POST-EVALUATION FOR ODA LOAN PROJECT – KINGDOM OF THAILAND "Overall Impact of Eastern Seaboard Development Program"

Kenichi Ariga*
Shinya Ejima**

SUMMARY

Thailand implemented the Eastern Seaboard Development Program from 1980s to the first half of 1990s. The goal of the Program was to develop the eastern seaboard in the southeast of Bangkok, reducing the exclusive concentration of industries in the metropolitan Bangkok region and, at the same time, building a new industrial infrastructure in Thailand. It had two core components, heavy and chemical industries that exploit natural gas produced in the Bay of Siam, and export-oriented industries (including machinery and electrical equipment) located in the vicinity of the newly-built international container port.

The Thai government adopted a policy of developing economic and social infrastructure on its own, while leaving investments in the production sector to private capital. Japan supported this policy by providing technical assistance and ODA loans. The Thai government sustained its steady effort to develop infrastructure in such areas as ports, roads, railroads, water for industrial use and industrial complex, at times reviewing and adjusting the scale of the projects and the timing of their implementation.

JBIC has recently conducted evaluation on the impact of the Eastern Seaboard Development Program based on the post-evaluation reports of 16 infrastructure projects, which were implemented under the Program with ODA loan support from JBIC. The result confirmed that the Program had achieved its initial objective-this region consolidated its position as the country's second largest economic zone next to the metropolitan Bangkok. It was also revealed that the infrastructure put in place by these projects was a major factor for private enterprises in deciding to move to this region and make capital investments.

The lessons learned from the evaluation are: (1) in large-scale development projects, it is instrumental to adjust the project plan as we go along in response to any changes in the circumstances, and this has to take place through the ownership of the project-residing country; (2) in development projects, anti-pollution measures have to be adopted by disclosing information to the local population and forming consensus among all the stakeholders; and (3) Large-scale regional development and industrialization will induce inflows of population in the region, thereby increasing demand for public sector services in the urban areas. It is therefore important to see to it that the local government has adequate fiscal resources and strengthens its administrative capacity in parallel with the development.

INTRODUCTION

This study is a summary of the results of evaluation on the general impact of the 16 projects that were undertaken under the Eastern Seaboard Development Program in Thailand. The evaluation was part of the post-project exercise required in ODA loan operations of JBIC. ODA loans are often used for infrastructure development. However, the Eastern Seaboard Development Program was unprecedented, whether in Thailand or in other countries, in the sense that it was based on a grand design and that as many as 16 ODA-financed infrastructure projects concentrated in

* Procurement Policy and Supervision Division, Project Development Department (at the time of evaluation: Economist, Sector Studies Group, Research Institute for Development Assistance, Overseas Economic Cooperation Fund)

** Director, Division1, Development Assistance Department I, (at the time of evaluation: Director, Post Evaluation, Research Institute for Development Assistance, Overseas Economic Cooperation Fund)

JBIC Review No. 2 November 2000 pp 81~115

one region were undertaken during a relatively limited period of time. Thus post-project evaluation, which is usually done for each project, was undertaken in the way that taked into account all the projects in the region. This has enabled us to make an overall assessment on the impact of the Eastern Seaboard Development Program on the region.

Recognizing that the ownership of the Thai government was one of the key elements in the success of the Eastern Seaboard Development Program, we went to some length to share information with Thai officials from the beginning of this overall evaluation, asked them to participate in on-site visit for research and held a workshop in August 1998, after the draft report was put together, to feed the results of the evaluation back into the participants. In the workshop, we exchanged views and opinions with Thai officials on wide-ranging issues and prepared this final report to reflect comments expressed on that occasion. In this sense, this report was not possible without the cooperation and understanding of officials and those in the private sector in Thailand who have been involved in this process. We express our deep gratitude for all of them.

This report deals with the result of the overall evaluation of the Program. Individual post-project evaluation has been done separately for each project under the Program. Their results are in the "Post-Evaluation Reports of ODA Projects," published by the Development Assistance Operations Evaluation Office of JBIC. Interested parties may turn to them for further information.

REFERENCE

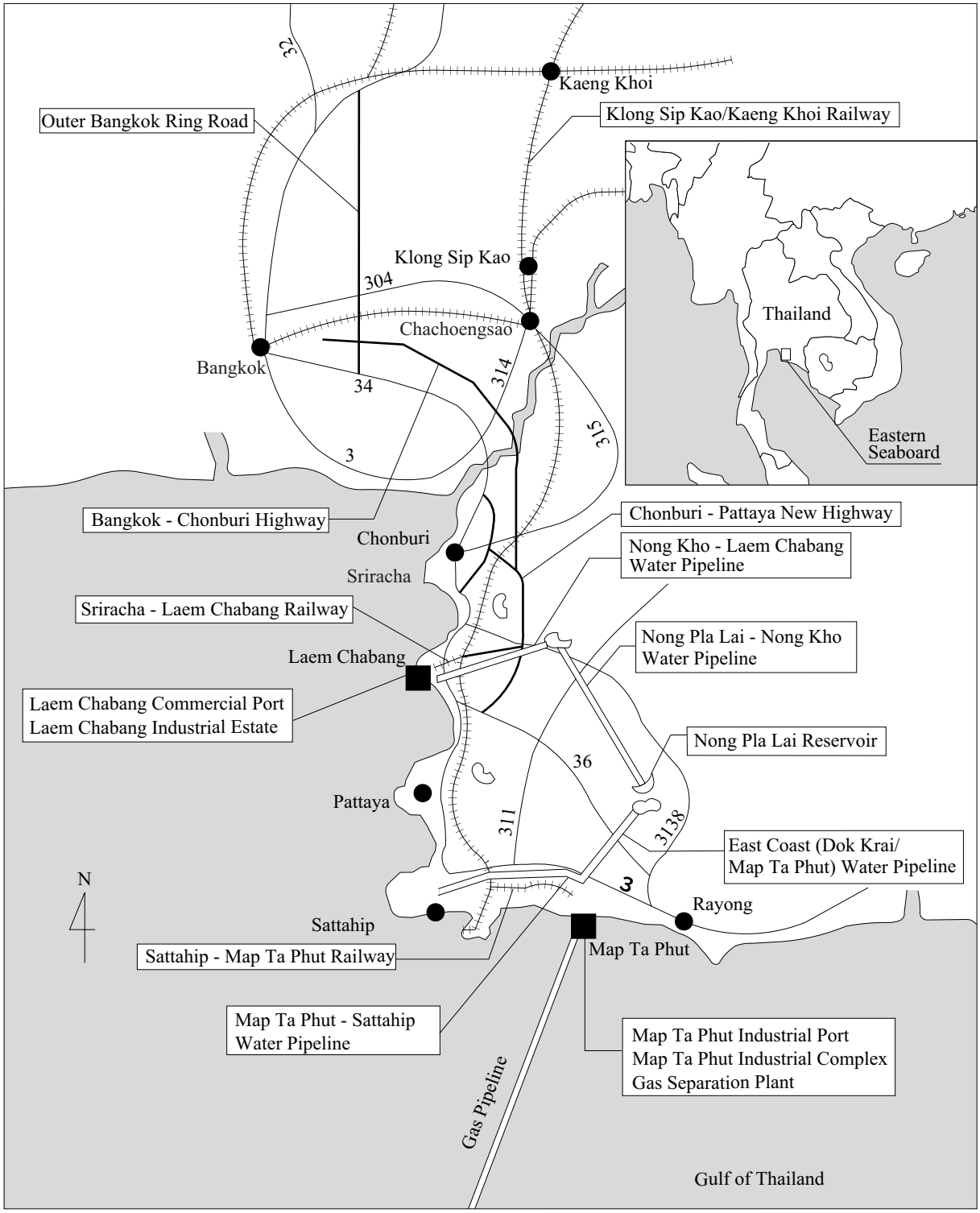
(1) Legend

- BOI: Board of Investment
- CDBIES: The Committee to Develop Basic Industries on the Eastern Seaboard
- CIPO: Center for Integrated Plan and Operations
- DIW: Department of Industrial Works
- ESDC: Eastern Seaboard Development Committee
- IEAT: Industrial Estate Authority of Thailand
- IFC: International Finance Corporation
- NESDB: National Economic and Social Development Board
- NFC: National Petrochemical Company Ltd.
- OEPP: Office of Environment Policy and Planning
- OESB: Office of Eastern Seaboard Development Committee
- PAT: Port Authority of Thailand
- PCD: Pollution Control Department
- PEA: Provincial Electricity Authority
- PTT: Petrochemical Authority of Thailand
- PWA: Provincial Waterworks Authority

(2) Terminology

- GRP (Gross Regional Products) : gross product for each of the following seven regions of the territory of Thailand, metropolitan region, eastern region, central region, western region, northeastern region, northern region and southern region .
- GPP (Gross Provincial Products) : Gross product of each of the 76 provinces of Thailand

Locations of ODA loan projects in Eastern Seaboard Development Program



CHAPTER 1. SUMMARY OF THE EASTERN SEABOARD DEVELOPMENT PROGRAM AND JBIC PORTION

1. SUMMARY OF THE EASTERN SEABOARD DEVELOPMENT PROGRAM

This program is intended to construct new infrastructures in the Eastern Seaboard Area (three provinces, Chachoengsao, Chon Buri, Rayong) 80 to 200 km east-south of Bangkok, avoiding excessive concentration of population and industries in Bangkok - the metropolitan area of Thailand. This project was initiated in the framework of the Fifth Five-Year Plan (1982 to 1986). Also in the Sixth Five-Year Plan, said program was given priority in terms of development strategy, and so, from the 1980s to the early 1990s, it was one of the main program for development planning both economic and social of Thailand.

The Eastern Seaboard Development Program was predominantly carried out in two districts : Map Ta Phut area which is a core district of heavy industries utilizing natural gas from the Gulf of Thailand, and Laem Chabang area with a new international commercial port, aiming to be a core of export-oriented light industries. In Map Ta Phut area in Rayong province, where petrochemical enterprises congregate, has been developed as the greatest base of petrochemical industries in this country[1]. Laem Chabang area located in the western coast district of Chon Buri province, and the inland district of this area (region along National Road No. 331 running across Chon Buri and Rayong provinces), gathering automotive, electric and machinery enterprises, have been developed as a nucleus of general industries in the Eastern Seaboard district, because of the benefits of its proximity to newly constructed Laem Chabang Commercial Port[2].

In the Thailand government, the Office of Eastern Seaboard Development Committee (OESB)[3] under the National Economic and Social Development Board (NESDB) which manages said development program, considers it as Phase I[4] of this program, the period from 1984 to 1994 when the ODA-loaned projects were implemented, leading to noticeable development of Map Ta Phut and Laem Chabang.

2. JBIC LOAN

(1) Summary of the JBIC loan for the Eastern Seaboard Development Program

JBIC has supported the Eastern Seaboard Development Program, focusing upon the development of Map Ta Phut and Laem Chabang. Up to now twenty seven ODA loans have been given to sixteen projects

---

1 In the initial plan, four sectors were considered as heavy chemical industries to be located in the Map Ta Phut area, that is, petrochemical, chemical fertilizer, soda ash, and doxidized iron (source : 5th Five-Year Plan). Actually, the development was centered on the petrochemical industry.

2 In the initial plan for the Laem Chabang area, location of export-oriented and pollution-free light industries was planned (source : 6th Five-Year Plan). "Light industries" usually designate an industrial section which processes non-metallic organic substances such as food, textile to produce consumable goods relatively light in weight. However, firms of "heavy industries" such as automotive and electric-machinery sectors, are actually included in the enterprises located in the Laem Chabang area, responding also to the domestic demand.
Though the export-oriented light industries were advocated as sectors to be attracted for location in the Laem Chabang area, the development program also considered, from the initial stage, sectors other than "export-oriented" sectors and "light industries". So it can be said that the development of the Laem Chabang area considered the location of general industries.

3 Bureau of the Eastern Seaboard Development Committee, of ministerial level, headed by the prime minister responsible for policy decision regarding the Eastern Seaboard Development Program. When the committee was set up in 1981, it was called Center for Integrated Plan and Operations (CIPO). Because it became necessary to enhance the bureau functions after the specific implementation of the program started, it was reorganized into OESB.

4 For Phase II of the Eastern Seaboard Development Program, two master plans had been formulated by the time of the field survey for the present evaluation (November 1998). Specific implementation planning of the program is now under review by the Thai government.

Table 1-1 ODA loan amount for Thailand and share for the Eastern Seaboard Development Program

(in million yen)

Fiscal year	Loan amount	Share for ESDP	
1982	84,240	21,570	(25.6%)
1983	67,360	1,720	(2.6%)
1984	49,432	9,927	(20.1%)
1985	60,793	23,537	(38.7%)
1986	32,489	12,287	(37.8%)
1987	72,646	3,003	(4.1%)
1988	49,493	13,948	(28.2%)
1989	66,357	14,798	(22.3%)
1990	43,773	28,455	(65.0%)
1991	84,687	9,065	(10.7%)
1992	127,375	6,362	(5.0%)
1993	104,462	34,100	(32.6%)
Total	804,107	178,768	(21.2%)

Source: OECF Note: The years shown in this table are Japanese fiscal years.

for constructing well equipped industrial infrastructures in this region[5]. The amount of these loans totals 178,768 million yen, which accounts for approximately ten percent of the sum of ODA loans for Thailand provided by JBIC till the end of fiscal 1998 (end of March 1999), that is, 1, 631, 196 million yen.

The agreements for these loans were concluded from fiscal 1982 to fiscal 1993. Of the sum of the ODA loans for Thailand during this period, the loan amount for the projects related to the Eastern Seaboard Development accounts for about 20%. Table 1-1 summarizes the share for the Eastern Seaboard Development Program in the total loan amount of ODA loan for Thailand. As known from the fact that in a fiscal year the share took on a majority of the total loan amount, Japanese support for Thailand placed an emphasis upon the Eastern Seaboard Development Program from the early 1980s to the early 1990s.

