



Title	A Study on the Repercussive Impact of the Employment Opportunities Arising from the Eastern Seaboard Development Program of Thailand
Author(s)	Mallikamari, Sunee; Yamamura, Etsuo; Ota, Mitsuru
Citation	Environmental science, Hokkaido University : journal of the Graduate School of Environmental Science, Hokkaido University, Sapporo, 13(1), 35-53
Issue Date	1990-12-20
Doc URL	http://hdl.handle.net/2115/37253
Type	bulletin (article)
File Information	13(1)_35-53.pdf



[Instructions for use](#)

Environ. Sci., Hokkaido University	13 (1)	35~53	June 1990
------------------------------------	--------	-------	-----------

A Study on the Repercussive Impact of the Employment Opportunities Arising from the Eastern Seaboard Development Program of Thailand

Sunee Mallikamarl

Faculty of Law, Chulalongkorn University, Bangkok Thailand

Etsuo Yamamura and Mitsuru Ota

Department of Regional Planning, Division of Environmental Planning,

Graduate School of Environmental Science, Hokkaido University

Sapporo, 060 Japan

Abstract

The regional employment opportunities arising from the industrial location in Eastern Seaboard Development Program which is a Large-scale industrial park are measured by the Interregional Input-Output Method.

The main results of the estimation of the direct and indirect repercussive employment opportunities of this study are as follows:-

(1) The total employment opportunities in the year after 1990 increased remarkably compared to those in the years before 1990 and 1990.

(2) The total regional employment opportunities in other regions are nearly equal to the ones in locational region. Among other regions besides Central region, Bangkok has the highest employment opportunity impact.

(3) The employment opportunities in every region in the year after 1990 increased over 100% of the year before 1990 and 1990.

(4) It is anticipated from the result of the study that by the year 2001 when the Eastern Seaboard Development Program has been completed, the total output and the number of employment opportunities will show a high increase which means the economy of the country will develop into that of Newly Industrialized Country. The ESDP is the first manifestation of industrial project which if successful in terms of economic progress, will be followed by other new industrial projects.

(5) To meet the policy of "economic progress with national harmony", it is necessary to continue the research of Regional Repercussive Pollution arising from the Eastern Seaboard Industrial Complex.

KEY WORDS: Repercussive employment opportunities, Interregional Input-Output Method, Large-scale industrial development. Eastern Seaboard Development Program, Map Ta Phut, Laem Chabang, National Economic and Social Development Plan, "economic progress with national harmony".

1. Introduction

Thailand (see Figure 1) is located in the middle of the Indochinese Peninsula. The total area is 513,115 square kilometers. The "Golden Axe" shape, provides over 2,614 kilometers of shorelines, facing both the Pacific and Indian Oceans with several hundred

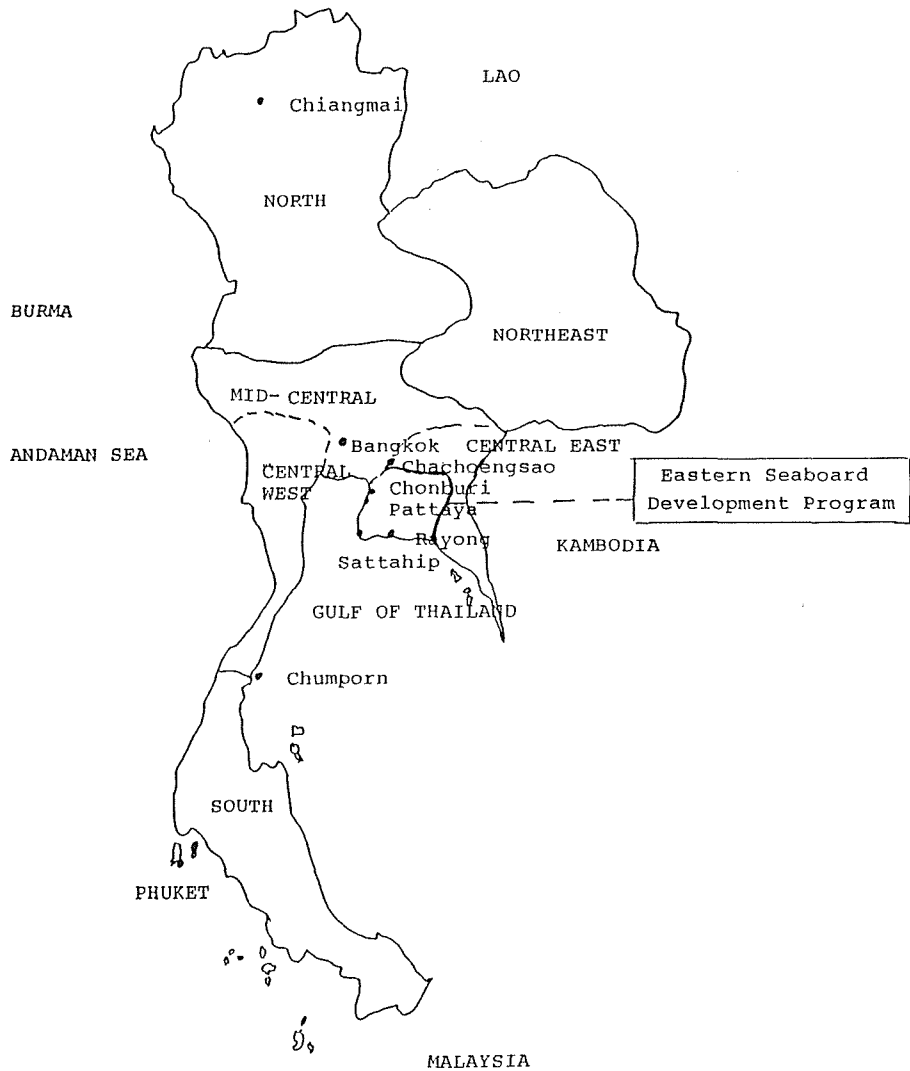


Figure. 1 Map of 4 regions of Thailand.

islands. The seacoast bordering the Gulf of Thailand is 1,660 kilometers long, and that bordering the Andaman Sea is 954 kilometers long. The land Boundary extends for some 3,400 kilometers, on the mainland and the peninsula.

Thailand is divided into 4 regions, composed of 73 Changwats (Provinces) (see Table 1); Central composed of 25 Provinces; Northeast composed of 12 Provinces; North composed of 17 Provinces and South composed of 14 Provinces.

The total population of the country in 1988 is 54,642,035 while that of Central region is 12,192,312; Northeast region is 19,254,245; North region is 10,622,609 and South region is 6,861,090. Bangkok is the capital city of Thailand with a total population of 5,716,779.

Looking back into the past, all the great industrialized countries once were agricul-

Table 1 The Classification of 4 Regions of Thailand.

