

Eastern Seaboard Development Plan

Laem Chabang Industrial Estate Project (1) (2)

1. Project Summary and Japan's ODA Loan

- (1) **Background:** As part of the Eastern Seaboard Development Plan, the development of the Laem Chabang area was planned to keep up with the necessity of an international deep port which will work as a substitute for Bangkok Port as well as the necessity of development of an industrial estate receiving export oriented industries. Laem Chabang area is expected to be a light industries' core base by constructing an industrial estate of export processing industries and general light industries in the neighboring land of the new international deep port which will take over the functions of Bangkok Port in the future.
- (2) **Objectives:** To provide a high-quality and low-cost industrial estate for light industries of export oriented type.
- (3) **Project Scope:** Construction of the Laem Chabang Industrial Estate (formation of lands, and development of the infrastructure). ODA loans are intended to supply full amount of foreign currency portion and a part of local currency portion for total project expenses.
- (4) **Borrower/Executing Agency:** Both are the Industrial Estate Authority of Thailand (IEAT) (Guarantor: Kingdom of Thailand)
- (5) **Outline of Loan Agreement:**

	Phase (1)	Phase (2)
Loan Amount	¥ 2,922 million	¥ 3,003 million
Loan Disbursed Amount	¥ 2,576 million	¥ 1,989 million
Date of Exchange of Notes Date of Loan Agreement	September 1985 October 1985	September 1987 September 1987
Loan Conditions		
Interest rate	3.5%	3.0%
Repayment Period(Grace Period)	30 years (10 years)	30 years (10 years)
Final Disbursement Date	October 1992	September 1992

2. Analysis and Evaluation

- (1) **Project Scope:** This project was halted for one year and one month, due to temporal suspension of the Eastern Seaboard Development Plan as a consequence of the reevaluation by the government of Thailand of foreign loan borrowing plans. When implementation was restarted, the project scope needed to be reviewed taking into consideration the changes in circumstances which had occurred during the suspension, and as a result, the area for development in the industrial estate was nearly doubled to respond to the increasing number of foreign companies moving into Thailand. Currently, considering that most of the land lots in the industrial estate are already contracted (occupancy agreement is lease-based for this industrial estate), the expansion

was proper. Furthermore, the purification plant in the industrial estate constructed by this project is originally planned to supply water to the new housing complex which accompanies the development of the industrial estate, but this plan was canceled so that the installed capacity of the purification plant and that of the sewage treatment plant were reduced accordingly. We can say that this change was also proper, reflecting the situation at that time. Moreover, regarding solid waste treatment, as a result of the study in the detailed design, an incinerator was installed.

(2) **Implementation Schedule:** Compared with the revised plan after restarting the project, the schedule was one year behind. The primary causes of the delay were the construction boom in Thailand at the time which caused hindrances in procuring building materials, and the rainy season which was not considered well in designing the construction process.

(2) **Project Cost:** Compared with the revised plan after restarting the project, slightly more than 60% of the original project cost had been expended. The primary reason for the decrease in project expenses is the reduction in expense for the purification plant and sewage treatment plant. The capacity of these facilities has been reduced to approximately two thirds of the initial plan.

Comparison of Original Plan and Actual

Item	Plan	Actual
Project Scope		
- Land formation (Preparation work / soil improvement)	368 ha/960,000 m ³	569 ha/3,706,200 m ³
- Purification plant (Treated water supply capacity)	35,800 m ³ /day	27,000 m ³ /day
- Sewage plant (Sewage treatment capacity)	33,200 m ³ /day	20,500 m ³ /day
- Solid waste treatment	Scheduled to be studied in the detailed design stage	One incinerator
- Standard factory etc.	24,450 m ²	19,920 m ²
- Other facilities	Roads, bridges, drainage, etc.	Roads, bridges, drainage, etc.
Implementation Schedule (commencement to completion)	July 1988 to March 1990	October 1988 to March 1991
Project Cost		
- Foreign currency	¥ 5,024 million	¥ 3,711 million
- Local currency	836 million bahts	505 million bahts
- Total	¥ 9,590 million	¥ 6,110 million
- Exchange Rate	1 baht = ¥ 5.5	1 baht = ¥ 4.75

(Note) Original Plan is that of appraisal of the Phase (2) of the project (after restarting the project).

