THE ALTERNATIVE SHORTER SEA ROUTES

VIA ISTHMUS OF KRA:

THE LAND BRIDGE APPROACH

by

SOMMART CHULIKPONGSE

B.B.A., NORTH TEXAS STATE UNIVERSITY, 1971

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DECLARATION

This thesis contains no material which
has been accepted for the award of any other
higher degree or graduate diploma in any
university and, to the best of my knowledge and
belief, contains no material previously
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when due reference is made in the text of the
thesis.

Sommart Chulikpongse

ABSTRACT

The Alternative Shorter Sea Route Via the Isthmus of Kra :

The Land Bridge Approach

Sommart Chulikpongse

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The Kra Canal was originally proposed due to the geographic indication that a shorter sea route might be achieved between the Far East and the Bay of Bengal area and the Persian Gulf. Of course, in Thailand the Kra project has recently (1981-1983) been discussed a great deal and commands wide interest among policy-makers and the informed public.

The Kra project involves not only the construction of a new waterway capable of greatly easing ocean-going traffic between the Pacific and the Indian Oceans Basins but also the projected industrial development zones and transshipment facilities associated with the canal project are of major significance for the entire Thai and broader regional economies. So far there is no evidence that the Kra Canal will become reality.

This research is a preliminary attempt to analyse the Kra project but base on the concept that the land bridge would be introduced in conjuction with two container ports, one on the Eastern

coast along the Gulf of Thailand, and the other on the Western coast along the Andaman Sea. If a railway network will link the two ports, thus intermodalism should provide the alternative possible service to the shippers.

In the first part, the infrastructures between the two proposed ports - Port of Songkhla and Port of Satun, the strategy for port development, the justification for the route are surveyed. Then, an analysis of the two ports investment project and the Songkhla-Satun Kra Land Bridge project are carried out by using benefit-cost study and present value methods. The results obtained show that port projects and the land bridge project are apparently viable when using discout rates under 9% and 8% respectively. Finally, the study concentrated on the economic impact of the Kra Land Bridge and the establishment of regional marketing depots; and major specific rationales are all found to have a significant effect on port development and the land bridge.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

CHAPTER 1.

INTRODUCTION

A. BACKGROUND OF THE ISTHMUS OF KRA AND THE CONCEPTION OF
THE KRA CANAL

An isthmus can be geographically defined as a narrow strip of land connecting two larger land areas otherwise separated by the sea. The two most famous are the Isthmus of Panama, connecting North and South America, and the Isthmus of Suez, connecting Africa and Asia.

From the solid body of Asia a narrow peninsula runs south, ending in Singapore and separating the Andaman Sea from the Gulf of Thailand and the South China Sea. In its northern end Burma and Thailand share the peninsula, Thailand at the eastern side. Then for a stretch the peninsula, from coast to coast, is Thai territory, before it widens out to become Malaysia. Near the northern limit of the all-Thai part of the peninsula it is relatively narrow and known as the Isthmus of Kra, illustrated in Figure 1.1.

Chronological history of the Kra Canal: The Kra Canal concept was first conceived in 1863 by two British engineers, Captains A. Frazer and J.C. Furlong, who crossed the Kra Isthmus by elephant to survey a route for a proposed.[1] Their report said that the building

1. S.G. Sturmey, Shipping Economics: Selected Papers,

(The Mcmillan Press, London, 1975), p. 133.

Figure 1.1

The Isthmus of Kra

Source: RPS
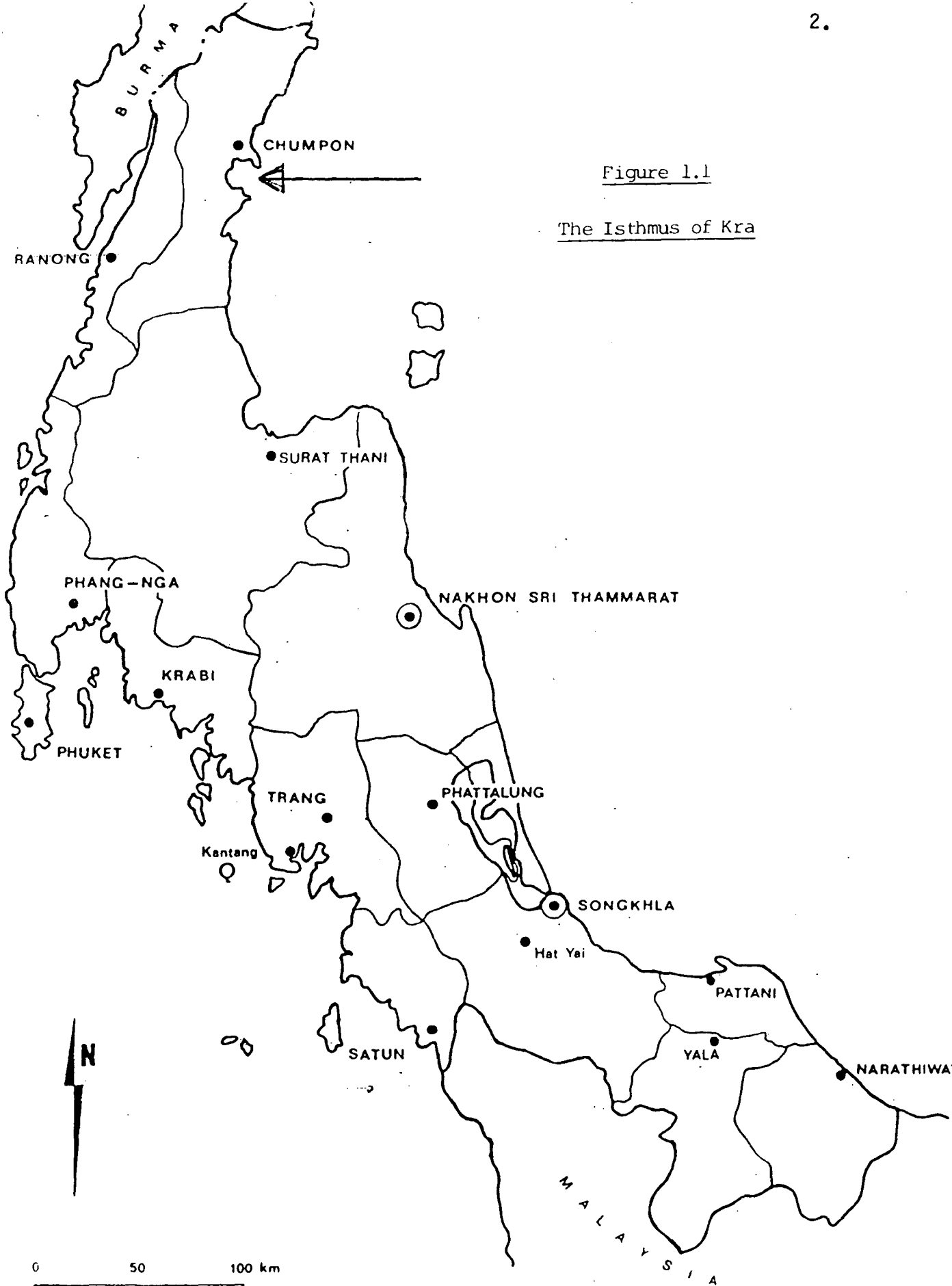
of a canal was impractical and suggested that a railway should be built instead. This recommendation was not followed.

In 1881, Count De Lesseps, the builder of the Suez Canal, examined the possibility of Kra Canal. For a combination of political reasons, the formidable technical difficulties, and the enormous money involved, the project was not seriously considered.

In 1883 the isthmus was again surveyed, by a team sent by the French Government, this team also deemed that the construction of the canal was impracticable.[2]

In the early 1960's the idea was reviewed seriously, with a new proposal to cut the canal by the use of small underground nuclear explosions. This has been shown to be theoretically possible and because of the desire of the American interests to test the theory in practice. Two proposals were put before the Thai Government, one by a Japanese company, and the other by the Golden Peninsula Development Company which is a consortium of companies from several nations.

The Kra Canal was originally proposed due to the geographic indication that a shorter sea route might be achieved between the Far East and the Bay of Bengal area and the Persian Gulf. What was not

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2. Ibid.

foreseen then, was the added dimension of danger caused by the great increase of shipping in the Malacca Straits. Apart from simple distance savings there would also be time saving and safety considerations.

The historic proposal to cut the Canal has remained unfulfilled for various economic, political, national and international reasons. There is no clear evidence that it will become reality.

B. THE SIGNIFICANCE OF THE LAND BRIDGE

The Kra Canal proposal has provided some background on the desire to shorten an important sea route. This project was not implemented - despite considerable attention from Thai public administrators, academics, the business sector, and the press. The Kra Canal project is an important issue in Thailand and has aroused considerable international interest. Thus there is a basis for a more acceptable approach in a study entitled "The Alternative Shorter Sea Routes via Isthmus of Kra: The Land Bridge Approach". This study reflects the on-going interest in the development of Southern Thailand. It is part of the total development in terms of infrastructure. It is envisaged that the land bridge will provide two or more modes to transport goods originating from a foreign point, transiting domestic points, and finding its final destination at another foreign point. Thus, the introduction of land-bridge to the Isthmus of Kra or Southern Thailand peninsula, will create a sea-land-sea system for constant cargo

flows. It is proposed that a substantial amount of ship time could be saved. It is estimated that the voyage between Manila and Rangoon via the land bridge could save between 30 and 40 hours of ship's time.[3] But time and cost for unloading or transhipment must be taken into account to determine whether the land bridge will yield certain benefits.

The approach to this land bridge model is by means of constructing two container ports, one on the eastern coast along the Gulf to Thailand, and the other on the western coast along the Andaman Sea, this can be seen in Figure 1.2. A railway network will link the two ports, thus intermodalism should provide the best possible service to the shippers. Figure 1.2 shows route Songkhla-Satun, which is located on the lower south, an approximate distance of 141 kilometres (from Port of Songkhla at the outer Khao Daeng site to Satun's coastal fishing port). Figure 1.3 shows the anticipated results when a ship moves onto the shorter route and can convey more tonnes per annum. If the land bridge is constructed it increased the tonnage moved as the sea length is reduced. The rearrangement of routing and scheduling will come into effect if shipping lines would consider this land bridge as their alternative intermodal transport hence avoid Singapore's traffic

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3. Mr. Pakorn Sae-lue estimates, Nippon Yusen Kaisha (NYK), Borneo Services Limited.

Figure 1.2

Songkhla – Satun Route and Ports of Songkhla and Satun Sites

National Highways

Provincial Highways

0   20   40   60 KM
SCALE

-Port of Songkhla site

Port of Satun site
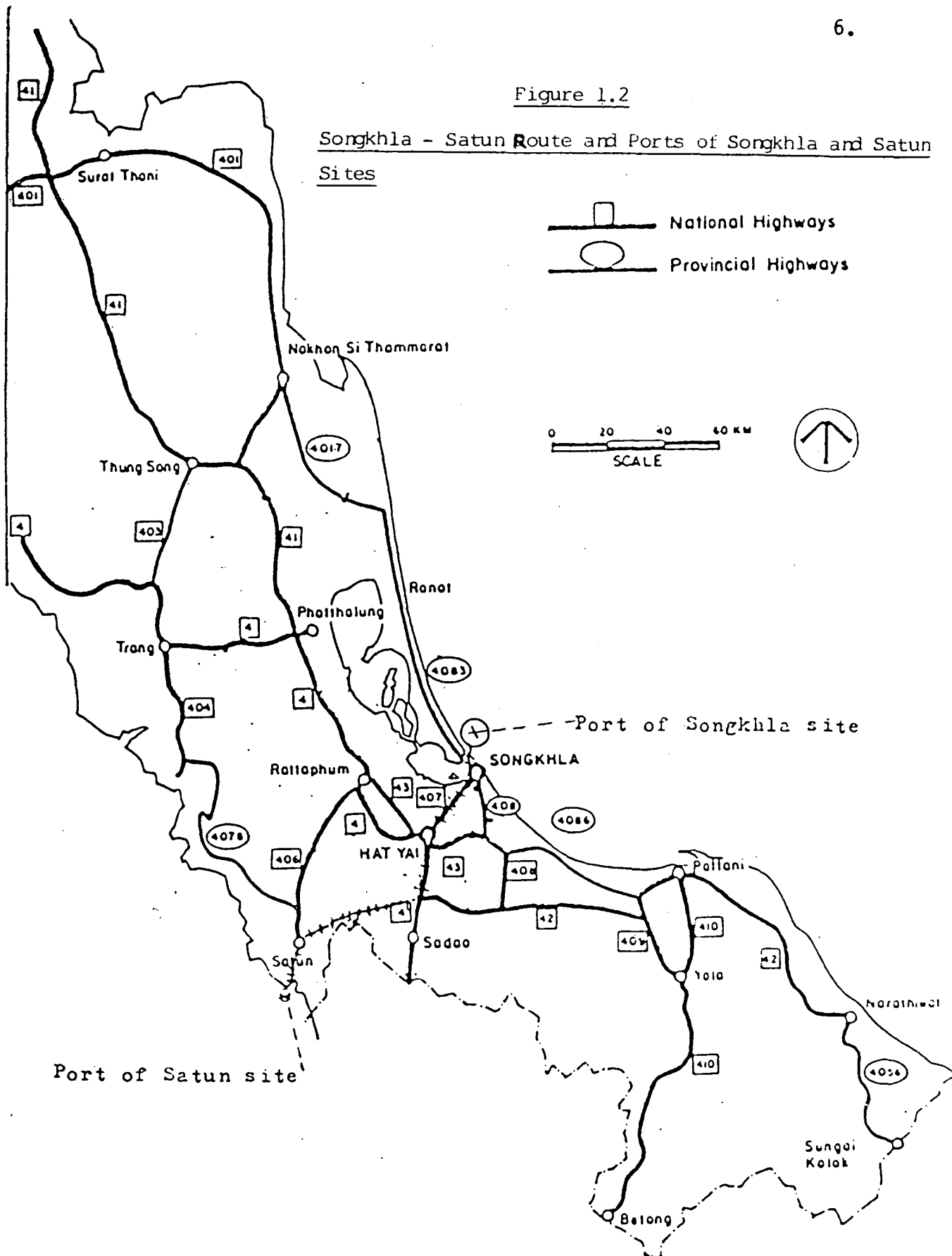
THE FAR EAST
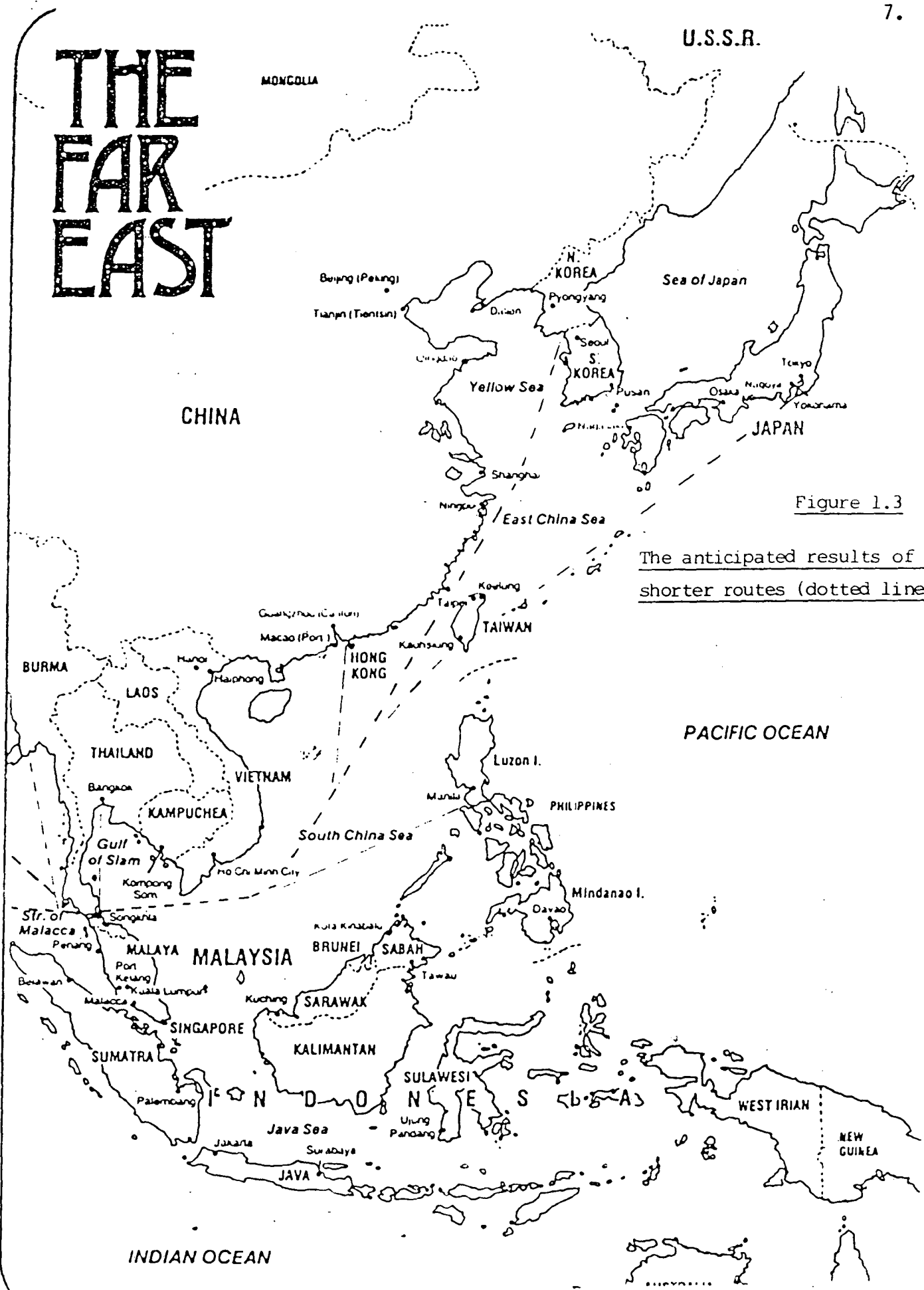
Figure 1.3

The anticipated results of the
shorter routes (dotted lines)

jam and shallow waters. As a result it may be a cost effective benefit in the total transport chain.

The development of the Songkhla-Satun land bridge would also promote intermodal transportation and containerization development in Southern Thailand. It is visualized that cargo would not only be in transit but also would penetrate deep into the interior with relative ease, containers moving hundreds of miles from ports of discharge to final destination. Thus, Thailand and to some extent, northern Malaysia will likely gain some benefit from the development.

With the introduction of a land bridge and container ports, there are economic and logistic justifications for the further establishment of a regional marketing depot that could serve not only Thailand but also Malaysia, Burma, Bangladesh, India, and Sri Lanka. Matters relating to an inland regional marketing depot is presented in this study.

Should this land bridge and container ports be constructed, they would become a vital element in the global transport chain. Current and anticipated trends in marine transport and containerization appear favorable to the further evaluation of the concept.

C. OBJECTIVE OF THE THESIS

The basic objective of the thesis is to find out the factors which influence the feasibility of the land bridge to be introduced and its development in conjunction with ports of Southern Thailand and intermodal transportation, and its economic viability. The proposed route and ports in the study is Songkhla-Satun.

In assessing the economic viability of the land bridge proposal, several factors are of importance and will be included in the study. The terms of reference are as follows:

- To examine the inventory of existing infrastructures which are relevant to the land bridge project.

- To study the strategy for port development and forecast the annual cargo tonnage through southern ports of Songkhla and Satun.

- To study the costs of two ports, railway east-west link, including costs of upgrading/improvement or partial new construction and the benefits of the project.

- To assess the potential traffic in Singapore-Malacca Straits and safety conditions as to the future requirement of an alternate route.
- To examine the relative economic impact of the land bridge project, such as its potentiality for employment

and industrial development; and to present also some
strategies for the industrial development in the
Landbridge zone.

- To study the establishment of inland regional marketing
  depots.

D. SCOPE AND LIMITATIONS OF THIS THESIS

The research base for the study has been limited to the
development of the Ports of Songkhla and Satun in conjuction with the
proposed Kra Land Bridge. This study will also examine the relative
economic impact of the two ports and land bridge such as its
potentiality for industrial development and employment. However,
the study is limited because of the paucity of secondary data,
therefore the study is based on information gathered from variouss
sources through visitation and interview with both government agencies
and private shipping lines in order to acquire sufficient information
on the subject. The analysis of these topics is perhaps brief but,
nevertheless, provides information to evaluate the related factors which
influence the development of the Ports and land bridge. In the study,
cost data has been used only to exemplify principles which apply to
the subject matter. And this treatment of the subject matter is not
meant to be of best analytical practice without further investigation.

E. LANDBRIDGES IN THE U.S.A.

In the United States, landbridges were at the origin of the
growth of containerization and become economically feasible. On certain

routes, landbridges made it possible for a land-sea transport combination haul to compete with sea trasport on a route of greater length.[4]

The typical example is the seaborne link between the United States West coast and Europe with a "land bridge" from the West coast to the East coast which involves a shorter sea journey than that through the Panama Canal.[5] By this method containers in effect travel along the shortest route in time between two points, which will usually involve transit across countries and continents for long distances.

For example, cargo between Europe and Japan would be shipped by container vessel from a European port to an east coast USA or Canadian port, where it would be loaded on to a rail wagon for the journey across America or Canada to a west coast port. Here it would again be loaded on a containership for the final leg of the journey to Japan. By this method the long sea voyage via the Panama canal would be cut out, and transit times would be considerably reduced.

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4. R. Callou and D. Schwartz, Transport and the Challenge of Structural Change, p. 156.

5. Ibid.

A possible drawback, may exist in the total cost involved, and the relative cheapness of transit by sea when compared with the uplift costs that would be occasioned by the present scale of rail rates truck rates. However, where regular bulk traffic can be offered to the land transports, a more competitive relationship should emerge. The Europ/Japan route via the North American continent has not developed as fully as has an alternative route using the Trans-Siberian Railway across Russia. However these continents (Asia, Europe and North America) were obstructed by winter snow and ice conditions almost every year, thus hampering the total transport chain if shippers were to use these routes.

The objective of the land-bridge is to provede the foreign shipper, and the foreign consumer (in the long run) the most efficient and economical means of carrying goods. As economical carriers, the U.S. responds to the world economic community. There are distinct benefits to the landbridge.[6] Monies accrue to U.S. carriers as those who can provide efficient and economical channels of trade.[7] The illustration of a flow of goods and a land bridge concept may be made clearer by the following diagram (Diagram 1.1).

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6. Rory K. Miller, "Land Bridge, Mini-Bridge, and Micro-Bridge: A Question of Getting It Together", Transportation Journal, Vol. 17, 1977 - 1978, pp. 64 - 66.

7. Ibid.

DIAGRAM 1.1

A diagramatic representation

of the flow of goods and landbridge

Foreign Shipper		Foreign Destination

U.S. Ocean Carrier		U.S. Ocean Carrier

U.S. Domestic Carrier	O R	U.S. Domestic Carrier

U.S. Ocean Carrier		U.S. Ocean Carrier

Foreign Destination		Foreign Shipper
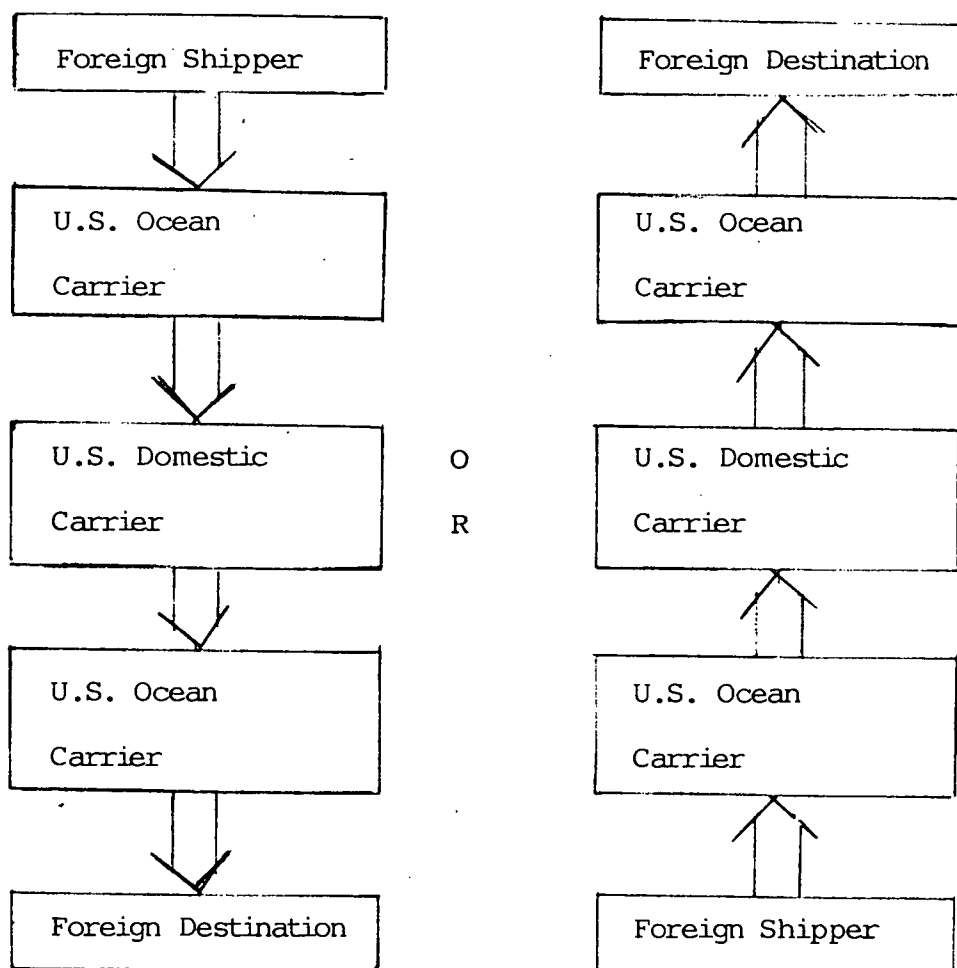
Source : Adapted from Rory K. Miller, "Land Bridge, Mini-Bridge, and

Micro-Bridge: A Question of Getting It Together", _Transpor-

tation Journal_, Vol. 17, 1977-1978, pp. 64-66.

F. AN AUSTRALIAN LANDBRIDGE

In 1975 the Bureau of Transport Economics investigated the economics of an Australian landbridge between the East Coast and Fremantle in Western Australia. In the Australian context, it has been suggested that ships sailing in the UK/Europe trade via the Indian Ocean, need not call at east coast ports-mainly Melbourne and Sydney, but should instead discharge and load all cargo at Fremantle. The Trans-Australian railway link would then be used to distribute and collect cargoes to and from the eastern states. Implied is the assumption that rail capacity would be adequate to carry this additional traffic. The economic benefit of such an operation would be determined by the trade-off between the improvement in productivity of container ships, as a result of shorter steaming and fewer port calls, and the cost of overland rail transport.[8] This investigation revealed that, unlike the U.S.A. and U.S.S.R. landbridges, the Australian version would not offer significant savings in linehaul distance.

This landbridge does exist but it is not yet well known or highly developed. Hence, after the investigation by the Bureau of Transport Economics, the study team concluded that an Australian landbridge serving the European trade from a Fremantle port would

8. Bureau of Transport Economics, The Economics of an Australian Landbridge, 1975, p. 1.

incur considerable losses. The cost of using the land route would be greater than the shipping costs available because:

- The rail distance between Fremantle and the south eastern ports is not much shorter than the sea distance.

- Fremantle generates only a small proportion of Australia's trade and hence most of the containers would have to be carried over the landbridge.[9]

G. LANDBRIDGE IN MEXICO

In the last quarter of 1982, the Mexican Government was also taking steps to relieve the pressure on the land transport systems by improving existing facilities. One of the more imaginative steps taken was the modernization of the rail/road link from the Pacific coast Port of Salina Cruz to Coatzacoalcos across the Isthmus of Tehuantepec, the narrowest part of Mexico. The government has spent $60 million in modernizing the rail/road link and installing modern container-handling facilities to provide a fast land containerization bridge between the Pacific ocean and the Gulf of Mexico[10] (Atlantic Ocean).

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9. Ibid. p. 16.

10. _____, "On Target and Achieving Aims," 100A1 The Magazine of Lloyd's Register of Shipping, October 1981, p. 20.

The new service, which hopes to become a viable alternative to the traditional all-water service through the Panama Canal, is now transporting only 200 to 300 container loads across the 300 km-long isthmus every ten days.

But optimism is expressed that between 40,000 and 70,000 containers will move on the combination rail and truck system during its first year of operation. This landbridge service, which cost the Mexican Government $60 million to build and provides employment for more than 1,500 people, came about largely to help reduce congestion through the Panam Canal. The operation of the Mexican landbridge is being geared specifically to containerized cargo.

One of main advantages of the Mexican landbridge appears to be its 12.2 m deep, access channel, the large turning basin and the container berth at Salina Cruz and at Coatzacoalcos.

These features are important for those lines which carry heavy containers that otherwise might not be able to pass through the shallower Panama Canal. Ships of the future that are being designed to carry even larger loads will find great difficulty transitting the Panama canal.

Current estimates have indicated that no more than three days will be required from the time containers are unloaded from one ship to the time they are reloaded on board another ship at the other side of the isthmus.

The landbridge portion itself will involve twelve hours for the rail haulage and six hours for the highway portion.

The strongest supporters of this new operation have understandably been ports which have lost significant portions of their Far East and Australian container business to west coast American ports.

H. EXISTING INFRASTRUCTURES BETWEEN SONGKHLA AND SATUN "KRA LANDBRIDGE PROPOSAL" AND THE LOWER SOUTH

ROAD TRANSPORT

Figure 1.2 also illustrates the main road network in the Lower South. Roads under the control of the Department of Highways (DOH) are divided into three categories: National Highways, Provincial Highways and other roads such as agricultural roads. The Provincial Highways and other categories include many minor roads, including all weather laterite or dirt roads, which are not shown on Figure 1.2.

The following roads pass through Songkhla and Satun Provinces and are relevant to its national and regional linkages:

(1) Route 4 (also called Thanon Pethkasem or Pethkasem Road)

This road runs from Bangkok to the Malaysian border at Sadao, a total distance of more than 1,000 km. In the Upper South,

it runs along the gulf of Thailand coast but comes to the west coast at Chumpon, and then runs through Ranong, Takua Pa, Phangnga and Krabi to Trang. Starting from Trang, it runs east, across the central mountain range to Phattalung, then south to Hat Yai, Sadao and the border.

It was opened as a direct route in 1953 thus opening up the Southern Region and facilitating movement between east and west coasts. It has now become less important as a national highway due to the construction of alternative routes, notably Route 41.

The section from Phattalung to Hat Yai describes a wide loop to the east through Rattaphum. A new road, Route 43, was opened in 1979 to provide a direct link to Hat Yai. The loop road is now bypassed and carries very low traffic loads.

