3.3.3 Prospect for Regional Center

As the completion of the two major infrastructure projects of the Eastern Seaboard Development Program, the Laem Chabang Deep-sea Port and the Map Ta Phud Industrial Port, is in sight, the Program is getting momentum. Some large scale factories have started operation in the huge Laem Chabang Industrial Estate and many are under construction or in the waiting. The first phase of the Laem Chabang Industrial Estate is expected to be filled in a short time. The second phase, the remaining 60% of the area, will be constructed in due course. For Map Ta Phud more than a dozen large scale plants, many are petrochemical related, have already applied for operation. And Phatthaya is conveniently located between Laem Chabang and Map Ta Phud.

Figure 3.3.2 shows schematically advantages of Phatthaya as a regional center. Its location and access to other parts of the region as well as to Bangkok is excellent, and it is the only area in the region where urban services comparable to Bangkok are already available.

Phatthaya will attract not only executives and managers of plants in Laem Chabang and Map Ta Phud but also industries serving industrial plants. Offices will be built where supporting services are available, that is Phatthaya.

Private sector already recognized the advantages and saw the opportunity. the construction boom of condominiums in Phatthaya, particularly in Jomtien Beach, is largely attributable to developers and purchasers' anticipation of latent demand for living quarters by executives of plants and other businesses in Laem Chabang, Map Ta Phud and service businesses in Phatthaya. The availability of condominiums in Phatthaya will induce company's decision on office location. Such offices will further reinforce condominiums. A self-reinforcing cycle has already begun.

There is little doubt that Phatthaya will become the main center of the whole Eastern Seaboard Region accepting influx of people and businesses regardless one likes it or not. It is therefore of vital importance to make a proper plan and implement it if Phatthaya is to maintain its reputation as one of the favorite tourist destinations.

Additional employment in Phatthaya generated by the Eastern Seaboard Program was estimated in 1982 at 5,000 by 2001. Because of time delay in implementation of the program, this estimate would not be far from what will

actually take place. But the eventual figure for the generated employment would far exceed 5,000.

