

Eastern Seaboard Development Plan

Road Project

1. Project Summary and Japna's ODA Loan

- (1) **Background:** Since new heavy demands for inland transportation were anticipated to arise in accordance with development of the Eastern Seaboard, the preparation of road and railway networks for handling these demands was necessary. In the said seaboard, since early in the 1980's, the expansion of national roads has progressed, financed by the Thai government's own funds and financial assistance from donor agencies such as World Bank. Then the preparation of the inter-city expressway known as the "Motorway" was accelerated with Japanese ODA loan. These motorways in the Eastern Seaboard form the first project in the development program of nation-wide Motorway network in Thailand.
- (2) **Objectives:** To meet the increasing demand for land transportation for industrial developments of the Eastern Seaboard.
- (3) **Project Scope:** This report deals with only the Chonburi-Pattaya Highway construction project (about 68 km long, four lanes), which is one of the three motorway construction projects included in the Eastern Seaboard Development Plan. The ODA loan covers full amount of the foreign currency portion and part of local currency portion required for the motorway construction. Since the three motorway projects are aiming at building an integrated network, the other two projects will be mentioned briefly in this evaluation.

Project name	Purpose	Remarks
Chonburi - Pattaya Highway (about 68 km)	Meet the demand for traffic between the Bangkok metropolitan area and Eastern Seaboard.	In the scope of present evaluation
Bangkok - Chonburi Highway (about 82 km)		Not yet completed at the time of field survey
Outer Bangkok Ring Road (East Portion) (about 63 km)	Meet the demand for traffic between the Eastern Seaboard and the other regions by bypassing the congested Bangkok.	

- (4) **Borrower/Executing Agency:** Government of the Kingdom of Thailand/Department of Highways (DOH), Ministry of Transport and Communications

(5) Outline of the Loan Agreement

	Chonburi - Pattaya Highway Construction Project (1)	Chonburi - Pattaya Highway Construction Project (2)
Loan Amount	¥ 4,117 million	¥ 5,670 million
Loan Disbursed Amount	¥ 4,074 million	¥ 4,512 million
Date of Exchange of Notes	September 1988	September 1991
Date of Loan Agreement	November 1988	September 1991
Loan Conditions		
Interest Rate	2.9%	3.0%
Repayment Period (Grace Period)	30 years (10 years)	25 years (7 years)
Final Disbursement Date	March 1994	November 1997

Note: Phase (2) is an additional loan due to increased project cost

2. Analysis and Evaluation

(1) Project Scope: A four-lane motorway was built between Chonburi and Laem Chabang (sections 1 to 3) and a two-lane motorway between Laem Chabang and Pattaya (section 4), as planned. Four of five projected interchanges have been constructed. The construction of six flyovers (overpasses) was included in the project later, but only two of them have been completed because of a delay in land acquisition. (There is no problem with the use of the motorway, however.)

(2) Implementation Schedule: The delay of about one year in selecting a consultant and a contractor occurred due to a delay in the detailed design which was implemented by DOH using its own budgets. Since the project cost bulged due to an increase in building material costs (see below), it needed much time to prepare additional funds (financed by additional ODA loan). Finally, the project was finished about two years behind the initial schedule at the time of appraisal in the first loan and about one year behind the revised schedule at the time of appraisal of the additional loan. This project, however, can be said to be successfully implemented by and large when considering it is construction of a new, large scale motorway.

(3) Project Cost: Originally, the project was to be financed by the 14th Yen loan alone, but as a result of the bidding, the total project cost was escalated to about 1.8 times higher than the original plan, because the construction costs bulged suddenly, reflecting a construction boom in Thailand. As the project cost increase was caused by unpredictable factors such as high growth of the Thai economy and its accompanying construction boom, an additional loan was granted in 1991 to cover the excess cost. Since then, the project could have been completed successfully within the cost estimated at the time of appraisal of the additional loan.

