

Ex-Post Evaluation of Japanese ODA Loan Project

Bai Chay Bridge Construction Project

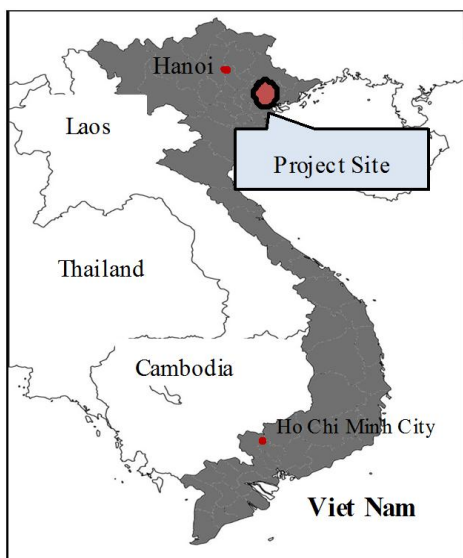
External Evaluator: Ryujiro Sasao, IC Net Limited

0. Summary

The objective of this project is to promote smooth distribution of goods along the National Highway No. 18 by constructing a new bridge together with an approach road across the Cua Luc Strait in Ha Long City of Quang Ninh Province, which is in line with Viet Nam's development plan and development needs as well as Japan's ODA policy. Therefore, the relevance of the project is high. The volume of traffic on the bridge and approach road has steadily been increasing, benefiting the local residents in various ways. A positive impact on the local economy has also been appearing.

Although the efficiency of the project is slightly low due to the prolonged project period, there appears no material problem in terms of operational status, management system, etc. The effectiveness of the project is expected to be maintained from this point onward.

1. Project Description



Project Location



Bai Chay Bridge

1.1 Background

The triangle linking Hanoi, Hai Phong and Ha Long (Quang Ninh Province) is positioned by the Vietnamese government as a key area of the northern region for development. The National Highway No. 18, an arterial road in northern Viet Nam with a total length of about 320 km

which runs from the capital city, Hanoi (Noi Bai Airport), goes across the northern part of Red River Delta, and reaches Bac Lung on the Sino-Viet Nam border by way of Ha Long City in Quang Ninh Province, is a vital transport route for the triangle. The region along the National Highway No. 18 includes Red River Delta, which is the major rice production area in Viet Nam, neighborhood of Noi Bai Airport where there was a plan of the construction of industrial parks and also tourism industries centered on Cai Lan port under construction (at appraisal in 2001) and Halon bay. Hence it was very important to improve the National Highway No. 18 in the industrial development of northern region.

Although the National Highway No. 18 plays the critical role in realizing the development plan of northern region, the road condition was poor. The road surface was damaged, bridges were aging and some sections were river or bay and had to be passed by ferry, which makes smooth traffic very difficult. Considering the above situation, the government of Japan provided the National Highway No. 18 Improvement Project with 11,863 million yen in the fiscal year 1997 and 11,586 million yen in 1999, based on the request of Vietnamese government.

This project is to construct a new bridge across the Cua Luc Strait at the entrance of Bai Chay bay located near the middle of the National Highway No. 18.

1.2 Project Outline

The objective of this project is to promote smooth distribution of goods along the National Highway No. 18 by constructing a new bridge together with an approach road across the Cua Luc Strait in Ha Long City of Quang Ninh Province, thereby contributing to the development of the Northern Economic Region as well as safe passage of large vessels in the Cua Luc Strait.

Loan Approved Amount / Disbursed Amount ¹	6,804 million yen / 6,710 million yen
Exchange of Notes Date / Loan Agreement Signing Date	June 2001 / July 2001
Terms and Conditions	Interest Rate: 0.95% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: Tied (Special yen loan project ²)
Borrower / Executing Agency	Government of the Socialist Republic of Viet Nam / Ministry of Transport of Viet Nam
Final Disbursement Date	May 2008
Main Contractor	Sumitomo Mitsui Construction Co., Ltd. (Japan) and Shimizu Corporation (Japan) (JV)
Main Consultant	None (Consultants were hired through “National Highway No. 18 Improvement Project (II)”.)
Feasibility Studies, etc.	Feasibility studies were conducted by Trafalgar House Corporate (July 1995).
Related Projects	(Technical cooperation) “National Transport Development Strategy Study in the Socialist Republic of Viet Nam” (JICA, July 2000) and “The Study on Environmental Management for Ha Long Bay” (JICA, 1999) (Yen loan) “National Highway No. 18 Improvement Project (I) (II)” and “Cai Lan Port Expansion Project”

2. Outline of the Evaluation Study

2.1 External Evaluator

Ryujiro Sasao, IC Net Limited

2.2 Duration of Evaluation Study

Duration of the Study: December 2010-November 2011

Duration of the Field Study: March 5-22, 2011 and July 10-30, 2011

2.3 Constraints during the Evaluation Study

None

¹ The funds of 2 yen loans are used for the construction of bridge and roads in the project. They are “Bai Chay Bridge Construction Project (VNIX-1)” and the part of “National Highway No. 18 Improvement Project (I) (II) (VNV-6, VNVII-6)”. The amount shown here is only that of “Bai Chay Bridge Construction Project (VNIX-1)”. The bridge portion of the project was funded by “Bai Chay Bridge Construction Project (VNIX-1)” and approach roads and consulting service were funded by “National Highway No. 18 Improvement Project (I) (II) (VNV-6, VNVII-6)”.

² Special Yen Loan (SYL) was applied for this project. SYL was originally introduced by the government of Japan in 1998. It is a scheme to support Asian countries for the purpose of quick recovery from Asia Currency Crisis and to provide funds to establish infrastructure in the fields of efficient distribution of goods, strengthening production basis, large scale disaster control and so on. Under this scheme generous loan condition of interest and repayment period is applied. In addition, the contractor is limited to Japanese corporations and procurement of products and services is limited to Japanese (share of other countries’ should be less than 50% of the entire loan amount), by which rule expansion of the Japanese corporations’ participation is also encouraged.

3. Results of the Evaluation (Overall Rating: A³)

3.1 Relevance (Rating: ③⁴)

3.1.1 Relevance with the Development Plan of Viet Nam

At the time of the appraisal, the road development plan of the Vietnamese government attached a great importance to establishment of road networks (including improvement of regional roads) factoring into increasing future transport demand, while a top priority was put on maintenance and repair of existing roads. The amount scheduled to be invested into the transport sector stood at around Four billion dollars, or accounted for 25% of total public investment plan of Viet Nam (1996-2000). Of this amount, about 2.5 billion dollars were earmarked for the road sector, indicating that roads absorbed the lion's share of the development investment the government made in the transport sector.