Regions	Changwat (Provinces) (73Changwats)
Central (25)	Mid – Central – Bangkok Nontaburi, Patumtani, Ayuthya, Saraburi, Lopburi, Singburi, Angthong, Chainat. Central East – Chonburi, Rayong, Chachoengsao, Chantaburi, Trat, Nakornnayok, Prajinburi, Samut – Prakarn. Central West – supanburi, Nakornpatom, Rajaburi, Petchaburi, Prachuabkirikan, Kanjanaburi, samut – songkrom, Samut – Sakorn.
Northeast (17)	Karasin, Khonkaen, Chaipoom, Nakornpanom, Burirum, Nakornrajsrima, Mahasarakam, Mukdaharn, Yasothorn, Roied, Loey, Srisaket, sakolnakorn, Surin, Hongkai, Udonthani, Ubonrajatiani.
North (17)	Nakornsawan, Kampangetch, Pak, Pitsanulok, Prae Petchaboon, Nan, Lampang, Lamphoon, Sukhothai, Utaradit, Uthai tani, Payao, Pichit, Chiangmai, Chiangrai, Maehongsorn.
South (14)	Chumporn, Krabi, Trang, Songkhla, Satoen, Yala, Naratiwas, Pattani, Pangnga, Nakornsritamaraj, Patalung, Phuket, Ranong, Surajtani.

tural countries, this includes the United Kingdom, Germany, Japan, Taiwan etc. Agriculture alone could not improve the economy of the country, therefore, such countries attempted to develop their economic systems from the agricultural system to agro-industrial system and finally to a fully developed industrial economic system.

Thailand's economic situation is not much different from the economic situations of those countries as she is an agricultural country earning income from agriculture. 80% of the population engage in agricultural activities. This has put Thailand in a state of poverty with heavy foreign debts. Eventually, the government realized that agriculture alone would not eradicate poverty. Therefore, since the 4th National Economic and Social Development Plan, the agro-industrial economic policy was included in the development plans that followed. Such policies improved the country's economy and the 6th National Economic and Social Development Plan is aiming at developing the country's economy to be that of a Newly Industrialized Country (NIC). It is anticipated that as a result factories for new industries will be set up which will help improve the country's economy.

It should be stated here that as previously Thailand did not have a national development plan, the national development policy and trend had to depend on the stability of the governments, which changed constantly. It was not until 1961 when the trend was set up to develop the country according to a defined National Economic and Social Development Plan that the National Economic and Social Development Board undertook the duty to define the plan. The first Plan was formed in 1961. This plan defined a six-year development plan from 1961–1966. However, the Plans which followed only covered a period of five years each. At present, we are in the period of the Sixth National Development Plan (1987

-1991).

Over the past twenty years the country started to develop in accordance with the Economic and Social Development Plan, the economy and the national income has expanded fourteen fold or over, from the economic base with a production value of 60,000 million baht in 1961 to 817,000 million baht in 1981. At the same time Thailand's per capita income increased eight fold from 22,000 baht in 1961 to 163,000 baht in 1982. In industry, during the past 20 years, investment has increased at a very high rate. There has been many new industries such as the electrical industry, electronics, oil refineries, automobile tyre, construction materials, garments, paper, iron, condensed milk, automobile parts, automobile assembly, and motorcycle assembly, including wood industry, furniture, ornaments and jewelry etc. The output of industry increased from 13% of the gross national products in 1960 to 21.1% in 1982. In comparison, agriculture attained 24.8% in 1980. It was expected that industry production value would rise at the same rate as agriculture if certain problems regarding balance of trade, balance of payment were solved and the increase of industrial development efficiency as targetted could be met. It was believed that the Thai economic situation would develop towards a "Newly Industrialized" as set in the Plan's policy and measure.

In order to lead the nation to become a newly industrialized country, in the Fifth Plan a "new direction" revision was designed. This direction was totally different from those in previous Plans. It was a clear that a "policy plan" that would be flexible and could operate with special features.

The five year period in this Plan was therefore considered a sensitive period when industry started to have an equal role to agriculture in the Thai economic system. The policy aimed to distribute the progress and economic activities among the regional rural areas.

The target of industrial growth was 7.6% per year. The general industrial structure relied less on import, turning more to local labor and local raw material.

With the economic system development policy, industry started to be distributed more into the regional area. The expectation was to distribute the agricultural products and the raw material available in the country to the industrial activities. Therefore, the plan to set up industries in the regional area started; for example, the land development project in the three eastern provinces to become industrial towns.

A policy of Decentralization especially of location of economic activities has been established. Furthermore, the recent discovery and development of natural gas deposits in the Gulf of Thailand has created a strong impetus for establishment of heavy industries. Hence, in 1981 the Royal Thai Government announced the Eastern Seaboard Development Program (ESDP) to the public. In 1982, the National Policy Objective for the Development of the Eastern Seaboard was announced making it clear that it will be a long range and large-scale program planned for implementation in the next 20 years till the year 2001. The government will support the industrial-based facilities including provision of the essential infrastructure ie., ports, roads, railways, water supply system, electricity system and telecommunication system etc.

It should be considered that the success of this 20-year project will depend upon

appropriate policy and planning. To meet the policy of “environmental cum economic” and the “economic progress with national harmony”, the government should carefully study not only the economic development but also to prevent environmental pollution from manufacturing activities as well.

However, though the feasibility of the Eastern Seaboard Development Program has already been studied and now the project is in action, we still realize the need to study the repercussive direct and indirect impacts of the project. We hope that this study will serve a useful purpose in policy formulation and efforts to transform Thailand to a Newly Industrialized Country with economic success and social happiness as mentioned in the Fifth and Sixth National Plans.

In this study we will consider 3 impacts namely:-

- (1) Regional Repercussive Employment Opportunities.
- (2) Regional Repercussive Pollution.
- (3) Bangkok and the Eastern Seaboard Dynamic System Model.

Regarding this article, the study will concentrate only on the impact of Regional Repercussive Employment Opportunities. The other two impacts will follow after.

2. The Method of Measurement of the Regional Employment Opportunities

The impact of the development of the Large-scale Industrial Park consists of three effects i.e., the effective demand making, intermediate demand making and consumption demand making, therefore, the following conditions should be taken into consideration to measure the regional employment opportunities arising from the industrial locations:-

- (1) The necessity to measure the regional employment opportunities by industries.
- (2) The differences of the regional economic structures.
- (3) The direct repercussive effects and the indirect repercussive effects of the locational industries.
- (4) The indirect repercussive employment opportunities of the locational industries regions and the other regions.

The basic method of the measurement of the employment opportunities has been presented by Isard. W. and Miller. R. E.

Isard conducted an impact study on the direct and indirect repercussions of the locational steel industry in the Greater New York-Philadelphia industrial region.

Miller also conducted the same impact study on the location of aluminum industry in the Pacific Northwest.