As will be discussed in the following, the objectives of the ODA loans for the ESDP include :developing Map Ta Phut area with a heavy petrochemical complex, developing Laem Chabang area which features a new international commercial port, that is a representative port of Thailand, and an industrial estate adjacent to this port, developing water resources for satisfying the demand mainly of these two areas, along with implementation of water pipeline project, and constructing railway and highway networks for meeting the transport demand in these areas.

(2) Development of Map Ta Phut area

(a) Map Ta Phut Industrial Complex Project and (b) Map Ta Phut Industrial Port Project

These are projects for constructing an industrial port (one multipurpose berth and two liquid cargo berths) and an industrial complex (grading of 380.8 ha and construction of infrastructures), with a view to promote location of heavy chemical industry in the Map Ta Phut area. Both for the industrial port and estate, the Industrial Estate Authority of Thailand (IEAT), which is the project executing agency, is expanding the facilities after the ODA-loaned portion was completed on its own initiative, in response to the increase of enterprises located there. The Map Ta Phut

5 The projects related to the Eastern Seaboard Area (16 projects, 27 loans) do not include the "construction project of fertilizer plant" for which the loan agreement was reached but the loan was not given because of the suspension of the project.

Industrial Complex currently covers 804.8 ha. About fifty enterprises, mainly of petrochemical industry are located in this complex as of 1998 which is now the greatest petrochemical core base in Thailand.

(c) Gas Separation Plant Project

This project is to construct a plant for separating the natural gas landed on the Map Ta Phut area into ethane, propane, LPG, etc. (processing capacity : 350 million cubic feet/day), and its auxiliary equipment such as pipeline on the land. It was jointly financed by the World bank (IBRD), JBIC (non-ODA loan; former Export-Import Bank of Japan), etc. After completion of this project, No.2 separation plant (250 million cubic feet/day) and No.3 separation plant (350 million cubic feet/day) were constructed adjacently, all these plants supplying energy required in Thailand and raw materials for the petrochemical industry.

(3) Laem Chabang area Development

(d) Laem Chabang Commercial Port Project

This project is to construct a commercial port for supplementing or substituting Bangkok Port which is a river harbor not allowing entry of large container vessels. The Port Authority of Thailand (PAT), which is the project executing agency, formulated a master plan consisted of three phases for responding to the container cargo handling demand up to the year 2025. Phase I (container handling capacity per year: 1.65 million TEU (twenty-feet equivalent units)) combines the ODA-loan portion and the partial expansion by the PAT. Laem Chabang Port recorded a container handling amount in fiscal 1998 (about 1.43 million TEU) which surpasses that of Bangkok Port (about 1.11 million TEU).

(e) Laem Chabang Industrial Estate Project

Along with the development of Laem Chabang Commercial Port, this project is to construct an industrial estate in a region adjacent to the port, including both an export processing industry zone and a general industry zone. The industrial estate (about 420 ha) was almost entirely occupied as of 1999; typical industries operating there include assembly and parts manufacturing of the automotive sector, and assembly and parts manufacturing of the electric and electronic sector. This estate has been growing as a new industrial core base in the Eastern Seaboard district.

(4) Water Resource Development and Water Pipeline Project

(f) Nong Pla Lai Reservoir Project, (g) Eastern Seaboard (Dok Krai - Map Ta Phut) Water Pipeline Project, (h) Map Ta Phut - Sattahip Water Pipeline Project (i) Nong Kho - Laem Chabang Water Pipeline Project, and (j) Nong Pla Lai - Nong Kho Water Pipeline Project

These projects involve the development of water resources (dam) ((f) above) and water pipeline construction ((g) to (j)) for coping with the water demand resulting from the large-scale industrial development of the Eastern Seaboard Area, to avoid water shortage which may impede normal economic activities and social life. Projects (g) and (h) above are intended to meet the demands for industrial and residential waters in the southern coastal region of the Eastern Seaboard Area. Projects (i) and (j) are for satisfying the demands for industrial and residential waters in the western coastal region where the Laem Chabang area is located.

(5) Railway Projects

(k) Si Racha - Laem Chabang Railway, (l) Sattahip - Map Ta Phut Railway, and (m) Klong Sip Kao - Kaeng Khoi Railway

These railways were constructed, essentially aiming at meeting the demand for long distance, massive transport, which is part of the new demands for transport arising from implementation of the Eastern Seaboard Development Program. First, the trunk railway (Chachoengsao- Sattahip Railway) in the Eastern Seaboard Area was constructed with the fund of the Thai government. Their branch lines, namely Si Racha - Laem Chabang Railway and Sattahip - Map Ta Phut Railway, were constructed under ODA loan. In addition, the Klong Sip Kao - Kaeng Khoi Railway was laid under ODA loan for

Table 1-2 Evaluation reports of the individual projects in the Eastern Seaboard Development Program

Project Name	Individual Evaluation Report name
(a) Map Ta Phut Industrial Complex Project	"Map Ta Phut Industrial Port Construction Project/Map Ta Phut Industrial Complex Construction Project" "Evaluation on Environmental Monitoring and Pollution Control Policies in Map Ta Phut Industrial Complex"
(b) Map Ta Phut Industrial Port Project	
(c) Gas Separation Plant Project	Post-evaluated in fiscal 1989
(d) Laem Chabang Commercial Port Project	"Laem Chabang Commercial Port Project"
(e) Laem Chabang Industrial Estate Project	"Laem Chabang Industrial Estate Project"
(f) Nong Pla Lai Reservoir Project,	"Water resource development and water pipeline project" Project (g) had been post-evaluated in fiscal 1989, and Project (i) in fiscal 1991. However, since the five projects (f) to (j) work conjunctly as a whole, the evaluation of operation, maintenance and effect covers all the five projects.
(g) East Coast (Dok Krai - Map Ta Phut) Water Pipeline Project	
(h) Map Ta Phut - Sattahip Water Pipeline Project	
(i) Nong Kho - Laem Chabang Water Pipeline Project	
(j) Nong Pla Lai - Nong Kho Water Pipeline Project	
(k) Si Racha - Laem Chabang Railway Project	"Railway projects" Project (k) had been post-evaluated in fiscal 1997. However, since the three projects (k) to (m) work conjunctly as a whole, the evaluation of operation, maintenance and effect covers all the three projects.
(l) Sattahip - Map Ta Phut Railway Project	
(m) Klong Sip Kao - Kaeng Khoi Railway Project	
(n) Chon Buri-Pattaya New Highway Construction Project	"Motor way construction project"
(o) Bangkok-Chon Buri Highway Construction Project	Since these projects were not completed at the time of the field survey in November 1998 (completed in December 1998), they are not included in the present post-evaluation.
(p) Outer Bangkok Ring Road (East Portion) Construction Project	

satisfying the transport demand between the Eastern Seaboard Area and Northern/Northeastern regions of Thailand; this railway bypasses Bangkok which experiences heavy traffic congestion. All these railway networks are used for long distance, massive transportation of container cargoes handled in Laem Chabang Commercial Port and energy such as LPG produced in the Map Ta Phut Industrial Complex.

(6) Road Projects

(n) Chon Buri-Pattaya New Highway, (o) Bangkok-Chon Buri Highway, and (p) Outer Bangkok Ring Road (East Portion)

New road networks were constructed to meet, together with railways, the demands for land transportation generated as a result of the development of the Eastern Seaboard Area. The ordinary national roads were first widened with the fund of the Thai government and partially under the supports of the World Bank, etc. Then "Motorways" ((n) to (p) mentioned above) linking Bangkok with the Eastern Seaboard Area were constructed under ODA loans.

These motorways are contributing to general land transportation of passengers and cargoes of this area.

(7) Evaluation of Individual Projects

For individual projects of the Eastern Seaboard Development Program, the evaluation is summarized in the six post-evaluation reports listed in the table below and one third-party evaluation report, apart from the present report. (Some projects had been already post-evaluated)

3. BACKGROUND OF THE EASTERN SEABOARD DEVELOPMENT PROGRAM

3.1. Background

(1) Discovery of natural gas in the Gulf of Thailand and Heavy Chemical Industry Development Program

The discovery of natural gas in the Gulf of Thailand in the 1970s gave the impetus for development of heavy chemical industry in the Map Ta Phut area. The survey of natural gas in this gulf was started in the end of the 1960s, and a commercially feasible gas reserve was found in 1973. A submarine pipeline spanning 425 km was laid from the gas well. In the Map Ta Phut area where the pipeline comes on to the land, establishment of heavy chemical plants using the natural gas was planned. Such heavy chemical industries include petrochemical, soda ash, chemical fertilizer, deoxidized iron sectors, etc.

(2) Development plan of Laem Chabang Port

Since Bangkok Port located along the Chao Phraya River is shallow and narrow, large ships cannot enter there (vessels using this port are of classes in dead weight tons of about 10,000 to 12,000). Container vessels transporting cargoes between Bangkok and European or American countries had been detained at the ports of Hongkong or Singapore, which are the hub ports of Southeast Asia, and their cargoes had been carried in and out by feeder-service vessels in these regions. To cope with international trend to depend more on container cargo transport, and to allow direct entrance of large size container vessels into the port, it became necessary to construct a new deep sea port to supplement and substitute Bangkok Port. The Laem Chabang area was selected for the location of such a substitute port.

(3) Excessive concentration of economic activities in Bangkok

In 1981, the portion of the Bangkok metropolitan area[6] accounted for more than 70% of the total of added value of Thai manufacturing sector. As proven by this ratio, the Thai industry was excessively concentrated in the metropolitan area. For creating a new industrial zone to alleviate the high concentration in the metropolitan area, the development program of the Eastern Seaboard Area was formulated, which is near Laem Chabang Port, a future international hub port, and provided with infrastructures of the heavy chemical industry in Map Ta Phut.

6 Bangkok, Samut Prakan, Pathun Thani, Samut Sakon, Nakhon Pathom, and Nonthaburi.

3.2. Chronology

1973		Discovery of natural gas reserve in the Gulf of Thailand
1980	December	The Committee to Develop Basic Industries on the Eastern Seaboard (CDBIES : headed by the prime minister Prem) established by Thai government
1981	January	Statement of the intention of cooperation for the "Eastern Seaboard Development Program" by the prime minister, Suzuki
	March	Formulation of the heavy industry development strategy of the Eastern Seaboard Area (Anat Arbhabhirama report) completed
	April	The Thai government cabinet approved the Eastern Seaboard Development Program.
	June	CDBIES rearranged into "Eastern Seaboard Development Committee" (ESDC headed by the prime minister Prem)
	September	Construction of the natural gas pipeline from the Gulf of Thailand to Map Ta Phut completed.
	October	The Eastern Seaboard Development Program was adopted in the framework of the "5th Five-Year Plan"
1982	March	F/S by JICA of "Eastern Water Resources Development Program" (Phase I) completed
	July	L/A (the 9th ODA loan) for "Gas Separation Plant Project" , "East Coast Water Pipeline Project" signed
	July	"Eastern Seaboard Master Plan" completed under the fund aid from IBRD and UK government. (Coopers & Lybrand report)
1983	August	Feasibility study of "Eastern Water Resources Development Program" (Phase II) by JICA completed
	September	L/A for Eastern Seaboard Development Project (E/S) signed (the 10th ODA loan)
	November	M/P and F/S by JICA of Map Ta Phut area development including Map Ta Phut Industrial Port and Industrial Estate completed
1984	September	L/A (the 11th ODA loan) for Laem Chabang Commercial Port Project (1), Map Ta Phut Industrial Port Project (1), 'Nog Kho-Laem Chabang Water Pipeline Project (E/S)' signed
	September	Establishment of NPC (The National Petrochemical Corporation)
	October	Completion of the 'East Coast Water Pipeline Project'
	December	Start of the test run of the gas separation plant
1985	February	M/P and F/S by JICA for the Laem Chabang Seaboard Development including Laem Chabang Port and Laem Chabang Industrial Estate completed
	October	L/A (the 12th ODA loan) for Map Ta Phut Industiral Port Project (2), "Nog Kho-Laem Chabang Water Pipeline Project. Laem Chabang Industrial Estate Project were signed
	November	The Thai government froze the Eastern Seaboard Development Program for reviewing the foreign loan plan.
1986	October	The Thai government decided to restart the project for the Laem Chabang area.
	November	L/A (the 12th ODA loan) for the Laem Chabang Commercial Port Project (2) was signed
	November	Start of the Phase I Petrochemical Project (NPC-1) in the Map Ta Phut Industrial Complex
1987	February	The Thai government decided to restart the Map Ta Phut Industrial Complex Project
	September	L/A (the 13th ODA loan) for the Laem Chabang Industrial Estate Project (2) was signed
1988	January	The Thai government decided the restart of the Map Ta Phut Industrial Port Project, and at the same time approved the Phase II Petrochemical Project (NPC-2).
	September	L/A (the 14th ODA loan) for the Nong Pla Lai Reservoir Project, Sattahip - Map Ta Phut Railway Project, Si Racha - Laem Chabang Railway Project were signed
	November	L/A (the 14th ODA loan) for Map Ta Phut - Sattahip Water Pipeline Project, Chon Buri-Pattaya New Highway Construction Project (Phase I) were signed
1989	March	Completion of the Nog Kho-Laem Chabang Water Pipeline Project
	March	M/P and F/S by JICA of the road network in central Thailand (including F/S of Chon Buri-Pattaya New Highway Construction Project) completed
	October	Start of the operation of the Phase I Petrochemical Project (NPC-1)
1990	February	L/A (the 15th ODA loan) for Laem Chabang Commercial Port Project (3), Nong Pla Lai - Nong Kho Water Pipeline Project (E/S), Klong Sip Kao - Kaeng Khoi Railway Project were signed
	May	Completion of the Map Ta Phut Industrial Complex
	December	L/A (the 15th loan) for the Outer Bangkok Ring Road (East portion) Construction Project, Bangkok-Chon Buri Highway Construction Project were signed
1991	January	Start of commercial operation of the Laem Chabang Commercial Port (completed in October 1991)
	September	L/A (the 16th ODA loan) for the Map Ta Phut Industrial Port Project (3), Chon Buri-Pattaya New Highway Construction (Phase II) were signed
1992	February	Completion of Map Ta Phut Industrial Port
	October	L/A (the 17th ODA loan) for Nong Pla Lai - Nong Kho Water Pipeline Project Start of operation of the Si Racha - Laem Chabang Railway (completed in April 1994) were signed
1993	March	Completion of the Map Ta Phut - Sattahip Water Pipeline, Laem Chabang Industrial Estate
	July	Completion of the Nong Pla Lai Reservoir
	September	L/A (the 18th ODA loan) for the Bangkok-Chon Buri Highway Construction Project, Outer Bangkok Ring Road (East portion) Construction Project were signed
1995	April	Completion of the Sattahip - Map Ta Phut Railway
	June	Completion of the Chon Buri-Pattaya New Highway Start of commercial operation of the Klong Sip Kao - Kaeng Khoi Railway (completed in October 1997)
1997	April	Completion of the Nong Pla Lai - Nong Kho Water Pipeline
1998	December	Completion of the Bangkok-Chon Buri Highway, Outer Bangkok Ring Road (East Portion)