As of the ex-post evaluation, the Five-Year Socio-Economic Development Plan (2006-2010) has confirmed that 27.5% of the national budget was invested in the transport and telecommunications sectors during the five years from 2000 through 2005. The Plan has set "to meet the goods and passenger transportation demand in the country" as a goal for the transport sector. The goal for the road sector in particular is specified as "to complete communication axes on the North-South lines, by connecting important economic areas, focus on the development of roads in mountainous regions, the Central Highland and the Mekong Delta."

Making a part of the National Highway No. 18, Bai Chay Bridge is closely linked with the importance of the route. The National Transport Development Strategy Study in the Socialist Republic of Viet Nam (2000), which was developed into a transport sector strategy and approved by the government in 2004 as the "Strategy of Transport Development in Viet Nam to 2020," focused on the improvement of the National Highway No. 18 as one of the most important projects aiming at the improvement of primary highways.

As described above, the development of road networks was a task of utmost importance not only for the national development plan at the time of the appraisal, but has remained so also for that at the time of the ex-post evaluation. The importance of this bridge, a part of a major highway, has been maintained as well.

3.1.2 Relevance with the Development Needs of Viet Nam

This project was aimed at the construction of a new bridge across the Cua Luc Strait located near the middle of the National Highway No. 18. At the time of appraisal, there was no bridge over the strait and transport was done by ferry. However, ferry transport had reached nearly maximum capacity backed by growing traffic volume in recent years, thus disturbing smooth distribution of goods along the National Highway No. 18. Meanwhile, the expansion of Cai Lan Port of Bai Chay Bay was expected to increase the number of large vessels shipping across the

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

⁴ ③: High, ② Fair, ① Low

Cua Luc Strait and the traffic risk of crossing shipping routes of large vessels and ferries became an impending safety issue to tackle. Because of these reasons, it was critical to construct a bridge over the strait and an approach road to it (including access roads).

In fact, the trend of traffic volume on the bridge after the completion of the project shows that the volume surged more rapidly than previously estimated, and gives an ex-post verification of the existence of the development needs. In addition, the importance of the National Highway No. 18 extending to the Sino-Viet Nam border seems to have further been strengthened on the back of the recent sharp rise in trade with China. Had it not been for the bridge, the road would not have reached the border without being interrupted by the strait. It can be said that the bridge is in great need in this sense as well.

3.1.3 Relevance with Japan's ODA Policy

JICA has offered support to Viet Nam centering on infrastructure development, since it resumed project loans to the country in fiscal 1993. JICA's country assistance program has placed a greatest importance on the transport sector as a target field along with the electricity sector.

“Japan's ODA Annual Report (1997),” published by the Economic Cooperation Bureau of the Ministry of Foreign Affairs of Japan positioned Viet Nam's transport sector as one of key fields for assistance in its chapter, “6. ODA Policy by Major Country,” mentioning that “Japan will develop infrastructure in the country that facilitates inward foreign investments for export-oriented economic growth (cooperation in the electricity sector to cope with future increase in demand, cooperation in the transport sector tailored to characteristics of each transportation mode).”

These indicate that Japan's ODA policy focused on Viet Nam's transport sector at the time of the appraisal. Therefore, this project has been highly relevant to Japan's ODA policy. As examined so far, this project has been highly relevant with Viet Nam's development plan, development needs, as well as Japan's ODA policy. Thus its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

(1) Construction works

Major parts of the bridge have been constructed within the planned scope of works. Both length and width of the approach road have slightly been revised from the initial plan, details of which are described below. As a whole, changes in the scope have had no detrimental impact on the objective of the project.

Table 1: Comparison of Scopes (Plan and Results)

Item	Initial plan	Actual results	Major changes and reasons
1.Main bridge			
Length	903 m	903 m	Unchanged
Traffic lane	4 lanes (2 lanes each way)	4 lanes (2 lanes each way)	Unchanged
Width	25.3 m	25.3 m	Unchanged
Height limit for navigation	50 m	50 m	Unchanged
Type	PC cable-stayed bridge	PC cable-stayed bridge	Unchanged
2.Approach bridge			
Length	99 m	99 m	Unchanged
Traffic lane	4 lanes (2 lanes each way)	4 lanes (2 lanes each way)	Unchanged
Width	23 m	23 m	Unchanged
Type	PC box-girder bridge	PC box-girder bridge	Unchanged
3.Approach road			
Length	Bai Chay side: 3,292 m (including 4 bridges) Hong Gai side: 4,594 m (including 3 bridges)	Bai Chay side: 4,318 m (including 4 bridges) Hong Gai side: 4,700 m (including 3 bridges)	Adjustment was made through D/D taking the actual land form into consideration. The approach road on the Bai Chay side was particularly lengthened because of the addition of a 600m road linking Bai Chay and Cai Lan Port, etc.
Traffic lane	Bridge and approach road: 4 lanes (2 lanes each way), access roads: 2 lanes (1 lane each way)	Bridge and approach road: 4 lanes (2 lanes each way), access roads: 2 lanes (1 lane each way)	Unchanged
Width	29 m (9 m in case of access roads)	23.3 m (bridge, 23.3 m; approach road, 23 m; there are 2 access roads on each of Bai Chay and Hong Gai sides, of which one is 5.5 m wide with 2 lanes each way, and the other is 3m wide with 1 lane each way)	The width was revised to be in line with the width of the National Highway No. 18 (24 m). Access roads have got narrowed due presumably to less traffic volume on those roads estimated at the time of D/D than initially projected.

