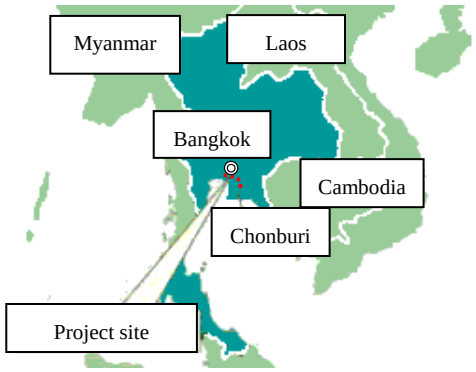
Thailand

Bangkok-Chonburi Highway Construction Project (2)

External Evaluator: Masaru Hirano (Mitsubishi UFJ Research and Consulting)
Field Survey: January 2006

1. Project Profile and Japan's ODA Loan



Map of project area: Bangkok-Chon Buri, Thailand

Bangkok-Chon Buri Expressway

1.1 Background

In the Sixth Five-Year National Economic and Social Development Plan (1987-1991), the Thai Government specified promotion of the Eastern Seaboard Development Plan as a priority project constituting a key element in the development of the country's industrial base. This plan sought the development of the eastern coastal area extending over the three provinces of Chon Buri, Rayong, and Chachoengsao (a 80-200km zone in Bangkok's southeastern district) as Thailand's No. 2 industrial belt next to Bangkok with a view to developing export industries and correcting regional disparities, thereby decentralizing economic functions that would contribute to ease over-concentrated situation in the Bangkok Metropolitan Area.

In response to this decision, the Ministry of Transport, Department of Highways (DOH) established the Sixth Five-Year Highway Development Plan (1987-1991), in which development of a highway network to support the development of the eastern coastal area was positioned as a top-priority project. To achieve this priority objective, the DOH planned construction of the following three routes: expansion of the highway for transport of goods and materials between Bangkok and the eastern coastal area

(projects (1) and (2) below), and construction of a highway linking Thailand's inland northeastern districts to the coastal area, bypassing highly congested Bangkok (project (3) below). Construction of these three routes would be financed through provision of JBIC loans from Japan. As a support to ensure the success of the Eastern Seaboard Development Plan, these projects were regarded as a matter of high priority.

(1) Chon Buri-Pattaya Expressway construction project（14th/16th yen loan）
(2) Bangkok-Chon Buri Expressway construction project (15th/18th yen loan)
(3) East Bangkok Beltway construction project (15th /18th yen loan)

This ex-post evaluation focuses on Phase II of the Bangkok-Chon Buri Expressway construction project of (2) above (18th yen loan).

1.2 Objective

This project's objective was to secure a transportation route to the eastern coastal area and ease traffic congestion in the Bangkok Metropolitan Area by constructing an expressway connecting the eastern coastal area with the northern and eastern regions of Thailand, thereby contributing to the economic development of the eastern coastal area.

1.3 Outline of project

This project involved the construction of an 81.8km expressway, nine interchanges, and access roads/ramps between Bangkok and Chon Buri in the eastern coastal area. The project covered all of 21 highway sections and was divided into two phases.

For Phase I (15th yen loan), a loan agreement covering 8 sections (36.5km expressway exclusively used by car driver between Bangkok and Banpakon) was concluded in December 1990.

In addition, for the Phase II (18th yen loan), which was the target of this project, a loan agreement covering 13 sections (45.3km expressway exclusively used by car driver between Bangkok and Chon Buri, 9 interchanges for all routes, and 6km of access roads/ramps) was concluded in September 1993, as outlined below.

1.4 Borrower/Executing Agency

Borrower: Government of the Kingdom of Thailand
Executing agency: Ministry of Transport, Department of Highways (DOH)

1.5 Outline of Loan Agreement

Loan Agreement Disbursed Amount	21,627 million yen 15,991 million yen
Exchange of Notes Loan Agreement	September 1993 September 1993
Terms and Conditions - Interest Rate - Repayment Period - Grace Period - Procurement	 3.0% p.a. 25 years 7 years General Untied
Final Disbursement Date	January 2002
Main Agreement	M.C. Construction(1979) Co., Ltd.(Thailand), The Nippon Road Co., Ltd.(Japan), Chainunt Construction Co., Ltd.(Thailand), Italian-Thai Development Public Co., Ltd.(Thailand), See Sang Karn Yotah(1979) Co., Ltd.(Thailand), Vichitbhan Construction Co. Ltd.(Thailand), Daewoo Corporation/Union Daewoo Engineering & Construction Co., Ltd.(Korea/Thailand)(JV), CH. Karnchang Co., Ltd./Tokyu Construction Co., Ltd./CH. Karnchang-Tokyu Construction Co., Ltd.(Thailand/Japan/Thailand)(JV), Thaiwat Engineering Co., Ltd./Vanitchai Construction (1979) Co., Ltd.(Thailand/Thailand)(JV), Thai Pipatana Ltd. Part.(Thailand)
Consulting Agreement	Katahira & Engineering International/ Thai Engineering Consultants Co., Ltd./ Moh and Associates Inc./ Upham International Cooperation （Japan/Thailand/Taiwan/U.S.）(JV)