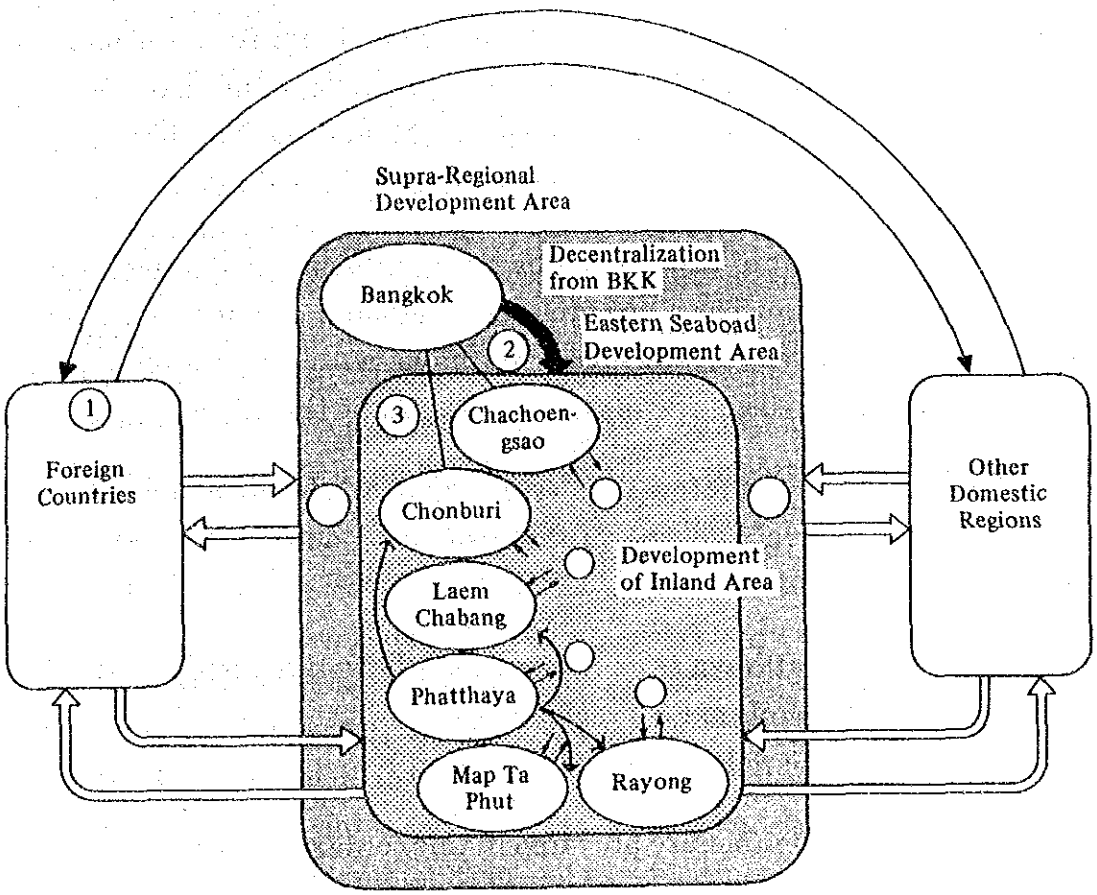

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Fig. 3.3.2
Phatthaya as Regional Center

3.4 Development Guidelines and Framework

3.4.1 Development Guidelines

Phatthaya has been playing a vital role in the national economic growth as an international resort of good repute. With the sharp rise of tourists and associated large investment by the private sector and inability of the public sector investment to meet the infrastructure requirement together with inadequate control of land use, disorderly land development and various urban problems have become serious, which now threaten the fame of Phatthaya.

As the development of ESB region has gone into orbit with the initiation of Laem Chabang and Map Tha Phut projects, a regional core for supporting their activities is required to be established. Phatthaya, with its locational advantage and established urban structure, is expected to assume the role of regional center.

Under these circumstances, it is essential to work out a proper guideline toward comprehensive and coordinated development with the following objectives:

- Revival of Phatthaya as an internationally well reputed resort
- Assuming the role of ESB regional center
- Enhancing the welfare of local community

The following guidelines are prepared in this context.

1) Guidelines for Regional Development

(1) Multi-Function City/ESB Regional Center
To exploit the locational advantages of closeness to the Bangkok Capital region and the central location of the ESB region as well as existing accumulation of urban facilities and manpower, Phatthaya area should be developed aiming at creating a mutli-function urbanized area (city) by adding or strengthening the functions of business, commerce, event-holding, service and information exchange as well as upgrading of the present tourism and resort function for international tourists. In particular, in order to back up the economic activities of the ESB region including Laem Chabang and Map Tha Phut manpower resources should be enhanced urgently.

(2) Preparation and Enforcement of General Plan and Specific Plan
To promote orderly development of the Study Area is essential for the

promotion of the efficient land use of the Study Area. General Plan prepared by DTCP in 1988 covers only the municipal area of Phatthaya and Bang Sare area is covered by Sanitary District Development Plan. Ko Lan and Na Jomtien areas are presently not designated as a city planning area and any development plan covers those area except "Changwat Structural Plan". In order to lead the development of the area, it is required to prepare the General Plans and Specific Plans for strict implementation of the detailed designation of land use.

(3) Acceleration of Infrastructure Development

To prevent or at least alleviate the existing urban problems caused mainly by the gap between the public investment on infrastructure facilities and aggressive investment by the private sector, public investment on infrastructure should be accelerated. Private investment should be regulated and administered by the Government so that they should comply with the development schedule of the public sector.

(4) Balanced development of the Study Area

To avoid the over-concentration of urban and tourism activities and associated urban problems including pollution in the coastal strip of the Study Area, development should be expanded to the inland area where land is available at relatively lower prices. Public sector should develop infrastructure facilities including road, water supply and other utilities according to a well-structured land use plan, in order to invite the private investment on tourism and various amenity facilities.