The key feature of the bridge is that as Ha Long Bay is one of the most scenic areas in Viet Nam and designated as UNESCO's World Heritage site, it has employed a single plane cable

system and single column towers so that it blends in the surrounding scenery⁵. In addition, groundwork for the bridge has not been placed in the Cua Luc Strait to reduce burdens on the surrounding environment. The map of the project site is shown in the f 1

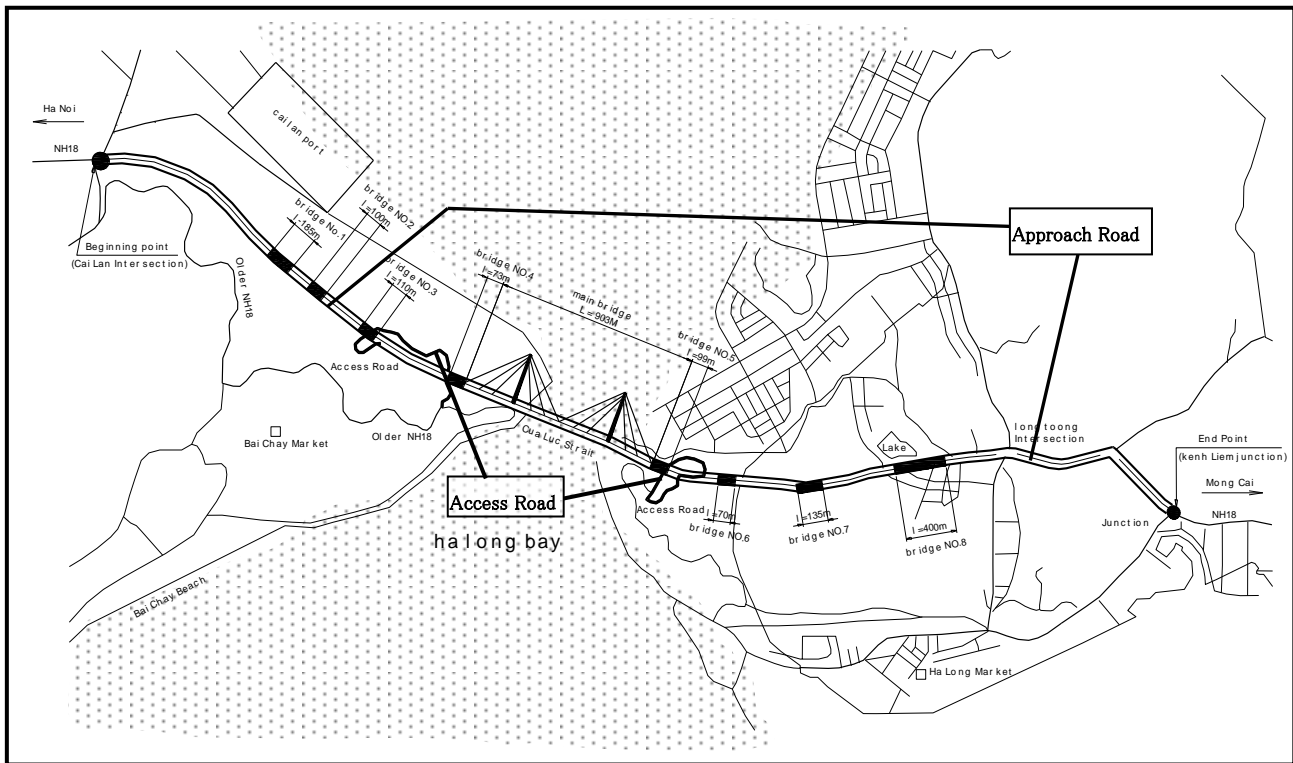


Figure 1: Location of Bai Chay bridge

At the time of the appraisal, systems to monitor maintenance and management of the bridge as well as traffic volume were planned to be introduced with budget allocated for that purpose. However, due to the difference in rules on the procurement of these systems applied to JICA and those to Viet Nam⁶, introduction has significantly been delayed up to the present date⁷. (As a result, a portion of scope of yen loan project was cancelled.)

The bridge under this project was designed to withstand wind speed of 50 m/s. In fact, when a gust of wind with intensity scale of 12⁸ or more occurred twice and blew down large cranes in

⁵ The distance between two columns of the bridge of 435m is the longest in the world as a PC cable-stayed bridge adopting a single plane cable system (as of 2006).

⁶ In JICA's rule contractors are allowed to procure the system at their own discretion but the rule of Vietnamese government required to conduct separate competitive bidding for the procurement of the system.

⁷ In order to confirm the safety in the course of construction, the bridge had been equipped with a monitoring system consisting of 2,500 m of optical fiber, which the contractors had developed and installed to measure vertical inclinations of major towers and girders. Even after the construction was completed, the system continued to be utilized by courtesy of the contractors to monitor bridge conditions for a while. The delay in introducing above-mentioned systems is considered due partly to functioning of this optical fiber monitoring system for a certain timeframe.

⁸ Scale 12 means wind speed of 32.7-36.9 m/s, 'a strong destructive wind' under Viet Nam's standards. According to the contractors, the aerovane installed in the bridge actually recorded the maximum speed of 48.1 m/s.

Cai Lan Port in November 2006, the bridge itself was not damaged at all.

(2) Consulting service

Expected tasks of consultants are detailed design review, bid and contract assistance and construction management (including environmental measures). These were conducted as planned. Technical guidance was also planned in and outside Viet Nam and it was also conducted.

The executing agency has assessed highly performance of the contractors (including quality of facilities) and quality of consulting services across the board. In particular, Japanese contractors and consultants have highly been praised. Favorable performance of the contractors is due partly to the fact that, even though it was a special yen loan project, the number of bidders, i.e., five, was not smaller than that for usual cases and there was good competition.

According to the executing agency's responses to questionnaire on the special yen loan, prime contractors smoothly transferred technologies⁹ to local contractors, which have been utilized in other construction works. It is also reported that engineers who have acquired the technologies were promoted within their respective companies.

3.2.2 Project Inputs

3.2.2.1 Project Cost

This project consisted of three major components: the main bridge, the approach roads and consulting service. (Of these, construction of the main bridge was covered by yen loan for the project, while that of the approach roads and consulting service was financed by yen loan for another project, "National Highway No. 18 Improvement Project (I) (II).") The project cost mentioned below means the total amount spent for the three components.

The project cost was initially estimated at 18,003 million yen, i.e. the total of 10,384 million yen and 973,052 million Vietnamese dong (or 7,619 million yen*).

*Exchange rate: 1 Vietnamese dong = 0.00783 yen

The actual project cost stood at 11,954 million yen, i.e. the total of 7,294 million yen and 610,747 million Vietnamese dong (or 4,660 million yen*).

*Exchange rate: 1 Vietnamese dong = 0.00763 yen

The following table shows the plan and results of the project cost.

⁹ To be more precise, these include "caisson pile method," "pneumatic caisson engineering," "cantilever system for cable-stayed bridge construction," etc.