The Hat Yai - Sadao section is the busiest in the Lower South with the exception of the Hat Yai - Songkhla road, Route 407. It is the most important border crossing for commercial and tourist traffic.

(2) Route 41

This road runs from Chumpon along the east coast and from Punpin, near Surat Thani, south through the centre of the region via Thung Song to Phattalung where it links with route 4. The section from Punpin was opened in 1978 and has become the main route north

for traffic originating in the Lower South. Average flows remain lower than those on the Phattalung - Trang section.

(3) Route 43

This road is in two sections: one runs from Rattaphum to Hat Yai cutting out the loop in Route 4 (see (1) above), the other runs from a junction with Route 4, just south of Hat Yai, to Chana where it joins route 408 from Songkhla. The northern section was opened in 1979 and the southern section in 1982. The intermediate section is due to be constructed as a priority project during the Sixth National Plan (1987-1991).

(4) Route 406

This road links Route 4 near Rattaphum to Satun (the proposed sea port in the study). It passes through a gap in the central mountain range at a level of about 120 meters above sea level. The main function of the road is for the transport of fish, rubber and palm oil from Satun province to processing plants in Hat Yai and Songkhla.

(5) Route 408

This road runs south from Songkhla to link with route 42 (a low capacity road). It is bisected by the new Route 43. It forms the direct link between Songkhla and the southern border provinces and was improved in 1982.

(6) Route 4017/4083

This road links Nakhon Si Thammarat in the north to Songkhla via Hua Sai, Ranot, Sathing Phra and the Songkhla ferry. It is a high standard two-lane road and is the preferred route north by many Hat Yai/Songkhla residents.

(7) Traffic Volumes

Measured daily traffic volumes from 1979 to 1983 on these routes are given in Table 1.1 and may refer to Figure 1.4. Security problems in 1979-81 led to a marked drop in traffic on most routes. The only increase during this period was on the trouble-free coastal Route 4083, but this was limited by the capacity of the Songkhla ferry, hence an overall decline in regional traffic resulted.

In recent years traffic on all formerly sensitive routes has increased and traffic on Route 4082 has declined. This trend is likely to continue as long as there are no further outbreaks of lawlessness on the inland routes. There is a clear indication that traffic volumes will also increase in response to population growth and prosperity.

(8) Committed and Planned Improvements

In the Fifth National Plan (1982-1986), a sum of Baht 3.2 billion was allocated for improvement of national and provincial highways in the Southern Region. It is expected that policies under

TABLE 1.1

AVERAGE DAILY TRAFFIC VEHICLE FLOWS ON MAJOR ROADS IN THE LOWER SOUTH

Route No.	Origin Destination	Reference Figure	Control Section	1979	1980	1981	1982	1983
4	Phathalung-Khuha	1.2	40	1,548	1,380	1,402	1,711	1,622
406	Khuanniang-Satun	1.2	02	774	608	966	943	959
	Khuanniang-Satun	1.2	03	1,701	1,849	1,863	2,173	2,781
408	Songkhla -Kuanmead (Jt. route 430 (Chango origin-destinstion in 1980, 1981, 1982)	1.2	01	2,810	1,906 (SK-CHANA)	2,269 (SK-CHANA)	2,658 (SK-CHANA)	2,658
4083	Songkhla-Huasai	1.2	0100	1,795	1,428	1,479	1,511	1,717
4083	Songkhla - Sathing Phra	1.2	0100	1,486	3,234	2,624	1,683	1,480
4083	Songkhla-Ranot	1.2	0201	N.A.	1,133	1,571	N.A.	N.A.
43	Hat Yai-Klong Ngae	1.2	44	4,870	4,367	4,416	4,561	4,393
4	Trang-Phatthalung	.1.	39	1,570	2,002	1,838	1,763	1,941
407	Hat Yai-Songkhla	1.2	0100	6,136	5,434	5,464	5,530	6,001

Source: Department of Highways

FIGURE 1.4

AVERAGE TWO-WAY DAILY VEHICLE FLOWS 1979-83
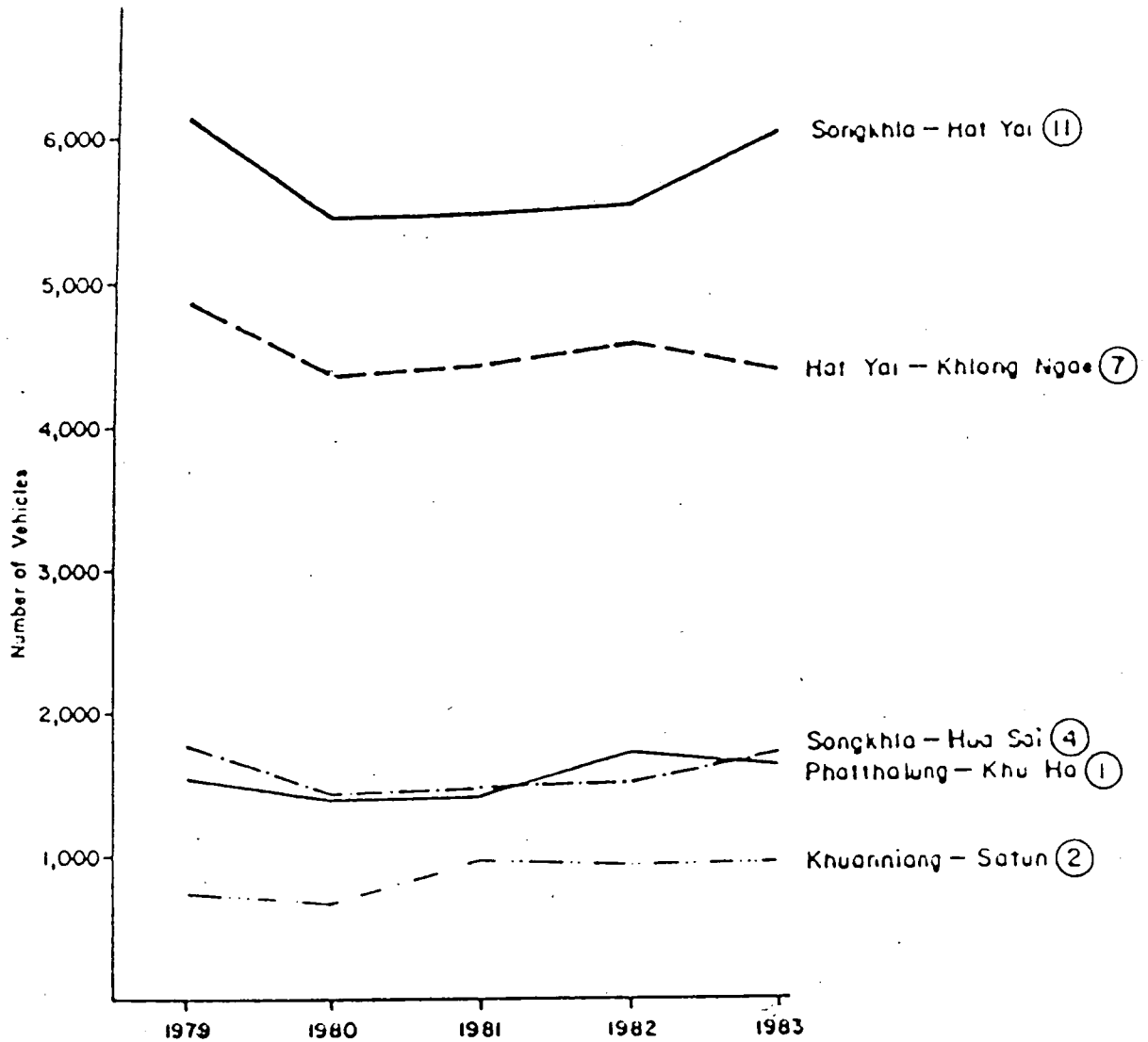
Source: Department of Highways.

the Sixth National Plan will place emphasis on construction of new roads linking district centres with their hinterlands, with a parallel program for upgrading and maintenance of national and provincial highways.

Committed or planned improvements are briefly discussed as follwes:

Songkhla Bridges Project: this project involves construction of 2 box girder bridges across Songkhla Lake, via Ko Yo (Yo Island), to link Route 407 with Route 4083, and specifically to provide access to the proposed Deep Sea Port of Songkhla at Khao Deang. Construction started in March 1984 and scheduled for completion in September of 1986.

Hat Yai Western Bypass – this is a high priority project in the current Department of Highways program and will link the two sections of Route 43.

Route 407 Widening – this road is the most heavily traffic congested road in Hat Yai/Songkhla area but with the approaches to both urban areas, is a two lane carriageway. The Department of Highways plan to widen this to a 4 lane, dual carriageway during the Sixth National Plan.

Hat Yai Northern Bypass – this is not the Department of Highways program but is proposed in the Hat Yai Master Plan prepared

by the Department of Town and Country Planning. This proposed route would link Route 407 with Route 43.

Routes 407/408 Link – this will extend the southern approach road to the Songkhla Bridge from Route 407 to Route 408. This is in the Department of Highways program for the Sixth National Plan.

Anticipated Traffic Growth – the recent gowth in traffic flows on the principal routes in the Songkhla-Satun Landbridge area is given in Table 1.1 and illustrated in Figure 1.4. These show a relatively modest increase in recent years.

Rattaphum and Ports of Songkhla and Satun – this route will become desirable if Rattaphum district develops as an industrial sattelite of Hat Yai for, say, agro-industries, and/or if there develops a significant demand for direct travel between Phattalung and the two ports. It would also act as a relief to any capacity constraint on the Ko Yo bridges (Songkhla bridges) which would be costly to duplicate. The need for a feasibility study for this route to be developed should be examined so that decision on development could be based on the study. It is anticipated that the traffic volume will increase in the next decade.

AIR TRANSPORT

There are five commercial airports in the Lower South: Hat

Yai, Nakhon Si Thammarat, Trang, Pattani and Narathiwat. Only Hat Yai is of an international standard with an instrumental approach runway. It can handle medium size jet aircraft (Boeing 737, DC 9) and has capacity to serve about 200 international passengers and 100 domestic passengers per hour. It has been used by Boeing 737-200 aircraft since 1977. The other airports listed can handle small aircraft only (e.g. Short 330).

Table 1.2 lists the frequency of commercial flights by airport. Thai Airways/Thai International currently operate flights Hat Yai - Bangkok direct 9 times per week, via Phuket or Surat Thani 3 times per week and 3 flights Bangkok - Hat Yai - Kuala lumpur - Singapore. MAS and Singapore Airlines operate 9 flights per week with Singapore, Kuala Lumpur and Penang as destinations.

TABLE 1.2

WEEKLY FLIGHT FREQUENCY AND AIRCRAFT TYPE

Airport	Medium size* aircraft (domestic)	Medium size* aircraft (international)	Small size** aircraft
Hat Yai	19	9	20
Trang	-	-	4
Pattani	-	-	2
Narathiwat	-	-	4
Nakhon Si Thammarat	-	-	2

Note :   *Boeing 737-200 (123 seats) DC 8 (150 seats)

       **Short 330-300 (30 seats)

Source :   Department of Civil Aviation 1984

RAILWAYS TRANSPORT

The main railway line connecting Southern Thailand with Bangkok and the rest of the State Railway of Thailand's system runs down the eastern side of the isthmus linking Chumpon, Surat Thani, Tung Song, Phattalung, Yala and the Malaysian railway system at Sungei Kolok. Branch lines connect Khiri Rat Nikhom, Nakorn Si Thammarat, Trang and Kantang, Songkhla and the Malaysian railway system at Padang Besar to the main line. Railway transport has played an important role in the economic development of the South since the construction of the rail network in the early twentieth century. This stimulated the emergence of new urban centres as alternatives to the traditional coastal centres viz. Punphin to Surat Thani, Tung Song to Nakorn Si Thammarat, Hat Yai to Songkhla and Yala to Pattani. No new reailway line construction has taken place in the Southern Region for many years. Instead the State Railway of Thailand have concentrated on improving services by dieselisation, replacing obsolete rolling stock, laying heavier track and strengthening bridges. Since the state railway's mobile equipment is deployed quite flexibly over the whole system it is not possible to make simple regional comparisons of the relative benefit of such improvements. However the North and North Eastern lines have received priority for complete dieselisation because of the heavier grades involved.

Recent improvements to the regional road network linking major centres in the South, often in parallel in the railways, have contributed to a relative decline in rail passenger traffic and cargo compared with other transport modes in recent years. A line from Hat Yai - Songkhla was in operation until 1977, it could not compete with road transport.

The State Railway of Thailand has a program of improvements to meet the growing demand anticipated as a result of the continued economic growth in the region. Such planned improvements include four additional passenger trains which will be put into service in 1987 to augment the services on the lines Songkhla - Yala and Bangkok - Sungai Golok. The State railway is also considering a feasibility study of the construction of a route to serve the deep-sea Port of Songkhla. Another plan is to introduce rail container transport between Bangkok and Butterworth, Malaysia in the near future.

CHAPTER 2.

THE STRATEGY FOR PORT DEVELOPMENT

A. OVERVIEW

The Thai economy relies heavily upon international trade, a fully developed system of transportation is therefore required. Virtually Thailand has well developed port facilities, airports, roads, and railways to suit her needs. Since the majority of Thailand's exports are bulky, low cost agricultural commodities, over 90 percent of Thailand's exports are transported by sea. Only the lighter industrial products and perishable goods like fruits, flowers and foodstuff, of which Thailand exports a considerable amount, travel by air to their destinations.

Port of Bangkok is the major entry-port into Thailand, and is geared to handle over 20 million tons of cargo a year. Bangkok Port used to have a reputation of heavy congestion but it has been greatly improved during the past three years. Increased use of containers and opening up the Sattahip Port for bulk cargo has helped to reduce congestion at Bangkok Port such that vessel turnaround is now only two to three days, at the most. One problem, however cannot be solved. The port locates up the Chao Phaya river, with the channel leading to the port is shallow in certain places. This prevents larger vessels form calling at Bangkok. Large ships are forced to anchor in

the lee cf an cffshcre island, Ko Sichang, where cargc is lcaded and cff-lcaded by lighters flying between the Port and the deep water anchcrage.[1] Thus many large ccntainer vessels tranship cargc destined fcr Bangkck onto ccntainer lighters in Hong Kong and Singapore instead.

Aware cf this handicab, the Thai Gcvernment has made available the fcrmer naval pcrt cf Sattahip, 160 kilcmetres frcm Bangkck for commercial purpcse. The port is ncw under gcing expansicn and by 1986 it will be able tc accommcdate 120,000 dwt vessels cf both conventicnal and ccntainer types. Rail links between Bangkck and Sattahip has recently been ccmpleted. At present, Sattahip is already servicable in scme parts and can accommodate 20,000 tc 50,000 tcns vessels. In internaticnal seaborne trade, Thailand is served by cver 50 fcreign shipping lines and represented by agents in Bangkck.[2]

Measured annual shipping lines outwards frcm Pcrt cf Bangkck frcm January to Lecember 1982 is shcwn in Table 2.1. This is tc illustrate the magnitude cf varicus international shipping lines classified by nationality frcm all cver the wcrld called at Port cf Bangkck, and the tctal annual cargc tcnnage was recorded at 19 millicn tcns.

1. L. Sternstein, Thailand: The Envircnment of Modernisaticn
   Sydney: Mcgraw-Hill Bock Ccmpany, 1976), p. 128.

2. Bangkok Shipowners and Agents Assicciaticn, BSAA Guide to the
   the Pcrts of Thailand, 1983 (Bangkck: Charecnsilp Printing, 1983).

TABLE 2.1

Port of Bangkok Outwards Classified by Nationality

Jan – Dec 1982

Nationality	With Cargo			In Ballast	
	No.	Registered Tonnage	Cargo Tonnage	No	Registered Tonnage
American	–	–	–	1	181
Argentine	7	42,827	8,240	1	6,451
Bangladesh	7	16,688	9,568	–	–
Belgian	3	112,235	253,178	2	12,327
British	48	649,472	1,119,112	25	346,552
Bulgarian	1	5,828	6,000	–	–
Burmese	2	1,289	224	–	–
Canadian	1	1,941	10,110	–	–
Chinese	114	702,728	1,362,893	75	307,183
Cuban	6	41,684	59,919	1	6,045
Cypriot	7	43,381	94,547	–	–
Danish	4	26,784	25,982	2	328
Dutch	16	108,253	54,887	3	14,209
French	1	10,797	17,953	2	15,016
German	17	171,033	223,304	15	297,476
Greek	96	972,522	1,929,700	36	456,240
Honduras	2	964	2,707	–	–
Hungarian	–	–	–	4	21,210
Indian	6	42,495	79,762	2	11,544
Indonesian	20	58,562	171,817	5	11,103
Iranian	16	130,888	232,855	3	19,308
Italian	2	14,440	17,113	–	–
Japanese	149	538,529	1,020,583	206	496,513

TABLE 2.1 contd.

Nationality	With Cargo			In Ballast	
	No.	Registered Tonnage	Cargo Tonnage	No.	Registered Tonnage
Korean	182	499,240	682,511	46	182,512
Kuwait	1	9,209	5,901	1	29,883
Liberian	132	1,174,648	1,780,620	95	786,082
Malaysian	104	323,888	325,337	12	33,326
Maldivian	34	184,424	320,717	2	12,985
Morococan	1	9,274	17,969	–	–
Norwegian	21	322,960	401,629	17	232,657
Oman	1	8,357	60,208	1	197
Pakistani	8	26,259	33,874	–	–
Panamanian	644	2,462,612	4,178,616	234	1,004,636
Philippino	23	171,335	326,957	9	30,071
Polish	14	63,125	53,175	3	10,984
Qatari	2	3,939	4,578	–	–
Rumanian	7	29,352	30,416	8	33,143
Russian	81	472,591	621,182	24	82,445
Saudi Arabian	17	128,147	103,825	3	76,372
Singaporean	413	1,549,735	1,419,900	99	1,824,360
Somalian	3	3,843	11,762	–	–
Spanish	3	17,462	28,721	–	–
Swedish	1	12,990	1,609	2	23,707
Swiss	1	5,014	1,216	–	–
Thai	624	1,159,544	1,780,361	100	382,593
Turkish	1	22,088	4,380	–	–
Vietnamese	6	35,800	56,829	–	–
Yugoslav	27	141,346	205,804	6	32,396
Total	2,876	12,533,522	19,149,561	1,045	6,800,035

Source: Foreign Trade Statistics of Thailand 1982, Department of Customs.

The growth of maritime traffic and international trade has led correspondingly to the expansion of port services throughout the country's major coastlines, such as the eastern seaboard, the coastline along the peninsula, both eastern and western coasts. Now Thailand is challenging for the world trade with emphasis on export oriented goal, thus the country relies heavily on the sealanes as conduits for her commerce. The integration and coordination of port planning, development, control and operations of all ports was initiated by the Government in 1951 with the setting up of the Port Authority of Thailand (PAT) under the Act.[3]

Prior to the creation of the PAT, port administration was split between the Department of Harbour and the Port of Bangkok Office.[4] However, such arrangement proved unsatisfactory in meeting the demands of efficient seaborne commerce and the requirements of accelerated national development. The task of the PAT, thus, was to implement and integrated programme for the planning, development, financing and operation of ports or port districts throughout the country. In line with this, the supervision of the Port of Bangkok was turned over to the Port Authority of Thailand.

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3. The Ministry of Communications, Annual Report, 1982
   (Bangkok:, 1982), p. 121.

4. Ibid., p. 129.

B. THE GOVERNMENTS'S CONTRIBUTION TO THE DEVELOPMENT OF
INFRASTRUCTURE

The Government's major contribution to economic growth over the past two decades has been through its provision of infrastructure, most notably in the areas of highways and irrigation. The expansion of the road network has had a considerable impact on agricultural development in the country: the road system not only brought many farmers previously producing only subsistence crops into contact with external markets and significantly increased the farmgate prices of cash crops, but also provided access to vast areas of hitherto uncultivated land. The irrigation systems, most of which have been built since 1950, now provide a degree of water control in the wet season for some 1.8 million has and dry season irrigation for about 0.5 million ha, against a total cultivated area of 20 million ha. The impact of public investment in irrigation is considerably less widespread than the road program and is concentrated in the Central.

In other types of economic infrastructure the public sector's achievement, especially during the second half of the 1960s, has also been quite commendable. In power, telecommunications, airports and harbours, the World Bank reported that Thailand now possesses basic infrastructure that compare favourably with most developing countries and is fairly well maintained.

Government expenditure on infrastructural support has been considerable all through the five-year development plans since 1960 in its efforts to provide the country with necessary basis for a developing economy. Now Thailand is in the mid of its Fifth Plan (1982-1986) formulated by the National Economic and Social Development Board.

Currently, the Port Authority of Thailand (PAT) renders port services and warehouse or storage facilities for cargo at Bangkok Port and Sattahip Commercial Deep Sea Port. The Government decided to assign responsibilities to the Provincial Administrative Organization, with the designated policy towards privatization to the most possible extent. In fact the PAT had been reluctant to assume responsibilities for the Southern ports' administration because the PAT had to be responsible also for loan payment for the construction of those ports done by the Harbour Department.

Conscious of the importance of good shipping facilities the Thai government has initiated several projects to increase its ports' facilities. Over the next five years $260 million dollars (approximately 6,000 million baht-Thai currency) will be spent to develop the Sattahip Port to enable ships of 120,000 dwt to berth. At present only those of 50,000 dwt can be accommodated. According to the Asian Development Bank Annual Report 1981, it stated that the Bank has approved a loan for Southern Thailand ports' development at $71.4 million to develop

ports; development at $71.4 million to develop deepwater berthing facilities at Songkhla and Phuket Ports, ports which are critical to the future economic and social development of the southern region of the country to enable them to handle a growing volume of traffic. New facilities will enable direct loading and discharging of cargo, thereby eliminating lighterage operations and encouraging trade through these ports rather than through Bangkok or Penang. This will lead to a substantial reduction in transhipment and long distant inland transportation costs. The project, which comprises the first phase of development of a long-term master plan for both ports, also includes construction of two interconnected bridges across Songkhla Lake.

The Harbour Department is responsible for maintaining and developing all coastal harbours as well as the 1,600 kilometres of inland waterways. The Department is currently in charge of developing deep water ports at Songkhla and Phuket.

Major rivers like Chao Phraya and Nan are navigable and are being developed for transportation of bulky agricultural products. The Chao Phraya basin between Nakorn Sawan and Bangkok is being deepened and a river port and a major cargo terminal are under construction at Nakorn Sawan.

C. EXISTING PORTS IN SOUTHERN THAILAND REGION

Coastal ports are of great importance in Southern Thailand. The elongated shape of the land area means that nearly major population centres are located within 50 kilometres of a port. There are 23 southern ports, 11 on the east coast, and 12 on the west coast. The coastal ports of Thailand are very small. Coastal traffic represents only a small fraction of international traffic moving to and from Thailand.[5] International traffic has traditionally been handled through Bangkok although a limited number of foreign vessels call at ports in Southern Thailand each year, to pick up cargoes of rubber, tin and miscellaneous goods. Coastal cargo movements have been equally dominated by Bangkok, which is the origin or destination of over 80 percent of coastal traffic.

The small coastal ports of Thailand are of two types; those mainly handling cargoes and those primarily concerned with the fishing industry.

The most important ports in the South are Songkhla, Pattani, Phuket, Kantang, Pak Panang and Bandon. All the ports of the Southern region are river ports except Phuket, and this places a serious

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5. Bangkok Shipowners and Agents Association, <u>BSSA Guide to the Ports of Thailand,</u> 1983 (Bangkok : 1983), p. 70 .

constraint on development since they suffer from draught problems due to siltation at the river mouth. This problem is aggravated on the east coast by the shallow water along the coastline and the North East monsoon winds which cause sand banks to drift across the channel.

All of the ports have developed through private initiative and most of the facilities are privately owned small wooden jetties. Until fairly recently the Government has taken major interest in their development. In 1964 the Harbour Department was assigned responsibility for port improvements. Since that time the channels at Kantang, Phuket, Songkhla, Surat Thani (Bandon) and Pattani have been dredged and other capital investments have been made at Kantang and Songkhla.[6] In addition the Fisheries Department have taken improvements of the fishing facilities at many ports. The ports continue, however, to be run by mainly private initiative and there is little overall administration or coordinated planning of their development.

D. BROAD FEATURES OF TRAFFIC IN THE SOUTH

The following sections present the data available on transport demand in Southern Thailand. The dominant feature of most traffic movements in the South is that they are short, involving the local

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6. _____, "Ports of the South" The Investor - Thailand,

Vol. 7, 1975, p. 51.

distribution of agricultural and other primary products, work journeys and trips to and from market. This characteristic is not only true of movements by road but also of a large proportion of rail passenger movements since rail is still the cheapest means of passenger transport in many areas.

Due the recent years of road network development, traffic flows between provincial towns are on the increasing trend, consisting mainly of truck movements, short distance village buses and some inter-provincial town buses as well as the long-distance bus services between Bangkok and major cities - Hat Yai-Songkhla, Phuket. Nearer to towns traffic build up and light buses (domestic designed and manufactured) loaded with passengers and agricultural products are the most common form of transport. In the immediate outskirts of towns motorcycle traffic is predominant with light bus and pick-up truck also much in evidence. Within the towns themselves the market areas are crowded with pedestrians, mini-buses and other vehicles.

Long distance freight movements broadly reflect the pattern of economic activity in the region, with agricultural and primary products, semi-manufactured products moving out of the region in exchange for manufactured goods, petroleum and oil, processed food products and rice.

E. FACTORS LEADING UP TO THE PORT DEVELOPMENT STRATEGY

In reality, there are several factors leading up to the development of the port. But this study will attempt to identify the economic factors related to transportation, i.e. commodity flows or the pattern of movement. Thus, in this section, the pattern of movement of each major item of commodities are briefly described and commented upon.

1. Rubber

Rubber is generally tapped by smallholders, to the lesser extent large plantations are available in every province in the South, and converted into unsmoked sheets. The sheets are taken by bicycle, pick-up trucks, light bus or motorcycle to the local village dealer who is usually located within a 10 kilometre radius. Most village dealers handle an average of about five tons of rubber a month. The village dealer sells his rubber to a middle dealer in the nearest provincial town which is usually within 50 kilometres. Volumes are usually sufficient for a light truck load, though occasionally the middle dealers own larger trucks and collect direct from the village dealers. The middle dealers sell to smoker/packers, most of whom are located in Hat Yai, Yala, Trang, Thung Song and Phuket and there the rubber is converted in to 111 kilogram bales. Finally the rubber is sent by road to the ports of Pattani, Songkhla, Kantang and Phuket (accounting for about 90 per cent of all rubber exported from the South)

in large, 10-wheel or 6-wheel lorries each carrying, since they are frequently overloaded, as much as 13 to 14 tons.

Approximately 50 per cent of Thailand's rubber is exported to Japan, while 20 per cent goes to Europe and about 10 per cent to the U.S.A. A further 10 per cent is sent to Malaysia and Singapore for transhipment to other destinations. The rest is for domestic uses such as tyres factory, rubber foam and rubber bands and etc.

On the east coast, at Songkhla and Pattani, rubber is lightered to ocean-going vessels, usually in the 2,000-3,000 dwt class for direct export to Japan, Europe and U.S.A. Some rubber is sent by coastal vessel to Singapore for transhipment. On the west coast, most of the rubber through Kantang is sent to Penang for transhipment. From Phuket about two thirds of the rubber is sent by coastal vessel to Penang for transhipment while the remainder is shipped directly, mainly to Japan.

Table 2.2 shows export of natural rubber from Thailand in 1983 cleared at Southern inland customs posts and ports, except Bangkok and Chantaburi.

TABLE 2.2

EXPORT OF NATURAL RUBBER FROM THAILAND

CLEARED AT CUSTOMS/PORTS FOR 1983

Province	Ports	Tons
Bangkok	Bangkok	126,270
Chantaburi	Tachalaab	8,017
Phuket	Phuket	54,196
Trang	Kantang	59,942
Satun	Ko Nok	4,500
Songkhla	Songkhla	120,116
Songkhla	Padang Besar*	127,940
Nakhon Si Thammarat	Nakhon Si Thammarat	1,717
Pattani	Pattani	26,145
Narathiwat	Narathiwat	4,910
Yala	Betong*	16,032
TOTAL		549,785

* Inland customs post

Source: Rubber Research Institute (RRI), Bangkok.

Note : RRI's forecasts for 1986 export will be 885,000 tons,
and 1,270,000 tons in 1991.

2. Rice

The main rice surplus areas in the South are Nakhon Si Thammarat and Phattalung. The main deficit areas are the western provinces of Ranong, Phuket, Phang-nga, Krabi and Trang and the other southern provinces are not connected to the railway and have no coastal shipping connection with Bangkok. Road transport from the rice surplus areas in other regions of Thailand involves long hauls and is expensive; therefore rice tends to be sent from the surplus areas within the South itself to the western deficit areas. The southern provinces of the region are connected to the rest of Thailand's rail and have coastal shipping connections to Bangkok. According to railway statistics, 166,000 tons of milled rice and 9,000 tons of unmilled rice came into the region from the rest of Thailand in 1971. Of this total, 118,000 tons was sent to the area south of Hat Yai and 17,000 tons was sent to the Trang area. In addition, 24,000 tons of rice was transported intra-regionally from Phattalung and Nakhon Si Thammarat by rail and most of this was destined for Hat Yai and places further south.

A pattern emerges in which the deficit areas of Hat Yai are supplied mainly from other regions in Thailand, while the other deficit areas in the South, unconnected to the railway, are supplied by road from the surplus areas within the region itself. A final factor which must be taken into account is the smuggling of rice to Malaysia. This could amount, on some estimates, to about 100,000 tons per year and

would therefore involve considerably heavier flows to the areas south of Songkhla than might be expected from their calculated deficit. Such clandestine movements tend by their very nature to be unrecorded.

3. Coconuts

The main coconut growing areas in the South are the coastal strip between Chumpon and Surat Thani, the coastal areas north of Nakhon Si Thammarat, the Island of Samui and the coastal areas of Pattani and Narathiwat. Some coconuts are used for local consumption and are moved to market towns by light truck. In the Pattani/Narathiwat area a large proportion is processed into oil which is sent in drums by ship to Bangkok. Large volumes of coconuts are sent by boat from Samui Island, Pak Panang and Bandon to Bangkok.

4. Tin

Tin mines are to be found in a number of areas in Southern Thailand, the main areas being in Phuket and Phang-nga. All of the ore is smelted at Phuket and the Thaisaco Smelting Company. Since tin exports only amount to about 23,000 tons per annum and there is a high concentration of metal in the ore, shipments by lorry to Phuket do not place a heavy demand on the road network. Tin ingots are made into 1 ton pallets and exported direct from Phuket in consignments of between 300-600 tons by vessels.

