KINGDOM OF THAILAND

INDUSTRIAL ESTATE AUTHORITY OF THAILAND

FINAL REPORT
FOR
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA

SECTORAL REPORT

FEBRUARY 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

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ABBREVIATION

A. ABBREVIATION OF MEASURES

(1)	Length	mm	=	millimeter
		cm	=	centimetre
		m	=	metre
		km	=	kilometre
(2)	Area	m^2	=	square metre
		ha	=	hectare = $10^6 m^2$
		rai	=	0.16 ha
(3)	Volume	lit, l	=	litre = 1,000 cm^3
		kl	=	kilolitre = 1 m^3
		m^3	=	cubic metres
(4)	Weight	kg	=	kilogramme
		t	=	ton = 1,000 kg
(5)	Time	s	=	second
		min	=	minute
		h	=	hour
		d	=	day
		yr	=	year
(6)	Money	฿	=	Baht (Thai currency US$ 1 = ฿ 22.9 as of October 1984)
		$	=	US dollar
		¥	=	Japanese Yen

(7) Electric Measures

kV	=	kilovolt
kW	=	kilowatt
MW	=	megawatt = 1,000 kW
kWh	=	kilowatt hour
kVA	=	kilovolt Ampere

(8) Other Measures

ppm	=	parts per million
ppb	=	parts per billion
%	=	per cent
o/oo	=	per millage
pH	=	scale for acidity
^{o}C	=	degree centigrade
10^{3}	=	thousand
10^{6}	=	million
10^{9}	=	billion (milliard)

B. OTHER ABBREVIATIONS

GDP	=	gross domestic product
GRP	=	gross regional product
El.	=	elevation
H.W.L	=	high water level
L.W.L	=	low water level
G.L	=	ground level
M.S.L	=	mean seawater level
L.L.W	=	lowest low level
BOD	=	biochemical oxygen demand
CDD	=	chemical oxygen demand

SS	=	suspended solids
T-N	=	total nitrogen
T-P	=	total phosphorous
ESS	=	Eastern Seaboard Study
IOS	=	Industrial Opportunities Identification Study

C. ABBREVIATION OF ORGANIZATIONS

BOI	=	Board of Investment
CAT	=	Communication Authority of Thailand
CIPO	=	Center for Integrated Plan of Operation
DOH	=	Department of Highway
DTCP	=	Department of Town and Country Planning
EGAT	=	Electricity Generating Authority of Thailand
ETO	=	Express Transportation Organization of Thailand
IEAT	=	Industrial Estate Authority of Thailand
IFCT	=	Industrial Finance Corporation of Thailand
LDD	=	Land Development Department
MEA	=	Metropolitan Electricity Authority
MOC	=	Ministry of Communication
MOI	=	Ministry of Industry
MOE	=	Ministry of Education
NESDB	=	National Economic and Social Development Board
NHA	=	National Housing Authority of Thailand
NSO	=	National Statistical Office
PAT	=	Port Authority of Thailand
PEA	=	Provincial Electricity Authority
PWD	=	Public Works Department

PTT	=	Petroleum Authority of Thailand
PWWA	=	Provincial Water Works Authority
RID	=	Royal Irrigation Department
TOT	=	Telephone Organization of Thailand
SRT	=	State Railway of Thailand

D. LOCAL TERMS

Changwat	=	Province
Amphoe	=	District (Township)
Tambon	=	Township (Town)
Muban	=	Village
Muang	=	Administrative Center of Province
King Amphoe	=	Sub-district
Mae Nam	=	River
Khwae	=	Main tributary of a river
Huai	=	Stream, creek or small tributary
Khlong	=	Canal

SECTORAL REPORT I

INDUSTRIAL DEVELOPMENT PLAN

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I. INDUSTRIAL DEVELOPMENT PLAN

1. National Industrial Policies and Programs

1.1 Thai Economy and Role of Manufacturing Sector

The industrial sector in Thailand in the past two decades has contributed significantly to the rapid growth and diversification of the country's economic activities. Industrial growth has averaged at 11.6% per annum during 1960-70 and 10.4% during 1970-79, which were faster than the GPD growth of 8.2% and 7.8% for the corresponding periods. During the periods, there has been rapid transformation of the economy from traditional to modern.

At present, agriculture accounts for 24% of GDP compared with just over 30% at the beginning of the 70s. The manufacturing sector, on the other hand, now accounts for about 21% of GDP compared with just under 18% at the beginning of the 70s.

However agriculture still remains the main stay of the Thai economy and accounts for over two thirds of goods exported and employment. Furthermore, the processing of agriculture products account a large part of manufacturing production and a significant proportion of the income of the service sector is derived from this sector. Since the labor absorption rate of agriculture has been lower than the growth rate of population, the manufacturing sector has to contribute significantly to employment creation and actually achieved expansion of employment at average annual rate of 6% from 1979 to 1982.

1.2 Current Situation of Manufacturing Sector and Its Development Issues

It is said that the past favorable growth in general of manufacturing sector was based on production for the domestic market, including significant amounts of import substitution in consumption goods. The domestic market was sufficiently large and profitable to sustain adequate level of outputs under a protected condition by the tariff barriers. However by

the late 70s, industrial development through the first phase of import substitution was almost completed and ceased to contribute industrial growth as before.

Then the manufactured export have become important only in the past few years as shown in the Table I.1.1, and they have grown quite rapidly in response to favorable external market conditions, endowed with comparative advantages such as relatively low wages and governments supporting measures towards exports. They now account for about a quarter of the total Thai exports of commodities amounting to 1.9 billion dollars in 1980. This indicates that Thai economy is in transition into the second stage of industrialization (export oriented based on labor intensive products) and partially into the third stage that is based on second phase of import substitution of capital and technology intensive products as indicated in the Table I.1.2.

The Government put into effect the Fifth National Economic and Social Development Plan (1982-86). The Plan envisages major changes in industrial development policies to meet the new challenges of the 80s. Export oriented strategy and rationalization of domestic industries are seen to be the basic strategies for efficient long term growth of the industrial sector. The Government intends to introduce several new and improved measures to promote exports such as new tax rebate scheme, a generous investment incentive package, and export processing zones including bonded manufacturing warehouses.

Leam Chabang Coastal Area is designated as an strategic area not only for industrial development but also for regional development of the Eastern Seaboard and further to release physically overloaded situation of Bangkok Metropolitan Area.

2. Trend of Industrial Location in Bangkok and its Surrounding Areas

According to the industrial statistics of 1982, a total number of factories in Thailand was about 86,000 which has been increasing at an average annual rate of about 9% since 1979. Out of them, about 20,000

(22.4%) factories are in Bangkok Metropolitan Area and 36,000 (41.6%) are located in the Central Region including Bangkok.

The fact that Bangkok Metropolitan Area (BMA) has over five million population with relatively higher income than those in other regions has resulted in the market oriented locational pattern in Bangkok. It has been pointed out that this pattern further enlarges the income disparity between Bangkok and other regions. However locational condition in the existing industrial area in Bangkok is deteriorating year by year and the advantage of agglomeration has been reduced.

Fig. I.2.1 and I.2.2 shows the existing distribution of factories in Bangkok and its hinterland. In Nonta Buri and Pathum Thani districts, beer and soft drink industries have located since relatively long time ago. Then industrialization has sprawled into Samut Prakan district in the south and Rangsit district in the north. Prepadaeng in Samut Prakan area is the center of machinery industries such as automobile, electric and general machinery industries. Bang Poo developed by a private sector is to accommodate industrial sprawl to the south.

In Rangsit district, textile, tire, motorcycle and cement industries are located along the National Highway No. 1. Nava Nakhorn which was originally developed by a private sector is considered an extension of Rangsit district. Recently, on the other hand, a new industrial corridor is forming along Highway No. 34, where locates a lot of automobile, motor, electrical appliances and urethane factories as shown in Fig. I.2.2. Bang Plee-Ban Bor estate of about 450 rai being developed as a part of the new town by the National Housing Authority of Thailand is so planned to accommodate industrial sprawl to the east in orderly manner and to control ribbon development along the highway.

As a general trend, from a long term viewpoint, three major development axes are recognized. The first is to the north extending towards and beyond Don Muang Airport. The second is to the west extending towards Samut Sakhorn along the highway No. 4 and No. 35.

The third is to the east along the highway No. 34 towards the Eastern

Seaboard. In the vicinity of Laem Chabang, Siracha Industrial Park has been developed by a private sector and such industries as garment, footware, foods and detergents are located. Also a sugar mill and broiler meat processing factory are located at adjacent areas. Another encouraging information is reported that several applications for land purchasing of the proposed Laem Chabang Industrial Estate have been submitted by investors such as automobile and electrical appliances industries. This indicates increasing interests of industrial investor to the Eastern Seaboard and its gradual shifting from the Bangkok area.

3. Review of the Previous Studies

There are two main previous studies related to the industrial development at Laem Chabang: Eastern Seaboard Regional Planning Study (ESS) and Industrial Opportunities Indentification Study (IOS) both conducted by Coopers & Lybrand Associates, in 1982.

The ESS provides a spatial framework for the development of Eastern Seaboard covering three Changwat of Chachoengsao, Chon Buri and Rayong. It set out an overall growth scenario for the sectoral development, the induced employment and the associated urban development. Development of manufacturing sector is a key element of the said scenario, and Map Ta Phut and Laem Chabang, were identified as dual growth poles of the Eastern Seaboard development. Other sub-poles in the region are proposed at Chon Buri, Rayong, Chachoengsao and Sattahip.

As to intra-regional distribution of industrial activities, light industry, export processing and port related industry were proposed for Laem Chabnag. This proposal is considered quite logical judging from the characteristics of its natural and infrastructural conditions. Qualitative comparision of locational conditions between Greater Bangkok and the Eastern Seaboard was attempted in a broad term in terms of 9 factors affecting operation costs in order to draw a set of industrial incentives required. Learning from this comparison, it was revealed that the Eastern Seaboard is more advantageous particularly in natural drainage and subsoil conditions.

Also extensive industrial survey was conducted in ESS on 58 selected manufacturing companies to find out mainly their perceptions about the Eastern Seaboard, their likely reaction to the proposed industrial incentives. The findings stated are almost similar to the findings in the Team's survey specifically made on Laem Chabang Project. It is worth mentioning that the Team's survey confirms foreign potential investors in general seem not so reluctant to locate investment outside of Bangkok, particulary at Laem Chabang, as local industrialists expressed in the previous study.

Industrial incentives proposed by ESS are:

(1) availability of serviced land and/or advance factory units on a leasehold basis.

(2) establishment of export processing zone.

(3) improved access to development capital.

(4) training grants, technical advisory services provision of worker housing and improved access to Bangkok.

(5) one-stop information center.

The sub-committee chaired by the Minister of Industry to deliberate and approve the special privileges and incentives to the industrial investment for the Eastern Seaboard, was organized and the proposal of ESS is now being studied at the secretariate office (BOI).

As to the size of development, ESS proposes that an initial development of some 200 rai on 1984 for the general industrial estate with the area for future expansion and another 200 rai as a first phase development of the export processing zone with ultimate size of 1,000 rai. Additional manufacturing employment projected by the ESS for Siracha - Laem Chabang Development Area are 9,450 in 1991 and 38,650 in 2001 including the future expansion of TORC, ESSO and Siracha Industrial Park. The above figures are now required to adjust due to the change in the implementation on schedule.

On the other hand, IOS which is complementary to the ESS has carried out detailed investigation of the issue of how to accelerate the industrial growth of the area. The identified specific development prospects, in terms of types of industries are summarised as below.

- Resource based

  Fish farming and fish processing and preservation
  Red meat and poultry slaughtering and preservation
  Processing and preserving of fruit and vegetables
  Animal feeds production
  Hide processing and leather goods manufacture
  Rubber processing and rubber goods
  Ethanol manufacture (from molasses)
  Furniture - teak, rattan and parawood
  Handicrafts

- Export processing:

  Electronics
  Others:
    Machinery (textile, agriculture and food products)
    Aluminium products
    Pharmaceuticals
    Cosmetics
    Jewelry
    Watch and clock assembly
    Toys and games
    Sports goods

- Downstream manufacturing activities

  Plastics, chiefly consumer products

- Ship repairing and services

  National facility at Sattahip or possibly Leam Chabang port.

- Polluting industries

  Relocation of pollutant industry from metropolitan Bangkok to Map Ta Phut

- Other light industries

  Development of backward and forward linkages
  Small scale energy intensive activities

Prior to determining the above prospective industries, the IOS identified foreign investment (in form of joint ventures or as wholly owned foreign operations) as the principal component for accelerating the development of the Eastern Seaboard.

Also the IOS identifies the Eastern Seaboard's and Thailand's advantage and disadvantage in comparison with the neighboring NICs and LDCs. The former is its cheep, skillful and large supply of labors for developing its natural resources and export processing activities. The latter is government's lack of concerted efforts to attract foreign investment and excessive bureaucracy for delivering incentives to industrialists.

The principles employed in IOS for indentifying industrial opportunities are:

(1) good prospects in domestic and export markets

(2) labour intensive

(3) technology employed is now in use and internationally competitive

(4) production processes are simple and standard, and involve relatively few machine operations

(5) industrial linkage building

(6) expanding use of locally available resources

The IOS's judgement for the expected role of foreign investments and the principle followed for identification of the above prospects seems quite reasonable particularly for the proposed export processing zone in Laem Chabang. However, taking into consideration water supply constraint from the Nong Kho reservoir, it may need to add "less water consuming production" in the above principle.

As impact on the Eastern Seaboard, the IOS projected direct additional employment of some 11,850 jobs in 1991 in the ESS's industrial development zones and which is a little over the figures presented in the ESS. Breakdown of source of employment by type of industry and location is given in IOS as follows:

By type of industry		By locational Source	
Resource based	26%	Laem Chabang	52%
Export processing	24%	Rayong/Map Ta Phut	19%
Light industries	20%	Sattahip	10%
Downstream	17%	Chon Buri	10%
Ship repair	9%	Chachoengsao	9%
Polluting industries	4%		100%
	100%		

Based on the above projection and assumption, direct employment at Laem Chabang will become a little over 6,000 which is about 30% less than the projection made under this study.

4. Industrial Development Potentials of Laem Chabang Coastal Area

4.1 Existing Industries in the Eastern Seaboard and Regional Development Projects.

Manufacturing employment in the Eastern Seaboard in 1981 totalled 51,300 jobs which is about 3% of the national total of the manufacturing sector. Also it is said that about 60% of this employment was located in rural areas being related to agricultural processing industries such as rice milling, sugar cane crushing and timber processing while the majority of the remaining 40% of urban manufacturing employment concentrates in Chon Buri where is functioning as a regional center. There are several large industries such as textile in Chon Buri, oil refineries in Siracha and petrochemicals in Rayong. Also there is a private industrial estate of 1,000 rai in Siracha where a variety of industries employing about 3,000 workers are located.

The Eastern Seaboard Development Programme involves the Government providing not only the industrial base but also the essential social infrastructure including a full communications network and urban areas designed to grow the region into an alternative to Bangkok as an industrial and commercial complex. There are eight large scale infrastructure development projects such as water, ports, railways and industrial estates and five large scale manufacturing projects being initiated by the public sector.

4.2 Characteristics of Laem Chabang as an Industrial Location

Heavy concentration of manufacturing enterprises in Bangkok Metropolitan Area where has almost a quarter of the national total in number of factories has deteriorated the locational condition and the advantage of industrial agglomeration there has been reduced. On the other hand, Laem Chabang Coastal Area has the following locational advantages.

(1) A large scale deep sea commercial port will become available and which will be connected with Chachoengsao-Sattahip line of the SRT by spur line.

(2) The area is directly connected to Bangkok by National Highways Route 3 and 34.

(3) Utapao Airport in Sattahip where is accessible within half an hour by car is now partially permitted for commercial use.

(4) The area will become a key transportation hub of the country

(5) Land for industrial estate has been already acquired at the location close to the proposed port.

(6) Physical conditions are better than those in Bangkok, particularly on foundation and drainage.

(7) Current industrial location has sprawled into Chan Buri and Sirach from the eastern fringe areas of Bangkok.

(8) An export processing zone will be established.

(9) Industrial linkage is expected to be built both with the heavy chemical industries planned in Map Ta Phut and those in Sirach Industrial Park and oil refineries.

(10) Ample agricultural and livestock resources supplied from the hinterland and energy resources such as natural gas and electricity are easily available.

(11) An international resort place of Pattaya is located in the vicinity and such facilities as convention and recreation are easily accessible.

(12) A New Town of over 100,000 population with various urban facilities will be established in conjunction with the development of harbor and industrial estate.

(13) Within 30km radius from Laem Chabang, there are about 150,000 labor forces and about 50% of which are employed in agriculture sector.

(14) Water will be supplied through a pipeline from the Nong Kho Reservoir but will not be sufficient in the long term.

(15) To enhance the proposed coastal industrial activities at Laem Chabang, an inland type back up industrial estate could be developed in future at the area around the junction of R-36 and R-331 where is strategically located to link Map Ta Phut, Utapao and Laem Chabang.

4.3 Views of the Selected Industrial Operators and Investors on Laem Chabang Industrial Location

Industrial Location Survey on the proposed Laem Chabang Industrial Estate and Export Processing Zone was conducted with assistance of the Thai Chamber of Commerce and the Thai Association of Industries. Though the total number of samples were only 120, they were selected to represent fairly their respective subsector. Out of 120 samples, 44 questionnaires were properly filled with necessary information and collected (effective rate of collection is 36.7%) for analysis.

Concerning the key factors for selection of the future plant site, 73% of the answers specify "Availability of Utility" as top factor which is followed by "Availability of Raw Materials". 27 companies have new investment plan by 1987 mostly for expansion of the existing factory. 15 companies showed their interests in Laem Chabang, 5 of which answered with size of the factory area requirement totalling to about 100 rai. For details, please refer to the result of analysis shown in the Annex I.

A local company who assembles automobiles is interested in Laem Chabang for implementation of their long term plan which requires about 500 rai of land. Main reasons for their preference of Laem Chabang are its excellent accessibility to commercial deep seaport, railway, highways, better geological and topographical conditions and availability of fully serviced land with reasonable land cost.

An executive of the company constructing advance factory building for sale and lease viewed Laem Chabang site would require a sort of psychological jump for local investors in general due to the physical distance from Bangkok and advised to market to rather younger

enterprenuers who wish to pioneer into new industries as done by the operator of Saha Pattana Vibul 10 years ago to develop Sirach Industrial Park.

Some of the representatives of the Japanese companies in Bangkok expressed their views that physical distance of Laem Chabang from Bangkok would not become big negative factor as it has much to offer. What they concern most is the certainty of time schedule of development and preparation of attractive package of incentives.

5. Planning Policy and Frame

5.1 Planning Policy

- To create an attractive environment for industrial investors, workers, the adjacent communities and the Eastern Seaboard subregion.
- To maximize the use of the existing natural resources such as public owned lands, labor force, water and man made resources such as port, railways, road, water and power supply.
- To invite such industries as meeting the government industrial policy, the area's socio economic, physical and environmental characteristics.
- To coordinate closely with the port and urban developments in such manner as to achieve the maximum long term benefits of integrated package development.
- To ensure future expansion within and without the area and to keep a reasonable flexibility in the plan to comply with any unforeseen changes in future.

5.2 Planning Frame

Prior to estimation of future industrial land demand in Laem Chabang, prime considerations were given to the following three points.

- Certainty of land acquisition

IEAT already acquired 2,800 rai of land adjacent to PAT land.

- Balanced distribution of industrial activity

  Siracha Industrial Park of about 1,000 rai located at some kilometers east of the IEAT site still has an undeveloped area of about 500 rai.

- Balance with commercial port town development

  Industrial development coupled with the first deep sea commercial port will act as prime mover for attracting population to settle in, but when the town grows to the level of over 100,000 population, the town requires to diversify its functions for further growth which may react to control excess growth of manufacturing activities within the town.

In order to assess the role of Laem Chabang in the industrial development of the Eastern Seaboord, attempts were made to estimate the land demand in Laem Chabang through the two different approaches under the following sets of assumptions.

(1) Approach A

	Assumptions 1981 - 2001	Past Performance 1975 - 1980
· Growth rate of GDP	6.0%	7.5%
· " " of manufacturing sector	8.24%	10.3%
· " " of manufacturing employment	4.9%	6.2%
· Share of manufacturing employment Bangkok + Central regions	64.4%(2001)	74.9%(1980)
· " Bangkok	30.3%(2001)	51.3%(1980)
· " Central region	69.7%(2001)	48.7%(1980)
· Employment density (gross rai)	7.7 workers	7.7 workers

Further more two cases were assumed for estimation.

Case I - Leam Chabang will have 5% share of the accumulated number of employment of the Central region - 5,477 rai

Chase II - Leam Chabang will have 5% share of the net increase of employment of the Central region - 3,143 rai

(2) Approach B

	Assumptions 1981 - 2001	Past performance 1970 - 1980
· Growth rate of manufacturing employment in Changwat Chon Buri	4.9%	5.3%
· Ratio of unban manufacturing employment	75.0%	40.0%
· Ratio of employment in the planned industrial estate	70.0%	N.A.

Further assuming that Laem Chabang will have 75% of the net increase of manufacturing employment of the planned industrial estate in the Changwat Chon Buri, it is estimated that the land demand will become 2,758 rai which is nearly equal to the area owned by IEAT.

Considering the above planning policy and availability of adjacent land for future expansion, it is proposed to set the planning frame under this study at 2,800 rai for the year 2001. As to the division of the land between EPZ and GIE, it is proposed to allocate 700 rai and 2,100 rai respectively considering the recommendations of ESS and IOS and the size of the existing EPZs in the neighboring countries.

6. Type of Industry and Industrial Mix

6.1 Criteria for Identification of Industries

As mentioned earlier, there are two types of industrial areas, namely EPZ and GIE in Laem Chabang. Based on the results of the foregoing subsections 3.2.1 through 3.2.5, the following criteria for identification were established.

(1) Export oriented industries
(2) Labor intensive industries
(3) Local resources oriented industries
(4) Infrastructures such as deep seaport oriented industries
(5) Industrial linkage building industries
(6) Less water consuming industries

(7) Agglomeration of Bangkok oriented industries

(8) Relocating industries from Bangkok and its surrounding areas.

Deep seaport oriented industries are those utilize the function of commercial port and do not require to own or use private berth for their specialized vessels. Accordingly it is not necessary for them to locate at water front.

Labor intensity by type of industries was determined by setting a criterion of 3.7 workers per ₱10 million of annual factory outputs based on the data surveyed in Japan in 1981 as industrial average. (Ref. Appendix 2)

Same thing was done for industrial water. 279 m^3 of replenished fresh water requirement per 10,000 m^2 of factory land was the national industrial average and those types of industries that consume less than the national average were considered water less consuming industries. (Ref. Appendix 3)

Further more the following additional criteria were established to scrutinize by cross check.

(1) Industries identified by BOI

(2) Industries identified by IOS

(3) Industries that have registered comparatively high growth. (Ref. Table I.6.1 and Fig. I.6.1.)

(4) Industries that have higher locational tendency by foreign investors.

6.2 Candidate Type of Industries

(1) EPZ

During the 1960s and 1970s many developing countries set out to attract foreign industrial investment to produce goods for export. Export processing zones (EPZs) are specific areas within the vicinity of a port or airport supplied with the necessary infrastructure usually

unavailable elsewhere in the country. Incentive "package" were offered to foreign firms to urge them to invest there. These incentive included tax holidays, duty free import of raw materials and equipment, union free low cost labour that encouraged firms to set up subsidiaries in the zones. Main motivations of establishing EPZ of host country are summarized as below.

- Job creation.
- Foreign exchange earning.
- Enhancement of regional industrialization.
- Technology transfer.

In Thailand the first EPZ was established within Lat Krabang Industrial Estate in 1980 as a pilot project with the size of about 170 rai. As of February, 1984, 8 firms have been invited for location. Their types of activity include stationery, bolts and nuts, lenses, electronic equipment, clothes, artificial flowers and trees and latex rubber gloves which has the dominant share in EPZ in terms of area occupied and employment. Recently there have been a surge of inquiries for unsold lots from abroad. This is partly due to quota systems practiced in the developed countries for typical products of EPZ in NICs. Under the circumstance like this, IEAT has a high hope to sell out all the lots in due course.

Table I.6.2 shows comparative advantage of Thailand in terms of labour cost. On top of this, other elements such as level of skill, availability of middle management workforce and readily available standard factories must be considered as well to indentify types of industries likely to come into the Laem Chabang EPZ.

The candidate types of industries selected through the above criteria for EPZ are as listed below.

Food industries.

- Manufacture of bakery and confectionery products.

Manufacture of textile mill products.

- Knitting mills.

Manufacture of textile mill products. (Cont'd)

- Manufacture of ropes and nettings.
- Lace and other textile goods.

Manufacture of apparel and other finished products.

- Manufacture of outer garment.
- White shirts and underwears.
- Manufacture of hats.
- Fur apparel and apparel accessories.
- Manufacture of miscellaneous textile apparel and accessories.
- Miscellaneous fabricated textile products.

Manufacture of furniture and fixtures.

- Manufacture of furniture.
- Furniture for religious purposes.
- Manufacture of miscellaneous furniture and fixtures.

Paper products.

- Manufacture of paper products.

Printing and allied industries.

- Printing industries
- Book binding and printed matters

Manufacture of chemical and allied products.

- Manufacture of drugs and medicines.

Manufacture of rubber products.

- Manufacture of tyres and inner tubes.
- Manufacture of rubber belts, hoses and mechanical rubber goods.
- Manufacture of miscellaneous rubber products.

Manufacture of leather products.

- Leather footwear.
- Leather gloves and mittens
- Luggage
- Handbags and small leather goods
- Fur skins
- Manufacture of miscellaneous leather products

Manufacture of ceramic, stone and clay products.

- Pottery and related products.

Manufacture of fabricated metal products.

- Manufacture of fabricated constructional and architectural metal products.

Manufacture of electrical machinery, equipment and supplies.

- Manufacture of communication equipment and related products.
- Manufacture of part for electronic appliances and communication equipment.

Manufacture of precision instruments and machinery.

- Manufacture of optical instruments and lenses.

Miscellaneous manufacturing industries.

- Precious metal products including jewel manufacture.
- Manufacture of musical instruments.
- Manufacture of stationery.
- Manufacture of plastic products.

(2) GIE

The IEAT estates at present in operation or under construction are as follows and the first three estates are located in the Metropolitan Bangkok Area.

Estate	Area
· Bang Chan	687 rai
· Lat Krabang	1,023 rai
· Ban Chang	5,784 rai
· Lamphun (under construction)	1,770 rai
· Map Ta Phut (under detail design)	2,600 rai

In addition to the above, the following two estates are in process of land acquisition.

Estate	Area
· Haad Yai-Songkhla	800 rai
· Samut Sakhorn	2,080 rai

Types of industries operated or going to be invited in the above estates vary with the year developed and locational characteristics of each estate. However dominant types fall under categories of import substitution and local resources oriented one. GIE in Laem Chabang has approximately 2,100 rai of area and is required to diversify its industrial activities to meet the government industrial policy and the area's characteristics. Candidate type of industries are identified as follows.

Consumer related group (JSIC Code 18, 19, 20, 21, 22, 23, 24, 25)

Foods industries

- Live stock products
- Sea food processing
- Manufacture of canned and preserved fruits and vegetable products.
- Manufacture of seasoning
- Manufacture of flour and grain mill products.
- Manufacture of bakery and confectionery products.
- Manufacture of animal and vegetable oil and fats.
- Manufacture of miscellaneous food and related products.

Textile industries

- Spinning mills
- Woven fabrics mills
- Miscellaneous textile mills
- Knitting mills (or EPZ)
- Lace and other textile goods (EPZ)
- Manufacture of outer garment (EPZ)
- White shirts and underwear (EPZ)
- Miscellaneous fabricated textile products.

Lumber and wood products

- Sawing, planing mills and wood products.
- Manufacture of millwork, prefabricated structural wood products.
- Manufacture of wooden containers including bamboo and rattan.
- Manufacture of miscellaneous wood products, including bamboo and rattan.