(5) Conservation of Natural Environment

In order to provide agreeable environment for the visitors as well as residents, environmental problems including water pollution and traffic congestion which are conspicuous particularly in the Phatthaya City area should be solved or at least alleviated by enhancing necessary infrastructure and reinforcing monitoring and enforcement of laws and regulations more strictly. Precious natural environment in the Tha Farang-Bang Sare area and Ko Lan including forest, wildlife and corals should be conserved duly by applying strict land use control and building permit.

(6) Safety and security

To provide more comfortable environment for the tourists and residents, measures should be taken for preventing natural disaster including flooding and reducing accidents induced by land and marine traffic.

Security should be strengthened by reinforcing police manpower and activities, considering the large number of non-resident population (tourists) and seasonal migrants.

2) Guideline for Tourism Development

(1) Although Phatthaya is a well-known marine resort, principal resources of beach and sea have been degraded. Enhancement should be urgently implemented. For those facilities which do not generate direct revenue, public sector should take initiative including funding.

(2) Regional tourism center

At present, Phatthaya is a major tourist destination in the national tourism network. To exploit the locational advantage of Phatthaya further, transport network, marine network in particular, should be set up by constructing tourism jetties and opening the sea routes between Phatthaya and Hua-Hin, Cha'am, Ko Samui, Songkla and Bangkok. Necessary tourist information should be stored and made available at Phatthaya for regional tourist activities.

(3) Inland area development

In order to avoid the over concentration of tourism activities in the coastal area, expansion of tourism development to the inland area should be promoted. The development should be accompanied by the urban infrastructure development in the area, particularly, transport network, utilities and urban facilities to support the tourism investment by private sector.

(4) Promotion of art and culture

"Art and culture" aspect should be upgraded to increase the variety of tourism attractions. Promotion of art and culture will contribute not only to attracting tourists but to upgrading the regional cultural standard and fulfilling the urban function as a centre of the Eastern Seaboard Development area. The necessary facilities should be prepared by the public sector, such as multi purpose hall, aquarium, museum and exhibition facilities.

(5) Promotion of events

Events such as convention, major trade exhibitions, major concerts, sports events, etc., will be one of the major potential activities proposed for Phatthaya. Well established accommodations and accumulated urban functions will be offered for the services for the visitors of events. The events will invite more visitors to Phatthaya as a new attraction through all the year around. It is recommended to undertake the event especially during the low tourist season. It is highly effective to increase the visitors in this season and improve the efficiency of the utilization of the facilities because the audience and attendants of the events are big potential tourists.

In order to promote the events effectively, it is recommended to establish a "coordination body" by the cooperation of the public and private sectors. The seasonal program, use of facilities and business promotion to invite the events to Phatthaya should be the responsibility of the "coordination body".

(6) Human resources

The human resource is essential elements to maintain the standard of service and operation of the tourist industry. Constant of qualified manpower should be satisfied by the well organized vocational training program. It is recommended that the private sector should take initiative for setting up the program. The public sector should give the legal and administrative support for giving licence, recognition of degree, etc.

(7) Increase of repeaters

In order to establish a stable tourism market, the increase of repeaters is of vital importance. Renovation, modification, discovery and creation of new tourism attractions should be constantly conducted with the effort of tourism relating organizations in Phatthaya. Event program, creation of new service, upgrading of hospitality are required as necessary "software" of tourism with upgrading of facilities as "hardware".

3) Improvement of Legal, Institutional and Financial Settings

(1) Institutional

(I) Development of the Study Area is very rapid and, therefore, close monitoring and prompt responses for taking measures to meeting the situation are essential considering the above. Institutional framework should be adjusted so that coordinated actions be taken among the Phatthaya City Government, Chonburi Provincial Government and Central Government including her branch offices in and around Phatthaya.