However, in these studies, hardly no work have been made on the relation of the four conditions mentioned above. Therefore, the new detailed method for the measurement of the regional employment opportunities arising from the Large-scale Industrial Park by the Interregional Input-Output Method will be considered for the analysis.

The definition of the notations of the partitioned matrices are as follows:-

A : interregional input coefficients matrix by regions.

I : identity matrix.

S : matrix having the values of input from other industries to locational industry

along the main diagonal (the diagonal running upper from the left to the lower right) and zeros elsewhere.

D : matrix having the values of input of locational industry along the column and zeros elsewhere.

R : basic unit of employment opportunities.

N : number of regions.

M : number of industries.

X represents the matrix of the total repercussive employment opportunities and satisfies the following equations.

$$X = D * R + A * S * R + A^2 * S * R + \dots$$

$$= D * R + [I + A + \dots] * A * S * R$$

$$= D * R + [I - A]^{-1} * A * S * R$$

Where, $D * R$ is the direct repercussive employment opportunities and $[I - A]^{-1} * A * S * R$ is the indirect one.

Let $[I - A]^{-1} * A$, S, D and R be the following partitioned matrices.

$$[I - A]^{-1} * A = \begin{bmatrix} a_{11}^{II} & \dots & a_{1N}^{II} & \dots & a_{11}^{IM} & \dots & a_{1N}^{IM} \\ \vdots & & \vdots & & \vdots & & \vdots \\ a_{N1}^{II} & \dots & a_{NN}^{II} & \dots & a_{N1}^{IM} & \dots & a_{NN}^{IM} \\ \vdots & & \vdots & & \vdots & & \vdots \\ a_{11}^{MI} & \dots & a_{1N}^{MI} & \dots & a_{11}^{MM} & \dots & a_{1N}^{MM} \\ \vdots & & \vdots & & \vdots & & \vdots \\ a_{N1}^{MI} & \dots & a_{NN}^{MI} & \dots & a_{N1}^{MM} & \dots & a_{NN}^{MM} \end{bmatrix}$$

$$S = \begin{bmatrix} S_1^I & \dots & S_N^I & \dots & 0 \\ \vdots & & \vdots & & \vdots \\ 0 & \dots & 0 & \dots & S_1^M & \dots & S_N^M \end{bmatrix}$$

Where, $s_j^k = 0$ ($k = k_0, j = j_0$)

$$D = \begin{bmatrix} d_{11}^{II} & \dots & d_{1N}^{II} & \dots & d_{11}^{IM} & \dots & d_{1N}^{IM} \\ \vdots & & \vdots & & \vdots & & \vdots \\ d_{N1}^{II} & \dots & d_{NN}^{II} & \dots & d_{N1}^{IM} & \dots & d_{NN}^{IM} \\ \vdots & & \vdots & & \vdots & & \vdots \\ d_{11}^{MI} & \dots & d_{1N}^{MI} & \dots & d_{11}^{MM} & \dots & d_{1N}^{MM} \\ \vdots & & \vdots & & \vdots & & \vdots \\ d_{N1}^{MI} & \dots & d_{NN}^{MI} & \dots & d_{N1}^{MM} & \dots & d_{NN}^{MM} \end{bmatrix}$$

Where, the relation of matrices S and D is as follows:

$$\begin{aligned} d_{ij}^{k,k} &= S_j^k \quad (k = k_0, j = j_0) \\ d_{ij}^{k,k} &= 0 \quad \text{other} \quad \begin{pmatrix} i, j = 1, 2, \dots, N \\ k', k = 1, 2, \dots, N \end{pmatrix} \end{aligned}$$

The small k is the locational industry and j is the locational region.

Where, * multiplication represents the next operation.

$$x_i^{k'} = \sum_{k=1}^N d_{ij}^{k,k} r_i^{k'} + \sum_{k=1}^N S_i^{k'} \cdot a_{ij}^{k',k} \cdot r_i^{k'}$$

$$(i, j = 1, 2, \dots, M, k', k = 1, 2, \dots, N)$$

The measurements of regional repercussive employment opportunities arising from the industrial location in the Eastern Seaboard Development have been allocated the following method because the interregional Input-Output Table has not been drawn up in Thailand.

The repercussive employment opportunities have been allocated into 5 regions namely: Central, Bangkok, Northeast, North and South. The direct repercussive employment opportunities will be the impact experienced in Central region where the locational industries are located; and the indirect repercussive employment opportunities will be the impacts of the other regions based on the employee share by industries (except for the Central region).

3. The Establishment of the Employment Opportunities arising from the Industrial Location in the Eastern Seaboard Development Program

As mentioned earlier the development of the country will be based upon the Five-Year National Economic and Social Development Plan. The Fifth National Plan began in October 1981 and its basic concept for the development aims at "economic progress in national harmony". The six major national development objectives are:-

- (a) Restoration of the country's economy and finances.
- (b) Adjustment of the economic structure and improvement in production capabilities.
- (c) Development of the social structure and distribution of social services.
- (d) Poverty abolishment in backward areas.
- (e) Coordination of economic development together with national security management.
- (f) Reformation of the National Development, Administration System and deconcentration of land ownership.

As for the policy of "economic progress in national harmony", the main motivation has been the utilization of natural gas in the Gulf of Thailand and the example of the rapid economic growth of Japan since 1955 where the chemical and heavy industries such as steel and petrochemicals have played an important role. Therefore special areas have been designated for industrial development in order to correct regional imbalances in economic development and limit the expansion of Bangkok Metropolis. The Eastern Seaboard Industrial Complex in the said area which comprises industrial, urban and tourism development with the provision of development transportation facilities.