Abbreviations : F/S = feasibility study, L/A = loan agreement, M/P = master plan

CHAPTER 2. ANALYSIS AND EVALUATION

1. INDUSTRIALIZATION OF THE EASTERN SEABOARD AREA

(1) Position of the Eastern Seaboard Area in the Thai economy

From the 1980s to the first half of the 1990s during which the Eastern Seaboard Development Program had been implemented, the said seaboard experienced enhanced industrialization, along with a remarkable growth of district economy. As a result, it can be said that the Eastern Seaboard, in terms of the economic scale, had assumed second place next to the Bangkok metropolitan area by the mid-1990s.

Table 2-1 shows the comparison in terms of the real GDP per capita as well as that in terms of GRP per capita (Gross Regional Product) for each area in Thailand over the period from the 1980s to the first half of the 1990s. The table suggests that from the 1980s to the first half of the 1990s, the Eastern Seaboard had achieved the most noticeable economic growth in Thailand. In the 1990s in particular, the Eastern Seaboard Area recorded the highest growth rate of 12.1% per annum (from 1991 to 1995) in the country, double that of the metropolitan area (annual rate 6.0%, 1991 to 1995). Consequently, although the GRP per capita was about 1.8 times the national average and 60% or less of the GRP of the metropolitan area in 1981, it increased in 1995 to the level approximately 2.6 times the national average and 80% or more of the level in the metropolitan area.

Furthermore, the comparison of added values in the manufacturing industry among the areas of Thailand demonstrates that the economic growth from the 1980s to the first half of the 1990s in the Eastern Seaboard could be achieved mainly depending upon the manufacturing industry (refer to Table 2-2). The manufacturing industry had made vigorous growth nationwide in the last half of 1980s, including the metropolitan area. Entering the 1990s, the concentration in the metropolitan area became intense, hampering construction of new factories, therein and under these circumstances, the growth rate in other areas started exceeding that of the metropolitan area.

In particular, the Eastern Seaboard area recorded the highest growth rate in the added value of the manufacturing industry. Looking at the changes from 1981 to 1995 in the share of various areas in terms of the added value amount, other areas marked increased share while the share by the metropolitan area decreased, with the most remarkable growth in share by the Eastern Seaboard Area. From the proportion of the manufacturing industry's added value to the gross product, it is possible to know that in the gross product for each area, any area other than the metropolitan area experienced, from 1981 to 1995, an remarkably increased share of manufacturing industry, while in 1995, more than the half of the gross product in the Eastern Seaboard Area depended upon the manufacturing industry, suggesting that over the

Table 2-1 Real GRP per capita in each of the areas of Thailand 1981-1995 (1988 price)

	Nation	Metropolitan area	East (ESB)	Central district	West district	Northeast district	North district	South district
Real GRP per capita								
1981	20,278	63,198	26,212 (35,564)	17,845	18,610	7,860	12,402	15,740
1995	49,514	149,592	80,232 (121,376)	48,558	37,295	16,631	23,681	31,735
Growth rate per capita (annual average)								
1981-86	3.4%	2.2%	5.8% (7.6%)	2.5%	3.5%	3.7%	3.5%	3.0%
1986-91	9.3%	11.0%	8.4% (8.5%)	9.5%	5.5%	6.2%	5.3%	7.2%
1991-95	7.3%	6.0%	11.5% (12.1%)	11.2%	6.6%	7.0%	5.5%	5.2%

Source: Calculation from NESDB materials.

Note: ESB= Eastern Seaboard, the Eastern Seaboard includes three provinces of ESB, and Trat province (Chon Buri province, Nakhon Nayok province, Prachin Buri province, Sa Kaew provinceÅiThis definition applies to the other tables).

Table 2-2 Added value in the manufacture industry for each of Thai regions

	Nation	Metropolitan area	East (ESB)	Central region	West region	East-north region	North region	South region
Growth rate of added value in the manufacture industry								
1981-86	5.6%	5.6%	5.0% (4.9%)	6.1%	7.7%	7.0%	4.9%	2.4%
1986-91	15.5%	15.5%	15.1% (15.1%)	23.4%	13.3%	12.9%	12.4%	14.0%
1991-95*	10.7%	6.9%	22.0% (22.0%)	20.0%	14.8%	18.7%	17.7%	9.4%
Share of added value in the manufacture industry								
1981	100%	72.2%	11.2% (10.6%)	3.3%	3.1%	3.9%	3.5%	2.7%
1995	100%	63.2%	15.8% (14.9%)	6.5%	3.6%	5.0%	3.8%	2.1%
Amount of added value /gross product in the manufacture industry								
1981	23.2%	36.1%	33.3% (42.5%)	16.7%	13.1%	6.7%	6.7%	6.4%
1995	30.8%	37.6%	47.6% (55.0%)	42.2%	26.3%	13.4%	13.2%	7.5%

Source: Calculation from NESDB materials.

period from the 1980s to the first half of the 1990s, the industrialization had proceeded significantly in the said area.

(2) Positioning of provinces in the industrialization of the Eastern Seaboard

Of the three provinces forming the Eastern Seaboard, the Chon Buri province including Laem Chabang area and the Rayong province including Map Ta Phut area are of importance in the economic terms.

Table 2.-3 shows the comparison of gross provincial products (GPP) among the three provinces. Over the period from the 1980s to the first half of the 1990s, each of the three provinces achieved a high growth, and among others, the growth of Chong Buri and Rayong provinces were remarkable.

The Chon Buri province marked a high growth rate, especially during the period of high growth seen in whole Thailand in the first half of the 1990s. GPP per capita in 1995 is the highest among the three provinces, exceeding GRP per capita in the metropolitan area. The Rayong province exhibited a particularly high growth rate in the first half of the 1980s as well as in the first half of the 1990s as in the case of the Chon Buri province with marked mining production due to the development of natural gases. GPP per capita in 1995 was equivalent to approximately 80% of GRP of the metropolitan average. On the other hand, although the Chachoengsao province marked a high growth in 1980s, it experienced a slow growth in the 1990s,. The revenue per capita of the Chachoengsao province in 1995 was almost less than half of the Chon Buri province and Rayong province.

Looking at the share of the Eastern Seaboard Area in the 1995's real gross product, the Chon Buri province occupied the two-third of the total and the Rayong province the one-forth, showing that these two provinces has an economical predominance.

Comparison of the three provinces of the Eastern Seaboard Area in terms of the added value amount of manufacture and mining demonstrates that the Chon Buri province is a nucleus of the manufacturing industry in the same area (Table 2.-4). The Chon Buri province by itself occupies 10 % of the added value of the manufacture industry in the whole country of Thailand, and also marked a remarkably high growth over the high growth period from the last half of the 1980s to the first half of the 1990s.

The Rayong province, through the mining production by development of natural gas in the Galf

Table 2-3 1981 - 1995 Real GPP of the Three Provinces in the Eastern Seaboard Area (price as of 1988)

	Chon Buri	Chachoengsao	Rayong
Real GPP per capita			
1981	52,697	18,000	25,340
1995	157,924	62,693	122,886
Real growth rate par capita			
1981-86	4.5%	8.7%	16.0%
1986-91	7.0%	12.0%	9.2%
1991-95	14.4%	6.9%	10.4%
Real GPP			
1995 (in million bahts)	148,132	37,428	61,074
Ratio to the total of the three provinces	60.1%	15.2%	24.8%

Source: Calculation from NESDB material

Table 2-4 Percentage of Added Value in Manufacture and Mining Industries from 1981 to 1995 (price as of 1988)

	Chon Buri	Chachoengsao	Rayong
Share of added value in the manufacture industry (ratio to the national value)			
1981	9.2%	0.5%	0.9%
1995	11.3%	2.1%	1.5%
Growth rate of added value in the manufacture industry (Annual average)			
1981-86	3.2%	25.4%	4.5%
1986-91	11.7%	27.0%	23.8%
1991-95	24.9%	13.2%	17.3%
Share of added value in the mining industry (ratio to the national value)			
1981	1.3%	-*	8.0%
1995	0.4%	-*	41.7%
Growth rate of added value in the mining industry (Annual average)			
1981-86	2.2%	10.9%	63.3%
1986-91	14.2%	-18.2%	11.0%
1991-95	-4.3%	43.8%	6.9%
Added value of manufacture and mining industries / gross product			
1981	28.7%	54.7%	13.1%
1995	38.3%	65.7%	49.7%

Source: Established from NESDB material * negligible

of Thailand had achieved a high growth since the first half of the 1980s, slightly earlier than the implementation of the Eastern Seaboard Development Program. As will be discussed in the ensuing chapters, the said province, even though its share in the added value of the nationwide manufacture industry is small, is playing an important role in the Thai economy as a nucleus of the petrochemical industry, because of the development of petrochemical complexes in Map Ta Phut area where natural gases are landed.

(3) Accumulation of petrochemical industries centered on in the Map Ta Phut area

In Thailand before the implementation of the Eastern Seaboard Development Program, the domestic production of synthetic resins, as representative petrochemical product, gradually started from the last half of the 1970s, depending on importation of the all raw materials. This is the first time in Thailand that, through development of Map Ta Phut area by the Eastern Seaboard Development Program, petrochemical complexes were developed integrating systematically the upstream sector producing ethylene and propylene as basic raw materials by the use of domestic raw material (natural gas) and the downstream for producing synthetic resins as final materials.

The first phase national petrochemical complex (NPC-1) using natural gas as raw material started its construction on the initiative of Thai Government in Map Ta Phut Industrial Complex in 1986 and entered into operation in 1989. Furthermore, the second phase national petrochemical complex (NPC -2), using imported naphtha as raw material was established in Map Ta Phut Industrial Complex as in the case of the

Table 2-5 Production and import of petrochemical products in Thailand

(unit: thousand tons/year)

		1985	1991	1997
Basic law material				
Ethylene	Demand	15	320	1,018
	Domestic prod.	0	230	978
	Net import	15	90	40
Propylene	Demand	0	190	649
	Domestic prod.	0	70	597
	Net import	0	120	52
Paraxylene	Demand	0	0	245
	Domestic prod.	0	0	256
	Net import	0	0	-11
Benzene	Demand	0	0	226
	Domestic prod.	0	0	252
	Net import	0	0	-26
Final material				
Polyethylene	Demand	82	305	647
	Domestic prod.	14	257	764
	Net import	69	49	-117
Vinyl chloride resin	Demand	65	191	413
	Domestic prod.	54	135	484
	Net import	11	56	-71
Polypropylene	Demand	73	155	426
	Domestic prod.	0	170	588
	Net import	73	-15	-162
Polystyrene	Demand	14	97	193
	Domestic prod.	11	76	241
	Net import	3	21	-48

Source: "Petrochemical Industries in Asia", 1993 and 1999 versions, Petrochemical Tsushin Sha

first one, and started operation during 1995 and 1997. In addition, a petrochemical complex was constructed in Map Ta Phut Industrial Complex and another one in the Rayong City by the group of private enterprises after 1994 when participation of new enterprises in the petrochemical industry was deregulated. Two industrial complexes (Eastern Industrial complex and Padaeng Industrial Estate) accommodating mainly trades of petrochemical downstream were constructed in the proximity of Map Ta Phut Industrial Complex At the moment of this evaluation as of November 1998, it was confirmed that the Ma Ta Phut Industrial Complex and the Rayong City accounted for the whole production capacity of olefin (ethylene and propylene) and aromatics (paraxylene and benzene) as basic raw material of petrochemical products, the whole production capacity of polyethylene and 80% or more of the capacity of vinyl chloride, as well as the whole capacity of polypropylene and more than 70% of the capacity of polystyrene in Thailand. From these facts, it is evident that the Eastern Seaboard Development Program spurred the formation of the first-rank petrochemical infrastructure in Thailand, around the Map Ta Phut Industrial Complex.

As a result of the petrochemical infrastructure being well equipped, as shown in 2.-5, most of the demand for the basic materials and final materials in Thai petrochemical can be supplied by domestic production. The petrochemical industry in Thailand, although having faced difficulties because of the economic crises since 1997 (at the time of the 1998's field survey), can be said to perform a significant development through the development of Map Ta Phut area as part of the Eastern Seaboard Development Program.