(ii) According to Royal Decree, numbers of civil servants and employees including police officers are determined according to the registered population of the Phatthaya City, resulting in inadequate manpower resources for city administration. Considering the actual population including the non-registered and huge number of visiting tourists, necessary actions should be taken to strengthen the manpower of the City Government for better management and control of the development as well as for provision of necessary infrastructures.

(2) Financial

(i) In 1987, 1.4 million tourists visited Phatthaya. Total expenditure of these tourists amounted to 16.4 billion Bahts, of which 15.4 billion Bahts were disbursed by foreign visitors. Further the Phatthaya area is expected to play a key role for the development of the ESB region as its regional center. Considering these important functions of the area in line with the national development policy, budget allocation of the Central Government should be reinforced sharply to develop adequate infrastructure facilities for the sustainable growth of the area.

(ii) To vitalize the Phatthaya area further, private investment should be strengthened on the condition that they should be directed to orderly development of the area, keeping pace with the infrastructure development by the public sector.

(iii) The Phatthaya area has been experiencing rapid development these years. Accordingly the level of economic activities has been raised and land price went up sharply. Tax structure as well as the applied

rates should be so revised that they reflect the advanced economy in order to enhance the revenue base of the city administration.

(iv) Principle of "beneficiary-to-pay" should be placed more emphasis and applied as far as practicable in collecting charges and fees by city administration and in meeting public development expenditure including these for alleviating the present urban problems. External diseconomy should be elimated.

(3) Legal

(i) Present law and regulation framework functioned properly while the Phatthaya area remained rural area but now need to be strengthened for the rapidly developing urbanized area of Phatthaya. Provisions should be augmented for more detailed land use, for example. Stronger legal support should be given to the local administration to cope with various urban problems including water pollution, encroachment to public land and disorderly land development by affording legal facilities for monitoring, conducting surveillance of, taking necessary actions against violation including giving penalties.

3.4.2 Tourism Growth Framework

The growth of guest arrivals to the Study Area was analyzed focusing on the following aspects.

- growth potential
- basic development policies on desired level of development
- cross-checking by existing estimates

1) Growth Potential

Regarding the future growth prospect of the Study Area, a number of cases are conceivable depending on the range and extent of measures to be taken by Phatthaya City and the Thai government as explained in Section 3.3.2.

Among three cases assumed, case I (no growth or decline) is the most undersired scenario from the viewpoint of the regional growth and contribution to the national economy. Measures to solve the problems which Phatthaya is currently facing should be positively taken to prevent this situation from taking

place. In the event that fundamental and positive measures are taken to eradicate the problems and enhance the attractiveness of Phatthaya, either case II-1 ($3,241 \times 10^3$ guest arrivals in 2006) or case II-2 ($4,514 \times 10^3$) is possible to be realized.

From the viewpoint of accelerating economic growth of the Study Area, either case II-1 or case II-2 is desirable. To achieve the figures of case II-1 or Case II-2 as the target in the future, Phatthaya City and the Thai Government should consolidate their efforts to further promote the tourism and to upgrade the infrastructure.

2) Basic Development Policies on Desired Level of Development

The number of guest arrivals to the Study Area in the target years needs to be analyzed from the viewpoint of regional development policy and supply capacity of the Study Area as well. In this sense, the following aspects were analyzed.

- availability of land area and desirable level of development
- availability of water resources

Land Requirements

Land requirement arising from the two alternative cases (Case II-1 and II-2) of the guest arrivals were estimated and compared with available land suitable for development. The following are the basic assumptions underlying the land requirement estimate.

- New development from now on takes place mostly in Jomtien area.
- Further development in Tha Farang area will be limited as much as possible to conserve natural resources.

The following table presents the balance of land requirement and availability in coastal strip of Jomtien area.