Project cost	Plan	Results
Amount paid in foreign currency	10,384 million yen	7,294 million yen
Amount paid in local currency	7,619 million yen (Local currency: 973,052 million VND)	4,660 million yen (Local currency: 610,747 million VND)
Total	18,003 million yen	11,954 million yen
Japanese ODA loan portion	13,241 million yen	9,298 million yen
Exchange rate	1 VND = 0.00783 yen (As of February 2001)	1 VND = 0.00763 yen (Weighted average rate)

In terms of yen, the actual project cost was 66.4% of the initial estimate, lower than planned.
(Sub-rating: ③)

Here are the reasons behind this:

- Thanks to public tender bid, contract price for approach road construction¹⁰ remained low at about 50% of the projected amount¹¹.
- Due to lower construction cost for the approach road, related management cost and tax spending decreased significantly.
- Some payment to the contractors has yet to be done¹².
- Interest payment during the construction period is not included in the above-mentioned project cost (actual results)¹³.
- Of the initially planned cost, those set for maintenance and management system and traffic volume monitoring system have not actually been spent.

“Planned cost set for maintenance and management system and traffic volume monitoring system have not actually been spent” mentioned above was a change in the construction scope. When this portion is subtracted from the initial cost estimate, the ratio of actual cost to planned cost is recalculated at 66.7%, but the sub-rating remains unchanged.

¹⁰ Accounting for about 50% of the total construction cost under this project, this was done under a different package from that for the bridge and financed by another yen loan (National Highway No. 18 Improvement Project).

¹¹ Although the portion of bridge was funded by special yen loan, 5 companies participated in P/Q, which is not smaller than that for usual public projects in Viet Nam (4 companies participated in bidding). According to the implementing agency, bidding prices were not particularly expensive as compared with other ordinary cases, too. An audit on procurement procedure was conducted by an auditing firm, KPMG, which found that there was no special problem.

¹² It was reported that about 70 billion VND (about 530 million JPY at actual exchange rate) is not paid yet. This is due to the fact that the payment amount was not fixed by the deadline of yen loan disbursement and eventually necessary funds were decided to be managed by Vietnamese side. However, even if the unpaid portion had fully been paid, the ratio of the actual cost to the planned cost mentioned in the text would not exceed 100%.

¹³ The executing agency did not disclose the amount.

3.2.2.2 Project Period

This project was scheduled to take five years and five months from execution of L/A (loan agreement) in June 2001 to completion of civil works in October 2006. In fact, L/A was executed in July 2001, while civil works were completed in March 2008. This indicates that the actual project period lasted 81 months compared with the initial projection of 65 months; it was 24.6% longer than planned. (Sub-rating:②)

The prolonged project period was due primarily to delay in constructing the approach road, not the main bridge. The approach road was to be built by cutting into gently undulating hills. The slope angle of the road turned out to be too steep and by the time nearly half of construction works had been done, several landslides occurred at both sides of the bridge. This has led to redesign of the road to revise the slope flat along with acquisition of additional land required for the new design.

It is reported that: about 14 months, a half of the period initially planned, had passed when the above-described problem arose; then around 15 months was required for redesign of the road and land acquisition, which was not initially factored into; and it took another 16 months to complete the construction work.

3.2.2.3 Consulting Service

Table 2 compares plan and actual results of consultants involved in the project in terms of MM. The increase in MM in actual results was due to larger volume of construction management tasks caused by the prolonged project period described in “3.2.2.2 Project Period” above.

Table 2: Comparison of Consultants' MM between plan and the results

Post	Tasks	Plan	Results
Japanese experts	Detailed design review	9	21.17
	Bid and contract assistance	12	
	Construction management (including environmental measures)	197	209.76
	Total	218	230.93
Vietnamese experts	Detailed design review	13	33.96
	Bid and contract assistance	11	
	Construction management (including environmental measures)	651	881.75
	Total	675	915.71
Local supporting staff	Detailed design review	21	67
	Bid and contract assistance	40	
	Construction management (including environmental measures)	490	479.87
	Total	551	546.87

Accordingly, although the project cost was within the plan, the project period was exceeded. Therefore the efficiency of the project is fair.

3.3 Effectiveness (Rating: ③)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators

Table 3: Trend of Traffic Volume on Bai Chay Bridge

Indicator	2006	2007	2008	2009	2010
Traffic volume target (PCU/day) *1	11,195	n.a.	n.a.	n.a.	21,512
Traffic volume results (PCU/day) *2	(Opened in December, 2006)	16,770	17,011	22,764	21,723
Traffic volume results (cars/day) *3	(Opened in December, 2006)	10,940	10,368	13,515	12,918

*1: From materials for the appraisal.

*2: Response from the executing agency to questionnaire.

*3: Response from the executing agency to questionnaire.

The table above shows a steady increase in traffic volume after the bridge was built¹⁴. Although the work was actually completed about one and half years behind schedule, traffic volume results (PCU/day) in 2010 were more or less in line with the target (PCU/day) for 2010 set at the time of the appraisal.

Monetary effects of shortened transport time as a result of this project were not recomputed (because data was not available from the operation and maintenance company). However, according to the study on beneficiaries, around 70% of residents in the neighborhood, who use the bridge, responded that transport time was shortened by 20 minutes or more, indicating that a situation more or less in line with the pre-project estimate, i.e. “the project will enable transport time to be shortened by 25 minutes,” has been realized.

Table shows a drop in traffic volume in 2010. According to reports from the operation and maintenance company, this appears due to improvement works carried out at two locations along the National Highway No. 18 since 2008¹⁵.

Previously, a limited number of special ferries carrying containers and heavy trucks were in service only in the evening. The new bridge has enabled such containers and heavy trucks to be transported at any time, which is believed to be bringing another enormous benefit.

¹⁴ The bridge was opened to traffic on December 2, 2006.

¹⁵ To be more precise, construction works were implemented between Mong Duong and Mong Cai from 2008 through 2010, and also between Cuaong and Mong Duong from 2009 through 2010. Both construction sites are located on the Hong Gai side of Bai Chay Bridge. Traffic volume from these areas to Bai Chay Bridge is considered to have decreased because of closure of the road for the work.

3.3.1.2 Results of Calculations of Internal Rates of Return (IRR)¹⁶ Economic Internal Rate of Return (EIRR)

Table 4: Comparison of Pre- and Post-Project EIRR

	At the time of appraisal	At the time of ex-post evaluation (recalculated)*
EIRR	16.73%	11.67%
(Calculation basis)		
Project life	25 years	25 years
Cost	Construction cost, operation and maintenance cost	Construction cost, operation and maintenance cost
Benefit	Increasing benefits in terms of time and travel, decreasing ferry operation cost, increasing benefits for commercial ships	Increasing benefits in terms of time and travel, decreasing ferry operation cost (increasing benefits for commercial ships is not included*)

* Since appraisal materials did not provide detailed description on computing process of benefits for commercial ships, they are not included in the calculation.