5. Fish

Since speed of transport is very important for fish, almost all the fish landed in the region is packed in ice and transported by road. Songkhla is the major area for fishing industry. A large proportion of the catch is consumed in the region itself - sent to grinding fish factory for powder fish production, but substantial volumes are exported to Malaysia and to Bangkok. A number of refrigerated lorries specialize in the long distance transport of fish. In this way fish can be sent by road from coastal towns to Bangkok within 20 hours.

6. Petrol and oil

Almost all the petroleum products and oil consumed in the region is transported by small tankers discharging at the main coastal ports (Songkhla, Pattani, Pak Panang, Bandon, Phuket and Kantang) into oil storage depots. On the east coast all oil products come from the refinery at Bangkok while the west coast is supplied from Singapore and Malaysia, Chumpon being supplied by rail. Almost all oil products are distributed inland by road, but certain isolated fishing ports are supplied with drums of oil by coastal vessels.

7. Miscellaneous goods

Most consumer goods are produced outside the region and thus must be imported. Trading companies located in the main provincial towns and retail outlets in smaller towns are responsible for their

distribution. Most of the goods come from warehouses in Bangkok while the balance is imported by sea from Singapore and by land from Malaysia.

Road, rail and coastal shipping compete for the bulk of the trade. On the west coast, as far south as Krabi, there is no direct rail or coastal shipping connection with Bangkok and goods are mainly supplied by road. Some are also distributed locally by road from trading companies located in Trang which is supplied by rail.

On the east coast, rail and coastal shipping compete for the bulk of the trade between Surat Thani and Narathiwat. There is some evidence of road competition, but generally the differential in frieght rates is too great, except for small consignments of high value goods.

Other commodities which are on the increasing trends are palm oil, coffee, aqua-culture shell, rubber-wood products and cement.

Besides the pattern of commodity flow, other justification which led to the development of the Port of Songkhla is the attempt to stop the influx of people into Bangkok. These people might compete for jobs, as well as making other competitive claims for other infrastructures. By developing this major port in the South, in the long run, it will help to create new jobs, and will lead to decentralization of regional development, as well as helping to promote direct international trade in the region.

Finally, the main purpose of port development is to lower the costs of exporting with a long term aim of developing a deep water port where ocean-going vessels can be serviced alongside wharves.[7]

F. THE IMPACT OF TECHNOLOGY ON PORT INDUSTRY

Fast technology changes in the marine transportation sector are the major challenges for the port industry in Thailand, as they are currently influence or will continue to influence port system designs, construction and operations.

Recently John Faruke, UN-Economic and Social Commission for Asia and the Pacific's (ESCAP) economic affairs officer contended on the "Port Development in the ESCAP Region" of the shipping seminar organised by the Bangkok Shipowners and Agents Association held in Bangkok that technology changes will have a substantial impact on ports and shipping industry.[8]

These changes in technology in the shipping industry could be traced back to the era of the introduction of containership in the mid 1960s, roll-on/roll-off vessels in the later years, LASH in the

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7. Hunting Technical Services Limited, "South Thailand

    Regional Planning Study: Transport Development",

    Songkhla, 1974.

8. Bangkok Post, 4 March 1982.

1970s and the trend towards bigger, faster and more-efficient liquid and dry bulk carriers started to place unprecedented demand on ports worldwide. Unlike the more affluent developed maritime countries, ports in Thailand as well as in the developing world were suddenly confronted by the realities brought home by the economic consequences of inadequate port systems.

However, it did not take long for Thailand to become acutely aware that any unnecessary delay to ships in its ports added to the cost of commodities, making imports more expensive and its export commodities and manufactured goods less competitive in the world markets.

While the development of ports in the ESCAP region has been characterised by caution and restraint, it did not take long for the view to be accepted that port were an important part of an interrelated transport system and could no longer be viewed in isolation.[9] There has been an increasing trend of specialised ports and port facilities due to specialisation in handling and transfer techniques of both bulk and general cargoes and the resulting requirements for massive investment in specialised handling and storage equipment. The trend to shift to capital-intensive cargo movement from the traditional labour-intensive has placed stringent demands on ports for new and

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9. Ibid.

sophisticated equipment such as gantry cranes, yard equipment, bulk loaders and unloaders, conveyor systems, slurry systems and heavy lifts. In paralled with cargo transfer technology developments, there have been many changes in the methods of storage, stacking, retrieval and maintenance.

Ports in Thailand as well as in other developing countries have generally been responsive to changing demands, economic and institutional barriers continue to hinder their development and progress. Invariably, ports must compete with other elements for scarce national resources and foreign exchange.[10] Port authorities, with their limited resources are being called upon to determine future or take part in the national planning on ports and their related activities, such as land waterfront requirements, to re-evaluate their terminal design and equipment needs, to consider the training or retraining of port workers to handle new and sophisticated equipment, and to alter their institutional and work practices in a highly capital-intensive industry.

However, much more significant changes have been in progress in container terminals, where remarkable self improvement by port transport industries are taking place through higher investment made by the shipping companies. The rapid growth of containerization

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10. Ibid.

together with other technological changes in marine transport swiftly make old-fashioned port transport obsolete.[11] The scrapping of excess lighter fleets is one of the effects of this.[12]

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11. United Nations, Economic and Social Commission for Asia and the Pacific, Planning and Management of Modern Cargo Terminals, ESCAP Port Development Series No. 5, November 1980.

12. Ibid.

CHAPTER 3.

THE ECONOMIC EVALUATION OF THE

SONGKHLA - SATUN LANDBRIDGE PROJECT

A. NEED FOR ADDITIONAL CONTAINER PORTS FOR THAILAND

Despite the impact of economic problem, Asia is now the World's major growth area for containerisation as it is shown in Table 3.1

Table 3.1

WORLD CONTAINERISED TRAFFIC 1970/1980/1990

WITH ASIAN PACIFIC RIM COUNTRIES AS A

SECTION OF THE WHOLE

million tonnes

	World total	Asian Pacific rim countries
1970	47.3	4.3
1980	255.5	66.8
1990 (projected)	408.4	111.5

Source : Cargo Systems Research Consultants Ltd.

In Thailand, increasing numbers of containers are now being handled at the Port of Bangkok. In response to the world's major growth for containerisation as well as the increasing utilization of containers in Thailand, thus the Port Authority of Thailand (PAT) is now engaged in boosting container handling capacity through both civil engineering works and the acquisition of new handling equipments. Port of Bangkok, for reasons connected with its accessibility and suitability for development on the landside, is not an ideal port at which to base container handling operations. Therefore the PAT is engaged in setting up a modern container commercial Port at Sattahip. located some 183 km Southeast of Bangkok.[1] The Royal Thai Navy recently gave a notice that she would like to have the commercial port at Sattahip back for military use. This stops all bidding procedures from the private sector formerly scheduled to open on April 25, 1986. Now all parties concerned are waiting for the Cabinet's decision.

Currently, the only major port serving Thailand is the Port of Bangkok, known locally as the Port of Klongtoey, and it is recognised that the container handling muscle now available here is insufficient to handle mounting throughput and thus to promote the economic well being of the country as a whole.[2]

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1. Mark Hamond, "Port Development: Thailand Builds container handling muscle, "Cargo Systems, Vol. 9, August 1982, p. 69.

2. Ibid.

The provision of new container handing capacity is a key objective in the development plans of the Port Authority of Thailand.[3] Container traffic at Port of Bangkok has sprung from a total of 72,874 TEU in 1977 to a level of 259,427 TEU in 1982 and is still climbing fast as shown in Figure 3.1.

B. EXISTING PORT OF SONGKHLA

Songkhla port is located at the mouth of the Songkhla Lake, at the town of Songkhla (a provincial capital), about 720 kilometres by sea from Bangkok. The navigation channel has been maintained by a 7 kilometres long channel.[4] The channel is 400 metres wide inside the Lake and 100 metres wide outside. A breakwater has been contructed 760 metres long from the head of the Songkhla Lake to prevent sand drifting into the channel. Despite the breakwater and efforts of the Harbour Department, the channel depth sometimes falls below 5.5 metres especially during the monsoon season.

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3. Ibid.

4. Hunting Technical Services Limited, <u>South Thailand regional Planning Study : Transport Development</u> (Songkhla : Hunting Technical Services Limited, 1974), p. 30.

FIGURE 3.1

TOTAL CONTAINER THROUGHPUT 1977 TO 1982 HANDLED
(TEU'S) AT THE PORT OF BANGKOK

	1977	1978	1979	1980	1981	1982
Inward	37,878	62,785	82,960	96,192	119,905	131,834
Outward	34,996	57,384	81,288	93,235	121,595	127,593
Total	72,874	120,169	164,248	189,427	241,500	259,427
Increase	. . . . .	64.90%	36.68%	15.33%	27.49%	7.42%
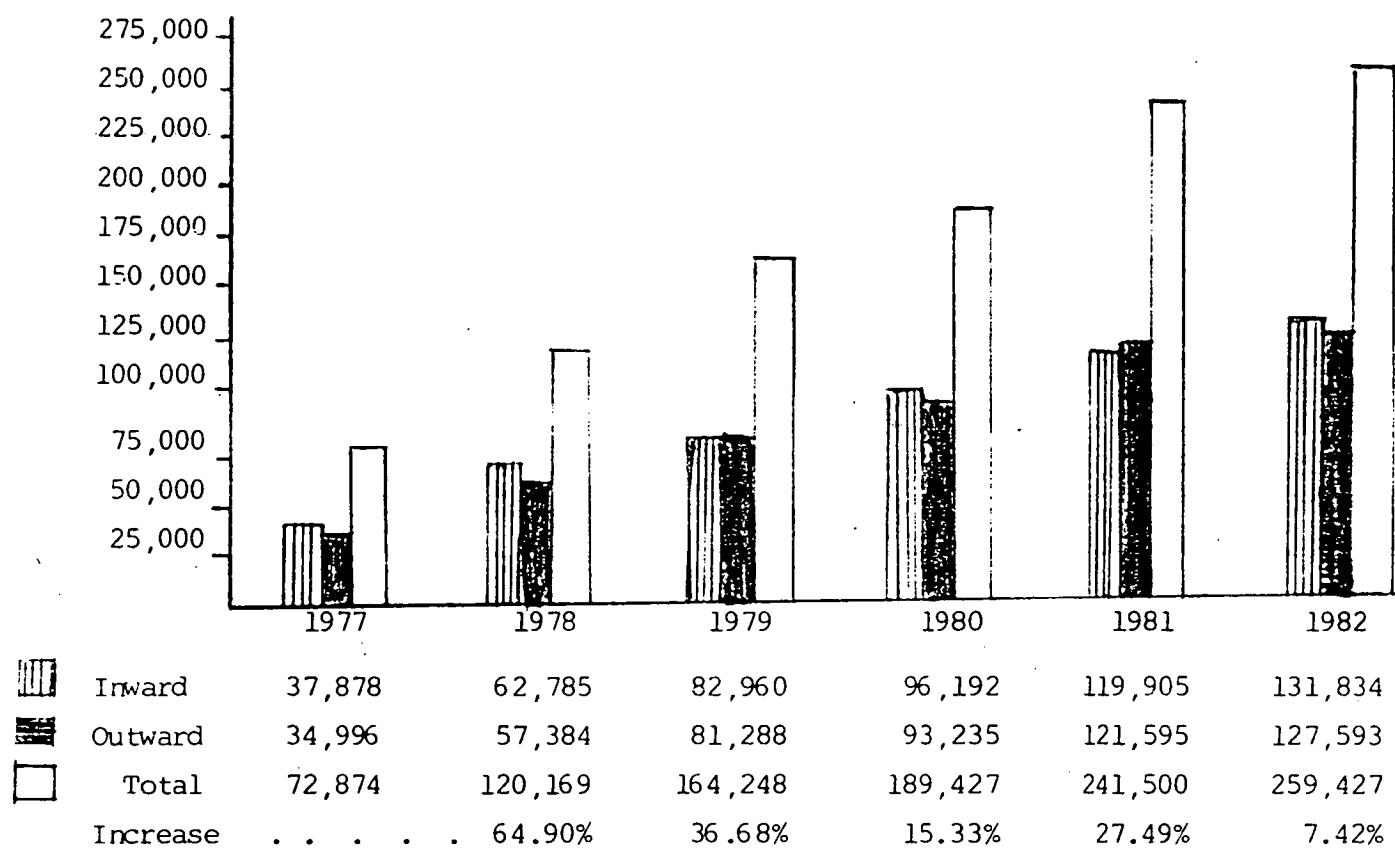
Source : Container Division, Port of Bangkok.

Since most of the facilities at the port are privately owned, a record of storage space is not readily available. The space available for rubber is probably less than 5,000 square metres and it appears that there is a shortage of storage space for both rubber and general cargo. There is little space available behind the water-front for expansion and the roads leading to the port are narrow.

There are 22 lighters with capacities ranging between 50 and 80 tons which are used for loading rubber. The rubber is handled manually at rates of about 15 tons per gang hour, usually with four gangs working. Labour is supplied under private contract as it is in all the ports of the South.

Domestic cargo is handled alongside berths in small ships of about 500 dwt or less. Most are wooden boats operated by private firms. The government owned Thai Navigation Company operates ships up to 1,000 dwt, mainly for domestic trade and for transhipment of rubber to Singapore.

An oil storage depot is located about 500 metres from the shoreline, and oil is discharged through a pipeline owned by the State Railways of Thailand, from small tankers.

There is less information available on the domestic cargo operations at Songkhla. All oil is now discharged at the Railway pier. Although discharge time varies with the size of the ship's pumps,

grade of oil, diameter of pipeline and number of grades; an average of about 100 tons per hour is probably a reasonable estimate.[5] The present oil storage tanks are located in the centre of the town. Relocation of the oil storage tanks, however, have to be considered earlier since this location in the town is in many respects undesirable.[6] Thus careful consideration should be given to this matter before any extensions of the existing tank farm is permitted.

Songkhla is the largest fishing port in Southern Thailand landing nearly 100,000 tons of fish annually. Fish is discharged in the centre of the town behind the fish market where there is a 200 metre wharf. A very large part of the waterfront is currently taken up by fishing boats moorings. Fishing stakes are often placed at a number of locations near the mouth of the lake and these sometimes interfere with shipping. Apart from this there appears to be no other conflict between the cargo and fishing operations at the port.

Songkhla is also connected by a single track railway to Hat Yai. This follows the same alignment as the road connecting the two towns. However, in 1977, this branch line was closed to traffic. And again in 1982, the State Railway of Thailand made a substantial maintenance of this line. The Public Relations of the State Railway

5. Ibid. p. 33.

6. Ibid.

released the news that the reinstatement of the branch line because of potential traffic - most likely with the cc-operation of the Malaysian Railway Administration, the detail of this is elaborated in the section C. of Chapter 6.

Songkhla rubber storage facilities are located on the east bank of the Songkhla Lake inlet and range from the origin wooden godown to modern warehouses. Access to the facilities is by way of narrow roads in the old town section. Vehicle congestion arises not only from traffic servicing the godowns but also from the through traffic using the roads for access to ferry crossing the lake. The business activities in this area, limited availability of land for expansion and traffic congestion are serious concerns of the town planning authorities.

The proposed site for the port at Outer Khao Daeng is situated to the north of Songkhla town on the oppsite side of the lake and is facing the Gulf of Thailand. The ferry service across the lake has five boats although only three seem to operate regularly. At peak hours there are long queues of traffic on either side.

Access to the proposed port site is at present limited to use either of the ferry service across the lake 'inlet' or the road from the north. Under the Eastern Highway scheme or Route 4083, three sections of a through road have been built in the area although none are surfaced as yet. The first road section leaves the main

highway connecting Hat Yai and Songkhla and provides access as far at the lakeside. The second section traverses Ko Yo Island (a small island of Songkhla Lake). The third runs from the eastern lake shore near Khao Daeng and joins the East Coast highway which runs from Khao Daeng to Nakhon Si Thammarat.

C. CONTAINER PORT FACILITY REQUIREMENTS

There could be various types of ports. However, major ports in Thailand are general cargo ports which usually handle both bulk and break-bulk traffic.[7] A general cargo port could also have facilities for handling pallets and containers. With a substantial growth in the volume of palletised or containerised traffic, separate terminals might be required.[8]

The proposed ports of Songkhla and Satun may base on general characteristics of the many developing country ports. Such a terminal would represent a minimum investment for an LDC port wishing to handle deep-sea container-ships of up to 2,000 TEU. A

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7. United Nations, Economic and Social Commission for Asia and the Pacific, Report of the Country-Level Workshop on Ocean Transport Costs and Negotiating Techniques in Shipping, 1-5 March 1982.

8. Ibid.

basic single-berth, single-gantry terminal may be of sufficient, but with a larger two-gantry terminal offers faster turnaround times when large numbers of containers are being loaded and discharged, permits the simultaneous berthing of deep-sea and feeder vessels and generally provides greater operating flexibility, whilst demanding a correspondingly higher through-put.[9] However, even a one-berth terminal as shown in Table 3.2 offers a potential throughput over four times that of a modern conventional berth in only just over twice the area. A birth of 290 metres with 11.5 metres of water alongside at all states of the tide would suffice for virtually all first and second generation container-ships under 2,000 TEU capacity.[10]

In most ports, the major investment required to accommodate fully cellular services involves terminal construction rather than dredging. Because of the high handling rates which can be achieved with containerships and gantry cranes, a large terminal area is normally required. The amount of space needed depends on a number of factors:[11]

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9. H.P. Drewry (Shipping Consultants), Perspectives on Third World Port Development, No.54, London: HPD Shipping Publications, 1977, p. 61.

10. Ibid.

11. Ibid. p. 62.

TABLE 3.2

MAIN CHARACTERISTICS OF DEEP-SEA CONTAINER

TERMINAL, SINGLE GANTRY CRANE

Berth throughput (tons per annum)	500,000
Length of berth (metres)	290
Area of berth (square metres)	52,000
Covered area (square metres)	12,500
Gantry crane	1
Straddle carriers	3
Tractors	3
Trailers	18
Fork-lift trucks	2

Source: H.P. Drewry (Shipping Consultants),

Perspectives on Third World Port

Development, #54, 1977, p. 62.

- the size and frequency of containerships using the terminal

- the maximum number of containers loaded and unloaded

- the length of time containers remain at the terminal prior to shipment and after discharge

- the handling and stacking systems employed[12]

- the range of ancillary operations carried out within the terminal confines

In shipping industry, the high cost of delays to containerships is sometime unavoidable. It is vital that there is sufficient space available to take the incoming load of containers so that the vessel is not delayed while space is cleared. Similarly, space is required to marshall containers for loading before the vessel arrives. Further space is needed to store export containers awaiting later vessel arrivals and import containers awaiting collection. Much depends on the time the containers spend at the terminal, it may

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12. The three basic systems in common use are: a) trailer systems, where each container is placed on a trailer and towed between the quay and storage area by a tractor, b) straddle carriers, which take the containers to and from the storage area and stack them, usually two high, and c) container yard gantry cranes, whichcan stack up to five high.

generally be more difficult to organise shippers and receivers so as to minimise dwell times. Therefore, in construction of the ports of Songkhla and Satun planners should consider the future needs of port requirements based on main characteristics of deep-sea container terminal experienced in most developing countries.

D. THE BASIC APPROACH IN THE COST - BENEFIT ANALYSIS OF

THE SONGKHLA - SATUN LANDBRIDGE DEVELOPMENT PROJECT

The Songkhla - Satun Landbridge Project consists of three

basic developments, namely, the development of the container

ports of Songkhla (Eastern side) and Satun (Western side) on

the opposite sides of the Southern Thailand penninsula, and

the establishment of a railway link between the two ports.

This is similar in concept to the landbridge development in the

U. S. A., Australia, and Mexico as already described in

Chapter 1.

In the economic analysis which will follow, the costs and

the benefits will be evaluated for individual part of the

project, but the final calculation of the net present value and

benefit/cost ratio will refer to the whole project which is

simply based on a combination of the costs items and benefits

items of the three development parts.

Therefore the analysis will entail the followings:

1. Songkhla Port Development (Port of Songkhla Investment),

2. Satun Port Development (Port of Satun Investment),

3. Songkhla - Satun Kra Development (Songkhla - Satun Landbridge), and

4. Total Development Project (Songkhla Port Development plus Satun Port Develpment plus Songkhla - Satun Kra Landbridge Development).

The primary reason for breaking the evaluation into three separate parts are:

(1). To indicate to the investor (Thai Government) the relative magnitudes of the costs and derived benefits among the three parts of the development.

(2). The investor would want to have some idea of the amount of investment to be allocated in each area to aid the national policy decision.

In this study, the economic analysis was simulated for a period of 30 years, which corresponds to the project life. The construction phase will take four years to complete, and the benefit will start to show in year 5 of the simulation. The discount rate used in the simulation runs vary between 7% to 10% as they represent the usual range of interest rate charged for public project investment in Thailand (but for some public

project which is deemed necessary and urgent for the welfare of the people, interest rate may be as low as 2% to 4% or no charges). Year 1 in the simulation corresponds to the year 1982 due to the completeness of the data required for initial estimate of costs and benefits for the simulation.

The details of cost and befit categories for each development part of the project are summarized in Figure 3.2.

FIGURE 3.2

ITEMIZATION OF THE COSTS AND

BENEFITS USED IN THE COMPUTER

SIMULATION ANALYSIS

I. Port of Songkhla Development

Costs

Cat. 1 : design and preparatory work

Cat. 2 : marine structure

Cat. 3 : building, navigation and miscellaneous

Cat. 4 : road, water and electricity supplies

Cat. 5 : operating, maintenance and miscellaneous

Benefits

Cat. 1 : saving in lighterage costs

Cat. 2 : transhipment cost savings

Cat. 3 : benefit to other foreign exports

Cat. 4 : savings to directly imported cargo

Cat. 5 : benefit to domestic dry cargo

FIGURE 3.2 contd.

II. Port of Satun Development

Costs

Cat. 1 : design and preparatory work

Cat. 2 : marine structure

Cat. 3 : building, navigation and miscellaneous

Cat. 4 : road, water and electricity supplies

Cat. 5 : operating, maintenance and miscellaneous

Benefits

Cat. 1 : saving in lighterage costs

Cat. 2 : transhipment cost savings

Cat. 3 : benefit to other foreign exports

Cat. 4 : savings to directly imported cargo

Cat. 5 : benefit to domestic dry cargo

FIGURE 3.2 contd.

III. Songkhla-Satun Landbridge Development

Costs

Cat. 1 : preparatory work, land and embarkment, bridges and ballast

Cat. 2 : wooden sleepers, fastening, points and crossings .

Cat. 3 : ballast and track transportation, track laying and rail welding

Cat. 4 : buildings, sheds, office, depots, signalling, telecommunications and contingencies

Cat. 5 : operating, maintenance and miscellaneous

Benefits

Cat* 1 :   - Nil -

Cat. 2 : transhipment cost saving

Cat. 3 : benefit to other foreign exports

Cat. 4 : savings to directly imported cargo

Cat. 5 : benefit to domestic dry cargo

Note * Cat. 1 equals to zero because there are only four categories of benefits in the landbridge development.

All the major cost items are included except some indrect
costs, such as those of environmental and traffic considerations.
The benefits considered in the analysis are direct benefits since
those benefit can be evaluated with high reliability. For those
indirect or intangible benefits, though not included in the
computation, some important ones such as better cargo handling
and storage facilities (resulting in less damage and greater
convenience), the availability of an increase of shipping services
on a wider variety of routes, the economic impacts, and the induced
industrial development will be discussed in qualitative terms in
the subsequent sections and in chapters 5 and 6. Hence the
results of the economic analysis will be on the conservative
side, underestimating the actual benefits that would occur.

The estimation of the construction cost for the port of
Songkhla was prepared by Thailand's National Economic and Social
Development Board (NESDB).

The direct benefits for Songkhla port were taken from the
report of the Hunting Technical Services Limited, which is a
consulting firm. Both costs and benefits of Satun port were
provided by the port Authority of Thailand. The estimation of
the costs and benefits of Songkhla - Satun Landbridge (an East -
West railway link) was obtained from the State Railway of Thailand,
which was found to be in good agreement with the Asian Development
Bank's estimates.

The details of the estimates of costs and benefits will be
discussed below.

E. THE PORT OF SONGKHLA DEVELOPMENT

1. COSTS

The proposed port of Songkhla project will require a four-year term for construction; in the first year the costs are $ 9.073 M.; the costs of the second year are $ 11.024 M.; the cost in the third year are $ 9.749 M.; and the cost in the fourth year are $ 4.605 M. as shown in Table 3.3. The equivalent present value of year 0 is $ 30.00 M. and has been discounted at 6 percent. The evaluation of the NPV* and B/C ratio are shown in Appendix A. and A. 1 as an illustration of the computation procedure. The simulation results of costs, benefits and NPV for port of Songkhla development are shown in Appendix A. 2.

Note : net present value (NPV*) The NPV equals the present value

of the cash inflows minus the present value of the cash

outflows with the cost of capital used as a discount rate.

If the NPV is positive, a project should be accepted.

TABLE 3.3

Schedule of Yearly Expenditure Breakdown

of Port of Songkhla Construction Phase

(1982 Price)

CATEGORY	Year 1	Year 2	Year 3	Year 4	TOTAL	Present value at year 0, i= 6%
1. Design and preparatory work	9.073	2.382	2.382	2.382	16.219	14.566
2. Marine Structure	–	6.037	5.419	–	11.456	9.920
3. Building, navigation and miscellaneous	–	1.750	0.780	2.223	4.753	3.972
4. Road, water and electricity supplies	–	0.855	1.168	–	2.023	1.742
	9.073	11.024	9.749	4.605	34.451	30.20

Source : Exiracted from "Circular Letter to the National Economic and Social Development Board"
issued by The Ministry of Communications (Thailand), 14 September 1981.

2. BENEFITS

i) Benefits to Rubber Cargo

The evaluation was based on cargo forecast as indicated in Table 3.5; that deep sea Port facilities are provided at Songkhla and improved lighterage at Pattani and Narathiwat.

Lighterage costs have been taken at $2.50 per ton. This is in fact the same as the present charges for this service and therefore might be thought to over-estimate the true resource cost savings. However, the additional inconvenience and damage caused by the double handling of cargo in lighters would probably more than offset this over-estimate. In 1973 more than 18 percent of Songkhla's rubber cargo was sent by coastal vessel and transhipped to Singapore. The extra costs of coastal shipping and transhipment tends to fluctuate and are currently more than $15 per ton. On construction of deep water port facilities at Songkhla, transhipment of rubber can be expected to fall considerably.

ii) Benefits to Other Cargo

Domestic cargo can also the be expected to benefit from improvements at Songkhla port. Not only will there be better cargo handling and storage available, but larger ship could be used for this trade. In the 'South Thailand Regional Planning Study - Transport Development'

this benefit was valued at $0.50 per ton on dry cargo only.   No benefits have been attributed to oil cargo, although there would probably be quite substantial savings from the use of larger tankers in a deeper channel. Besides this, Songkhla is a major petroleum and oil distribution centre in the southern region.

iii) Breakdown of Total Benetifs

In order to judge the relative size of each of these benefits, therefore, it is essential to present them below for the single year, as shown in Table 3.4.

TABLE 3.4

Breakdown of benefits to

Songkhla Port project for year 5

(a single year)

		$ million
1. Saving in lighterage costs	. .	1.300
2. Transhipment cost savings	. .	0.500
3. Benefits to other foreign exports	. .	0.191
4. Savings to directly imported cargo	. .	0.645
5. Benefit to domestic dry cargo	. .	0.075
TOTAL annual benefits	. .	2.711

Source : Hunting Technical Services Limited, South

Thailand Regional Planning Study :

Transport Development.

FORECAST OF RUBBER EXPORTS THROUGH

THE PORTS OF SOUTH THAILAND

The forecast of total rubber exports for the whole of
Thailand made by the Rubber Replanting Aid Fund Board is
presented.

Forecast of Thailand's rubber

export to 1996

Year	thousand tons Exports
1973	368
1976	460
1981	615
1986	885
1991	1270
1996	1660

Source :   Rubber Replanting Aid Fund Board

F. THE PORT OF SATUN DEVELOPMENT

Satun is a province located in the Southern Region on the west coast of Thailand, the land area covers about 2,497 square kilometres. Satun has common boundary with Trang and Phattalung in the North, Songkhla in the East, Malaysia in the South and Indian Ocean in the West. The climate is moderate throughout the year. For administrative purpose, Satun is divided into 6 districts (Amphoe), 29 communes (Tambon), 221 villages, and 1 municipal area where the Satun provincial centre is located. Total population enumerated from the 1980 Population and Housing Cencus as of April 1, 1980, was approximately 156,485 persons in Satun (may also refer to 'Population by Province in Southern Region' in Chapter 6).

In Satun, the highest percentage of population engaged in agriculture, and the next three predominant industries were services, commerce and manufacturing respectively as shown in Table 3.5.

TABLE 3.5

PERCENTAGE OF POPULATION 11 YEARS OF AGE AND
OVER ENGAGED IN INDUSTRY BY MUNICIPAL AND
NON-MUNICIPAL AREAS AND SEX

Major industry group (April 1979 - March 1980)	Total	Municipal area	Non-municipal area
Both sexes			
1. Agriculture	80.18	21.99	85.52
2. Services	7.45	32.38	5.17
3. Commerce	5.78	20.40	4.44
4. Manufacturing	2.90	11.26	2.14
Male			
1. Agriculture	78.26	28.85	83.56
2. Services	8.73	27.56	6.72
3. Commerce	3.70	12.00	2.81
4. Manufacturing	3.30	12.05	-
5. Transport, Storage and Communication	-	-	2.16
Female			
1. Agriculture	82.85	9.86	87.89
2. Commerce	8.37	35.29	6.41
3. Services	5.86	40.92	3.30
4. Manufacturing	2.41	9.86	1.87

Source: National Statistical Office, 1980 Population and
Housing Cencus - Changwat Satun, Bangkok.

Satun is one of the most neglected provinces for major infra-structure development in Southern Thailand. The surfaced road which serves the province in Route 406 from Rattaphum. Road running from the north of the province is the other surfaced coastal road from Palian in Trang province to Satun-Route 4078. The proposal to link Khuansataw to Khong Ngae/Padang Besar in Songkhla province will give the province an alternative outlet to the east instead of via Rattaphum. The road at certain section, however, will be expensive to construct, since it passes through mountainous terrain. The road if completely constructed will reduce the isolation of the province and this may be desirable.

The other new surfaced road from Satun city/Ko Nok to Tammalung is a short road about 10 km running to the coast south of Satun to serve the coastal fishing port of Satun.

Satun may be viewed as an important rubber export and domestic cargo port while fishing is also quite an important activity.