Comparison of Original Plan and Actual

Item	Plan	Actual
Project Scope		
- Motorway construction		
Section 1 (Chonburi bypass)	Widening of the two-lane road to four lanes. (13.851 km)	Widening of the two-lane road to four lanes. (13.851 km)
Section 2 (Chonburi bypass - Laem Chabang intersection)	Construction of a new four-lane motorway (24.548 km)	Construction of a new four-lane motorway (24.548 km)
Section 3 (Laem Chabang intersection - Laem Chabang Industrial Estate)	Construction of a new four-lane motorway (7.625 km)	Construction of a new four-lane motorway (7.425 km)
Section 4 (Laem Chabang intersection - National road 36)	Construction of a new two-lane motorway (17.384 km)	Construction of a new two-lane motorway (17.384 km)
- Interchange construction	Five locations	Four locations
- Consulting service ¹⁾	F37 M/M / L30 M/M	F52 M/M / L30 M/M
Implementation Schedule (commencement to completion)		
- Motorway construction	July 1990 to September 1992	June 1990 to May 1993
- Interchange construction	October 1991 to May 1993	December 1991 to June 1994
Project Cost		
- Foreign currency	¥ 6,046 million	¥ 7,712 million
- Local currency	1,321 million bahts	474 million bahts
- Total	2,462 million bahts (¥ 13,049 million)	2,425 million bahts (¥ 9,943 million)
- Exchange Rate	1 baht = ¥ 5.3	1 baht = ¥ 4.1

- 1) Consulting service: F: Foreign consultant; L: Local consultant
- 2) The original plan of implementation schedule and project cost was at the time of appraisal of the additional loan.

(4) Project Implementation Scheme: The executing agency is DOH. DOH has long experience in many ODA loan projects and is familiar with the loan procedure. Although DOH needed an additional loan to make up for the shortage of the project cost, DOH was able to minimize the delay in completing the project, and the efforts by DOH for this purpose should be highly appreciated.

(5) Operations and Maintenance: DOH has created a practical road maintenance manual based on its long experience. The Chonburi - Pattaya Highway has been maintained properly, but the rate of traffic volume of heavy vehicles (large and medium-sized trucks) to the whole traffic in 1997 was 40.1%, which is much higher than the initial projection (14.9% in 2000). Thus, the highway may be subject to severe loads more than expected, and it is necessary to implement due maintenance and to make sufficient budgetary request and their execution, taking account of such conditions.

(6) Operational Performance: The daily average traffic volume of the Chonburi-Pattaya Highway is as follows:

(Unit: vehicles)

Year	1994	1995	1996	1997
Section 1	22,178	24,155	26,308	28,461
Section 2	22,513	24,520	26,705	28,890
Section 3	45,024	49,037	53,408	57,779
Section 4	12,576	13,695	14,913	16,131

This motorway connects Chonburi, one of large cities in the Eastern Seaboard, and Pattaya, an international tourism resort, to accommodate the need of transporting many passengers travelling for tourism or on business. This motorway also provides a direct access to the Laem Chabang Port, a major international port in Thailand, and to Laem Chabang City, where Laem Chabang Industrial Estate is located, responding to the demand of cargo transportation from/to said port and industrial estate.

(7) Motorway Tolling (See Annex 2 for more detailed discussion) : The Chonburi-Pattaya Highway was originally planned as a toll road with full access control, but no fee was charged as of 1998. Motorways, including the Chonburi-Pattaya Highway, are designed to provide the service with higher value added than national roads. The toll fees of motorways should be chiefly borne by their beneficiaries, from the standpoint of economic-efficiency. Construction of the motorway network in Thailand is at its initial stage, therefore it is now necessary and useful for Thai government to examine a proper tolling policy for said network, considering the increasing financial burden in the future.

(8) Project Effects and Impacts

(i) Quantitative Effects

(a) Chonburi - Pattaya Highway Traffic Volume: The traffic volume of the Chonburi - Pattaya Highway accounts for about 56% of the south-north traffic volume in the Eastern Seaboard (Chonburi-Pattaya Highway plus two national roads paralleling said motorway) (see Table below), and functions as a trunk road in the Eastern Seaboard.