Manufacture of furniture and fixtures

° Manufacture of furniture

° Manufacture of miscellaneous furniture and fixtures.

Paper Products

° Manufacture of paper products.

° Manufacture of paper containers.

Publishing, printing and allied industries

° Publishing industries

° Printing (EPZ)

° Book binding and printed matters (EPZ)

° Service industries related to printing.

Basic Material Group (JSIC Code No. 26, 28, 29, 30, 31, 32)

Manufacture of chemical and allied products

° Manufacture of oil and fat products, soaps, synthetic detergents surface active agents and paints.

° Manufacture of drugs and medicines.

Manufacture of rubber products

° Manufacture of tyres and inner tubes

° Manufacture of rubber belts and hoses and mechanical rubber goods.

° Manufacture of miscellaneous rubber products.

Leather tanning and manufacture of leather products

° Leather tanning and finishing

° Mechanical leather products

° Leather footwear

° Leather gloves and mitten (EPZ)

° Luggage

° Handbags and small leather goods

° Manufacture of miscellaneous leather products

Manufacture of Ceramic, Stone and Clay Products

° Manufacture of glass and its products
° Manufacture of cement products
° Manufacture of structural clay products
° Manufacture of pottery and related products
° Manufacture of abrasive products
° Manufacture of miscellaneous ceramics

Iron and Steel Products

° Manufacture of steel materials
° Manufacture of coated steel
° Manufacture of miscellaneous iron and steel

Manufacture of Non-ferrous Metals and Products

° Rolling of non-ferrous metals and alloys including drawing and extruding.
° Electric wire and cable

C. Processing & Assembly Group (JSIC Code No. 33, 34, 35, 36, 37, 39)

Manufacture of Fabricated Metal Products.

° Tin cans and other plated sheet products.
° Manufacture of tableware, hand tools and hardware.
° Manufacture of heating apparatus and plumbing supplies.
° Manufacture of fabricated constructional and architectual metal products including fabricated plate work and sheet metal work.
° Manufacture of fabricated metal stamping, coating, engraving and heat treating.
° Manufacture of fabricated wire products.
° Bolts, nuts, rivets, screws.
° Manufacture of miscellaneous fabricated metal products.

Manufacture of General Machinery and its Attachments and accessories.

° Manufacture of boilers, engines and turbines.

Manufacture of General Machinery and its Attachments and Accessories. (Cont'd)

° Agricultural machinery and equipments.
° Manufacture of machinery and equipment for construction and mining, including tractors for construction, agriculture and transportation of goods.
° Manufacture of metal working machinery.
° Manufacture of textile machinery.
° Manufacture of special industry machinery.
° Manufacture of general industry machinery and equipment.
° Manufacture of office, service industry and household machines.
° Manufacture of miscellaneous machinery and machine parts.

Manufacture of Electrical Machinery Equipments and Supplies.

° Manufacture of electrical generating, transmission, distribution and industrial apparatus.
° Household electrical appliances.
° Manufacture of electric bulks and lighting fixtures.
° Manufacture of communication equipment and related products.
° Manufacture of parts for electronic appliances and communication equipment.
° Manufacture of miscellaneous electrical machinery, equipment and supplies.

Manufacture of Transportation Equipment.

° Manufacture of motor vehicles and motor vehicle and equipment.
° Manufacture of railroad equipment and parts.
° Bicycles and parts.
° Miscellaneous transportation equipment.

Manufacture of Precision Instruments and Machinery.

° Manufacture of measuring instruments, analytical instruments and testing machines.
° Manufacture of optical instruments and lenses.

Manufacture of Precision Instruments and Machinery. (Cont'd)

° Manufacture of watches, clocks, clockwork-operated devices and parts.

Miscellaneous Manufacturing Industries.

° Precious metal products including jewel manufacture.
° Manufacture of musical instruments and phonograph records.
° Manufacture of pens, lead pencils, painting materials and stationery.
° Manufacture of costume jewellery, costume accessories, buttons and related products, except precious metals and jewellery.
° Lacquer ware.
° Manufacturing industries, not elsewhere classified.

6.3. Industrial Mix

(1) EPZ

As shown in Appendix V, types of industry located in Asia are mainly textile, clothing, electronics, plastic products, footwears, rubber products and food industry. Generally, labor intensive industries which do not require high technology are located.

Consumer electronics such as Color TV, B/W TV, radios, cassette tape, recorder, car radios, stereos and stereo sets are the fast growing industry worldwide and have become top choice industry for the newly emerging EPZs at it is considered footloose in locating investment.

Manufacture of micro-chips includes the design and the production of silicon wafers which are cut into minute chips and then encased in plastic or ceramic packages. The most expensive stage is the wafer production which is technology and capital intensive, which has been carried out in the US, Japan and Europe. The assembly stage of attaching external wires and encapsulating the chips is very labor intensive.

Many multinationals, especially the Americans have set up assembly and testing plants in developing countries since the 1960s to take advantage of the lower labor cost and favorable investment climate, particularly for export products. Favourite location for assembly for assembly plants are Hong Kong, Singapore, Republic of Korea, and Mexico though other countries - the Philippines, Malaysia, Indonesia, Brazil, and in the Caribbean - with even lower labor costs are trying to attract such investment by offering investment conditions similar to those of the first group.

The proposed Laem Chabang Export Processing Zone is considered competitive to the above second group in attracting investors in the areas of consumer electronics and micro-chips. However it may require to watch the new trend of factory automation which is becoming more common and making it possible for the whole operation to be carried out in the developed countries. This and increasing wages in the NICs make overseas assembly less attractive except where wage rates are still relatively low.

Package of incentives and availability of cheap and abundant labor are the key determining factors for investment for this type of industry. High absorption of labor and technology transfer effect are expected.

Also the traditional textile and apparel industries are considered desirable for Laem Chabang EPZ in terms of high labor absorption rate and revealed comparative advantage of Thailand over the developed and newly industrialized countries.

In order to propose the industrial mix of the Laem Chabang EPZ as a guide and basis of planning the required infrastructure and utilities, the following points were considered.

- Trends of the EPZs in Asia (Appendix V)
- Trends of the Japanese foreign industrial investment (Appendix IV)
- Trends of the American investment in the field of electronics industry in Thailand
- Foreign investment promotion policy of the RTG
- Locational characteristics of Laem Chabang

The result is shown below in terms of space allocation by the three categories. For acceleration of foreign investments at an early stage, it is necessary to allocate some area for the so called standard factory building and it is proposed to allocate 10% of the space for this purpose.

EPZ

Category	Type	Composition
Consumer related group	Foods, textile, apparel, wood, wood products, furniture, rubber & plastic products leather products, mis. products	40% (33.6 ha)
Basic material group	Chemicals, paper products, ceramics, non-ferrous metal	15% (12.8 ha)
Processing & assembly group	General machinery, electrical machinery, transportation equipments precision instruments	45% (38.0 ha)

Based on the information from Japan's industrial location data (1981) and size of factory space at the proposed standard factory building, the number of firm in EPZ is estimated at 90.

(2) GIE

From the Table I.6.3, the gradual structural change of the Thai manufacturing sector is seen.

	Share in Manufacturing (%)	
	1975	1980
· Consumer related group	67.8%	59.6%
· Basic material group	22.8%	28.4%
· Processing & assembly	9.4%	12.0%
	100.0%	100.0%

Though they are finalized yet, the several large investment projects are proposed by the local investors for location at Laem Chabang. One is a car manufacturing project which requires about 1,000 rai with foundry included and 500 rai with foundry excluded. Another is an electrical home appliances manufacturing project which requires 50 to 100 rai.

Judging from the trend of market growth, type of activities, amount of investment, employment and its impacts, they are expected to become nucleus factories in the GIE. Also a ship repairing project is proposed by BOI at Laem Chabang for private investment, the feasibility study for which is currently conducted by another JICA team.

Based on the above facts coupled with the RTG's policy to accelerate restructuring of manufacturing sector, it is proposed the following model composition.

GIE

Category	Type	Composition
Consumer related group	Foods, textile, apparel, wood, wood products, furniture, rubber & plastic products leather products, mis. products	10% (22.8 ha)
Basic material group	Chemicals, ceramics, non metalic minerals, iron & steel, non-ferrous metals	30% (71.1 ha)
Processing & assembly group	General machinery, electrical machinery, transportation equipments precision instruments	60% (139.1 ha)

The total number of factory in GIE is estimated at 92 on the basis of the same information as used in EPZ but the number of firm will be reduced to around 83 due to the large car manufacturing project.

7. Employment, Cargos and Industrial Water

7.1 Employment

Based on the composition of the industry discussed at above and

the information on location planning units surveyed in Japan in 1981, the total number of employment at full development was estimated as below. However an adjustment was made on EPZ in accordance with the result of analysis for 18 EPZs in Asia (6 in Malaysia, 3 in Philippines, 4 in Singapore, 3 in Taiwan, 1 in Korea and 1 in Thailand) were studied for reasonable adjustment in number. Operation of EPZ was assumed to be double shifts at an average.

	Total	Density
(1) EPZ	19,000 workers	36 workers/net rai
(2) GIE	15,500 workers	11 workers/net rai

7.2 Cargos

Cargos of both generated and arrived were estimated by the Japanese data on industrial location surveyed in 1974 and then further broken into port cargo and non port cargo by the data surveyed in Japan in 1978.

(1) GIE

	Total cargos (10^3t)	Port cargos (10^3t)
Generated	1,264	563
Arrived	1,432	824

(2) EPZ

	Total cargos (10^3t)	Port cargos (10^3t)
Generated	176	165
Arrived	194	180

7.3 Industrial Water

Data surveyed in Japan in 1981 was used assuming that water technology would be equally adopted in Thailand in at full development. (Fig. I.7.1)

(1) GIE 24,800 m^3/day

(2) EPZ 8,500 m^3/day

8. Physical Condition of the IEAT Site

The site is located in the west of the Siracha Satellite Station, at the opposite side of the Route 3. In the eastern part of the site, there lies a low hill which provides the area with gentle slopes extending in three directions. Generally, it is flat land, but microscopically it is more intricate by small flat lands and small depressions. Elevation of the site ranges from 2m to 30m above sea level, as show in Fig. I.8.1.

The site is mainly covered by paddy field and cassava field. The composition of the existing land use are summarized in the Table I.8.1 and Fig. I.8.2.

Geology of the IEAT site is characterized by deposited layer of 5 to 7 meters thick of clayey sand on the rock base of granite extending over almost the whole area. And, on the higher parts of the hill, the rock base is found close to the surface.

The site has two small river basins. The northern part of the site belongs to the river basin flowing into Ban Laem Chabang and the southern part is covered by the other river basin which flows into Ban Bang Lamung, as shown in Fig. I.8.3.

9. Layout Plan of GIE & EPZ

9.1 Basic Development Policies

This section deals with the layout plans for facilities and factory lots of GIE and EPZ. An optimum layout plan will be prepared both for the land use alternatives A and B, and A' analyzing characteristics and size of each industry expected to move into the estate.

There are several development policies serving as a basis of the layout planning. They include the following.

(1) Laem Chabang is well known for its beautiful setting to be preserved. It is essential to prepare a land use plan of the

estate area paying due attention to the conservation of the existing natural environment to the extent possible, while seeking the most efficient use of available land resources.

(2) EPZ with a gross area of 700 rai will be located as near to the public berths as possible, and GIE with 2,100 rai in gross will be laid on the rest of the area.

(3) The factory land ratio is aimed at around 65% and open spaces are set aside for roads, parks and greenery, so that the estate area will have features similar to an industrial park.

(4) Plan shall have flexibility, adaptability and adjustability to meet unforeseen changes in future.

9.2 Principles for Factory Lots Subdivision and Layout Plan

(1) Subdivision Plan

In order to prepare the subdivision plan, an analysis was made on the following data and information.

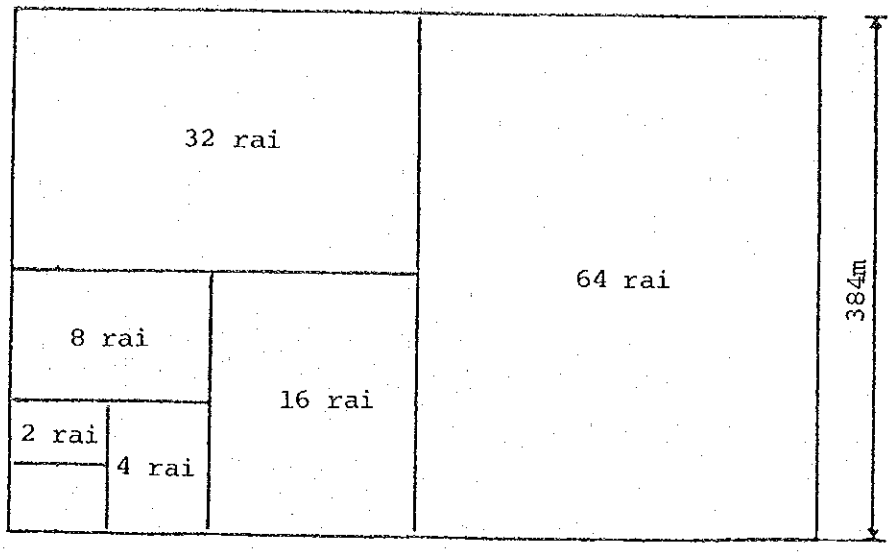
- Whole Kingdom Industrial Output 1975.
- Data on the existing 3 industrial estates in Thailand

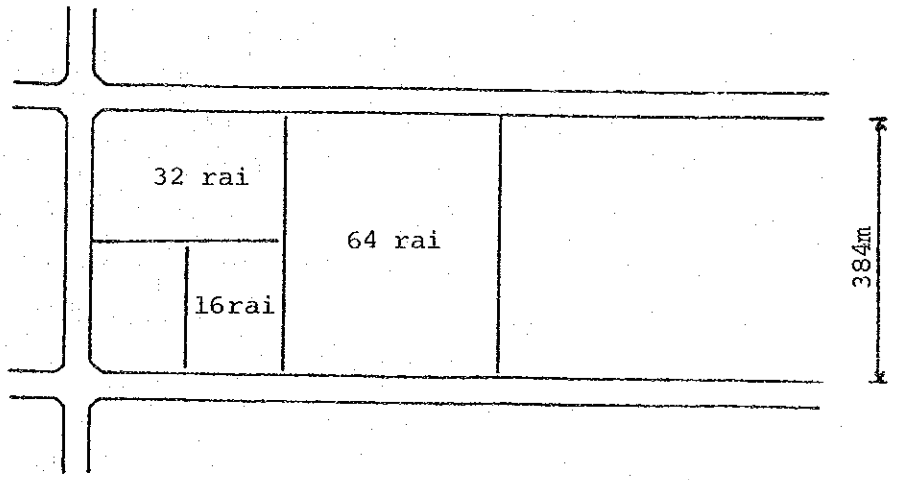
Since the data for the national average size of factory lot was not available, it was approached by the national average size of employment per factory which was 123.6 workers. Based on the average density of employment at 9 to 11 workers per rai which came from the data on the existing industrial estates, it was assumed that the average size of factory plot was ranging between 13.7 rai to 11.2 rai. On the other hand, it was also revealed that the plot size of the existing industrial estates ranged between 2 rai and 120 rai and dominant size was 8 rai to 16 rai which occupied almost 35% of the total number of factory.

As to the type of industry and their plot size, it was also assumed through the size of employment. Number of average worker by type of industry is as shown below.

	SITC
Less than 50 workers	371 Iron, steel
	382 Machinery
	385 Precision instrument
50 - 100 workers	332 Furniture
	342 Printing
	356, 39 Plastic, others
	331 Wood lumber
	381 Manufacture of fabricated metal
	311 - 314 Food stuff
	384 Transport equipment
101 - 150 workers	351 - 352 Chemicals
	355 Rubber products
	361 - 369 China, Clay
	332 Apparel
151 - 200 workers	323 - 324 Leather, Foot wear
	341 Paper
201 - 250 workers	---
251 - 300 workers	353 - 354 Petroleum
301 - 350 workers	383 Electrical industry
351 - 400 workers	---
more than 400 workers	321 textiles

As a result, a minimum lot size of 2 rai was set as a module for practical and efficient subdivision as shown below.





(2) Factory Lot Layout By Grouping

Factory lot layout is planned by classifying various industries into several groups. Grouping was made by the following critera.

(i) Grouping by Labor Intensity.

Considering commuting of workers to the Laem Chabang estate, attention should be given to the availability of transportation facilities and to the accessibility to the welfare facilities. Example of grouping by labor intensive industries are printing, publishing, knitting, paper products, assembly of motor-cycles, electric apparatus and parts, radio, TV, communications equipment, furniture etc.

(ii) Grouping by the Type of Pollution

Industries should be grouped by the type of pollution such as noise, vibration, dust. Example of grouping by noise and vibration are saw mills, iron & steel etc. Example of grouping by dust are lime, cement products, bricks, clay products, porcelain, ceramic etc.

(iii) Grouping by open shed for storing raw materials and semi-finished products

Some industries require uncovered storage within the factory site for storing raw material and semi-finished products. These lots are offensive to the sight, and therefore, these industries which require such uncovered storage should be located together. Example of this type include are beer, soft drings, saw will, cement products, bricks, porcelain, ceramic, clay products etc.

(iv) Grouping by Proximity to the Port

As the industries planned for EPZ depend mostly on imported raw material and ship their products through the port, it may require to have easy access to the port.

Example of grouping by proximity to the port site are knitted fabrics, textile products, paper products, toys, paints, pigments, rubber products, leather goods, glassware, light metal shapes, metal molds, machine parts, motor vehicle bodies, watches & clocks, electronic components, power amplifiers,

jewelry and boutique item etc.

(v) Group of factories emitting other pollutant(liquid)

Factories in this gruoup will be those like leather products, lumber, paints, fertilizer, detergent, asphalt, rubber and metal products. There are a wide range of fluid pollutant that these plants emit, but they should be placed in an area which would be collectively pretreated.

There will be a wide variety in the type of industry that have potential to be located at this GIE & EPZ and if no consideration is given to place these industries according to type, the Estate becomes unorganized and unattractive one. In addition to the general principle of arrangment by plant size it is also required to consider the density of employees at the plant, the type of raw materials and fuel it will require, the patterns of land use on the factory lot and the types of environmental hazards that the plant is likely to put out for processing each application.

9.3 Land Use Plan of GIE & EPZ

Following factors are considered for formulation of land use plan alternatives.

- To be a model of new town in the country having self reliant economic base centering on industrial and commercial port activities.
- Environmental protections including flood control within and around GIE & EPZ.
- Efficient and safe circulation systems of goods and people.
- Coordinated allocation of the common facilities among the industrial, port and urban sectors.

Characteristics of the three alternatives are summarized below:

Alternative (A)

Both GIE & EPZ are laid out within the land owned by IEAT. The alternative A has 3% more of factory land than the Alternative B due to less buffer green area requirement.

Alternative (A')

Alternative A' which is a transformation of the Alternative A and is laid out in T shape to allow EPZ have direct connection with the port area partly using the PAT owned land.

Alternative (B)

The plan is laid out in the I shaped land in the north end of IEAT and PAT lands running parallel along the spur line of the railways. This plan requires IEAT to exchange about 50% of its land with that of PAT. The plan requires more land for the buffer green and the right of ways.

The above three alternatives were presented to the Thai side at the Interim Report and the alternative (A') was finally selected by the Thai Steering Committee.

Land Use of the Plan A'

9.4 Overall design of the Estate

The area proposed in this plan constitutes an integral part of the Laem Chabang Coastal Area development that includes residential area, business and commercial area and port area. In order to create attractive environment of the area while keeping functional integration, the entire estate shall be surrounded with green as a buffer. The estate center is located near the business and commercial area, EPZ center is located near the port area, the factory land is placed within this framework.

9.5 Land Use of GIE

(1) Factory Land

The factory plot area is about 226 hectares which is zoned for large, medium and small scale respectively. Zones for large and medium scale industry are laid out along the Route 3 (Sukhumvit Road) and near the business and commercial zone. Small scale industry zone is laid out in between the large and medium scale zones.

(2) Main facilities

A sports park is one of symbols of the estate and is located in the central area. Three sub-centers are laid out in such manner as to allow easy access by workers in addition to the estate center. Green belt with 100 meters wide is laid out along the Route 3.

(3) Road

The road network of GIE is planned to provide an efficient circulation of surface traffic. In case the proposed car manufacturing project finalized, those subdividing roads in the center zone could be eliminated. District distribution road (V_3) will connect on a straight line the business and commercial area and intra urban primary road (V_2).

9.6 Land Use of EPZ

(1) Factory Land

The net factory plot area is about 84 hectares which is zone for the standard factory building (SFB), small scale industry and medium scale industry. The SFB zone covers 10% of the factory land and is laid out near the EPZ center. The medium scale industry zone is laid out at the center of EPZ.

(2) Main facilities

EPZ center is located at the main entrance and one sub-center is located in the middle. Guard house is located on the district distributor road (V_3) in the estate. Warehouse is placed at the SFB zone.

(3) Road

Local road (V_4) directly connects EPZ with the port area through a bridge over the primary road (V_2).

9.7 Composition of the Land Use for the Long Term Plan

The clssified table for the Long Term Plan is as follows.

GIE

Item	Area (m^2)	Ratio (%)
1.estate center & sub c.	45,000	1.3
2. Factory land	2,330,665	69.4
3. Green Belt	362,660	10.8
4. Park	90,000	2.7
5. Road	489,525	14.6
6. Channel	42,150	1.2
Total	3,360,000	100

EPZ

Item	Area (m^2)	Ratio (%)
1. EPZ center & sub	25,000	2.2
2. Factory land	844,665	75.4
3. Green Belt	56,820	5.1
4. Park	15,000	1.3
5. Road	148,875	13.3
6. Channel	29,640	2.7
Total	1,120,0000	100

10. Considerations Required for Promotion of Laem Chabang Industrial Location

Success of GIE & EPZ development entirely depends on how fast and effectively the country can attract industrial investors in line with types of industry identified under this study. Provision of GIE & EPZ at Laem Chabang is one of the key elements for attraction. However the fully serviced physical facilities alone can not exhibit their full force without the necessary supports of the policy measures. Major points to be considered are as follows.

(1) To establish a workable guidelines for standardization of of automotive and machinery parts and components to allow those industries increase production units for possible cost reduction to an extent that they can export a part of their products. Continued efforts are required for materialization of the ASEAN industrial cooperation program in this field.

(2) To streamline the taxation system to encourage to build broader contractor-subcontractor relation in the manufacturing field.

(3) To effectuate quick tax rebate for export producers.

(4) To provide credit facility on more liberal term to the local export producers and to those samll and medium scale industries that wish to relocate from Bangkok.

(5) To enhance the vocational school in Sattahip or to locate another specific trade oriented technical training center in Laem Chabang to meet the requirement of industries.

(6) To embark on aggresive promotional activities at the major developed countries.

11. Industrial Land Development Frame

In the Interim Report, a phased development plan was presented which was based on a land sale projection interpolated at the year 1991 on the Master Plan Frame with the following assumptions.

(1) EPZ will be completely sold in 15 years (2001) after inauguration of the port. Each factory will have an future expansion program and becomes 100% operative in 5 years counting from the year of purchasing land.

(2) GIE will be completely sold in 20 years (2007) after inauguration of the port. Each factory will have an future expansion program and become 100% operative in 8 years counting from the year of purchasing land.

The frame proposed was 600 rai in net or 900 rai in gross for the short term plan. As shown in Fig. I.11.1, the projection line applied in the Interim Report was not straight assuming that sales at pre-development stages would be slow. Then the inauguration of the first stage of the port facilities and the start of construction of a well known or representative factory give substantial impact on the increasing sales afterwards. In other words, the short term period would be the buyer's market and then the trend would shift into the seller's market and sales become snowballing.

However it was found during the field work that the RTG felt the current investment climate of the country was on the high tide side on the basis of number of inquiries on industrial land from both the Thai and foreign investors.

Several discussions were held on the size of the short term development with the officials of the concerned agencies (IEAT, CIPO and BOI). The following views of the officials are considered to be reflecting their recognition of the current trend and expectation.

Agency A	1,000 - 1,500	rai (net)
	1,400 - 2,100	rai (gross)
Agency B	600 - 1,200	rai (net)
	900 - 1,700	rai (gross)

Location of the proposed car manufacturing plant by a private local company is still uncertain at this moment. It will seriously affect the size of the short term development for it requires about 1,000 rai with foundry included and 500 rai with foundry excluded. The foundry, however, is not acceptable at Laem Chabang in view of its possible impact on environment. Assuming that the project will be located in Laem Chabang without foundry, the Study Team proposes the revised frame as follows, which was accepted by the members of the Steering Committee,

SHORT TERM INDUSTRIAL FRAME

Item	GIE	EPZ	Total
1. Area (rai)			
gross	1,367	423	1,790
net	900	288	1,188
2. Employment	9,900	10,370	20,270
3. Area in operation	40%	52%	
4. Workers (active)	4,040	5,430	9,470

12. Candidate Type of Industries (EPZ & GIE)

12.1 GIE

Though there is still uncertainty about location of the proposed car manufacturing plan in Laem Chabang as mentioned above, it is hoped to be realized in some way. Judging from trend of market growth, type of activities, amount of investment, employment and its impacts on the related industries, it will become a nucleus factory in the GIE. Other types sounded to date with the concerned agencies are those manufactureres of

steel welded pipe, electric home appliances such as washing machine, refrigerator and air conditioner, prestressed concrete products and wooden furnitures. Also the result of the questionnaire survey conducted in last February indicates that non metalic minerals industry, electricla machinery, foods and textile industries are likely to locate in Laem Chabang for expansion and relocation.

12.2 EPZ

Among those industries stated in Section 6, the industry which deals with high technology products such as micro electronic devices and its related products is considered as one of promising industries in addition to the conventional type of EPZ industries. Their market is currently expanding rapidly worldwide and the BOI has been emphasing on promoting this type of industry in Thailand. Another promising new type of industry is such information processing related industry as printing, coding, punching and programming which requires labor intensive activities.

13. Facility Plan

The facilities of GIE & EPZ will have a direct and indirect influence on the incoming companies, their employess and visitors. They are chiefly designed to provide a broad range of services required for GIE & EPZ. Network of green belt in the GIE & EPZ is shown in Fig. I.14.1. At this time we will discuss these required facilities as to their contents and scale in the short term plan.

13.1 Facilities of GIE

(1) Estate Center

The following facilties will be incorporated into the Estate Center. The size of the land is 15,000m^2. About 50 people will work here and be in charge of the management and industrial services, engineering and sanitary operation of the Estate. The total floor space of the building is 1,400m^2 to accommodate IEAT office, an exhibition room, a library, a canteen, shops, repair workshop, etc. Parking and approach road require 8,700m^2. Garden space is 5,250m^2.

(2) GIE Sub center

There are three (3) sub-centers and each has about the same type of operations with 5,000m^2 of land space. There are a small meeting room, a small hall, a canteen, a shop etc. The total space of the building is 250m^2. Parking and approach road area is 250m^2. Garden space is 1,600m^2.

(3) Sports Park

The park is primarily used by the workers and employers of the Estate for such intra and inter company games and sports club activities of everyday but is also allowed for the neighboring communities until the proposed park at the urban center becomes operative. The total space is 30,000m^2 composed of a soccer court, a running track, swimming pools, tennis courts, basketball courts and Thai style football courts etc.

(4) Buffer Green Zone

A green belt buffer zone of 100 meters wide is secured along the Route No. 3 (Sukhumvit Road). The buffer zone could be developed as a golf course too not only for scenic amenity but also for attraction of businessmen and workers and for generation of upkeeping expenses. In these places where the topography permits rest areas and walkways is provided.

(5) Green Belt Along the Roads

A 25 meters wide green belt is secured along both sides of the main artery road. This green belt functions as a buffer to the industrial activities inside of the Estate and to give a feeling of safety to motorists.

13.2 Facilities of EPZ

(1) EPZ Center and Park

The following facilities is incorporated into the EPZ Center and Park. The size of the land is 21,000m^2. About 20 people will work here and be in charge of customs procedure and administration of the EPZ.