2. Evaluation Result

2.1 Relevance of the plan

2.1.1 Relevance at the time of appraisal

At the time of the appraisal for this project, Thailand’s national program, the Sixth

Five-Year National Economic and Social Development Plan (1987-91) stated policy to achieve a strengthened and more efficient transportation sector and development of the country's eastern coastal area. In addition, the Sixth Five-Year Road Development Project (1987-1991) based on the said National Economic and Social Development Plan instituted by the Ministry of Transport and Communications (the present Ministry of Transport), Department of Highways (DOH) stated as well that an expansion of the highway linking the Bangkok Metropolitan Area to the eastern coastal area as one of the indirect support for the Eastern Seaboard Development Plan. Development of the eastern coastal area was aimed both at the industrialization of the heavy chemical field and promotion of light industry for export, and it was expected that the transport of goods and materials between Bangkok and the northern and northeastern regions would rapidly increase. This project was concerned with the construction of a new high-standard expressway exclusively used by car driver linking the Bangkok Metropolitan Area to the eastern coastal area, and, as a project aimed at achieving the above objectives, priority of this project was high.

2.1.2 Relevance at the time of evaluation

As part of measures to bolster the international competitiveness of Thailand's economy under the Ninth Five-Year National Economic and Social Development Plan (2002-2006) in progress at the time of this evaluation, the development of the Bangkok Metropolitan Area and the eastern coastal area and efforts to achieve a more strengthened and efficient domestic infrastructure to support this development were promoted as prioritized measures. The Sixth Five-Year Road Development Plan (2002-2006) instituted by DOH based on the said Five-Year National Economic and Social Development Plan also aimed for development and expansion of the domestic highway network. The eastern coastal area had achieved remarkable growth as a base for the development of Thailand's economy and industry. For example, the Laem Chabang District within the eastern coastal area had expanded to become a major center for the automobile and electrical machinery industries and the Maptaput region had grown to become the country's sole base for the heavy chemical industry. The completed Bangkok-Chon Buri Expressway, which serves as a basic industry transport road essential to the development of these industrial belts, is being used to an extent exceeding the forecasted traffic volume in almost all sections. Because this traffic volume is expected to increase in the future, an additional project for expanding the number of lanes from two in each direction to three (four in some sectors) is in progress through a budget allocated by the Thai government. Since this project has furthered the development of the Bangkok Metropolitan Area and the eastern coastal

area and has helped to strengthen domestic infrastructure so as to support this development, the priority of this project remains highly important.

2.2 Efficiency

2.2.1 Outputs

This project concerned the construction of an 81.8km expressway linking the Bangkok Metropolitan Area to Chon Buri in the eastern coastal area. The first phase of the project, the 35.5km section from Bangkok to Banpakon was completed in 1998. In the second phase (13 sections of a total of 21), the 45.3km of the remaining sections, as well as interchanges and related facilities such as access roads/ramps, were all constructed during the same period.

The 45.3km of the expressway was completed as initially planned, and opened for traffic in February 1998 as a toll highway (maximum speed is 120km/hr in the two lanes for each direction)[1]. Initially, it was planned to construct nine interchanges, but the project for construction of an interchange for access to the second international airport (Suvarnabhumi International Airport) currently under construction was separated from this project and transferred to the airport construction budget, so only eight interchanges were constructed. The initially planned length of the access roads/ramps of 6.0km was shortened to 5.0km after a review of requirements, and there are no particular problems in use of these roads.

2.2.2 Project period

Initially, Phase II construction was scheduled to be completed in December 1996, but construction of the all expressway lanes and the main interchanges was not completed until May 1998, a delay of a year and 4 months. In addition, because of a delay in acquisition of sites for some of the access roads/ramps to the Rong Kham Interchange, the start of construction was delayed, and in the end construction was not completed until May 2001, 4 years and 4 months later than initially planned.