(4) **Project Implementation Scheme :** The executing agency was Industrial Estate Authority of Thailand (IEAT). The IEAT was founded in 1972 for the purpose of construction, operation, and maintenance of industrial estates and export processing zones. As of 1998 it had jurisdiction nationwide over 29 industrial estates (including those developed jointly with private firms). Construction of this project was delayed, but most of the reasons thereof were external causes. It can be said that there is no major problem with the capability of the IEAT as an executing agency.

(5) **Operations and Maintenance:** An on-site office is built for each industrial estate by the IEAT. In the case of this project, operation and maintenance of purification plant, sewage treatment plant

and rainwater drainage ditches have been commissioned to a private company. The IEAT operates and maintains roads and other structures. Furthermore, the IEAT holds a regular monthly meeting with four organizations composed of firms occupying the estate. Problems of maintenance are discussed with due consideration; however, some investors point out the problem of inadequate maintenance, for example, roads, and the attention should be paid to these claims.

(6) Operational Performance: The number of firms occupying the Laem Chabang Industrial/Urban Estate is increasing steadily as shown in the following table (the figures are the number of firms signing contracts in the given year). Occupants are manufacturers of electrical products, automobile related products, etc.

Year	1991	1992	1993	1994	1995	1996	1997	1998	Total
General factory district	10	8	6	10	4	2	4	2	46
Export processing district	5	-	8	6	9	4	7	4	43
Standard factories	-	-	1	4	3	-	3	1	12
Total	15	8	15	20	16	6	14	7	101

The utilization ratio of facilities for water and sewage treatment in the Laem Chabang Industrial Estate are shown in the table below, which represents a utilization rate of approximately 40% of capacity. This might be because firms moving into the industrial estate are those not using much water since there are many types of industries that recycle a large percentage of water (electric products and automobile related industries), and because some firms planning for future factory expansion are not yet utilizing a portion of their area. Compared with the facilities of other industrial estates, the capacity of these facilities is not overly large, rather appropriately sized when we consider the nature of the industrial estate which should provide satisfactory facilities no matter what types of firms move in. Thus, as long as maintenance is adequate, the current utilization status is not a major problem.

	1991	1992	1993	1994	1995	1996	1997	1998*
Water treatment (%)	2.0	7.1	20.3	33.5	34.0	44.4	43.4	46.9
Sewage treatment (%)	0.9	4.0	12.0	20.0	20.5	30.4	33.3	39.8

(Note): * The figures for 1998 are performance values for January through September.

The years 1991 - 1994 are IEAT estimates. The years 1995 and later are actual BJT values.

The incinerator for solid waste is not being used, since landfill disposal by the neighboring municipality, Si Racha, is less expensive. (The IEAT is maintaining the incinerator for future utilization.) The capacity may be limited for the landfill disposal, so it may be desirable to begin discussions with the municipality of Si Racha regarding the timing and quantity of waste to be treated in the incinerator to achieve the reduction of waste amount from the estate in the future. On that occasion, however, consideration must be given to new environmental problems that will arise due to exhaust gasses from the incinerator.

(See Appendix 1 for more detailed discussion on purification plant, sewage treatment plant, and incinerator.)

(7) Management Performance of the IEAT: The IEAT, compared to its business scale, has earned sizable profits every year (ratio of recurring profit to sales in 1995 - 1997: 30% - 34%), and its management performance can be said to be favorable. As the income has increased greatly from the land lease and various services to enterprises along with increase in the number of enterprises in

this industrial complex, the operation revenue grew by 1.5 times from 1,158 million bahts in 1995 to 1,811 million bahts in 1997.

(8) Project Effects and Impacts

(i) Quantitative Effects

(a) Occupancy: The number of firms occupying the industrial estate at the time of field survey (1998) has reached a total of 101 companies. The occupancy of the General Industrial Zone and standard factories is 100%, and that of the Export Processing Zones was about 93% of the sites.

(b) Creation of Employment: At the time of appraisal, it is expected that jobs for 25,000 workers will be created in firms occupying the Laem Chabang Industrial Estate by the year 2000, while the 30,402 workers were employed at the end of 1997, so it can be said that the impacts of employment creation far exceeds the initial assumptions.

(c) Financial Internal Rate of Return: Calculating based on performance, the FIRR of this project is 12.8%.