The total floor space of the building is 500m^2 where a customs office and IEAT office, a meeting room, a canteen, shops etc. are housed. Space for parking and approach road and a bus stop is 6,800m^2. Tennis courts. basketball court, Thai style football courts require 4,000m^2. Garden space is 9,700m^2.

(2) EPZ Sub-center

The size of the land is 7,200m^2 with the total floor space of the building of 250m^2 to have a guard house, a small hall, a canteen and shop. Space for parking and approach road and a bus stop is 4,750m^2. Garden space is 2,200m^2.

(3) EPZ Guard House

The size of the land is 6,000m^2 with the total floor space of the building of 50m^2. Space for parking, approach road and a bus stop is 3,860m^2. Garden space is 2,090m^2.

(4) Warehouse

The size of the land is 8,500m^2. The floor space of the building is 3,000m^2 surrounded by 1,000m^2 of approach raod and 4,500m^2 of turf and tree.

(5) Standard Factory Building (SFB)

There are two types of the SFB. A-type SFB is a single storey building with 810m^2 floor space in the land space of 3,000m^2. Eight (8) buildings are planned to be built. B-type SFB is a three storey building with the total floor space of 2,430m^2 in the land space of 6,000m^2. Four (4) buildings are planned to be built. Space for parking and approach road is 3,000m^2. There are an uncovered storage yard of 600m2 and 1,590m^2 of open space.

14. Land Use Plan

14.1 Basic Policy on Land Use Plan

The area required for the short term plan is 1,790 rai which is subdivided into 1,367 rai for GIE and 423 rai for EPZ.

The basic policy is to provide a good productive environment which is essential for formation of GIE and EPZ. In addition, attractive work environment and scenic beauty should be created in the estate itself.

It is planned that the estate should have a high level of service with higher land utilization efficiency and less development costs.

14.2 General Industrial Estate (GIE)

(1) Selection of the Area for Short Term Plan

In selecting optimal area for the short term, examinations were made of a range of factors, including natural and socio-economic conditions and infrastructural condition. The criteria for selection are as follows.

1. Easier land preparation from the topographical condition.
2. Better soil condition to allow speedy construction of factory building.
3. Easier access to the planned business and commercial area.
4. Shorter commuting distance for workers.

Based upon the above criteria, the area shown in Figure I.14.1 was selected for the short term development which has 1.367 rai in gross.

(2) Estate Center and Sub-Center

In order to provide such services as estate management, meeting, shopping, food catering, welfare and recreation within the estate, the estate center and sub-centers will be established.

The estate center is placed at southern zone facing the business and commercial area across the road. Taking into consideration walking distance from each factory, GIE sub-center is set in the central and northern zones.

The estate center occupied 1.5 hectares of land and has such facilities as IEAT office, assembly hall, canteen, shops, repair shop and parking lots. The GIE sub-center covers 0.5 hectares of land and has IEAT branch, a small meeting room, a canteen, a shop and parking lots.

(3) Factory Land

In order to ensure a proper balance between the productive and the non-productive space, the factory plot areas will be 60 percent to 70 percent of the total. The general policy for locating factories is not to assign them to sites divided by the artery road and channel and to place them together in as large plot as possible. As a result, approximately 280 rai (45 HA) along channel in the northern zone and 1,000 rai (160 HA) in remainder southern zone will be used for factory location as shown in Fig. I.14.2

Site for small scale industry and medium scale industry will have to be placed on both sides of north and south. Site for large scale industry (proposed car assembly plant requiring 500 rai) will have to be placed in the central zone.

A distinctive feature of the short term plan is that most of the factories are of small size of 2 to 8 rai. In locating factories, it is necessary to give special consideration to the units of this size. They will probably vary in size and their appearance from outside will not be very attractive if they are located randomly. Therefore those

small scale factories are best located at the inner portion of the estate where they will not be so conspicuous.

(4) Green Belt

Green belts are designed to be used to protect from fire, to provide visual distance, to improve the scenery, to conserve trees and to serve as recreation areas. Trees in the vicinity of the industrial estate shall be left as they are and lined up with channels so that they shall surround the entire estate. There is 100 meter wide green belt in the area along the Route No. 3 (Sukhumvit Rd.) and 25 meter wide strips along the intra-estate district roads (V_3).

(5) Park and Square

A large park of 6 hectares is located adjacent to the estate center and a square of 1.5 hectares will be provided next to the GIE sub-center. A large park will have facilities such as soccer field, tennis court, basketball court and swimming pool which could be used also by workers at the port area during the short term period as the planned central park in the urban area will not be made before 1991. A function of square is to provide rest for employees where they take a break.

(6) Local and Collector Road

Local roads which are to be classified as the vehicle-4, serve to distribute the traffic within the Industrial site. Collector roads to be classified as the vehicle-5 distribute the traffic within sub-district. These will be built on both zones of small and medium scale industry sites.

14.3 Export Processing Zone (EPZ)

(1) Selection of the Area for the Short Term Plan

In its future course of development, this area could become a major center of the Laem Chabang, being composed of the sea-borne traffic area,

the business area and the industrial area. An area of 423 rai in gross for the short-term development was selected to be as shown in Fig. I.14.? mainly for the following reasons. Firstly it becomes possible to develop a center of various kinds of activities by locating EPZ contiguous to the business and commercial area. Secondly EPZ is better to be linked with GIE to ensure an effective interaction of industrial goods between GIE and EPZ.

While this location is directly connected with the port area for convenience of security control and management through provision of overpass which is for exclusive use for transporting cargoes between EPZ and the port confined area.

(2) EPZ Center and Sub-Center

The EPZ center is placed at west side near the port and the sub-center will be located on central-south side near the business and commercial area. A gaurd gate is located on the east side near GIE.

The EPZ center with 1.5 hectares of land and will have such facilities as government office branch, IEAT office branch, trainning room, gaurd house, exhibition room, canteen, shops, parking lots and warehouse. The EPZ sub-center with 0.5 hectares of land will comprise IEAT office branch, gaurd house, small meeting room, canteen, shop and parking lots. The EPZ eastern guard gate will be located on 0.5 hectares of land and will have IEAT office branch, gaurd house, canteen, shop and parking lots.

(3) Factory Land

EPZ will be loosely composed of 16-32 rai size factories to 2-4 rai size factories and standard factory of less than 1 rai. Appropriate zone for locating these factories with different sizes are summarized as below.

Lot Size (Rai)	Zone
16 - 32	Central
6 - 8	northern
2 - 4	Both sides of south & north
Standard Factories	western

Standard factories will be placed on western zone. Total area allocated for standard factory building is 7 ha or 10 percent of EPZ area.

(4) Green Belt

Green belt are designed to be used to prevent, to improve the scenery. They shall surround the entire area of EPE. It will be able to watch closely through the green belt. There is 25 meter wide green belt along V_2, 12 meter wide strips of green belt along channel and collector road to allow regular guarding.

(5) Square

A square of 1.5 hectares with the same functions as the one for GIE will surround the EPZ sub-center.

(6) Local and Collector Road

Local and collector roads are in the both zone of 2-8 rai size factory zone and standard building factory zone. Local and collector road has the same wide as GIE.

(7) Standard Factory Building

The standard factory is a leased factory with a lot less than 1,000 m^2. Standard specifications will be applied to shape, size of the land and architectual style of the buildings. These factories shall be equiped with electricity, water supply, waste disposal, lighting, illumination, ventilation and sanitation facilities.

The purpose of this standard factory is to help develop small factories by providing the entrepreneurs with the required space for factory on rental basis. In addition, leased warehouses and transport services will be provided for the standard factory, so that even a small-sized enterprise will be able to have a very carefully

laid out facilities including common welfare facility for employees. Land use plan of EPZ is shown in Fig. I.14.4.

I4.4 Composition of Land Use for the Short Term Plan

In accordance with the policy for land use planning suggested in the Master Plan, the classified table for the Short Term Plan is shown below.

GIE

Item	Area (m^2)	Ratio (%)
1. Estate Center & sub.	40,000	1.8
2. Factory land	1,508,195	69.0
3. Green Belt	248,280	11.4
4. Park	75,000	3.4
5. Road	282,075	12.9
6. Channel	33,450	1.5
Total	2,187,000	100.0

EPZ

Item	Area (m^2)	Ratio (%)
1. EPZ Center & sub.	25,000	3.7
2. Factory land	461,025	68.1
3. Green belt	34,860	5.1
4. Park	15,000	2.2
5. Road	111,475	16.5
6. Channel	29,640	4.4
Total	677,000	100.0

15. For Realization of the Short Term Plan

The project is designed to develop a new population growth center in the Eastern Seaboard sub-region in order to promote regional development, to help restructure the country's industrial base and to contribute to help control the excessive growth of Bangkok. Development of commercial port, industrial estates and urban areas are all required to be integrated to sychronize effectively and efficiently to achieve the above goals. Industrial location as planned could not realize without a concerted efforts of all parties concerned. The followings are the actions to be taken for promotion of industrial location in Laem Chabang in addition to the points stated in 3.2.10.

1) Periodical publicity of the plan and progress of the development to the members of Thai economic organizations such as Thai Association of industries, Thai Chamber of Commerce and resident foreign businessmen's associations.

2) To proceed into detailed engineering design to facilitate implementation as schedule and to formulate a pricing policy with accurate land sale prices.

3) To establish further incentive package if necessary after further studies on strategic types of industries for their location are made. Possible competition with the EPZ's in the neighboring countries particularly with the China's Special Economic Zones.

4) Early announcement of the container terminal operators and new shipping tariff rates to convince the investors the advantage and certainty of the Laem Chabang port operation.

5) Preparation of the inventory of the existing and potential labor resources showing quantity and quality that will become available around 1987 onwards.

6) Further study on viability of converting the Utapao airport into a regular international aircargo terminal to attract the multi-national high technology industries.

7) In order not to miss opportunity to promote early settlement of the factories in Laem Chabang at pre-development and development stages, consideration should be taken to allow those investors requiring small and medium plots for urgent occupancy. The area deemed appropriate to accommodate is the northern portion of GIE under the short term plan and the provisional infrastructures are required to be made.

Table I.1.1 MANUFACTURED EXPORTS BY SITIC CATEGORY
(Thousand US$)

SITC	Category	1968	1973	1979	Share(%) 1968	Share(%) 1973	Share(%) 1979	Growth (% p.a.) /a 1968-73	Growth (% p.a.) /a 1973-79	Growth (% p.a.) /a 1968-79
51	Chemical elements	177	1,060	5,951	0.8	0.4	0.5	43.0	33.3	37.6
53	Dyes - tanning	11	73	1,164	-	-	0.1	46.0	59.1	53.0
54	Medicinal products	443	2,256	13,284	2.0	0.9	1.1	38.5	34.4	36.2
55	Perfume products	153	815	2,650	0.7	0.3	0.2	39.7	21.7	29.6
56	Fertilizer AFS	1	76	-	-	-	-	-	-	-
58	Plastic materials	4	1,405	9,666	-	0.6	0.3	222.9	37.9	103.3
59	Chemicals NES	59	2,145	1,742	0.3	0.9	0.2	105.2	-3.4	36.0
61	Leather, etc.	201	5,185	20,096	0.9	2.1	1.7	91.6	25.3	52.0
62	Rubber manufactures	274	2,028	16,200	1.2	0.8	1.4	49.2	41.4	44.9
63	Wood manufactures	904	21,481	65,300	4.1	8.8	1.6	88.4	20.4	47.6
64	Paper and paperboard	143	3,031	7,458	0.6	1.2	0.6	84.2	16.2	43.3
65	Textile yarn and cloth	7,496	87,847	341,833	34.1	36.0	9.5	63.6	25.4	41.3
66	Nonmetallic minerals	8,153	50,082	130,096	37.1	20.3	11.2	43.8	17.2	28.6
67	Iron and steel	800	6,607	21,816	3.7	2.7	1.9	52.5	22.0	35.1
69	Metals - Misc.	507	6,810	32,393	2.3	2.8	2.0	68.1	29.7	45.9
71	Nonelectric machinery	137	1,707	1,632	0.6	0.7	0.1	65.6	-0.7	25.3
72	Electric machinery	219	1,756	148,577	1.0	0.7	12.8	51.6	109.5	80.9
73	Transport equipment	58	685	4,667	0.3	0.3	0.4	63.9	37.7	49.0
81	Plumbing equipment	26	373	3,020	0.1	0.2	0.3	70.4	41.7	54.1
82	Furniture	25	1,477	19,875	0.1	0.6	1.7	126.1	54.2	83.5
83	Travel goods	120	362	10,167	0.6	0.2	0.4	14.7	74.3	49.7
84	Clothing	1,025	34,474	209,066	4.7	14.1	18.1	102.0	35.0	62.2
85	Footwear	21	209	8,808	0.1	0.1	0.8	58.3	86.5	73.2
86	Instruments	5	2,645	14,705	-	1.1	1.3	250.5	33.1	106.7
89	Misc. manufactures	1,020	9,670	67,313	4.6	4.0	5.8	56.8	38.2	46.4
	Total Manufactured Exports	21,982	244,259	1,157,499	100.0	100.0	100.0	61.9	29.6	43.6

/a End point compound growth rates.

Table I.1.2 Import Statistics by Kind of Commodity

unit: million baht

Commodity \ Year	1960	1970	1975	1977	1978	1979	1980	1981
A. Consumer's goods	3,365	5,299	8,455	11,144	12,942	15,933	19,286	22,899
	(35.0)	(19.4)	(12.7)	(11.8)	(11.9)	(10.9)	(10.2)	(10.6)
1. non durable	2,258	3,486	5,148	6,346	7,544	9,343	12,257	13,473
2. durable	807	1,743	3,307	4,768	5,398	6,590	7,029	9,485
B. Raw Materials & Intermediate goods	1,746	6,725	16,105	26,921	29,598	43,500	45,312	53,349
	(18.1)	(24.9)	(24.1)	(28.6)	(27.2)	(29.8)	(24.0)	(24.7)
1. consumption goods use	1,030	4,139	10,318	16,060	16,937	26,108	28,182	33,637
textile	60	602	1,902	3,134	2,236	3,189	3,175	3,880
2. capital goods use	716	2,586	5,787	10,861	12,661	17,392	17,130	19,712
iron & steel	568	1,647	3,236	6,352	7,765	10,035	10,335	11,922
C. Capital goods	2,367	9,371	22,239	24,393	31,317	39,902	46,075	56,664
	(24.6)	(34.7)	(33.3)	(25.9)	(28.8)	(27.3)	(24.4)	(26.2)
gene. machinery	1,021	4,723	11,973	12,592	15,894	18,648	20,402	25,778
electrical machinery	334	1,419	2,730	3,555	5,836	7,355	11,206	10,928
D. Others	2,144	5,684	20,036	31,749	35,042	46,826	78,013	83,335
	(22.3)	(21.0)	(30.0)	(33.7)	(32.2)	(32.0)	(41.3)	(38.5)
automobile	-	2,204	4,542	7,958	7,550	7,126	6,912	9,437
petroleum products	-	2,329	14,233	20,889	22,851	32,647	58,733	56,040
	9,622	27,009	66,835	94,177	108,899	146,161	188,686*	216,246*
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Bank of Thailand ( ) denotes share in percentage

Table I.6.1 TRENDS OF PRODUCTION OF THE MAJOR COMMODITIES BY INDEX

1970=100

	Commodity	Year	1970	1975	1976	1977	1978	1979	1980	1981	1982
A.	Foods & Tobacco										
	1. Sugar		100	272	394	580	109	453	210	409	680
	2. Beer		100	169	206	284	298	430	342	290	335
	3. Monosodium Glutamate		100	156	143	459	174	163	89	-	-
	4. Condensed Milk		100	123	137	143	147	152	139	138	119
	5. Tobacco		100	148	161	154	156	178	201	215	176
B.	Textile & Paper Products										
	1. Cotton Textile		100	165	199	205	218	224	235	240	243
	2. Synthetic textile		100	469	507	641	807	889	942	1037	1043
	3. Gunny bags		100	204	184	211	275	319	338	333	319
	4. Printing & writing equip.		100	79	91	111	120	141	138	-	-
C.	Building Materials										
	1. Cement		100	110	123	141	140	145	148	174	183
	2. Plywood		100	99	96	145	157	146	148	140	130
	3. Vinyl Floor Tile		100	93	135	160	223	265	-	-	-
D.	Chemicals										
	1. Petroleum products		100	197	217	226	230	241	87	221	381
	2. Detergent		100	187	203	219	226	270	312	289	311
	3. Fertilizer		100	385	449	363	0	0	-	-	-
	4. Sodium Silicate		100	456	451	513	536	662	-	-	-
	5. Sulfuric Acid		100	252	278	321	402	321	234	-	-
	6. Hydrochloric Acid		100	176	188	227	211	241	230	-	-
	7. Caustic Soda		100	172	187	199	190	204	190	-	-
E.	Iron & Steel										
	1. Pig Iron		100	125	170	181	195	221	160	-	-
	2. Galvanized Iron Sheets		100	97	104	119	99	119	113	117	148
	3. Tin Plate		100	102	247	340	414	610	661	742	586
F.	Transportation Equipment										
	1. Passenger cars		100	235	232	270	355	327	355	404	373
	2. Commercial vehicle		100	381	795	1164	1098	1111	1244	1489	1296
	3. Motor cycle			100	123	178	227	291	338	364	349
	4. Passenger car tire		100	141	144	191	211	200	197	180	157
	5. Truck tire		100	172	206	252	276	307	289	321	249
	6. Tractor tire		100	124	160	163	163	162	123	215	189

Bank of Thailand Quaterly 1983.3

TABLE I.6.2 WAGE LEVELS IN MANUFACTURING IN SELECTED ASIAN COUNTRIES

(US$ per Month)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
THAILAND	26.90	31.24	33.78	37.12	43.99	44.60	45.60	70.57	79.10	79.87
SOUTH KOREA	56.06	74.42	79.29	106.79	142.91	191.96	246.93	241.78	258.69	276.44
PHILIPPINES	44.55	46.70	46.08	60.84	68.67	74.62	78.30	79.94[e]	N.A.	N.A.
SINGAPORE	88.40	103.40	123.14	123.88	131.17	150.39	173.82	198.95	236.67	255.14
MALAYSIA	77.76	90.98	98.27	99.44	111.32	127.81	146.23	N.A.	N.A.	N.A.
TAIWAN	66.62	89.30	106.17	124.03	146.09	177.77	210.62	255.78	291.82	299.97
HONG KONG	104.96	114.05	115.82	144.64	162.30	175.88	200.74	219.49	229.78	225.67

Note : N.A. = Not Available

Source : UN Yearbook of Labour Statistics, 1983., Philippine Statistics Year Book, 1980 and "Social and Economic Trend 1970 - 1980", Census and Statistics Department, Hong Kong.

Table I.6.3 STRUCTURE AND GROWTH OF MANUFACTURING

Sector	Type	Value added /b			Growth (% per year)			Share in manuf. current prices (%)		
		1975	1978	1980	1975-78	1978-80	1975-80	1975	1978	1980
Processed food	C	6,810	8,380	8,598	7.2	1.3	5.8	23.7	17.2	14.5
Beverages	C	3,348	5,585	5,890	18.6	2.7	12.0	7.9	8.7	8.2
Tobacco and snuff	C	3,444	3,610	4,601	1.6	12.9	6.0	8.4	6.7	5.9
Textile	C	5,058	7,197	8,839	12.5	10.8	11.8	8.7	8.6	8.8
Wearing apparel	C	2,680	4,560	5,566	19.4	10.5	15.7	7.7	9.2	10.5
Leather, leather products	C	326	317	315	-0.9	-0.3	-0.7	0.7	0.5	0.4
Wood and cork	C	942	815	829	-4.7	0.9	-2.5	2.8	2.2	2.4
Furniture and fixtures	C	268	351	353	9.4	0.3	5.7	1.0	1.0	0.9
Paper and paper products	B	341	732	959	29.0	9.4	23.0	0.7	1.1	1.2
Printing and publishing	C	1,026	1,412	1,665	11.2	8.6	10.2	2.8	2.1	2.2
Chemicals and chemical products	B	1,840	3,544	5,035	24.4	19.4	22.4	4.4	5.8	6.8
Petroleum	B	2,782	3,246	3,108	5.3	-2.1	2.2	9.1	8.4	10.8
Rubber and rubber products	C	903	1,386	1,611	15.4	7.8	12.3	2.1	2.5	2.3
Nonmetallic mineral products	B	2,192	3,193	3,387	13.4	3.0	9.1	5.1	6.5	6.4
Basic metal products	B	408	577	710	12.2	10.9	11.7	1.8	2.2	2.0
Metal products	B	519	488	632	-2.0	13.8	4.0	1.7	2.3	1.2
Machinery	A	621	872	1,102	12.0	12.4	12.2	1.5	1.3	1.2
Electrical machinery	A	468	989	1,237	28.3	11.8	21.5	1.2	2.3	2.3
Transport equipment	A	2,387	4,141	4,812	20.3	7.8	15.1	6.7	9.1	8.5
Miscellaneous	C	792	1,126	1,348	12.4	9.4	11.2	2.1	2.3	2.5
Total Manufacturing		37,146	52,251	60,597	12.2	7.4	10.3	100.0	100.0	100.0
GDP		204,056	261,097	292,852	8.6	5.9	7.5	18.3/a	18.9/a	19.6/a

/a Share of manufacturing in GDP.

/b Million baht in 1972 prices.

Source: NESDB

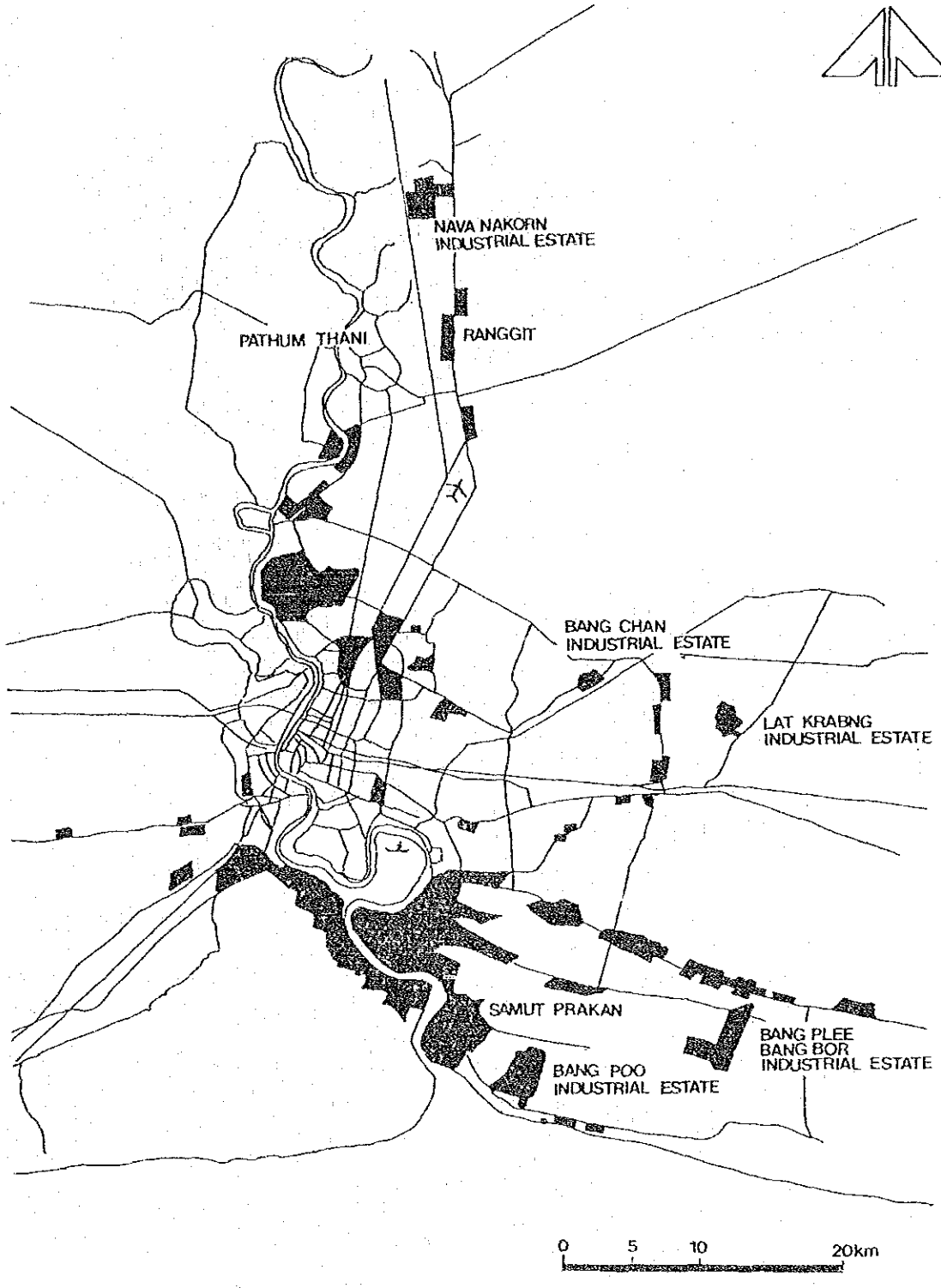
C = consumer related

B = basic material

A = assembly & processing

Table I.8.1 EXISTING LAND USE

	thousand m^2	
Total area of IEAT	4,500	100.0 %
Paddy field	1,958	43.5
Coconut field	187	4.2
Cassava field	2,194	48.7
Residential land	109	2.4
Road	17	0.4
Pond & Marsh	22	0.5
Grass land	13	0.3



LEGEND

FACTRIES

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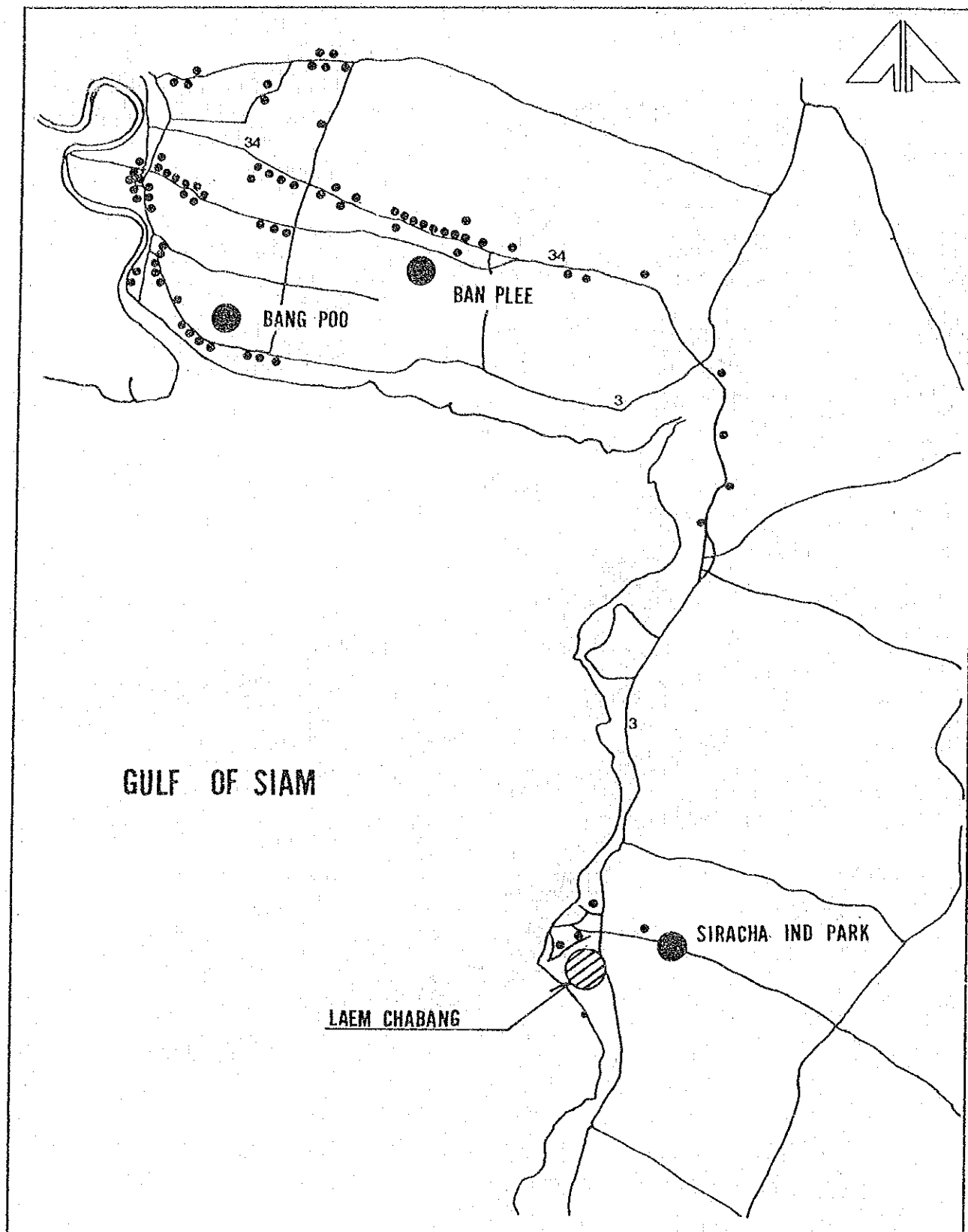
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. I.2.1
Trend of Industrial Location (BKK)