1. COSTS

The proposed Port of Satun project will be assumed to require a four-year term for construction; in the first year the costs are $ 3.800 M.; the costs in the second year are $ 12.114 M.; the costs in the third year are $ 9.236 M., and the costs in the fourth year are $ 1.750 M. as shown in Table 3.7 with capital costs kept to a minimum. Simulation results of costs, benefits and NPV for port of Satun development are shown in Appendix A.3.

TABLE 3.6

Schedule of Yearly Expenditure Breakdown

of Port of Satun Construction Phase

(1982 price)

CATEGORY	Year 1	Year 2	Year 3	Year 4	TOTAL
1. Design and preparatory work	3.800	1.000	1.000	1.000	6.800
2. Marine structure	–	9.154	7.046	–	16.200
3. Building, navigation and miscellaneous	–	1.110	0.540	0.750	2.400
4. Road, water and electricity supplies	–	0.850	0.650	–	1.500
	3.800	12.114	9.236	1.750	26.900

Source : Port Authority of Thailand estimates

2. BENEFITS

The evaluation of the benefits attributable to the development a deep sea port at Satun has been based on a similar methodology to that of the Port of Songkhla. The cost savings are: saving in ligh-terage costs, transhipment cost saving, faster throughput of cargo, saving to directly imported cargo, and to some extent the elemination of the costs of additional facilities that would be required to cope with forecast growth in trade.

Rubber is transported by road from Hat Yai to Padang Besar on the Thailand/Malaysia Border. From there the rubber is "stuffed" into container and then moved by rail to Penang for export to various destinations including West Germany and Romania[13].

The provision of a deep sea port at Satun and the containerisa-tion of Thailand's rubber will eliminate the transport operation through Port Penang, Malaysia. The costs that could be saved include the road movment cost from Hat Yai to Padang Besar, and the handling cost from road vehicle to container and the rail freight charge from Padang Besar to Penang. Using the economic cost of road movement estimated at $ 0.25 per truck/km and the charge made by the Malaysian

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13. See Appendix B. of TABLE B.6 Principal Exports by Country.

Railways hence this represents an overseas payment, the net moving cost saving has been estimated at at us. $ 7.13 per ton[14].

Savings in ship delay costs are among other benefits arising from port development. Without development the rate at which port can handle traffic is restricted and as traffic increases so too does the time vessels spend waiting for service. The length of this delay is determined principally by the rate of cargo handling, the productive hours worked, consignment sizes and ship arrival patterns.

Initially the costs of such delays are borned by the shipping lines but in general these costs are quickly passed on through increased freight rates. For export cargo this could lead to a reduction in foreign exchange earnings. Increased freight charges may result in a rise in the final price of Thailand's exports in the world market, exports may therefore become less competitive and seles ultimately deteriorate.

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14. State Railway of Thailand estimates.

3. Breakdown of Total Benefits

The total benefits of the proposed Port of Satun is presented in a single year, as shown in Table 3.7

TABLE 3.7

Breakdown of benefits to Port of

Satun project in year 5

		$ million
1. Saving in lighterage costs	. .	1.040
2. Transhipment cost saving	. .	0.400
3. Benefit to other foreign exports	. .	0.153
4. Saving to directly imported cargo	. .	0.516
5. Benefit to domestic dry cargo	. .	0.060
TOTAL annual benefits	. .	2.169

Source : Port Authority of Thailand estimatation.

G. THE SONGKHLA — SATUN KRA LANDBRIDGE DEVELOPMENT

Songkhla and Satun provinces lie on the elongated Southern peninsula Thailand, both facing the seas, Songkhla on the eastern coast along the Gulf of Thailand and South China Sea, while Satun on the western coast along the Andaman Sea and Indian Ocean. These two provinces situated far south of the original Isthmus of Kra, but situated between the international sea routes. The justification for the route is that the actual savings in distance affected by the proposed route, "Songkhla - Satun Kra Landbridge" against the Straits of Malacca route would be about 1440 km (900 miles).

There are also other principal associated factors which define overall importance and viability of the project, such as potentiality for permanent employment and ancillary industrial development potential based on construction of two deep sea ports at both of the landbridge outlets. A railway network will link the two ports, a total east-west rail distance is about 141 km. However, the additional new rail construction is only about 90 km; one would be extended westward between the Hat Yai - Padang Besar (Thai/Malaysian border) line at Khlong Ngae station to the proposed port of Satun about 80 km, the other part would be extended between a short branch line running east from Hat Yai to Songkhla city to create a new 10 km line to the proposed port of Songkhla.

1. COSTS

The east-west link by the proposed Songkhla – Satun Kra Landbridge will require a four-year term of construction because some part of the line has to pass through the mountainous terrain in Satun province. In the first year, the costs are $ 6.030 M.; the costs of the second year are $ 12.129 M.; the costs in the third year are also $ 12.129 M.; and the costs in the fourth year are $ 5.712 M. as shown in Table 3.8 , operating, maintenance and miscellaneous costs will be started on the fifth year. The simulation results of the costs, benefits, and NPV for this case are shown in Appendix A.4.

TABLE   3.8

Schedulde of Yearly Expenditure Breakdown of

Songkhla – Satun Kra Landbridge Construction Phase

(1982 price)

					million dollars
CATEGORY	Year 1	Year 2	Year 3	Year 4	TOTAL
1. Preparatory work, land and embankment, bridges and ballast	6.030	3.015	3.015	–	12.060
2. Wooden sleepers, fastenings, points and crossings	–	3.402	3.402	–	6.804
3. Ballast and track transportation, track laying and rail welding	–	0.738	0.738	0.738	2.214
4. Buildings, sheds,office, depots, signalling, communications and contingencies	–	4.974	4.974	4.974	14.922
	6.030	12.129	12.129	5.712	36.000

Source : State Railway of Thailand estimation

2. BENEFITS

Benefits to rubber cargo, domestic dry cargo, savings to directly imported cargo, saving in transhipment, and benefit to other foreign exports has been estimated, and it is to present them for the single year, as shown in Table 3.9.

TABLE 3.9

Breakdown of benefits to

Songkhla – Satun Kra Landbridge project

in year 5

			$ million
1.[*]	– Nil –	. .	–
2.	Transhipment cost saving	. .	0.195
3.	Benefit to other foreign exports	. .	0.445
4.	Savings to directly imported cargo	. .	0.150
5.	Benefit to domestic dry cargo	. .	0.545
	TOTAL annual benefits	. .	1.335

Source : State Railway of Thailand estimates

Note : 1* (category) equals to zero because there are only four

categories of benefits in the landbridge development

H.   THE EVALUATION OF THE SIMULATION RESULTS

The simulated values of the N P V, benefits, and costs of each part of the project and for the whole project are shown in Table 3.10. The criteria used for the evlauation of the project are (i) N P V, (ii) I R R and (iii) Benefit / Cost ratio.

Table 3.10 shows that the whole project is viable or economically justified if the discount rate from 8% downward.

TABLE 3.10

EVALUATION OF SIMULATION RESULTS

(Unit: Million dollars)

I. Songkhla Port Development

		Discount Rate		
	7%	8%	9%	10%
N P V	9.693	4.618	0.422	-3.047
Benefit	49.80	43.23	37.73	33.12
Cost	40.11	38.61	37.31	36.17

II. Satun Port Development

		Discount Rate		
	7%	8%	9%	10%
N P V	7.015	3.158	-0.396	-2.861
Benefit	38.78	33.82	29.27	25.91
Cost	31.77	30.66	29.66	28.78

III. Songkhla-Satun Kra Development

		Discount Rate		
	7%	8%	9%	10%
N P V	4.296	0.566	-4.252	-7.564
Benefit	49.98	44.40	37.92	33.15
Cost	45.69	43.83	42.17	40.71

IV. Total Project Development : which includes
    (1). Songkhla Port Development
    (2). Satun Port Development, and
    (3). Songkhla - Satun Kra Landbridge Development

		Discount Rate		
	7%	8%	9%	10%
Benefits	138.56	121.45	104.92	92.18
Cost	117.57	113.10	109.14	105.66
Evaluation Criteria				
(i) N P V	21.004	8.342	-4.226	-13.472
(ii) I R R		between 8% and 9%		
(iii) Benefit/Cost	1.179	1.074	0.961	0.872

I. INDIRECT OR INTANGIBLE BENEFITS OF THE PROJECT

For the port of Songkhla development the indirect benefits can
be generally in terms of sufficient outlets for agro-industrial
commodities, mineral output in areas with a high resource base be
provided due to new port operation. These benefits will include
from fast, safe and cheap waterborne commerce for international
and domestic trade, supporting the government's drive for regional
dispersal of industries and population to benefit through
improvement the standard of living of people in some areas where
inadequate transport facilities have hindered social and economic
progress.

The indirect benefits which will be arising from the
East - West rail link "Songkhla - Satun Kra Landbridge" are
mainly in the areas of the future development of the Lower Southern
Thailand Region, i.e., social, tourism, industrial development, ship
building and ship repairing, defence aspects, and some improvement of
standards of living and better quality of life of the people in the
development zone. In the study, at this juncture, it is not aware
of any consistent and reliable method of quantifying the benefits
generated from the areas mentioned above.

The indirect benefits resulting from the economic impact will
be discussed in some detail in Chapter 5. Chapter 6 will discuss the
establishment of inland regional marketing depots as a consequence
of the project development.

CHAPTER 4.

TRAFFIC DENSITY AND SAFETY CONDITIONS IN THE

STRAITS OF MALACCA AND SINGAPORE

In Asia there are more than twenty straits used as major shipping routes and alternate routes. For hundreds of years the Straits of Malacca have been used for various navigational purposes. Among the 25 principal straits in Asia, the Straits of Malacca, serving as the major shipping route between the Pacific and the Indian Oceans, is one of the most important and heavily travelled. Together with Sunda Straits, they provide the sea links between the Western world, North Africa, and West and South Asia, on the one hand, and Southeast Asia and the Eastern world on the other.

From an operational viewpoint, every ship from Europe or from the Middle East going to the Far East must pass through the Straits along Indonesia's Sumatra. Ships from Calcutta bound for the Far East will travel along the south-west coast of Thailand and the west coast of Malaysia.

At present time, the Straits of Malacca is the shortest waterway lying between the Indian and the Pacific Oceans. The common position of user-states, such as Japan, the Soviet Union, the United States, and the United Kingdom, is to keep the Straits open, although the fundamental interest in the use of the Straits is different for each

country. This is why the American and Russian proposals in general are similar in using the legal term "free transit" applied to the Straits of Malacca for all kinds of ships, including nuclear submarines, and why they have been supported by the Japanese and the British.[1]

Nevertheless, the closure of this passageway could do more harm to the Japanese economy than to that of the United States, because the Japanese tankers use the Straits of Malacca for the transportation of most of the nation's petroleum requirements. On the other hand, for the United States there is the need to keep the Straits open for manoeuvres of the Seventh Fleet from the South China Sea to the Indian Ocean. Since US political influence in the Straits zone remains stronger than any other maritime Power's, the American policy regarding the "Straits used for international navigation" could be more flexible than that of the other maritime Powers.[2]

Every Asian State is concerned about the future juridical status as well as the traffic density of the Straits of Malacca, but Singapore and Thailand have special interests. As an international seaport, Singapore's economy depends essentially on the circulation of ships through the Straits. The blockade due to various reasons,

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1. Phiphat Tangsubkul, "Law of the Sea: An Asian Viewpoint on the Status of Straits", South-East Asian Spectrum, Vol. 2, July 1974, p. 71.

2. Ibid.

of ships through the Straits. The blockade due to various reasons, such as an accident of any super tanker at the shallowest point which is less than 10 metres in depth, or the juridical closures of the Straits would therefore, affect that economy directly. Indirectly, too, the 12-mile claim by Malaysia and Indonesia, will stimulate the Japanese as well as the American to consider more seriously the project for the Kra Canal. If the Kra Canal were built, obviously the new waterway as the shortest passage linking the Andaman and South China seas thus would reduce significantly the number of ships using the Port of Singapore.

A. TRAFFIC DENSITY IN THE STRAITS OF MALACCA AND SINGAPORE

The physical structure of the Straits of Malacca is funnel-shaped, opening out to the Andaman Sea and tapering to the southeast. Below about the town of Malacca, the width is generally less than 39 kilometres. The danger of collision in the Straits lies partly in the heavy marine traffic and partly in the narrowness of the Straits and shallowness of the water. The situation is aggravated by the presence of numerous shoals, the occurence of moving sand waves at the bottom, and wrecks along the Straits.[3]

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3. Chia Lin Sien, Southeast Asian Seas Frontiers for Development, ed. Chia Lin Sien and Colin MacAndrews (Singapore : McGraw-Hill International Book Company, 19810, p. 252.

Within the wide western entrance of the Straits of Malacca,
the depths vary considerably between 34 metres and 84 metres until
the Indonesian and Malaysian waters begin to overlap.   Near the
Indonesian Aruah Islands, the depths are only 18 to 19 metres.
Towards the area off Port Kelang of Malaysia lies a cluster of shoals
including Angsa Bank, North Sands, One Fathom Bank, and South Sands.
The depth of water is less than 10 metres in large areas.   For
deep-draught vessel Very Large Crude Carriers (VLCCs) and Ultra Large
Crude Carriers (ULCCs), passage is only possible is a narrow channel
of 600 metres width where the depth is 23 metres.[4]   Due to the
restricted natural physical structure of the Straits, combined with
the increasing number of ships using this passage, this straits at some
time in the future will not accommodate all shipping trafic requirement.

The Straits of Malacca and Singapore are the busiest in the
world after the Dover Straits where a traffic separation scheme has
been in operation since June 1967.   The Port of Singapore Authority
(PSA) has been monitoring the traffic density in the Straits of
Singapore since 1969 and has been conducting such surveys over a
period of 28 days once every two years from 1974.   The total number
of vessel movements in the Straits has increases from 129.4 per day
in 1969 to 153.8 per day in 1978, representing an increase of 19 per
cent during the interval.

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4. Ibid. p. 253.

Concerning the traffic density in the Straits of Malacca, Dr. Parpart (1983) stated that, by 1982, the shipping volume through the Straits had reached 40,000 ships per year.[5] Using the most conservative economic growth scenario, this volume will go up to at least 110,000 ships by the year 2,000 and again increase tenfold to over one million ships by 2020.[6] There is general agreement among experts that even the first of these shipping volumes cannot be handled safely or within an economically feasible transit time by the Straits of Malacca. Failure to provide for alternatives will create a major infrastructural bottleneck for a sizable portion of the world trade.

Additional information provided by the Port of Singapore Authority on the number of ships calling at the Port during 1978 numbered about 45,600, an average of 125 ships per day. Thus there might be a discrepancy on information provided by Dr. Parpart that ships plying in the Straits in 1982 was recorded at 40,000 ships, an average of 110 ships per day, or the number of ships had been underestimated.

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5. Uwe Henke v. Parpart, Fusion Energy Foundation, "The Kra Canal and the Future of the Thai Economy", speech given in Bangkok, 27 October 1983.

6. Ibid.

A large tanker normally would take about 36 hours to transit the Straits from the Andaman Sea to the South China Sea. On the basis of the earlier estimate of 200 vessels plying the Straits of Malacca each day, such a tanker would have to pass 150 vessels moving in the opposite direction during the period of transit.

B. SAFETY CONDITION IN THE STRAITS

Since the Straits of Malacca and Singapore are the second busiest in the world, it is obvious that shipping casualties and oil spills in the Straits are a matter of interest to Malaysia, Indonesia, Singapore and Japan. There is a tendency for oil tankers to sink slighty at the stern (squat) when moving at speed. Tanker operation would therefore necessarily reduce speed to reduce the squat in order to avoid grounding the vessel. Another danger is that the large variations in the size and type of vessels moving at different speeds means that overtaking occurs frequently. It is also not infrequent that fishing vessels are found stationary in the deep channels designated for large ships, and large vessels are then forced to swerve suddenly to avoid collision.[7]

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7. Chia Lin Sien, Southeast Asian Seas Frontiers for Development, ed. Chia Lin Sien and Colin MacAndrews (Singapore: McGraw-Hill International Book Company, 1981), p. 258.

The average number of oil pollution cases during 1973-78 is about 74, although this average is increased somewhat by the large number of cases (132) in 1973. While the number of major cases involving more than 100 tonnes of oil spilled is small in any one year, the amount of oil spilled may exceed the total of all the minor and medium spills combined during that year. The number of collisions is high, averaging 50 per cent of all shipping casualties or about four a month.[9] The number of groundings averaged about 18 per year, while there was an unusually high incidence of sinkings in 1976 and 1977.

C. THE INTRODUCTION OF SONGKHLA - SATUN KRA LANDBRIDGE

This section of the thesis contains viewpoints of those personnel who are directly involved in shipping business or currently working in shipping companies. Viewpoints and considerations related to the present existing shipping routes between the Far East and Middle East/Europe or routes via the Straits of Malacca and Singapore versus the proposed "Songkhla - Satun Kra Landbridge" are presented on a comparison basis in the following paragraphs.

There are some indications, based on the past and current trends of international trade, that the Songkhla-Satun Kra Landbridge

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9. Ibid. p. 261.

would be able to offer a future solution for the route that is needed in the 1990's.[10] Because by then the traffic in the Straits of Malacca and Singapore would be congested, thus ships would have to operate at a considerably slower speed than that of the present operation in order to avoid collision. In a sense, therefore, the proposed Songkhla-Satun Kra Landbridge which would present the new alternative route for the shipping lines would be feasible and necessary. However, comparing Songkhla - Satun Kra Landbrid with the proposed "Kra Canal" project, the shipping lines are in favour of the construction of the Kra Canal because this project, if completed, would be able to offer an efficient throughput in which time and costs could be saved, hence eliminating the double handling costs at the intermodal changes when utilising the Landbridge route.[11]

Then, what would divert the shipping lines to consider the proposed Landbridge? Shipping difficulties in the Straits of Malacca and Singapore would be a push factor for the shipping lines to overcome the difficulties by improving the navigation in the Straits or seeking a suitable alternative route. If the Songkhla - Satun Kra

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10. Personal interview with Mr. Mongkol Teonukul, Manager,

    ScanDutch, The East Asiatic Co., (Thailand), October 1984.

11. Personal interview with Mr. Amnuey Supachinda, Technical

    Office, Port Authority of Thailand, June 1984.

could offer efficient new transport links to shipping lines then they would consider using the Landbridge. It was suggested that by giving subsidies to shipping lines or to the Landbridge operator for the first few years this would likely be a factor that could induce shipping lines to divert the route from the Straits of Malacca and Singapore.[12] Or other forms of incentives would be given to transport related industry to ensure acceleration of sound transport development in the Landbridge zone.

In the final analysis, the Kra Canal is at the very beginning stages of study and feasibility. The total costs involved and the long period of time needs for planning and construction on international scale deminishes the likihood the Canal will be built in within the critical timeframe of the next ten years. The Songkhla - Satun Landbridge offers the solution to the impending shipping crisis for many shipping lines in the Malacca Straits. Figure 4.1 illustrated the current shipping route and ports on Thai - Malay Penninsula

12. Personal interview with Mr. Pakorn Sae-lue,

   Nippon Yusen Kaisha (NYK), Borneo Services Limited,

   October 1984.

Figure 4.1

International Shipping Route and Ports on

Thai - Malay Penninsula

BURMA

Hanoi

Chiang Mai

Udon thani

LAOS

Khon Kaen

Bangkok

LEGEND :

INTERNATIONAL PORT NEWLY PROPOSED

EXISTING INTERNATIONAL PORT

CONCEPTIONAL INTERNATIONAL SHIPPING ROUTES

CAMBODIA

Phanom Penh

VIETNAM

Hochimin (Saigon)

SURAT THANI

PHUKET

SONGKHLA

Kota Baharu

Penang

MALAYSIA

Kuantan

Kelang

SINGAPORE

SUMATERA
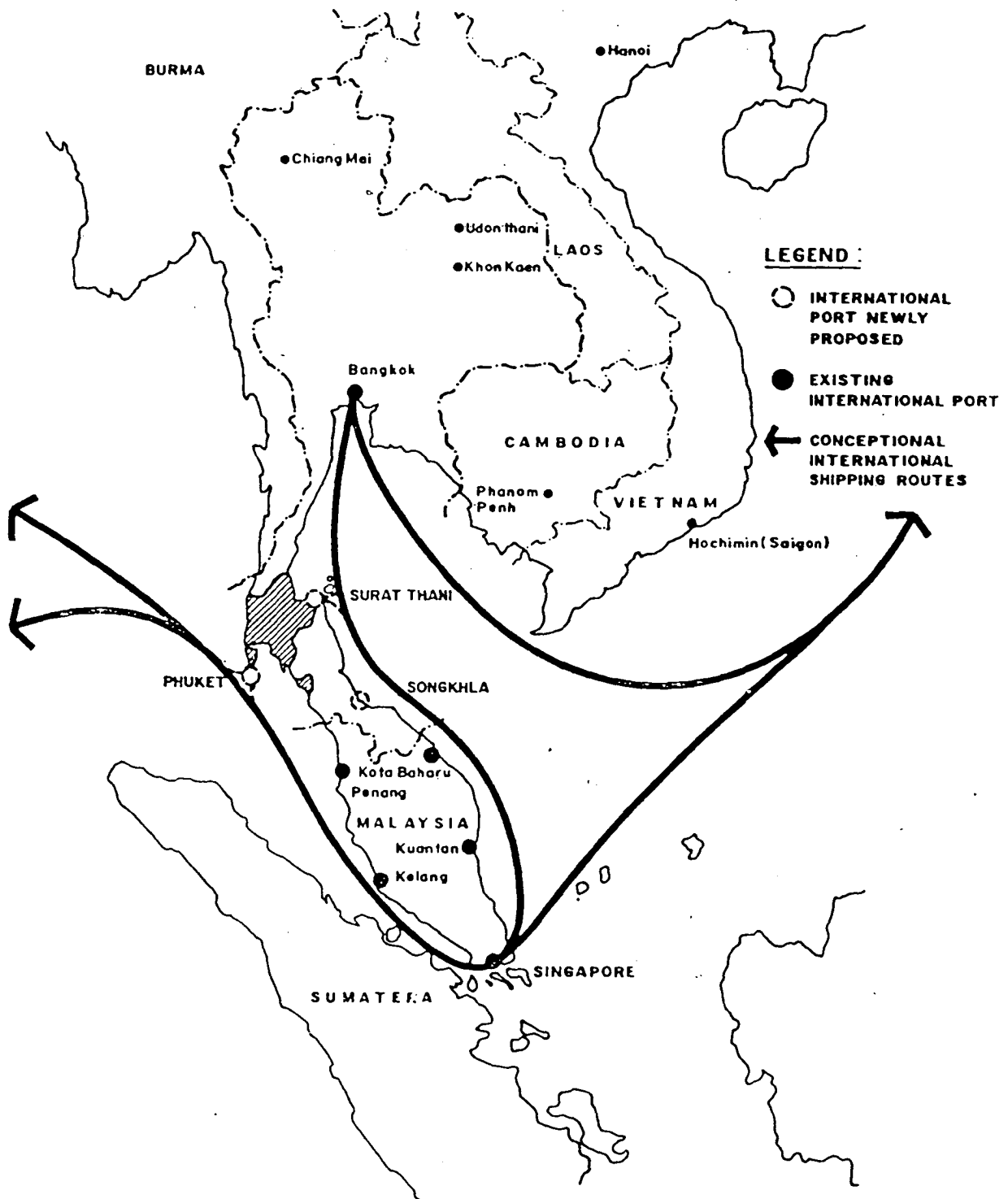
CHAPTER 5.

THE ECONOMIC IMPACTS OF THE KRA LANDBRIDGE PROJECT

If the proposed "landbridge" would be accepted as an alternative sea route system, it is clear that the proposed railway route between Songkhla and Satun which to form an East-West Link is likely to pass through a few townships, reserved lands and agricultural areas. The construction of a railway could have a substantial impacts of economic and beneficial social implications for those people domiciled along its route.

During the construction phase and the later operation and maintenance stages there will be employment opportunities. Particular attention should be given to contracting jobs which could be performed by surplus labour and technicians already available in the Southern Region. This would be particularly important in view of currently high levels of national unemployment. The unemployed population as of February 1983 was estimated at 1.68 million.[1]

Additionally, during the phase of construction of the railway, local communities along the construction route could avail themselves

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1. National Statistical Office, Report of the Labor Force Survey - Whole Kingdom (Round 1), Bangkok, 1983.

of opportunities to provide construction workers with fresh produce and some other appropriate products.

The proximity of the rail link to ports would facilitate freighting by a reliable and regular mode of transport. Moreover, it is likely that freight charges will be economically more attractive because of escalating road freight costs.

These factors could also provide incentives and motivation for minority Thai Muslims in Satun to engage in commercial enterprises, thus increasing the levels of self-management and self-sufficiency in remote areas before reaching Satun provincial city. For example, produce growing in Songkhla and Satun areas and fishing and poultry production could become a more value-added enterprises. Oil palm production in the district of Khuan Ka Long of Satun province is at the dawn of boom as this area is blessed with suitable land for oil palm production where the highest percentage of population engaged in agriculture.[2] Fresh fruit bunch of oil palm will be transported to Hat Yai for processing for vegetable oil where domestic market is promising. Other potential small business enterprises would be given added incentive in and around the communities or sub-district en route, such as Khlong Ngae, Khuan Don and Cha-lung.

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2. National Statistical Office, 1980 Population and Housing Cencus - Changwat Satun, Bangkok, 1980.

A. <u>POTENTIALITY FOR EMPLOYMENT</u>

The potentiality for employment under the proposed development of Songkhla - Satun Kra Landbridge in conjuction with the development of the Ports of Songkhla and Satun, it could broadly and cursory examine the potentiality for direct employment under three groups.

(a) Potential employment at the Port of Songkhla,

(b) Potential employment at the Port of Satun, and

(c) Potential employment by the railway operation

a) <u>Potential Employment at the Port of Songkhla</u>

This potential employment can be viewed under general 'Port Management' structure which include the key management positions of :

- Port Manager

- Harbour Master

- Deputy Port Manager

- Assistant Port Manager

- Assistant Harbour Master

- Shed Manager

- Container Operation Manager

- Engineering Manager

Besides these key positions, there are also other middle management and lower management positions. The labour force are of various kind of equipment operators which include :

Cargo handling

- Forklift truck operators
- Tractor operators
- Trailer operators
- Forklift for working in ship's holds operators
- Top lift front end loader operators

Miscellaneous

- Bus drivers (buses for port labour)
- General purpose lorries drivers
- Drivers for special duty lorry/van for port health
- Security and fire appliance staff
- Car drivers for port staff

A total force of management, 655 staff and labour of 655 has been estimated to be required to operate the port in 1986/1987.[3] Therefore, potential for employment would be a total of 1310 persons.

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3. Harbour Department (Bangkok) estimates.

b)   Potential Employment at the Port of Satun

It is envisaged that the proposed port of Satun would function similar to the Port of Songkhla. Hence potentiality for employment would be comparable to the Port of Songkhla. The task force would also include the management force of 491 staff and labour force of 491 has been estimated to be required to operate the Port of Satun. The the total employment would be 982 persons.

In this study, the employment of stevedores at both Songkhla and Satun were excluded from the analysis because it was assumed that this function would be supplied direct to the ships from existing private contractors.

c)   Potential Employment by the Railway Operation

Potential employment under the proposed East-West link by railroad would require additional employment. It is assumed that the State Railway of Thailand would operate the line and render ancillary services. The manpower requirement for the task force of this short line would include : station master, locomotive operators and assistant, warehouse supervisor, and track maintenance labour, and engineers. A total work force of 65 persons has been estimated to be required to render the service and operate the railway.[4]

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4.   State Railway of Thailand estimates.

B. INDUSTRIAL DEVELOPMENT

This section considers the basis on which present industry or industrial development will generate increased freight. It is designated to present a picture of manufacturing sector in Songkhla - Satun and to some extent of Southern Thailand.

It is worthwhile outlining the potential contribution which the expansion of manufacturing industry could have an impact on the proposed "Landbridge" and the economy of Southern Thailand Region. The following paragraphs summarise the role of the industrial sector in regional development in :

a) Processing primary products for export: in virtually all cases in Southern Thailand, primary products require some proceesing before regional (or national) export. Rubber has to be made into sheets or blocks, tin ore must be smelted and coconuts may be processed into coir. These processes add considerable value to the natural products.

b) Filling local needs: the regional and sub-regional markets in developing countries may not be large enough to generate manufacturing industry on a large scale but there will always be some requirements which can be met by local manufacture. In Southern Thailand there are industries catering for a wide range of local need. Some examples are food manufacture, ice production, boat and vehicle repairing, the manufacture of metal products and many others.

c) Substituting for imports : agricultural economics have a high propensity to import manufactured goods, and this is particularly true of Southern Thailand. By developing some local manufacturing capacity the balance can be partially redressed and an unnecessary outflow of funds avoided.

d) Raising incomes : although small scale industry tends to be labour intensive in comparision with larger scale operations it is still highly productive, in value added terms, when compared to the primary sectors.

Considering Songkhla city which it is situated some 26 km from Hat Yai, however, Hat Yai - Songkhla might more realistically be considered "a single regional growth pole city". Songkhla has been nominated by the World Bank as a growth pole centre of the Southern region.[5] The area between Hat Yai and Songkhla being devoted to agro-industry. There are rubber-smokehouses, fish cannery, ice factories, fish meal plants, animal feed plants along the highway. Most activity at Songkhla are clustered on or near the lakeside and are centred around the fishing industry. Ice is supplied for packing or preserved of fish. As already mentioned that Songkhla has been

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5. World Bank Report No. 2059-TH, Thailand: Toward a Development Strategy of Full Participation A Basic Economic Report (East Asia and Pacific Regional Office, 1978), p. 104.

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5. World Bank Report No. 2059-TH, Thailand: Toward a Development Strategy of Full Participation A Basic Economic Report (East Asia and Pacific Regional Office, 1978), p. 104.

or preserved of fish. As already mentioned that Songkhla has been designated as a growth pole centre, and a possible site has been found for a future industrial estate approximately 10 km west of Hat Yai, a highway leading to Satun. With the introduction of a deep sea port, it is considered unlikely that large industrial developments will take place, bearing in mind the dominating role that Bangkok plays in the manufacture of goods.

In Satun, when consider manufacturing industry in a way which relates to its economic function and will likely have some impact on port development and the Landbridge, are those processing industries and manufacturing industries. The manufacturing sector in the province is small and widely dispersed. There is little manufacture for final sale or export, examples are high-quality bricks for export, canned fish. Even in processing, industry in the province is limited to rice milling, rubber processing, oil palm processing, fish processing, and forest processing. Hence, this will have a small impact on the landbridge development at the early stage of operation; but in the long run the Songkhla - Satun Landbridge will contribute to the industrial growth in the region.