Year	1990	1997
National road 3	77.1%	31.0%
Chonburi - Pattaya highway (Section 2)	-	56.3%
National road 331	22.9%	12.7%

(b) Effects of ODA Loan Projects on the Road Traffic in the Whole Eastern Seaboard (See Annex 1 for more detailed discussion): The simulation based upon the Thai traffic model which was created by the Office of the Commission for the Management of Land Traffic (OCMLT) demonstrates that, if all the road projects of the Eastern Seaboard Development Plan had not been implemented, the traffic volume would have been less than 80% and the average speed would have been about 70% of the level achieved when these projects are implemented (as of 1997). It also predicts that, if the ODA loan projects including the Chonburi - Pattaya Highway had not been implemented, the traffic volume would have been less than 80% and the average speed would have been about 75% of the level when all of the road projects are implemented. From this simulation, it is clear that construction of the motorway has a significant positive effect on the road traffic in the entire Eastern Seaboard.

(c) Economic Internal Rate of Return (EIRR): The EIRR of the Chonburi - Pattaya Highway is calculated to be 23.3% based on the actual performance.

(ii) Qualitative Effects

(a) Promotion of Industrial Developments in the Eastern Seaboard: The road network developed around the Chonburi - Pattaya Highway in the Eastern Seaboard makes a great contribution to the industrial development of said seaboard through the provision of inland transportation of raw materials and products from various factories therein and of cargoes handled at the Laem Chabang Port.

(b) Smooth Land Transportation between the Eastern Seaboard and Other Regions: The Chonburi-Pattaya Highway, connected with the Bangkok-Chonburi Highway and the Outer Bangkok Ring Road (East Portion) which were completed just at the end of 1998, is expected to function as an integral motorway network to make great contribution to ensuring a smooth transportation route between the Eastern Seaboard and the Bangkok metropolitan region, and to extending the route from said Seaboard to the northern and north-eastern parts of Thailand, by forming a new route bypassing the Bangkok metropolitan region.

Results of Road Network Simulation for Eastern Seaboard

With the Eastern Seaboard Development Plan, new construction of three JBIC-financed motorway projects as well as enlargement and improvement of ordinary national roads have been proceeded with. The national roads which had been improved or enlarged until 1998 are as shown in Table 1. As indicated in the table, some ordinary national roads were financed by the Thai government's own budget and others were implemented with the support by the World Bank and the Asian Development Bank (ADB). National road 344 has been developed with ODA loan ("Regional Road Improvement Project "). The project effects and impacts of the Chonburi-Pattaya Highway materialized together with those of these ordinary national roads to accommodate road traffic demand for passenger and freight transportation in the Eastern Seaboard.

Table 1 Ordinary national road construction projects in the Eastern Seaboard Development Plan

Road (Section)	Description	Fund	Traffic volume (vehicles) (1998)
National road 3 (several sections)	Widening of the two-lane roads to four or six lanes	Thai government's own funds, partly financed by the World Bank and ADB	15,938
National road 34 (Bang Na - Trad)	Widening of the four-lane roads to eight lanes	Thai government's own funds, partly financed by the ADB	123,489
National road 314 (National road 15 - Chachoengsao)	Construction of a new four-lane road	Thai government's own funds	32,025
National road 304 (Phanom Sarakham Bypass)	Construction of a new four-lane road	Thai government's own funds	8,432
National road 331 (Sattahip - Phanom Sarakham)	Widening of the two-lane to four lanes	World Bank fund	6,512
National road 344 (Bang Bung - Klaeng)	Widening of the two-lane to four lanes	ODA loan by JBIC	9,415

Source: DOH

In order to examine the impacts and effects brought about from the newly developed road network under the Eastern Seaboard Development Plan and the ODA loan projects in the road networks covering the whole Eastern Seaboard, the With or Without simulation of changes in the traffic volume¹ over the whole Eastern Seaboard was conducted in this ex-post evaluation (Table 2).

Table 2 Results of simulation of road traffic volumes in the Eastern Seaboard

(Unit: Million vehicles km/day)¹

	Vehicle km	Speed rate
Case all ESDP road projects ²⁾ are implemented (current)	5,488 (1.00)	1.00
Case only the ODA loan projects ³⁾ in the ESDP road project are not implemented	4,289 (0.78)	0.75

¹ This simulation was carried out by the use of the Thai traffic model (UTDM National Transport Model) which was created by the Office of the Commission for the Management of Land Traffic (OCMLT) with assistance from the Asian Development Bank. The changes of the traffic volume inside the Eastern Seaboard were simulated on the assumption that the inter-regional traffic between the Eastern Seaboard and other regions was constant at the actual traffic in 1997.