(ii) Qualitative Effects

(a) Industrialization of the Eastern Seaboard: By implementing the Eastern Seaboard Development Plan, the Eastern Seaboard achieved a rapid economic growth. From 1991 through 1996, the real GNP per capita for all of Thailand achieved an annual average growth rate of 6.6%, but the real GNP per capita for the Eastern Seaboard and Chonburi Province exceeded that of Thailand remarkably, achieving annual average growth rates of 11.7% and 10.9% respectively. Furthermore, looking at the value added of manufacturing, Chonburi Province grew at a rate twice that of the nation. The value added of manufacturing by said province occupies as much as 11.3% of that of the nation. The Laem Chabang Industrial Estate is the main one among the five industrial Estates in Chonburi Province, so it can be said that it has played a major role in the industrialization of this province.

Purification Plant, Sewage Treatment Plant, Incinerator

(1) Installed capacity of the purification plant and sewage treatment facilities

The change along with time of the installed capacity of the purification plant and sewage treatment facilities is shown in Table 1.

Table 1 Change of the installed capacity of the purification plant and sewage
(in cubic meters per day)

	in the 12 th loan appraisal	in the 13 th loan appraisal	in the detail design
Purification facility	46,000	35,800	27,000
Sewage treatment facility	45,500	33,200	20,500

At the time of 12th loan appraisal, the installed capacity of the purification plant was determined considering the water supply to the housing complex to be newly constructed near the Laem Chabang Industrial Estate. Since it was decided that the industrial estate would be constructed prior to the housing complex by the time of 13th loan appraisal, the water supply to the housing complex was excluded from this project.

The installed capacity of the purification plant set at the time of 12th loan appraisal was based on the Feasibility Study (F/S) of JICA. This F/S estimated the water supply demand for the Laem Chabang Industrial Estate, assuming the specific water demand is 99 to 110 m³/day/ha on the basis of the experience concerning the industrial estates in Japan. This assumption concerning the General Industrial Zone was reviewed at the 13th loan appraisal, referring to the results of other industrial estates in Thailand. The water demand projected in this way was 80 m³/day/ha.

As a consequence of the review, the capacity of the purification plant set at the 13th loan appraisal was reduced to 35,800 m³/day from 46,000 m³/day.

Thereafter, the purification plant capacity was reduced further to 27,000 m³/day in the detailed design stage, because an enterprise that planned to move into the Laem Chabang Industrial Estate and to consume a lot of water decided to buy raw water instead of treated water.

The installed capacity of the sewage treatment plant too was reduced as a function of the decrease of the purification plant capacity.

It can be rightly said that the reduction of the installed capacity of the purification facility and sewage treatment facility is appropriate, since it was determined to keep up with the actual situation, and as mentioned later, the actual water supply volume and sewage treatment volume are within the installed capacity.

(2) Operational performance of the water treatment and sewage treatment facilities

Table 2 summarizes the operational performance of the water and sewage treatment facilities.

Table 2 Operational Performance of the water treatment and sewage treatment facilities.

	1991	1992	1993	1994	1995	1996	1997	1998*
Water supply (1,000m ³)	200	700	2,000	3,300	3,355	4,379	4,274	3,467
Utilization rate (%)	2.0	7.1	20.3	33.5	34.0	44.4	43.4	46.9
Sewage treatment (1,000m ³)	70	300	900	1,500	1,533	2,275	2,488	2,234
Utilization rate (%)	0.9	4.0	12.0	20.0	20.5	30.4	33.3	39.8

(Source): IEAT, BJT

(Note): * The result for 1998 is that from January to September.
The values shown for 1991 to 1994 are estimated values of IEAT, whereas, for 1995 and onward, the values are the actual performance of BJT.

In response to the increase in number of enterprises moving into the estate, the water supply volume and sewage treatment volume increased. In 1997, the annual water supply was 4,274 thousand m³ (averaging 11,710 m³/day) and the annual sewage treatment volume was 2,488 thousand m³ (averaging 6,816 m³/day). In the scope of the JBIC-financed project, a purification facility with a capacity of 27,000 m³/day and a sewage treatment facility with a capacity of 20,500 m³ were constructed. The ratio of actual treatment to the installed capacity recorded in 1997 is 43% (for water treatment) and 33% (sewage treatment).

These results may be due to the fact that a larger part of the enterprises which moved to the Laem Chabang Industrial Estate are not the industries which use a huge amount of water (food processing, textile, etc.) but those do not use much water or largely recycle water (electric appliances, automotive industries, etc.). In addition, some enterprises in the estate leave a part of their land lot unused, planning for future expansion, which contributes to the amount of water used less than the purification capacity of the Estate.