(4) Industrial accumulation in Laem Chabang area and inland district

Construction of Laem Chabang Industrial Estate was completed in 1991 using ODA Loan, and has continued functioning as an infrastructure affording industrial accumulation in Laem Chabang area. As of August 1999, 94 firms in the general industry zone and the export processing zone were currently operating in said industrial estate. Worth noting is the fact that MMC Sitipol Co., Ltd., (referred to as MMC), who is a local company of Mitsubishi Motors Corporation, decided to establish an assembling factory in Laem Chabang Industrial Estate in 1990 and more than 10 Japanese automobile parts manufacturers also installed factories there to supply parts to MMC, which lead to accumulation of automobile industries in the estate. In addition to this, the Siam Cement Group, one of the local leading companies, and Japanese firms formed a series of joint ventures in the estate to produce glass bulbs, picture tubes, assembling of color TV set/PC monitors and electronic devices. The Laem Chabang Industrial Estate mainly includes automobile assembly and productin of automobile parts, electric and electronic assembly and production of the parts.

Under the initial plan, the Laem Chabang Industrial Estate was designed to serve for export-oriented light industries, but in reality, many heavy industries for domestic market such as automobiles and electronic devices were installed. However, the Thai Government, although having initially publicized the location of light industries there, did not necessarily stick to the original policy of locating such specific trades only. As a result, the categories of industries participating in the Laem Chabang Industrial Estate reflect the high growth of Thai economy and the highly sophisticated industrial structure starting from the last half of the 1980s.

Before the development of infrastructures in Laem Chabang area such as the port and industrial estate, the high growth of Thai economy and the increase of direct investments have started, and under such circumstances, the location of plants in this area therefore gradually extended from the Bangkok metropolitan area to the Laem Chabang area. In Thailand, for example, accumulation of manufacturers for white appliances including air conditioners and refrigerators is remarkable in comparison with other countries in the east-south Asia. When new factories of this kind were located one after another in the last half of the 1980s, many of them decided to construct their factories along the trunk roads extending from Bangkok to the Eastern Seaboard Area, because these locations were provided with excellent access to both the existing Bangkok Port and the Laem Chabang Port which were then under construction. This kind of development pattern for location of factories demonstrates that the Eastern Seaboard Area was developed

as an extension of the Metropolitan economic area.

Since then, towards the mid-1990s, location of industrial estates was moved from the Laem Chabang area, facing the Gulf of Thailand to inland area, along with National Road No. 331. Representative industrial estates in the inland area are Chon Buri Industrial Estate (constructed in 1991) , Eastern Seaboard Industrial Estate (constructed in 1994), Amata City Rayong Industrial Estate (constructed in 1996), etc. These three estates were constructed by private developers jointly with IEAT, and they were designed to be managed under the control of IEAT.

Out of these industrial estates, the Eastern Seaboard Industrial Estate which accommodates the most numerous firms, accounts for 48 firms currently under operation, and 5 firms which are constructing their plants as of the November 1998's field survey for the post-evaluation. In the said industrial estate, are located a pickup truck assembling factory, a joint venture of Ford Motors and Matsuda as well as an automobile assembling factory of General Motors, including approximately 30 firms exclusively relating to automobile assembly and industry of automobile parts. Considering the presence of MMC in the Laem Chabang Industrial Estate and that of an automobile assembling factory of Toyota Motors in the Gate Way City Industrial Estate in Chachoengsao province which is situated when going up a little north along National Road No. 331, we can know that this area is a place accumulating automobile industries.

As discussed above, Laem Chabang area and its inland area have developed as a new industrial infrastructure for supplementing or substituting for the metropolitan area where factories are accumulated excessively.

2. IMPACT OF THE EASTERN SEABOARD DEVELOPMENT PROGRAM

As mentioned heretofore, the Eastern Seaboard Area has developed mainly around two areas; the one is the Map Ta Phut area whose development has been achieved as a petrochemical center and the other is the Laem Chabang and its inland area along National Road No. 331, developing as a core center receiving industries designed to substitute or supplement the metropolitan area.

The industrial development in these areas was enabled by increase of private sector's investments (installation of plants) including foreign investments in the area, however, the Eastern Seaboard Development Program by the Thai government supported by the ODA loan seems to have contributed to development of the Eastern Seaboard Area as priming water effects for these investments.

As part of the post-evaluation, in order to validate the impact of the Eastern Seaboard Development Program on investments of private sector, interview survey was implemented about the factories of 113 firms which are located in the Eastern Seaboard Area[7]. The factories to be interviewed were selected from

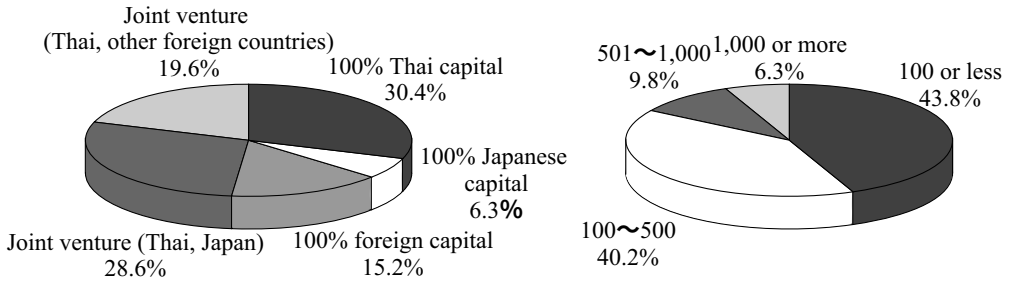
Table 2-6 Factories interviewed for the post-evaluation

	Number of Factories	Number of samples
Laem Chabang Industrial Estate	94	32
Chon Buri Industrial Estate	27	6
Map Ta Phut Industrial Complex	47	18
Eastern Industrial Estate	20	7
Eastern Seaboard Estate	46	20
Total of factories in industrial estate	213	83
Number of factories outside industrial estate	2,420	30

Source: Interview survey for the post-evaluation

7 This interview survey was entrusted to a private research institute in Bangkok, and implemented in cooperation with Japan International Cooperation Agency which was then conducting the post-evaluation of the development survey on the Laem Chabang Industrial Estate, at the same time of the field survey for this evaluation.

Fig.2-1 Composition of the capital composition of firms (factories) and size of employment (number of employees)



Source: Interview survey for the post-evaluation

those which are located in the southern Chon Buri province on which government investments are centered, mainly from the Laem Chabang area, and those in the western Rayong province, in the case of the latter, mainly from the Map Ta Phut area. Considering that most of the main factories in the same area are centered on the industrial estates under the management of IEAT, 70% of the factories to be interviewed were selected from those in five industrial estates accommodating particularly numerous factories, out of those under IEAT management[8]. The remaining about 30% were selected from the factories located in other places than the industrial estates of the Chon Buri and Rayong provinces (Table 2-6).

Of the number of the factories (firms) to be interviewed, approximately only 30% is by 100% local capital, and the remaining 70% are either 100% foreign capital (about 20%) or joint ventures by local and foreign capitals (about 50%). This composition suggests that direct investment from abroad played a major part in promoting the installation of plants in the Eastern Seaboard Area. Approximately 40% of the factories to be interviewed have employees of less than 100, and the employment of most factories is about 500 or less (Fig.2-1).

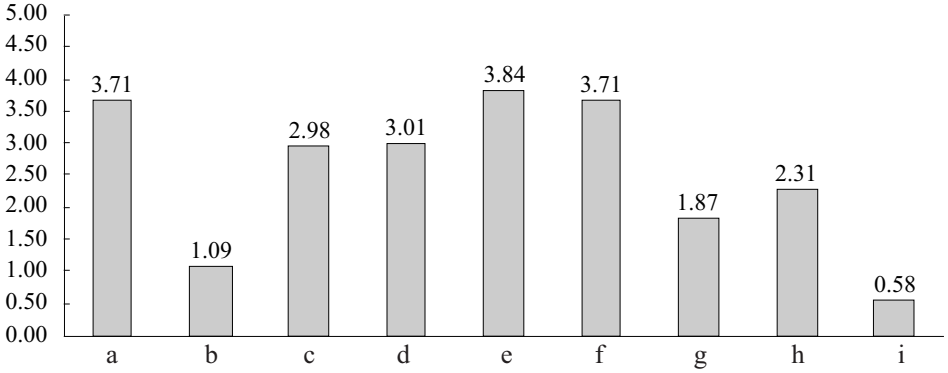
In order to examine the impact of public investments (for infrastructures) brought about by the Eastern Seaboard Development Program on the industrial development of the area thereof, each of the firms concerned was interviewed about the reason why they had decided to locate their plants in the Eastern Seaboard Area. The results of the interview are shown in Fig. 2-2, reflecting the response to the questions on the contribution of each factors to decide plant location (0 = no contribution to investment, 5= very important to invest; the figures in Fig.2-2 are average of points from all the firms having answered to interview).

According to the result, there are three particularly predominant factors which have contributed largely to promote the location of factories in the Eastern Seaboard Area, that is, incentives to investment by BOI (Thai Board of Investment), development of transport infrastructures such as roads and railways, and richness of public services such as electricity, water supply and communications.

The policy of BOI since the last half of the 1980s is that the whole country of Thailand is divided into three zones, and under such zoning, the incentives to the third zone, remote areas, was maximized to promote investment to that zone. At the moment of the field survey as of 1998, the Rayong province and the Laem Chabang Industrial Estate were classified as the third zone enabling to enjoy the maximum

8 Of the industrial estates under the IEAT which are located in Chon Buri province and Rayong province, Banpakon Industrial Estate also houses numerous plants. However the said Estate is not included in this survey, because it is situated in the northern Chong Buri province, comparatively close to the Bangkok Metropolitan area, but remote from the southern Chon Buri province where government projects relating the ODA-loaned Eastern Seaboard Development Program are concentrated. Furthermore, in Thailand, there are industrial complexes not under the IEAT, but a considerable number of factories among the major ones in the Eastern Seaboard Area are those in the industrial estates of IEAT, the IEAT industrial estates only are a subject of this survey.

Fig. 2-2 Factors making the factories interviewed (firms) decide to locate their factories in the Eastern Seaboard Area



a) BIO's incentive measure for investments
b) Investment incentive measure for export processing zone
c) Proximity to the port
d) Proximity to Bangkok
e) Transportation infrastructure (roads, railway, etc) being well equipped
f) Public services such as electricity, waterworks, communications etc being well equipped
g) Proximity to supplier-supporting industries
h) Proximity to consumers and customers
i) Proximity to parent companies

Source: Interview survey for the post-evaluation

incentive measure[9]. With this scheme, therefore, the incentive measures by BOI seem to have largely contributed to the installation of plants in the Eastern Seaboard Area. The third zone, however, includes all other provinces than the metropolitan area and its surrounding 16 provinces, therefore the reason why plant location was decided in the Eastern Seaboard cannot be sufficiently explained merely from the incentive measure by BOI.

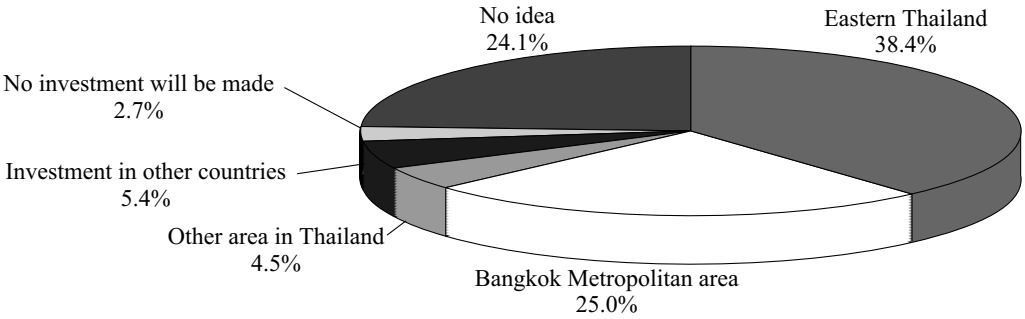
In tandem with the BOI's incentive, the important factors referred to are development of transport infrastructures such as roads and railways and that of public services such as electricity, water supply, communications, etc. Both these developments are resulted by the government's efforts to enhance public investments in the Eastern Seaboard Area via the Eastern Seaboard Development Program. The Eastern Seaboard Area is characterized remarkably by enhanced efforts of such public investments, in contrast of the other provinces which are favored by the maximized incentive measure for investment. The Eastern Seaboard Development Program by the Thai Government, including ODA loan projects, can be said to have produced priming water effect for promoting installation of factories in the Eastern Seaboard Area, given the support of ODA loans for transport infrastructures and public services.

The factors ranking next to these three reasons in the terms of the importance are proximity to Bangkok and to the port. According to many of the firms occupying the Eastern Seaboard Area, they consider that the said area is still insufficient in social service such as residential conditions and education of children. Many of the employees in middle or higher classes are employed in Bangkok, where they leave their families and return to weekends.

Considering the conditions above, it seems that proximity to the Bangkok metropolitan area, an economic activity core in Thailand, works favorably to enhance the convenience in locating factories in

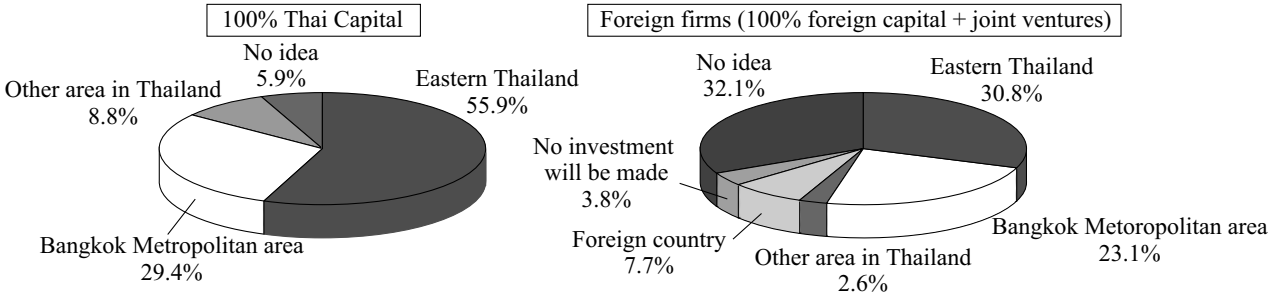
9 The first zone is composed 6 provinces forming the Bangkok metropolitan area, the second zone is 10 provinces including the Chon Buri province and Chachoengsao provinceÅAand the third zone includes other all provinces. The Chon Buri province is classified in the third zone, but the Laem Chabang Industrial Estate in said province belongs to the third zone. Until 1989, the Chon Buri province and Chachoengsao province had been classified in the third zone.