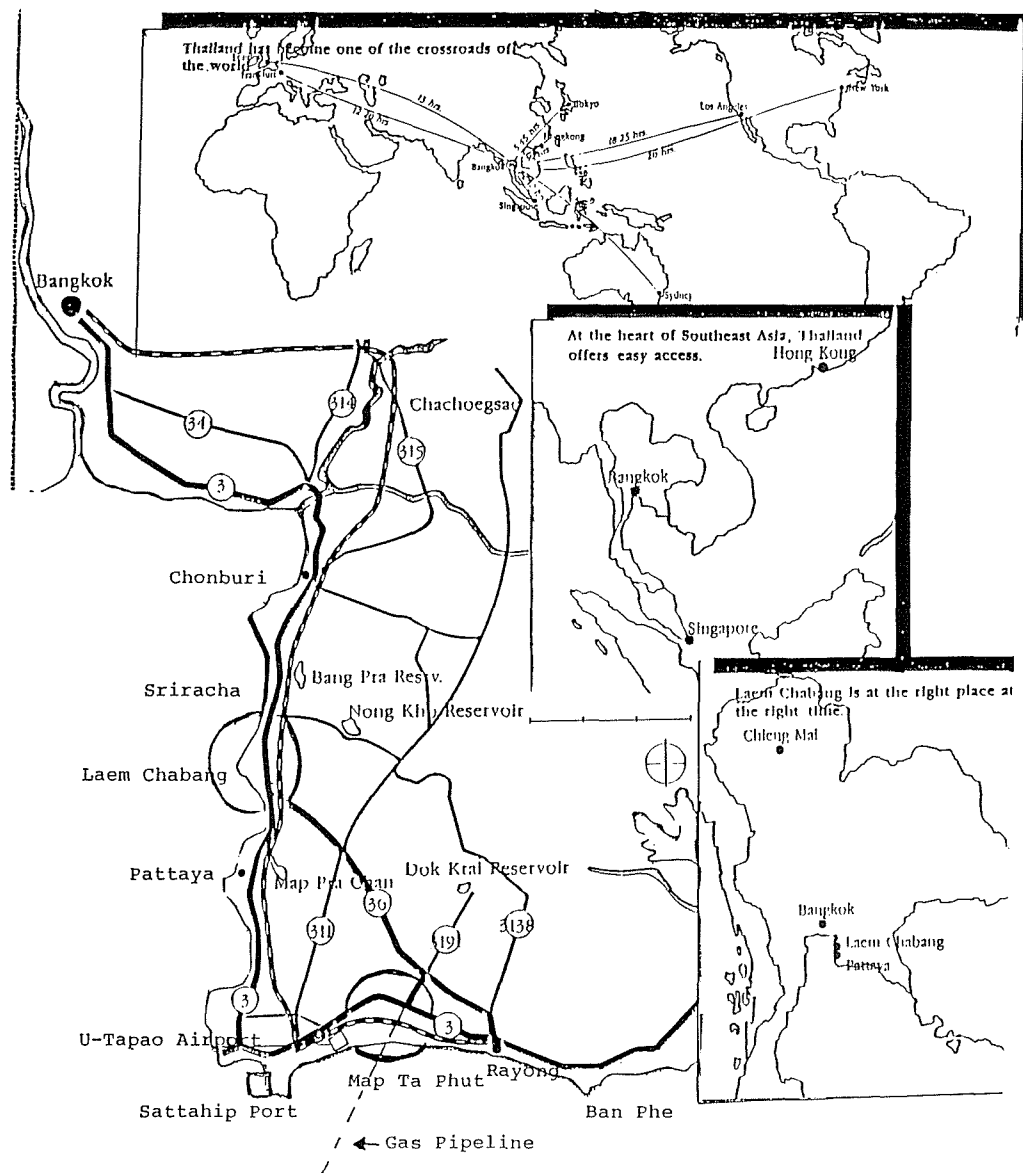


Figure. 2 Map of Eastern Seaboard Development Program
source : Industrial Estate of Thailand

Six zones on the Eastern Seaboard have been selected as development zones. Development targets for each are:

- (1) Map Ta Phut Zone Heavy and Petrochemical (polluting) industries.
- (2) Laem Chabang Zone Export processing and light industries.
- (3) Sattahip Zone Ship repair, ship building and transshipment industries.
- (4) Chonburi Zone Urban service industries.
- (5) Rayong Zone Agro-industry, especially fishery and rubber-related

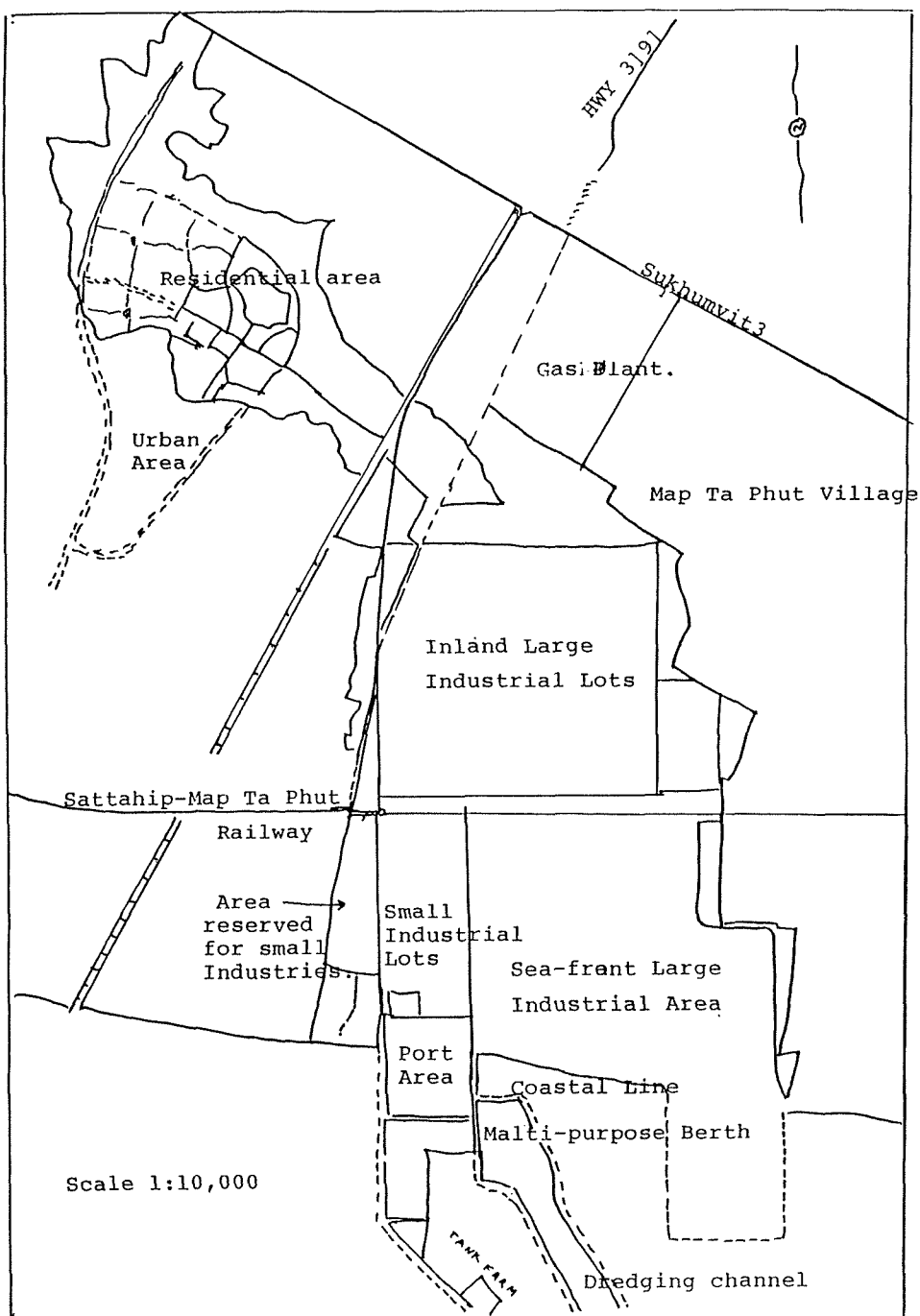


Figure. 3 Map of Map Ta Phut Industrial Estate.

source : Office of the National Economic and Social Development Board.

