General Cargo Ship) b） General Cargo Berth x 2 (for 20,000DWT General Cargo Ship) (Total Annual Handling Capacity: 1.2 million tons) 2) Stockyard (47,000 ㎡)	 1) Wharf Structure (However the total length is 577m) Almost as planned (Total annual handling capacity: 1.774 million tons) 2) Stockyard As planned
	2. Procurement of Handling Equipments 1)Crane Set 2)Tank Truck (8,000 liters) for Supplying Oil to Machinery and Cars ×1 3)Carriage Trailer between Berths and Yard, Trailer Chassis x Total 79 4) Other Machinery and Equipments (Loaders, Heavy Machinery, Forklifts, etc.)	 1)2)4) As planned 3) Almost as planned （Trailer x 38, Trailer Chassis x 34: Total 72）
	3. Construction of Handling Facility Building, Operation and Management Building and Residential Houses for Port Workers (Living Environment Buildings), etc	One Warehouse and one Port Company Building were only constructed.
	4. Development of Water and Power Supply, etc (Water Supply and Drainage, Power Supply, Environmental Work Boat (120-ton boat x 1), Environmental Protection, etc)	As planned
	5. Procurement and Installation of Communication and Navigation Support System (Buoys x 7)	Almost as planned (However, the number of the procured buoys was 4.）
	6. Procurement of Port Boat (Tug Boat) x 1 and Patrol Vehicle x 3	Almost as planned (However, the number of the procured vehicles was 2.)
	7. Construction of Product (Cargo) Inspection Facilities, Procurement and Installation of Equipments, etc	Cancelled (However, the facilities and equipments were constructed and procured by China's own funds)
	8. Technical Cooperation (Dispatch of Training Group)	Cancelled (Partially implemented by China's own funds)

	9. Consulting Service No Plan for Hiring Foreign Consultants	As planned However, Shenghua, Guangzhou Province Transport and Construction Examiner, a local consultant was hired. (From November 1996 to April 1997: Total 5M/M)
		(Additional Outputs) 290,000 m^2 of stockyards (Expansion of container cargo and transport area: it was constructed with China's own funds).
2. Project Period	November 1995 to June 1999 (44 months)	November 1995 to September 2005 (119 months)
3. Project Cost Amount paid in Foreign currency	4,300 million yen	3,372 million yen
Amount paid in Local currency	5,078 million yen （434,000,000 CNY）	3,447 million yen （266,360,000 CNY）
Total	9,378 million yen	6,819 million yen
Japanese ODA loan portion	4,300 million yen	3,372 million yen
Exchange Rate	1 CNY＝11.7 yen （As of November 1995）	1 CNY＝12.94 yen （Average between November 1995 and September 2005）