The economic rate of return is slightly lower than that at the time of appraisal. However, as noted above, this appears due to the fact that some benefits factored into the calculation at the time of appraisal are excluded from that at the time of ex-post evaluation.

3.3.2 Qualitative Effects

Results of the study on beneficiaries (residents living near of Bai Chay Bridge and the approach road) are described below and clearly indicate that the project has promoted smooth distribution of goods.

Resident respondents (total 110) consist of almost equal numbers of males and females. They are mainly office clerks, business operators (store managers, etc.), and civil servants. 46 of them, or more than 40% of the total, use the bridge every day.

Some responses have identified direct benefits from the project such as follows:

- Smooth transport as a result of the project has enabled goods to be delivered to areas further away than previously, or from areas further away than previously (the former, more than 80% of the total respondents, while the latter, more than 90%). Thanks to the project, shipping volume of goods (agricultural product, processed product, craftwork, etc.) has increased (91 respondents, or more than 80% of the total)¹⁷.
- Transport time has been shortened compared with that of ferry transport before the project (100% of the respondents, of which 70%, or 81 respondents, said that transport time was

¹⁶ Although tolls are charged on the bridge, several entities are in charge of management of the bridge. For this reason, calculation of FIRR (financial internal rate of return) has been omitted.

¹⁷ It is estimated that influence of the road improvement of National Highway 18 is also significant for this effect.

shortened by 20 minutes or more).

- Improvement of access has also been identified as follows:

Destination	Ratio of respondents identifying access improvement (%)
Markets/stores	61.8
Social services (schools, etc.)	65.5
Hospitals	82.7
Administrative institutions	76.4
NGO offices*	44.5
Other	37.3

* Associations of military veterans, women, the youth, etc.

As thus far seen, this project has largely achieved its objective. Therefore its effectiveness is high.

3.4 Impact

3.4.1 Intended Impacts

Impacts of the project that were expected during the appraisal are the development of an economic zone in the northern part of Viet Nam and the safety of large vessel routes in the Cua Luc passage. Here, we found impacts on Quang Ninh Province, which are considered to be largely affected by this project in terms of geography.

In the “Long-Term Socio-Economic Development Plan” of Quang Ninh Province, the target levels have generally been achieved in the major indices by 2010 shown below.

Table 5: Major Indices of the “Long-Term Socio-Economic Development Plan”

	2005 (Results) *1	2006-2010 Annual average growth (Estimate) *1	2006-2010 Annual average growth (Results) *2
Population growth (Annual average percentage)	1,070,000	1.00%	1.74%
Annual average regional GDP growth (Fixed value in 1994)	6,229 (1 billion VND)	13%	12.13%

Source:

*1. Department of Planning & Investment, Quang Ninh Province, “Master Plan for Socio-Economic Development of Quang Ninh Province up to 2010 and orientation to 2020”

*2. Statistics Office, Quang Ninh

Changes in other major economic indices concerning Quang Ninh Province are as follows.

Table 6: Other Major Economic Indices Concerning Quang Ninh Province

Indices	2005	2006	2007	2008	2009	2010
Business sales (1 billion VND)	10,172	11,782	15,942	18,765	21,593	n.a.
Freight transport volume (tons)	9,034,000	9,976,000	13,238,000	14,346,000	15,984,000	n.a.
Agricultural production volume (tons)	1,782,150	1,720,870	2,616,525	3,382,815	3,444,379	n.a.
Industrial production (1billion VND)	23,451	29,118	39,393	53,623	64,818	n.a.
Number of visitors (in the whole province)	2,485,000	3,110,000	3,600,200	4,514,541	4,800,800	5,417,000
Number of visitors (in the Ha Long Bay district)	1,472,000	1,489,820	1,790,289	2,622,130	2,352,934	2,800,000
Income per capita (US dollars/month)	721.7	887.1	1,043.5	1,134.9	1,158.4	1,293.9

Source: Statistics Office, Quang Ninh

Bai Chay Bridge opened on December 2, 2006. After its opening, economic indices of Quang Ninh Province grew significantly in 2007 and each index has continued to grow steadily. Various factors are considered to have led to the improvement of major economic indices. However, it is estimated that the project has made a certain contribution to the development of the economic zone in northern Viet Nam, together with the relevant upgrading of the National Highway No. 18, through the smoother transportation of goods. This is based on qualitative impacts found through the following interviews and beneficiary survey.

The following is the summary of qualitative impacts found through various types of interviews.

- 1) Increase in the means of transportation: At the time of the interim review in March 2007, two routes that go through the bridge were operated by a bus company under the provincial government. In addition, the third and the fourth bus routes were operated at the time of the ex-post evaluation.
- 2) Tourism: In the above-mentioned beneficiary survey, all respondents said that the design of the bridge matches the landscape of Ha Long Bay. The bridge received good reviews by tourists in the on-site interview with tourists and tour guide/interpreters¹⁸. As shown in Table 6, the number of tourists in Ha Long district, Quang Ninh Province is rapidly increasing after 2006.

Previously, tourists only visited Ha Long Bay. After the completion of the Bai Chay Bridge, the number of tourists who go to Van Don Island near the Viet Nam-China border, located about an hour by car from the bridge, has been increasing. (Note: the upgrading of

¹⁸ Bai Chay Bridge is extensively advertised in tourism brochures of Ha Long Bay.

the National Highway No. 18 is considered to have also contributed to this increase.) As seen in the above Table, the number of tourists in the entire Quang Ninh Province is also steadily increasing after 2006.

- 3) Industrial development: The bridge is considered to contribute to the promotion of industrial parks in Quang Ninh Province in purchase (raw procurement), distribution and sales. For example, the occupancy rate of the neighboring Cai Lan Industrial Park is 100%¹⁹.
- 4) Health of local residents: The level of medical care in districts around Bai Chay is not always high. After the upgrading of the National Highway No. 18 and the construction of bridge, it became easy for doctors in Hanoi to access the districts. On the contrary, patients in the districts gained easy access to Hanoi (Note: According to the beneficiary survey, many people in the districts answered that access to hospitals has improved).

According to the beneficiary survey (on residents), the results concerning the impact of the project are as follows. These results of the beneficiary survey confirm the economic effect of the project.