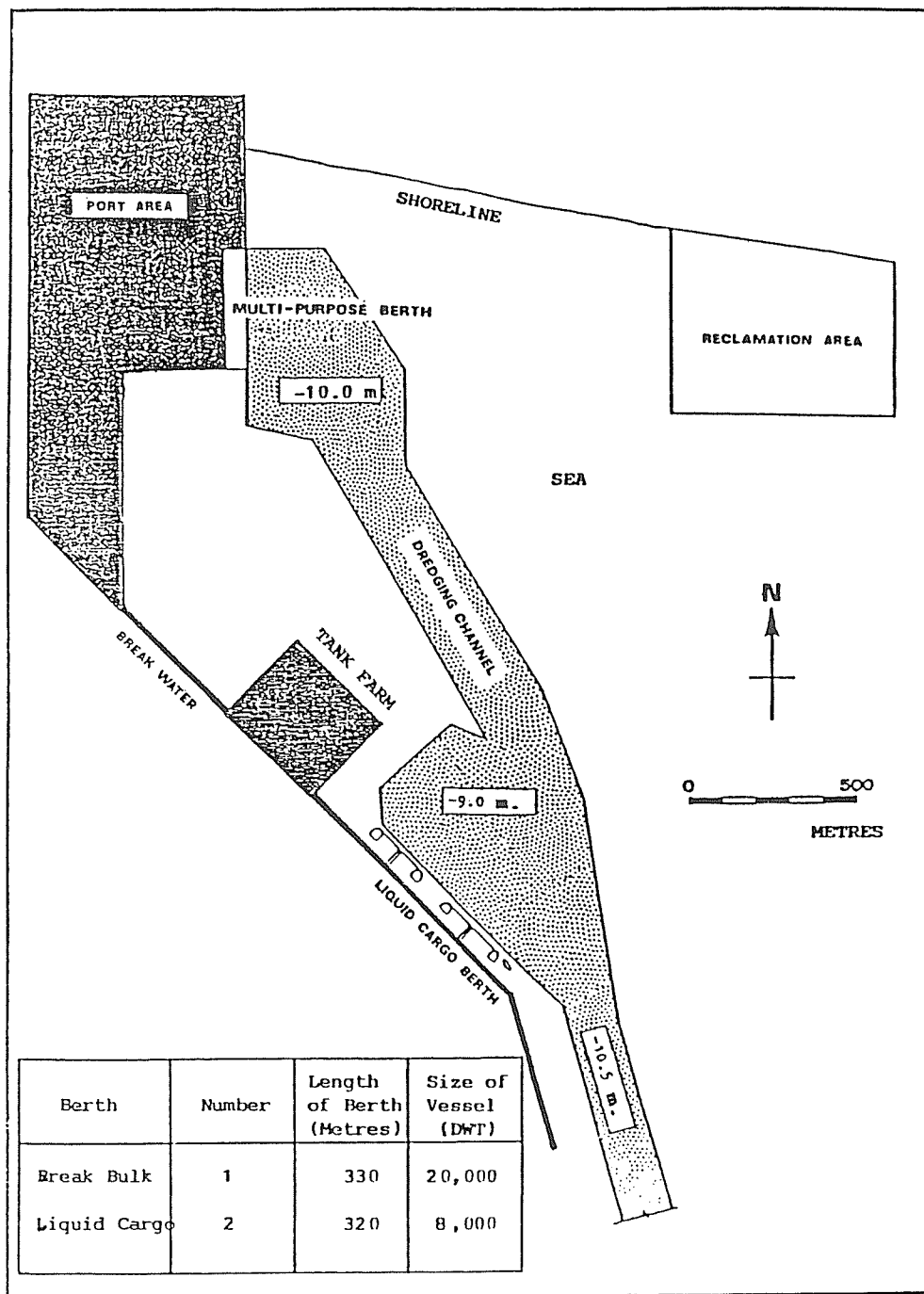


Figure.4 Map of Map Ta Phut Port.

source : Office of the National Economic and Social Development Board.