Fig.2-3 Location of plants if there had been no Eastern Seaboard Development Program



Source: Interview survey for the post-evaluation

Fig.2-4 Location of plants if there had not been no Eastern Seaboard Development Program (per capital composition)



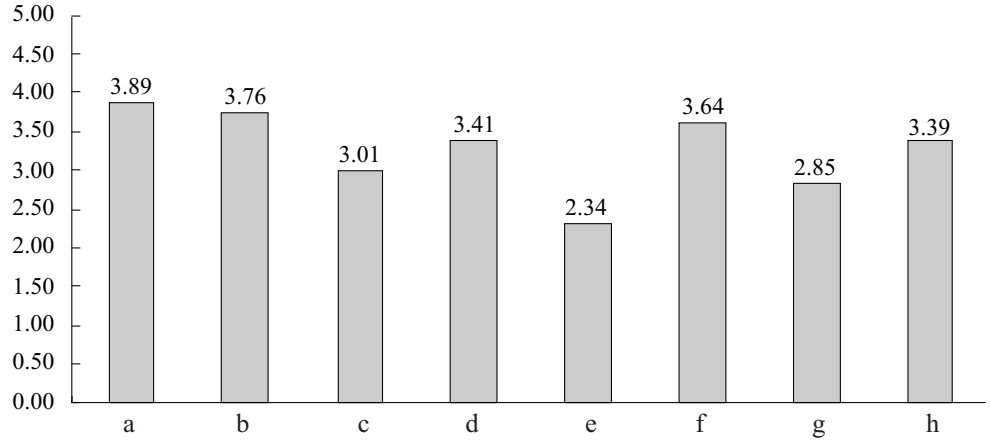
Source: Interview survey for the post-evaluation

the Eastern Seaboard Area. The port referred to here is Laem Chabang Port which was constructed with the support of ODA loan; and the proximity to the Laem Chabang deep sea commercial port ranking the first in Thailand is likely to contribute to the enhanced efficiency of cargo transortation for factories in the area. The presence of the Laem Chabang Commercial Port is made Eastern Seaboard Area more attractive in comparison with other areas.

Fig.2-3 demonstrates the results of answers from the interviewed plants (firms) when questioned where they might have located their plants, if there had not been the Eastern Seaboard Development Program. When those who answered "we have no idea" are excluded, those having answered "would have located their plant in the eastern Thailand ", and those having answered "would have located their plant in other places than the eastern Thailand " are approximately same in number. The fact that those having answered "would have located in the eastern Thailand " occupy just under 40% means that the Eastern Seaboard Area is attractive as a location of constructing new plants, because of being given the privilege of incentive measure of BOI for investment and of location merit such as proximity to Bangkok. However the other under 40% answered that they might have located in other areas if there had not been the Eastern Seaboard Development Program, and from this, it is possible to assume that location of plants in the Eastern Seaboard Area might be induced by the infrastructures and public services being well equipped thanks to the said Program.

As shown in Fig.2-4, among the answers which said "would have constructed their plants in the eastern Thailand even if there had not been the Eastern Seaboard Development Program", the share (30.8%) of foreign firms including joint ventures (about 70% of the interviewed firms) is only a half of the share (55.9%) of the 100% Thai capital firms (about 30% of the interviewed firms). From this, we can assume that the government investment for this project played the role of an incentive to promote installation of firms in the Eastern Seaboard Area, especially for foreign firms.

Fig.2-5 Reasons why interviewed foreign firms (100% foreign capital + joint ventures) decided to invest in Thailand



a) BIO's incentive measure for investments
b) Well equipped infrastructures
c) Well developed supporting industries
d) Low wage
e) Abundant resources
f) Prospective domestic market
g) Regional industrial core base for the firms
h) Political stability

Out of the other areas they listed as desirable location for construction of factories if there had not been the Eastern Seaboard Development Program, the place most frequently referred to is the Bangkok metropolitan area. Therefore, if the said Program were not implemented, industrial locations and economic activities would have been concentrated further in Bangkok. One of the major purposes of the Eastern Seaboard Development Program was to avoid the excessive concentration of economic activities in Bangkok. The results of the survey demonstrates that the said Program, through promoting new factories into the Eastern Seaboard Area, contributed largely to achievement of the purpose of avoiding excessive concentration of economic activities in Bangkok.

Of the foreign firms including joint ventures, less than 10% answered that they would have invested in other countries than Thailand, if there had not been the Eastern Seaboard Development Program. This result suggests that most foreign firms had decided to make investment in Thailand, independently from whether the Eastern Seaboard Development Program was implemented or not. Fig.2-5 indicates to what extent each of reason items worked as decision factor when a foreign firm decided to invest in Thailand (0 = no relation with investment decision, 5= very important; the figures in Fig.2-5 are the average of points from all the firms who responded). The positive factors in inducing the foreign firms to invest in Thailand are BOI's incentive measure for investment, generally well equipped infrastructures and presence of prospective domestic markets in view of the population and development stage achieved in Thailand.

After having decided to make investment in Thailand, these foreign firms seem to have selected, at the stage of examining specific areas for location of plants, the Eastern Seaboard Area as investment target which is being developed in infrastructures and public services by the development program thereof. In other words, the Eastern Seaboard Development Program by itself does not necessarily lead to increase of direct investments by making Thailand more effective as investment target for foreign investors, rather the Eastern Seaboard Area worked as a recipient for receiving direct investments when foreign investment has increased and Thai economy has grown, in tandem with government investments being implemented in good timing through the Eastern Seaboard Development Program. Around the last half of the 1980s when Thailand entered the period of high growth, concentration of industries in Bangkok met-

ropolitan area made it difficult to locate factories therein, and the insufficiently equipped infrastructure had been the subject of a live discussion as a bottle-neck hampering economic growth. Supposing that there had not been government investments based upon the Eastern Seaboard Development Program, because of the infrastructure for receiving of new plants being insufficiently equipped, the economic growth in Thailand would have been impeded and not realized as experienced over the period from the last half of the 1980s to the first half of 1990s. It can be said that the Eastern Seaboard Development Program have played a major role in supporting Thai high economic growth, by developing the infrastructure for new industries over the period when Thailand was suffering form shortage of industrial infrastructures during the period of a high growth in Thailand.

3. FACTORS FOR SUCCESS IN INDUSTRIAL DEVELOPMENT

(1) Development of heavy chemical industry in the Map Ta Phut area

The development of heavy chemical industry in the Map Ta Phut area was planned as a national project led by the Thai government, with success achieved mainly in the petrochemical industry. When, at the initial stage, the Thai government formulated a plan of heavy chemical industry utilizing the natural gas produced in the Eastern Seaboard Area, four sectors were involved in the national project, that is, chemical fertilizer, soda ash, deoxidized iron in addition to the petrochemical sector. (See the 5th Five-Year Plan formulated in 1981) Then, as a result of repeated studies of the economic performance of the individual projects and reviews reflecting the changes in the economic situations, the projects other than the petrochemical sector had been abandoned till the start of full implementation of the Eastern Seaboard Development Program (1998). Consequently, the petrochemical project alone was performed as a national plan.

The deoxidized iron project is to construct a pig iron making process by the direct deoxidizing method using natural gas as reducing agent. On the planning of an iron-making complex involving not only the reducing process but also steel making process with electric furnaces, and rolling process, a feasibility study was conducted by JICA. Yet, since this planning was estimated to be of poor economic performance, it was left as a mere idea, so almost no specific attempts were made by the Thai government toward project implementation.

The soda ash project is a joint-project with other ASEAN countries to manufacture soda, which is mainly used as a raw material of glass, by the use of rock salt produced in the northeastern district of Thailand and carbon dioxide gas separated from natural gas, planning to export the produced soda ash to the ASEAN countries. For this project too, a feasibility study was conducted under the support from the Asia Development Bank, and this feasibility study was reviewed through the development survey by JICA, then a project enterprise was established under the funds including that of the Thai government. However, as a result of repeated review of its economical feasibility, the project was formally abandoned in 1985.

Table 2-7 History of the national plans in connection with the heavy chemical industry in the Map Ta Phut area

Initial plan (1981)	At the time of ODA loan review for Map Ta Phut Industrial Port (1984)	A the time of ODA loan review for Map Ta Phut Industrial Complex (1985)	At the time of restart of ODA- loaned Map Ta Phut Industrial Port project (1988)
Petrochemical	Petrochemical	Petrochemical	Petrochemical
Chemical fertilizer	Chemical fertilizer	Chemical fertilizer	–
Soda ash	Soda ash	–	–
Deoxidized iron	–	–	–

Source: OECF's document for the 5th Five-Year Plan

The chemical fertilizer project is a plan to produce chemical fertilizers using methane separated from natural gas. The plants were planned to be constructed under the ODA loan. In the case of this project, after repeated review of its economic performance taking into account the changes in the international market, etc., postponement for a long period was decided in 1987, and consequently the ODA loan was not used[10].

As for the petrochemical project as mentioned earlier, the construction of the first phase petrochemical complex (NPC-1) of the upstream sector, i.e. government-private joint venture and downstream sector, i.e., private enterprises, was started in 1986, and its operation began in 1989, giving the momentum for construction of the heavy chemical industry center in the Map Ta Phut area.

Out of the initially planned four categories of projects, three were not implemented, as a result of the meticulous study by the Thai government of the economic performance of the individual projects, taking into full account the economic situations. The growth and expansion of particular industries such as the development of heavy chemical industry in the Map Ta Phut area tends to be noticeably influenced by the changes in the economic situations and the trends of each industry. So, the behavior of the Thai government who had studied the economic performance of each project with circumspection, can be evaluated to be appropriate. Judging from the fact that the petrochemical project was implemented with considerable success and expansion, the judgment of the Thai government about the heavy chemical industry development in the Map Ta Phut area, was by and large appropriate. The reduction of the heavy chemical industry development plan to a feasible size, on the basis of its minute review by the Thai government can be considered a key factor of the success of said industry in the Map Ta Phut area.

In the implementation of the petrochemical project (NPC-1), which is one of national projects, the upstream olefin production is operated by a joint venture of four private enterprises and the government (public corporation), and the downstream sectors are run by these four private enterprises. It seems that the involvement of private enterprises as executing agency in this way contributed to enhancement of the project efficiency and commercial success. In addition, since this is the first petrochemical center construction project in Thailand under the governmental regulation on participation, there were no domestic competitors, and when this project was in operation (1989), Thailand saw high economic growth accompanied by increased demand of petrochemical products. All these favorable conditions seem to have contributed to the success of this project.

(2) Industrial development of the Laem Chabang area and inland district

The export-oriented light industries (food, textile, etc.) were initially expected to be established in the Laem Chabang area and inland district. Yet the enterprises established there are mainly of heavy industries such as automotive assembly and parts, electric and electronic sectors, satisfying also the domestic demand. This may reflect the high growth of the Thai economy from the late 1980s to early 1990s, and the structural conversion of industries stemming from such growth. The success of the development in the Laem Chabang area and inland district is due to the fact that the development worked as a recipient for the expansion of heavy industries.

The period mentioned above is just after the stabilization of the Thai macroeconomics in the early 1980s under the finance for structural adjustment by the World Bank, etc. In this period, when the yen was strongly appreciated after the Plaza Accord 1985, the increased direct investment from Japan was one of the key contributors to the beginning of the high growth of Thai economy. Under that positive economic situation with economic activities heavily concentrated in the Bangkok metropolitan area, this period is also characterized by the insufficiency of recipients for accommodating new plants. It can be rightly said that the primary reason for the success of

10 Then, in the 1990s, through reconstruction of NFC's business, the fertilizer plant construction project restarted. The plant with the dedicated berth was constructed by the fund from private sectors, and its operation started from May 1998.

the industrial development in the Laem Chabang area and its inland district is the fact that a new industrial foundation was timely provided in such period, with construction of Laem Chabang Port and well equipped infrastructures including motorways.

In fact, prior to the creation of the industrial foundation by the Eastern Seaboard Development Program, the high growth of the Thai economy began, and direct investment and plant establishment increased; around 1990, the insufficient infrastructure was quite frequently referred to as a bottleneck impeding the expansion of Thailand. All the same, this fact can be also interpreted as follows; in the period when the necessity for a new recipient of industrial facilities was stressed with keen recognition of the poor infrastructure as a bottleneck, the investment for the industrial infrastructure was given rather timely under the Eastern Seaboard Development Program, though the completion of the project was behind the start of the high growth.

The increase of investment slightly preceded, as mentioned above, the construction of the infrastructures in the Laem Chabang area and inland district ; consequently, the location of factories gradually extended from the Bangkok metropolitan area to the Laem Chabang area. The second contributor to the industrial development in the Laem Chabang area and inland district is the construction of a new industrial foundation in a place not so far (about 100 km) from the Bangkok metropolitan area, which enabled the extension in the southeast direction of the metropolitan area.