C. STRATEGIES FOR INDUSTRIAL DEVELOPMENT IN THE SONGKHLA
SATUN LANDBRIDGE ZONE

Toward the year 2,000 a limit in agricultural expansion in terms of both land and yield vis-a-vis the need to create a huge number of job opportunities will make industrialization an inevitable trend in Thailand as many industrialized and newly industrializing countries have been experiencing. Thai industrialization which have been based on a piecemeal expansion of resource processing, consumer goods import substituting and labour intensive export industries is now at the transitional stage toward integration of these industries. The integration will involve the import substitution of more diversified goods, the increased degree of domestic resource processing, the diversification of industrial linkages and the strengthening of export competitiveness.

The strategies for industrial development in the Songkhla Satun Landbridge zone may consist of Bottom-Up Strategies and Top-Down Strategies.

Bottom-Up Strategies[6]

a) Promotion of Local Consumer Market Oriented Industries

6. National Economic and Social Development Board, The Sub-regional Development Study of the Upper-Southern Part of Thailand Volume 4 (Bangkok: NESDB, March 1985), p. 30.

Increase of income and purchasing ability of local people in the Songkhla - Satun Landbridge zone and Southern Thailand region will bring opportunities for investors in manufactured products of durable and nondurable. Recently, factories producing such products as rubber wood furniture, canned sea food, food and beverage, construction materials (cement products, high quality bricks, etc.) are growing in the Lower South and new investments in these are in boom now.

b) Promotion of Resource-Base Industries

This strategy exists in the promotion of resource-based industries because there are several unique resources to be processed into industrial finished products in the Songkhla - Satun Landbridge zone. These include rubber and rubber wood, palm oil, minerals, metallic and nonmetallic, marine fish, and timber and wood from forest.

c) Promotion of the Industries Related to Major Local Industries

The third point of view for the scenario of industrialization is to promote the industries related to such major local industries as rubber and rubber products, fishery, mining, tin mining in particular, and palm oil extraction. The example industry related to local industries in the Southern region that there is an existing in plentiful supply with sawdust from rubber wood processing and saw-mills. This sawdust could further be processed as barbecue charcoal or bricket used as a fuel, adsorbent, filter, etc.

In fact, there are several such industries growing in the Lower South. These include metal works for ship-repairing, auto-repairing, tin mines, and shipbuilding for fishery. Promotion of these related industries does open a possibility to improve the efficiency of the major industries themselves, to diversify the industrial structure of the region and to produce new products that will gear to more[7] value added manufactured.

Top-Down Strategies[7]

a) Needs of Incentines

Within the framework of these strategies, some additional incentines could be introduced to break the increasing external diseconomy in the metropolis, to provide the investors potentially moving out with alternative locations and accelerate the development of regional economy. Among others, the improvement of infrastructure will come first, and promotional privileges, and tax incentines will complementarily follow. Urban services in Hat Yai, Songkhla and Satun and the so called solf infrastructure such as banking and financing services, information services and educational and training services will also be important.

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7. Ibid. p. 32.

b) Locational Advantage of The Songkhla - Satun Landbridge Zone

A concept of the Songkhla - Satun Landbridge representing the East-West Link which will have a great meaning in the industrial development strategies of Thailand. Efficient operation of the East-West Link will ensure better accessibility of investors to foreign markets at both sides of the southern peninsula (further discussion appears in Chapter 6). In particular, the accessibility to the Western markets, Burma, Bangladesh, India, Sri Lanka, the Middle East, Africa, and Europe, will be enormously improved.

A combination of abundant resources, a growing population and a Government committed to supporting private sector development make the Songkhla - Satun Landbridge zone an attractive prospect for the investor and entrepreneur. At the same time, its proximity to the rest of Asia and Australia's South Pacific neighbours has provided it with potential to play an increasingly important regional role.

CHAPTER 6.

THE ESTABLISHMENT OF REGIONAL

MARKETING DEPOTS

The study Area 'Songkhla-Satun Kra Landbridge' has clearly attained the geographical position of the commercial and distribution centre of the Lower South and in certain respects of the whole Southern Region and its neighbouring countries. The Study Area as well as the Lower South will play an important role in reintegrating the national space to cope with growing interdependence between national and world economics, expanding seaboard industrial development for national industrialization and accelerating development of regional cities and their hinterlands for decentralization of Bangkok. This role, if fully performed, will enhance the position of Satun province to be the country's western entrance to the world ceconomy. With this, Songkhla will become a southern base of the seaboard industrial development along the Gulf of Thailand. The east-west transportation link between Satun and Songkhla will be the breakthrough in tailoring Lower South development and distribution into this role.

This development has been evidently aided by the official designation of Hat Yai/Songkhla as the regional growth centre. Regional offices of several government and public enterprises and higher educational institutes have been located here and the private sector

followed the lead and built its representation/distribution network accoringly. The government units are predominantly in the provincial capital of Songkhla, whereas business units tend to be more in Hat Yai. While Satun tend to draw new investors into the province in recent years.

A. DISTRIBUTION POINTS AND CONSOLIDATION

In intermodal transportation era, the physical distribution of cargo is being increasingly viewed as a totally integrated system of marketing, in which producers, ocean and land carriers, inventory control services, warehousing and customs inspection closely co-operate. One manifestation of this system that has developed over the past decade and has become a major element in the overall transport chain, is the concept of an inland container port.[1] Variously called inland container depot, or terminal, the implementation of the concept has affected trade-flows, specific routeing between ports and hinterlands and some traditional port functions.[2]

The range of functions of an inland container depot is wide. It may serve as a cargo consolidation and deconsolidation centre, where containers are stuffed or stripped, sorted, packed and transported

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1. Yehuda Hayut, "Inland container terminal-function and rationale" Maritime Policy and Management, Vol. 7, 1980, p. 283.

2. Ibid.

either to seaports or to inland destinations.[3]   The depot may serve

as a base for customs clearance.   The main function of the customs

are to collect the appropriate duty on goods and to prevent evasion

of payments; to provide a record of imports and exports and to act

as agents for other organisations and government departments.[4]   The

other functions of an inland container terminal may include warehousing

services and storage area, or probably a marshalling yard for containers

terminal may include warehousing services and storage area, or probably

a marshalling yard for containers destined for various modes of transportation

and a variety of destinations.   Yehuda Hayut (1980) illustrated a summary

of the functions of the inland container terminal[5] and a summary is

shown in figure 6.1

3. Ibid.

4. P.M. Alderton, Sea Transport: Operation and Economics,
    (Bath, Thomas Reed Publications Limited, 1980), p. 187.

5. Yehuda Hayut, "Inland container terminal - function and rationale",
    Maritime Policy and Management, Vol. 7, 1980, p. 284.

FIGURE 6.1

Functions of an inland container terminal
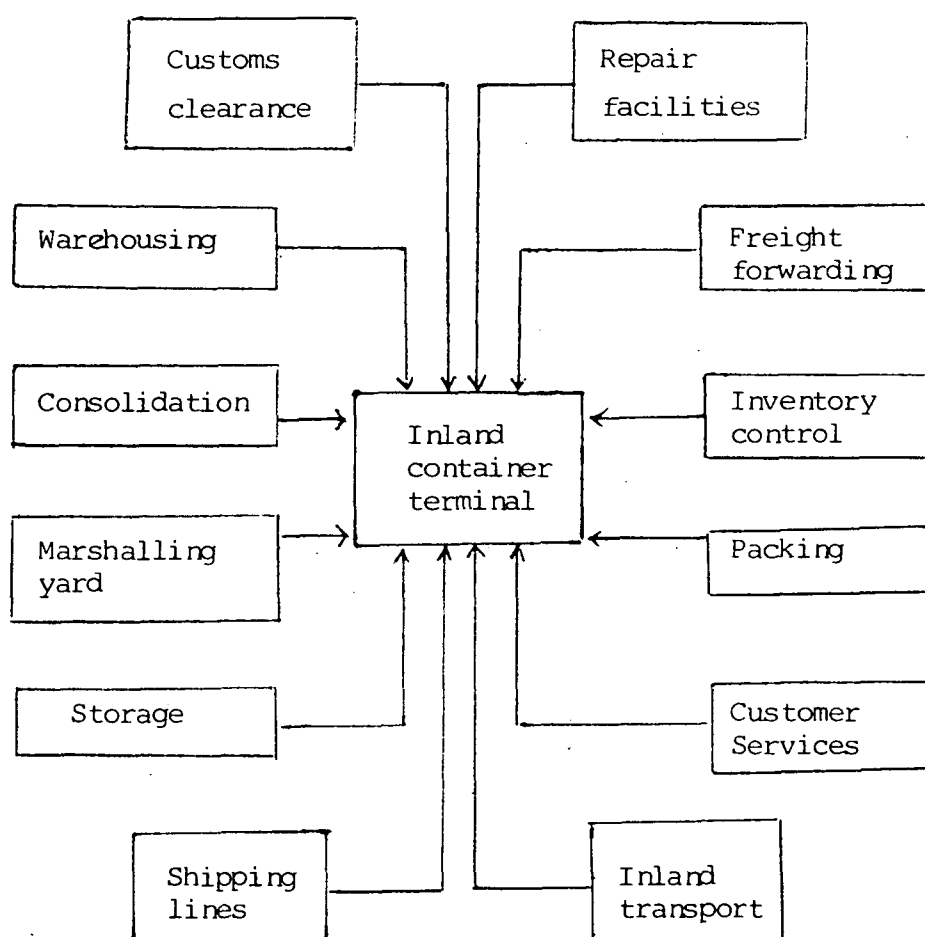
In this study, Hat Yai commands a suitable site for consolidation centre and regional marketing depot because it has high accessibility to major highways, railways (presented in Chapter 1), and the proposed seaports. In addition, it is located in a major commercial and industrial centre or close to a border-point-Malaysia. One of the important functions of an inland depot is to consolidate shipments: the grouping of consignments with different origins and destinations into larger units, like full container loads or full car loads, for next leg of journey. Thus the consolidation function may benefit both small and large shippers. For the small shippers, especially if located away from the port area, an inland consolidation centre can minimize tranortation costs by exploiting the economy of movements of full container loads. A consolidation centre located close to the port area has the advantage of performing its function with lower property costs and under loss congested condition than would be the case in the port itself.[6] Such a centre, if being established, can deconsolidate containers arriving from different overseas origins, dispatch consignments intended for the local market, and consolidate consignments bound for different inland destinations-thus obtaining higher utilization from the containers are thereby saving transportation costs.

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6. Ibid. p. 286.

B. <u>REGIONAL MARKETING DEPOT FOR DOMESTIC</u>

An inland regional marketing depot can ease one of the most difficult and wasteful problems of container transportation - the empty leg. A truck that carries a loaded container from the port to an inland destination quite often returns to the port with an empty box. An inland regional depot can shorten this empty leg by providing cargo intended for the port. Most often the truck owner will agree to carry the return voyage goods at a reduced rate. Regional marketing depot for domestic if established in Hat Yai, it would serve as a physical distribution centre to the whole southern region, namely Satun, Trang, Phuket, Surat Thani and Nakhon Si Thammarat. Hat Yai, by occupying a pivotal location at a junction of major railroads and highways, it can offer prompt delivery to the entire southern region market. It is envisaged that this regional marketing depot accompanied by development of an improved road or railway link - the 'proposed landbridge', will help to exploit the benefits of door-to-door service beyond the coastal regions, and to serve as an extension of a coastal port and as a regional marketing centre.

It is expected that the domestic regional marketing depot in Hat Yai could serve all fourteen southern provinces, and total population by province is shown in Table 6.1

TABLE 6.1

POPULATION BY PROVINCE IN SOUTHERN REGION

Province	Population
Krabi	216,167
Chumphon	310,503
Trang	446,656
Nakhon Si Thammarat	1,214,498
Narathiwat	397,840
Pattani	418,932
Phangnga	170,299
Phattalung	410,311
Phuket	130,996
Yala	265,276
Ranong	83,545
Songkhla	818,327
Satun	156,485
Surat Thani	588,381
TOTAL.......................	5,628,216

Source : National Statistical Office, 1980 Population and
Housing Cencus-Southern Region, Bangkok.

C. INTERNATIONAL REGIONAL MARKETING DEPOT

Toward national challenges of economic expansion internationalization and Bangkok decentralization, Lower South or the Study Area can potentially play a vital role for the following major reasons. First, the proposed deep seaport of Satun will be a new western entrance from the Andaman Sea thus will open up east-west link which offer a very significant strategy for shipping internationalization. Second, the Study Area will potentially be a key section of the seaboard development along the Gulf of Thailand toward national industrialization for its location to be a midpoint between Bangkok and Singapore or closer to most of the Association of Southeast Asian Nations (ASEAN) member countries, thus to have possible site of deep seaports both in west and eastern sides of the area and to be endowed with rich local resources, including water, land and potential industrial materials. Third, intergration of these two factors of national importance will give a strong impetus to decentralization of Bangkok.

In terms of national and international economic activities, a thrust to strengthen the Lower South's comparative advantage to have international access is a short-cut link between Songkhla and Satun. If the Songkhla-Satun Kra Landbridge is to be constructed and linked with the proposed Satun deep seaport, it would give a great impact on national and international cargo flows by reducing the heavy

dependence of west-bound export/import of the country[7] on the long way round the Malay Peninsula and intermediary activities in Singapore.

The role of international regional marketing depot is to facilitate the flow of goods especially in containers to various different destinations. So far there is a promising activity that could support the regional marketing depot. For ilnstance, in the north of Malaysia, the State Railway of Thailand (SRT) and the Malaysian Railway Administration (MRA) are faced with an equally positive situation for container operations.[8] The potential for picking up new container business here is steady expanding as more operators are attracted to the idea of routing export cargo originating from the south of Thailand out through the Port of Penang.[9] The advantage of this, of course, is that it is a shorter haul from many regions (provinces) of southern Thailand to Penang than it is to the Port of Bangkok, Thailand's only major container Port.[10] Comsequently, the MRA reports that it is now transporting around 400 loaded containers per month from the Thailand border to Penang.[11]

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7. In 1981, the Department of Customs indicated that westbound export and import accounted for more than 32 and 36 percent of the national total export and import, respectively.

8. "Malaysia: Inland transport - Railway to keep pace with container prospects?, <u>Cargo Systems,</u> Vol. 9, November 1982, P. 108.

9. Ibid.   10. Ibid.   11. Ibid.

Besides Malaysia, the regional marketing could serve her other neighbouring countries and within the vicinity nearby such as Bangladesh, Burma, India, Sri Lanka and Sumatra of Indonesia.

CHAPTER 7.

CONCLUSIONS AND RECOMMENDATIONS

The basic objective of this thesis was to find out and describe the factors which influence the Songkhla – Satun Kra Landbridge to be proposed and developed in conjunction with the Ports of Songkhla and Satun development in terms of intermodal transportation and its exonomic viability.

The purpose of this thesis is not to de termine whether or when the proposed 'Landbridge' and the Port of Satun should be constructed. Therefore the decisions of when to build the 'Landbridge' and the 'Port of Satun' will be made in the light of many other considerations, not all of which can be covered in this thesis, and which will reflect value judgement on unquantifiable benefits and varying degrees of optimism in the more uncertain future expectations.

The information from which this thesis was written was drawn from a wide range of sources. To mention a few, such sources included the Ministry of Communications (Thailand), the National Economic and Social Development Board (NESDB), the Port Authority of Thailand and the State Railway of Thailand. The key source was the interviews held with provincial government agencies, shipping lines and public enterprises. A total forty interviews was undertaken.

This thesis study has endeavoured to examine those facts and considerations within the confines of its terms of reference.

The conclusions with regard to the terms of reference and associated factors have been discussed and presented in the various chapters of this thesis. These conclusions together with the recommendations have been summarised and set out in this Chapter.

A. CONCLUSIONS

1) The existing Ports of Songkhla and Satun

The present system of loading deep sea vessels at anchor by means of lighterage will be totally inadequate for the projected traffic, and facilities are not suitable for the handling of containerised cargo.

2) Traffic forecast

The main commodity handled at the port is rubber and it is forecasted that 885,000 tons will be exported in 1986, and 1,270,000 tons in 1991.

3) Future ports development

A deep sea port is required at Songkhla to handle the increased trade and to provide facilities which would permit the use

of containers. A deep sea port at Satun is also required for the Develop
ment.

4) The Landbridge

An east-west railway link with the Ports of Songkhla and Satun will
be beneficial to the Lower Southern Region. It will be a feasible
alternative route for the shipping lines and transport concerned.

5) Cost and economic viability

The costs and direct benefits derived from the project are shown
and described in Chapter 3. The result of the cost-benefit analysis
shown that the whole project is viable at the discount rate of
approximately 8% or below. When examined separately, Port of Songkhla
is viable at 9%, Port of Satun at 8%, and the Landbridge also at 8%
of the discount rate. The result is a rather conservative evaluation,
not including several important indirect benefits, such as the economic
impact of the project, induced industrialization in the areas and
improvement in the quality of life and job opportunity, for instance.

B. RECOMMENDATIONS

Following upon these conclusions it is recommended that the Government
of Thailand should undertake a phased development to provide deep sea port
facilities at Outer Khao Daeng, Songkhla for overseas trade, principally
to facilitate rubber exports. The Port of Satun and a railway link
should undertake but detail feasibility study is recommended.

The Government should consider the good advantage location of Satun, which it is situated at the inflow-outflow of the major sea route "the Straits of Malacca". Thus the development of shipbuilding and repairing could contribute to economic growth of the region. It might be of not too difficult to attract ships call at Satun for repairing. Currently, at least two evidences would support this, first the strategic location of Satun which is situated at the natural geographic inflow-outflow of the major sea route thus ships could save time and money if they were to call for repairing, second, on the comparision basis, Thai skilled labour cost if lower than that of her neighbours, especially of Singapore. However, further and detailed study is warranted in this promising field of industry. A full feasibility study (economic and engineering feasibility studies) of Songkhla/Satun development in conjunction with the proposed Songkhla - Satun Landbridge, shipbuilding and ship repairing should be initiated. This study should be carried out in two phases. The first, a desk study based on data provided in this thesis and other relevant date from the Port Authority of Thailand and others, and the second (if it proves necessary) including detailed field work and observations.

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A P P E N D I C E S

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APPENDIX A.

Evaluation Results – Manual Calculation

Present Value Discounted to Year 1 at 6%

Cost Categories are as follows:	million dollars
1. Design and preparatory work	15.440
2. Marine structure	10.518
3. Building, navigation and miscellaneous	4.212
4, Road, water and electricity supplies	1.846
Total of construction costs	32.016
5. Operating, maintenance and miscellaneuous	9.847
TOTAL COSTS	41.863

COSTS OF THE PROJECT IN SUMMARY

The port of Songkhla project will require a four-year term for construction; the life of the project is 30 years if started from year 1982 to year 2012; in the first year the costs are $9.073 M.; the costs of the second year are $11.024 M.; the costs in the third year are $9.794 M.; and the costs in the fourth year are $4.605 M. as shown in

Table A.1. The eqivalent value of year 1 is $ 32.016 M. and has

been discounted at 6 percent; this rate is qpproved by the Asian

Development Bank (ADB) who agreed to give loan to the Port of

Songkhla Project. The rest of the projects in this study (Port

of Satun, and Songkhla - Satun Kra Landbridge) thus would be

using the discount rate for simulation analysis at 7%, 8%, 9%,

and 10% respectively for calculation. It is evident that most

of the public investment projects in Thailand would obtain, if it

were to borrow money for investment project, the interest rate

in the range of 6% to 10%. However, some projects if those deemed

it was to be of necessity and urgent for the welfare of the people,

the cost of borrowing might be low, i.e. 2% to 4% interest rate, and

virtually sometimes no interest charges. It depends upon the

individual sources of fund. The Evaluation Result of the project

is shown in Appendices A. 1. and A. 2.

TABLE A.1

Schedule of Yearly Expenditure Breakdown

of Port of Songkhla Construction Phase

(1982 Price)

CATEGORY	Year 1	Year 2	Year 3	Year 4	TOTAL	Present Value at Uear 1. i = 6%
1. Design and preparatory work	9.073	2.382	2.382	2.382	16.219	15.44
2. Marine Structure	–	6.037	5.419	–	11.456	10.518
3. Building navigation and miscellaneous	–	1.750	0.780	2.223	4.753	4.212
4. Road, water and electricity supplies	–	0.855	1.168	–	2.023	1.846
	9.073	11.024	9.749	4.605	34.451	32.016
5. Operating, Maintenance and miscellaneous (started from year 5 to year 30)						9.847

TOTAL COSTS 41.86

APPENDIX A.1

THE COSTS AND EXAMPLE OF CAICULATION

Example of calculation of the present value discounted to year one at 6% for Costs categories.

At year 1 category 1 :

$$9.073 + 2.382 \left(\frac{1}{1.06}\right) + 2.382 \left(\frac{1}{1.06^2}\right) + 2.382 \left(\frac{1}{1.06^3}\right)$$

$$= 15.44$$

At year 1 category 2 :

$$0 + 6.037 \left(\frac{1}{1.06}\right) + 5.419 \left(\frac{1}{1.06^2}\right)$$

$$= 0 + 5.695 + 4.823$$

$$= 10.518$$

At year 1 category 3 :

$$0 + 1.750 \left(\frac{1}{1.06}\right) + 0.780 \left(\frac{1}{1.06^2}\right) + 2.223 \left(\frac{1}{1.06^3}\right)$$

$$= 0 + 1.651 + 0.694 + 1.866$$

$$= 4.212$$

At year 1 category 4:

$$0 + 0.855 \left(\frac{1}{1.06}\right) + 1.68 \left(\frac{1}{1.06^2}\right)$$

$$= 0 + 0.807 + 1.04$$

$$= 1.846$$

At year 1 category 5:

$$0 + 0 + 0 + 0 + 0.390\left(\frac{1}{1.06^4}\right) + 0.445\left(\frac{1}{1.06^5}\right) + 0.500\left(\frac{1}{1.06^6}\right)$$

$$+ 0.554\left(\frac{1}{1.06^7}\right) + 0.609\left(\frac{1}{1.06^8}\right) + 0.664\left(\frac{1}{1.06^9}\right)$$

$$+ 0.719\left(\frac{1}{1.06^{10}}\right) + 0.774\left(\frac{1}{1.06^{11}}\right) + 0.828\left(\frac{1}{1.06^{12}}\right)$$

$$+ 0.883\left(\frac{1}{1.06^{13}}\right) + 0.938\left(\frac{1}{1.06^{14}}\right) + 0.993\left(\frac{1}{1.06^{15}}\right)$$

$$+ 1.048\left(\frac{1}{1.06^{16}}\right) + 1.102\left(\frac{1}{1.06^{17}}\right) + 1.157\left(\frac{1}{1.06^{18}}\right)$$

$$+ 1.212\left(\frac{1}{1.06^{19}}\right) + 1.267\left(\frac{1}{1.06^{20}}\right) + 1.322\left(\frac{1}{1.06^{21}}\right)$$

$$+ 1.376\left(\frac{1}{1.06^{22}}\right) + 1.431\left(\frac{1}{1.06^{23}}\right) + 1.486\left(\frac{1}{1.06^{24}}\right)$$

$$+ 1.541\left(\frac{1}{1.06^{25}}\right) + 1.596\left(\frac{1}{1.06^{26}}\right) + 1.650\left(\frac{1}{1.06^{27}}\right)$$

$$+ 1.705\left(\frac{1}{1.06^{28}}\right) + 1.760\left(\frac{1}{1.06^{29}}\right)$$

$$= 9.847$$

THE BENEFITS

Benefit Categories are as follows:

	million dollars
1. Saving in lighterage costs	19.880
2. Transhipment cost savings	11.068
3. Benefit to other foreign exports	7.695
4. Savings to directly imported cargo	12.651
5. Benefit to domestic dry cargo	6.428
Total benefits ...	57.722

The method of calculation of the Present Value for benefits is the same as that used for the calculation of the present value for the cost categories.

The Calculation of Net Present Value

The net present value is defined as the difference between the present value of benefits, B and the present value of costs, C.

$$NPV = B - C$$
$$= 57.720 - 41.860$$
$$\therefore NPV = 15.86$$

Since the NPV is greater than 0 the port project is viable.

The calculation of Benefit-Cost Ratio

The benefit-cost ratio is defined as the ration of the present value of the benefit, B to the present value of cost, C.

$$\text{Benefit-Cost Ratio} = \frac{B}{C}$$

$$= \frac{57.722}{41.863}$$

$$= 1.379$$

Since the Benefit-Cost Ratio is greater than one therefore the port project is viable.

APPENDIX A.2

EVALUATION RESULTS

This appendix contains the computer printouts for the INVESTMENT PROJECT runs undertaken.

There are five categories of costs:

Cat. 1 : design and preparatory work

Cat. 2 : marine structure

Cat. 3 : building, navigation and miscellaneous

Cat. 4 : road, water and electricity supplies

Cat. 5 : operating, maintenance and miscellaneous

There are five categories of benefits:

Cat. 1 : saving in lighterage costs

Cat. 2 : transhipment cost savings

Cat. 3 : benefit to other foreign exports

Cat. 4 : savings to directly imported cargo

Cat. 5 : benefit to domestic dry cargo

There were 4 runs undertaken:

1. at 7%

2. at 8%

3. at 9%

4. at 10%

BESULTS OF EVALUATIONS

Criterion	Discount Rate			
	7%	8%	9%	10%
IRR = 9.2%				
NPV	9.693	4.618	0.422	-3.047
B/C Ratio	1.242	1.120	1.011	0.916

As the 7%, 8% and 9% discount rates the port project is viable or economically justified; but when using 10% discount rate as the cost of borrowing capital, therefore the project is not viable because this discount rate is greater than the established "rate of interest" by IRR method.

PROFILE NUMBER   18
DISCOUNT RATE 7.0%
DISCOUNTED TO YEAR   1

PORT OF SONGKHLA INVESTMENT

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	9.073	0.000	0.000	0.000	0.000	9.07	0.000	0.000	0.000	0.000	0.000	0.00
2	2.226	5.642	1.636	0.799	0.000	10.30	0.000	0.000	0.000	0.000	0.000	0.00
3	2.081	4.733	0.681	1.020	0.000	8.52	0.000	0.000	0.000	0.000	0.000	0.00
4	1.944	0.000	1.815	0.000	0.000	3.76	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.298	0.30	0.992	0.381	0.146	0.492	0.057	2.07
6	0.000	0.000	0.000	0.000	0.317	0.32	0.967	0.396	0.175	0.499	0.093	2.13
7	0.000	0.000	0.000	0.000	0.333	0.33	0.941	0.406	0.201	0.503	0.123	2.17
8	0.000	0.000	0.000	0.000	0.345	0.35	0.914	0.414	0.222	0.504	0.149	2.20
9	0.000	0.000	0.000	0.000	0.355	0.36	0.886	0.419	0.239	0.503	0.172	2.22
10	0.000	0.000	0.000	0.000	0.361	0.36	0.859	0.422	0.253	0.500	0.190	2.22
11	0.000	0.000	0.000	0.000	0.365	0.37	0.831	0.422	0.265	0.496	0.206	2.22
12	0.000	0.000	0.000	0.000	0.368	0.37	0.803	0.420	0.274	0.489	0.219	2.21
13	0.000	0.000	0.000	0.000	0.368	0.37	0.775	0.417	0.280	0.482	0.229	2.18
14	0.000	0.000	0.000	0.000	0.366	0.37	0.748	0.413	0.285	0.473	0.237	2.16
15	0.000	0.000	0.000	0.000	0.364	0.36	0.720	0.407	0.287	0.463	0.242	2.12
16	0.000	0.000	0.000	0.000	0.360	0.36	0.693	0.401	0.289	0.453	0.246	2.08
17	0.000	0.000	0.000	0.000	0.355	0.36	0.667	0.393	0.288	0.442	0.249	2.04
18	0.000	0.000	0.000	0.000	0.349	0.35	0.641	0.385	0.287	0.431	0.250	1.99
19	0.000	0.000	0.000	0.000	0.342	0.34	0.616	0.376	0.284	0.419	0.250	1.95
20	0.000	0.000	0.000	0.000	0.335	0.34	0.591	0.366	0.281	0.406	0.249	1.89
21	0.000	0.000	0.000	0.000	0.327	0.33	0.566	0.357	0.277	0.394	0.247	1.84
22	0.000	0.000	0.000	0.000	0.319	0.32	0.543	0.347	0.272	0.382	0.244	1.79
23	0.000	0.000	0.000	0.000	0.311	0.31	0.520	0.336	0.267	0.369	0.240	1.73
24	0.000	0.000	0.000	0.000	0.302	0.30	0.498	0.326	0.261	0.357	0.236	1.68
25	0.000	0.000	0.000	0.000	0.293	0.29	0.476	0.315	0.255	0.344	0.232	1.62
26	0.000	0.000	0.000	0.000	0.284	0.28	0.455	0.305	0.248	0.332	0.227	1.57
27	0.000	0.000	0.000	0.000	0.275	0.28	0.435	0.294	0.241	0.319	0.221	1.51
28	0.000	0.000	0.000	0.000	0.266	0.27	0.416	0.284	0.234	0.307	0.216	1.46
29	0.000	0.000	0.000	0.000	0.256	0.26	0.397	0.274	0.227	0.296	0.210	1.40
30	0.000	0.000	0.000	0.000	0.247	0.25	0.379	0.264	0.220	0.284	0.204	1.35
SUMS	15.324	10.375	4.132	1.819	8.461	40.11	17.329	9.540	6.558	10.939	5.438	49.80