LEGEND

- FACTORY
- INDUSTRIAL ESTATE

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Fig. I.2.2
Trend of Industrial Location along R-34 & R-3

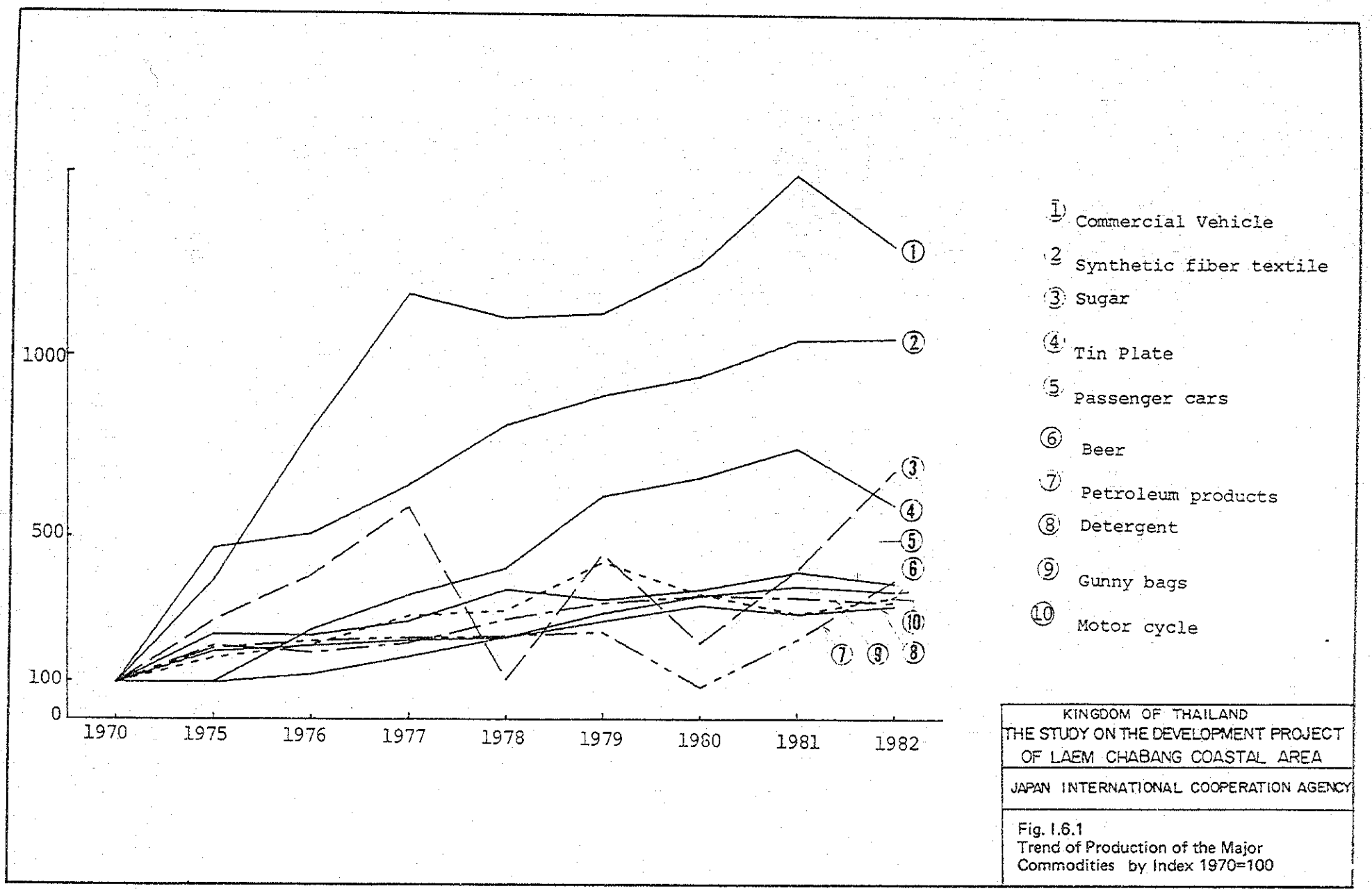

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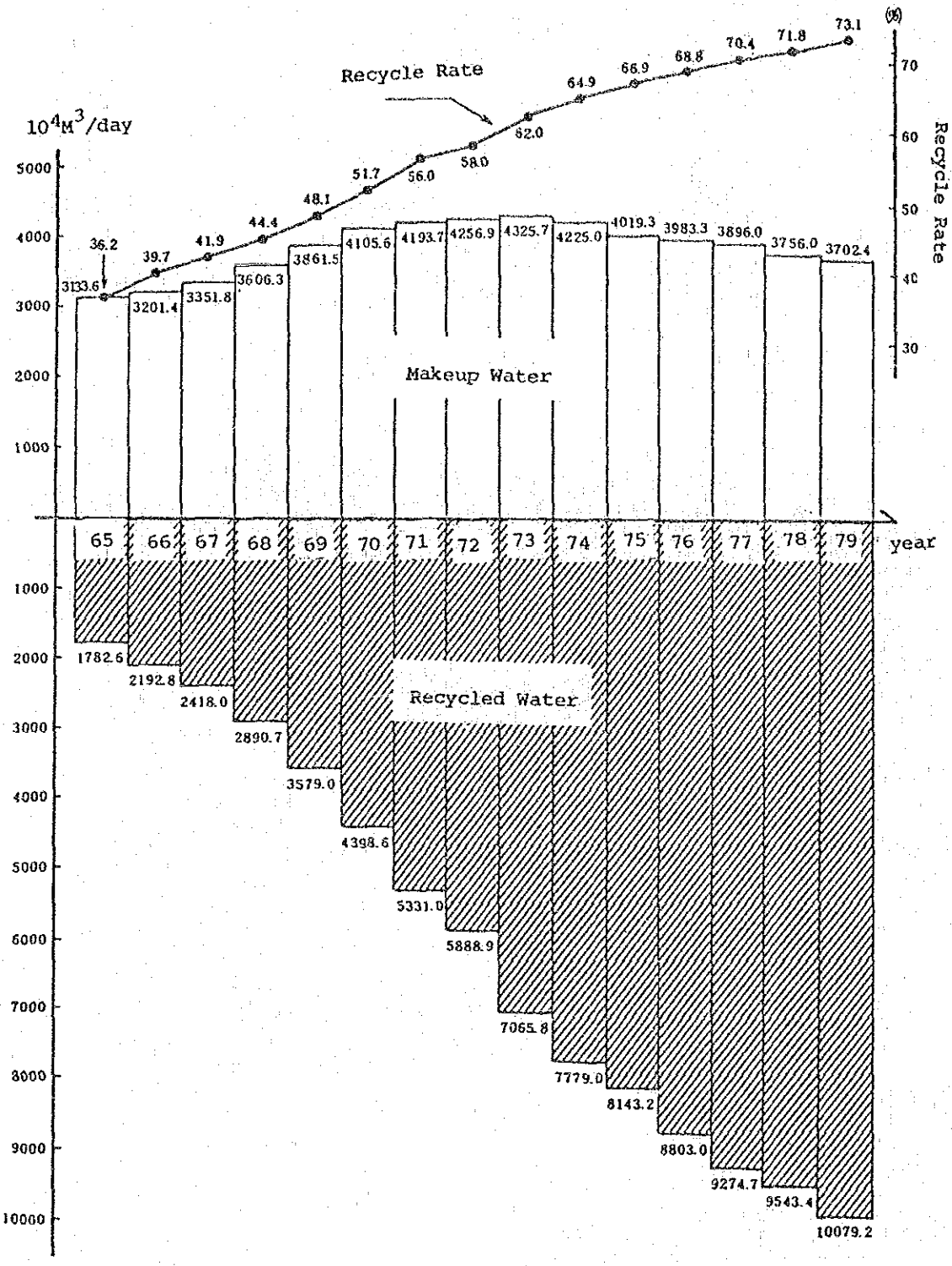
Fig. I.6.1
Trend of Production of the Major Commodities by Index 1970=100



LEGEND

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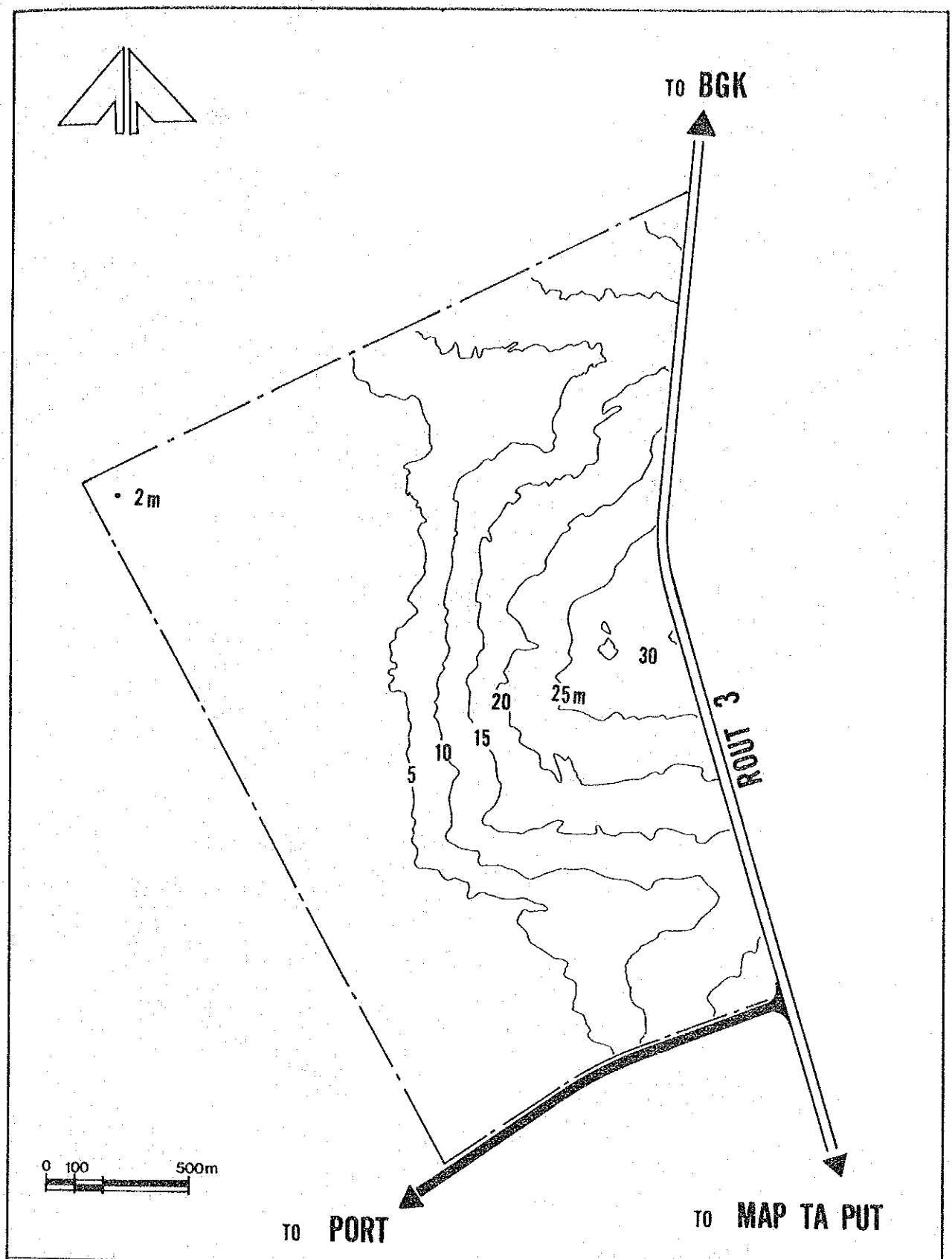
Fig. I.7.1
Change in Water Recycle in Japan



LEGEND

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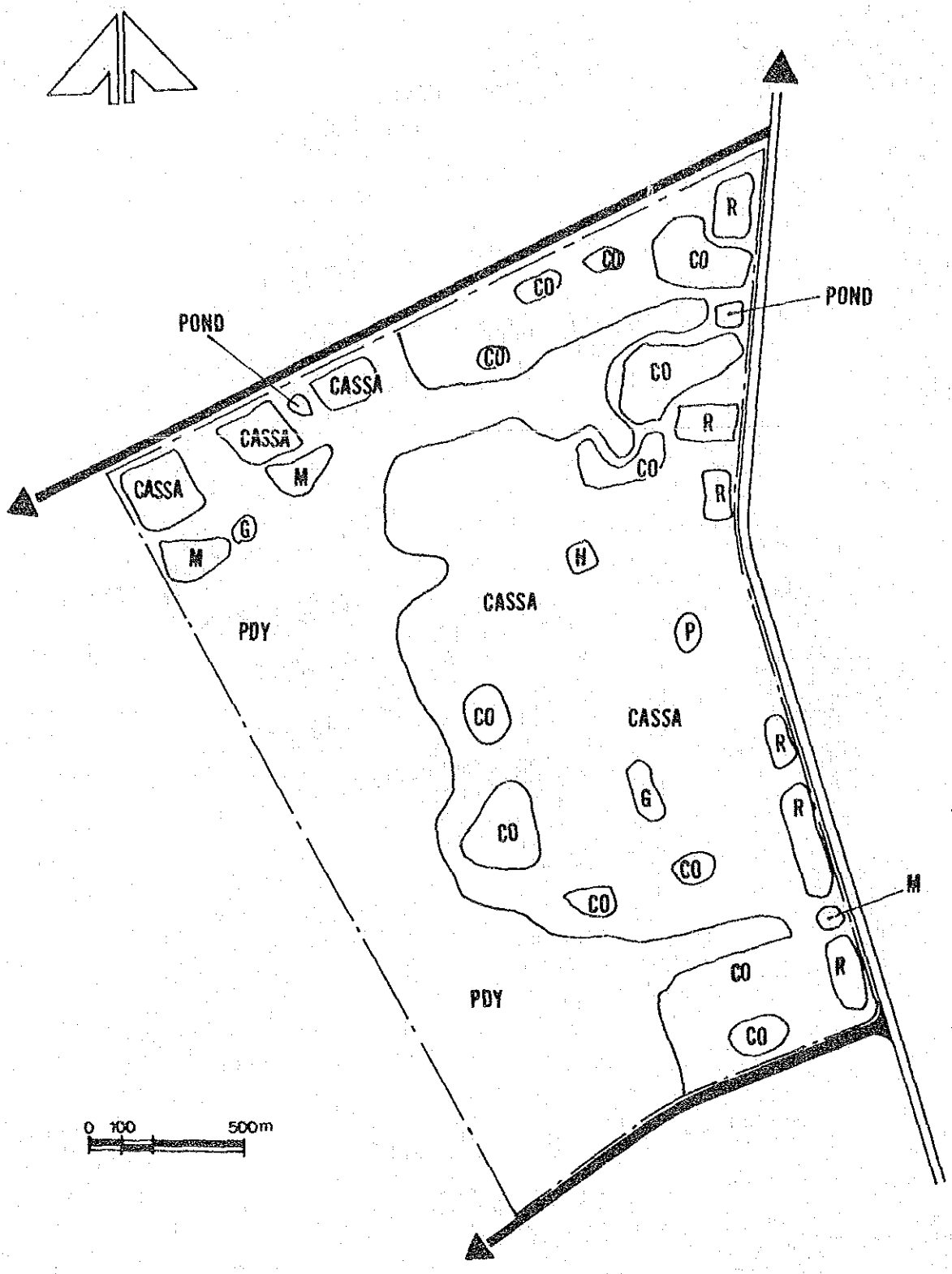
Fig. I.8.1
Topography



LEGEND

PDY	:	PADDY FIELD
CO	:	COCONUT FIELD
CASSA	:	CASSAVA FIELD
R	:	RESIDENTIAL LAND
G	:	GRASS LAND
POND	:	POND
M	:	MARH

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THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA

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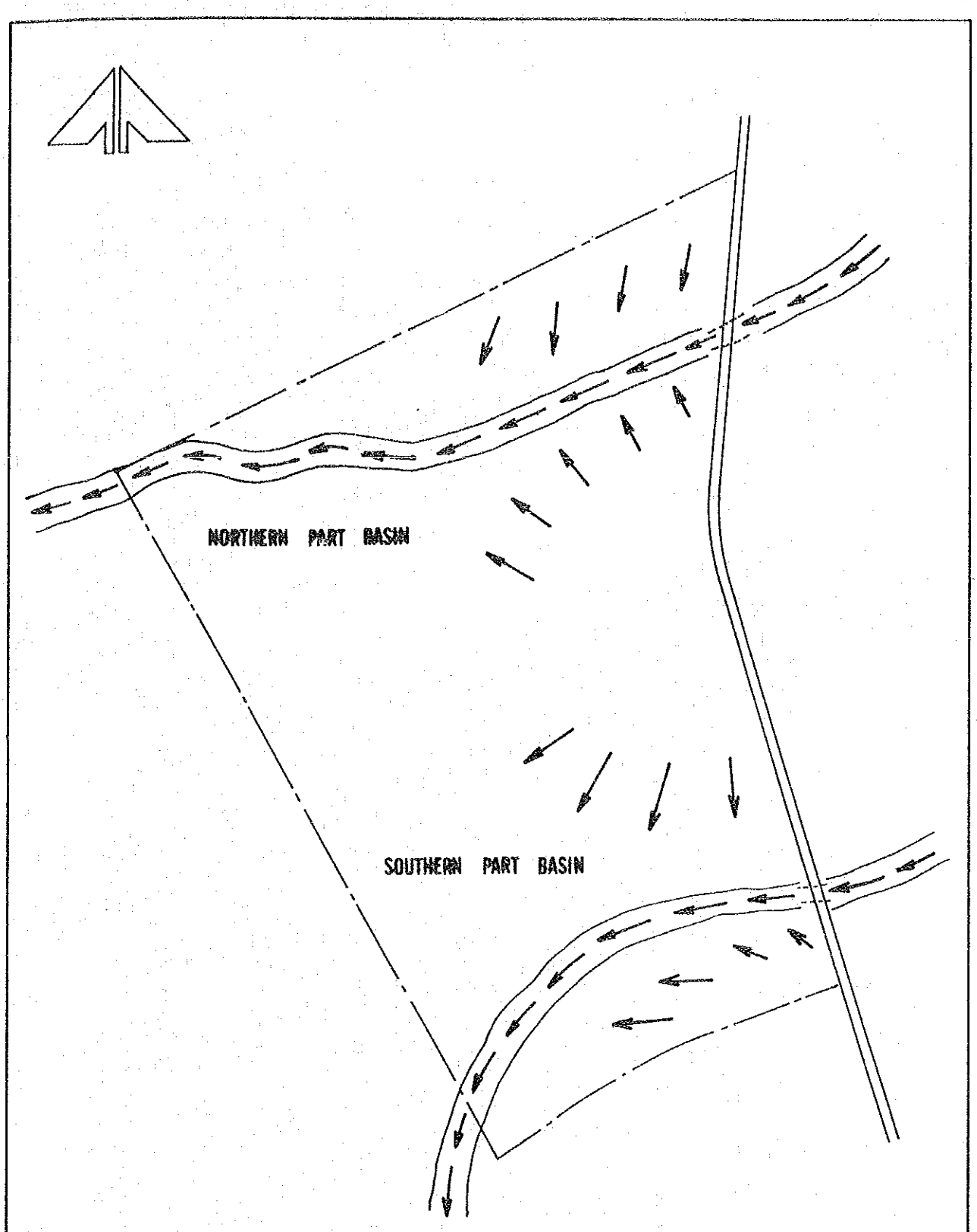
Fig. I.8.2
Existing Land Use



LEGEND

KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA

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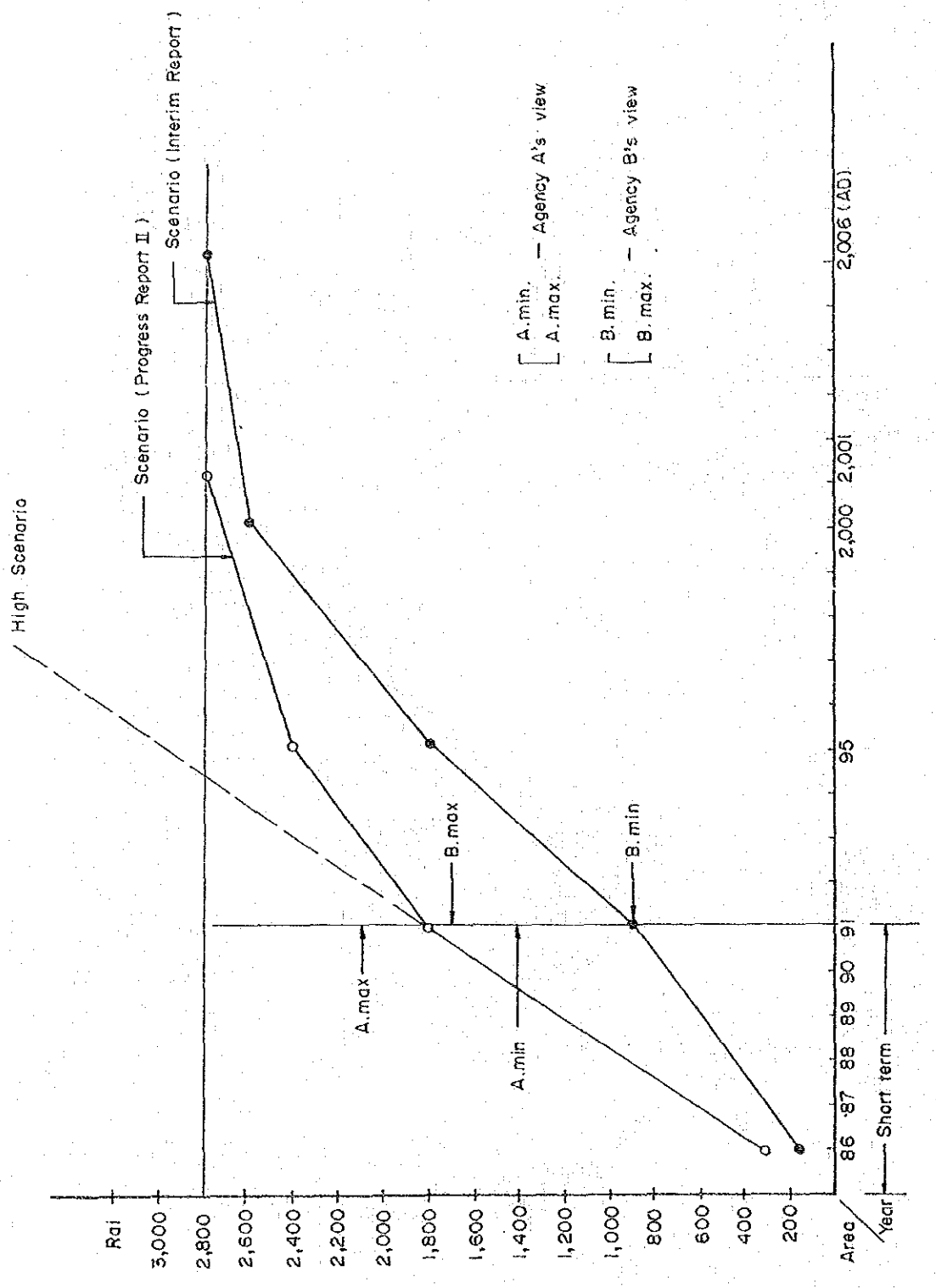
Fig. I.8.3
River & Stream



LEGEND

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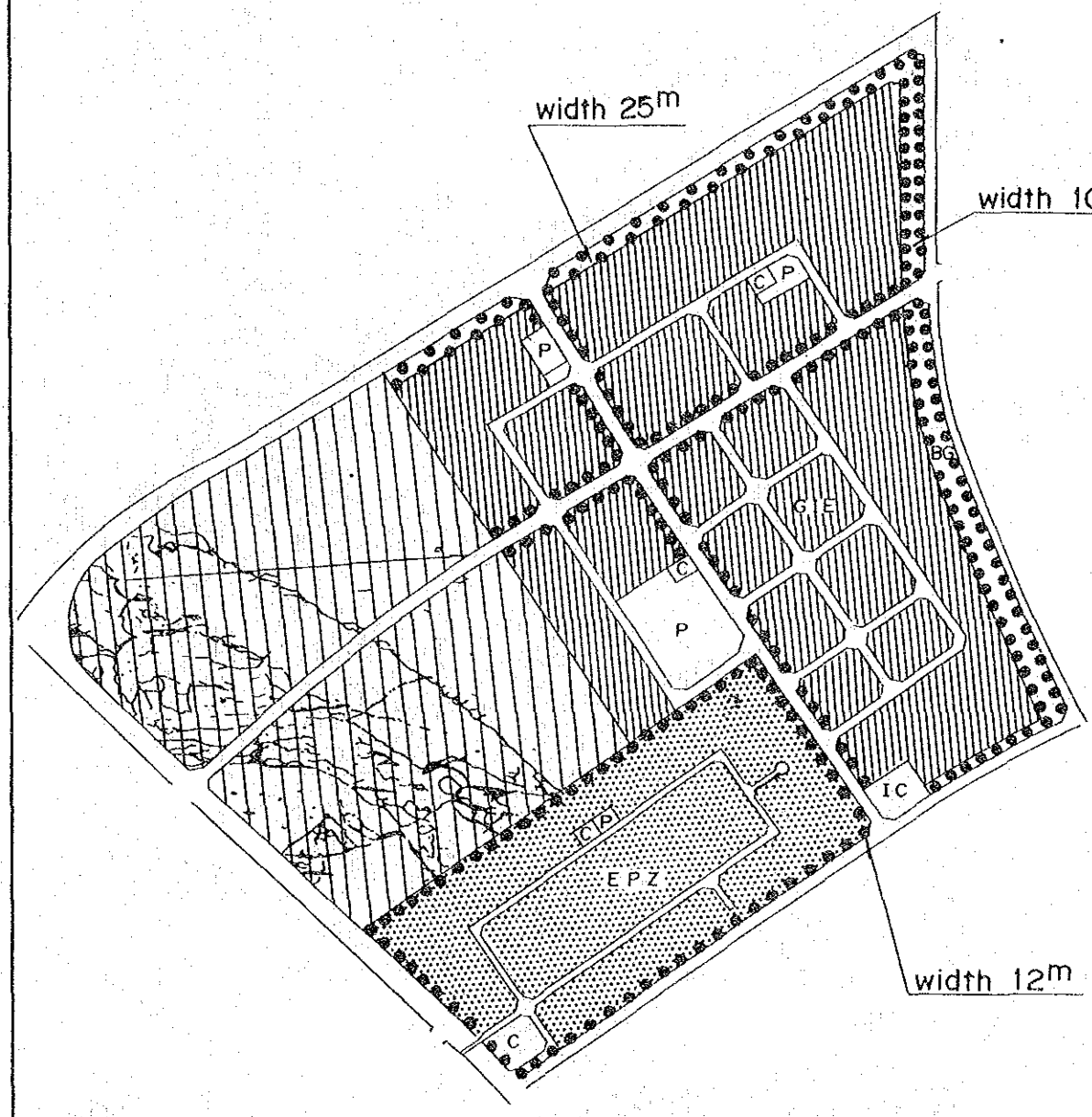
Fig. I.11.1
Industrial Development Scenarios