Item	(Unit)	Case II-1	Case II-2
(a) Guest Arrival, 2006	(10^3)	3,241	4,514
(b) Area Additionally Required in net			
- beach front /1	(ha)	44	75
- "inland area" /2	(ha)	88	150
- Total	(ha)	132	225
(c) Available land			
- beach front /1	(ha)	110	110
- inland area /2	(ha)	180	180
- Total	(ha)	290	290
(d) Balance (c - b)			
- beach front /1	(ha)	66	35
- inland area /2	(ha)	92	30
- Total	(ha)	158	65
(e) Balance (b/c)			
- beach front /1	(%)	40	68
- inland area /2	(%)	50	83
- Total	(%)	45	78

Remarks: /1 Area within 400 m from beach
/2 "Inland area" here means the area behind beach front area and 200 m toward inland
/3 Details are shown in Table 4.2.4.

Process of deriving the figures above is presented in Table 4.2.4.

In case II-1, area additionally required to accommodate 3,241 thousand tourists amounts to 130 ha in 2006, about a half (45%) of the land available in Jomtien's coastal area. In Case II-2, about 225 ha or 78% of the available land needs to be developed to accommodate $4,514 \times 10^3$ tourists.

As explained in sub-section 5.1.3 "Development Perspective for Each Area", desirable growth direction of Jomtien Beach Area is to grow the area into an amenity town with beautiful beach. It would be possible to achieve this target under case II-1 scenario. Areas left out from private development, amounting to 158 ha or 55% of the total available area, could be used to attach unique characteristics to Jomtien Beach Area. These areas could be utilized mainly for public purpose through allocating such functions as parks, spacious plaza, wide street, green area, pedestrian mall etc. With these new

functions, Jomtien Beach Area will have distinct characteristics from the existing Phatthaya area. Good mixture of natural beauty and urban amenity in Jomtien Beach Area would become one of the major attractions of the Study Area contributing to attracting potential visitors.

Under Case II-2 scenario, the area required to accommodate $4,514 \times 10^3$ tourists amounts to 225 ha or 78% of the total available land. It would be almost impossible to allocate sufficient spaces to a variety of public and amenity functions. Jomtien Beach Area will become an area just like hotel areas of existing Phatthaya. From the viewpoint of growing Jomtien Beach Area into "Amenity town with beautiful beach", this scenario is not desirable.

Availability of Water Resources

As explained in Section 3.3.1 "Advantages and Constraints" for development, water resources available in the Study Area is not abundant. In the midium-run by 1996 at earliest, water requirement in the Study Area will have to be catered for by existing and potential water resources in and around the Study Area. In the long-run, water diversion from Nong Kho reservoir could be expected, once water pipeline connecting Nong Pla Lai reservoir and Nong Kho reservoir is completed and water supply capacity of Nong Kho reservoir is augmented. In the following part, water supply and demand balance is analyzed for case II-1 and II-2 to assess an appropriate level of development in the Study Area from the viewpoint of water resources availability.

Table 3.4.1 and Fig. 3.4.1 presents water supply and demand balance in the Study Area in 1996 and 2006.

Water supply capacity in the Study Area is estimated to be 31.6×10^6 m^3, of which 9.6×10^6 m^3 is supplied by the existing Map Prachan reservoir and the remaining 22.0×10^6 m^3 by planned four new reservoirs and a pipeline as explained in subsection 4.2.7. Water supply capacity was assumed to be augmented in the year in which all water supply facilities for the reservoirs are completed. Water demand was calculated based on unit water consumption rates, population and guest arrivals presented in Section 3.3.2 for each case (II-1 and II-2) respectively.

The water supply and demand balance derived shows that in both cases of II-1 or II-2, water supply capacity falls short of water demand after around 1996. Water diversion from other river basin (e.g., Nong Kho reservoir) will become necessary to meet increasing demand in 1997.

From the viewpoint of water resources availability, development under case II-1 scenario is desirable for the following reasons.

- Once on-going water resources and supply projects in the Study Area are completed in 1992, water supply capacity will be able to cater for most of water demand until the medium target year 1996. Water shortage, however, in case II-2 will be about 2.8×10^6 m^3 or 10% of the total demand in 1996.