PRESENT VALUE 9.693
BENEFIT-COST RATIO 1.242

DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

PROFILE NUMBER 18
DISCOUNT RATE 8.0%
DISCOUNTED TO YEAR 1

PORT OF SONGKHLA INVESTMENT

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	9.073	0.000	0.000	0.000	0.000	9.07	0.000	0.000	0.000	0.000	0.000	0.00
2	2.206	5.590	1.620	0.792	0.000	10.21	0.000	0.000	0.000	0.000	0.000	0.00
3	2.042	4.646	0.669	1.001	0.000	8.36	0.000	0.000	0.000	0.000	0.000	0.00
4	1.891	0.000	1.765	0.000	0.000	3.66	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.287	0.29	0.956	0.368	0.140	0.474	0.055	1.99
6	0.000	0.000	0.000	0.000	0.303	0.30	0.923	0.378	0.167	0.476	0.088	2.03
7	0.000	0.000	0.000	0.000	0.315	0.32	0.889	0.384	0.190	0.476	0.117	2.06
8	0.000	0.000	0.000	0.000	0.323	0.32	0.856	0.388	0.208	0.473	0.140	2.07
9	0.000	0.000	0.000	0.000	0.329	0.33	0.823	0.389	0.222	0.467	0.159	2.06
10	0.000	0.000	0.000	0.000	0.332	0.33	0.790	0.388	0.233	0.460	0.175	2.05
11	0.000	0.000	0.000	0.000	0.333	0.33	0.757	0.384	0.241	0.452	0.188	2.02
12	0.000	0.000	0.000	0.000	0.332	0.33	0.725	0.380	0.247	0.442	0.197	1.99
13	0.000	0.000	0.000	0.000	0.329	0.33	0.693	0.373	0.251	0.431	0.205	1.95
14	0.000	0.000	0.000	0.000	0.325	0.33	0.663	0.366	0.252	0.419	0.210	1.91
15	0.000	0.000	0.000	0.000	0.319	0.32	0.632	0.357	0.252	0.407	0.213	1.86
16	0.000	0.000	0.000	0.000	0.313	0.31	0.603	0.348	0.251	0.394	0.214	1.81
17	0.000	0.000	0.000	0.000	0.306	0.31	0.575	0.339	0.248	0.381	0.215	1.76
18	0.000	0.000	0.000	0.000	0.298	0.30	0.547	0.329	0.245	0.368	0.214	1.70
19	0.000	0.000	0.000	0.000	0.290	0.29	0.521	0.318	0.240	0.354	0.211	1.64
20	0.000	0.000	0.000	0.000	0.281	0.28	0.495	0.307	0.235	0.341	0.209	1.59
21	0.000	0.000	0.000	0.000	0.272	0.27	0.470	0.296	0.230	0.327	0.205	1.53
22	0.000	0.000	0.000	0.000	0.263	0.26	0.447	0.285	0.224	0.314	0.201	1.47
23	0.000	0.000	0.000	0.000	0.253	0.25	0.424	0.274	0.217	0.301	0.196	1.41
24	0.000	0.000	0.000	0.000	0.244	0.24	0.402	0.263	0.211	0.288	0.191	1.36
25	0.000	0.000	0.000	0.000	0.234	0.23	0.381	0.252	0.204	0.275	0.185	1.30
26	0.000	0.000	0.000	0.000	0.225	0.23	0.361	0.242	0.197	0.263	0.180	1.24
27	0.000	0.000	0.000	0.000	0.216	0.22	0.342	0.231	0.189	0.251	0.174	1.19
28	0.000	0.000	0.000	0.000	0.207	0.21	0.323	0.221	0.182	0.239	0.168	1.13
29	0.000	0.000	0.000	0.000	0.198	0.20	0.306	0.211	0.175	0.228	0.162	1.08
30	0.000	0.000	0.000	0.000	0.189	0.19	0.289	0.201	0.168	0.217	0.156	1.03
SUMS	15.212	10.236	4.054	1.793	7.316	38.61	15.193	8.271	5.619	9.518	4.628	43.23

PRESENT VALUE 4.618
BENEFIT-COST RATIO 1.120

DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

PORT OF SONGKHLA INVESTMENT

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	9.073	0.000	0.000	0.000	0.000	9.07	0.000	0.000	0.000	0.000	0.000	0.00
2	2.185	5.539	1.606	0.784	0.000	10.11	0.000	0.000	0.000	0.000	0.000	0.00
3	2.005	4.561	0.657	0.983	0.000	8.21	0.000	0.000	0.000	0.000	0.000	0.00
4	1.839	0.000	1.717	0.000	0.000	3.56	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.276	0.28	0.921	0.354	0.135	0.457	0.053	1.92
6	0.000	0.000	0.000	0.000	0.289	0.29	0.881	0.361	0.160	0.455	0.084	1.94
7	0.000	0.000	0.000	0.000	0.298	0.30	0.842	0.364	0.179	0.450	0.110	1.95
8	0.000	0.000	0.000	0.000	0.303	0.30	0.803	0.364	0.195	0.443	0.131	1.94
9	0.000	0.000	0.000	0.000	0.306	0.31	0.764	0.361	0.206	0.434	0.148	1.91
10	0.000	0.000	0.000	0.000	0.306	0.31	0.727	0.357	0.215	0.424	0.161	1.88
11	0.000	0.000	0.000	0.000	0.304	0.30	0.690	0.351	0.220	0.412	0.171	1.84
12	0.000	0.000	0.000	0.000	0.300	0.30	0.655	0.343	0.223	0.399	0.178	1.80
13	0.000	0.000	0.000	0.000	0.295	0.30	0.621	0.334	0.224	0.386	0.183	1.75
14	0.000	0.000	0.000	0.000	0.288	0.29	0.588	0.325	0.224	0.372	0.186	1.70
15	0.000	0.000	0.000	0.000	0.281	0.28	0.556	0.314	0.222	0.358	0.187	1.64
16	0.000	0.000	0.000	0.000	0.273	0.27	0.525	0.303	0.219	0.343	0.187	1.58
17	0.000	0.000	0.000	0.000	0.264	0.26	0.496	0.292	0.214	0.329	0.185	1.52
18	0.000	0.000	0.000	0.000	0.255	0.26	0.468	0.281	0.209	0.314	0.193	1.46
19	0.000	0.000	0.000	0.000	0.245	0.25	0.441	0.269	0.204	0.300	0.179	1.39
20	0.000	0.000	0.000	0.000	0.236	0.24	0.416	0.258	0.198	0.296	0.175	1.33
21	0.000	0.000	0.000	0.000	0.226	0.23	0.391	0.246	0.191	0.272	0.170	1.27
22	0.000	0.000	0.000	0.000	0.216	0.22	0.368	0.235	0.184	0.259	0.165	1.21
23	0.000	0.000	0.000	0.000	0.207	0.21	0.346	0.224	0.177	0.246	0.160	1.15
24	0.000	0.000	0.000	0.000	0.197	0.20	0.325	0.213	0.170	0.233	0.154	1.10
25	0.000	0.000	0.000	0.000	0.188	0.19	0.305	0.202	0.163	0.221	0.149	1.04
26	0.000	0.000	0.000	0.000	0.179	0.18	0.287	0.192	0.156	0.209	0.143	0.99
27	0.000	0.000	0.000	0.000	0.170	0.17	0.269	0.182	0.149	0.197	0.137	0.93
28	0.000	0.000	0.000	0.000	0.161	0.16	0.252	0.172	0.142	0.186	0.131	0.88
29	0.000	0.000	0.000	0.000	0.153	0.15	0.236	0.163	0.135	0.176	0.125	0.84
30	0.000	0.000	0.000	0.000	0.145	0.15	0.221	0.154	0.129	0.166	0.119	0.79
SUMS	15.102	10.100	3.930	1.767	6.361	37.31	13.394	7.214	4.843	8.327	3.954	37.73

PRESENT VALUE 0.422
BENEFIT-COST RATIO 1.011

DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

PROFILE NUMBER 18
DISCOUNT RATE 10.0%
DISCOUNTED TO YEAR 1

PORT OF SONGKHLA INVESTMENT

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	9.073	0.000	0.000	0.000	0.000	9.07	0.000	0.000	0.000	0.000	0.000	0.00
2	2.165	5.488	1.591	0.777	0.000	10.02	0.000	0.000	0.000	0.000	0.000	0.00
3	1.969	4.479	0.645	0.965	0.000	8.06	0.000	0.000	0.000	0.000	0.000	0.00
4	1.790	0.000	1.670	0.000	0.000	3.46	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.266	0.27	0.888	0.342	0.130	0.441	0.051	1.85
6	0.000	0.000	0.000	0.000	0.276	0.28	0.842	0.345	0.153	0.435	0.081	1.86
7	0.000	0.000	0.000	0.000	0.282	0.28	0.797	0.344	0.170	0.426	0.104	1.84
8	0.000	0.000	0.000	0.000	0.284	0.28	0.753	0.341	0.183	0.416	0.123	1.82
9	0.000	0.000	0.000	0.000	0.284	0.28	0.711	0.336	0.192	0.404	0.138	1.78
10	0.000	0.000	0.000	0.000	0.282	0.28	0.670	0.329	0.198	0.390	0.148	1.74
11	0.000	0.000	0.000	0.000	0.277	0.28	0.630	0.320	0.201	0.376	0.156	1.68
12	0.000	0.000	0.000	0.000	0.271	0.27	0.592	0.310	0.202	0.361	0.161	1.63
13	0.000	0.000	0.000	0.000	0.264	0.26	0.556	0.300	0.201	0.346	0.164	1.57
14	0.000	0.000	0.000	0.000	0.256	0.26	0.522	0.299	0.199	0.330	0.165	1.50
15	0.000	0.000	0.000	0.000	0.247	0.25	0.489	0.276	0.195	0.315	0.165	1.44
16	0.000	0.000	0.000	0.000	0.238	0.24	0.458	0.265	0.191	0.299	0.163	1.38
17	0.000	0.000	0.000	0.000	0.228	0.23	0.429	0.252	0.185	0.284	0.160	1.31
18	0.000	0.000	0.000	0.000	0.218	0.22	0.401	0.240	0.179	0.269	0.156	1.25
19	0.000	0.000	0.000	0.000	0.208	0.21	0.374	0.228	0.173	0.255	0.152	1.18
20	0.000	0.000	0.000	0.000	0.198	0.20	0.349	0.217	0.166	0.240	0.147	1.12
21	0.000	0.000	0.000	0.000	0.188	0.19	0.326	0.205	0.159	0.227	0.142	1.06
22	0.000	0.000	0.000	0.000	0.179	0.18	0.304	0.194	0.152	0.214	0.136	1.00
23	0.000	0.000	0.000	0.000	0.169	0.17	0.283	0.183	0.145	0.201	0.131	0.94
24	0.000	0.000	0.000	0.000	0.160	0.16	0.263	0.173	0.138	0.189	0.125	0.89
25	0.000	0.000	0.000	0.000	0.151	0.15	0.245	0.162	0.131	0.177	0.119	0.83
26	0.000	0.000	0.000	0.000	0.142	0.14	0.229	0.153	0.124	0.166	0.114	0.79
27	0.000	0.000	0.000	0.000	0.134	0.13	0.212	0.143	0.118	0.156	0.108	0.74
28	0.000	0.000	0.000	0.000	0.126	0.13	0.197	0.135	0.111	0.146	0.102	0.69
29	0.000	0.000	0.000	0.000	0.118	0.12	0.183	0.126	0.105	0.136	0.097	0.65
30	0.000	0.000	0.000	0.000	0.111	0.11	0.170	0.118	0.099	0.127	0.091	0.61
SUMS	14.997	9.967	3.906	1.742	5.557	36.17	11.872	6.325	4.200	7.326	3.399	33.12

PRESENT VALUE .... -3.047
BENEFIT-COST RATIO 0.916

DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

APPENDIX A.3

EVALUATION RESULTS

This appendix contains the computer printouts for the Port
of Satun INVESTMENT PROJECT runs undertaken.

There are five categories of costs:

Cat. 1 : design and preparatory work

Cat. 2 : marine structure

Cat. 3 : building, navigation and miscellaneous

Cat. 4 : road, water and electricity supplies

Cat. 5 : operating, maintenance and miscellaneous

There are five categories of benefits:

Cat. 1 : saving in lighterage costs

Cat. 2 : transhipment cost savings

Cat. 3 : benefit to other foreign exports

Cat. 4 : savings to directly imported cargo

Cat. 5 : benefit to domestic dry cargo

There were 4 runs undertaken:

1. at 7 %

2.   at 8 %

3.   at 9 %

4.   at 10%

RESULTS OF EVALUATIONS

Criterion	Discount Rate			
	7%	8%	9%	10%
IRR is between 8 and 9%				
NPV	7.015	3.158	-0.396	-2.861
B/C Ratio	1.221	1.103	0.987	0.901

As the 7% and 8% discount rates the port of Satun project is viable or economically justified; but when using 9% or 10% discount rate as the cost of borrowing capital is higher, the project is not viable.

PORT OF SATUN INVESTMENT

146.

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	3.800	0.000	0.000	0.000	0.000	3.80	0.000	0.000	0.000	0.000	0.000	0.00
2	0.930	8.513	1.032	0.791	0.000	11.27	0.000	0.000	0.000	0.000	0.000	0.00
3	0.865	6.553	0.502	0.605	0.000	8.52	0.000	0.000	0.000	0.000	0.000	0.00
4	0.804	0.000	0.698	0.000	0.000	1.50	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.234	0.23	0.801	0.305	0.118	0.397	0.046	1.67
6	0.000	0.000	0.000	0.000	0.248	0.25	0.781	0.316	0.137	0.403	0.063	1.70
7	0.000	0.000	0.000	0.000	0.260	0.26	0.760	0.324	0.155	0.406	0.078	1.72
8	0.000	0.000	0.000	0.000	0.271	0.27	0.739	0.330	0.170	0.407	0.091	1.74
9	0.000	0.000	0.000	0.000	0.279	0.28	0.717	0.334	0.182	0.408	0.103	1.74
10	0.000	0.000	0.000	0.000	0.285	0.28	0.696	0.337	0.192	0.410	0.113	1.75
11	0.000	0.000	0.000	0.000	0.287	0.29	0.673	0.337	0.201	0.407	0.122	1.74
12	0.000	0.000	0.000	0.000	0.290	0.29	0.650	0.335	0.207	0.401	0.129	1.72
13	0.000	0.000	0.000	0.000	0.290	0.29	0.628	0.333	0.211	0.396	0.135	1.70
14	0.000	0.000	0.000	0.000	0.288	0.29	0.606	0.330	0.215	0.388	0.139	1.68
15	0.000	0.000	0.000	0.000	0.287	0.29	0.583	0.325	0.217	0.380	0.142	1.65
16	0.000	0.000	0.000	0.000	0.284	0.28	0.562	0.320	0.215	0.372	0.144	1.61
17	0.000	0.000	0.000	0.000	0.280	0.28	0.541	0.314	0.215	0.363	0.146	1.58
18	0.000	0.000	0.000	0.000	0.275	0.28	0.520	0.308	0.214	0.354	0.147	1.54
19	0.000	0.000	0.000	0.000	0.270	0.27	0.499	0.300	0.212	0.344	0.147	1.50
20	0.000	0.000	0.000	0.000	0.264	0.26	0.480	0.293	0.210	0.334	0.146	1.46
21	0.000	0.000	0.000	0.000	0.259	0.26	0.459	0.285	0.207	0.324	0.145	1.42
22	0.000	0.000	0.000	0.000	0.253	0.25	0.441	0.277	0.203	0.314	0.143	1.38
23	0.000	0.000	0.000	0.000	0.246	0.25	0.422	0.268	0.199	0.304	0.141	1.33
24	0.000	0.000	0.000	0.000	0.239	0.24	0.404	0.261	0.195	0.294	0.138	1.29
25	0.000	0.000	0.000	0.000	0.232	0.23	0.387	0.252	0.191	0.283	0.136	1.25
26	0.000	0.000	0.000	0.000	0.225	0.23	0.370	0.244	0.185	0.273	0.133	1.21
27	0.000	0.000	0.000	0.000	0.218	0.22	0.353	0.235	0.180	0.263	0.130	1.16
28	0.000	0.000	0.000	0.000	0.211	0.21	0.338	0.227	0.175	0.253	0.127	1.12
29	0.000	0.000	0.000	0.000	0.203	0.20	0.323	0.219	0.170	0.244	0.123	1.08
30	0.000	0.000	0.000	0.000	0.196	0.20	0.308	0.211	0.164	0.234	0.120	1.04
SUMS	6.399	15.066	2.232	1.395	6.676	31.77	14.039	7.621	4.940	8.958	3.225	38.78

PRESENT VALUE 7.015
BENEFIT-COST RATIO 1.221

DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

PORT OF SATUN INVESTMENT

147.

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	3.800	0.000	0.000	0.000	0.000	3.80	0.000	0.000	0.000	0.000	0.000	0.00
2	0.920	8.422	1.021	0.782	0.000	11.14	0.000	0.000	0.000	0.000	0.000	0.00
3	0.846	6.482	0.497	0.599	0.000	8.42	0.000	0.000	0.000	0.000	0.000	0.00
4	0.779	0.000	0.690	0.000	0.000	1.47	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.230	0.23	0.764	0.294	0.112	0.379	0.044	1.59
6	0.000	0.000	0.000	0.000	0.242	0.24	0.738	0.302	0.130	0.394	0.061	1.63
7	0.000	0.000	0.000	0.000	0.251	0.25	0.711	0.307	0.146	0.374	0.076	1.63
8	0.000	0.000	0.000	0.000	0.257	0.26	0.685	0.310	0.159	0.392	0.090	1.64
9	0.000	0.000	0.000	0.000	0.262	0.26	0.659	0.311	0.169	0.387	0.101	1.63
10	0.000	0.000	0.000	0.000	0.264	0.26	0.632	0.310	0.177	0.381	0.110	1.61
11	0.000	0.000	0.000	0.000	0.265	0.26	0.606	0.305	0.182	0.375	0.118	1.59
12	0.000	0.000	0.000	0.000	0.264	0.26	0.580	0.302	0.187	0.366	0.123	1.56
13	0.000	0.000	0.000	0.000	0.262	0.26	0.555	0.297	0.190	0.357	0.128	1.53
14	0.000	0.000	0.000	0.000	0.258	0.26	0.531	0.291	0.191	0.347	0.131	1.49
15	0.000	0.000	0.000	0.000	0.254	0.25	0.507	0.283	0.191	0.337	0.133	1.45
16	0.000	0.000	0.000	0.000	0.249	0.25	0.483	0.276	0.190	0.326	0.134	1.41
17	0.000	0.000	0.000	0.000	0.244	0.24	0.461	0.269	0.187	0.316	0.134	1.37
18	0.000	0.000	0.000	0.000	0.237	0.24	0.439	0.260	0.185	0.305	0.134	1.32
19	0.000	0.000	0.000	0.000	0.231	0.23	0.418	0.253	0.182	0.293	0.132	1.28
20	0.000	0.000	0.000	0.000	0.224	0.22	0.393	0.244	0.178	0.282	0.131	1.23
21	0.000	0.000	0.000	0.000	0.216	0.22	0.378	0.235	0.174	0.271	0.128	1.19
22	0.000	0.000	0.000	0.000	0.209	0.21	0.359	0.226	0.169	0.260	0.126	1.14
23	0.000	0.000	0.000	0.000	0.201	0.20	0.341	0.218	0.164	0.250	0.123	1.10
24	0.000	0.000	0.000	0.000	0.194	0.19	0.323	0.209	0.160	0.239	0.119	1.05
25	0.000	0.000	0.000	0.000	0.186	0.19	0.307	0.200	0.154	0.228	0.116	1.01
26	0.000	0.000	0.000	0.000	0.179	0.18	0.291	0.192	0.149	0.218	0.113	0.96
27	0.000	0.000	0.000	0.000	0.172	0.17	0.275	0.184	0.143	0.208	0.109	0.92
28	0.000	0.000	0.000	0.000	0.165	0.16	0.260	0.176	0.138	0.198	0.105	0.88
29	0.000	0.000	0.000	0.000	0.158	0.16	0.246	0.168	0.133	0.187	0.101	0.84
30	0.000	0.000	0.000	0.000	0.151	0.15	0.233	0.160	0.127	0.180	0.098	0.80
SUMS	6.345	14.904	2.208	1.380	5.823	30.66	12.181	6.581	4.266	7.875	2.917	33.82

PRESENT VALUE 3.158
BENEFIT-COST RATIO 1.103

DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

PORT OF SATUN INVESTMENT

148. –

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	3.800	0.000	0.000	0.000	0.000	3.80	0.000	0.000	0.000	0.000	0.000	0.00
2	0.910	8.330	1.010	0.774	0.000	11.02	0.000	0.000	0.000	0.000	0.000	0.00
3	0.828	6.412	0.491	0.592	0.000	8.32	0.000	0.000	0.000	0.000	0.000	0.00
4	0.754	0.000	0.683	0.000	0.000	1.44	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.221	0.22	0.737	0.283	0.108	0.366	0.042	1.54
6	0.000	0.000	0.000	0.000	0.231	0.23	0.706	0.289	0.125	0.351	0.058	1.53
7	0.000	0.000	0.000	0.000	0.238	0.24	0.675	0.291	0.138	0.347	0.072	1.52
8	0.000	0.000	0.000	0.000	0.242	0.24	0.644	0.291	0.150	0.342	0.083	1.51
9	0.000	0.000	0.000	0.000	0.244	0.24	0.613	0.285	0.158	0.335	0.093	1.48
10	0.000	0.000	0.000	0.000	0.244	0.24	0.596	0.282	0.164	0.328	0.100	1.47
11	0.000	0.000	0.000	0.000	0.243	0.24	0.565	0.277	0.168	0.318	0.106	1.44
12	0.000	0.000	0.000	0.000	0.239	0.24	0.536	0.271	0.170	0.309	0.110	1.40
13	0.000	0.000	0.000	0.000	0.236	0.24	0.508	0.264	0.171	0.299	0.113	1.36
14	0.000	0.000	0.000	0.000	0.230	0.23	0.481	0.257	0.171	0.288	0.115	1.31
15	0.000	0.000	0.000	0.000	0.224	0.22	0.455	0.248	0.169	0.277	0.116	1.27
16	0.000	0.000	0.000	0.000	0.218	0.22	0.430	0.239	0.167	0.266	0.116	1.22
17	0.000	0.000	0.000	0.000	0.211	0.21	0.406	0.231	0.163	0.255	0.115	1.17
18	0.000	0.000	0.000	0.000	0.204	0.20	0.384	0.222	0.160	0.244	0.113	1.12
19	0.000	0.000	0.000	0.000	0.196	0.20	0.362	0.213	0.156	0.233	0.111	1.07
20	0.000	0.000	0.000	0.000	0.189	0.19	0.341	0.204	0.151	0.222	0.108	1.03
21	0.000	0.000	0.000	0.000	0.181	0.18	0.321	0.195	0.146	0.211	0.105	0.98
22	0.000	0.000	0.000	0.000	0.173	0.17	0.302	0.186	0.141	0.201	0.102	0.93
23	0.000	0.000	0.000	0.000	0.165	0.17	0.284	0.177	0.136	0.191	0.099	0.89
24	0.000	0.000	0.000	0.000	0.157	0.16	0.267	0.169	0.130	0.181	0.096	0.84
25	0.000	0.000	0.000	0.000	0.150	0.15	0.251	0.160	0.125	0.171	0.092	0.80
26	0.000	0.000	0.000	0.000	0.143	0.14	0.236	0.152	0.120	0.162	0.089	0.76
27	0.000	0.000	0.000	0.000	0.136	0.14	0.221	0.144	0.114	0.153	0.085	0.72
28	0.000	0.000	0.000	0.000	0.129	0.13	0.207	0.136	0.109	0.144	0.081	0.68
29	0.000	0.000	0.000	0.000	0.122	0.12	0.194	0.129	0.103	0.137	0.077	0.64
30	0.000	0.000	0.000	0.000	0.116	0.12	0.182	0.122	0.099	0.129	0.074	0.61
SUMS	6.292	14.742	2.184	1.365	5.080	29.66	10.905	5.718	3.712	6.459	2.473	29.27

PRESENT VALUE .... -0.396
BENEFIT-COST RATIO 0.987

DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

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PROFILE NUMBER ...............    18
DISCOUNT RATE ................   10.0%
DISCOUNTED TO YEAR ..........     1
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PORT OF SATUN INVESTMENT

149.

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	3.800	0.000	0.000	0.000	0.000	3.80	0.000	0.000	0.000	0.000	0.000	0.00
2	0.900	8.239	0.999	0.765	0.000	10.90	0.000	0.000	0.000	0.000	0.000	0.00
3	0.810	6.341	0.486	0.585	0.000	8.22	0.000	0.000	0.000	0.000	0.000	0.00
4	0.729	0.000	0.675	0.000	0.000	1.40	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.213	0.21	0.711	0.274	0.104	0.353	0.041	1.48
6	0.000	0.000	0.000	0.000	0.221	0.22	0.675	0.276	0.120	0.348	0.056	1.47
7	0.000	0.000	0.000	0.000	0.225	0.23	0.639	0.277	0.132	0.341	0.068	1.46
8	0.000	0.000	0.000	0.000	0.227	0.23	0.604	0.274	0.141	0.333	0.079	1.43
9	0.000	0.000	0.000	0.000	0.227	0.23	0.571	0.271	0.148	0.324	0.087	1.40
10	0.000	0.000	0.000	0.000	0.225	0.23	0.538	0.265	0.152	0.313	0.093	1.36
11	0.000	0.000	0.000	0.000	0.221	0.22	0.507	0.258	0.154	0.302	0.098	1.32
12	0.000	0.000	0.000	0.000	0.217	0.22	0.476	0.250	0.155	0.290	0.101	1.27
13	0.000	0.000	0.000	0.000	0.211	0.21	0.447	0.242	0.154	0.278	0.103	1.22
14	0.000	0.000	0.000	0.000	0.205	0.20	0.420	0.232	0.153	0.265	0.103	1.17
15	0.000	0.000	0.000	0.000	0.198	0.20	0.393	0.223	0.150	0.253	0.103	1.12
16	0.000	0.000	0.000	0.000	0.190	0.19	0.369	0.214	0.147	0.240	0.102	1.07
17	0.000	0.000	0.000	0.000	0.182	0.18	0.345	0.203	0.142	0.228	0.100	1.02
18	0.000	0.000	0.000	0.000	0.174	0.17	0.323	0.194	0.138	0.215	0.098	0.97
19	0.000	0.000	0.000	0.000	0.166	0.17	0.301	0.184	0.133	0.205	0.095	0.92
20	0.000	0.000	0.000	0.000	0.158	0.16	0.281	0.175	0.128	0.193	0.092	0.87
21	0.000	0.000	0.000	0.000	0.150	0.15	0.263	0.165	0.123	0.183	0.089	0.82
22	0.000	0.000	0.000	0.000	0.143	0.14	0.245	0.157	0.117	0.172	0.085	0.78
23	0.000	0.000	0.000	0.000	0.135	0.14	0.228	0.148	0.112	0.162	0.082	0.73
24	0.000	0.000	0.000	0.000	0.128	0.13	0.212	0.140	0.106	0.152	0.078	0.69
25	0.000	0.000	0.000	0.000	0.121	0.12	0.197	0.131	0.101	0.143	0.075	0.65
26	0.000	0.000	0.000	0.000	0.114	0.11	0.184	0.124	0.096	0.134	0.071	0.61
27	0.000	0.000	0.000	0.000	0.107	0.11	0.171	0.116	0.091	0.126	0.068	0.57
28	0.000	0.000	0.000	0.000	0.101	0.10	0.159	0.109	0.086	0.118	0.064	0.54
29	0.000	0.000	0.000	0.000	0.095	0.09	0.148	0.102	0.081	0.110	0.061	0.50
30	0.000	0.000	0.000	0.000	0.087	0.09	0.137	0.096	0.076	0.102	0.057	0.47
SUMS	6.239	14.580	2.160	1.350	4.446	28.78	9.545	5.097	3.240	5.882	2.150	25.91

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PRESENT VALUE ...............   -2.861
BENEFIT-COST RATIO .........    0.901
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DIV	CAT	
1	1	DESIGN AND PREPARATORY WORK
1	2	MARINE STRUCTURE
1	3	BUILDING NAVIGATION AND MISCELLANEOUS
1	4	ROAD, WATER AND ELECTRICITY SUPPLIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	SAVING IN LIGHTERAGE COSTS
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

APPENDIX A. 4

EVALUATION RESULTS OF SONGKHLA - SATUN LANDBRIDGE

This appendix contains the computer printouts for the Songkhla - Satun Landbridge (Songkhla - Satun Kra Landbridge) INVESTMENT PROJECT runs undertaken.

There are five categories of costs:

Cat. 1 : Preparatory work, land and embankment, bridges and ballast

Cat. 2 : wooden sleepers, fastening, points and crossings

Cat. 3 : wooden sleepers, fastening, points and crossings

cat. 4 : buildings, sheds, office, depots, signalling, telecommunications and contingencies

Cat. 5 : operating, maintenance and miscellaneous

There are four categories of benefits:

Cat.* 1 :   - Nil -

Cat. 2 : transhipment cost saving

Cat. 3 : benefit to other foreign exports

Cat. 4 : savings to directly imported cargo

Cat. 5 : benefit to domestic dry cargo

There were 4 runs undertaken:

1. at 7 %

2. at 8 %

3. at 9 %

4. at 10 %

Note * Cat. 1 is equal to zero because there are only four

    categories of benefits in the landbridge development.

RESULTS OF EVALUATIONS

Criterion	Discount rate			
	7 %	8 %	9 %	10 %
IRR is between 8 and 9 %				
NPV	4.296	0.566	−4.252	−7.564
B/C Ratio	1.094	1.013	0.899	0.814

The discount rate at 7% and 8%, the Songkhla - Satun Landbridge is justified or economically viable; however, when using 9% or 10% discount rate which means the cost of borrowing is higher, the project is not viable.