Delays in construction stemmed from the fact that most of the route passed through irrigated fields and marshlands and (1) because of flooding in 1995, some construction had to be redone[2], (2) construction methods had to be changed to deal with softer ground than expected[3], (3) it took time for site acquisition in order to negotiate

[1] The expressway (toll road) was opened on February 4, 1998. Although construction of interchanges and access ramps had not been completed at that time, the expressway was nevertheless opened because the main highway part was completed. Afterward, interchanges and access ramps were completed and opened in succession, and all highway sections were opened on August 1, 1999.

[2] Due to flooding, all construction sections were submerged, it had been required that some construction had to be redone, which caused a 5-month delay.

[3] The PVD (Prefabricated Vertical Drain) construction method was used as a measure to deal with the soft ground, which required changes in design, construction methods, and extension of the construction period.

compensation terms with land owners, and (4) due to the 1997 economic crisis, construction was temporarily halted because the agreement with the construction contractor was temporarily suspended.

The principal reason for the delay associated with site acquisitions was the request by land owners for a larger amount of compensation for farm land located in the southeast section of the Lom Kao Interchange. Although delayed, site acquisition was carried out appropriately in accordance with domestic laws and regulations.

Since the expressway was completed and opened for traffic in February 1998, the construction delays are considered to have had almost no real impact.

2.2.3 Project cost

The total project cost (for Phase II) was estimated to be 48,342 million yen (of which the foreign currency amount would be 21,627 million yen, and the local currency amount, 6,044 million baht). However, the actual expenditure was 40,372 million yen, 7,970 million yen less than the original estimate. The reasons for this reduction included the facts that (1) using competitive bidding allowed to place an order in more efficient way than initially expected and as a result construction costs were lowered; (2) because of a major devaluation of the Thai baht, there was a corresponding reduction in the amount of Japanese yen, the capital for local currency payments.

2.3 Effectiveness

2.3.1 Traffic volume

The Bangkok-Chon Buri expressway was opened for traffic as a toll highway in February 1998, and since then traffic volume has steadily been increasing. As shown in Table 1, actual traffic volume in 2004 exceeded the initially forecasted volume in three of four sections where it was measured, although there was some variation between sections. On average, a traffic volume in all sections has been secured virtually equal to initial forecasts.

Table 1. Comparison of Forecasted Traffic with Actual Traffic in FY2004

Unit: vehicles/day

	0-19 km	19 km-47 km	47 km-64 km	64 km-79 km	Average for all sections
Initial forecast	57,334	40,752	38,642	28,723	41,363
Actual	41,025	42,773	45,093	31,926	40,204

Source: Average Annual Daily Traffic on Highways (DOH, Ministry of Transport)[4]

This expressway connects with the East Bangkok Beltway and the Chon Buri-Pattaya Expressway, and has had a significant impact as an industrial road linking industrial parks developed in the surrounding districts. Since the proportion of actual traffic volume of trucks in all sections in FY2004 has been increased to 37%, the expressway could be said that it is performing well as an industrial road. In

[4] These are average figures calculated by counting traffic volume at various locations four times a year on Wednesday, Saturdays and Sundays in January, April, July and October and calculating the corresponding 24-hour figures in the road traffic volume survey performed every year by DOH.

addition, truck transport volume is expected to increase even more in this road as an artery linking Laem Chabang Port, which is an important base for forwarding and loading/unloading outward freight, to the Bang Rakam inland container depot. It is also expected that when the construction of Bangkok's No. 2 international airport (Suvarnabhumi International Airport) is completed, the expressway will serve as an access road to the new airport and draw even more traffic.

2.3.2 Quantitative effectiveness

The benefits enjoyed by users as a result of this project include savings in vehicle operating costs (VOC) and travel time savings in the sections covered by this project. Taking these savings as the economic benefit and project cost and operation and maintenance expenses as the cost, the Economic Internal Rate of Return (EIRR) was re-calculated based on actual figures, as shown in the table below. Because the economic growth rate and the population growth rate were revised, future traffic volume is expected to exceed more than the initially forecasted, and thus the effect of this project will surpass initial plans.

Table 2. Comparison of Planned and Actual Economic Internal Rate of Return (EIRR)

	Planned (1993)	Actual (2004)
Project Life	15 years	Same as at left
Benefit	VOC saving effect Time saving effect	Same as at left
Cost	Construction costs Operation and maintenance costs	Same as at left
EIRR	23.6%	32.47%

Source: DOH data

This expressway is operated as a toll road. The Financial Internal Rate of Return (FIRR) calculated using toll income as the benefit and the result of calculating FIRR is -2.90%. Although this project focused primarily on relieving traffic congestion, a toll increase will probably be needed to allow the expressway to be maintained financially.