Table 3 shows comparison of water supply capacity¹ between the Laem Chabang Industrial Estate and those of three industrial estates developed jointly by a private enterprise and IEAT. Compared with these three industrial estates, the water supply capacity in the Laem Chabang Industrial Estate is not excessively large. So, it can be said that the installed capacity of the purification plant is in a suitable range.

Table 3 Comparison of purification plant between industrial estates

	Laem Chabang IE	Chonburi IE	Eastern IE	Eastern Seaboard IE
Water supply capacity	64 m ³ /ha/day	50 m ³ /ha/day	63 m ³ /ha/day	44 m ³ /ha/day

Source: Hemaraj Land and Development Public Co., Ltd. for the three other industrial estates.

Note: IE represents Industrial Estate.

¹ This water supply capacity for the Laem Chabang Industrial Estate is obtained by dividing the capacity of purification facility (27,000m³/day) by the total area (about 420 ha) of general industrial zone and export processing zone.

The Laem Chabang Industrial Estate was intended to provide satisfactory facilities for any kind of enterprise of light industry or export-oriented company. Taking into account this nature of the estate, no specific problem is posed if the purification facility is properly operated and maintained, offering sufficient water to the enterprises in the estate. In fact, the operation and maintenance is correctly performed by BJT, and the enterprises in the estate are provided with water at a price similar to that of industrial water in Bangkok². Since the purification facility well accommodates the demand of the enterprises in the estate for water, its contribution to the production activities of these enterprises should be appreciated.

On the other hand, the sewage treatment facility is operated at about 30% of the installed capacity. This operating status corresponds to the utilization state of the purification facility. So, the sewage treatment facility should be positively evaluated as with the purification facility. The sewage treatment facility too is properly maintained by BJT, well meeting the demand for wastewater treatment of the enterprises in the estate. Thus, its contribution to production activities of these enterprises is appreciated.

It should be noted that these purification and sewage treatment facilities are capable of accommodating the demand increase for water supply and sewage treatment, even when, in the future, the existing enterprises in the estate extend their factories using the land lots reserved for extension. The purification plant in the Laem Chabang Industrial Estate is also supplying water to Laem Chabang Port neighboring the estate. Even after the port is extended, this purification plant is planned to supply water there³.

(3) Incinerator

With regard to the solid waste treatment plant, at the time of the 13th loan appraisal, it was planned that necessary facilities would be studied in the detailed design. On the basis of the study in the detailed design, an incinerator with a capacity of about 10 tons/day was constructed.

When the post-evaluation field survey was carried out in 1998, the incinerator was not used. The reason for this is the use for landfilling by Si Racha municipality is more economical. The city collects general solid waste at 0.5 bahts per kilogram, and uses it in the landfill site of 30 rai (4.8 ha) owned by the same city. Treatment in the incinerator of the industrial estate will cost 3.5 bahts per kilogram.

At the time of the field survey mentioned above, however, the IEAT began to give a suggestion to the enterprises in the estate for intermediate treatment using the incinerator, considering the limited capacity of the landfill site. For promoting the use of the incinerator, IEAT considers to make the disposal cost partially borne by IEAT (one baht per kilogram would levied on the enterprises in the estate).

Since disposal by landfill is common practice in Thailand, the construction of incinerator is an advanced investment. But, for elongating the life of the landfill site, it is desirable to reduce the disposal volume by intermediately treating the waste from the industrial estate in the incinerator. IEAT has been maintaining the incinerator, considering the use in the future. It is recommended for IEAT to discuss

² The water rate was uniformly set at 14 bahts/m³ in 1998. A sliding scale is applied to the rate of industrial water of the Metropolitan Water Supply Authority (MWA) which supplies Bangkok with water : 14.18 bahts/m³ for 201 to 2,000 m³, 13.92 bahts/m³ for 2,001 to 4,000 m³, ... 12.10 bahts/m³ for 10,001 to 20,000 m³, 11.45 bahts/m³ for 20,001 to 30,000 m³.

³ There is also an extension plan of 500 rai (80 ha) of the Laem Chabang Industrial Estate. The implementation period has not been determined as of 1998.

with the Si Racha municipality the time to start using incinerator and how much of waste is treated by incinerator. In the case of using the incinerator, due attention must be paid to new environmental issues due to exhaust gas from the incinerator.