PROFILE NUMBER   18
DISCOUNT RATE 7.0%
DISCOUNTED TO YEAR   1

SONGKHLA - SATUN LANDBRIDGE PROJECT

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	6.030	0.000	0.000	0.000	0.000	6.03	0.000	0.000	0.000	0.000	0.000	0.00
2	2.804	3.164	0.686	4.626	0.000	11.28	0.000	0.000	0.000	0.000	0.000	0.00
3	2.608	3.164	0.686	4.626	0.000	11.08	0.000	0.000	0.000	0.000	0.000	0.00
4	0.000	0.000	0.686	4.626	0.000	5.31	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.420	0.42	0.000	0.149	0.343	0.116	0.414	1.02
6	0.000	0.000	0.000	0.000	0.445	0.45	0.000	0.154	0.400	0.117	0.572	1.24
7	0.000	0.000	0.000	0.000	0.467	0.47	0.000	0.158	0.451	0.118	0.709	1.44
8	0.000	0.000	0.000	0.000	0.486	0.49	0.000	0.161	0.494	0.118	0.829	1.60
9	0.000	0.000	0.000	0.000	0.501	0.50	0.000	0.163	0.529	0.119	0.937	1.75
10	0.000	0.000	0.000	0.000	0.511	0.51	0.000	0.164	0.558	0.119	1.026	1.87
11	0.000	0.000	0.000	0.000	0.516	0.52	0.000	0.164	0.583	0.118	1.105	1.97
12	0.000	0.000	0.000	0.000	0.520	0.52	0.000	0.163	0.602	0.117	1.170	2.05
13	0.000	0.000	0.000	0.000	0.520	0.52	0.000	0.162	0.615	0.115	1.222	2.11
14	0.000	0.000	0.000	0.000	0.517	0.52	0.000	0.161	0.626	0.113	1.263	2.16
15	0.000	0.000	0.000	0.000	0.515	0.51	0.000	0.158	0.630	0.111	1.290	2.19
16	0.000	0.000	0.000	0.000	0.510	0.51	0.000	0.156	0.626	0.108	1.311	2.20
17	0.000	0.000	0.000	0.000	0.503	0.50	0.000	0.153	0.624	0.106	1.326	2.21
18	0.000	0.000	0.000	0.000	0.494	0.49	0.000	0.150	0.622	0.103	1.332	2.21
19	0.000	0.000	0.000	0.000	0.484	0.48	0.000	0.146	0.616	0.100	1.332	2.19
20	0.000	0.000	0.000	0.000	0.474	0.47	0.000	0.143	0.610	0.097	1.326	2.18
21	0.000	0.000	0.000	0.000	0.465	0.46	0.000	0.139	0.601	0.094	1.316	2.15
22	0.000	0.000	0.000	0.000	0.454	0.45	0.000	0.135	0.591	0.091	1.300	2.12
23	0.000	0.000	0.000	0.000	0.442	0.44	0.000	0.131	0.580	0.088	1.279	2.08
24	0.000	0.000	0.000	0.000	0.430	0.43	0.000	0.127	0.567	0.085	1.257	2.04
25	0.000	0.000	0.000	0.000	0.417	0.42	0.000	0.123	0.554	0.082	1.236	2.00
26	0.000	0.000	0.000	0.000	0.405	0.40	0.000	0.119	0.539	0.079	1.210	1.95
27	0.000	0.000	0.000	0.000	0.392	0.39	0.000	0.115	0.524	0.076	1.178	1.89
28	0.000	0.000	0.000	0.000	0.379	0.38	0.000	0.111	0.509	0.074	1.151	1.84
29	0.000	0.000	0.000	0.000	0.365	0.36	0.000	0.107	0.494	0.071	1.119	1.79
30	0.000	0.000	0.000	0.000	0.352	0.35	0.000	0.103	0.478	0.068	1.088	1.74
SUMS	11.442	6.328	2.059	13.877	11.983	45.69	0.000	3.715	14.367	2.604	29.298	49.98

PRESENT VALUE 4.296
BENEFIT-COST RATIO 1.094

DIV	CAT	
1	1	PREPARATORY WORK, LAND AND EMBANKMENT, BRIDGES AND BALLAST
1	2	WOODEN SLEEPERS, FASTENINGS, POINTS AND CROSSINGS
1	3	BALLAST AND TRACK TRANSPORTATION, TRACK LAYING AND RAIL WELDING
1	4	BUILDINGS, SHEDS, OFFICE, DEPOTS, SIGNALLING, TELECOMMUNICATIONS AND CONTIGENCIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	----- NIL -----
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

SONGKHLA - SATUN LANDBRIDGE PROJECT   154.

	COSTS						BENEFITS				
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	6.030	0.000	0.000	0.000	0.000	6.03	0.000	0.000	0.000	0.000	0.000	0.00
2	2.774	3.130	0.679	4.576	0.000	11.16	0.000	0.000	0.000	0.000	0.000	0.00
3	2.552	3.130	0.679	4.576	0.000	10.94	0.000	0.000	0.000	0.000	0.000	0.00
4	0.000	0.000	0.679	4.576	0.000	5.26	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.412	0.41	0.000	0.144	0.326	0.110	0.400	0.98
6	0.000	0.000	0.000	0.000	0.434	0.43	0.000	0.147	0.379	0.115	0.550	1.19
7	0.000	0.000	0.000	0.000	0.450	0.45	0.000	0.150	0.425	0.115	0.636	1.37
8	0.000	0.000	0.000	0.000	0.461	0.46	0.000	0.151	0.461	0.114	0.820	1.55
9	0.000	0.000	0.000	0.000	0.470	0.47	0.000	0.151	0.491	0.112	0.918	1.67
10	0.000	0.000	0.000	0.000	0.474	0.47	0.000	0.151	0.514	0.111	1.001	1.78
11	0.000	0.000	0.000	0.000	0.475	0.48	0.000	0.149	0.531	0.109	1.071	1.86
12	0.000	0.000	0.000	0.000	0.474	0.47	0.000	0.147	0.543	0.107	1.120	1.92
13	0.000	0.000	0.000	0.000	0.470	0.47	0.000	0.145	0.552	0.104	1.164	1.96
14	0.000	0.000	0.000	0.000	0.464	0.46	0.000	0.142	0.554	0.101	1.191	1.99
15	0.000	0.000	0.000	0.000	0.456	0.46	0.000	0.138	0.554	0.098	1.208	2.00
16	0.000	0.000	0.000	0.000	0.447	0.45	0.000	0.135	0.552	0.095	1.214	2.00
17	0.000	0.000	0.000	0.000	0.437	0.44	0.000	0.131	0.545	0.092	1.220	1.99
18	0.000	0.000	0.000	0.000	0.426	0.43	0.000	0.127	0.539	0.089	1.214	1.97
19	0.000	0.000	0.000	0.000	0.414	0.41	0.000	0.123	0.528	0.085	1.197	1.93
20	0.000	0.000	0.000	0.000	0.401	0.40	0.000	0.119	0.517	0.082	1.186	1.90
21	0.000	0.000	0.000	0.000	0.389	0.39	0.000	0.115	0.506	0.079	1.164	1.86
22	0.000	0.000	0.000	0.000	0.376	0.38	0.000	0.110	0.493	0.076	1.142	1.82
23	0.000	0.000	0.000	0.000	0.361	0.36	0.000	0.106	0.478	0.073	1.113	1.77
24	0.000	0.000	0.000	0.000	0.348	0.35	0.000	0.102	0.464	0.069	1.085	1.72
25	0.000	0.000	0.000	0.000	0.334	0.33	0.000	0.098	0.449	0.066	1.052	1.66
26	0.000	0.000	0.000	0.000	0.321	0.32	0.000	0.094	0.434	0.063	1.023	1.61
27	0.000	0.000	0.000	0.000	0.309	0.31	0.000	0.089	0.416	0.060	0.990	1.56
28	0.000	0.000	0.000	0.000	0.296	0.30	0.000	0.086	0.401	0.058	0.956	1.50
29	0.000	0.000	0.000	0.000	0.283	0.28	0.000	0.082	0.386	0.055	0.921	1.44
30	0.000	0.000	0.000	0.000	0.270	0.27	0.000	0.078	0.370	0.052	0.837	1.39
SUMS	11.356	6.260	2.037	13.728	10.452	43.83	0.000	3.208	12.407	2.289	26.495	44.40

PRESENT VALUE 0.566
BENEFIT-COST RATIO 1.013

DIV	CAT	
1	1	PREPARATORY WORK, LAND AND EMBANKMENT, BRIDGES AND BALLAST
1	2	WOODEN SLEEPERS, FASTENINGS, POINTS AND CROSSINGS
1	3	BALLAST AND TRACK TRANSPORTATION, TRACK LAYING AND RAIL WELDING
1	4	BUILDINGS, SHEDS, OFFICE, DEPOTS, SIGNALLING, TELECOMMUNICATIONS AND CONTIGENCIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	----- NIL -----
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

PROFILE NUMBER 18
DISCOUNT RATE 9.0%
DISCOUNTED TO YEAR 1

SONGKHLA - SATUN LANDBRIDGE PROJECT

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	6.030	0.000	0.000	0.000	0.000	6.03	0.000	0.000	0.000	0.000	0.000	0.00
2	2.744	3.096	0.672	4.526	0.000	11.04	0.000	0.000	0.000	0.000	0.000	0.00
3	2.497	3.096	0.672	4.526	0.000	10.79	0.000	0.000	0.000	0.000	0.000	0.00
4	0.000	0.000	0.672	4.526	0.000	5.20	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.396	0.40	0.000	0.138	0.315	0.106	0.385	0.94
6	0.000	0.000	0.000	0.000	0.414	0.41	0.000	0.141	0.364	0.102	0.527	1.13
7	0.000	0.000	0.000	0.000	0.427	0.43	0.000	0.142	0.402	0.101	0.652	1.30
8	0.000	0.000	0.000	0.000	0.434	0.43	0.000	0.142	0.435	0.099	0.756	1.43
9	0.000	0.000	0.000	0.000	0.438	0.44	0.000	0.139	0.458	0.097	0.843	1.54
10	0.000	0.000	0.000	0.000	0.438	0.44	0.000	0.138	0.473	0.095	0.912	1.62
11	0.000	0.000	0.000	0.000	0.435	0.44	0.000	0.135	0.489	0.093	0.964	1.68
12	0.000	0.000	0.000	0.000	0.430	0.43	0.000	0.132	0.495	0.090	1.002	1.72
13	0.000	0.000	0.000	0.000	0.423	0.42	0.000	0.129	0.497	0.087	1.029	1.74
14	0.000	0.000	0.000	0.000	0.413	0.41	0.000	0.125	0.497	0.084	1.046	1.75
15	0.000	0.000	0.000	0.000	0.403	0.40	0.000	0.121	0.492	0.081	1.051	1.74
16	0.000	0.000	0.000	0.000	0.391	0.39	0.000	0.117	0.486	0.077	1.051	1.73
17	0.000	0.000	0.000	0.000	0.379	0.38	0.000	0.113	0.475	0.074	1.040	1.70
18	0.000	0.000	0.000	0.000	0.366	0.37	0.000	0.108	0.464	0.071	1.029	1.67
19	0.000	0.000	0.000	0.000	0.351	0.35	0.000	0.104	0.454	0.068	1.006	1.63
20	0.000	0.000	0.000	0.000	0.338	0.34	0.000	0.099	0.441	0.064	0.984	1.59
21	0.000	0.000	0.000	0.000	0.324	0.32	0.000	0.095	0.425	0.061	0.957	1.54
22	0.000	0.000	0.000	0.000	0.310	0.31	0.000	0.091	0.410	0.058	0.929	1.49
23	0.000	0.000	0.000	0.000	0.297	0.30	0.000	0.086	0.394	0.055	0.901	1.44
24	0.000	0.000	0.000	0.000	0.283	0.28	0.000	0.082	0.379	0.053	0.869	1.38
25	0.000	0.000	0.000	0.000	0.270	0.27	0.000	0.078	0.363	0.050	0.840	1.33
26	0.000	0.000	0.000	0.000	0.257	0.26	0.000	0.074	0.348	0.047	0.806	1.28
27	0.000	0.000	0.000	0.000	0.244	0.24	0.000	0.070	0.332	0.044	0.772	1.22
28	0.000	0.000	0.000	0.000	0.231	0.23	0.000	0.066	0.316	0.042	0.738	1.16
29	0.000	0.000	0.000	0.000	0.220	0.22	0.000	0.063	0.301	0.040	0.702	1.11
30	0.000	0.000	0.000	0.000	0.208	0.21	0.000	0.059	0.288	0.037	0.669	1.05
SUMS	11.270	6.192	2.015	13.579	9.118	42.17	0.000	2.787	10.797	1.878	22.460	37.92

PRESENT VALUE .... -4.252
BENEFIT-COST RATIO 0.899

DIV	CAT	
1	1	PREPARATORY WORK, LAND AND EMBANKMENT, BRIDGES AND BALLAST
1	2	WOODEN SLEEPERS, FASTENINGS, POINTS AND CROSSINGS
1	3	BALLAST AND TRACK TRANSPORTATION, TRACK LAYING AND RAIL WELDING
1	4	BUILDINGS, SHEDS, OFFICE, DEPOTS, SIGNALLING, TELECOMMUNICATIONS AND CONTIGENCIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	----- NIL -----
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

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PROFILE NUMBER .............    18
DISCOUNT RATE .............   10.0%
DISCOUNTED TO YEAR .........    1
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SONGKHLA - SATUN LANDBRIDGE PROJECT

	COSTS						BENEFITS					
YEAR	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL	CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	TOTAL
0	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.00
1	6.030	0.000	0.000	0.000	0.000	6.03	0.000	0.000	0.000	0.000	0.000	0.00
2	2.714	3.062	0.664	4.477	0.000	10.92	0.000	0.000	0.000	0.000	0.000	0.00
3	2.442	3.062	0.664	4.477	0.000	10.64	0.000	0.000	0.000	0.000	0.000	0.00
4	0.000	0.000	0.664	4.477	0.000	5.14	0.000	0.000	0.000	0.000	0.000	0.00
5	0.000	0.000	0.000	0.000	0.382	0.38	0.000	0.133	0.303	0.103	0.371	0.91
6	0.000	0.000	0.000	0.000	0.396	0.40	0.000	0.134	0.349	0.101	0.508	1.09
7	0.000	0.000	0.000	0.000	0.405	0.40	0.000	0.135	0.383	0.099	0.620	1.24
8	0.000	0.000	0.000	0.000	0.407	0.41	0.000	0.134	0.411	0.097	0.715	1.36
9	0.000	0.000	0.000	0.000	0.407	0.41	0.000	0.132	0.429	0.094	0.793	1.45
10	0.000	0.000	0.000	0.000	0.405	0.40	0.000	0.127	0.442	0.091	0.846	1.51
11	0.000	0.000	0.000	0.000	0.397	0.40	0.000	0.126	0.449	0.088	0.889	1.55
12	0.000	0.000	0.000	0.000	0.389	0.39	0.000	0.122	0.451	0.084	0.916	1.57
13	0.000	0.000	0.000	0.000	0.379	0.38	0.000	0.118	0.449	0.081	0.933	1.58
14	0.000	0.000	0.000	0.000	0.367	0.37	0.000	0.113	0.445	0.077	0.939	1.57
15	0.000	0.000	0.000	0.000	0.355	0.35	0.000	0.108	0.436	0.074	0.939	1.56
16	0.000	0.000	0.000	0.000	0.342	0.34	0.000	0.104	0.427	0.070	0.927	1.53
17	0.000	0.000	0.000	0.000	0.327	0.33	0.000	0.099	0.414	0.066	0.911	1.49
18	0.000	0.000	0.000	0.000	0.313	0.31	0.000	0.094	0.401	0.063	0.888	1.45
19	0.000	0.000	0.000	0.000	0.299	0.30	0.000	0.090	0.388	0.060	0.865	1.40
20	0.000	0.000	0.000	0.000	0.284	0.28	0.000	0.085	0.372	0.056	0.836	1.35
21	0.000	0.000	0.000	0.000	0.270	0.27	0.000	0.081	0.356	0.053	0.808	1.30
22	0.000	0.000	0.000	0.000	0.257	0.26	0.000	0.076	0.341	0.050	0.774	1.24
23	0.000	0.000	0.000	0.000	0.243	0.24	0.000	0.072	0.325	0.047	0.745	1.19
24	0.000	0.000	0.000	0.000	0.230	0.23	0.000	0.068	0.309	0.044	0.712	1.13
25	0.000	0.000	0.000	0.000	0.217	0.22	0.000	0.064	0.294	0.041	0.678	1.08
26	0.000	0.000	0.000	0.000	0.204	0.20	0.000	0.060	0.278	0.039	0.649	1.03
27	0.000	0.000	0.000	0.000	0.193	0.19	0.000	0.056	0.265	0.037	0.615	0.97
28	0.000	0.000	0.000	0.000	0.181	0.18	0.000	0.053	0.249	0.034	0.581	0.92
29	0.000	0.000	0.000	0.000	0.170	0.17	0.000	0.050	0.236	0.032	0.553	0.87
30	0.000	0.000	0.000	0.000	0.160	0.16	0.000	0.047	0.222	0.030	0.519	0.82
SUMS	11.186	6.124	1.993	13.430	7.980	40.71	0.000	2.485	9.425	1.710	19.528	33.15

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PRESENT VALUE .............    -7.564
BENEFIT-COST RATIO ........     0.814
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DIV	CAT	
1	1	PREPARATORY WORK, LAND AND EMBANKMENT, BRIDGES AND BALLAST
1	2	WOODEN SLEEPERS, FASTENINGS, POINTS AND CROSSINGS
1	3	BALLAST AND TRACK TRANSPORTATION, TRACK LAYING AND RAIL WELDING
1	4	BUILDINGS, SHEDS, OFFICE, DEPOTS, SIGNALLING, TELECOMMUNICATIONS AND CONTIGENCIES
1	5	OPERATING MAINTENANCE AND MISCELLANEOUS
2	1	----- NIL -----
2	2	TRANSHIPMENT COST SAVING
2	3	BENEFIT TO OTHER FOREIGN EXPORTS
2	4	SAVINGS TO DIRECTLY IMPORTED CARGO
2	5	BENEFIT TO DOMESTIC DRY CARGO

APPENDIX B.

FOREIGN TRADE AND PAYMENTS

TABLE B. 1

Total Value of Trade

(Millions of Baht)

Line		1977	1978	1979	1980	1981	1982	1983
1	Exports (f.o.b.): Domestic products	71,198	83,065	108,179	133,197	153,001	159,729	146,472
2	Port of Bangkok	57,817	64,050	82,057	101,856	126,506	136,449	126,267
3	Provincial ports	12,580	17,202	24,279	28,550	22,456	19,591	18,055
	Re-exports:							
4	Port of Bangkok	771	1,781	1,499	2,595	3,763	3,103	1,855
5	Provincial ports	30	32	344	196	276	585	295
6	Imports (c.i.f.):	94,177	108,899	146,161	188,686*	216,746*	196,616	236,609
7	Port of Bangkok	93,543	108,134	144,338	185,740	211,654	194,285	233,672
8	Provincial ports	634	765	1,823	2,946	5,092	2,331	2,937
9	Trade balance	-22,979	-25,834	-37,982	-55,489	-63,745	-36,888	-90,137

1/

Trade by Commodity Group

Line		1977	1978	1979	1980	1981	1982	1983
	a. Exports							
1	Food	40,239	40,617	50,087	59,338	80,038	86,371	73,755
2	Beverages and tobacco ..	931	1,173	1,266	1,393	1,758	2,599	1,860
3	Crude materials	10,965	12,571	17,862	19,095	16,722	15,134	16,288
4	Mineral fuels and lubricant	20	14	33	86	37	40	30
5	Animal and vegetable oils and fats	26	40	22	222	232	298	270
6	Chemicals	298	444	722	936	1,191	1,253	1,673
7	Manufactured goods	11,963	17,479	23,532	29,474	26,941	26,587	26,002
8	Machinery	1,713	2,719	3,972	7,618	7,662	8,293	8,356
9	Miscellaneous manufac- tured goods	2,750	4,213	6,149	8,467	11,731	13,404	14,756
10	Miscellaneous transactions and commodities	1,492	1,982	2,691	3,777	2,650	2,060	1,332
11	Re-exports	801	1,813	1,843	2,791	4,039	3,689	2,150
12	Total	71,198	83,065	108,179	133,197	153,001	159,728	146,472

1/ Excluding military aids.

Line		1977	1978	1979	1980	1981	1982	1983
	b. imports							
13	Food	2,503	2,846	3,899	5,763	5,795	5,061	6,501
14	Beverages and tobacco ..	1.043	1.013	1.214	1.518	1.588	2.327	1.268
15	Crude materials	7,404	7,316	11,415	10,755	13,297	11,516	14,376
16	Mineral fuel and lubricant	20,889	22,851	32,647	58,733	65,100	60,765	57,065
17	Animal, vegetable oils and fats	292	272	473	1,458	903	438	781
18	Chemicals	13,356	14,979	21,794	22,352	26,761	24,848	31,804
19	Manufactured goods	15,409	18,479	26,345	28,152	34,512	30,597	39,034
20	Machinery	27,979	33,635	37,742	43,102	54,371	46,503	68,361
21	Miscellaneous manufactured goods	3,782	4,843	7,919	10,959	10,899	11,194	14,041
22	Miscellaneous transactions and commodities	1,463	1,831	2,242	5,894	3,520	3,347	3,343
23	Gold	57	834	471	-	-	20	35
24	Total	94,177	108,899	146,161	188,686*	216,746*	196,616	236,609

* Excluding imports of aircraft which have been taken account of in the balance of payments statistics for the actual month of imports.

Source : Bank of Thailand Quarterly Bulletin (various issues).

TABLE B. 3

Trade $^{1/}$ by Country

(Millions of Baht)

Line			1977	1978	1979	1980	1981	1982	1983
1a	Brunei..........	Export	136	116	134	190	240	187	221
b		Import	1,306	1,562	2,218	4,443	3,338	2,278	2,760
2a	China..........	Export	2,082	1,498	1,572	2,531	4,064	7,053	2,468
b		Import	1,371	1,704	4,940	8,535	6,983	5,374	6,099
3a	Hong Kong.......	Export	3,342	4,436	5,260	6,754	7,350	7,934	7,281
b		Import	1,086	1,230	1,546	1,792	1,942	2,059	2,704
4a	Indonesia.......	Export	4,281	1,394	3,862	4,835	2,958	4,251	2,754
b		Import	163	504	1,143	919	524	532	777
5a	Iran...........	Export	1,117	752	113	2,131	4,602	2,287	2,373
b		Import	210	771	333	705	263	127	1
6a	Japan..........	Export	14,029	16,866	22,901	20,098	21,704	21,947	22,087
b		Import	30,469	33,461	37,636	39,984	52,521	46,086	64,757
7a	S.Korea........	Export	560	732	1,033	1,008	3,214	1,888	2,097
b		Import	957	1,655	2,381	4,047	3,017	3,589	5,602
8a	Malaysia........	Export	3,769	4,296	4,769	5,990	6,968	8,342	6,561
b		Import	897	1,367	2,491	3,398	5,891	10,214	12,738
9a	Philippines.....	Export	250	416	237	480	445	806	1,554
b		Import	179	158	534	1,606	435	444	356

1/ Excluding military aids.

Line			1977	1978	1979	1980	1981	1982	1933
10a	Oater..........	Export	24	7	12	37	32	45	52
b		Import	4,956	4,783	6,539	10,336	7,075	4,219	2,907
11a	Saudi Arabia...	Export	717	1,161	1,810	2,320	3,118	4,261	4,245
b		Import	7,789	6,076	9,404	19,103	29,395	29,819	24,430
12a	Singapore......	Export	4,505	6,723	9,222	10,292	11,991	11,654	11,913
b		Import	2,789	4,419	6,848	12,261	14,949	12,455	14,623
13a	Taiwan.........	Export	3,167	1,088	1,365	1,791	2,014	1,916	1,472
b		Import	2,336	3,690	4,028	3,955	4,589	5,501	6,762
14a	Belgium........	Export	469	1,481	1,958	3,306	1,595	1,730	1,432
b		Import	552	672	1,323	1,033	1,944	1,449	2,760
15a	France.........	Export	872	1,638	2,009	2,192	2,833	3,030	2,813
b		Import	1,239	1,420	2,524	1,911	3,918	2,917	3,593
16a	W.Germany......	Export	2,491	3,441	4,391	5,516	4,934	5,355	5,105
b		Import	5,194	6,300	7,936	8,222	9,336	7,624	11,065
17a	Italy..........	Export	841	1,471	2,173	2,613	2,147	2,577	2,072
b		Import	1,184	1,305	2,182	2,664	2,488	2,107	3,195
18a	Netherlands....	Export	9,564	12,185	12,260	17,639	18,674	21,013	15,883
b		Import	1,189	1,314	1,749	4,676	2,786	2,275	2,672
19a	Switzerland....	Export	623	722	1,626	2,579	2,044	1,745	1,662
b		Import	804	1,117	1,524	1,658	1,971	1,837	2,534
20a	United Kingdom.	Export	1,017	1,283	1,989	2,493	2,464	3,043	2,990
b		Import	3,808	4,164	4,708	5,033	5,851	5,023	5,390

Imports from Major Suppliers by Economic Classification

(Millions of Baht)

Line			1977	1978	1979	1980	1981	1982	1983
		a. Japan							
1	I.	CONSUMER GOODS.................	3,748	3,919	4,213	4,793	6,287	6,118	8,449
2		Food and beverages.............	165	143	183	251	361	345	628
3		Toilet and cleaning articles...	138	167	209	200	240	211	275
4		Clothing and footwear..........	678	725	747	1,109	1,334	1,291	1,595
5		Household goods.................	453	524	575	623	817	845	1,033
6		Electrical appliances..........	1,019	1,296	1,296	1,680	2,323	2,384	3,609
7		Cycles, motorcycles, carts, etc.	1,096	893	735	709	982	837	1,042
8		Others.........................	199	171	201	221	230	205	267
	II.	INTERMEDIATE PRODUCTS AND RAW MATERIALS.....................	10,131	10,130	13,553	14,303	16,485	14,519	17,058
10		Animal and vegetable crude materials......................	141	165	205	385	294	245	279
11		Paper and paperboard...........	402	309	444	351	574	609	630
12		Chemicals......................	3,525	3,826	5,007	5,160	5,945	4,840	5,652
13		Iron and steel.................	5,093	4,972	6,971	7,310	8,155	7,474	9,036
14		Other base metal...............	590	596	578	655	793	739	807
15		Others.........................	380	262	348	442	724	612	654
16	III.	CAPITAL GOODS..................	9,574	12,434	13,331	14,370	19,696	17,111	28,001
17		Fertilizers and pesticides.....	231	284	529	600	671	710	714
18		Tubes and pipes................	96	118	206	278	577	391	672
19		Glass and other mineral manufactures...................	255	293	324	369	434	379	626

(Millions of Baht)

Line			1977	1978	1979	1980	1981	1982	1983
20		Metal manufactures........	697	804	938	1,047	1,389	1,143	1,528
21		Non-electrical machinery and parts..................	5,793	7,769	8,344	8,239	12,024	10,362	15,739
22		Electrical machinery and parts......................	1,430	2,273	1,888	2,271	2,925	2,775	6,265
23		Scientific and optical instruments................	289	394	444	770	926	906	1,218
24		Others.....................	783	499	658	796	750	443	1,239
25	IV.	OTHER IMPORTS.............	7,016	6,978	6,539	6,518	10,053	8,338	11,249
26		Vehicles and parts........	6,579	6,307	5,863	5,742	8,579	6,609	9,956
27		Fuel and lubricants.......	147	270	157	203	839	676	442
28		Others.....................	290	401	519	573	635	1,053	851
29	V.	TOTAL IMPORTS FROM JAPAN..	30,469	33,461	37,636	39,984	52,521	46,086	64,757
		b. U.S.A.							
30	I.	CONSUMER GOODS.............	1,217	1,383	1,670	2,144	2,711	2,521	3,173
31		Food and beverages........	382	454	613	802	1,104	815	1,043
32		Toilet and cleaning articles...................	86	125	154	132	170	166	163
33		Medicinal and pharmaceutical products..............	183	156	200	245	312	304	345
34		Household goods...........	222	251	286	332	455	384	398
35		Electrical appliances.....	140	152	178	330	275	315	515
36		Others.....................	204	245	239	303	395	537	709

Line			1977	1978	1979	1980	1981	1982	1983
	II.	INTERMEDIATE PRODUCTS AND RAW MATERIALS.........	4,330	4,634	7,979	8,035	8,985	7,807	8,365
38		Tobacco leaves...............	813	690	742	1,006	854	1,602	561
39		Wood, lumber, cork pulp, waste paper...............	230	220	344	373	571	598	392
40		Textile fibres...............	1,222	1,228	1,802	1,833	2,142	1,457	1,650
41		Chemicals...............	1,082	1,282	2,812	3,169	3,745	3,129	4,612
42		Base metals...............	799	885	1,837	1,120	1,069	620	597
43		Others...............	184	329	442	534	604	401	553
	III.	CAPITAL GOODS...............	4,609	6,877	9,359	10,464*	11,429*	11,523	12,501
45		Fertilizers and pesticides	994	1,052	1,164	1,219	1,205	575	792
46		Metal manufactures........	328	368	412	483	459	406	629
47		Non-electrical machinery and parts...............	1,733	2,404	2,814	2,565	2,988	2,974	5,029
48		Electrical machinery and parts...............	930	2,101	3,816	5,192	5,472	5,365	4,454
49		Scientific and optical instruments...............	274	374	469	501	659	699	968
50		Aircrafts and ships.......	162	362	342	131*	406*	1,237	229
51		Others...............	188	216	342	373	240	267	400
52	IV.	OTHER IMPORTS...............	1,414	1,937	3,746	6,565	4,962	4,369	5,669
53		Fuel and lubricants.......	127	103	120	367	1,081	343	483
54		Munition used in official services...............	955	1,305	3,042	5,149	3,014	3,437	4,502
55		Others...............	332	529	584	1,049	867	589	684
56	V.	TOTAL IMPORTS FROM THE U.S.A...............	11,570	14,831	22,754	27,208*	28,087*	26,220	29,708

* Excluding imports of aircraft which have been taken account of in the balance of payments statistics for the actual month of imports.

TABLE B. 4 (cont.)

Line		1977	1978	1979	1980	1981	1982	1983
	c. W. Germany							
57	I. CONSUMER GOODS..............	660	767	969	1,018	1,090	1,250	1,465
58	Food and beverages........	132	126	247	312	287	354	399
59	Toilet and cleaning articles...................	50	72	95	88	100	102	107
60	Medicinal and pharmaceutical products...................	231	274	296	309	307	365	394
61	Household goods............	75	91	118	111	128	144	188
62	Electrical appliances.....	101	144	135	117	164	171	193
63	Others....................	71	60	78	81	104	114	184
	II. INTERMEDIATE PRODUCTS AND RAW MATERIALS..............	1,359	1,577	2,215	1,716	2,195	1,588	2,387
65	Paper and paperboard......	72	64	99	62	117	97	121
66	Chemicals.................	814	940	1,476	1,226	1,288	1,223	1,608
67	Base metals...............	426	532	527	359	714	196	571
68	Others....................	47	41	113	69	76	72	87
69	III. CAPITAL GOODS..............	2,371	2,599	3,371	4,397	4,930	3,897	5,996
70	Fertilizers and pesticides	425	475	557	565	470	925	905
71	Glass and other mineral manufactures...............	55	66	94	87	105	102	119
72	Metal manufactures........	142	181	248	238	511	229	281
73	Non-electrical machinery and parts.................	1,275	1,402	1,856	1,690	2,432	1,905	3,095
74	Electrical machinery and parts....................	226	280	363	1,194	645	423	1,156

TABLE B. 4   (Cont.)