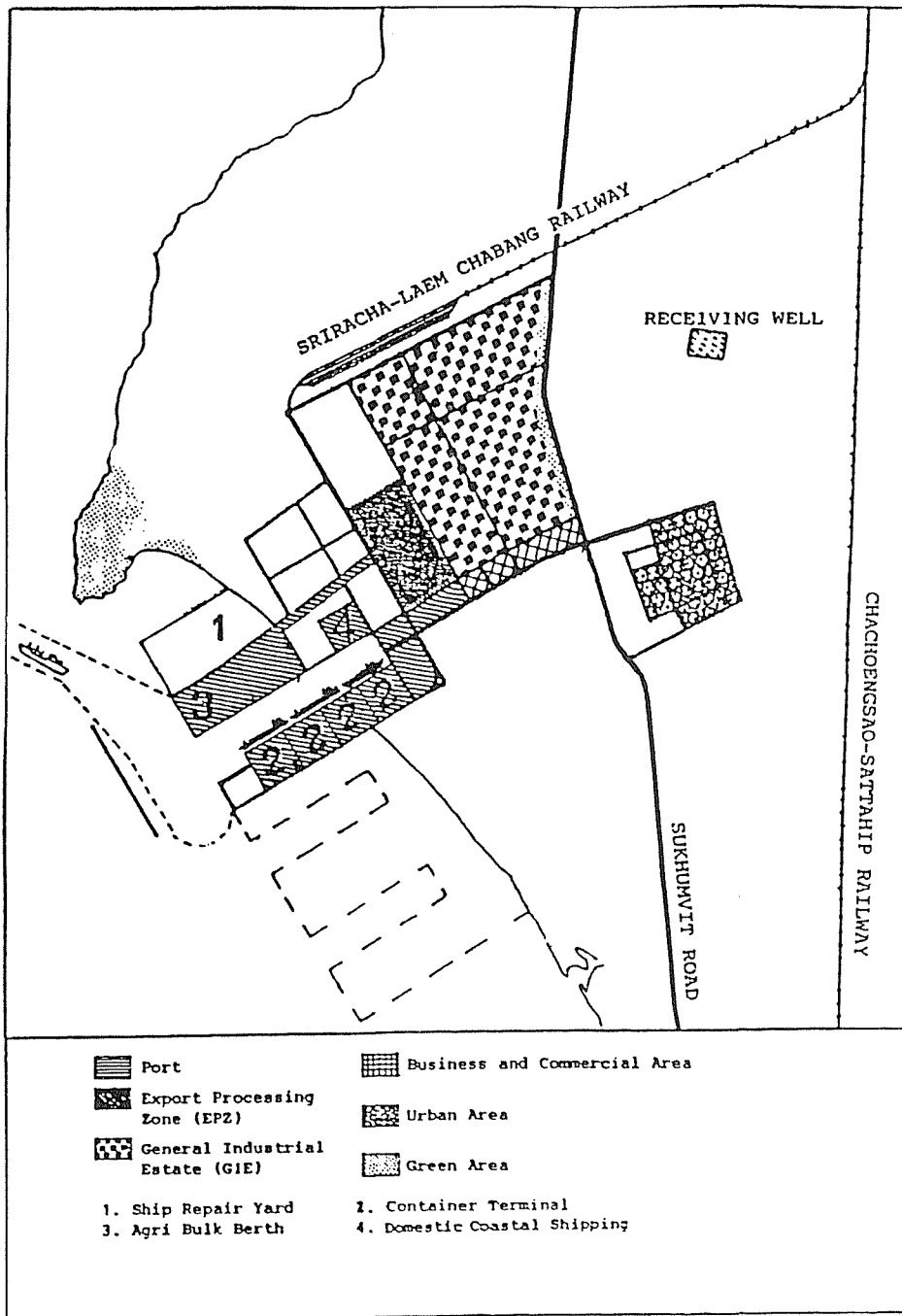


Figure. 5 Map of Laem Chabang Complex.

source : Office of the National Economic and Social Development Board.

Table 2 Classification of 21 Sectors.

Number.	Sectors.
1	Agriculture, Livestock, Forestry and Fishery.
2	Mining.
3	Food Processing, Beverage and Tobacco.
4	Textile.
5	Leather Products, Rubber and Rubber Products.
6	Wood Products.
7	Paper and Paper Products.
8	Non-Metal Products.
9	Light Industries.
10	Petroleum.
11	Basic Chemical.
12	Basic Metal.
13	Fabricated Metal.
14	Machinery.
15	Electrical Machinery.
16	Transport Equipment.
17	Electricity.
18	Construction.
19	Trade.
20	Transport and Communication.
21	Banking and Finance, Public Administration and Business Services.

Table 3 Classification of Sectors of ESDP

Number.	Sectors.	Locations.
3	Food, Beverage and Tobacco	Laem Chabang
4	Textile	Laem Chabang
5	Leather Products, Rubber and Rubber Products	Laem Chabang Map Ta Phut
8	Non-Metal Products	Laem Chabang
10	Petroleum	Laem Chabang Map Ta Phut
11	Basic Chemical	Laem Chabang Map Ta Phut
13	Fabricated Metal	Laem Chabang
15	Electrical Machinery	Laem Chabang
16	Transport Equipment	Laem Chabang

industries.

- (6) Chachoengsao Zone Agro-industry, especially livestock and meat-packing.

The major projects planned in the Eastern Seaboard are located in three of the seven Provinces in the East Region, namely Chonburi, Rayong and Chachoengsao (see Figure 2) an area of about 13,000 sq. kms. with a population of about 1.6 million. The ESDP is focussed on two major target areas, namely Map Ta Phut and Laem Chabang. The other related development areas are Pattaya and Sattahip:-

1. Map Ta Phut (see Figure 3 and 4)

The Map Ta Phut Development area is located in Rayong Province, south of Highway Route 3, between Amphoe (District) Ban Chang and Map Ta Phut (Amphoe Muang).

Table 4 The Outputs and Employees of the Locational Industries.

Year	Before 1990 and 1990		After 1990	
Sector	Outputs	Employees	Output	Employees
Map Ta Phut				
Leather, Rubber & Rubber Products	—	—	336,741.78	340
Petroleum	51,111,107.05	2,341	80,268,569.32	4,205
Basic Chemical	—	—	1,378,035.80	1,150
Total MTP	51,111,107.05	2,341	81,983,436.90	5,695
Laem Chabang				
Food, Beverage and Tobacco	—	—	350,764.21	373
Textile	181,045.44	576	181,045.44	576
Non—Metal Products	—	—	605,361.11	683
Leather, Rubber & Rubber Products	531,853.92	537	783,419.83	587
Petroleum	—	—	8,501,174.15	350
Basic Chemical	47,931.68	40	907,107.04	385
Fabricated Metal	—	—	71,483.04	120
Electric Machinery	1,139,846.40	1,400	2,300,047.20	2,825
Transport Equipment	—	—	2,782,368.45	3,358
Total LB	1,900,677.44	2,553	16,482,770.47	9,257
Total all	53,011,784.49	4,894	98,466,117.37	14,952

(Estimated output : million baht based on 1985 currency year).

Source : Office of the Eastern Seaboard Development Committee.

The Municipality of Rayong, about 15 kms eastward from Map Ta Phut town, is the leading commercial and social service center with a large hinterland in this province. The area covers the existing Map Ta Phut town and vast farmland with some scattered housing, schools and temples. The natural terrain in this area is nearly flat and gradually slopes towards the seashore with the altitude difference of about 40 m. The national Highway Route 3 runs through the area parallel to the coastal line of Rayong Bay to Sattahip and Rayong Municipality to the west and east direction respectively.

The aim of the development plan in Map Ta Phut is the establishment of the heavy and chemical industries. Due to the fact that a subaqueous gas pipeline carrying natural gas produced in the Gulf of Thailand comes ashore in this area, the dew point control plant for gas had already started operation and the construction of the gas separation plant has been decided upon by the government.

The Map Ta Phut Industrial Complex combines 2 phases

First Phase is the short-term development projects, the implementation has already been accomplished since the target year is 1987.

Second Phase is the long-term development projects and is a master plan with the target year up to the year 2001.

The Thai Government has planned for an industrial deep-sea port to be built adjacent

Table 5 The Repercussive Employment Opportunities by Industries, before 1990 and 1990, and after 1990.