LEGEND

width 100m

width 25m

width 12m

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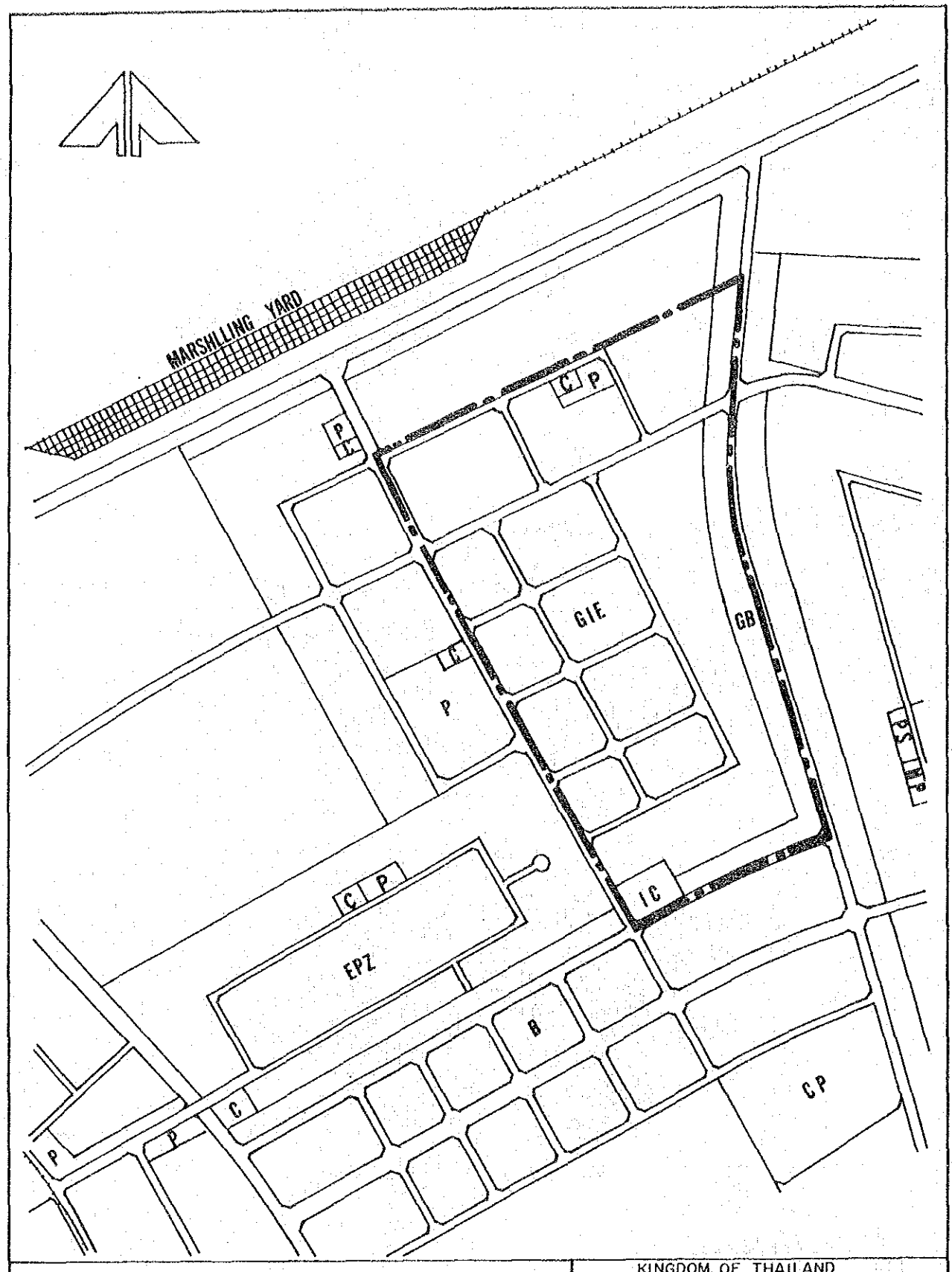
Fig. I.14.1
Network of Greenbelt in the GIE & EPZ



LEGEND

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THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA

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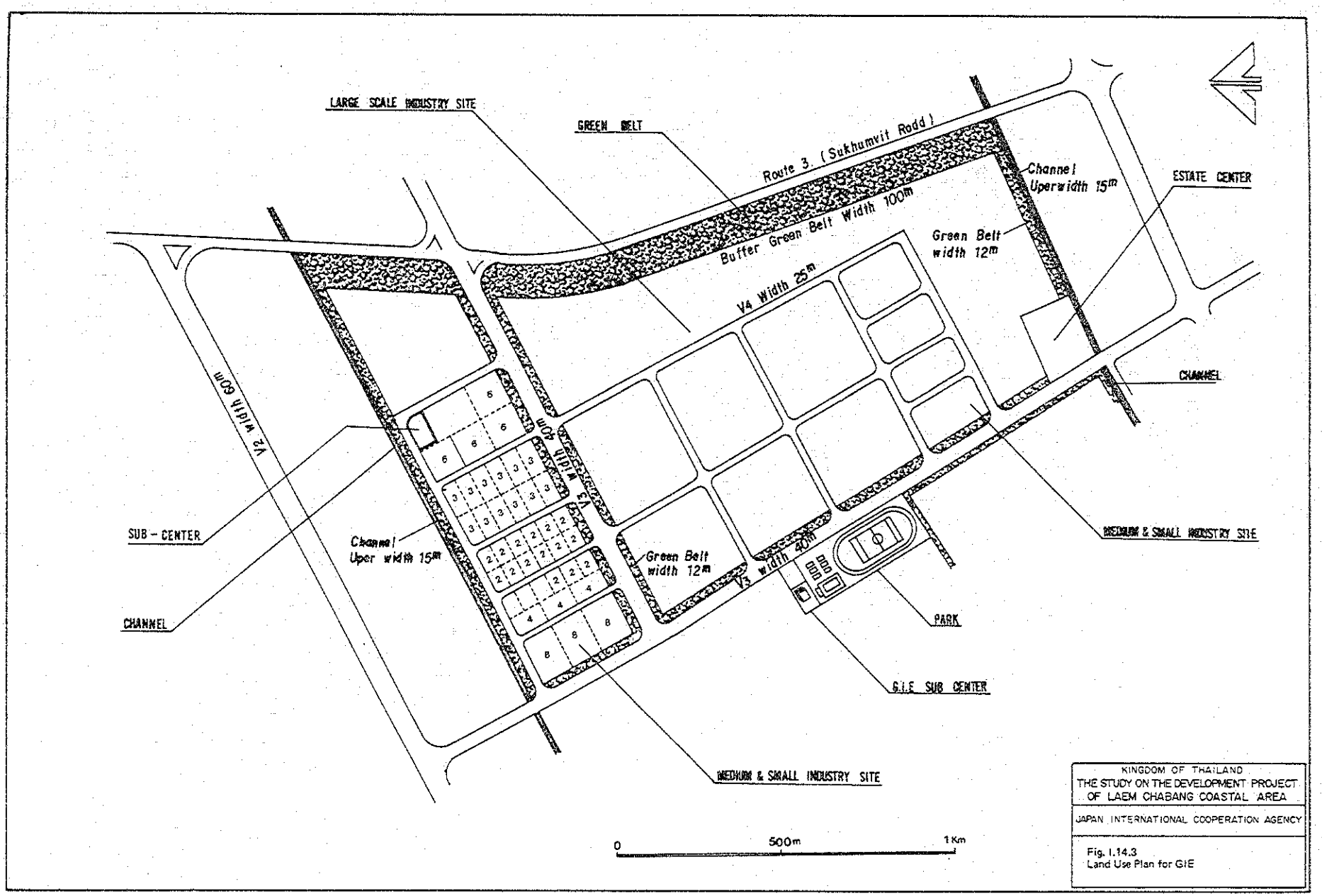
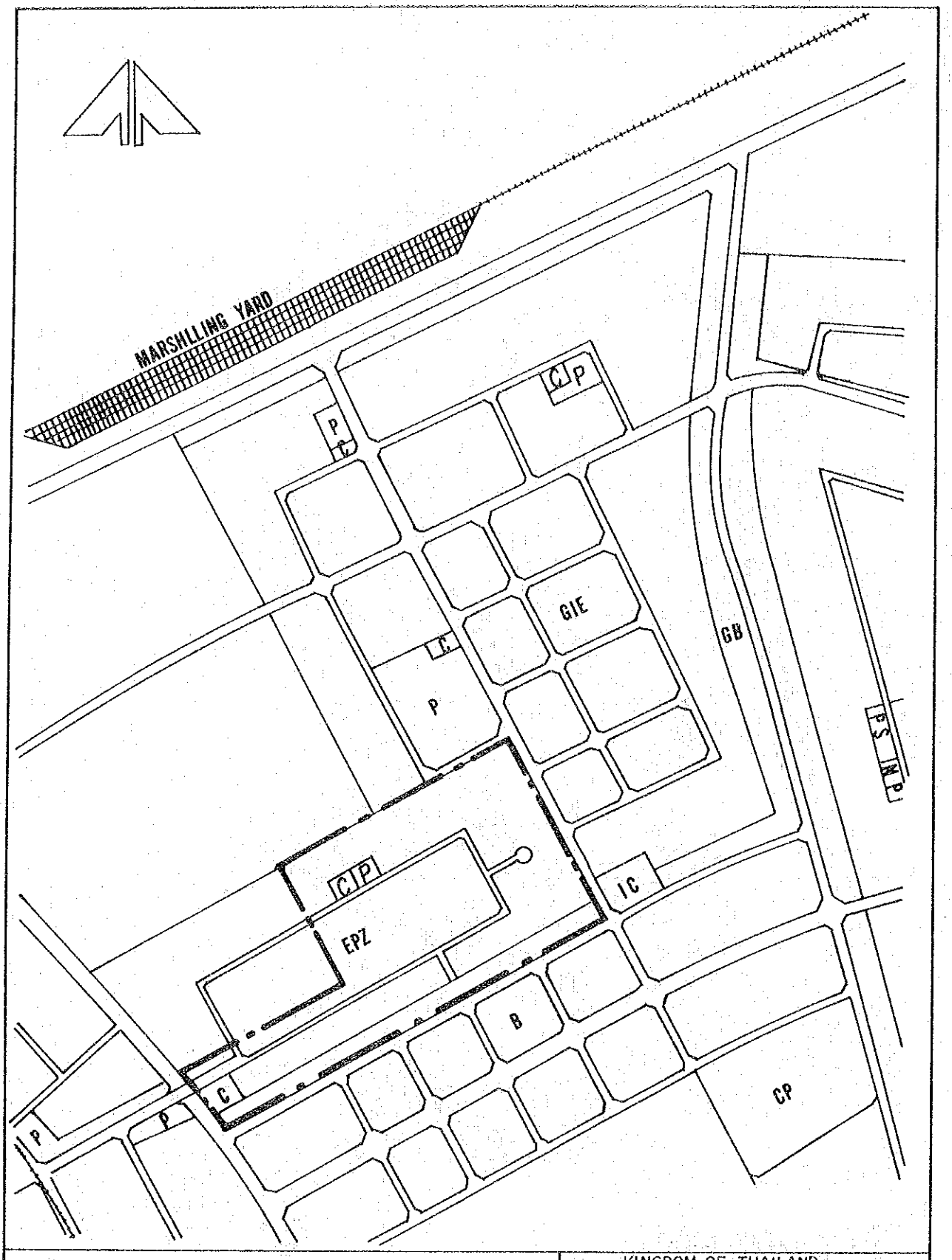
Fig. I.14.2
Selected Site for GIE


LARGE SCALE INDUSTRY SITE
GREEN BELT
Route 3 (Sukhumvit Road)
Buffer Green Belt Width 100m
Channel Uperwidth 15m
ESTATE CENTER
Green Belt width 12m
V4 Width 25m
CHANNEL
V2 Width 60m
V3 Width 40m
SUB - CENTER
Channel Uper width 15m
Green Belt width 12m
V3 width 40m
MEDIUM & SMALL INDUSTRY SITE
CHANNEL
PARK
G.I.E SUB CENTER
MEDIUM & SMALL INDUSTRY SITE
0
500m
1 Km
KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. I.14.3
Land Use Plan for GIE



LEGEND

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THE STUDY ON THE DEVELOPMENT PROJECT OF LAEM CHABANG COASTAL AREA

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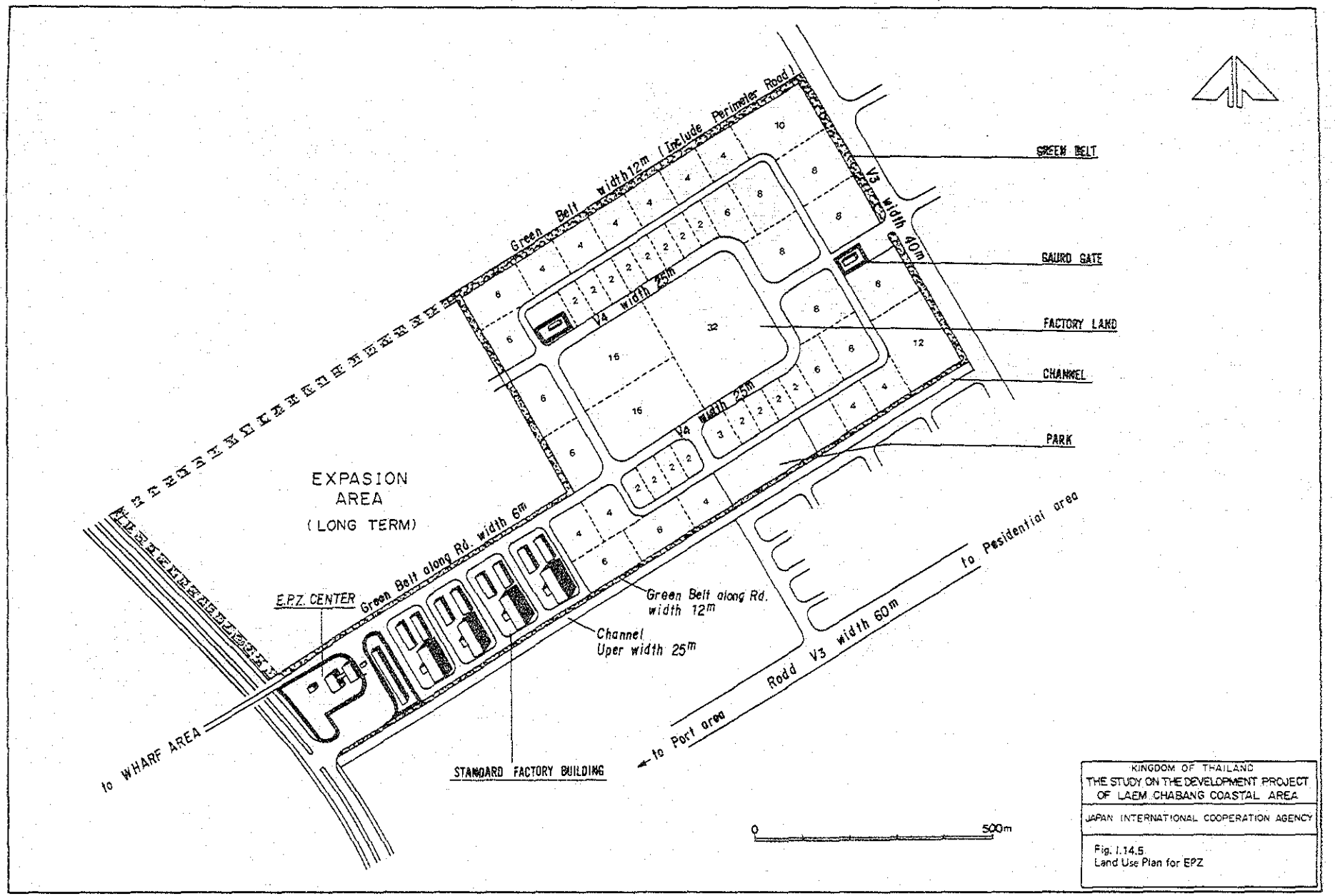
Fig. I.14.4
Selected Site for EPZ


GREEN BELT
SAURD GATE
FACTORY LAND
CHANNEL
PARK
Green Belt width12m (Include Perimeter Road)
V3 width 40m
V4 width 25m
V4 width 25m
EXPASION
AREA
(LONG TERM)
E.P.Z. CENTER
Green Belt along Rd. width 6m
Green Belt along Rd.
width 12m
Channel
Uper width 25m
STANDARD FACTORY BUILDING
to WHARF AREA
to Port area
Rodd V3 width 60m
to Pesidential area
0
500m
KINGDOM OF THAILAND
THE STUDY ON THE DEVELOPMENT PROJECT
OF LAEM CHABANG COASTAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY
Fig. I.14.5
Land Use Plan for EPZ

A P P E N D I X

APPENDIX I-I INDUSTRIAL LOCATION SURVEY (LEAM CHABANG INDUSTRIAL ESTATE)
แบบสอบถามเพื่อการสำรวจที่ตั้งของอุตสาหกรรม (โครงการนิคมอุตสาหกรรมแหลมฉะบัง)

I Identification of Industry _____
ประเภทของอุตสาหกรรม

Name of Company : _____
ชื่อบริษัท

Address : _____
ที่ตั้ง

Phone Number : _____ (Number of Phone owned)
หมายเลขโทรศัพท์ มีโทรศัพท์หมาย ลข

Category of Industry : _____
ประกอบอุตสาหกรรมประเภท

Number of Workers : _____
จำนวนคนงาน

(1) Permanent
คนงานประจำ _____ คน

(2) Casual
ลูกจ้างชั่วคราว _____ คน

Factory land area _____ m^2
เนื้อที่ของโรงงาน ตารางเมตร

II Products (1983, if not available 1982)
ผลิตภัณฑ์ (ตามสถิติของปี 2526 หากไม่อาจหาได้ให้ใช้ของปี 2525)

	Name รายชื่อผลิตภัณฑ์	Quantity ปริมาณการผลิต	Sales รายได้
1.	_____	_____ ton/month or m^3/month	฿
2.	_____	_____ ตัน/เดือน หรือ ลบ.ม./เดือน	฿
3.	_____	_____ " — "	฿

Raw material
วัตถุดิบที่ใช้ในการผลิต

	NAME รายชื่อ	QUANTITY ปริมาณ	
1.	_____	_____	ton/month or m^3/month
2.	_____	_____	ตัน/เดือน หรือ ลบ.ม./เดือน
3.	_____	_____	" _ "

Market of total products (%)
ตลาดที่จำหน่ายผลิตภัณฑ์ (%)

1. Domestic จำหน่ายภายในประเทศ _____ %
2. Export จำหน่ายต่างประเทศ _____ %

III Utility สาธารณูปโภค

Water Consumption : _____ m^3/month
ปริมาณน้ำที่ใช้ในการผลิต ลบ.ม./เดือน

Electricity : _____ Contracted (kw)
ปริมาณการใช้ไฟ (กิโลวัตต์)

IV (1) Transportation of Product:
การขนส่งผลิตภัณฑ์

Mode แบบ	Quantity ปริมาณ
Truck รถบรรทุก	_____
Train รถไฟ	_____
Vessel เรือ	_____
Others อื่นๆ	_____

(2) Transportation of Raw Material:
การขนส่งวัตถุดิบ

Mode แบบ	Quantity ปริมาณ
Truck รถบรรทุก	_____
Train รถไฟ	_____
Vessel เรือ	_____
Others อื่นๆ	_____

V In case of new investment, What are the important factors choosing your plant site ?
ในกรณีที่ต้องการลงทุน ท่านจะเลือกอะไรเป็นปัจจัยสำคัญในการตั้งโรงงาน ?

(1) Availability of Raw materials
มีวัตถุดิบพอเพียง

(2) Availability of Labor (skilled & unskilled)
มีแรงงาน (คนงาน และ ลูกจ้าง) พอเพียง

(3) Site (large space, low cost of land)
สถานที่ (กว้างใหญ่และราคาที่ดินถูก)

(4) Accessibility to market
มีตลาดพอเพียงที่จะส่งผลิตภัณฑ์ไปจำหน่าย

(5) Availability of Utility (water, electricity, telephone)
มีระบบสาธารณูปโภคพอเพียง (น้ำประปา, ไฟฟ้า, โทรศัพท์)

(6) Access Road (major highway)
มีถนนพอเพียง (ถนนสายหลัก)

(7) Others (Specify)
อื่นๆ (โปรดระบุ)

VI Do you face problems or inconvenience at the present location ?
ทานประสบกับปัญหาหรืออุปสรรคในโรงงานที่ตั้งอยู่ในปัจจุบันหรือไม่ ?

(1) Lack of space
เนื้อที่จำกัด

(2) Complaints from neighbors about the industrial pollution as shown below
คำร้องเรียนจากบ้านใกล้เรือนเคียง เรื่องมลภาวะที่เกิดจากโรงงานดังกล่าวข้างล่าง

air water noise vioration etc.
อากาศเป็นพิษ น้ำเป็นพิษ เสียงรบกวน ทำความเสียหาย อื่นๆ

(3) Difficult to obtain labor (skilled & unskilled)
ปัญหาขาดแคลนแรงงาน (คนงาน และ ลูกจ้าง)

(4) Inadequate supply of water, electricity etc.
ปัญหาขาดแคลนน้ำประปา, ไฟฟ้า

(5) Others (Specify)
อื่นๆ (โปรดระบุ)

Do you have a plan to invest by 1987 ?
ทานมีแผนการณ์ที่จะลงทุนในปี 2530 หรือไม่

Yes มี No ไม่มี

New investment is :-
การลงทุนในทัศนคติของทานหมายถึง

(1) Expansion of axisting factory
การขยายโรงงานที่มีอยู่ในปัจจุบัน

(2) New branch factory at new location
การตาสาขาใหม่ในที่แห่งใหม่

(3) Relocation of the present factory
การยายโรงงานเดิม

VII Do you have any special area for your plant site in your mind ?
ท่านเลือกสถานที่ตั้งของโรงงานไว้แล้วหรือยัง ?

(1) already acquired
ซื้อไว้เรียบร้อยแล้ว

(2) already decided
ตัดสินใจไว้แล้ว

(3) not decided
ยังไม่ได้ตัดสินใจ

If (1) and (2) : where _____
ถ้าเลือกข้อ (1) และ ข้อ (2) โปรดระบุสถานที่

Size of land _____
ขนาดพื้นที่

Price of land _____
ราคาที่ดิน

VIII Are you interested in locating your new factory in the proposed Laem Chabang Industrial Estate/Export Processing Zone ?
ท่านมีความสนใจในการตั้งโรงงานในนิคมอุตสาหกรรมแหลมฉบังหรือในเขตอุตสาหกรรมส่งออกหรือไม่

YES or may be	กรณีที่สนใจ หรือ อาจจะ

If yes or may be why ? โปรดเลือกเหตุผลดังต่อไปนี้

(1) Convenient location
ทำเลที่ตั้งดีและเหมาะสม

(2) Other (specify) _____
อื่นๆ (โปรดระบุ)

How many rai of land do you want ?
ท่านคิดว่าท่านต้องการใช้พื้นที่กี่ไร่ ?

_____ rai ไร่

NO กรณีที่ไม่สนใจ

If no why ? โปรดเลือกเหตุผลดังต่อไปนี้

(1) Too far from Bangkok
ไกลจากกรุงเทพฯ เกินไป

(2) Inconvenience (specify)
ความไม่สะดวกอื่นๆ (โปรดระบุ)

(3) Others (specify) _____
อื่นๆ (โปรดระบุ)

With the given conditions are you willing to move to Laem Chabang Industrial Estate and or Export Processing Zone ?
ในกรณีที่ได้แก้ไขข้อบกพร่องต่างๆ (ข้างต้นแล้ว) ท่านเต็มใจที่จะย้ายเข้ามาตั้งโรงงานในนิคมอุตสาหกรรม และ/หรือ เขตอุตสาหกรรมส่งออกที่แหลมฉบังหรือไม่ ?

(1) Definitely yes
ตกลงแน่

(2) Most likely
เห็นชอบด้วย

(3) May be
อาจจะ

(4) No
ไม่

Thank you very much for your troubles in answering the above questions. For our further contact with you concerning the progress of the development from time to time, you are kindly requested to write the name of person who answered the questions.
ขอขอบคุณที่ท่านได้สละเวลาตอบคำถามข้างบนนี้ เพื่อเป็นการสะดวกในการติดต่อกับท่านเกี่ยวกับความก้าวหน้าของการพัฒนาต่อไป โปรดกรุณาเขียนชื่อและตำแหน่งของท่านไว้ด้วย

Name: ชื่อ .....

Title: ตำแหน่ง .....

– โครงการนิคมอุตสาหกรรมภาคตะวันออก
การนิคมอุตสาหกรรมแห่งประเทศไทย

14 ก.พ. 2527

APPENDIX I-2 Industrial Location Survey in Laem Chabang

I. Introduction

In order to identify industrial land demand for Laem Chabang Industrial Estate (LCIE)/Export Processing Zone (EPZ) from the existing industies, a questionnaire survey was conducted. The Purpose of this survey is as follows:

i) To find out manufacturing establishments interested in moving into GIE/EPZ as a result of their expansion or relocation plans, and

ii) To find out land demand by size and type of those establishments which are interested in GIE/EPZ.

With the cooperation of the Thai Chamber of Commerce and the Association of Thai Industries, 120 samples were selected and Questionnaires were mailed to ask their interest in the proposed Industrial Estate in February 1984.

The questionnaires were collected in the middle of March. Out of 120, effective data were collected from 44 factories.

II. Results of the Survey

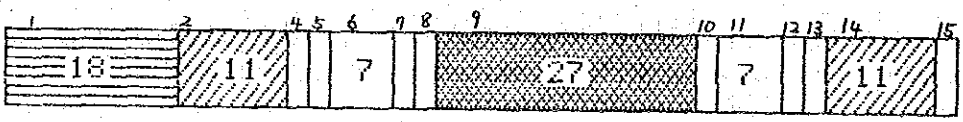
1. Category of Industry (Type of Industry)

44 factories consists of the following types of Industries. (figure) The stone, clay and glass industry (including Ceramic) has 12 factories and accounts for 27.3 percent. The foods industry hold the second place and then followed by textile and garment industry.

	1	2	3	4	5	6	7	8	9	10	11
a	8	5	0	1	1	3	1	1	12	1	3
b	18.2	11.4	0.0	2.3	2.3	6.8	2.3	2.3	27.3	2.3	6.8

	12	13	14	15	T	N
a	1	1	5	1	44	44
b	2.3	2.3	11.4	2.3	100.0	100.0

1	food	9	stone, clay and glass
2	textile	10	steel
3	garment	11	electric machinery
4	wood	12	transportation equipment
5	furniture	13	precision machine
6	chemical	14	Others
7	rubber	15	non-manufacture industry
8	leather		



2. Number of Workers Per Factory Including Casual Workers

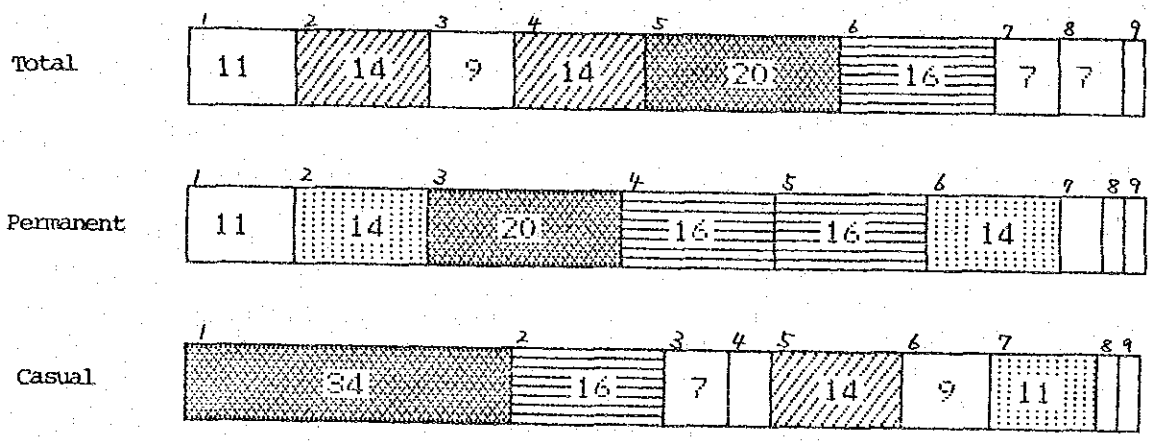
As to the number of workers per factory including casual workers, the bracket falls under 301 - 500 workers has the largest share of 20.5 percent at 9 factories which is followed by 501 - 1000 workers at 15.9 percent with 7 factories. The number of permanent workers has the same tendency of the total number of workers including casual workers.