- In the long-run, it would be easier to secure water required for diversion from Nong Kho reservoir in Case II-1 than in Case II-2, since required amount of water to be diverted is less in volume.

3) Evaluation of Tourism Forecasts for Phatthaya

The preceding sections concluded that the desirable target of tourist arrivals to Phatthaya for the year 2006 were 1,374,000 Thais and 1,867,000 foreigners. Implied growth rates are 6.64% per annum for Thais and 3.27% per annum for foreigners over 1987 figures.

Thai Tourists to Phatthaya

During the period 1982-1987 Thai Tourists to Phatthaya grew on average at a rate of 22.1% per year or with an average annual increase of 51,000. The following table and Figure 3.4.2 show annual Thai tourist arrivals to Phatthaya.

Thai Tourists Arrivals to Phatthaya

1982	1983	1984	1985	1986	1987
149,527	161,799	210,619	233,613	300,343	405,270

Source: TAT Statistics (Unit: in person)

During the same period Gross Domestic Product grew at a rate of 5.9% per annum. the following table and Figure 3.4.3 show the growth during that period.

Gross Domestic Product of Thailand

1982	1983	1984	1985	1986	1987
331,228	355,408	380,738	394,113	412,609	441,893

Source: NES D B Statistics (Unit: in Million Baht)

The elasticity of Thai tourists to Phatthaya with respect to GDP for that period was thus 3.75. It is reasonable to assume that Thailand, particularly Bangkok, has reached a stage that the growth of tourism exceeds the growth of economy. However, during the above period Phatthaya was in a position without much completion with other tourist destinations in Thailand, although the share of Phatthaya in the domestic tourism market has already started to decline as shown in the table below and Figure 3.4.4.

Share of Phatthaya in the Domestic Market

1983	1984	1985	1986
18.45	17.16	17.83	19.06

Source: TAT Statistics (Unit: in Percent)

The situation has started to change rapidly as far as the completion with other tourist destinations is concerned. Many resorts have been started, accommodation facilities in upcountry cities have been upgraded and many more are under construction or under planning in recent years. The share of Phatthaya in the total Thai tourist arrivals among major tourist destinations in Thailand fell from 18.9% in 1984 to 16.1% in 1986. The drop in the share must have been more pronounced in recent years and will continue to decline. It is therefore reasonable to assume that the share of Phatthaya would keep falling and the growth of the total Thai Tourist arrivals would not be exponential in the future. The annual increment of Thai tourist arrivals of 51,000 should be considered reasonable.

Foreign Tourist Arrivals

During the period of 1982-1987 the total number of foreign tourist arrivals to Phatthaya grew at an annual rate of 1716% or with an average annual increment of 112,435. For the year 1987 an intensive tourism campaign was carried out as it was designated as "Visit Thailand Year" and its result was a 50% jump in the total foreign tourist arrival in Thailand in that year. The following table and Figure 3.4.5 shows the growth of the total tourist arrivals in Thailand. The average growth rate for the period of 1983-1988 was 14.1% per annum.

Growth of Total Tourists Arrivals in Thailand

1982	1983	1984	1985	1986	1987	1988
2,218	2,191	2,347	2,438	2,818	3,483	4,231

Source: TAT Statistics (Unit: in thousand persons)

According to the statistics made by the World Tourism Organization during the period of 1983-1988 the total tourist arrivals in the world grew at a rate of

major tourist generating countries. Reflecting the strengthening of tourism facilities and respective economies in general, the share of ASEAN countries in the world market has been steadily growing as shown in the following table and Fig. 3.4.6.

Tourists Arrivals in ASEAN Countries in the World

	1983	1984	1985	1986	1987	1988
World Tourism/	292,298	315,359	332,911	332,924	358,659	390,000
Tourism to ASEAN/	13,527	14,303	14,792	16,176	18,409	20,687
Shares of ASEAN in the World	(4.6%)	(4.5%)	(4.4%)	(4.9%)	(5.1%)	(5.3%)

Source: WTO, MOT Statistics (Unit: in thousand persons)

The average growth rate of ASEAN countries was 8.9% per annum for the period. Within ASEAN Thailand fares well. Its share grew from 16.2% in 1983 to 20.5% in 1988 as shown in the table below and Figure 3.4.7.