(3) Relationship between donor agencies and Thai government

As one of the reasons for the success of heavy chemical development in the Map Ta Phut area, we noted above the reduction of the size to a feasible one, of the development plan of this type of industry through repeated review on the economic performance of individual projects. And as the key contributor to the success of the industrial development in the Laem Chabang area and inland district, we cited above the timely construction of the industrial foundation or infrastructures, synchronizing with the beginning of the high growth of Thai economy. What is essential is the fact that the size and timing of the large-scale investment were suitable, in the framework of the Eastern Seaboard Development Program, as proven by the project results. It seems that this fact was achieved by close discussion on the size and timing of said project between the Thai government and main donor agencies such as World Bank and Japan, and by the appropriate ownership of the Thai government in the final decision making.

(a) Discussion with the main donor agencies

Since the Eastern Seaboard Development Program was formulated in the beginning of the 1980s, the World Bank asked cautious study of this program and positively evaluated the review by the Thai government of the planning at the initial stage, and realistic scale reduction[11]. Before the formulation of the said Program, the World Bank had been participating in the feasibility study on the development of industries using natural gas from the Gulf of Thailand. But, for the first phase petrochemical industry project (NPC-1) which has seen a significant development later, it proposed to reduce the initially planned investment size to about a half, on the basis of the results of the survey conducted by the International Finance Corporation (IFC) of the World Bank group jointly with the Petrochemical Authority of Thailand (PTT). The Thai government, also taking due account of the results of this survey, implemented NPC-1 after repetitive review with circumspection. Such proposal by the World Bank may have given the impetus for the meticulous reviews by the Thai government on the heavy chemical industry development.

Furthermore, the World Bank expressed negative view regarding the planned construction of the two deep sea ports, Laem Chabang Commercial Port and Map Ta Phut Industrial Port[12]. The primary reason is the unstable macroeconomic situation in the early 1980s. The Thai economy in this period, though the GDP was still growing, experienced unstable

11 World Bank (1983). Thailand: Managing Public Resources for Structural Adjustment.
12 World bank (1983). Thailand: Growth with Stability. A Challenge for the Sixth Plan Period. Country Economic Report.

Table 2-8 Macroeconomic indexes of Thailand in the 1980s

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Actual GDP growth rate (%)	5	5.9	5.4	5.6	5.8	4.6	5.5	9.5	13.3	12.2	11.2
Financial-deficit-to-GDP ratio (%)	-5.1	-3.5	-6.5	-4	-3.5	-5.3	-4.3	-2.3	0.7	3.1	4.7
Current-account-balance-to-GDP ratio (%)	-6.4	-7.4	-2.7	-7.2	-5.1	-4	0.6	-0.7	-2.7	-3.5	-8.5
Export growth ratio (%)	18.4	-4	-11.9	2.1	-3.7	-10.4	6.2	9.8	8.4	1.1	2.8
Import growth ratio (%)	4.4	9.9	-4.3	-4.9	-2.1	-2.8	-3.1	11.6	6.8	5	5.6
Dead service ratio (%)	14.4	19.4	20.3	23.7	25.3	29.5	27.7	21.6	18.3	15.3	14.3
Foreign currency reserves (months)	1.7	1.7	1.7	1.6	1.8	2.2	2.8	2.9	3.1	3.9	4.1
Direct investment (million dollars)	225	197	176	313	328	241	318	728	1,321	2,828	1,981

Source: Institute of International Finance

macroeconomic conditions, namely, sluggish exportation, an ordinary loss and a financial deficit higher than up to the 1970s, a dead service ratio exceeding 20%, and foreign currency reserves less than the amount of 2 months of import (see Table 2.-8). Consequently, in 1982 and 1983, Thailand received a structural adjustment loan twice from the World Bank. In the circumstances, the World Bank pointed out that the new large-scale investment for the Eastern Seaboard Development Program should be postponed, giving priority to stabilization of macroeconomic aspects by limiting the foreign debt and fiscal expenditure.

The second reason suggested by the World Bank is that there is no such a high demand for cargo transport needing the two new ports. The view of the World Bank is as follows; regarding Laem Chabang Commercial Port, no considerable increase in container transport in Thailand is expected, and so the extension of Bangkok Port and utilization of Sattahip Port owned by the navy may suffice, and as for Map Ta Phut Industrial Port too, no cargo transport demand needing this port may not occur as a result of reduction in the heavy chemical project in the Map Ta Phut area, and so the use of Sattahip Port about 25 km west of Map Ta Phut may be sufficient for meeting the demand.

Considering such view of the World Bank, in November 1985 when the dead service ratio badly increased, the Thai government reviewed the large-scale projects under foreign debts, and decided temporal suspension of the new investment to the Laem Chabang and Map Ta Phut areas in the Eastern Seaboard Development Program. Yet in 1986, under the influence of the strong yen after the Plaza Accord in 1985, direct investment mainly from Japan increased, and the export recovered; these factors made a promising prospect of the Thai economy appear on the horizon. In response to such change in the situation, the Thai government decided in October 1986 the restart of the project of the Laem Chabang area including the industrial estate and new port for supporting the industrial activities, thus providing a proper recipient for the increasing direct investment. In addition, also in 1986, specific planning was formulated for the first phase petrochemical project in the Map Ta Phut, and its construction began in November 1986. In connection with this work, the Thai government decided to restart the construction project of the Map Ta Phut Industrial Complex in February 1987.

The restart of the project of Map Ta Phut Industrial Port was delayed most significantly, because its economic performance was reviewed several times, taking fully into account the strong yen and changes in the international market situation of fertilizers, as the main industry of the demand for cargo handling initially expected was fertilizer plants. Yet, since the Thai economy began to experience a robust growth, and so a high demand for petrochemical products was predicted, the planning to locate the second phase petrochemical project (NPC-2) in the Map Ta Phut

Industrial Complex came to the fore. In response to such development of petrochemical industry, the Thai government changed the port construction plan into that focusing upon petrochemical cargoes, and decided in February 1988 to restart the construction project of Map Ta Phut Industrial Port along with the implementation of NPC-2.

Due to the high economic growth in Thailand from the late 1980s, both in Laem Chabang Commercial Port and Map Ta Phut Industrial Port, a demand for cargo handling was created, which was a great deal larger than anticipated, contrary to the prediction of the World Bank. In fact these ports played an indispensable role for supporting the rapid economic growth of Thailand. In spite of the negative view of the World Bank regarding the two ports, the attitude of Japanese government and JBIC remained positive in aiding the construction of the two ports through ODA loan, supporting thereby the aggressive review by the Thai government on the necessity of these ports. It can be rightly said that such continuous supporting attitude contributed to the timely implementation of the project, when the Thai government finally decided the construction of the ports, sustaining the rapid economic growth of Thailand in this period.

(b) Ownership of the Thai government

The key factors leading to the success of the Eastern Seaboard Development Program were the minute review repeated several times by the Thai government on the size and timing of the government investment, and the review of the project including the reduction of its size. On such circumspect yet flexible behavior of the Thai government, the discussion between the government and donor agencies, namely, World Bank, Japan, etc. may have exerted favorable influence. In the reviews of the development projects, the Thai government, as the owner of the project, made his own judgment, as in the case of the Laem Chabang Commercial Port and Map Ta Phut Industrial Port, instead of accepting without investigation the proposals by the donor agencies. Not only for the project of the two ports but also for the fertilizer plant in the Map Ta Phut area, the Thai government made a judgment on its own initiative, that is, suspending the project implementation for a long time and abandoning the use of ODA loan for this project, based on the assessment of the changing economic situations. From this fact, the following lesson is obtained; for decision of the size and time, and implementation of a large-scale development project of a developing country, the discussion between the country and several donor agencies is effective, and, in the finial decision, the ownership of its government is important.

4. IMPACT UPON THE ENVIRONMENT : GOVERNMENTAL POLLUTION MEASURES IN THE MAP TA PHUT INDUSTRIAL COMPLEX

4.1 Development of Industrialization and Governmental Pollution Measures in the Eastern Seaboard Area

As a result of the implementation of the Eastern Seaboard Development Program, this area saw remarkable industrialization. As it is clearly known from the experience of Japan, the industrialization increases the potential of environmental pollution because of exhaust gas and water from plants. For minimizing the adverse impact on the environment, it is necessary to implement effective pollution measures at each of the plants, and it is essential for the relevant governmental entities to monitor the pollution and give guidance for specific anti-pollution measures to each plant.

For limiting the environmental impact of the Eastern Seaboard Development Program, the governmental pollution measures for the Map Ta Phut Industrial Complex may be the most important, since the Thai petrochemical industry is concentrated there. This post-evaluation focuses upon, therefore, the governmental pollution measures in this industrial complex.

The evaluation of the governmental pollution measures in the Map Ta Phut Industrial Complex was commissioned to a third party, that is, the Bureau of Environmental Protection of the Tokyo Metropolitan Government which has long-year experience in the governmental pollution measures. A field survey was conducted in November 1998 by experts of the

Research Institute for Environmental Protection under said Bureau, for evaluating the actual situation and governmental measures in connection with malodorousness, general atmosphere, water quality and treatment of industrial wastes. The survey results are addressed in detail in the third-party evaluation report ("Post-Evaluation Reports of ODA Projects" 1999). So, the present report discusses the outline of actions by the Thai government for pollution prevention in the Map Ta Phut Industrial Complex, mainly referring to the points not mentioned in the third-party evaluation report.

4.2 Governmental Pollution Measures in the Map Ta Phut Industrial Complex

(1) Organizations related to pollution measures in the Map Ta Phut Industrial Complex

Four organizations are involved in the pollution measures for the Map Ta Phut Industrial Complex, namely, Industrial Estates Authority of Thailand (IEAT), Office of Environment Policy & Planning (OEPP) and Pollution Control Department (PCD) under the Ministry of Science, Technology and Environment, and Department of Industrial Works (DIW). The IEAT assumes the first responsibility for management of the pollution measures in the industrial estates under its control, including the Map Ta Phut Industrial Complex. The OEPP is in charge of the review of environmental impact evaluation results of governmental projects and plant locations. The PCD is engaged in setting up the exhaust and environmental standard, monitoring and general pollution measures. The DIW has the authority to deliver the permit of construction and operation of plants. It is also responsible for supervising the observation of work hygiene criteria and pollution measures in plants. The organization first responsible for the pollution measures in the Map Ta Phut Industrial Complex is the IEAT. However, since this industrial complex is the primary petrochemical complex in this country, and so it has a vital significance in the pollution policy in Thailand, the four organizations jointly established a committee for pollution policy in this industrial complex, given the momentum by the occurrence of odor problem mentioned below.

(2) Actual situation of the Map Ta Phut Industrial Complex

Most of enterprises located in this complex use natural gas as raw material or fuel[13]. Since many plants are run by foreign capital firms or joint ventures of local capital with developed country capital, they use the state-of-the-art environment friendly technology. Because of these reasons, there occurs no such serious pollution as that with the Japanese petrochemical complexes in the 1960s.

Accordingly, the third-party evaluation points out that there is no great problem of the general atmosphere, and that the primary environmental problems may be the water pollution and odor. Of these problems, the water pollution has not been in a serious state, and so, as a future action, implementation of preventive measures is expected. The current primary environmental issue is the odor which has attracted attention in Thailand, in connection with complaints from residents around the complex made in the past two to three years.

(3) Malodorousness in the Map Ta Phut Industrial Complex

About the odor in the Map Ta Phut Industrial Complex, the local residents made complaints from around 1996. The typical trouble was the case of a middle school (Map Ta Phut Panpittyakarn School) located northeast of the complex, adjacent to the oil refinery located in the complex; in this school, the odor made it impossible to conduct educational operations[14]. This odor problem became an acute topic intensively debated in Thailand. Consequently, in addition to measures taken by the IEAT, a committee for working on the problem was established by the pollution-measures-related organizations including OEPP, PCD, DIW as well as IEAT, as mentioned above.

In 1998 this committee designated seven plants

13 The emission of SOx and NOx is remarkably reduced, compared with the use of petrol or coal as raw material or fuel.

14 Since the middle school is adjacent to the Map Ta Phut Industrial Complex, it was decided to move this school to another place (as of the time of field survey in November 1998).

in the Map Ta Phut Industrial Complex as sources of malodorousness, and the IEAT gave guidance to these plants for measures to be taken aiming at improvement of the odor nuisance. Observing the guidance, measures for reducing the odor were taken, for example, modification of the facility emitting the odor into a hermetic structure, resulting in a certain improvement verified by the field survey of the present evaluation in November 1998. The JBIC staff revisited the Map Ta Phut Industrial Complex in August 1999 for feedback of the post-evaluation results, and observed that there had been still complaints about the odor even after the beginning of 1999, and actions to solve this problem were being continued in August 1999. However, the IEAT reported that less complaints were made than in 1998. This may demonstrate a certain effect of countermeasures has been achieved. The third-party report suggests measures to be taken for more effective odor reduction. It is desirable that the IEAT and other environment-related organization of the Thai government should continue efforts for improving the odor status[15].

(4) Cooperation with local residents in odor countermeasures

For tackling the odor problem of the Map Ta Phut Industrial Complex, the IEAT, in addition to cooperation with the relevant organizations of the Thai central government, set up a monitoring committee involving local residents and representatives of middle schools complaining about the odor and staff of the Map Ta Phut City, to conduct at regular intervals joint survey of the odor status in the complex.

Implementation of odor countermeasures began on the occurrence of complaints from local residents who had suffered from the malodorousness. In the interview with local residents at the time of this field survey of the present evaluation, some of them complained about the failure to prevent the malodorousness, and about the fact that the countermeasures had not been implemented promptly. It is natural for the local residents to make such complaints, whose daily life has been noticeably affected. It could be said, however, implementation of perfect measures from the initial stage would be difficult, considering that Thailand experienced the operation of such a great scale petrochemical complex as the Map Ta Phut Complex for the first time, and that there were no legal regulations of odor at that time nor experience of enforcement of such regulations. Anyway, the IEAT has been making efforts to improve the status, providing opportunities of communication with suffering residents as much as possible. This commitment should be highly appreciated.