As to the number of casual workers, 15 or 34.1% of factories have no casual workers and 17 or 38.7% of factories use more than 51 casual workers. 3 factories (one is food industry and the others are textile industry) employ over 500 casual workers.

		1	2	3	4	5	6	7	8	9	T	N
Total	a	5	6	4	6	9	7	3	3	1	44	44
	b	11.4	13.6	9.1	13.6	20.5	15.9	6.8	6.8	2.3	100.0	100.0

		1	2	3	4	5	6	7	8	9	T	N
Permanent	a	5	6	9	7	7	6	2	1	1	44	44
	b	11.4	13.6	20.5	15.9	15.9	13.6	4.5	2.3	2.3	100.0	100.0

		1	2	3	4	5	6	7	8	9	T	N
Casual	a	15	7	3	2	6	4	5	1	1	44	44
	b	34.1	15.9	6.8	4.5	13.6	9.1	11.4	2.3	2.3	100.0	100.0

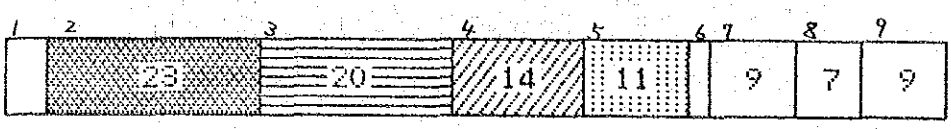


Total Permanent	1	- 50	Casual	1	0
	2	50 - 100		2	1 - 10
	3	101 - 200		3	11 - 20
	4	201 - 300		4	21 - 50
	5	301 - 500		5	51 - 100
	6	501 - 1,000		6	101 - 200
	7	1,001 - 1,500		7	201 - 500
	8	1,501 - 3,000		8	501 - 1,000
	9	3,001 -		9	1,001 -

3. Factory Area

Factory area is widely ranged from 1,600 m^2 to 659,000 m^2. 2,000 - 5,000 m^2 factories hold the first place (10 factories), and 5,001 - 10,000 m^2 factories hold the second place (9 factories).

	1	2	3	4	5	6	7	8	9	T	N
a	2	10	9	6	5	1	4	3	4	44	44
b	4.5	22.7	20.5	13.6	11.4	2.3	9.1	6.8	9.1	100.0	100.0

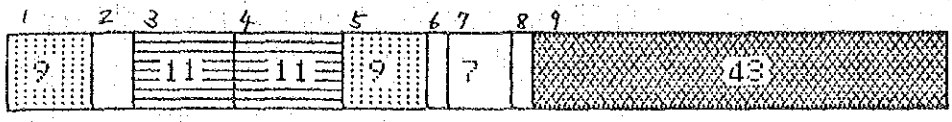


1 - 2,000 m^2
2 2,000 - 5,000 m^2
3 5,001 - 10,000 m^2
4 10,001 - 20,000 m^2
5 20,001 - 50,000 m^2
6 50,001 - 100,000 m^2
7 100,001 - 300,000 m^2
8 300,001 m^2
9 No Answer

4. Sales

The group having sales of ₿ 11-20 million and 21-30 million has 5 factories respectively which is highest and is followed by below ₿ 5 million and ₿ 31-50 million group.

	1	2	3	4	5	6	7	8	9	T	N
a	4	2	5	5	4	1	3	1	19	44	44
b	9.1	4.5	11.4	11.4	9.1	2.3	6.8	2.3	43.2	100.0	100.0



1	- 5 Mil.B	6	51 - 100 Mil.B
2	5 - 10 Mil.B	7	101 - 500 Mil.B
3	11 - 20 Mil.B	8	501 - Mil.B
4	21 - 30 Mil.B	9	No Answer
5	31 - 50 Mil.B		

5. Products and Materials

44 factories produce many kinds of products such as cloth, food, concrete, gem stones, stationary, miscellaneous goods and so on. As to materials, jute, cement, lumber, coconut, plastic, rubber, tapioca and so on are listed up.

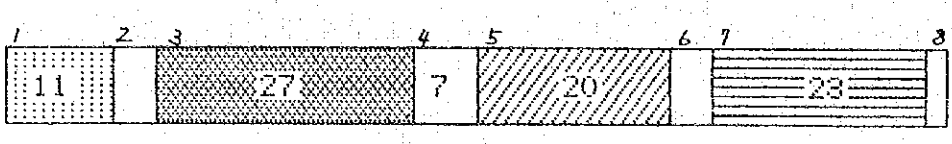
6. Market/Domestic and Overseas

Out of 44 factories, there are 24 factories whose share of products for the domestic market are over 50 percent. On the other hand, 13 factories are mainly dependent upon the overseas markets. Three of them export their all products. With respect to the type of industry, foods industry shows a export-oriented tendency in particular.

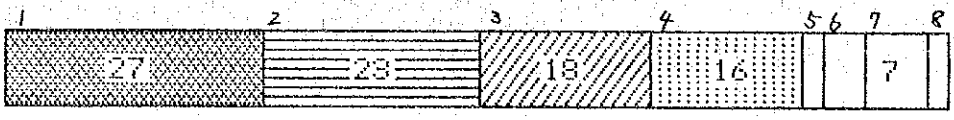
Market Share (domestic)		1	2	3	4	5	6	7	8	T	N
	a	5	2	12	3	9	2	10	1	44	44
	b	11.4	4.5	27.3	6.8	20.5	4.5	22.7	2.3	100.0	100.0

Market Share (export)		1	2	3	4	5	6	7	8	T	N
	a	12	10	8	7	1	2	3	1	44	44
	b	27.3	22.7	18.2	15.9	2.3	4.5	6.8	2.3	100.0	100.0

Market Share (domestic)



Market Share (export)



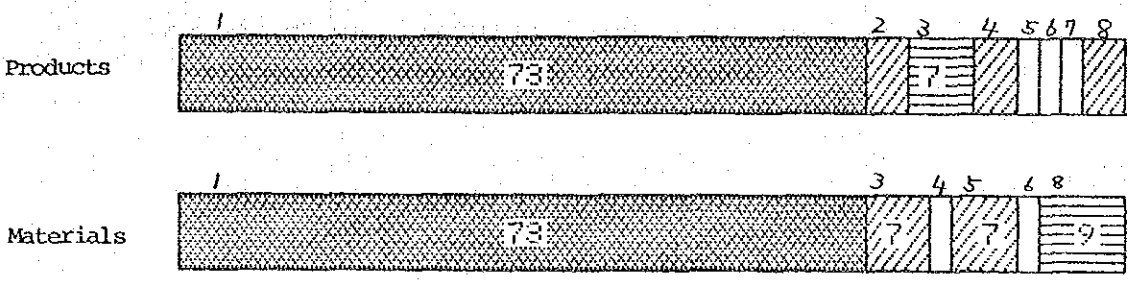
1	- 5 %	5	71 - 90 %
2	5 - 30 %	6	91 - 99 %
3	31 - 50 %	7	100 %
4	51 - 70 %	8	No Answer

7. Transportation/Products and Materials

Truck command an absolute majority in modes of transportation of both products and materials. The share of ship for materials transportation is slightly higher than that of ship for products transportation.

		1	2	3	4	5	6	7	8	T	N
Products	a	32	2	3	2	1	1	1	2	44	44
	b	72.7	4.5	6.8	4.5	2.3	2.3	2.3	4.5	100.0	100.0

		1	2	3	4	5	6	7	8	T	N
Materials	a	32	0	3	1	3	1	0	4	44	44
	b	72.7	0.0	6.8	2.3	6.8	2.3	0.0	9.1	100.0	100.0



(Products)

1 truck 100 %
2 truck 80 - 99 % : train 1 - 20 %
3 : ship 1 - 20 %
4 truck 50 - 79% : ship 21 - 50 %
5 : others 21 - 50 %
6 : train 21 - 50 %
7 others
8 no answer

(Materials)

1 truck 100 %
2 truck 80 - 99 % : train 1 - 20 %
3 : ship 1 - 20 %
4 : train & ship 1 - 20 %
5 truck 50 - 79 % : ship 21 - 50 %
6 ship 100 %
7 others
8 no anwer

8. Factors for Choosing Plant Site

As a result of the plural answers, "Availability of Utility (Water, electricity, telephone)" stands first and accounts for 72.7 percent (32 factories). "Availability of Raw materials" stands second (63.6 percent). All factors except (2) and (7) have the share of over 40 percent. The result, therefore, shows that most of factors are considered important in chosing the site.

Factors choosing site

(1) Availability of Raw materials

(2) Availability of Laber (skilled & unskilled)

(3) Site (large space, low cost of land)

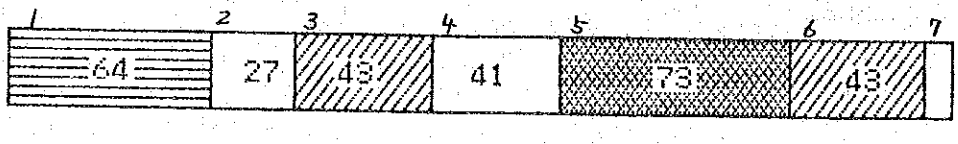
(4) Accessibility to market

(5) Availability of Utility (water, electricity, telephone)

(6) Access Road (major highway)

(7) Others (Sepcify)

	1	2	3	4	5	6	7	T	N
a	28	12	19	18	32	19	4	132	44
b	63.6	27.3	43.2	40.9	72.7	43.2	9.1	300.0	100.0



9. Problems and Inconvenience at the Present Location

"Lack of space" holds the first place and amounts to 20 factories. "Complaints from neighbors about the industrial pollution" amounts to 4, and "Inadequate supply of water, electricity etc." amounts to 3.

10. Investment Plan by 1987

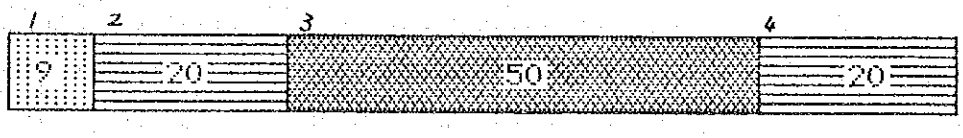
Out of 44 factories, 27 factories have a plan to invest by 1987, on the other hand 16 factories have no plan. About the objective of new investment, most of factories answer, "Expansion of existing factory" or "New branch factory at new location."

11. New Plant Site

4 factories have already acquired the new plant site and 9 factories have already decided the site. Half of 44 factories have not decided yet. The sites which are already acquired or decided are located in North East, Bangkok, Bangpoo Industrial Estate and so on. The specified size of land required is mainly within 16,000 m^2 (10 Rai).

	1	2	3	4	T	N
a	4	9	22	9	44	44
b	9.1	20.5	50.0	20.5	100.0	100.0

(1) already acqired
(2) already decided
(3) not decided
(4) no answer



12. Interest in Moving into Laem Chabang IE/EPZ and Possibility to Move

15 factories out of 44 have interest in moving into LCIE/EPZ. 24 have no interest and 5 have no answer. In the light of type of industry, 4 factories belong to stone, clay and glass industry, 3 belong to electrical machinery and the others belong to foods, textile and so on.

Among 15 factories which show the interest, 5 factories answer the size of land required. The specified land demand amounts to 156,800 m^2 (98 Rai) in the aggregate.

As the reason why they are interested in moving into LCIE/EPZ, "Convenient location" is picked up by 7 factories. On the other hand, most of factories which show no interest take up "Too far from Bangkok" as its reason.

As to possibility of location to LCIE/EPZ, 4 factories answer, "Most likely" and 11 factories answer, "May be".

III. General Comments on the Results of Survey

Although the absolute numbers of questionnaire sent were only 120 which represents about 6% of the members of the two major economic organizations in Thailand and only 44 effective answers were used for statistical analysis, it is considered good indication that about 35% of the factories showed their interest in the proposed Laem Chabang CIE and EPZ.

The fact that a little over 60% of the factories have continued investment plan implies strong confidence of the Thai entrepreneurs on future economy of the country. Therefore it is felt necessary to maintain continuous publicity on the project both to the local and foreign investors. By doing so and let them witness the real physical development, it is expected that more investors will show their interest.

Factory No.		Category of Industry	No. of Workers	Perma-nent	Casual	Factory Area (m^2)	Name	Quantity	Sales	Total Sales of Product
1	28	Tire	65	60	5	3 (Rai)	Automobile tire	2,000 pc/mon.		
2	35	Battery	250	240	10	18,832	Car Battery	181,019 pc/yr.		
3	30	Concrete	831	831	-	659,000	Mixed Concrete	155,000 ton/mon.	62.4 Mil.B	103.5 Mil.B
4	26	Consumption Goods	549	477	72	12 (Rai)	Soap	7,700 "	290 Mil.B	460 Mil.B
5	30	Sheet Glass	810	709	101	272,000	Clear Glass	7,115 "	799 "	890 "
6	26	Soap	175	175	-	6,400	Soap	950 "	-	
7	20	Jute Industry	2,400	2,400	-	25,000	Jute Bag	855 "	18 Mil.B	28 "
8	30	Sanitary Ware	315	252	63	10,000	Sanitary Ware	440 "	24 "	24 "
9	20	Textile (Jute)	4,000	3,500	500	300,000	Skenaff	2,000 "		
10	18-19	Food	1,750	250	1,500	1.7 (Rai)	Pipe apple	1,500 "	250 "	280 "
11	20	Jute Industry	2,500	1,500	1,000	187,200	Jute	1,500 "	18.5 "	25 "
12	18-19	Wheat Flour	394	274	120	73,600	Wheat Flour	3,858,708 "	40.5 "	40.5 "
13	23	Flash Light Case	164	152	12	4,740	Flash Light Case	5,118 dozen/mon.		
14		General Trade	52	52	-	-				
15	36	Assembly of Vehicle	686	600	86	7.5 (Rai)	Motor Cycle	48,000 unit/	1.0 Mil.B	1.0 Mil.B
16	22	Wood Parquet	230	200	30	17 (Rai)	Wood Parquet	160,000 m^2/mon.	48 "	48 "
17	30	Asbestos Product	386	260	126	4.5 (Rai)	Veneer	6,000 m^3/mon.	18 "	18 "
18	20	Carpet	486	412	74	11 (Rai)	Carpet	192 ton/mon.	7.6 "	7.6 "
19	18-19	Tapioca Product	628	327	301	500 (Rai)	Tapioca Flour	10,000 "		
20	31	Steel	1,300	1,300	-	200 (Rai)	Steel Wire	8,000 "	70.2 "	90.5 "
21	18-19	Preserving Product	255	200	55	10.5 (Rai)	Reserve Product from Ginger	5,000 "		
22	30	Mosaic Tile	1,173	760	473	16 (Rai)	Mosaic Tile	5,000 "		
23	35	Electronic	54	54	-	4 (Rai)	Computer Games	300,000 "	50 "	50 "
24	39	Ball pen	82	80	2	1 (Rai)	Ball pen	7 Mil.unit/mon.		
25	39	Pencil	63	63	-	1.5 (Rai)	Pencil	10 Mil.unit/mon.		
26	20	Socks	318	253	65	3.5 (Rai)	Socks	3.6 Mil.pairs/mon.	40 "	40 "

Factory No.		Category of Industry	No. of Workers	Perma-nent	Casual	Factory Area (m^2)	Name	Quantity		Sales		Total Sales of Product	
27	39	Button	239	200	39	1 (Rai)	Button	102,423	gross dozen	2	Mil.B	2	Mil.B
28	18-19	Canned Seafood	1,015	622	393	14 (Rai)	Canned Seafood	14,323	ton/mon.	16.7	"	16.7	"
29	30	Polishing of Gem Stones	173	160	13	1.5 (Rai)	Finish Polishes Diamond	30,000	carats/mon.				
30	18-19	Vegetable Oil	42	31	11	4 (Rai)	Vegetable Oil	20,000	ton/mon.	0.3	"	0.3	"
31	29	Watch Belt	206	196	10		Watch Belt	1,147,000	unit				
32	30	Cutting and Polishing of Gem Stones	212	212	-	2.3 (Rai)	Cut & Polished Diamond	57,000	carats	30	"	30	"
33	30	Production of Lenses	328	328	-	4.2 (Rai)	Spherical Len.	-		-			
34	30	Production of Lense	43	43	-	1.5 (Rai)	Spectacle Len.	70,000	pieces	26	"	26	"
35	35	Reel Tape Cassettes Tape	120	120	-		Reel Tape	625,000	units/mon.	-			
36	39	Record	48	40	8	4.3 (Rai)	Record	880,200	pcs.	19	"	19	"
37	30	Concrete	26	22	4	4,944 (m^2)	Added Mixture Concrete	53	ton/mon.	12	"	12	"
38	26	Medicine Capsule	62	62	-	3 (Rai)	Medical Capsules	700	Mil.Unit	17.6	"	17.6	"
39	39	Plastic Pipe	365	360	5	110 (Rai)	Plastic Pipe	6,000	ton/mon.	-			
40	30	Glass Tube	48	48		6.2 (Rai)	Glass Tube	9	Mil.tube/ month	7.2	"	7.2	"
41	18-19	Milk & Butter	578	210	368	7 (Rai)	Condensed Milk	2,315,844	case				
42	30	Glass Bottle	518	518	-	21 (Rai)	Glass Bottle	55,750	ton/mon.	2.3	"	2.3	"
43	18-19	Coconut Product (Milk)	300	120	180	2.4 (Rai)	Coconut Milk	2,100	"				
44	37	Module for Electric & Digital Watch	450	450	-		Led Module	1,800,000	(PES)				

No.	Utility		Transp. of Product				Transp. of Raw Material				V	VI	VII				VIII		
	Water	Electricity	Truck	Train	Vessel	Others	Truck	Train	Vessel	Others		Problems	Investment by 1987		Where	Size	Price	Land Area (Rai)		
1	-	50,000	80%	20%	-	-	70%	-	30%	-	7	3	Yes	1,2	3	-	-	-	-	-	-
2	1,000	218,900kw/m	300t/m	-	-	-	400 ~500t/M	-	-	-	1,3,5,6	1,5 (Ext.road)	No	-	-	-	-	-	Yes	1	30
3	13,430	3.2Mil.	100%	-	-	-	90%	-	10%	-	1,4,5.6	2(dirt)	Yes	2	3	-	-	-	No	-	-
4	2,500	260,000	100%	-	-	-	100%	-	-	-	1,2,3,4, 5	1	Yes	1	2	Not specify	12 Rai	-	No	-	-
5	-	1,354,100	60trip/ day	-	-	-	40trip/ day	-	-	-	1,4,5	1	No	-	3	-	-	-	No	-	-
6	8,471	4,469,152	950t/m	-	-	-	950t/m	-	-	-	-	-	Yes	1	1	Ladkra bang	117 Rai	-	No	-	-
7	-	1,800	1,000t/m	500t/m	-	-	1,750t/m	-	-	-	1,3,4	-	No	-	-	-	-	-	No	-	-
8	3,800	218,000	86%	-	14%	-	94%	-	6%	-	1,2,3, 4,5,6	5(Tele- phone line)	No	-	-	-	-	-	No	-	-
9	1,300	2,200	35,000ton	-	-	-	42,000ton	-	-	-	1,2	-	Yes	2	3	-	-	-	Yes	1	50
10	45,000	110,000	20,000ton	-	-	-	5,000ton	-	-	-	1,2,3,4, 5,6	4	Yes	1	1	-	-	-	No	-	-
11	1,200	1,400	100%	-	-	-	100%	-	-	-	1-7(near port etc.)	1	Yes	2	3	-	-	-	No	-	-
12	Deep well water	334,131	100%	-	-	-	-	-	100%	-	2,4,6	-	No	-	3	-	-	-	No	-	-
13	300	150	2,000kg	-	-	-	6ton	-	-	-	1-7	1,4	No	-	3	-	-	-	No	-	-
14	-	-	-	-	-	-	-	-	-	-	1,5	5(Tax)	Yes	4	-	-	-	-	No	-	-
15	2,200	7,400	80%	-	20%	-	100%	-	-	-	1,5,6	1	Yes	1	3	-	-	-	No	-	-
16	12,000	39,000	100%	-	-	-	80%	-	20%	-	1,4,5	2(Noise)	No	-	-	-	-	-	No	-	-
17	3,800	1,400	100%	-	-	-	100%	-	-	-	1,3,5,6	2(Noise)	No	-	-	-	-	-	Yes	1	-
18	-	420,000	100%	-	-	-	100%	-	-	-	1,2,3,5	1	Yes	1	2	-	-	-	No	-	-
19	360,000	5,500	100% (Export)	-	100% (Export)	-	100%	-	-	-	1,2,3,5, 6,7	-	Yes	1-3	2,3	North East	200- 300 Rai	-	No	-	-
20	Self- construction	12,000	95%	5%	-	-	80%	5%	15%	-	-	-	-	-	-	-	-	-	No	-	-
21	1,300	550	90	-	10	-	100	-	-	-	1,2,5	1	Yes	1	3	-	-	-	Yes	2	-

No.	Utility		Transp. of Product				Transp. of Raw Material				V	VI	VII			VIII			
	Water	Electricity	Truck	Train	Vessel	Others	Truck	Train	Vessel	Others		Problems	Investment by 1987		Where	Size	Price	Land Area (Rai)	
22	-	-	100	-	-	-	100	-	-	-	1,3,5	1	Yes	2	2	Bangkok	10 Rai	-	No - -
23	1,200	3,400	60	-	40	-	100	-	-	-	1,5,6	1,3	Yes	1	3	-	-	-	Yes 1 -
24	-	-	100	-	-	-	100	-	-	-	1,4	-	Yes	2	3	-	-	-	Yes 2 -
25	-	-	100	-	-	-	100	-	-	-	1,4,5	1	Yes	1	2	Bangkok M.A. or near	5 Rai	-	Yes - -
26	400	3,500	100	-	-	-	-	-	-	-	1,2,5	1	No	-	3	-	-	-	- - -
27	1,200	-	100	-	-	-	100	-	-	-	4,5	-	Yes	2	3	-	-	-	No - -
28	-	-	100	-	-	-	100	-	-	-	1,4,5	-	No	-	2	-	-	-	No - -
29	-	-	100	-	-	-	100	-	-	-	-	-	No	-	-	-	-	-	Yes 1 -
30	-	-	-	-	-	-	-	-	-	-	3,5,6	-	Yes	2	3	-	-	-	- - -
31	-	-	100	-	-	-	100	-	-	-	4	-	No	-	3	-	-	-	Yes 2 -
32	1,200	2,400	100	-	-	-	100	-	-	-	3,5,6	3	No	-	3	-	-	-	Yes 2 3
33	1,400	-	100	-	-	-	60	-	40	-	3.6	1	Yes	1	2	Bangkok	4 Rai	-	No - -
34	2,000	3,300	100	-	-	-	-	-	-	-	3,5,6	4	Yes	2	1	Bangkok	4Rai	1 Mil.B/ rai	No - -
35	-	-	100	-	-	-	100	-	-	-	3,5	1	Yes	1	2	-	-	-	Yes 2 -
36	-	5,200	100	-	-	-	100	-	-	-	3,4	1	Yes	2	3	-	-	-	Yes 2 5(?
37	170	4,233	100	-	-	-	100	-	-	-	5	2(rai)	Yes	1	1	Pangpoo I.E.	3Rai	Rent from TFD	No - -
38	-	-	100	-	-	-	100	-	-	-	1,5,6	1	Yes	1	2	-	2Rai	-	No - -
39	-	-	100	-	-	-	100	-	-	-	1,5,6	4	Yes	3	3	-	-	-	No - -
40	-	-	100	-	-	-	100	-	-	-	1,3,5	1,4	Yes	3	3	-	-	-	No - -
41	-	-	100	-	-	-	100	-	-	-	1,4,5,6	1	No	1	3	-	-	-	- - -
42	-	-	100	-	-	-	100	-	-	-	3,5,6	1	Yes	1	3	-	-	-	Yes 1 10
43	-	-	50	-	50	-	50	-	50	-	1,5	1	No	1	3	-	-	-	Yes 1 -
44	-	-	75	-	-	25	100	-	-	-	2,4	1	Yes	2	3	-	-	-	- - -

(Total 98) = 156,800m^2

No	Product 2			Product 3			Raw Material 1		Raw Material 2		Raw Material 3		Market of Total Products	
	Name	Quantity	Sales	Name	Quantity	Sales	Name	Quantity	Name	Quantity	Name	Quantity	Domestic	Export
1	Bycycle tire	2,100 pc/mon.	-	Motor cycle tire	1,200 pc/mon.	-	Rubber	12	Ash	4.2	Chemical	3	100	-
2	Motor cycle Bot.	272,000 pc/yr..	-	-	-	-	Lead	142.12	Stick	140.32	Rubber	15	90	10
3	Finish Concrete	34,600 ton/mon.	41.1 Mil.B	-	-	-	Cement	25,750	Sand	78,130 m^3/mon.	Steel	630	100	-
4	Candy	2,600 ton/mon.	116 Mil.B	Cosmetic	-	54 Mil.B	Animal Eat	500	Sugar	150	Perfume	4.5	99	1
5	Decolated Glass	1,046 ton/mon.	47 Mil.B	Colour Glass	1,395	44 Mil.B	Sand	4,684	Soda	1,536	Others	3,115	85	15
6	-	-	-	-	-	-	Vegetable Oil	611	Perfume	10.6	-	-	99.5	0.5
7	Jute yarn	595 ton/mon.	10 Mil.B	-	-	-	Jute, Kenaf	1,750	-	-	-	-	40	60
8	-	-	-	-	-	-	Clay	168	White Clay	74	Fracemar	141	86	14
9	Jute	800 ton/mon.	-	-	-	-	Skenaff	3,500	-	-	-	-	35	65
10	Syrnp	150 t/mon.	30 Mil.B	-	-	-	Pipeapple	4,000	Tin plat	300	Sugar	100	4	96
11	Jute tie	500 "	6.5 "	-	-	-	Jute	2,300	Batching Oil	60	Emulsi-fier	2	55	45
12	-	-	-	-	-	-	Wheat	2,006	-	-	-	-	100	-
13	-	-	-	-	-	-	Steel	20	Aluminum	2	Bronze	0.7	90	10
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	Rubber	-	Iron	-	-	-	100	-
16	-	-	-	-	-	-	Wood	110,000m^2	-	-	-	-	40	60
17	-	-	-	-	-	-	Wood	7,000m^3	Latex	-	-	-	50	50
18	-	-	-	-	-	-	Jute	100t/mon.	-	-	-	-	50	50