Tourists Arrivals in Thailand Among ASEAN Countries

	1983	1984	1985	1986	1987	1988
Arrivals to ASEAN/	13,527	14,303	14,792	16,176	18,409	20,687
Arrivals to Thailand/	2,191	2,347	2,438	2,818	3,263	4,231
Shares of Thailand in ASEAN	(16.2%)	(16.4%)	(16.5%)	(17.4%)	(17.7%)	(20.5%)

Source: WTO, TAT Statistics (Unit: in thousand persons)

Phatthaya is the second most popular tourist destination in Thailand. Its share in the foreign tourist market, however, has also been declining in recent years as shown in the table below and Figure 3.4.8, from 23.1% in 1983 to 16.1% in 1988. Phatthaya may well have been in the bottom in terms of popularity due to widely published pollution problems and proliferation of a certain disease. With the effort being undertaken by various quarters to reverse the trend of popularity decline, it is not unreasonable to assume that the share of Phatthaya

in the foreign tourist market in Phatthaya be stabilized at 16% of the total foreign tourist arrivals in the long run.

Foreign Visitors to Major Tourism Destinations

	1983	1984	1985	1986
Bangkok	1,143,044	1,619,796	2,469,291	2,743,180
Chiang Mai	144,791	187,144	215,600	268,129
Kanchanaburi	59,793	37,862	8,021	25,601
Phatthaya	431,775	470,800	562,434	633,624
Phuket	86,965	173,428	156,174	253,731
Total	1,866,368	2,489,030	3,408,520	3,924,265
Share of Phatthaya	(23.13%)	(18.9%)	(16.5%)	(16.1%)

Source: TAT Statistics (Unit: in person)

Assuming that foreign tourist arrivals in Thailand among ASEAN would grow at a long run growth rate of 5.5% per annum, the total would reach 54,230,000 by 2006. Thailand share by then would be at a figure slightly higher than now, say 22%. Assuming again Phatthaya a share at 16%, the total foreign tourist arrival can be calculated at 1,909,000.

According to the comparison of foreign tourists to Phatthaya in the world tourists, average ratio of the number of foreign tourist is 0.19% of world tourists.

The average increase ratio of world tourist is 5.3% and it is calculated at 570,870 million in 1996 and 956,799 million in 2006. therefore the foreign tourists to Phatthaya will be:

1996 570,870 mill. $\times$0.19% =1,084,653
2006 956,799 mill. $\times$0.19% =1,817,918

The previously arrived desired target figure of 1,867,000 seems quite reasonable.

Table 3.4.1 WATER SUPPLY DEMAND BALANCE IN 1996 AND 2006

Item	Unit	1989	Case II-1		Case II-2	
			1996	2006	1996	2006
A. Domestic population		100,000	161,000	220,000	183,000	273,000
Unit Consumption	lcd	230	289	303	289	303
Service Factor	%	49	64	77	64	77
Water demand	MCM/year	4.1	10.9	18.7	12.4	23.2
B. Public (15% of domestic)	MCM/year	0.6	1.6	2.8	1.9	3.5
C. Tourism						
Number of guest arrivals		1,609,000	2,281,000	3,241,000	2,750,000	4,514,000
Unit of consumption	lcd	850	900	900	900	900
Water demand	MCM/year	5.5	8.2	11.7	9.9	16.3
D. Commercial (52% of tourism)	MCM/year	2.8	4.3	6.1	5.1	8.5
E. Total	MCM/year	13.0	25.0	39.3	29.3	51.4
Total Water Demand (assuming loss of 15%)	MCM/year	15.3	29,.4	46.2	34.4	60.5
F. Deficit/surplus (demand minus 31.6 MCM)	MCM/year	-6.6	-4.4	-21.2	-9.4	-35.5