Before 1990 and 1990						
Sector	Location	Central	Bangkok	Northeast	North	South
01	—	684	33	74	94	83
02	—	35,399	—	3,393	1,536	17,458
03	—	1	26	—	1	—
04	—	8	40	1	2	1
05	537	3	28	1	1	1
06	—	17	99	4	7	4
07	—	15	205	8	14	7
08	—	7	35	1	2	1
09	—	1	10	—	—	—
10	1,854	—	279	11	20	11
11	40	149	1,582	66	112	65
12	—	12	77	3	5	3
13	—	102	418	17	29	16
14	576	10	1,351	56	96	55
15	1,400	—	—	—	—	—
16	—	2	98	3	6	3
17	—	968	15,390	345	6,750	822
18	—	2	1	—	—	—
19	—	83	186	7	4	13
20	—	61	516	23	24	30
21	—	59	124	5	8	7
Total	4,407	41,990	20,498	4,018	8,711	18,580
After 1990						
01	—	6,525	319	714	900	797
02	—	61,517	—	5,933	2,686	30,635
03	333	7	113	3	6	3
04	—	28	13	4	8	4
05	999	99	661	27	45	26
06	—	96	558	23	39	22
07	—	145	1,830	76	130	74
08	683	40	191	6	12	6
09	—	2	28	—	1	—
10	4,545	—	1,726	72	122	71
11	1,862	315	3,432	144	244	141
12	—	161	970	40	69	40
13	120	442	1,798	74	127	72
14	576	42	5,405	228	386	223
15	2,825	95	156	6	11	6
16	3,358	3	218	7	13	7
17	—	1,712	27,225	610	11,678	1,455
18	—	12	6	—	—	—
19	—	292	655	27	171	46
20	—	139	1,170	52	54	69
21	—	128	269	11	18	15
Total	15,301	71,800	46,867	8,057	16,720	33,712

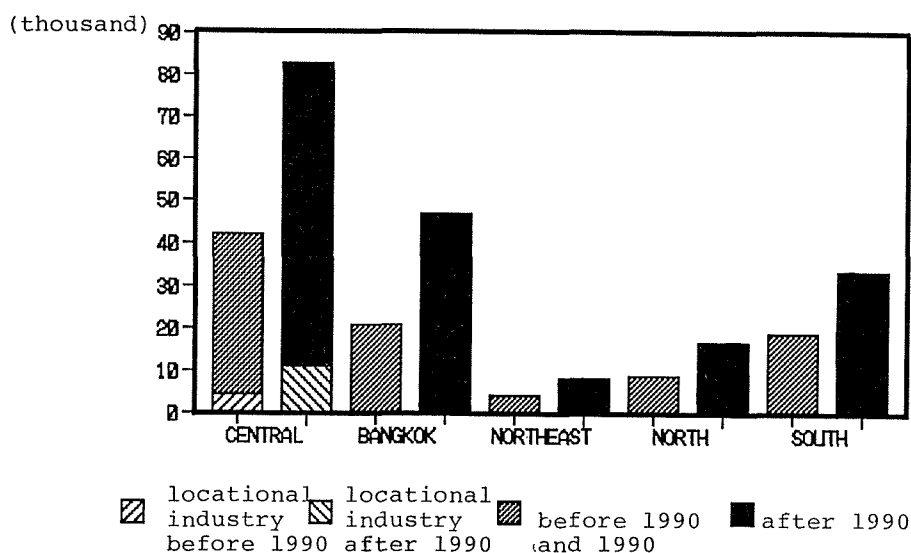


Figure. 6 The Locational and Regional Repercussive employment opportunities.

to an 870 ha industrial estate, presently under construction together with full supportive infrastructure and utilities.

2. Laem Chabang (see Figure 5)

The Laem Chabang Development area is situated in Chonburi Province, half way down the eastern gulf coast, only 125 kms., southeast of Bangkok and 15 kms. north of the international resort city of Pattaya. The Laem Chabang complex will have a commercial deep-sea port, an industrial estate and export processing zone, backed up by a completely new urban community and essential infrastructure. The planned industries will primarily consist of small-scale labor-intensive and non-pollution type.

3. The Related Development Areas.

Pattaya: According to the ESDP, Pattaya city, a seasonal tourist city, will be developed as a center of tourism and trade for the region. In 1978, the Royal Thai government passed the "Administration of Pattaya City Act. B. E. 2521 (1978)" giving the city special self governing powers, and power to raise money for operation, maintenance and development of its infrastructure and functions. These powers are not enjoyed by any other municipality in Thailand outside of Bangkok.

Development planned for Pattaya City includes the construction of the supporting infrastructure and services such as road network system, drainage and sewerage system.

Sattahip: The Sattahip area has two functioning infrastructure, namely, Sattahip deep-sea port and U-Tapao airport owned by the Royal Thai Navy. The U-Tapao is now operated as a joint military base and occasional commercial airport. These two facilities are the existing transportation facilities in the Eastern Seaboard region. Development planned for Sattahip will include the upgrading of the commercial port facilities.

The results of the study are as follows:

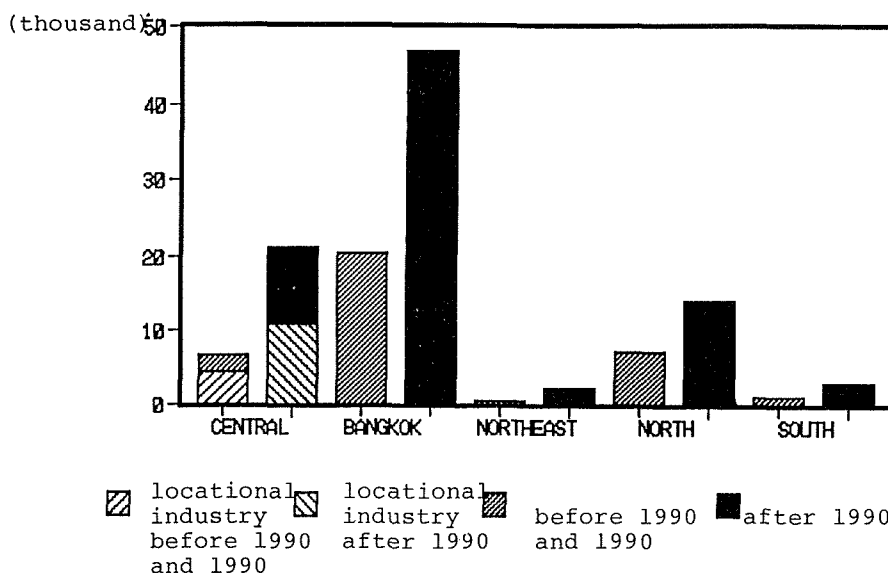


Figure. 7 The Locational and Regional Repercussive employment opportunities.

The Input-Output Table for the analysis of the Employment Opportunities arising from the Eastern Seaboard Development Program has been classified into 21 sectors (see Table 2) and the ESDP Sectors have been classified in Table 3 (see Table 3). The data for the Input-Output is based on the Statistics of Thailand in 1985.

From the fact presented in Figure 2 and Table 3, the Eastern Seaboard Industrial Complex will be completed with transportation facilities, ie., port, airport, railway and highways. The main location industries are both heavy industries in Map Ta Phut and light industries in Laem Chabang, which are the international competitive industries.

The outputs and employees of the locational industries in the year before 1990 and 1990, and in the year after 1990 are estimated in table 4 (see Table 4).

The total employment opportunities of the locational and regional repercussive levels are measured by the Interregional Input-Output Method.

The main results are as follows:-

(1) From the facts presented in Table 4, the total employment opportunities of the locational industries in the year after 1990 will increase remarkably compared to those in the years before 1990 and 1990.