No	Product 2			Product 3			Raw Material 1		Raw Material 2		Raw Material 3		Market of Total Products	
	Name	Quantity	Sales	Name	Quantity	Sales	Name	Quantity	Name	Quantity	Name	Quantity	Domestic	Export
19	Small ball of Tapioca Flour	30,000t/m	-	-	-	-	Tapioca	125,000t/m	-	-	-	-	0-5	95-100
20	Steel wire (special)	2,500t/m	20.3Mil.B	Steel wire (tough)	1,000	19.0 Mil.B	Iron	11,000"	Ferro-alloy	130	Others	1,800	100	-
21	Cucumber	1,000 "	-	Onion	300	-	Ginger's onion	14,000"	Sugar	200	Salt	400	30	70
22	-	-	-	-	-	-	-	-	-	-	-	-	50	50
23	-	-	-	-	-	-	-	-	-	-	-	-	-	100
24	-	-	-	-	-	-	-	-	-	-	-	-	100	-
25	-	-	-	-	-	-	-	-	-	-	-	-	100	-
26	-	-	-	-	-	-	Nylon	-	-	-	-	-	100	-
27	-	-	-	-	-	-	Plastic	132t/m	-	-	-	-	70	30
28	-	-	-	-	-	-	Tuna Fish	7,200 "	Shrimp	5,150	Crab Meat	2,000	40	60
29	-	-	-	-	-	-	-	-	-	-	-	-	40	60
30	-	-	-	-	-	-	Caster Bean	30,000 "	Coconuts	10,000	-	-	50	50
31	-	-	-	-	-	-	-	-	-	-	-	-	-	100
32	-	-	-	-	-	-	-	-	-	-	-	-	50	50
33	Ajdin drical	6,000,000 pcs.	-	Ophthalmic Len.	13,276,165 pcs.	-	-	-	-	-	-	-	40	60
34	-	-	-	-	-	-	-	-	-	-	-	-	50	50
35	Cassettes Tape	3,000,000 units	-	-	-	-	Plastic	-	-	-	-	-	80	20
36	-	-	-	-	-	-	Plastic	-	-	-	-	-	80	20
37	-	-	-	-	-	-	-	-	-	-	-	-	100	-
38	-	-	-	-	-	-	-	-	-	-	-	-	90	10
39	-	-	-	-	-	-	-	-	-	-	-	-	60	40
40	-	-	-	-	-	-	-	-	-	-	-	-	85	15
41	Evaporated Milk	345,642 case	-	Butter	658 case	-	-	-	-	-	-	-	80	20
42	-	-	-	-	-	-	-	-	-	-	-	-	100	-
43	Coconut Milk Powder	600 ton/M	-	By product	1,528 ton/M	-	-	-	-	-	-	-	-	100
44	ICD Module	1,800,000 pcs.	-	Display Handheld Games	1,800,000 pcs.	-	-	-	-	-	-	-	25	75

APPENDIX I-3 Labor Intensity Check List

Nos. of worker / Type	more than 10	5 to 10	3 to 5
Foods		o live stock products o sea food processing o preserved fruits & vegetable o bakery & confectionery products o Manufacture of miscellaneous food and related products	o seasonings o Manufacture of miscellaneous food and related products
Textile		o Spinning mills o Twisting and bulky yarns o Woren fabric mills o Knitting mills o Dyeing and finishing textiles o Manufacture of ropes and nettings o Lace and other textile goods	o Silk reeling plants o Miscellaneous textile mill products
Apparel and other finished products	o Men's outer garment o White shirts and underwear o Manufacture of hats o Manufacture of miscellaneous textile apparel and accessories	o Fur apparel and apparel accessories o Miscellaneous fabricated textile products	
Lumber and wood products		o Sawing, planing mills and wood products o Manufacture of wooden containers, including bamboo and rattan o Manufacture of miscellaneous wood products	o Manufacture of millwork, plywood and prefabricated structural wood products
Furniture and fixtures	o Furniture for religious	o Manufacture of furniture o Manufacture of sliding doors and screens o Manufacture of miscellaneous furniture and fixtures	

Pulp, paper and paper products		o Manufacture of paper products o Manufacture of miscellaneous pulp, paper and paper worked products	o Manufacture of paper coating and glazing o Manufacture of paper containers
Publishing, printing and allied industries	o Book-binding and printed matters	o Printing industry	o Newspaper industry
Chemical and allied products			o Manufacture of chemical fibres
Petroleum and coal products		o Briquettes and balls	o Paving materials
Rubber products		o Manufacture of rubber belts and hoses and mechanical rubber goods product o Manufacture of rubber belts, hoses and mechanical rubber products o Manufacture of miscellaneous rubber products	o Manufacture of tyres and inner tubes
Leather products	o Boot and shoe cut stock and findings	o Leather footwear o Leather gloves and mittens o Luggage o Handbags and small leather goods o Fur skins o Manufacture of miscellaneous leather products	o Leather tanning and finishing
Ceramic, stone and clay products	o Manufacture of structural clay products o Manufacture of pottery and related products	o Manufacture of clay refactones o Manufacture of abrasive products o Manufacture of aggregate and stone products	o Manufacture of glass and its products o Manufacture of cement and its products o Manufacture of carbon and graphite products o Manufacture of miscellaneous ceramic, stone and clay procucts
Iron and steel			o Manufacture of steel forgings, secondary forgings and steel castings o Manufacture of iron castings

Non-ferrous metals and products		o Manufacture of non-ferrous foundries o Manufacture of miscellaneous non-ferrous metal products
Fabricated metal products	o Tableware, cutlery, hand tools and hardware o Heating apparatus and plumbing supplies o Faloricated metal stamping, coating, engraving and heat treating o Fabricated wire products o Bolts, nuts, rivets, screws and wood screws o Manufacture of miscellaneous fabricated metal products	o Fabricated constructional and architectual metal products
General machinery	o Agricultural machinery and equipment o Textile machinery o Special-industry machinery o Manufacture of miscellaneous machinery and machine parts	o Boilers, engine and turbines o Machinery and equipment for construction and mining o Metal working machinery o General industry machinery o Office, Service industry and house-hold machines
Electrical machinery	o Electrical generating, transmission, distribution and industrial apparatus o Electric measuring instruments o Manufacture of parts for electronic appliances and communication equipment o Manufacture of miscellaneous electrical machinery, equipm ent and supplies	o Household electric appliances o Electric bulbs and lighting fixtures o Communication equipment and related products o Electronics equipment
Transportation equipment	o Aircraft and parts	o Railroad equipment and parts o Bicycles and parts o Shipbuilding and repairing and manufacture of marine engines o Mescellaneous transportation equipment

Precision instruments and machinery		o Measuring instruments, analytical instruments and testing machines o Surveying instruments o Medical instruments and apparatus o Physical and chemical instruments o Optical instruments and lenses o Ophthalmic goods, including frames o Watches, clocks and parts	
Miscellaneous manufacturing industries	o Lacquer ware	o Toys and sporting goods o Pens, lead pencils, painting materials and stationery o Costume jewellery, costume accessories, buttons and related products o Manufacturing industries, not elsewhere classified	o Pecious metal products o Musical instruments and phonograph records o Plastic products o Manufacturing industries not elsewhere classified

APPENDIX I-4 Check List of Industrial Water Demand (m^3/day/HA)

	-50 (m^3/day/HA)	50 - 100 (m^3/day/HA)	100 - 300 (m^3/day/HA)
Foods		o Flour and grain mill products o Prepared animal foods and organic fertilizers	o Bakery and confectionery products
Textile	o Ropes and nettings		o Silk reeling plants o Knitting mills o Lace and other textile goods o Miscellaneous textile mill products
Apparel and finished products	o White shirts and underwear	o Outer garment o Fur apparel and apparel accessories o Miscellaneous textile apparel and accessories o Miscellaneous fabricated textile products	o Hats
Lumber and wood products	o Sawing, planing mills and wood products o Millwork, plywood and prefabriciated structural wood products o Wooden containers, including bamboo and rattan o Miscellaneous wood products		
Furniture and fixtures	o Furniture o Sliding doors and screens	o Furniture for religious purposes o Miscellaneous furniture and fixtures	
Pulp, paper and paper products	o Paper products	o Paper containers	
Publishing, printing and allied industries		o Book-binding and printed matters	o Publishing industry o Printing industry o Book-binding and printed matters

Chemical and allied products			o Oil and fat products, soaps, synthetic detergents, surface-active agents and paints
Petroleum and coal products	o Briquettes and briquette balls o Paving materials o Miscellaneous petroleum and coal products	o Lubricating oils and greases	o Petroleum refining, lubricating oils and greases o Coke
Rubber products			o Tyres and inner tubes o Rubber belts and hoses and mechanical rubber goods products o Rubber belts, hoses and mechanical rubber products o Miscellaneous rubber products
Leather products	o Luggage o Handbags and small leather goods o Miscellaneous leather roducts	o Boot and shoe cut stock and findin gs o Leather footwear o Leather gloves and mittens	o Fur skins
Ceramic, stone and clay products	o Structural clay products	o Cement and its products o Pottery and related products	o Glass and its products o Clay refractories o Carbon and graphite products o Abrasive products o Aggregate and stone products o Miscellaneous ceramic, stone and clay products
Iron and steel	o Miscellaneous iron and steel		o Iron smelting, with blast furnaces o Steel, with rolling facilities o Steel materials o Coasted Steel o Steel forgings, secondary forgings and steel castings o Iron casting

Non-ferrous metals and products		o Non-ferrous foundries	o Primary smelting and refining of non-ferous metals o Secondary smelting and refining of non-ferous metals o Electric wire and cable o Miscellaneous non-ferrous metal products
Fabricated metal products	o Fabricated constructional and architectual metal products	o Tin cans and other plated sheet products o Tableware, cutlery, hand tools and hardware o Heating apparatus and plumbin g supplies o Bolts, nuts, rivets, screws and wood screws o Miscellaneous fabricated metal products	o Fabricated metal stamping, coating, engraving and heat treatin g o Fabricated wire procucts
General machinery	o Special-industry machinery o General industry machinery and equipment	o Boilers, engines and turbines o Agricultural machinery and equipment o Machinery and equipment for construction and mining o Metal working machinery o Textile machinery o Office, service industry and house-hold machines o Miscellaneous machinery and machine parts	
Electrical machinery		o Electrical generating, transmission, distribu-tion and industrial apparatus o Electric bulbs and lighting fixtures o Communication equipment and related products o Electronics equipment o Electric measuring instruments	o Household electric appliances o Parts for electronic appliances and com-munication equipment o Miscellaneous electrical machinery, equipment and supplies

Transportation equipment	o Railroad equipment and parts o Shipbuilding and repairing and manufacture of marine engines o Miscellaneous transportation equipment	o Moter vehicles and equipment o Aircraft and parts	o Bicyle and parts
Precision instruments and machinery	o Surveying instruments o Physical and chemical instruments		o Measuring instruments, analytical instruments a testing machines o Medical instruments and apparatus o Optical instruments and lenses o Ophthalmic goods, inclu ing frames o Watches, clocks, clockwo operated devices and pa
Ordnance	o Small arms (rifles)		
Miscellaneous manufactuing industries	o Lacquer ware	o Pecious metal products o Toys and sporting goods o Costume jewellery, costume accessories, buttons and related products o Manufacturing industries, not elsewhere classified	o Musical instruments and phonograph records o Pens, lead pencils, pai ing materials and stationery o Plastic products

APPENDIX I-5 BEHAVIOR OF JAPANESE INVESTORS TO OVERSEAS INDUSTRIAL LOCATION

General

Direct foreign investments by Japanese companies during the F.Y. 1982 reached $7.7 billion which marks the second highest foreign investment record following $8.9 billion achieved in the previous year. Foreign investments by Japanese industrialists still seem brisk as demonstrated by such large investment ventures as automobile and VTR in the U.S.A. and Europe.

As of June, 1983, there were 7,351 investments and 36.9% of which or 2,718 investments relate to manufacturing ventures. Electrical machinery is the largest group with 532 investments (19.6%) which is followed by chemicals with 407 (15.0%) and textile with 287 (10.0%) and etc. If combine those four (4) types of machinery, general machinery, electrical machinery, transportation equipment and precision instrument into one group, the sub total becomes 1,063 in number and or 39.1% of the total investments in manufacturing ventures.

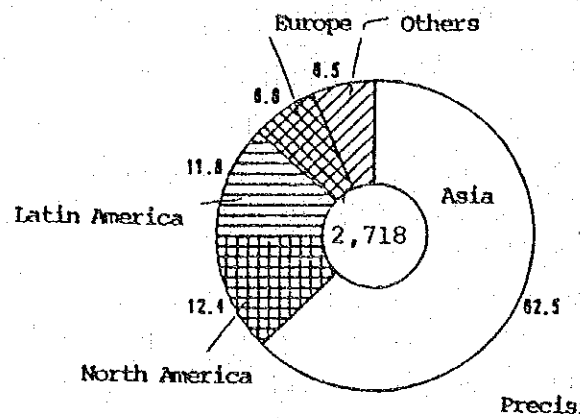
Investment activities in foods and textile industries have declined recently and on other hand, transportation equipments, electrical machinery and chemicals are largely increasing their shares. Number of investment of transport equipment sector are relatively small but their investment amount reached $440 million in 1982 which ranks this sub sector at No. 3 in the manufacturing sector. This implies that the unit investment of transportation equipment sector is getting larger scale.

In the area distribution of Japanese foreign investment in manufacturing sector, Asia is found No. 1 at 1700 in number or about 60% of the total, which is followed by North America with 13.1%, Central America with 12.4% and Europe 7%. However it seems that the current weight of investments has been shifted more to the U.S.A. and to other developed countries particularly in the area of high technological products. There are many reasons for this such as the market potentials, preventive counter measures to probable import restriction derived from the trade friction, appearance of negative factors from the developing countries such as fast rising wage level

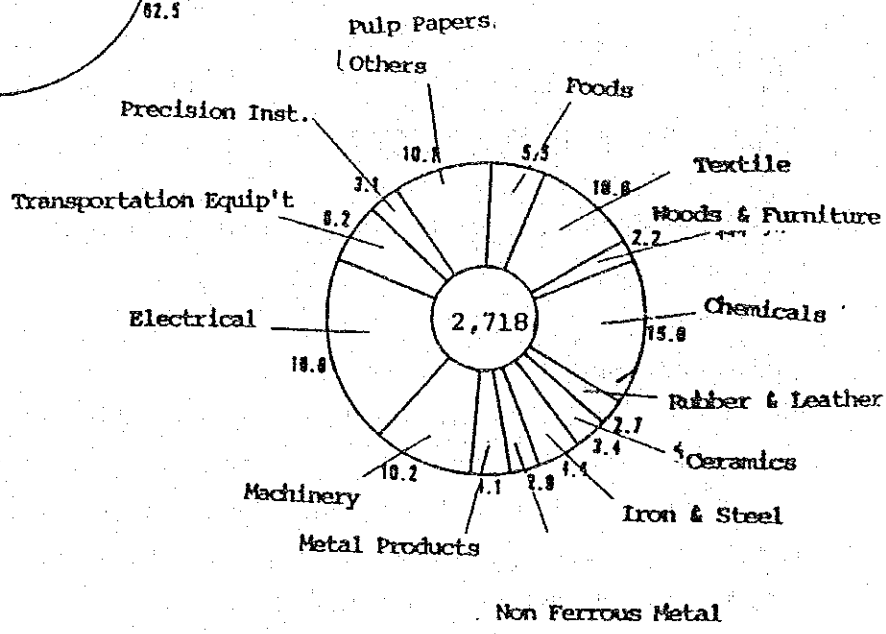
and debt crisis. However it must be also noted that there have been aggressive approaches by those Western countries to invite location of Japanese investments with well deliberated and functional package of incentives.

Japanese Manufacturing Investments by Region

(Nos. of Investment)



Composition of Type of Industry

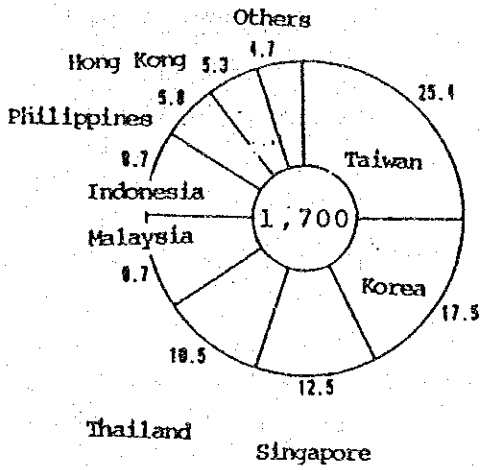


Activities of the Japanese companies in manufacturing sector in Thailand

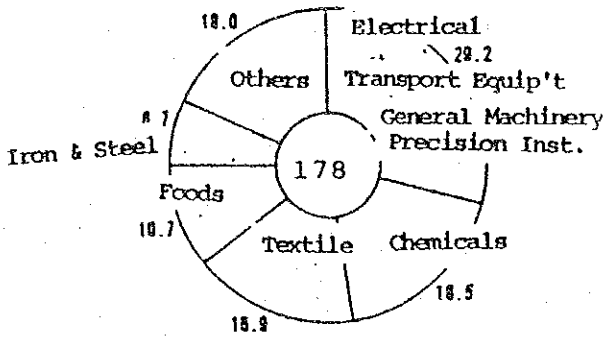
As mentioned earlier, 60% of the Japanese investment in the manufacturing sector concentrates in Asia where Taiwan has the largest share of 16.7% which is followed by Korea 11.5%, Singapore 8.3% and Thailand 6.9%. Malaysia has comparable share to Thailand.

Investment by type of industry is as shown in the Fig. below.

Japanese Investment in Manufacturing in Asia



Japanese Investment in Manufacturing in Thailand



Chemical has the largest share at 18.5% then textile at 16.9%, foods, electrical machinery, transportation equipment of four types has 10.7% each. Accordingly if group together the four types of so called machinery family, the group has about 30% share.

Major products of chemical industry are caustic soda, sheet glass, polyurethane foam, pharmaceuticals, detergent, paint, farm chemicals, surface active agent, etc. Automobile, motorcycle, diesel engine, pump, elevator, bearing, electric motor, condensor and electrical appliance and the major products of the machinery group. Textile industry's major products are yarn and fabrics, garment, underwear, towel, blanket, fastener and fishing net. Rice cookie, instant noodle, seasoning, broiler, refined sugar, canned pineapple and marine foods are major products of foods industry.

Table 4.1.2 shown below indicates the number of application and registered investment amounts filed at BOI. The year 1978 was highest in number of application but 1981 took record amount of investment of 17,895 million baht. There was sharp drop in 1982 supposedly due to slow business climate affected by poor production of agricultural sector. Then there was upturn of application of 175 in the first half of 1983. It is quite possible that the annual total of 1983 would go over the previous year level.

Table 4.1.2 APPLICATION TO BOI INCENTIVES

(Unit: Million Baht)

	1975	1976	1977	1978	1979	1980	1981	1982
Nos. of application	111	119	264	342	338	245	265	200
Investment amount	1,078	1,233	4,598	10,923	14,241	11,754	17,895	5,019
Foreign investment	230	280	1,012	1,800	3,077	2,858	5,662	127
(Japanese)	37	37	422	175	316	80	965	95

Source: BOI

As of 1982, accumulated amount of the Japanese investment in manufacturing sector was 95 million baht which is about 6.2% of the total registered investment and is followed by Taiwan and U.S.A. Though there are pending issues such as restrictions on working visa and equity share and increment of local contents, the Japanese investors have generally hopeful long term outlook on Thai economy. According to the survey conducted by the Japanese Chamber of Commerce in Bangkok, more than 20 companies have investment plans of over 10 million baht each which is worth noting.

At any rate Japanese investment in Thailand would basically continue to increase in the future and Laem Chabang will become a focal point of their interests in terms of industrial location. Since it is in planning stage, no specific interests are expressed by the Japanese businessmen in Bangkok but they are generally favorable to a concept and will show more interest when the plan takes shape.

APPENDIX I-6 OUTLINE OF FTZ (EPZ) IN ASIA

In the recent year increasing attention has been shown in establishment or concept building of Free Trade Zone (FTZ) and or Export Processing Zone (EPZ) world wide and it is not exceptional to Asia where there are 11 countries that have established FTZ. During the period from the mid 60s to the first half of 70s, Taiwan, Korea and Singapore established FTZs which could be called as the first stage of FTZ development in Asia. Now it is considered the second stage that such countries as India, Sri Lanka, Pakistan, Philippines and lately The Peoples Republic of China started development of FTZ. As already known well, Thailand established her first EPZ in Lat Krabag Industrial Estate with the size of about 27 ha. and have tried to invite investors there by offering a set of incentives (exemption of taxes and duties).

These boom in development of FTZ might be stimulated by the success of the advanced FTZs in Taiwan and Korea. The common objectives of FTZ are generally job creation, foreign exchange earning and transfer of technology through introduction of foreign investment.

The types of the located industries are of those labor intensive ones which generally do not require special technologies and skills, their representative products are textile, garments, electronics, plastic products, footwares, rubber products and foods. Lately there have been marked progress in location of electronic industries but what is doen in FTZ is chiefly the last process of production, namely assembly and testing by using abundant and comparatively cheap labor.

In such advanced countries in FTZ development as Taiwan, Korea, Hong Kong and Singapore, some industries have lost their international competitive edge as their standard wage goes high and plan to transfer a part of their production into other developping countries. It is worth noting that such NICs are becoming source of external investment in FTZ and so called international division of labor is being formed among the FTZs in the region. Under these circumstances, it is required to study carefully the recent aggressive approach of the Peoples Republic of China for external open policy that is to invite foreign investment in the four (4) special economic zones and fourteen (14) economic development zones to achieve the Four Modernization Programme which may increase more competitions among the coming FTZ in Asia.

Outline of the Major FTZ in Asia

Country	Name	Location	Incentives	Regulations
Korea	Free Export Zone	Masan Iri	No restrictions on importation of raw materials. Reduction on income and corporate taxes. Exemption on Business tax, import duty, commodity taxes and income for expatriate	Prohition of reentry of the products into the customs zone, max. foreign participation is not more than 50% of the investment amount. Labor intensive industries.
Taiwan	Export Processing Zone	Kaoshung Nantze Taichung	Exemption of commodity tax, business tax and corporate tax, Exemption of import duties on capital goods, raw materials and semi finished products.	Prohition of reentry of the products into customs zone. Minimum amount of investment US$50,000. Only applicable to export processing and assembly
Hong Kong	Free port Area	All areas	No license, no permit is required except for submission of import declaration. No taxes on export and reexport.	Import duties are applicable only to liquor, cigarettes and table water. Limited commodities are not allowed for import.
Singapore	Free Trade zone		Minimum level of duties and trade controls even at outside of the zones	Dutialbe or seleected 300 commodities. 100 commodities require special import license. Import/export permits are required.
Malaysia	Free Trade zone	BayanLepas, Prai, Sungei way, Batu Brendan, Tanjang, Klong	With some exceptions, no taxes for import and export, manufacturing, assembly and processing	Liquor, cigarettes, match and petroleum products are subject to import duties. Some commodities require license for import and export.
Phillip-pines	Export Processing zone	Bataan Mactan Buguio	Tax and duties exempted. Preferential foreign exchange allocation. 100% foreign ownership is allowed. No restriction in transfer of the principal and profit.	Allowable only for export and export assiting companies. Minimum investment required of 0.3 milion. Employment 250 and annual export of $2.5 million.
Indonesia	Import Bonded warehouse	Kampung Bandan (Jakarta)	Quick customs clearance. Taxes and duties exempted.	Origin of the commodity must be one of the aids giving countries to Indonesia and such commodities shall be the ones purchased under the aid programme.
Sri Lanka	Free Trade zone	Katunayake (Colombo)	Reduction of income tax. Exemption of duties, import/export port taxes. Exemption from application of foreign exchange law. Assurance for non expropriation. No restrictions on remittance to home country.	When ship to the local market, import duties will be charged more than 75% within 20 years.
India	Free Trade zone Electronics Export processing zone	Kandla Santa Cruz	Exemption of duties. No import license is required. - ditto -	Reexport shall be made with 6 months. Import in ristricted only for reexport
Pakistan	Export processing zone	Karachi	*Exemption of duties, Federal/Provincial/ local taxes. *5 years tax credit.	Foreign nationals or joint ventures with Overseas Pakistani.

Abstract of the Major EPZs in Asia

Country	Name of EPZ	Net Area(HA)	Occupied(HA)	Nos. of Ent.	Nos.of Workers	Average Density/HA	Average size of plot HA	Major types of Industry	Mother Town
Malaysia	Bayan Lepas	104	81	42	31,632	391	1.9	Electronics/Rubber/Precision/Textile	Georgetown 14km
"	Prai	150	118	10	5,158	44	11.8	Textile/Rubber/Precision	Butterworth 5km
"	Prai Wharf	13	8	1	2,572	321	8.0	Textile	" "
"	Batu/Berendam	18	12	8	6,087	507	1.5	Electronics/Precision	Malacca 5km
"	Tanjung Kling	7	7	3	902	129	2.3	Leather/Apparel	" "
"	Pulau Jerejak	114	8	1	527	66	8.0	Transportation equip't	Penang
Philippines	Bataan	167	140	52	19,151	137	2.7	Apparel/Electrical/Rubber/Metal	Manila 170km
"	Mactan	58	11	5	1,176	107	2.2	Electronics/Apparel	Cebu
"	Baguio	32	11	1	1,556	142	11.0	Electronics/Apparel/Metals	Baguio
Singapore	Ayer Rajah	16	16	128(119)*	11,564	723	0.13	N. A.	Singapore
"	Kallang Basin	49	49	501(492)	41,643	850	0.10	N. A.	"
"	Kranji	73	73	35 (29)	3,636	50	2.5	N. A.	"
"	Woodland East	13	13	23 (14)	435	34	0.9	N. A.	"
Taiwan	Kaoshung	69	69	119	37,360	541	0.54	Electrical/Apparel/Plastic/Textile	Kaoshung
"	Nantze	90	56	96	24,613	273	0.45	Electrical/Plastic/Metals	Nantze
"	Taichun	23	23	48	16,553	720	0.5	Electronics/Leather	Taichun
Korea	Masan	68	68	91	27,512	405	0.75	Electrical/Metal/Machinery/Textile	Masan
Thailand	Lat Krabang	27		8	1,956	72	3.38		Bangkok 30km

* operated

	HONG KONG	INDONESIA	KOREA	MALAYSIA	PHILIPPINES	SINGAPORE	TAIWAN, ROC	THAILAND
Summary of Comparative Investment Incentives								
Basic Rights and Guarantees to Investors								
Guarantee against expropriation	✓	✓	✓	✓	✓	✓	✓	✓
Guarantee against losses due to:								
a. nationalization	–	✓	–	✓	–	✓	–	✓
b. damage caused by war	–	✓	–	✓	–	–	–	–
c. inconvertibility of currency	–	✓	✓	✓	–	✓	–	✓
Remittance of foreign exchange earnings and payments	✓	✓	✓	✓	✓	✓	✓	✓
Repatriation of capital	✓	✓	✓	✓	✓	✓	✓	✓
Protection Schemes and Priorities Given to Investors and Aliens								
Employment of aliens	✓	✓	✓	✓	✓	✓	✓	✓
Patent protection	✓	✓	✓	✓	✓	✓	✓	✓
Preference in the granting of government loans	–	–	–	✓	✓	✓	✓	✓
Protection against unjust competition								
a. Import competition	–	✓	✓	✓	✓*	–	✓	✓
b. Government competition	–	–	–	–	✓*	–	–	✓
c. Local competition	–	✓	–	–	✓*	–	–	✓
Real estate ownership by alien investors	✓	–	✓	✓	–	✓	✓	✓
Exemptions from Taxes and Tariff Duties								
Capital gains tax	✓	–	✓	✓	✓*	–	✓	–
Corporate income tax	✓	✓	✓	✓	–	✓	✓	✓
Taxes on imported capital goods	✓	✓	✓	✓	✓	–	✓	✓
Taxes on imported raw materials	✓	✓	✓	✓	✓	–	✓	✓
Taxes on royalties	✓	–	✓	✓	–	✓	✓	✓
Withholding tax on interest on foreign loans	✓	–	✓	✓	–	✓	✓	✓
Other taxes and fees	✓	✓	✓	✓	✓	✓	✓	✓
Deductions from Taxable Corporate Income								
Accelerated depreciation allowance	✓	✓	✓	✓	–	✓	✓	✓
Carry forward of capital allowance during the relief period	✓	–	–	✓	✓*	✓	–	–
Carry forward of loss	✓	✓	✓	✓	✓	✓	✓	✓
Export allowances/deductions	–	–	–	✓	✓	✓	✓	✓
Deduction of organization and preoperating expenses								
a. Organization expenses	–	–	✓	✓	✓	–	–	✓
b. Preoperating expenses	✓	–	✓	–	✓	–	✓	✓
Reinvested profits	–	–	–	–	✓	–	✓	–
Investment allowance	–	✓	–	✓	–	✓	–	–
Tax Credits (Direct Reduction from Corporate Income Taxes)								
Investment tax credits	–	–	✓	✓	–	✓	✓	–
Tax credit on domestic capital equipment	–	–	✓	✓	✓	–	–	–
Other tax credits	–	–	✓	✓	✓	–	✓	✓
Extension of Incentive Availment Period	–	–	–	✓	–	✓	–	–
Special Incentives								
To multinational companies	–	–	–	–	✓	–	✓	–
To exporters	–	–	✓	✓	✓	✓	✓	✓
To offshore banking units	–	–	–	✓	✓	✓	✓	–
Other laws granting benefits to foreign investors	✓	–	–	✓	✓	✓	✓	–
Assistance to Investors								
Joint venture brokerage	✓	✓	✓	✓	✓*	✓	✓	–
Technical assistance	✓	–	✓	✓	✓**	✓	✓	✓
Processing of applications and other requirements	–	✓	✓	✓	✓	✓	–	✓

*Application only to NOI-registered enterprises; other industries are applicable to both EPZA- and NOI-registered firms.