Case only the ODA loan projects in the ESDP road project are implemented	5,486 (1.00)	0.95
Case none of the ESDP road projects are implemented	4,252 (0.78)	0.70

- 1) A vehicle indicates a passenger car unit. A figure in parentheses in the Vehicle km column is a percentage when the vehicle km in Case is assumed to be a unity. A "speed rate" is a percentage when the speed rate in Case is assumed to be a unity.
- 2) The "ESDP Road Project" means all road projects (including ordinary national roads and motorways) for the Eastern Seaboard Development Plan.
- 3) ODA loan projects are three new motorway construction projects and enlargement of National road 344.

The "vehicle km" in Table 2 is given by multiplying the daily traffic volume multiplied by traveling distance in the Eastern Seaboard. Compare Case where all ESDP projects are implemented and Case where all ESDP road projects are not implemented. When Case is compared with Case in the traffic volume, Case can only achieve less than 80% of the Case. This means that in the case where all ESDP road projects are not implemented, the remaining road traffic demand could not be handled, resulting in an adverse effect on the land transportation to/from Laem Chabang Port and other many industrial estates. As a consequence thereof, development of the Eastern Seaboard would have been hindered significantly.

The same conclusion is also drawn from the results of simulation in terms of average speeds. In Case, the calculated average speed is only about 70% of the average speed of Case due to traffic congestion which should be caused because of the roads being left with low capacity or poor conditions. It can be said that if the road projects in the Eastern Seaboard Development Plan had not been implemented, the convenience of the roads in the Eastern Seaboard would have been significantly reduced.

In addition, the following two comparisons can be made: a comparison between Case where JBIC-financed roads alone among the road projects in the ESDP are implemented and Case where all the project are implemented; and another comparison between Case where the projects except for ODA loan projects are implemented and Case where all the projects are not implemented. In each of the comparisons, almost no change occurs in traffic volume and average speed. This result suggests that the ODA loan projects play a very important role in the road networks in the ESDP.

The trunk roads with largest traffic volume in the road networks of the Eastern Seaboard are the Chonburi - Pattaya Highway, National road 36, and National road 344. The Chonburi - Pattaya Highway is a highway running through the seaboard longitudinally from north to south. National road 36 traverses the region from northwest to southeast at the southern end of the Chonburi - Pattaya Highway. National road 344 also traverses the region from northwest to southeast at north of the Chonburi - Pattaya Highway. Among these three trunk roads, ODA loan supported the development of two routes, Chonburi - Pattaya Highway and National road 344. Therefore, it seems that the results of the simulation as shown above are obtained.

Motorway Tolling

The Chonburi - Pattaya Highway was originally planned as a toll road with full access control. No toll fee has been charged since it opened in 1994, however, and it was still toll-free as of 1998. The Department of Highways (DOH) plans to introduce the tolling system for the Chonburi - Pattaya Highway phase by phase after Bangkok-Chonburi Highway linking to the Chonburi-Pattaya Highway is opened and the motorway between Bangkok and the Eastern Seaboard (in the vicinity of Pattaya) is fully connected.

Theoretically, the Chonburi-Pattaya Highway cannot be deemed to be subject to the principle of “non-competitiveness in consumption” and “non-excludability”, requirements for public goods, and can be considered distinguishable from ordinary national roads. In the north-south road traffic in the Eastern Seaboard including the Chonburi-Pattaya Highway, the traffic volume is increasing drastically as mentioned above, so the degree of congestion is worsen extremely. Consequently, “non-competitiveness in consumption” is assumed to decline considerably² in comparison with the ordinary roads suffering no congestion. In addition to the existing national roads, this motorway is aimed to provide the services with higher value added (faster road transportation) through the use of access control. The introduction of access control and installation of tollgates make it possible to realize “Exclusion of Consumption”. In this case, the road users who do not want to use the value-added service by paying a charge are given an option to utilize the existing ordinary national roads.