On the whole, although the project is highly evaluated, many local residents are concerned about the increasing number of traffic accidents and some call for a corrective measure. When an interview with the local police was conducted in the secondary site visit, the situation of traffic accidents was as shown in the following Table 7 and the main causes of traffic accidents are vehicles running on an inappropriate lane, careless driving, pedestrians going through a red light, vehicles with excessive speeds and so on. The number of people who had traffic accidents around Bai Chay Bridge decreased from that in the previous year. However, this is still at a relatively high level compared to those in other areas. It is therefore preferable that some improvement measure is conducted in cooperation with relevant organizations.

Table 7: Status of Traffic Accidents around Bai Chay Bridge in Recent Years

Year	Total number of accidents	Number of deaths	Number of people injured
2007	7	2	8
2008	16	4	16
2009	15	12	19
2010	8	5	9

Source: Police station that administers Bai Chay Bridge

¹⁹ According to the developer of Cai Lan industrial park, one of the strong motivation factors of companies to enter is the existence of Cai Lan port.

Detailed answers concerning the impact of the project by the residents (beneficiary survey, 110 replies) are as follows:

- 1) Employment opportunities: gained new employment opportunities or expanded business after the project²⁰: Yes (39.1%); No (60.9%)
- 2) Change in income: Household income increased after the project: Yes (5%); No (35.5%); no answer (0%)²¹
- 3) Change in the number of traffic accidents: Increased (59.1%); Decreased (20.0%); Unclear (20.9%)
- 4) Impacts on business-owned land and houses: Affected (28.2%)²²
- 5) Changes in the environment after bridge construction (only major categories abstracted, percentage of respondents)

Category	Worsened	Not changed	Improved
Air	73.6	18.2	8.2
Noise	80.9	10.9	8.2
Water quality	4.5	93.6	1.8

- 6) Comprehensive evaluation of the benefits of the project

Category	Percentage of respondents (%)
Excellent	60.9
Good	38.2
Neutral	0
Slightly negative	0
Very negative	0
No Answer	0.9

3.4.2 Other Impacts

Measures that had been originally assumed were comprehensively taken for matters of concern. It is therefore considered that there were no negative impacts.

²⁰ Examples are opening a shop (restaurant) near the bridge, starting transport business such as taxi, tourism related jobs and so on.

²¹ Owing to the above gained new employment opportunities

²² Most of these are the cases where they sold their private land to the government for the project.

1) Impacts on the natural environment

Ha Long Bay, in which the bridge is located, has a unique landscape with almost 2,000 large and small islands and oddly-shaped rocks. It was registered as a UNESCO World Heritage site in 1994. As the location of the project is in the buffer zone between the designated areas for the Ha Long Bay World Heritage site, implementation of the following environment conservation measures was called for as part of the project: 1) tree plantation along approach roads as a landscape measure; and 2) implementation of continuous monitoring concerning air pollution and noise during and after construction.

After the implementation of the project, at the time of the interim review, it was confirmed that the Environmental Impact Assessment (EIA) was conducted before implementing the project and environmental measures were taken under EIA based on the comments of UNESCO. The executing agency set up an environmental monitoring unit, took environment conservation measures based on EIA results and conducted monitoring during the construction period²³. To compensate for the area of vegetation that was cut down for businesses, mangrove trees are planted in the area equivalent to or larger than deforested area in Cua Luc Bay. Trees are also being planted around the main bridge piers.

At the time of the ex-post evaluation, the implementation state of five categories of environment conservation measures²⁴ that were identified during the appraisal was confirmed and they were all implemented as planned.

According to interviews with the operation and maintenance company using a concise environment check list that was used in the past appraisal of this project, it was confirmed that there was no problem concerning air, noise and so on²⁵.

On the other hand, the beneficiary survey shows that many people said air pollution and noise became worse compared to the natural environment before and after construction. However, according to the overall survey results, it is fair to say that these environmental impacts are not so serious²⁶.

2) Land Acquisition and Resettlement

The number of households affected directly by the project was 478, and 162 households had to move their houses. Resettlement of residents completed before bidding in compliance with

²³ There is no adverse impact on the environment according to the "Environmental Management Final Report" (formulated by a consultant in 2006).

²⁴ Submission of project completion chart (plan) before construction, conducting vegetation, assistance to the implementation of EIA content, conducting environment monitoring and so on

²⁵ In 3 grade evaluation on the impact on environment (Big, Small and None), most of items were regarded as "None".

²⁶ There are following reasons. 1. The answer options on questionnaire were "worsened," "remained the same" and "improved," and the level of worsening was not clear. If there are any serious problems, respondents would usually write down problems in the "opinion" space for improvement on questionnaire. No opinions about air pollution and noise were written down. (About 20 respondents out of 110 wrote down some opinion). 2. The evaluators themselves did not feel that there was a problem when they actually conducted exploratory investigation around Bai Chay Bridge.

Vietnamese laws and the land was acquired without any problems. Residents who had to move was provided an average of 67.5 m² of land per house in the Yet Kieu district in Ha Long City (developed by Quang Ninh Province), which is located approximately 1.5 km north from the previous residences of most of relocatees²⁷. A certain amount of compensation was paid to the remaining 316 households. All compensation details were accepted by the Quang Ninh Province People's Committee.

3) Other Positive/Negative Impacts

Among approximately 600 employees who were working in the company at that time, about 220 left in a few years and about 100 moved to An Sinh Company that currently collects toll fares. Other 280 are employed by Quang Ninh Bridge & Ferry Management Company.

As mentioned above, in general, there were realized impacts that were assumed at the time of appraisal such as the development of the Northern Economic Region as well as safe passage of large vessels in the Cua Luc Strait.

In 2011, a comprehensive analysis was conducted on the roles that the five yen loan projects played in improving distribution systems and reducing poverty in the northern region of Viet Nam. The five projects include three out of the six projects subject to the Fiscal Year (FY) 2010 Package of Ex-Post Evaluation IV-1 (Viet Nam) such as the "Cai Lan Port Expansion Project," "Bai Chay Bridge Construction Project" and "National Highway No. 18 Improvement Project (I) (II)" and the "National Highway No. 10 Improvement Project (I) (II)" and the "Binh Bridge Construction Project" for which ex-post evaluations were conducted in FY 2009.

The results of the analysis are summarized as follows.