(2) The Locational and Regional Repercussive Employment Opportunities are shown in Figure 6 and Table 5. From the facts presented in Figure 6 and Table 5, the sum of total employment opportunities in other regions are nearly equal to the ones in the locational region. The total employment opportunities in Bangkok is the highest compared with other regions besides location region, ie., Central region. This is due to the fact that Bangkok is the nearest city to the locational industrial complex and is the center of all facilities. South region is also the second highest level due to the remarkable sum total of output in mining

Table 6 The Regional Employment Opportunities by Industries before 1990 and 1990, and after 1990.

Before 1990 and 1990						
Sector	Location	Central	Bangkok	Northeast	North	South
01	—	684	33	74	94	83
03	—	1	26	—	1	—
04	—	8	40	1	2	1
05	537	3	28	1	1	1
06	—	17	99	4	7	4
07	—	15	205	8	14	7
08	—	7	35	1	2	1
09	—	1	10	—	—	—
10	1,854	—	279	11	20	11
11	40	149	1,582	66	112	65
12	—	12	77	3	5	3
13	—	102	418	17	29	16
14	576	10	1,351	56	96	55
15	1,400	—	—	—	—	—
16	—	2	98	3	6	3
17	—	968	15,390	345	6,750	822
18	—	2	1	—	—	—
19	—	83	186	7	48	13
20	—	61	516	23	24	30
21	—	59	124	5	8	7
Total	4,407	2,184	20,498	625	7,219	1,122
After 1990						
01	—	6,525	319	714	900	797
03	333	7	113	3	6	3
04	—	28	137	4	8	4
05	999	99	661	27	45	26
06	—	96	558	23	39	22
07	—	145	1,830	76	130	74
08	683	40	191	6	12	6
09	—	2	28	—	1	—
10	4,545	—	1,726	72	122	71
11	1,862	315	3,432	144	244	141
12	—	161	970	40	69	40
13	120	442	1,798	74	127	72
14	576	42	5,405	228	386	223
15	2,825	95	156	6	11	6
16	3,358	3	218	7	13	7
17	—	1,712	27,225	610	11,678	1,455
18	—	12	6	—	—	—
19	—	292	655	27	171	46
20	—	139	1,170	52	54	69
21	—	128	269	11	18	15
Total	15,301	10,283	46,867	2,124	14,034	3,077

of sector 2.

(3) The regional total employment opportunities by industries in the year after 1990 are shown in Table 5 and 6. In Table 5 the sum of locational employment opportunities in the year after 1990 increases over 300% of the year before 1990 and 1990. (It should be noticed that actually, at the time of the analysis there were some factories waiting for the approval of the government to be established and some were negotiating joint-venture investment). The remarkable increase of total employment opportunities in Central region in the year after 1990 is around 100% of the year before 1990 and 1990 (see Table 5). The repercussive employment opportunities in Central region is nearly equal to the total of other regions due to the fact that Central region is the location of industries to which the impact of locational industries has been included (see Figure 6). The sector 2 has the highest sum total of employment due to the fact that sector 2 includes natural gas. Bangkok region has the second highest repercussive employment opportunities, which is about 53.82% while other regions have 66.97%. Sector 17 has the highest sum total of employment due to the fact that sector 17 has electricity resources. There is no employment opportunities in sector 2 (see Table 6). This may be due to the indirect repercussive impact of the locational industries.

(4) The regional total employment opportunities by industries (where sector 2 is omitted) is seen in Figure 7 and Table 6. Bangkok region has the highest repercussive employment opportunities impact. It is nearly equal to the total for all the other regions including Central and locational regions.

4. Conclusion.

An attempt has been made to measure the regional employment opportunities arising from the industrial locations on a Large-scale Industrial Park. The Interregional Input-Output Method, has been used to estimate the direct and indirect repercussive employment opportunities arising from many industries located in the Eastern Seaboard Industrial complex.

The result of the research indicates that both direct and indirect repercussive employment opportunities in locational industries, and other regions as well show a remarkable increase especially in the Provinces of Chonburi and Rayong where the Eastern Seaboard Industrial Complex is located. It is anticipated that some of the manpower will migrate from other regions such as Northeast and some from other Provinces of Central region. Therefore the population in Chonburi Province and Rayong Province will rapidly increase. The employees who migrate from elsewhere will require such facilities as residential areas in the vicinity of the industrial complex. Also other social facilities such as school, hospital, entertainment areas etc., should be taken into consideration for the immediate policy and planning action.

It is noticeable that Bangkok is the region which has the highest indirect repercussive employment opportunities impact. This impact will contradict the policy of Decentralization of location of economic activities and the suppression of the growth of Bangkok. However, from the result of the research, it should be well planned how to control and

provide facilities for such increasing population in Bangkok due to migration from other regions.

It can be concluded that the Eastern Seaboard Development Program will meet the policy of "economic progress" but to confirm the policy of "national harmony" would require further research of the Regional Repercussive Pollution arising from the project of Eastern Seaboard Development Program.

Acknowledgements

This study has been supported by The Japan Society for the Promotion of Science (JSPS), Ronpaku Program, which the authors hereby acknowledge with thanks.

References

- 1) The Statistical Office of Thailand.: The Statistical Yearbook of Thailand No. 34 (1985-1986) and No. 35 (1987-1988).
- 2) The Statistical Office of Thailand.: Report of the Labour Force Survey Whole Kingdom (Round 1) February 1985, (Round 2) May 1987.
- 3) The Statistical Office of Thailand.: Labour Statistics 1985 and 1987.
- 4) JICA.: Final Report. (1983). The Study on The Development Project of the Industrial Port on the Eastern Seaboard in the Kingdom of Thailand.
- 5) Office of The National Environmental Board with SEATEC International, USAID/DETEC Emerging Problems in Development Program. (1986): Final Report, Eastern Seaboard Regional Environmental Management Plan.
- 6) Office of the Eastern Seaboard Development Committee, Office of the National Economic and Social Development Program.
- 7) Thailand Development Research Institute. (1987): Thailand Natural Resources Profile.
- 8) Institute of Developing Economics (IDE), (1982), Tokyo, Socio-Economic Policy and Forecasting Unit, Social Science Research Institute, Chulalongkorn University, Thailand.: Input-Output Table of Thailand.
- 9) Yamamura, E. (1979): A Study on the Impact of the Regional Employment Opportunities arising from the Industrial Locations on the Large-scale Industrial Park. Environmental Science, Hokkaido, Journal of the Graduate School of Environmental Science, Hokkaido University, No. 2, 59-74. pp. 66-68.
- 10) Sunee Mallikamarl et.al.Fuculty of Law, (1988), The Institute of Environmental Research, Chulalongkorn University, and The Japan Foundation: The Study of the Pollution Related Health Damage Compensation in Thailand. pp. 24-26, 31-37.