**Applicable only to Filipino subscribers to firms registered under P.D. 66 and to firms registering as pioneer firms under P.D. 1789.

18	Food and tobacco manufacturing
181	Live-stock products
1811	Meat products, except Slaughtering
1812	Dairy products
1819	Miscellaneous livestock food products
182	Sea food processing
1821	Canned seafood and seaweed
1822	Seaweed products, except canned
1823	Agar-agar and isinglass
1824	Fish meat ham and sausage
1825	Fish paste products
1826	Frozen seafood products (unprocessed and unpackaged)
1827	Frozen seafood products (preprocessed and packaged)
1829	Miscellaneous seafood products
183	Manufacture of canned and preserved fruits and vegetables products
1831	Canned and preserved fruits and vegetables products, except vegetables pickled or in brine
1832	Vegetables pickled or in brine, not in airtight containers
184	Manufacture of seasonings
1841	Bean paste "Miso"
1842	Soy sauce "Shōyu" and edible amino acids
1843	Chemical seasonings
1844	Sauces
1845	Vinegar
1849	Miscellaneous seasonings
185	Manufacture of flour and grain mill products
1851	Rice cleaning
1852	Wheat and barley cleaning
1853	Wheat flour
1859	Miscellaneous flour and grain mill products
186	Sugar processing
1861	Sugar, except refined sugar
1862	Refined sugar products
187	Manufacture of bakery and confectionery products
1871	Bread
1872	Pastries and cakes
1873	Biscuit, crackers and other dry bakery products
1874	Rice candies
1879	Miscellaneous bakery and confectionery products
188	Beverage industries
1881	Soft drinks and carbonated water
1882	Wine, except "sake"
1883	Malt liquors
1884	Rice wine "Sake"
1885	Distilled, rectified and blended liquors
189	Manufacture of prepared animal foods and organic fertilizers
1891	Balanced compound feeds
1892	Elemental feeds
1893	Organic fertilizers
191	Manufacture of animal and vegetable oils and fats
1911	Vegetable oils and fats
1912	Animal oils and fats
1913	Edible oils and fats
192	Manufacture of miscellaneous food and related products
1921	Baking powder, yeast and other leavening compounds
1922	Tea
1923	Starch
1924	Dextrose and maltose
1925	Manufactured ice
1926	Noodles, macaroni and spaghetti
1927	Malt and malt extract
1928	Bean curd "tōfu" and fried bean curd "abura-age"
1929	Sweet bean paste "anko" and related products
193	Manufacture of miscellaneous food and related products
1931	Coffee
1932	Precooked frozen food
1939	Food and related products, not elsewhere classified
20	Manufacture of textile mill products, except apparel and other finished products made from fabrics and similar materials
201	Silk reeling plants
2011	Machine reeled raw silk
2012	Hand reeled silk
2013	Dupion silk
202	Spinning mills
2021	Spinning mills, cotton
2022	Spinning mills, man-made staple fibre
2023	Spinning mills, wool
2024	Spinning mills, silk staple
2025	Spinning mills, hard and bast
2029	Miscellaneous spinning mills
203	Twisting and bulky yarns
2031	Twisting yarns
2032	Bulky yarns
204	Woven fabric mills
2041	Fabric mills, woven cotton and spun rayon
2042	Fabric mills, woven silk and rayon
2043	Fabric mills, woven woolen and worsted

2044	Fabric mills, woven hard and bast fibre
2049	Miscellaneous woven fabric mills
205	Knitting mills
2051	Tubular knit fabrics and its products
2052	Warp knit fabrics and its products
2053	Flat knit fabrics
2054	Hosiery
2055	Knit glove
206	Dyeing and finishing textiles
2061	Machine dyed and finished cotton, spun rayon, and others
2062	Machine dyed and finished silk and rayon fabrics
2063	Machine dyed and finished woolen and worsted fabrics
2064	Finished woven fabrics
2065	Hand dyed and finished woven fabrics
2066	Dyed and finished quasi-cotton fibre and yarns
2067	Dyed and finished knit and lace
2068	Dyed and finished miscellaneous textiles
207	Manufacture of ropes and nettings
2071	Ropes
2072	Fishing nets
2079	Miscellaneous nettings
208	Lace and other textile goods
2081	Embroidered lace
2082	Knit lace
2083	Bobbin lace
2084	Braids
2085	Narrow fabrics (under 13 cm width)
2089	Miscellaneous lace and textile goods
209	Miscellaneous textile mill products
2091	Scouring and combing plants
2092	Scutching hard and bast fibres
2093	Shearing plants
2094	Wadding
2095	Felt and bonded fabrics
2096	Carpets and miscellaneous textile mats
2097	Coated waterproof fabrics
2098	Textile sanitary materials
2099	Textile mill products, not elsewhere classified
21	Manufacture of apparel and other finished products made from fabrics and similar materials
211	Manufacture of outer garment, except Japanese style
2111	Men's outer garment
2112	Women's and children's outer garment
2113	Work, sport and sanitary clothing
2114	School uniforms
212	White shirts and underwear, except Japanese style
2121	White shirts, open shirts
2122	Underwear
2123	Foundation garment
213	Manufacture of hats
2132	Woven fabric hats
214	Fur apparel and apparel accessories
2141	Fur apparel and apparel accessories
215	Manufacture of miscellaneous textile apparel and accessories, including Japanese style
2151	Japanese style apparel
2152	Ties
2153	Scarfs and mufflers
2154	Handkerchieves
2155	Japanese socks "tabi"
2159	Textile apparel and accessories, not elsewhere classified
219	Miscellaneous fabricated textile products
2191	Bedding
2193	Canvas products
2194	Textile bags
2195	Embroidery
2199	Fabricated textile products, not elsewhere classified
22	Manufacture of lumber and wood products, except furniture
221	Sawing, planing mills and wood products
2211	General sawing and planing mills
2212	Veneer wood
2213	Shingle wood
2214	Wood shaving and chipping
2217	Flooring wood
2218	Wood chip
2219	Miscellaneous saw mills and planing mills
222	Manufacture of millwork, plywood and prefabricated structural wood products
2221	Millwork, except lumber for fixtures
2222	Plywood
2223	Prefabricated wooden buildings and structural members
2224	Particle board
223	Manufacture of wooden containers, including bamboo and rattan
2231	Bamboo, rattan and willow baskets
2232	Chipping boxes
2233	Wooden boxes, except chipping boxes
2234	Japanese style barrels "Wataru"
2235	Foreign style barrels "Yōtaru"
2236	Wooden tubs
224	Wooden footwear

2241	Wooden footwear
229	Manufacture of miscellaneous wood products, including bamboo and rattan
2291	Wood preserving plants
2292	Lasts and related products
2293	Bent work basic products
2299	Wood products, not elsewhere classified, including bamboo and rattan
23	Manufacture of furniture and fixtures
231	Manufacture of furniture
2311	Furniture, except metal and japanned
2312	Metal furniture
2313	Matresses and connected springs
232	Furniture for religious purposes
2321	Furniture for religious purposes
233	Manufacture of sliding doors and screens
2331	Manufacture of sliding doors and screens
239	Manufacture of miscellaneous furniture and fixtures
2391	Office and store fixtures
2392	Window and door screens and shades
2393	Japanese screens, clothes racks and bamboo shades
2394	Mirror frames and picture frames
2399	Furniture and fixtures, not elsewhere classified
24	Manufacture of pulp, paper and paper products
241	Manufacture of pulp
2411	Dissolved pulp
2412	Paper pulp
242	Manufacture of paper
2421	Foreign style paper
2422	Paperboard
2424	Hand-made Japanese paper
243	Manufacture of paper coating and glazing
2431	Coated paper
2432	Corrugated board
2433	Wall paper and "Fusuma" sliding door paper
2434	Book-binding cloth
244	Manufacture of paper products
2441	Office paper products
2442	School paper products
2443	Paper products for daily use
2449	Miscellaneous paper products
245	Manufacture of paper containers
2451	Sacks for heavy weight shipping
2452	Corrugated board boxes
2453	Paperboard boxes and cups
2454	Solid fibre and vulcanized fibre products
2455	Solid fibre and vulcanized fibre products
249	Manufacture of miscellaneous pulp, paper and paper worked products
2491	Cellophane
2492	Fibreboard
2493	Paper-made sanitary materials
2499	Pulp, paper and paper worked products, not elsewhere classified
25	Publishing, printing and allied industries
251	Newspaper industry
2511	Newspapers (with own printing facilities of newsprinting paper)
2512	Newspaper(with own printing facilitiesof ordinary printing papers)
2513	Newspapers (publishing without own printing facilities)
252	Publishing industry
2521	Publishing industry
253	Printing industry, except mimeograph printing
2531	Printing industry, except mimeograph printing
254	Book-binding and printed matters
2541	Book-binding
2542	Printed matters
2543	Copper plate & wood block sculture
255	Book-binding and printed matters
2551	Book-binding
2552	Printed matters
259	Service indestries relater to printing trade
2599	Miscellaneous service indestries related to printing trade
26	Manufacture of chemical and allied products
261	Manufacture of chemical fertilizers

2611	Nitric and phosphatic fertilizers
2612	Compound fertilizers
2619	Miscellaneous chemical fertilizers
262	Manufacture of industrial inorganic chemicals
2621	Soda
2622	Electrothermic industry
2623	Inorganic pigments
2624	Compressed and liquified gases
2625	Salt
2629	Industrial inorganic chemicals, not elsewhere classified
263	Manufacture of industrial organic chemicals
2631	Basic petroleum-chemicals
2632	Aliphatic intermediates (including aliphatic solvent)
2633	Methane derivatives
2635	Coal-tar products
2636	Cyclic intermediates, synthetic dyes and organic pigments
2637	Plastics
2638	Synthetic rubber
2639	Industrial organic chemicals, not elsewhere classified
264	Manufacture of chemical fibres
2641	Rayon fibres
2642	Acetate fibres
2643	Synthetic fibres
265	Manufacture of oil and fat products, soaps, synthetic detergents surface-active agents and paints
2651	Fatty acids, hydrogenated oils and glycerin
2652	Soaps and synthetic detergents
2653	Surface-active agents, except soaps and synthetic detergents
2654	Paints
2655	Printing ink
2656	Cleaning and scouring preperations
2657	Candles
266	Manufacture of drugs and medicines
2661	Medical material preparations
2662	Medical product preparations
2663	Biological preparations
2664	Natural drugs and medicines
2665	Medical products for animals
269	Manufacture of miscellaneous chemical and allied products
2691	Industrial explosives
2692	Explosives for ordnance
2693	Agricultural chemicals
2694	Perfumes and fragrant materials
2695	Toiletries, toothpaste and other related articles
2696	Gelatin and adhesives
2697	Photosensitive materials
2698	Natural resin and wood chemical products
2699	Chemicals and allied products, not elsewhere classified
27	Manufacture of petroleum and coal products
271	Petroleum refining, lubricating oils and greases (not made in petroleum refineries)
2711	Petroleum refining, lubricating oils and greases (not made in petroleum refineries)
272	Lubricating oils and greases (not made in petroleum refineries)
2721	Lubricating oils
2722	Greases
273	Coke
2731	Coke
274	Briquettes and briquette balls
2741	Briquettes and briquette balls
275	Paving materials
2751	Paving materials
279	Miscellaneous petroleum and coal products
2799	Miscellaneous petroleum and coal products
28	Manufacture of rubber products
281	Manufacture of tyres and inner tubes
2811	Tyres and tubes for automobiles
2812	Tyres and tubes for bicycles
282	Manufacture of rubber belts and hoses and mechanical goods products
2821	Rubber footwear and its accessories
2822	Plastic footwear and its accessories
283	Manufacture of rubber belts, hoses and mechanical rub products
2831	Rubber belts
2832	Rubber hoses
2833	Industrial rubber products
289	Manufacture of Miscellaneous rubber products
2891	Rubber coated cloth and its products
2892	Medical and sanitary rubber products
2893	Rubber sheet (Repair sheet)
2894	Retreaded tyres
2895	Reclaimed rubber
2899	Rubber products, not elsewhere classified

29	Leather tanning and manufacture of leather products, and fur skins
291	Leather tanning and finishing
2911	Leather tanning and finishing
292	Mechanical leather products, except gloves and mittens
2921	Mechanical leather products, except gloves and mittens
293	Boot and shoe cut stock and findings
2931	Boot and shoe cut stock and findings
294	Leather footwear
2941	Leather footwear
295	Leather gloves and mittens
2951	Leather gloves and mittens
296	Luggage
2961	Luggage
297	Handbags and small leather goods
2971	Handbags and small leather goods
298	Fur skins
2981	Fur skins
299	Manufacture of miscellaneous leather products
2999	Leather products, not elsewhere classified
30	Manufacture of ceramic, stone and clay products
301	Manufacture of glass and its products
3011	Flat glass
3012	Processed flat glass
3013	Glass processing materials
3014	Glass containers
3015	Scientific glass instruments
3016	Table and kitchen glass instruments
3017	Glass fibre and its products
3019	Miscellaneous glass and its products
302	Manufacture of cement and its products
3021	Cement
3022	Fresh concrete
3023	Concrete products
3029	Miscellaneous cement products
303	Manufacture of structural clay products, except those of pottery
3031	Clay roofing tile
3032	Building brick
3033	Clay pipe
3039	Miscellaneous structural clay products
304	Manufacture of pottery and related products
3041	Sanitary pottery
3042	Tableware pottery
3043	Pottery ornaments
3044	Porcelain electrical supplies
3045	Scientific and industrial ceramic poroducts
3046	Tile and mosaic, except quarry tile
3047	Pottery decorating
3048	Preparing pottery clay
3049	Miscellaneous pottery and related products
305	Manufacture of clay refractories
3051	Fire bricks
3059	Miscellaneous refractories
306	Manufacture of carbon and graphite products
3061	Carbonaceous electrodes
3069	Miscellaneous carbon and graphite products
307	Manufacture of abrasive products
3071	Abrasive grains
3072	Abrasive products
3073	Abrasive cloth and paper
3079	Miscellaneous abrasive products
308	Manufacture of aggregate and stone products
3081	Crushed stones
3082	Artificial aggregate
3083	Cut-stones and stoneware products
3084	Diatomaceous earth and its products
3085	Minerals and stones crushed or otherwise treated
309	Manufacture of miscellaneous ceramic, stone and clay products
3091	Enamelled ironware
3092	Cloisonne
3093	Artificial jewels
3094	Rock wool, slag wool and its products
3095	Asbestos products
3096	Gypsum products
3097	Lime products
3099	Ceramic, stone and clay products, not elsewhere classified

31	Iron and steel industries
311	Iron smelting, with blast furnaces
3111	Pig iron and steel, manufactured with blast furnaces and rolling facilities
3112	Pig iron and steel, with blast furnaces and without rolling facilitie
312	Iron smelting, without blast furnaces
3121	Pig iron and steel, with electric furnaces
3122	Pig iron and steel, with charcoal blast furnaces
3123	Ferro-alloys
313	Manufacture of steel, with rolling facilities
3132	Steel manufactured, with converters
3133	Steel manufactured, with electric furnaces, including single electric furnaces, and with rolling facilities
314	Manufacture of steel materials, except smelting furnaces and stee works with rolling facilities
3141	Hot rolling
3142	Cold rolling
3143	Cold rolled steel shapes
3144	Steel pipes and tubes
3145	Re-rolled steel products
3146	Cold finished steel bars
3147	Pipes and tubes drawing
3148	Wire drawing
315	Manufacture of coated steel
3152	Galvanized steel sheets
3153	Coated steel pipes
3159	Miscellaneous coated steel
316	Manufacture of steel forgings, secondary forgings and steel castir
3161	Steel forgings
3162	Secondary forgings
3163	Steel castings
317	Manufacture of iron castings
3171	Iron castings, except cast iron pipes and malleable iron castings
3172	Cast iron pipes
3173	Malleable iron castings
319	Manufacture of miscellaneous iron and steel
3191	Iron powder
3192	Iron and steel shearing and slitting
3193	Iron and steel shearing and slitting
3199	Iron and steel, not elsewhere classified
32	Manufacture of non-ferrous metals and products
321	Primary smelting and refining of non-ferrous metals
3211	Primary smelting and refining of copper
3212	Primary smelting and refining of lead
3213	Primary smelting and refining of zinc
3214	Primary smelting and refining of precious metals
3215	Primary smelting and refining of nickel
3216	Primary smelting and refining of aluminium
3217	Primary smelting and refining of titanium
3219	Miscellaneous primary smelting and refining of non-ferrous metals
322	Secondary smelting and refining of non-ferrous metals, including non ferrous alloys
3221	Secondary smelting and refining of lead, including lead alloys
3222	Secondary smelting and refining of zinc, including zinc alloys
3223	Secondary smelting and refining of aluminium
3229	Miscellaneous secondary smelting and refining of non-ferrous metals, including alloys
323	Rolling of non-ferrous metals and alloys, including drawing and extruding
3231	Rolling and drawing of copper and copper alloys
3232	Rolling of lead and lead alloys, including extruding
3233	Rolling of aluminium and aluminium alloys
3239	Rolling of miscellaneous non-ferrous metals and alloys, incl. drawing and extruding
324	Manufacture of non-ferrous foundries
3241	Non-ferrous castings
3242	Non-ferrous die castings
325	Electric wire and cable
3251	Electric wire and cable
329	Manufacture of miscellaneous non-ferrous metal products
3291	Nuclear fuels
3299	Non-ferrous metal products, not elsewhere classified
33	Manufacture of fabricated metal products
331	Tin cans and other plated sheet products
3311	Tin cans and other plated sheet products
332	Manufacture of tableware (foreign type), cutlery, hand tools : hardware
3321	Tableware (foreign type)
3322	Edge tools for machinery
3323	Edge tools, artisans tools and hand tools
3324	Working tools
3325	Files
3326	Hand saws and saw blades
3327	Agricultural tools, except agricultural machinery
3329	Miscellaneous hardware
333	Manufacture of heating apparatus and plumbing supplies

3331	Plumbers' supplies, except valves and cocks
3332	Gas and oil appliances
3333	Heated air and hot water heating systems
3339	Miscellaneous heating and cooking apparatus, except electrical appliances and gas and oil appliances
334	Manufacture of fabricated constructional and architectural metal products, including fabricated plate work and sheet metal work
3341	Fabricated constructional metal products
3342	Fabricated architectural metal products, except structural hardware
3343	Fabricated plate work and sheet metal work
335	Manufacture of fabricated metal stamping, coating, engraving and heat treating except enamelled ironware
3351	Stamped and pressed aluminium products
3352	Stamped and pressed metal products
3353	Powder metallurgy products
3354	Coating metal products
3355	Galvanized and other hot-dip coated metal products
3356	Engraving on metals
3357	Electroplated metal products except steel plated
3358	Heat treated metal
3359	Miscellaneous treatment of metal surfaces
336	Manufacture of fabricated wire products
3361	Nails
3369	Fabricated wire products, not elsewhere classified
337	Bolts, nuts, rivets, screws and wood screws
3371	Bolts, nuts, rivets, screws and wood screws
339	Manufacture of miscellaneous fabricated metal products
3391	Safes
3392	Metallic springs
3399	Fabricated metal products, not elsewhere classified
34	Manufacture of general machinery and its attachments and accessories
341	Manufacture of boilers, engines and turbines
3411	Boilers
3412	Steam engines, turbines and water wheels, except marine engines
3413	Internal combustion engines
3419	Miscellaneous engines and turbines
342	Agricultural machinery and equipment
3421	Agricultural machinery and equipment
343	Manufacture of machinery and equipment for construction and mining, including tractors for construction, agriculture and transportation of goods
3431	Machinery and equipment for construction and mining
3432	Tractors
344	Manufacture of metal working machinery
3441	Metal machine tools
3442	Metal working machinery, except metal machine tools
3443	Parts and accessories for metal working machines and machine tools
3444	Machinist's precision tools, except powder metallurgy products
345	Manufacture of textile machinery
3451	Spinning machinery
3452	Looms and knitting machinery
3453	Dyeing and finishing machinery
3454	Textile machinery parts, attachments accessories
346	Manufacture of special-industry machinery
3461	Food processing machinery
3462	Wood working machinery
3463	Pulp and paper industries machinery
3464	Printing, book-binding and paper converting machinery
3465	Foundry equipment
3466	Plastic working machinery and accessories
3469	Miscellaneous special-industry machinery
347	Manufacture of general industry machinery and equipment
3471	Pumps and pumping equipment
3472	Air compressors, gas compressors and blowers
3473	Elevators and escalators
3474	Conveyors and conveying equipment
3475	Powertransmission equipment, except ball and roller bearings
3476	Industrial furnaces and ovens
3477	Oil hydraulic equipment
3478	Chemical machinery and its equipment
3479	Miscellaneous general industry machinery and equipment
348	Manufacture of office, service industry and house-hold machines
3481	Office machines
3482	Sewing machines
3483	Woolen yarn hand knitting machines
3484	Refrigerators and air conditioning apparatus
3489	Miscellaneous machines for offices, service industry and house-hold
349	Manufacture of miscellaneous machinery and machine parts
3491	Fire extinguishing equipment and apparatus
3492	Valves and fittings
3493	Fabricated pipe and fittings
3494	Ball and roller bearings
3495	Piston rings
3496	Moulds and dies, parts and accessories
3497	Packing machines
3498	Industrial robbots
3499	Machine and parts shops (jobbing and repair)
35	Manufacture of electrical machinery, equipment and supplies
351	Manufacture of electrical generating, transmission, distribution and industrial apparatus
3511	Generators, motors and other rotating electrical machinery
3512	Power and distribution transformers
3513	Relay switch, switchboard and electrical control equipment
3514	Wiring devices and supplies
3515	Electrical welding equipment

3516	Auxiliary equipment for internal combustion engines
3519	Miscellaneous industrial electrical apparatus (including those for vehicles and vessels)
352	Household electric appliances
3521	Household electric appliances
353	Manufacture of electric bulbs and lighting fixtures
3531	Electric bulbs
3532	Electric lighting fixtures
354	Manufacture of communication equipment and related products
3541	Communication equipment (wired)
3542	Radio communication equipment
3543	Radio and television receivers
3544	Electric audio equipment
3545	Railway signals and safety appliances
3549	Miscellaneous communication equipment and related products
355	Manufacture of electronics equipment
3551	X-ray equipment
3552	Electronic data processing machines, digital and analog computer
3559	Miscellaneous electronics equipment
356	Manufacture of electric measuring instruments
3561	Electric measuring instruments
3562	Industrial process controlling instruments
357	Manufacture of parts for electronic appliances and communication equipment
3571	Electron tubes
3572	Semi-conductor devices
3573	Integrated circuits
3579	Miscellaneous parts for electronic appliances and communication equipment
359	Manufacture of miscellaneous electrical machinery, equipment and supplies
3591	Storage batteries
3592	Primary batteries (dry and wet)
3599	Electrical machinery equipment and supplies, not elsewhere classified
36	Manufacture of transportation equipment
361	Manufacture of motor vehicles and motor vehicle and equipment
3611	Motor vehicles including 3 wheelers and 2 wheelers
3612	Motor vehicle bodies and trailers
3613	Motor vehicle parts and accessories
362	Manufacture of railroad equipment and parts
3621	Railroad vehicles
3622	Railroad vehicle parts
363	Bicycles and parts
3631	Bicycles and parts
364	Shipbuilding and repairing and manufacture of marine engines
3641	Steel ship building and repairing
3642	Hull blocks
3643	Wooden ship building and repairing
3644	Small watercraft building and repairing
3645	Marine engines
365	Manufacture of aircraft and parts
3651	Aircraft
3652	Aircraft engines
3659	Miscellaneous aircraft parts and auxiliary equipment
369	Miscellaneous transportation equipment
3691	Industrial trucks
3699	Transportation equipment, not elsewhere classified
37	Manufacture of precision instruments and machinery
371	Manufacture of measuring instruments, analytical instruments and testing machines
3711	Universal length measures
3712	Volumeters
3713	Balances and scales
3714	Thermometers
3715	Manometers, flowmeters and quantity gauges
3716	Precision measurement instruments
3717	Analytical instruments
3718	Testing machines
3719	Miscellaneous measuring instruments, analytical instruments and testing machines
372	Surveying instruments
3721	Surveying instruments
373	Manufacture of medical instruments and apparatus
3731	Diagnostic instruments and apparatus
3732	Dental instruments and apparatus
3733	Veterinary instruments and apparatus
3734	Medical Materials
3735	Dental materials
374	Physical and chemical instruments
3741	Physical and chemical instruments
375	Manufacture of optical instruments and lenses

3751	Microscopes and telescopes
3752	Cameras and its parts
3753	Motion picture equipment and its parts
3754	Optical lenses and prisms
376	Ophthalmic goods, including frames
3761	Ophthalmic goods, including frames
377	Manufacture of watches, clocks, clockwork-operated devices and parts
3771	Watches, clocks and parts, except watchcases
3772	Watchcases
38	Manufacture of ordnance
381	Small arms (rifles)
3811	Small arms (rifles)
39	Miscellaneous manufacturing industries
391	Pecious metal products, including jewel manufacture
3911	Precious metal products
3912	Jewellers' findings and its materials
392	Manufacture of musical instruments and phonograph records
3921	Pianos
3923	Guitars
3924	Phonograph records
3929	Musical instruments, parts and its materials, not elsewhere classified
393	Manufacture of toys and sporting goods
3931	Games and toys, except dolls and children's vehicles
3932	Dolls
3933	Children's vehicles
3934	Sporting and athletic goods
394	Manufacture of pens, lead pencils, painting materials and stationery
3941	Pens, mechanical pencils and pen nibs
3942	Ball-point pens and marking pens
3943	Lead pencils
3944	Calliography brushes and painting materials, except pencils
3949	Office supplies, not elsewhere classified
395	Manufacture of costume jewellery, costume accessories, button and related products, except precious metals and jewellery
3951	Costume jewellery, and costume accessories
3952	Artificial flowers, and ornamental feathers
3953	Buttons
3954	Needles, pins, hooks, snaps and related articles
396	Manufacture of plastic products, except the plastic products included in other groups
3961	Plastic plates, pipes and tubes, bars and rods, pipe fittings
3962	Plastic films and sheets
3963	Synthetic leather
3964	Plastic floor materials
3965	Industrial plastic products
3966	Plastic foamed products
3967	Reinforced plastic products
3968	Processed plastics and materials for
3969	Miscellaneous plastics
397	Lacquer ware
3971	Lacquer ware
398	Manufacturing industries, not elsewhere classified
3981	Straw and panama hats
3982	"Tatami" (Japanese mats)
3984	Brooms and brushes
3985	Cork fabricated basic materials and cork goods
3986	Matches
3987	Fireworks
3988	Sign boards and signs
3989	Hari work wigs
399	Manufacturing industries, not elsewhere classified
3991	Umbrellas, parasols and parts (foreign style)
3993	Fans and lanterns (Japanese style)
3994	Models and patterns, except of paper
3995	Thermos bottles
3996	Pallests
3999	Miscellaneous manufacturing industries, not elsewhere classified
99	TOTAL