In the case of odor problems in the past in Japan, attempting to reach agreement among government, residents and plant owner, a long time was spent to seek solutions. Malodorousness countermeasures needed additional investment by the plant owner in many cases, and handling of individual complaint about the odor took much time, say, several years in some cases, with steady efforts toward improvement. In the case of the odor countermeasures for the Map Ta Phut Industrial Complex too, steady efforts have been exerted through close communication and IEAT, local residents and plants located there. Such attitude is expected to be continued in the future. The IEAT, in particular, is expected to be positively committed to implementation of pollution countermeasures, through sufficient communications with the residents by providing them with information in a way easy to understand, including the measurement data of environmental indexes of odor, atmosphere and water quality, and by frequent discussions with the residents.

(5) Evaluation

From the early stage of the implementation of the Eastern Seaboard Development Program, the Thai government was aware of the necessity of environmental considerations, stemming from industrialization, including pollution measures for the Map Ta Phut Industrial Complex. A odor problem occurred in this complex, and measures for improving the status have been taken mainly by the IEAT, which is the management agency of this complex, as mentioned earlier. The IEAT also conducted at regular

15 The third party report points out that, as a result of the countermeasures taken for the clearly defined odor sources in the Map Ta Phut Industrial Complex, the odor would become more minor. The report also suggests to quantify odors to distinguish the minor odor sources and to provide concrete criteria for setting the improvement target of odor for each plant.

intervals monitoring of the general atmosphere stipulated by the environmental impact evaluation of said complex, as well as monitoring of the water quality, etc. of the canal in the industrial estates and surrounding sea areas, to check the environmental pollution status. Furthermore, at the time of revisit to the site in August 1999, it was confirmed that improvements of monitoring (introduction of automatic measuring instruments, etc.[16]) were carried out, following the suggestions by the expert who conducted the third-party evaluation in November 1998. These implementations are highly appreciated for a developing country who has only quite recently experienced large-scale industrialization for the first time.

The OESB generally managing the Eastern Seaboard Development Program announced its policy to accentuate the environmental considerations and harmony with the local residents in the future development of the Eastern Seaboard Area (Phase II mentioned earlier). So, current pollution countermeasures and efforts for harmonization with the residents in the Map Ta Phut Industrial Complex are expected to be maintained.

5. IMPACT ON THE LOCAL MUNICIPALITY: CASE OF LAEM CHABANG

5.1 Increase in Flow of Population into the Eastern Seaboard Area and in Demand for Public Services in the Urban Zone

Tables 2-9 and 2-10 show the population increase rates of the different districts of Thailand and three provinces in the Eastern Seaboard Area. From the late 1980s to the early 1990s, when the industrialization in this area was accelerated, the annual population increase rate in this area is 2.5% (1986-1991) to 1.9% (1991-1996), which is higher than the nationwide average annual rate, that is, 1.5% (1986 to 1991) to 1.4% (1991-1996), and also higher compared with other districts. In the case of Chon Buri province, in particular, which led the way toward the industrialization of the Eastern Seaboard Area, the annual population increase ratio is 2.5% (1986-1991) to 2.6% (1991-1996), which is much higher than the nationwide average and that of the other districts, demonstrating the considerable flow-in of labor from other districts along with the industrialization.

The results of the interview mentioned earlier

Table 2-9 Average population increase rate of the different districts in Thailand (1981-1995)

	Nationwide	Metropolitan zone	Eastern district (ESB)	Central district	Western district	Northeastern district	Northern district	Southern district
1981-86	1.9%	2.9%	2.2% (1.5%)	1.1%	1.6%	1.7%	1.4%	2.5%
1986-91	1.5%	2.6%	2.1% (2.5%)	1.3%	0.8%	1.3%	1.1%	1.6%
1991-96	1.4%	0.6%	2.3% (1.9%)	0.7%	1.9%	1.4%	2.0%	1.0%

Source: Calculated by data from National Statistical Office (NSO)

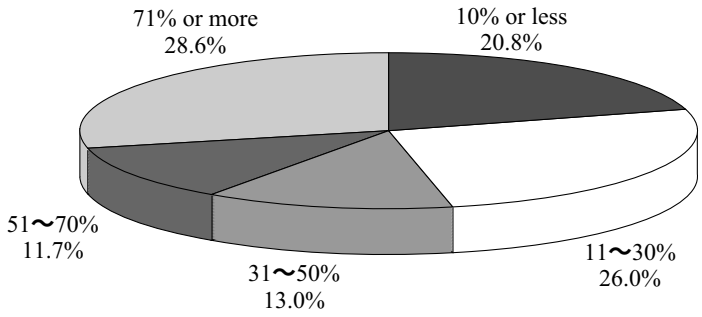
Table 2-10 Annual average population increase rate in the three provinces in the Eastern Seaboard Area (1981-1995)

	Chonburi	Rayong	Chachoengsao
1981-86	1.7%	2.3%	0.7%
1986-91	2.5%	3.0%	2.1%
1991-96	2.6%	0.8%	1.9%

Source: Calculated by data from National Statistical Office (NSO)

16 Introduced in 1999 under the support of the New Energy and Industrial Technology Development Organization (NEDO) of Japan.

Fig. 2-6 Ratio of the Personnel from the Eastern Seaboard Area to the Total of Employees in the Interviewed firms



Source: Post-evaluation interview research

with the plants located in Chonburi and Rayong provinces show that sixty percent of the interviewed firms answered 'the staff from the Eastern Seaboard Area accounts for less than a half of the employees' (Fig. 2-6). From this interview result too, it is know that much labor has flowed in from other districts.

As a result of population flow-in from the other districts, the demand was increased for improvement of the residential conditions, and public services such as education, medical services, and social welfare. Consequently, the local municipalities were required to well satisfy such increased demand.

For the present post-evaluation, the interview was implemented with the staff of the local municipality and local residents, selecting the case of Laem Chabang City which has seen accelerated-pace industrialization and urbanization, where Laem Chabang Commercial Port and Laem Chabang Industrial Estate are located, that is, the key projects of said program (November 1998).

5.2 Case of Laem Chabang City

(1) Laem Chabang City

Laem Chabang City corresponds to an administrative unit called Municipality[17]. The said city was once an area of 109.7 km^2 (including a sea area) that belonged to Ao Udom and Banglamung[18] Sanitary Districts, and later as a result of the large scale development through the Eastern Seaboard Development Program, was raised to a higher status of municipality(January, 1992), that is, current Laem Chabang City.

The Laem Chabang area, in tandem with the Map Ta Phut heavy chemical industrial district is rated as a general industrial core in this program. In this program, large development projects were concentrated in this area, such as Laem Chabang Commercial Port, Laem Chabang Industrial Estate, and public housing estate development by NHA. Of them, Laem Chabang Commercial Port and Laem Chabang Industrial Estate were developed with the support of ODA loan.

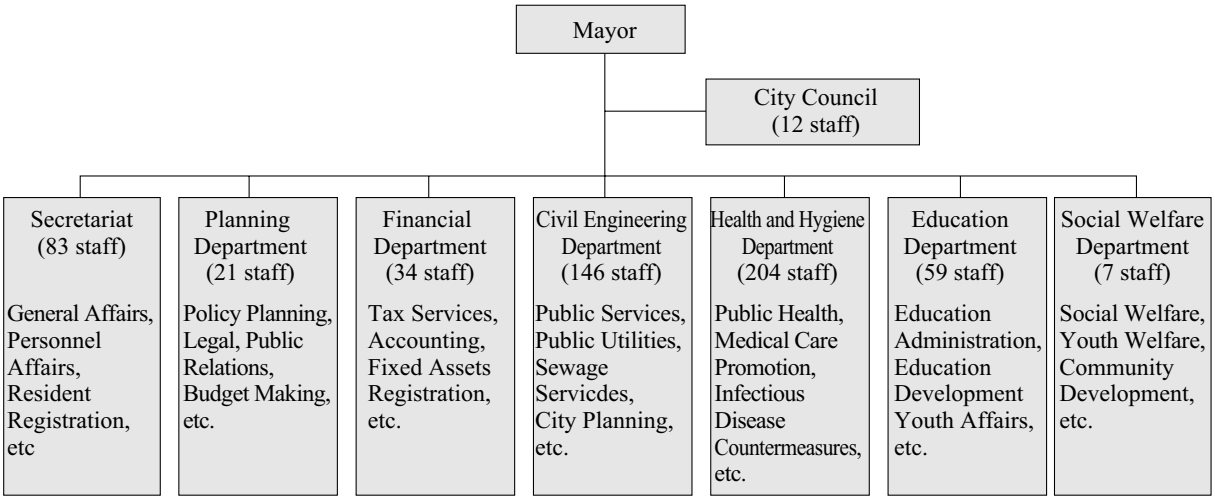
Principal economic activities of Laem Chabang City include cargo handling in the Laem Chabang Commercial Port and industrial production mainly in the Laem Chabang Industrial Estate. In this city, in addition to the industrial estate (industrial land: about 520 ha, number of tenant enterprises: about 90, number of employees: about 30,000), is located the Sahabhat Group Industrial Park (industrial land: about 125 ha, number of tenant enterprises: about 70, number of employees: about 20,000) developed and operated by a private business group, Sahabhat Group, and they generate large employment as predominant business entity in the municipality.

The number of municipal staff are 554 as of July, 1998, including 129 full-time, 83 contract, and 342

17 Municipality may be approximated to "City" in Japanese. This report uses a term "City"

18 The "Sanitary District" is one form of urban area authorities whose level of autonomy is lower than the municipality. Along with decentralization restructuring on the basis of the 1997 New Constitution, all of sanitary districts will be raised in grade to the status of a city.

Fig. 2-7 Organization chart of Laem Chabang City



Source: Laem Chabang City

short-term contract staffs. They offer administrative services through seven departments of secretariat, planning, financial, civil engineering, health and hygiene, education, and social welfare (Fig. 2-7). As will be described later, the registered population of Laem Chabang City is about 40,000, but it is estimated that there are additionally about 40,000 unregistered people. The population is concentrated mainly in four urban areas; Ao Udom area, which is old urban areas contiguous to the port and the Laem Chabang Industrial Estate, Ban Bang lamung area, urban areas in the neighborhood of Sahabhat Industrial Group and new towns housing NHA public housing estate.

At the time of the field survey for this evaluation in November 1998, there were 13 communities[19] in Laem Chabang City and each community has a council comprising nine members elected by residents. In areas where there is no community with a council, the social welfare department of the Laem Chabang City is proceeding with organization of communities. Eight more communities were being organized at the time of 1998 November's field survey for the post-evaluation.

During field survey of this post-evaluation, interview was made with the Mayor of Laem Chabang City and Directors of Planning, Financial, Civil Engineering, Health and Hygiene, Education, and Welfare (partially substituted by a representative because the director was absent). Visiting survey was conducted about four places (two villages remote from the urban area and two districts in urban area) out of 13 communities to have an interview with community council representatives elected from residents. The following description is based mainly on the result of these interviews.

(2) Impact of the Eastern Seaboard Development Program on Laem Chabang City

(a) Employment creation effect

Laem Chabang City staff members and community representatives interviewed during the field survey were unanimous in affirmative evaluation of this development program as it has accelerated industrial development and generated many employment opportunities for the city, contributing greatly to enhancement of the living standard. The Laem Chabang Industrial Estate development, which was one of core projects of the Eastern Seaboard Development Program, generated new employment for about 30,000.

19 Being organized in each village, these communities may be approximated to neighborhood associations or residents' association (Chonaikai or Jichikai in Japan). The staff of Laem Chabang denominated them as "communities", they are considered to be equivalent to Mu-Ban or the smallest administrative unit in Thailand. There are 65,944 Mu-Bans and many villages hold a council or committee. Seven to eleven members are selected through election of village people (Source: Facts About DOLA, 1994). Communities of Laem Chabang include those that should rather be called villages away from the urban area or residents' associations that are made up from a part of urban area.

This accounts for as many as about 3/4 of the registered population, and about 40% of the estimated total population including unregistered population of Laem Chabang City. This fact indicates how great the Program influenced positively the municipality's economic activities and employment.

(b) Population growth

The population of Laem Chabang City grew considerably mainly due to creation of new employment in the Laem Chabang Industrial Estate. Table 2.-11 shows comparison between the registered population of Laem Chabang City in 1993 and 1998. During this period of five years, the registered population increased by 5.1% on annual average, which exceeds greatly the annual average population growth rate of the Chon Buri Province (in which the Laem Chabang City is located), as shown in Table 2.-10. In addition, it is estimated that there are about 40,000 unregistered people, so that the total population including the unregistered portion of Laem Chabang City becomes about 80,000. The unregistered population is calculated mainly from the amount of wastes generated within this municipality and includes the persons who were employed in the municipality but living outside the municipality, as well as the persons that has flowed into the municipality seeking for jobs but not registered. Industrialization through the Eastern Seaboard Development Program brought about mass population influx, including the unregistered portion, into Laem Chabang City.

(c) Growth in demand for public services

Progress of industrialization and accompanying population growth in Laem Chabang City created increased demand for public services. Interviews with members of the Laem Chabang City staff demonstrates that they recognize that in spite of efforts to enrich the public services, they could not meet all of increasing demands. An example of the status quo of public service is shown below.

Table 2-11 Registered population of Laem Chabang City

Registered population in 1993	29,787
Registered population in 1998	38,186
Annual average population growth rate (1993 - 1998)	5.1%

Source: Chon Buri Province and Laem Chabang City

(i) Road development

Full-scale cargo handling in the Laem Chabang Commercial Port and growth of industrial production of the Laem Chabang Industrial Estate have lead to growing demand for the infrastructures for supporting economic activities.