Line		1977	1978	1979	1980	1981	1982	1983
75	Scientific and optical instruments................	116	123	168	185	253	188	301
76	Others.....................	132	72	85	438	514	125	139
77	IV. OTHER IMPORTS..............	807	1,357	1,381	1,091	1,121	889	1,217
78	Vehicles and parts........	635	442	311	596	340	424	606
79	Munition used in official services..................	95	101	508	358	577	262	396
80	Others....................	74	814	562	137	204	203	215
81	V. TOTAL IMPORT FROM W.GERMANY	5,194	6,300	7,936	8,222	9,336	7,624	11,065
	d. United Kingdom							
82	I. CONSUMER GOODS.............	648	728	943	1,102	1,170	1,058	1,494
83	Food and beverages........	182	250	355	425	510	432	485
84	Toilet and cleaning articles..................	70	97	114	98	129	110	135
85	Clothing and footwear.....	30	39	45	48	44	49	49
86	Medicinal and pharmaceutical products...................	174	176	205	236	247	236	298
87	Household goods...........	88	100	124	135	141	127	142
88	Electrical appliances.....	29	38	37	51	43	47	71
89	Others....................	75	28	63	109	56	57	69
90	II. INTERMEDIATE PRODUCTS AND RAW MATERIELS..............	824	1,046	1,039	941	969	1,064	1,433
91	Paper and paper board.....	72	92	87	80	85	83	71
92	Chemicals.................	458	522	639	654	699	806	1,121

Line			1977	1978	1979	1980	1981	1982	1983
93		Base metals................	212	374	239	124	144	129	173
94		Others.....................	82	58	74	83	41	46	68
95	III.	CAPITAL GOODS..............	1,948	1,995	2,285	2,616	2,562	2,504	2,373
96		Fertilizers and pesticides	63	102	132	183	275	240	180
97		Glass and other mineral manufactures...............	48	65	80	83	72	84	98
98		Metal manufactures........	127	144	211	177	139	156	146
99		Non-electrical machinery and parts.................	1,354	1,281	1,325	1,638	1,601	1,200	1,268
100		Electrical machinery and parts......................	115	146	264	311	250	336	408
101		Scientific and opitcal instruments...............	79	95	124	138	152	172	159
102		Others.....................	162	162	149	86	73	316	114
103	IV.	OTHER IMPORTS..............	388	395	441	374	1,150	397	335
104		Vehicles and parts........	145	153	111	91	60	36	37
105		Munition used in official services..................	50	86	177	103	979	276	171
106		Others.....................	193	156	153	180	111	85	127
107	V.	TOTAL IMPORTS FROM THE UNITED KINGDOM.............	3,808	4,164	4,708	5,033	5,851	5,023	5,390

Line			1977	1978	1979	1980	1981	1982	1983
21a	U.S.S.R.	Export	69	147	827	3,366	6,752	4,212	1,505
b		Import	301	174	163	233	328	300	388
22a	Canada........	Export	231	239	520	495	681	657	1,226
b		Import	1,277	1,329	1,706	2,707	2,903	2,769	3,403
23a	U.S.A.	Export	6,939	9,153	12,106	16,834	19,794	20,257	21,895
b		Import	11,570	14,831	22,754	27,208*	28,087*	26,220	29,708
24a	Nigeria.......	Export	1,591	3,639	1,351	1,487	2,008	1,561	2,907
b		Import	31	8	-	-	-	-	3
25a	Australia.....	Export	661	724	1,047	1,431	1,749	1,715	2,148
b		Import	1,882	2,457	3,268	3,549	4,223	4,339	4,279
26a	Others........	Export	7,851	7,457	13,632	14,789	18,626	20,263	19,756
b		Import	10,638	12,428	16,283	18,708	21,989	17,059	23,103
27a	Total.........	Export	71,198	83,065	108,179	133,197	153,001	159,728	146,472
b		Import	94,177	108,899	146,161	188,686*	216,746*	196,616	236,609

* Excluding imports of aircraft which have been taken account of in the balance of payments statistics for the actual month of imports.

Principal Export by Country

Line			1977	1978	1979	1980	1981	1982	1983
	a. Principal Exports								
1a	Rice................Metric tons		2,946,434	1,606,752	2,796,869	2,799,724	3,031,783	3,784,143	3,476,480
b		Millions of Baht	13,383	10,424	15,592	19,508	26,366	22,510	20,157
2a	Rubber.............Metric tons		401,863	442,191	520,953	455,006	472,122	544,487	555,060
b	1/	Millions of Baht	6,163	8,030	12,351	12,351	10,841	9,490	11,787
3a	Maize ....Metric tons		1,541,958	1,972,446	2,013,985	2,202,510	2,574,608	2,830,701	2,658,679
b		Millions of Baht	3,345	4,275	5,644	7,299	8,349	8,330	8,488
4a	Tapioca products.....Metric tons		3,954,365	6,287,965	3,961,201	5,217,702	6,265,833	7,815,455	5,196,751
b		Millions of Baht	7,720	10,892	9,891	14,887	16,446	19,752	15,387
5a	Prawns.............Metric tons		13,661	15,378	18,626	17,915	18,761	20,138	20,150
b		Millions of Baht	1,171	1,500	2,372	1,961	2,136	2,764	3,164
6a	Tin................Metric tons		21,437	28,943	31,308	33,955	30,074	24,889	17,724
b		Millions of Baht	4,542	7,229	9,252	11,347	9,091	7,773	5,265
7a	Sugar..............Metric tons		1,654,610	1,040,049	1,189,818	451,696	1,118,639	2,206,240	1,536,891
b		Millions of Baht	7,445	3,970	4,797	2,975	9,572	12,932	6,338
8a	Intergrated circuits.Thousand units		171,137	254,690	314,063	621,186	599,100	448,005	453,379
b		Millions of Baht	1,145	2,158	2,903	6,156	6,193	5,930	5,829
9	Textile products.....Millions of Baht		4,594	6,866	8,795	9,643	12,570	14,005	14,351

1/ Including maize groats and meal.

TABLE B. 5   cont.

Line			1977	1978	1979	1980	1981	1982	1983
10	Precious stones.........Millions of Baht		1,056	1,707	2,250	3,240	4,486	4,671	6,214
11	Total principal exports.Millions of Baht		50,564	57,061	73,847	89,367	106,050	108,157	96,978
12	Others..................Millions of Baht		20,634	26,014	34,332	43,830	46,951	51,571	49,494
13	Total...................Millions of Baht		71,198	83,065	108,179	133,197	153,001	159,728	146,472
	b. Other Exports								
14a	Tobacco leaves..........Metric tons		27,981	34,810	34,050	39,067	36,646	38,260	35,560
b	Millions of Baht		924	1,161	1,243	1,371	1,739	2,546	1,791
15a	Mung beans..............Metric tons		107,776	160,608	177,554	179,350	172,176	190,230	156,859
b	Millions of Baht		1,059	1,161	1,375	1,448	1,693	1,915	1,562
16a	Frozen fowl.............Metric tons		4,254	9,287	14,158	18,503	26,905	33,217	22,926
b	Millions of Baht		158	334	517	656	1,187	1,310	946
17a	Sorghum.................Metric tons		135,464	158,065	167,034	180,592	220,618	288,755	228,279
b	Millions of Baht		299	372	495	661	904	928	790
18a	Fresh fruits............Metric tons		37,606	43,441	42,802	37,278	47,535	62,631	51,104
b	Millions of Baht		158	180	215	275	426	657	525
19a	Natural orchids.........Metric tons		2,974	4,330	4,035	4,483	5,309	6,323	7,940
b	Millions of Baht		131	187	373	422	402	334	354
20a	Raw cotton..............Metric tons		2,506	4,945	4,540	10,845	10,715	20,862	12,675
b	Millions of Baht		38	100	88	343	267	627	268
21a	Unworked feather........Metric tons		95	145	1,923	745	1,097	1,224	1,269
b	Millions of Baht		8	3	111	135	323	434	366
22a	Coffee..................Metric tons		1,124	1,445	3,933	2,157	5,673	8,313	10,810
b	Millions of Baht		79	63	127	173	231	352	452

TABLE B. 5 (cont.)

Line		1977	1978	1979	1980	1981	1982	1983
23a	Kapok fibre.............Metric tons	15,442	16,826	18,720	14,771	12,447	10,123	11,558
b	Millions of Baht	244	237	264	255	285	229	250
24a	Fresh cuttlefish........Metric tons	25,739	34,011	39,357	38,641	39,804	42,656	39,322
b	Millions of Baht	664	1,022	1,471	1,301	1,336	1,784	1,637
25a	Fish meal.............Metric tons	75,617	102,971	128,469	114,343	113,771	83,074	93,246
b	Millions of Baht	535	727	884	972	1,014	701	785
26a	Fresh fish.............Metric tons	40,197	48,187	45,977	41,435	56,867	53,216	53,410
b	Millions of Baht	234	318	399	331	767	689	686
27a	Dried cuttlefish........Metric tons	2,195	2,459	2,542	2,456	2,912	3,565	3,441
b	Millions of Baht	209	318	362	378	488	607	630
28a	Tungsten..............Metric tons	3,971	5,774	3,609	3,637	1,993	1,412	1,189
b	Millions of Baht	798	1,020	620	647	379	200	132
29a	Fluorite..............Metric tons	241,459	205,697	219,390	226,305	221,838	182,388	183,002
b	Millions of Baht	229	206	252	314	332	320	289
30a	Canned pineapple.......Metric tons	88,090	113,859	117,304	127,800	161,591	150,242	135,795
b	Millions of Baht	868	1,201	1,244	1,432	2,039	1,993	1,871
31a	Canned fish...........Metric tons	4,798	9,833	10,553	14,159	28,371	43,706	49,947
b	Millions of Baht	147	253	374	603	1,109	1,665	2,116
32a	Canned crustaceans.....Metric tons	5,052	6,241	13,408	17,038	15,250	20,722	19,580
b	Millions of Baht	257	363	844	987	1,600	1,479	1,664
33a	Molasses..............Metric tons	953,176	742,030	533,033	245,846	443,325	927,422	726,839
b	Millions of Baht	745	507	528	364	969	851	609
34a	Iron or steel tubes and pipes.......Metric tons	11,260	28,799	40,269	87,198	55,035	47,502	50,056
b	Millions of Baht	84	219	395	932	580	468	429

TABLE B. 5　(cont.)

Line			1977	1978	1979	1980	1981	1982	1983
35a	Leather gloves..........	Thousand pairs	12,211	25,333	38,654	23,994	15,340	16,867	14,922
b		Millions of Baht	134	264	553	410	242	250	223
36a	Artificial flowers......	Metric tons	3,089	3,283	5,178	4,795	5,793	5,110	4,430
b		Millions of Baht	103	120	166	286	383	372	461
37a	Wall and floor tiles....	Metric tons	17,719	28,915	21,732	19,985	20,151	21,414	25,611
b		Millions of Baht	98	199	177	218	227	217	302
38	Wood products..........	Millions of Baht	865	1,002	1,333	1,363	1,367	1,332	1,336
39	Jute products..........	Millions of Baht	479	914	1,380	1,518	1,245	1,292	1,100
40	Footwear...............	Millions of Baht	25	92	181	358	956	1,340	1,743
41	Furniture and parts.....	Millions of Baht	109	200	378	576	707	793	981
42	Plastic products.......	Millions of Baht	195	203	370	610	689	713	938
43	Jewellery..............	Millions of Baht	154	352	502	533	526	578	938
44	Others................	Millions of Baht	10,574	12,716	17,111	23,908	23,403	24,595	23,220
45	Total.................	Millions of Baht	20,634	26,014	34,332	43,830	46,951	51,571	49,494

Principal Exports by Country

Line			1977	1978	1979	1980	1981	1982	1983
	a. Rice								
1a	China.....................	Metric tons	85	11	71,668	19,627	215,247	337,579	28,999
b		Millions of Baht	-	-	374	103	1,448	1,892	143
2a	Hong Kong................	Metric tons	113,635	93,046	109,794	128,467	114,625	121,521	149,316
b		Millions of Baht	601	662	724	1,057	1,172	952	1,196
3a	India....................	Metric tons	18	333	18	16	53,983	1,006	195,608
b		Millions of Baht	-	2	-	-	469	8	997
4a	Indonesia...............	Metric tons	851,164	170,051	632,178	647,454	198,029	185,308	258,582
b		Millions of Baht	3,685	813	3,048	3,627	1,719	1,256	1,402
5a	Iran....................	Metric tons	84,934	29,189	2	182,219	324,480	317,615	400,884
b		Millions of Baht	472	176	-	1,539	3,490	2,128	2,361
6a	Malaysia................	Metric tons	204,556	160,270	103,718	152,754	235,652	407,505	254,675
b		Millions of Baht	882	891	667	1,170	2,150	2,777	1,595
7a	Saudi Arabia............	Metric tons	26,002	41,406	43,144	45,014	87,649	94,856	72,995
b		Millions of Baht	155	298	274	388	885	670	469
8a	Singapore...............	Metric tons	220,253	141,366	192,863	182,246	157,426	177,342	178,911
b		Millions of Baht	1,082	1,016	1,325	1,436	1,728	1,431	1,325
9a	United Arab Emirates...	Metric tons	1,882	14,621	53,135	119,451	46,089	16,112	29,027
b		Millions of Baht	11	107	380	1,050	435	104	174
10a	U.S.S.R................	Metric tons	-	-	57,349	207,860	273,755	41,105	200
b		Millions of Baht	-	-	357	1,739	2,619	174	1

Line			1977	1978	1979	1980	1981	1982	1983
11a	Brazil...............	Metric tons	—	—	289,615	56,890	43,017	—	106,002
b		Millions of Baht	—	—	1,819	478	352	—	603
12a	Ivory Coast.........	Metric tons	11,641	—	—	—	157,167	134,639	66,267
b		Millions of Baht	48	—	—	—	1,008	676	410
13a	Malagasy............	Metric tons	—	1,000	—	—	19,546	262,752	119,259
b		Millions of Baht	—	4	—		97	1,140	479
14a	Nigeria.............	Metric tons	272,902	473,624	198,368	177,113	190,685	195,316	471,191
b		Millions of Baht	1,578	3,527	1,246	1,380	1,769	1,147	2,783
15a	Senegal.............	Metric tons	67,428	59,503	234,447	313,625	217,267	354,366	230,962
b		Millions of Baht	233	266	889	1,554	1,171	1,378	933
16a	Others..............	Metric tons	1,091,934	422,332	810,570	566,988	697,166	1,137,121	892,602
b		Millions of Baht	4,636	2,662	4,489	3,987	5,854	6,777	5,286
17a	Total...............	Metric tons	2,946,434	1,606,752	2,796,869	2,799,724	3,031,783	3,784,143	3,476,480
b		Millions of Baht	13,383	10,424	15,592	19,508	26,366	22,510	20,157
	b. Rubber								
18a	China...............	Metric tons	12,650	8,200	16,800	16,500	10,200	29,924	38,910
b		Millions of Baht	203	145	377	471	204	525	843
19a	Japan...............	Metric tons	213,092	246,825	304,782	299,766	329,038	320,259	319,940
b		Millions of Baht	3,272	4,392	7,220	8,109	7,649	5,592	6,801
20a	S. Korea............	Metric tons	6,966	1,655	4,190	2,135	5,952	16,563	11,183
b		Millions of Baht	106	34	97	58	130	290	220

Line			1977	1978	1979	1980	1981	1982	1983
21a	Malaysia..........Metric tons		28,255	27,975	27,277	22,664	16,463	17,899	17,111
b		Millions of Baht	422	502	623	586	355	295	366
22a	Singapore.........Metric tons		53,189	80,783	75,907	45,355	32,045	58,178	53,859
b		Millions of Baht	800	1,515	1,813	1,234	717	990	1,049
23a	Taiwan............Metric tons		9,188	8,393	6,895	4,968	3,925	7,541	5,809
b		Millions of Baht	145	154	164	124	84	126	122
24a	W.Germany.........Metric tons		6,574	2,395	20,330	15,372	10,232	10,706	9,071
b		Millions of Baht	104	46	502	427	233	187	187
25a	Romania...........Metric tons		7,668	6,925	9,005	8,370	11,118	10,160	7,500
b		Millions of Baht	119	142	217	238	269	189	170
26a	U.S.A.............Metric tons		55,203	48,815	46,877	35,685	42,040	48,451	69,052
b		Millions of Baht	853	910	1,132	990	951	857	1,526
27a	Others............Metric tons		9,078	10,225	8,890	4,191	11,109	24,806	22,625
b		Millions of Baht	139	190	206	114	249	439	503
28a	Total.............Metric tons		401,863	442,191	520,953	455,006	472,122	544,487	555,060
b		Millions of Baht	6,163	8,030	12,351	12,351	10,841	9,490	11,787
	c. Maize								
29a	China.............Metric tons		−	66,313	33,801	130,410	143,340	94,610	162,014
b		Millions of Baht	−	154	81	395	510	272	537
30a	Hong Kong.........Metric tons		158,416	186,563	230,980	169,972	134,017	262,447	265,222
b		Millions of Baht	382	412	666	501	431	746	845
31a	Indonesia.........Metric tons		5,521	21,700	37,327	19,950	−	220,475	45,580
b		Millions of Baht	12	47	114	68	−	683	145

Line			1977	1978	1979	1980	1981	1982	1983
32a b	Iran..............	Metric tons Millions of Baht	- -	- -	- -	72,531 229	273,920 806	31,500 85	- -
33a b	Iraq.............	Metric tons Millions of Baht	15,905 39	88,865 1,067	151,895 1,144	82,943 310	5,996 65	1,488 556	25,488 36
34a b	Japan............	Metric tons Millions of Baht	399,955 746	545,422 1,067	469,763 1,144	111,011 310	20,619 65	185,617 556	10,580 36
35a b	Jordan...........	Metric tons Millions of Baht	- -	41,955 88	- -	643 3	99,126 320	33,302 107	61,850 193
36a b	S. Korea.........	Metric tons Millions of Baht	- -	- -	- -	- -	50,990 149	21,678 56	71,500 216
37a b	Kuwait...........	Metric tons Millions of Baht	31,235 76	30,135 70	32,085 93	59,108 209	239,653 874	82,914 258	161,749 519
38a b	Malaysia.........	Metric tons Millions of Baht	205,191 484	349,919 773	414,104 1,216	20,756 76	471,413 1,506	578,701 1,732	539,591 1,746
39a b	Philippines......	Metric tons Millions of Baht	20,865 50	81,550 199	9,960 23	44,751 146	49,109 164	126,310 397	178,400 587
40a b	Saudi Arabia.....	Metric tons Millions of Baht	107,953 258	96,249 219	157,421 457	133,397 462	201,252 663	320,563 984	370,100 1,175
41a b	Singapore........	Metric tons Millions of Baht	176,640 421	314,775 686	269,759 778	289,875 956	365,070 1,073	464,984 1,296	382,500 1,178
42a b	Taiwan...........	Metric tons Millions of Baht	389,675 804	- -	72,062 203	165,246 550	99,908 342	190,958 524	7,263 29

Line			1977	1978	1979	1980	1981	1982	1983
43a	U.S.S.R.............	Metric tons	-	-	50,892	284,096	252,579	110,690	171,690
b		Millions of Baht	-	-	158	1,057	850	308	523
44a	Others..........	Metric tons	30,602	149,000	83,936	617,816	167,616	104,464	205,172
b		Millions of Baht	73	337	258	2,077	576	321	673
45a	Total............	Metric tons	1,541,958	1,972,446	2,013,985	2,202,510	2,574,608	2,930,701	2,658,679
b		Millions of Baht	3,345	4,275	5,644	7,299	8,349	8,330	8,486
	d. Tapioca Products								
46a	Indonesia.........	Metric tons	4,750	900	6,000	11,600	2	100,648	47,271
b		Millions of Baht	17	2	24	56	-	451	253
47a	Japan............	Metric tons	97,000	94,311	59,637	58,683	78,495	79,479	60,310
b		Millions of Baht	313	271	258	313	355	401	323
48a	S. Korea.........	Metric tons	9,065	13,339	440	668	86,282	55,869	122,734
b		Millions of Baht	17	24	2	3	227	134	363
49a	Taiwan...........	Metric tons	45,429	103,769	24,109	61,211	85,961	70,103	80,849
b		Millions of Baht	117	214	109	314	370	324	426
50a	Belgium..........	Metric tons	88,716	610,941	467,509	787,204	209,932	369,482	130,992
b		Millions of Baht	179	1,061	1,242	2,517	724	893	354
51a	France..........	Metric tons	139,087	473,222	265,574	125,365	101,633	166,061	89,593
b		Millions of Baht	268	822	636	344	260	419	251
52a	W.Germany........	Metric tons	186,570	435,895	223,891	339,384	243,808	279,697	97,706
b		Millions of Baht	345	750	547	982	608	690	270
53a	Italy...........	Metric tons	7,871	209,236	166,421	73,995	76,493	124,128	27,025
b		Millions of Baht	13	357	376	197	187	311	76

TABLE B. 6   (cont.)

Line			1977	1978	1979	1980	1981	1982	1983
54a	Netherlands.......	Metric tons	3,302,129	4,208,746	2,683,645	3,666,326	4,907,321	6,379,568	4,362,394
b		Millions of Baht	6,216	7,052	6,476	9,768	12,229	15,405	12,115
55a	U.S.S.R.........o...	Metric tons	-	-	148	-	307,050	54,380	88,510
b		Millions of Baht	-	-	1	-	876	235	484
56a	U.S.A.............	Metric tons	33,549	33,005	21,222	27,272	40,627	25,209	35,983
b		Millions of Baht	126	118	99	163	220	133	211
57a	Others...........	Metric tons	40,199	104,601	42,605	65,994	128,229	110,831	53,334
b		Millions of Baht	109	221	121	230	390	356	261
58a	Total...........	Metric tons	3,954,365	6,287,965	2,961,201	5,217,702	6,265,833	7,815,455	5,196,751
b		Millions of Baht	7,720	10,892	9,891	14,887	16,446	19,752	15,387
	e. Prawns								
59a	Hong Kong.........	Metric tons	2,829	2,232	2,699	2,341	2,725	3,431	2,503
b		Millions of Baht	113	91	115	100	129	188	139
60a	Japan............	Metric tons	7,404	8,596	10,123	10,074	10,395	9,804	7,662
b		Millions of Baht	779	1,055	1,651	1,362	1,450	1,853	1,536
61a	Singapore........	Metric tons	-	1	2	84	344	375	459
b		Millions of Baht	-	-	-	6	36	39	42
62a	France..........	Metric tons	83	160	87	146	247	384	378
b		Millions of Baht	4	7	6	20	23	36	44
63a	W.Germany........	Metric tons	245	189	202	349	280	394	479
b		Millions of Baht	40	35	45	66	51	74	110

Line			1977	1978	1979	1980	1981	1982	1983
64a	Italy............	Metric tons	308	1,405	527	996	584	740	157
b		Millions of Baht	15	69	33	63	37	50	115
65a	United Kingdom....	Metric tons	86	469	581	421	689	718	894
b		Millions of Baht	7	39	72	39	70	86	115
66a	U.S.A............	Metric tons	2,088	1,835	4,256	2,921	2,475	3,458	6,149
b		Millions of Baht	192	178	439	240	235	351	873
67a	Australia........	Metric tons	71	226	69	295	417	418	1,002
b		Millions of Baht	7	17	5	46	72	53	216
68a	Others...........	Metric tons	547	265	80	288	605	416	467
b		Millions of Baht	14	9	6	19	33	34	77
69a	Total...........	Metric tons	13,661	15,378	18,626	17,915	18,761	20,138	20,150
b		Millions of Baht	1,171	1,500	2,372	1,961	2,136	2,764	3,164
	f. Tin								
70a	Japan...........	Metric tons	6,056	6,109	5,828	5,914	4,496	4,324	3,941
b		Millions of Baht	1,289	1,530	1,727	1,979	1,363	1,295	1,175
71a	Netherlands......	Metric tons	8,168	15,620	14,643	14,951	14,666	10,379	5,935
b		Millions of Baht	1,761	3,856	4,341	5,018	4,459	3,461	1,760
72a	U.S.A...........	Metric tons	7,213	7,165	10,837	13,090	9,859	9,775	7,292
b		Millions of Baht	1,492	1,831	3,184	4,350	2,956	2,904	2,171
73a	Others..........	Metric tons	-	49	-	-	1,053	411	556
b		Millions of Baht	-	12	-	-	313	113	159

Line			1977	1978	1979	1980	1981	1982	1983
74a	Total............	Metric tons	21,437	28,943	31,308	33,955	30,074	24,889	17,724
b		Millions of Baht	4,542	7,229	9,252	11,347	9,091	7,773	5,265
	g. Sugar								
75a	China............	Metric tons	390,232	239,807	61,183	52,570	109,798	518,437	83,599
b		Millions of Baht	1,813	938	240	352	834	3,049	299
76a	Indonesia........	Metric tons	9,557	5,282	-	-	18,813	64,460	45,905
b		Millions of Baht	37	18	-	-	115	404	202
77a	Japan............	Metric tons	627,092	411,357	655,232	123,766	104,474	401,602	632,902
b		Millions of Baht	2,753	1,533	2,738	807	871	1,997	2,559
78a	S. Korea.........	Metric tons	10,855	73,101	78,007	15,089	113,833	93,810	165,169
b		Millions of Baht	46	278	307	108	1,156	575	684
79a	Malaysia.........	Metric tons	173,733	108,543	123,307	17,943	42,975	98,500	78,906
b		Millions of Baht	695	418	456	112	363	540	305
80a	Saudi Arabia.....	Metric tons	-	-	-	-	-	35,900	21,026
b		Millions of Baht	-	-	-	-	-	253	110
81a	Singapore........	Metric tons	1,123	24,566	45,394	17,733	16,340	681	1,907
b		Millions of Baht	5	97	169	124	127	3	9
82a	Sri Lanka........	Metric tons	19,638	-	-	-	-	6,841	66,729
b		Millions of Baht	73	-	-	-	-	33	294
83a	U.S.S.R..........	Metric tons	-	-	42,959	71,362	269,942	593,806	129,511
b		Millions of Baht	-	-	171	476	2,122	3,374	444

Line			1977	1978	1979	1980	1981	1982	1983
84a	U.S.A.	Metric tons	-	64,997	33,764	79,496	275,116	290,948	29,683
b		Millions of Baht	-	267	129	559	2,548	2,039	186
85a	Egypt	Metric tons	-	-	-	-	-	-	44,667
b		Millions of Baht	-	-	-	-	-	-	226
86a	Morocco	Metric tons	-	-	74,961	48,288	132,792	65,196	71,426
b		Millions of Baht	-	-	286	257	1,102	423	299
87a	Others	Metric tons	422,380	112,396	75,011	25,449	34,556	36,059	165,381
b		Millions of Baht	2,023	421	301	180	334	242	721
88a	Total	Metric tons	1,654,610	1,040,049	1,189,818	451,696	1,118,639	2,206,240	1,536,891
b		Millions of Baht	7,445	3,970	4,797	2,975	9,572	12,932	6,338

h. Integrated Circuits

Line			1977	1978	1979	1980	1981	1982	1983
89a	Hong Kong	Thousand units	9,330	19,340	20,976	40,004	35,552	31,916	17,893
b		Millions of Baht	80	207	155	411	474	566	263
90a	S. Korea	Thousand units	25,664	35,482	48,974	73,351	21,069	11,130	13,989
b		Millions of Baht	97	124	184	274	107	35	30
91a	Malaysia	Thousand units	36,343	47,454	54,308	152,152	83,882	24,602	7,620
b		Millions of Baht	171	201	277	892	552	260	30
92a	Singapore	Thousand units	68,905	82,751	96,820	165,288	128,288	114,832	145,622
b		Millions of Baht	455	877	1,532	2,861	2,609	2,294	2,999
93a	France	Thousand units	-	-	-	28	414	1,411	3,823
b		Millions of Baht	-	-	-	-	5	28	159

Line			1977	1978	1979	1980	1981	1982	1983
74a	W. Germany........Thousand units		-	3	454	9,094	18,274	27,897	13,545
b		Millions of Baht	-	-.	3	43	85	182	78
95a	United Kingdom....Thousand units		412	1,256	501	2,992	3,036	7,911	1,035
b		Millions of Baht	4	11	4	30	32	100	58
96a	U.S.A............Thousand units		29,143	65,520	87,492	171,777	295,832	218,022	226,680
b		Millions of Baht	336	734	729	1,617	2,295	2,416	2,116
97a	Others...........Thousand units		1,340	2,884	4,538	6,530	12,753	10,284	23,667
b		Millions of Baht	2	4	19	28	34	39	96
98a	Total............Thousand units		171,137	254,690	314,063	621,186	599,100	448,005	453,879
b		Millions of Baht	1,145	2,158	2,903	6,156	6,193	5,930	5,829
	i. Textile Products								
99	Bangladesh........Millions of Baht		7	23	50	54	61	76	75
100	Hong Kong........Millions of Baht		319	548	698	675	848	835	657
101	Indonesia........Millions of Baht		90	64	56	137	180	176	34
102	Japan............Millions of Baht		172	312	464	374	577	618	494
103	Kuwait...........Millions of Baht		54	68	89	134	348	273	225
104	Laos.............Millions of Baht		16	23	68	213	104	136	200
105	Malaysia.........Millions of Baht		105	217	191	153	165	278	213
106	Philippines......Millions of Baht		24	46	53	23	13	25	29
107	Saudi Arabia.....Millions of Baht		158	227	410	425	529	719	663
108	Singapore........Millions of Baht		223	519	591	351	585	891	776
109	United Arab Emirates.........Millions of Baht		141	432	473	607	713	569	747
110	Denmark..........Millions of Baht		174	195	301	255	215	231	218
111	France...........Millions of Baht		66	88	199	282	513	524	431

TABLE 1. 8 (cont.)

Line		1977	1978	1979	1980	1981	1982	1983
112	W. Germany........Millions of Baht	490	554	880	1,057	1,075	1,342	1,295
113	Italy............Millions of Baht	418	476	770	893	768	871	682
114	Netherlands.......Millions of Baht	108	121	213	293	348	459	431
115	Sweden...........Millions of Baht	126	146	247	267	272	295	293
116	United Kingdom....Millions of Baht	186	225	406	455	709	829	600
117	Canada...........Millions of Baht	95	44	151	87	174	165	382
118	U.S.A............Millions of Baht	822	1,443	1,353	1,450	2,518	2,649	3,931
119	Australia........Millions of Baht	93	114	130	118	163	208	368
120	Others...........Millions of Baht	707	981	1,002	1,340	1,692	1,836	1,607
121	Total............Millions of Baht	4,594	6,866	8,795	9,643	12,570	14,005	14,351
	j. Precious Stones							
122	Hong Kong........Millions of Baht	87	206	260	429	693	801	939
123	Japan............Millions of Baht	202	514	582	546	912	1,179	1,531
124	Singapore........Millions of Baht	4	8	17	14	27	44	83
125	Belgium..........Millions of Baht	6	10	17	34	57	102	170
126	France...........Millions of Baht	36	87	123	174	228	172	197
127	W. Germany.......Millions of Baht	75	118	154	201	259	229	266
128	Italy............Millions of Baht	30	40	70	98	139	227	160
129	Spain............Millions of Baht	11	7	9	19	47	72	69
130	Switzerland......Millions of Baht	221	213	407	640	874	825	1,040
131	United Kingdom....Millions of Baht	71	76	116	121	139	133	180
132	U.S.A............Millions of Baht	212	310	388	824	850	672	1,315
133	Australia........Millions of Baht	21	18	19	58	105	62	46
134	Others ....Millions of Baht	80	100	88	82	156	153	218
135	Total............Millions of Baht	1,056	1,707	2,250	3,240	4,486	4,671	6,214

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B I B L I O G R P H Y

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