It is matter to be decided by the Thai government whether the cost should be born by only the beneficiaries of the particular motorway, or by the general road users including not only those using the motorway but also those using other ordinary roads, or by general taxpayers. The following is pointed out, however, on economic grounds. Cost of the ordinary national roads should be borne by general road users or general taxpayers since these are deemed public goods, and cost of mortorways should be borne by the particular users, since these provide higher value-added services in addition to ordinary national roads. By so doing, it is likely that their costs and benefits are more properly matched and that resource allocation becomes more efficient.

Thai Motorway network is a program consisting of a total of 4,150 km length nationwide which was approved by the 1997 Cabinet Meeting, partly based upon the proposal by “Survey on Toll Motorway Network” of JICA completed in July 1991, and is scheduled to be constructed phase by phase in several decades. The Chonburi-Pattaya Highway is the initial project of this Motorway Network Program.³ If this program is to be materialized over a long span of time, it is necessary to secure huge amounts of construction and maintenance costs. When considering the characteristics of this motorway network, as mentioned above, bearing these costs by beneficiaries through the tolling system seems to be more efficient than taxation only. Now, the Bangkok - Chonburi Highway and Outer Bangkok Ring Road are finished, and an integral network, which links the Eastern Seaboard to the Bangkok metropolitan and other regions bypassing Bangkok, is established. Actually, the toll fees

² Even if the consumption of the Chonburi-Pattaya Highway is supposed to be not competitive, it is theoretically considered that it is distinguished from public goods and can be charged. The 1994 World Development Report published by the World Bank defined that the consumption of inter-city roads (toll roads) is non-competitive, but excludible (and has low externality), and they are classified as chargeable Club Goods.

³ The toll roads in Thailand were the Urban Expressway System in the Bangkok metropolitan area, which is administered by the Expressway and Rapid Transit Authority (ETA), and some inter-city national roads which are managed by DOH. Among the DOH-managed roads, National road 32, which runs from Bangkok to the north, had been tolled since the first half of the 1970's, and National road 34, which runs from Bangkok to the east, had been tolled since the first half of the 1980's. Thai government decided a policy of not tolling ordinary national roads in 1994 and abolished toll fees for the national roads. From now on, DOH will toll only inter-city highways known as motorways under its control.

are collected at the Bangkok - Chonburi Highway that came fully into line in December 1998. This might be the best opportunity to reconsider the motorway tolling policy.

At the time of appraisal of the Chonburi - Pattaya Highway project, recovery of maintenance cost only was assumed in tolling policy. If the motorway network is to be developed phase by phase over a long span of time, it is necessary to provide large amounts of construction cost. Financing of all the construction costs by tax leads to a large burden on the public finance. Therefore, it can be considered meaningful to establish a tariff system able to recover not only maintenance costs but also construction costs⁴. National road 32 running north of Bangkok had used a toll tariff system for approximately 20 years since the first half of the 1970's for the purpose of raising funds for its maintenance. This tariff level and structure has been left unchanged since its establishment. Taking account of the price increase, this level of toll cannot be deemed as being able to afford the maintenance cost. Unchanging of the tariff over the long time may be due to some reasons, for example, political difficulty in raising the public utility rates. Although setting the public utility rates at an appropriate level is an issue involving such difficulties, it is meaningful to reconsider the tolling policy, keeping recovery of construction costs as option in mind.

Five years have already elapsed since the Chonburi-Pattaya Highway was placed in operation, with the toll-free system. There are some spots where a private road to this motorway is provided from the premises of the neighboring houses along the motorway. As a result, if DOH tolls the motorway fee through the full access control, it faces increasing difficulty in raising additional investments for full access control and in coordinating with the residents in the neighborhood. This experience suggests that it is important to toll motorway fees from the beginning of the motorway construction. Now, the construction of motorway network is in the initial stage of their development project, and it is necessary to clearly set the tolling policy for motorways at this timing.

⁴ Note the argument here does not encourage a pooling system in which cross subsidy is done among different roads. If matching between costs and benefits is strictly enforced, it is the best choice to cover the cost by each individual road. Whether cross subsidy among different roads is necessary or not should be carefully considered in the particular case.