For example, road transport has increased for cargo handled in the Port and for handling of industrial materials and products used and produced from the factories in the industrial estates. Some roads are narrow and congestion increases as there had been no need of coping with increasing traffic volume, before the implementation of the Eastern Seaboard Development Program. Besides, as old roads are not installed well-equipped drainage, road congestion is accelerated because of inundation in rainy seasons. Road surface is deteriorated severely because of traffic of a large number of heavy trucks.

Laem Chabang City has been making efforts in the repair and maintenance of roads, and their improvement is realized gradually. The Mayor and Civil Engineering Department, however, consider that the level which may offer sufficient safety in the road traffic is not yet achieved, because of budgetary limitations, etc.

(ii) Elementary education

In addition to demand for public services for economic activities in the course of industrialization, population growth has lead to increase in the demand for social services to the civil life, such as education, medical services, social welfare, etc.

Elementary education of the Laem Chabang City has been provided conventionally by means of several small-scale national and private elementary schools. Under population growth after the Program, two municipal elementary schools were constructed by utilizing the subsidy of MOI. The First Municipal Elementary School was opened in 1994 and the field survey in November 1998 showed that about 1200 pupils were studying there. The Second Municipal

Table 2-12 Number of Pupils per Teacher and per Schoolroom of Elementary Education

Number of pupils per teacher	National average (1998)	18
	Maximum per province (Rayong province, 1997)	25
	Laem Chabang City (1988)	40
Number of pupils per classroom	Maximum per province (Bangkok, 1997)	35
	Laem Chabang City (1998)	40

Source: National average and prefectural maximum were obtained from data of Thailand National Education Committee while data of Laem Chabang was obtained from interview with the Director Education of Laem Chabang City

Elementary School was opened in 1998 and has about 300 pupils at the time of field survey.

According to the interview with the Manager of Education Department in 1998, the quantitative level of elementary education in the city is lower than the national level (Table 2-12)[20]. For the elementary education of Thailand, the number of pupils per teacher is 18 on the national average (1998). The largest number by province was 25 pupils of Rayong (1997), but that of Laem Chabang in 1998 was about 40 that is far above that of Rayong[21]. In terms of the number of pupils per classroom in the elementary education, Laem Chabang shows about 40 pupils which is larger than 35 pupils of Bangkok that was the largest in 1997.

The quantitative level of elementary education in Laem Chabang City comes short of the national average of Thailand. But it must be rated high that with the number of pupils per teacher and per classroom being maintained at about 40, a high level is maintained, which is not necessarily low when compared with the past experience of Japan, without decreasing the percentage of school attendance significantly. The Municipal Education Department said that it will challenge quantitative increase and qualitative improvement with a target set at the desirable level of 25 pupils in Thailand.

Apart from elementary education, medical service and social welfare are also covered by the efforts of the city to provide the satisfactory services. Interview with representatives from residents showed appraisal of municipal efforts to a certain degree while requesting further development of services. Directors of Education, Health and Hygiene, and Social Welfare of the Municipality admitted that the services provided by the Municipality is not enough to meet demands associated with population growth, and recognized that the essential subject is improvement of municipal services in the future.

(iii) Waterworks

Certain public services are the responsibility of not the Municipality, but of government. For example, among social infrastructures supporting civil life, water service network is under control of the Provincial Waterworks Authority (PWA), a state-owned enterprise.

PWA estimates that the distribution rate of waterworks in Laem Chabang City is about 37% as of 1997 (Table 2-13). PWA made their own estimation that the population in the water supply district is about 100,000. Even based upon the municipal estimation of approximately 80,000 mentioned above, the distribution rate remains less than 50%. Households not covered by the PWA's water service network rely on well water, rainwater and water purchase from private water suppliers for drinking water. From the necessity of ensuring safer and cheaper drinking water, the Mayor and resident representatives pointed out that it is necessary to expand the PWA water supply

20 Percentage of school attendance in elementary education of Thailand is as high as 90.7% (according to the data of Thailand National Education Committee in 1998). Though the correct statistics for this matter of Laem Chabang City is not known, the Director of Education Department said in the interview that the city's level is as high as the national average.

21 In Thailand, it is said that the figure of 18 pupils per teacher in elementary education is too low (that is, the number of teaches are too many for the number of pupils). It is planned to increase the number of pupils per teacher in elementary education to 25 by the year 2002 to achieve efficient elementary education.

Table 2-13 Distribution Rate of Waterworks in Laem Chabang City (1997)

Population in the water supply district	100,400
Population served	37,590
Distribution rate of waterworks	37.4%

Sourc: PWA

network. It is said that Laem Chabang City is requesting such expansion to PWA.

The expansion work by the PWA's Laem Chabang Water Supply Office depends upon the policy of the PWA Headquarters in terms of the work budget and plan, and therefore this is not an issue which can be achieved through the efforts of Laem Chabang City only. The same applies to the power distribution grids, and expansion of such grids in the city is under control of the state-owned Provincial Electricity Authority (PEA).

(3) Evaluation of the efforts by Laem Chabang City

In order to meet growing demands for public services along with progress of industrialization and population growth in Laem Chabang City, said city has made efforts to strengthen the commitment. Considering that the city has experienced rapid development within a short period due to the Eastern Seaboard Development Program, it is no wonder that said city is unable to cope with all of the demands for public services. Laem Chabang City is making every effort to develop public services, and interview with resident representatives indicated they place a certain level of high evaluation on the effort. Such aggressive attitude of the city in tacking the issue can be highly appreciated.

Out of the demands for public services which are increasing along with rapid industrialization and population growth, those that remain to meet must be coped with in the near future. Development of municipal public services is an issue for the future.

5.3 Future Subjects

The conditions similar to the examples as the above in Laem Chabang City are also observed in other urban areas of the Eastern Seaboard. As industrialization proceeds, population influx occurs from other regions, resulting in population growth. Local governments are making efforts to meet growing demands for public services, but can not necessarily meet all of these demands because of restrictions in terms of the budget and organization capacity as in the case of Laem Chabang City.

The Mayor and department directors of Laem Chabang City pointed out that the municipal financial resources that are deficient relative to growing demands for public services is the largest obstacle for expansion and improvement of services. They also pointed out, as means to solve these problems, the necessity of increase in the financial resources unique to local government and promotion of financial transfer from the central government.

Whether or not Thai local finance and the mechanism of transferring finances to local authorities are appropriate is not discussed here, because they are not included in the scope of this post-evaluation. However in order that the public services of local governments may be well developed in the urban areas of the Eastern Seaboard with advanced industrialization and high growth of population, it is necessary to establish the system of local administration and finances which makes it possible for these local governments to take adequate measures in terms of powers and financial resources. At present, Thailand is undergoing decentralization. The conventional centralized local administration and financial systems are renovated to develop public services on the local level. These renovations, involving appropriate delegation of power to local authorities, securing of financial resources, and strengthening of the organization, are expected to enable the local governments to cope with the growing demands on public services through industrialization of the Eastern Seaboard.

CHAPTER 3 LESSONS LEARNED FROM THIS EVALUATION

1. WHAT LESSONS?

One of the purposes of post-evaluation operation at JBIC is to feed the result back into those involved in the project inside and outside JBIC so that the

knowledge learned will put to use for more effective and efficient undertaking of future ODA-financed development projects. The post-evaluation report sums up in general terms "lessons drawn from the post-evaluation"[22] in its final section, touching on issues that have to be taken into account or are worth noting in undertaking similar projects in the future. This report follows the same format and will describe lessons learned from the overall evaluation.

The feedback into the people outside JBIC-those involved in the Program in the Thai public and private sectors-took place in the workshop of August 1998, as mentioned in Introduction. The Thai participants expressed their willingness to address the issues fed back one by one if some improvements and additional measures were called for. Among them was the problem of unpleasant odors at the Map Ta Phut Industrial Complex Project. It is notable that the measures for this issue had been taken by the time the workshop was held in August 1998. The Thai participants also stated that they had taken valuable lessons from this evaluation with respect to the importance of environmental consideration and coordination with local authorities from the project planning stage and that such lessons would necessarily be reflected in the next development project.

2. LESSONS LEARNED FROM THIS EVALUATION

2.1 Adjusting the Initial Plan in Development Projects (with Mid-Point Evaluation/Evaluation at specified Milestones) and Importance of the Ownership of the Project Executor (Developing Country Government)

In the case of industrial or regional development projects of large scale, the project components, investment scale and timing need to be reviewed repeatedly and it is required to change the projects scope including reduction of projects scale and prolongation of implementation, in case of necessity. One of the effective measures for this review is that the donor agencies concerned and the government in a developing country keep a close dialog, while the ownership by the said government is also important.

The Eastern Seaboard Development Program is the first industrial and regional development plans in Thailand. Aids through ODA loan for the program accounted for about 10% of the approved total sum by the end of 1998. The factor for success of this program involving large-scale investment is as follows. Namely, the Thai Government repeatedly reviewed the content of the plan, the investment scale and timing until they changed the plan including downsizing and postponement according to its necessity. In consequence, the investment scale and timing could be controlled to the reasonable condition.

(i) The Laem Chabang area attained success in the extension of the metropolitan economic zone, thanks to its proximity to Bangkok Metropolitan Area. On the other hand, the Map Ta Phut area could become prosperous by utilizing the natural gas landing into this area. These are positive examples brought about by the study of regional development plans according to regional characteristics.

(ii) In spite of negative view on freight cargo demand, the investment of an appropriate scale could be made to both Laem Chabang and Map Ta Phut Ports. This was possible on the basis of proper understanding of the economic growth and increase in the freight cargo demand in Thailand. On the other hand, the heavy chemical industrial development in the Map Ta Phut area was made successful by downsizing the original concept to an appropriate scale. These are examples of thorough review on whether or not the investment scale is appropriate.

(iii) Success in the Laem Chabang area could be attributed to provision of the new industrial infrastructures in good timing along with growth of direct investment to Thailand. Success in the Map Ta Phut area was achieved by implementation of the first and sole

22 "Lessons" may often be taken to be reflections on problems that came up, and tend to stress negative aspects. In the post-evaluation report of JBIC, however, lessons have positive implications, as they focus on points that may provide a touchstone for future operations by generalizing specific issues.

petrochemical project at a time when the high economic growth rate brought about growing demand for petrochemical products. These are examples of appropriate reviews made on whether or not the investment timing is proper.

Development of industrial infrastructures through construction of ports and industrial estates and petrochemical projects based on natural gas were successful in the Eastern Seaboard. It should be born in mind, however, that the similar regional development is not always successful in regions with different characteristics or in a different timing. In order to prevent wasting of investments, repeated careful reviews on the content of the plan, the investment scale and timing are essential in the course of regional development plan involving large-scale public investment.

Dialogs with multiple donor agencies on the program scale and timing as well as the ownership of the Thai government seem to lead to careful review by the Thai government on the Eastern Seaboard Development Program.

Such repeated discussions among governments of developing countries and donor agencies are effective especially when one reviews carefully the content of industrial and regional development plans involving large public investments as well as the investment scale and timing.

2.2 Importance of Information Disclosure and Dialogues in Environmental Consideration

For implementing pollution countermeasures in development projects, the three parties, administration, habitants and factories, are requested to find solution in a steady manner by forming a consensus among them step by step. In particular, the authority in charge of anti-pollution is required to disclose the information to affected habitant (or possible to be affected) and to ask understanding of the people on the current situation of pollution and its countermeasures through repeated dialogs.

In the case of Map Ta Phut Industrial Complex, the first large petrochemical complex in Thailand, a problem of offensive odor occurred. For this matter, there have been no sufficient experience and no legal regulations. The Thai Government is proceeding with countermeasures mainly by the initiative of IEAT, management entity of the complex. Since offensive odor is a sensory pollution to cause residents to suffer discomfort and feeling of repulsion, dialog with surrounding residents was extremely important.

If an industrial complex is to be operated without causing credibility gap among surrounding residents, information such as monitoring results of general atmosphere and water quality, measures taken for specific pollution, etc. must be disclosed in a readily understandable manner to residents. To seek their understanding through unremitting dialogs is indispensable.

2.3 The Role of Local Authorities in Development Process and Support from JBIC

Regional development and industrialization of a large scale create population flow into the area concerned, resulting in the increase of the demand for public services of the urban areas. To respond to the demand for these public services the role of local governments in the urban area is important, and it is necessary to ensure financial resources and enhance the organization of local governments. The central government in the developing country and JBIC should establish a project framework leading to enhancement of local governments in parallel with region development projects, while providing necessary intellectual support.

As industrialization of the Eastern Seaboard advances, large population influx occurred from other areas into this area, promoting urbanization. In consequence, local governments are facing growing demand for public services, such as enrichment of residential conditions, education, and medical service. Though these governments are making efforts to cope with growing demand, they can not cope with all of demands because of limited budgetary and organizational capacities. Decentralization currently under way in Thailand is expected to involve appropriate delegation of powers to local authorities, securing of financial resources, and strengthening of the organization for the future.

In order to cope with demands for public services which are closely related to daily life of urban

population growing through urbanization, the local government attached close to the residents has an important role. The role of such government is also important, when talk about pollution measures described before, in view of coordination with affected residents and from the necessity to solve environmental problems closely related to the region. For example, in Japan, local governments have played an important role in environmental monitoring, guidance on improvement of plants, and individual claim handling, etc.

When a local government is to play an adequate role for provision of public services and pollution control, securing of financial resources and strengthening of the organizational capacity are indispensable. The government of a developing country must proceed with strengthening of local governments along with regional development projects. Since supporting of these local governments is the important development issue in the developing countries, JBIC is expected to make up a framework that leads to strengthening of their local governments while developing necessary intellectual supports.