- To understand the current distribution situation throughout Viet Nam, the changes in two indicators, i.e., the volume of passenger traffic and that of freight traffic, from 2000 to 2008 in all the regions were researched. In both indicators, the growth of northern Viet Nam was the highest. The above mentioned five projects cover eight out of the 12 provinces in the northern region. The shares of the eight provinces in the northern region are 87.3% of land passenger traffic and 89.5% of land freight traffic²⁸. Therefore, it is estimated that five evaluation projects have contributed to the growth of passenger traffic and freight traffic in the northern region to a certain extent. As for the aid amount, JICA's contribution is the largest of all the donors in Viet Nam's transport sector²⁹.
- In particular, with regard to the "Cai Lan Port Expansion Project," "Bai Chay Bridge

²⁷ Their residences were near the 8th bridge on Hong Gai side of the project road (approach road).

²⁸ Not all the traffic is through the roads constructed with Japan's loan assistance.

²⁹ The share of JICA in the total invest amount of all the ODA projects (including the funds provided by the Vietnamese government) conducted from 1993 to 2011 is 36%. Those of the Asian Development Bank and the World Bank are 14% and 11%, respectively.

Construction Project” and “National Highway No. 18 Improvement Project (I) (II)” which are strongly related to one another because of close locations, a certain synergy effect was confirmed quantitatively.

- The annual growth rate of the entire Viet Nam industrial outputs from 2000 to 2008 is 16.4%. The annual growth rate of northern Viet Nam is 19.9% which exceeds the national average. One of the likely background factors for the high growth rate is the increase in foreign direct investment since the late 1990s. Businesses that chose to invest in northern Viet Nam regarded transport improvements as a factor of paramount importance in their decision. Most of the major industrial parks are actually located along the National Highways No. 18, 10, and 5, all of which JICA provided assistance for improvement. In addition, the agriculture sector has enjoyed the benefit of expanded distribution coverage and reduced damage to agricultural products by the reduction of transport time owing to the improvement of roads.
- The poverty ratio in Viet Nam as a whole has been declining steadily since the late 1990s. The poverty ratio of the northern region, whose poverty ratio had already been lower than most of the country, decreased to a single digit level as of the year 2008. In the northern region, both industrial and agricultural production increased in the 2000s, led to the income increase of people engaged in these industries as well as general poverty reduction. In summary, the improvement in the roads and the port created smooth traffic of goods and people and contributed to the development of industries and poverty reduction in the region.

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

At the time of appraisal, the Regional Road Management Unit (RRMU) under the Ministry of Transport was supposed to be in charge of operation, maintenance and management after the completion of the facility. The company that had previously been operating ferries was reorganized as Quang Ninh Bridge & Ferry Management Company. The government approved and decided to let the company³⁰ manage the facility under the Department of Transportation, Quang Ninh Province³¹. Now the same company still manages the facility.

Currently, the company has 282 employees. In addition to the management of Bai Chay Bridge, it manages three other facilities that provide ferry service and other several small-scale bridges. Total 70 staff members are engaged in the management of Bai Chay Bridge including

³⁰ There are two reasons why the bridge was not managed by RRMU as originally assumed: 1) Although it is best if local staff who know situations of the area are in charge taking into account the safety of the bridge, RRMU did not have an office at the site. 2) It was deemed that the Department of Transportation of Quang Ninh Province and Quang Ninh Bridge & Ferry Management Company have sufficient capacity to manage (Transfer of facility management authority to local companies is common nationwide).

³¹ The owner of this company is the Quang Ninh Province People's Committee.

the following 35³².

Table 8: Maintenance Organization of Bai Chay Bridge

Responsible staff	Facility	Major responsibilities of management
<ul style="list-style-type: none"> • Department chief (1) • Professional staff (4) • Engineers and employees (30) 	Bridge	(Main responsibility) <ul style="list-style-type: none"> – Daily patrol and check – Daily cleaning of bridge surface – Cleaning of bridge surface and parapets (monthly) – Check of box girder, cables, bridge piers and towers (weekly)³³ (Manuals used) <ul style="list-style-type: none"> – “Sector Standards of Road Maintenance” – “Bai Chay Bridge Maintenance Manual” (Obtaining spare parts) <ul style="list-style-type: none"> – Some parts are imported as they are unavailable in Viet Nam.
	Approach roads	(Main responsibility) <ul style="list-style-type: none"> – Daily patrol and check – Daily cleaning of road surface – Cleaning of road surface and guard rails (monthly) (Manuals used) <ul style="list-style-type: none"> – “Sector Standards of Road Maintenance” – “Bai Chay Bridge Maintenance Manual” (Obtaining spare parts) <ul style="list-style-type: none"> – No problem

3.5.2 Technical Aspects of Operation and Maintenance

There are no problems in the technical aspect of operation and maintenance.

The maintenance personnel are the department chief (top of department), who is an engineer and has 23-year working experience in the field, and the assistant chief of department, who possesses an engineering degree and has worked in the field for 11 years. These staff members have worked on other bridges and also received training from the contractor before the transfer of authority when the bridge was completed. As shown in Paragraph 3.5.1, maintenance manuals are available and utilized.

3.5.3 Financial Aspects of Operation and Maintenance

Budgets that are necessary for the maintenance of the bridge are requested to the central Department of Road Management of the Ministry of Transportation by Quang Ninh Bridge & Ferry Management Company through the Quang Ninh provincial government, and allocated by the Ministry of Finance to Quang Ninh Province from the government budget via the Ministry

³² Other staff members belong to administration and traffic control departments.

³³ According to JICA Hanoi office, in October which is after the second site visit by the evaluator, the contractor of the project reported that the cable of the bridge seemed not to be cleaned properly (rusty parts were found).

of Transportation.

Recent situation of initial budgets of maintenance costs and final results are shown in the Table 9.

Table 9: Budgets and Results of Maintenance Costs

Unit: million VND		
Fiscal year	Initial budgets	Results
2007	4,200	4,030
2008	7,113	7,052
2009	8,126	8,125
2010	9,900	9,900

According to the operation and maintenance company, the budget scales shown in the above table are basically enough for necessary personnel costs and purchasing spare parts.

A toll fare is collected at Bai Chay Bridge. The fare was collected previously by the operation and maintenance company but the service was separated from other maintenance services. Instead, it was carried out by another private company (An Sinh Company) from January 2010, which won a bid for a five-year contract with the government for the fare collection service.

The contract allows the winner to take all collected fares as its income if it pays a certain amount of money to the government³⁴. Changes in income from the bridge toll are shown in the following table. Collection of fare in 2007 started around May 20.