2.4 Impact

2.4.1 Economic development in the eastern coastal area

The Bangkok-Chon Buri Expressway is linked to the Chon Buri-Pattaya Expressway and the East Bangkok Beltway, and has contributed substantially to the

transport of goods and materials between Bangkok and the eastern coastal area and to the northern and northeastern regions bypassing Bangkok. In addition, container freight transport centered in Laem Chabang Port is rapidly increasing, and since 60% of this freight is transported by truck, this expressway plays the central role in this transport route. Companies that operate in this district frequently use the expressway for materials collection, product shipments, sales activities, and daily commuting.

Thus, the expressway has stimulated corporate activity in this district. The number of companies operating there has increased remarkably, and the eastern coastal area, which straddles the districts of Chon Buri, Rayong and Chachoengsao, has achieved substantial economic development, and has become major industrial center which is the second biggest industrial belt next to Bangkok. Whereas GDP/GRP of the agriculture sector in this district has remained almost flat during this period, GDP/GRP of the non-agriculture sector has risen sharply, increasing 1.5 to 2 times as shown in Table 3 below. It is confirmed that there is the development in the eastern coastal area from 1996 to 2004.

Table 3. Gross Regional Product in the Eastern Coastal Area by District

(Unit: millions of baht)

	1996	2004	Growth Rate
Chon Buri District			
Agriculture Sector	9,394	11,776	25.3%
Non-Agriculture Sector	212,935	342,254	60.7%
Rayong District			
Agriculture Sector	7,869	10,216	29.8%
Non-Agriculture Sector	147,332	368,888	150%
Chachoengsao District			
Agriculture Sector	6,889	8,795	27.7%
Non-Agriculture Sector	72,808	113,961	56.5%

Source: Thailand National Economic and Social Development Bureau (NESDB)

In addition, both the Laem Chabang and Maptaput districts have achieved substantial development, the former as a center for the automobile and electrical machinery industries, the latter as a center for the heavy chemical industry, and as a result, job creation has been considerable. From 1995 to 1997, 240,000 jobs were created in the 3 districts of the eastern coastal area.

2.4.2 Impact on the environment

An environmental assessment following completion of the expressway was performed in 2001 by a consultant employed by DOH. The results showed no problems concerning the environmental impact (in terms of air pollution, noise, and vibration) on farmland, such as rice and other crop fields, or on marshland in the vicinity of the expressway. The figures related with the environmental impact fell within the prescribed standards, and there was no need for any measures against the impact on the surrounding environment. An environmental assessment performed prior to construction verified that there were locations where it was required to consider regarding the measures for noise in sections of the expressway bordering residence area(5 schools and 3 temples), and DOH has dealt with this problem by installing noise barriers.

However, the environmental impact report did state that there is a need to consider the expressway's negative impact of dividing the local roadside community and that roadside residents have requested the construction of pedestrian overpasses. The report advised that pedestrian overpasses should be installed in at least two locations. In response, DOH built pedestrian overpasses in six locations including the two recommended. This measure satisfied residents, and there have been no further complaints or requests from residents.

In addition, the acquisition of sites for implementation of this project did not involve any particular relocation of residents. Although time was required to obtain agreement for site acquisition from land owners, this was carried out appropriately in accordance with domestic laws and regulations.

2.4.3 Interview survey of expressway users

In this field survey, a hearing concerning the use of this expressway was conducted by visiting 13 companies located in Bangkok and in four major industrial parks constructed in the eastern coastal area.

The majority of companies responded that they used the expressway nearly every day, and that the expressway was highly useful to the company's activities. The most frequently mentioned purpose for using the expressway was for transport of products and raw materials, which indicates that this expressway is essential for access to Laem Chabang Port, Bangkok and the Bangkok airport. In addition, users expressed various opinions regarding operation and maintenance of the expressway. These opinions are summarized in the recommendations presented at the end of this report.

2.5 Sustainability

2.5.1 Executing agency

2.5.1.1 Structure

This expressway was constructed by the Department of Highways (DOH), which has considerable experience in the construction, operation, and management of Thailand's national highways. To carry out the operation and maintenance of toll roads, DOH has established the Office of Inter-City Motorway. The main departments of this office include the Planning Department, Toll Collection Department, Office of Operation and Maintenance of Inter-City Motorways, and the Safety Control Department, which together constitute the organizational framework for operation and maintenance of toll highways.

The Office of Inter-City Motorway-Maintenance was established to perform operation and maintenance of the Bangkok-Chon Buri Expressway as an inter-city toll highway. This office was established in a service area located halfway along the expressway with 40 staff, and handles normal maintenance and response to emergencies.

2.5.1.2 Technical capacity

The DOH Office of Inter-City Motorway has secured an adequate level of technical knowledge and skill for its operations, appointing 4 senior engineers as specialists in operation and maintenance, 6 technical personnel to establish operation and maintenance plans, and 3 technical personnel for computer management. For the Bangkok-Chon Buri Expressway, the Office of Inter-City Motorway-Maintenance, which is in charge of operation and maintenance of the expressway, has a full complement of staff for its operation and maintenance operations, with 3 senior engineers and 6 technical personnel.

2.5.1.3 Financial status

The Bangkok-Chon Buri expressway is provided for use as a toll road and collects tolls from vehicles using the road. Fixed-rate tolls are collected from vehicles passing toll booths set up at 2 locations and at 4 interchanges along the main highway. Current rates are 30 baht for ordinary vehicles, 50 baht for large vehicles (buses and trucks) and 70 baht for extra-large vehicles (trailers). Table 3 shows yearly toll income. Thanks to the increase in traffic volume, toll income has more than doubled over the past five years, from 400 million baht in 2001 to 1 billion baht in 2005.

Table 4. Toll Income and Operation and Maintenance Expenditures for the Bangkok-Chon Buri Expressway

Unit: millions of baht

	FY2001	FY2002	FY2003	FY2004	FY2005
Toll Income	453	535	704	920	1,010
Operation and maintenance Expenditures (annual budget)	195	324	139	114	171

Source: DOH data (Thailand's accounting year begins in October and ends in September)

Annual operation and maintenance costs for the Bangkok-Chon Buri Expressway have ranged between 100 million baht to 300 million baht. According to the Office of Inter-City Motorway- Maintenance, an adequate budget for expressway operation and maintenance has been secured, and maintenance and repair work is executed on a consistent basis.

With regard to cash flow relating to toll income and operation and maintenance costs, all of yearly toll income is pooled in the "DOH toll collection fund" managed by the Ministry of Finance, and depending on financial plan yearly budget is allocated including operation and maintenance costs. According to DOH, approximately 5% of the annual toll income is allocated to the budget for normal operation and maintenance every year, and a separate special budget is allocated for major paving improvements performed once every few years. DOH explained that at present, there were no particular obstacles to securing this operation and maintenance budget.

2.5.2 Operation and maintenance

Operation and maintenance work is divided into six programs, which are carried out regularly only to the extent required.

Table 4. Operation and Maintenance Programs

Program	Frequency	Details
(1) Regular operation and maintenance	Every year	Repair of road surface/shoulder, repair of water drainage system and related facilities
(2) Periodic operation and maintenance	Every two years	Road surface/shoulder maintenance
(3) Special operation and maintenance	When required	Major road surface maintenance, improvement of attached

		structures
(4) Rehabilitation work	When required	Repaving, etc.
(5) Improvement work	When required	Improvement of paving and extension of road surface/shoulder, improvement of paving of access roads/ramps
(6) Emergency repairs	When required	Response to natural disasters, etc.

Source: DOH data

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

In the course of evaluation for this project, various opinions and requests for improvement were offered. The most frequently heard requests are listed below. Although none of these improvements are particularly urgent, it is thought that these could be handled within the operation and maintenance programs. Therefore, it is suggested that DOH should give serious consideration to these requests.

Requests received from expressway users:

- establishment of additional rest areas (increase the number of parking areas and restrooms)
- Improve incidental facilities (more lightening up with illumination at night, more telephones for emergencies)
- Improvement in the steepness of highway bridges (One of the slope of bridges in highway is too steep. Users want more gradual slopes so that large trucks can drive over bridges without slowing down).

Comparison of Original and Actual Scope

Project (Phase II) only

Item	Plan	Actual
(1) Project Scope ・ Construction of the Bangkok-Chon Buri section of the Bangkok-Chon Buri Expressway ・ Construction of interchanges ・ Construction of secondary facilities	45.3km 9 6km of access roads/ramps	45.3km 8 5km of access roads/ramps
(2) Project Period	September 1993-December 1996 (36 months)	September 1993-May 2001 (97 months)
(3) Project Cost Foreign currency Local currency Total ODA Loan Portion (foreign currency only) Exchange rate	 21,627 million yen 6,044 million baht 48,342 million yen 21,627 million yen 1 baht = 4.42 yen	 15,991 million yen 5,806 million baht 40,372 million yen 15,991 million yen 1 baht = 4.205 yen