Table 10: Changes in Income from the Bridge Toll

Unit: VND	
Fiscal year	Total income
2007	23,147,833,000
2008	44,601,013,000
2009	45,911,295,000
2010*	65,052,056,000

*Note: The amount of traffic on the bridge in 2009 and 2010 is almost at the same level. According to the operation and maintenance company that had been collecting toll fare until 2009, there is a difference in incomes between these years because they actively issued weekly/monthly discount tickets (frequent users gain more discounts) but An Sinh Company preferred not to. However, details are unclear.

Therefore, collected fares are not used for the maintenance of the bridge. The profit ability

³⁴ 332 billion VND is paid to the government by An Sinh Company for the five-year contract. The amount is approximately five times that of the toll fare collected by the company in 2010.

status of main services by An Sinh Company is basically good³⁵.

3.5.4 Current Status of Operation and Maintenance

The state of the main bridge and approach roads is basically good except for the issue of landslides on the roadside slope of the approach roads mentioned below. Although there are minor problems such as asphalt coming off, this is not the state where repair is urgently needed. As for approach roads and bridges, an expansion joint of Bridge No. 4 was damaged but has already been repaired.

Imported spare parts are used for the bridge, although they are costly. There is no problem with approach roads on spare parts.

There was no serious problem on facilities when evaluators actually conducted site visit, either. However, traces of landslides were found in some areas on the roadside slope of approach roads to Bai Chay Bridge after construction³⁶.

According to the beneficiary survey, 95.5% of 110 residents answered that they were satisfied with the maintenance state of the bridge.

Therefore, no major problems have been observed in the system, technology and financial state concerning maintenance for the project and the sustainability of the effects emerged from the project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project is to promote smooth distribution of goods along the National Highway No. 18 by constructing a new bridge together with an approach road across the Cua Luc Strait, which is in line with Viet Nam's development plan and development needs as well as Japan's ODA policy. Therefore, the relevance of the project is high. The volume of traffic on the bridge and approach road has steadily been increasing, benefiting the local residents in various ways. A positive impact on the local economy has also been appearing.

Although the efficiency of the project is slightly low due to the prolonged project period, there appears no material problem in terms of operational status, management system, etc. The effectiveness of the project is expected to be maintained from this point onward. Therefore, this project is evaluated to be highly satisfactory.

³⁵ Interview was conducted on recent financial situation but financial documents were not obtained.

³⁶ According to the site inspection conducted by Infrastructure Development Institute-Japan, it seems that landslide continues and the situation is getting serious.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Countermeasures to traffic accidents

On the whole, the beneficiary survey shows high reputations of the project. However, 60% of the respondents are aware of the increase of traffic accidents and some call for corrective measures. The local police department also thinks that there are not a few traffic accidents. It is preferable that people concerned conduct on-site inspections to discuss detailed improvement measures.

(2) Protection of slopes on approach roads

It was found that landslides occurred in some areas on the roadside slope of approach roads to Bai Chay Bridge after construction. And it seems the landslide still continues³⁷. It is preferable that corrective works to strengthen the slope are conducted, preventive measures for landslides are taken and the state of slopes is carefully monitored. In addition, operation and maintenance of the bridge such as cleaning of cable should be conducted thoroughly.

(3) Full-scale introduction of bridge monitoring system

During construction, the contractor installed a 2,500m optical fiber to build a monitoring system that enables to measure gaps in main towers and girders in order to check safety. Although the system had been operated for a while after the completion of the bridge, it is no longer used, as this system was not installed in the project. Such system uses a cutting-edge technology and the technology was not used as a standard facility for similar-scale bridges that had previously been built. However, during the survey period, it was confirmed that the Ministry of Transportation of Viet Nam feels the need of such system and is considering introducing it in the future. It is expected that the maintenance of the bridge will be enhanced by introducing the system immediately.

Although it is not a problem concerning the project facility itself, payment to the contractor has not completed even though the construction has finished. It is preferable that debt will be paid off as soon as possible.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

The ex-post evaluation results of the “National Highway No. 18 Improvement Project (I) (II)” and the “Cai Lan Port Expansion Project,” which are associated with the bridge project,

³⁷ See footnote 36.

show that each project had realized expected effects and impacts. These three projects are included in the Master Plan that was developed with the support of JICA. As these projects were planned and implemented at around the same time, they contributed greatly to the improvement of transportation situation in northern part of Viet Nam. Synergistic effects between the three projects seemed high. This series of projects will be good models for creating and implementing future projects with a programmatic approach.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1) Project Outputs		
1. Main bridge		
Length	903 m	As planned
Lane	4 lanes (2 lanes on one side)	As planned
Total width	25.3 m	As planned
Limit of navigation height	50 m	As planned
Style	PC cable-stayed bridge	As planned
2. Approach bridge		
Length	99 m	As planned
Lane	4 lanes (2 lanes on one side)	As planned
Total width	23 m	As planned
Style	PC box-girder bridge	As planned
3. Approach road		
Length	Bai Chay side: 3,292 m (including 4 bridges) Hon Gay side: 4,594 m (including 3 bridges)	Bai Chay side: 4,318 m (including 4 bridges) Hon Gay side: 4,700 m (including 3 bridges)
Lane	Bridge and approach road: 4 lanes (2 lanes on one side) Access road: 2 lanes (1 lane on one side)	Bridge and approach road: 4 lanes (2 lanes on one side) Access road: 2 lanes (1 lane on one side)
Total width	29 m (Access road: 9 m)	23.3 m (Bridge: 23.3 m, approach road: 23 m, there are two access roads on each of both sides (Bai Chay, Hon Gay) and the widths of the two roads are 5.5 m (2 lanes on one side) and 3 m (one lane on one side))
2) Project Period	June 2001 - October 2006 (65 months)	July 2001 - March 2008 (81 months)
3) Project Cost		
Amount paid in foreign currency	10,384 million yen	7,294 million yen
Amount paid in local currency	7,619 million yen (Local currency: 973,052 million VND) 18,003 million yen	4,660 million yen (Local currency: 610,747million VND) 11,954 million yen
Total Japanese ODA loan portion	13,241 million yen	9,298 million yen
Exchange rate	1 VND = 0.00783 yen (As of February 2001)	1 VND = 0.00763 yen (Weighted average rate)

Note: The funds of 2 yen loans are used for the project. They are “Bai Chay Bridge Construction Project (VNIX-1)” and the part of “National Highway No. 18 Improvement Project (I) (II) (VNV-6, VNVII-6)”. The amount shown here is only that of “Bai Chay Bridge Construction Project (VNIX-1)”.