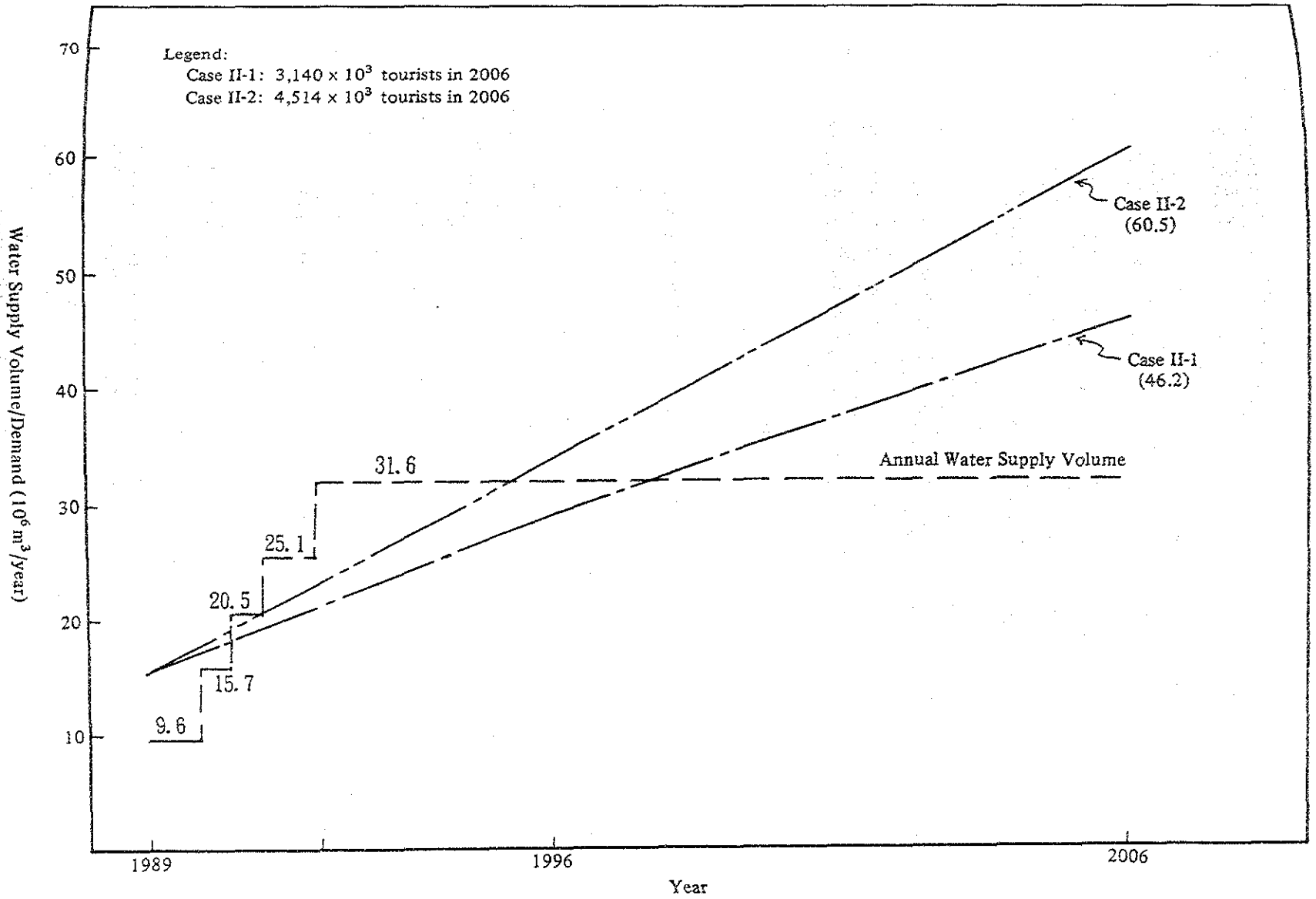
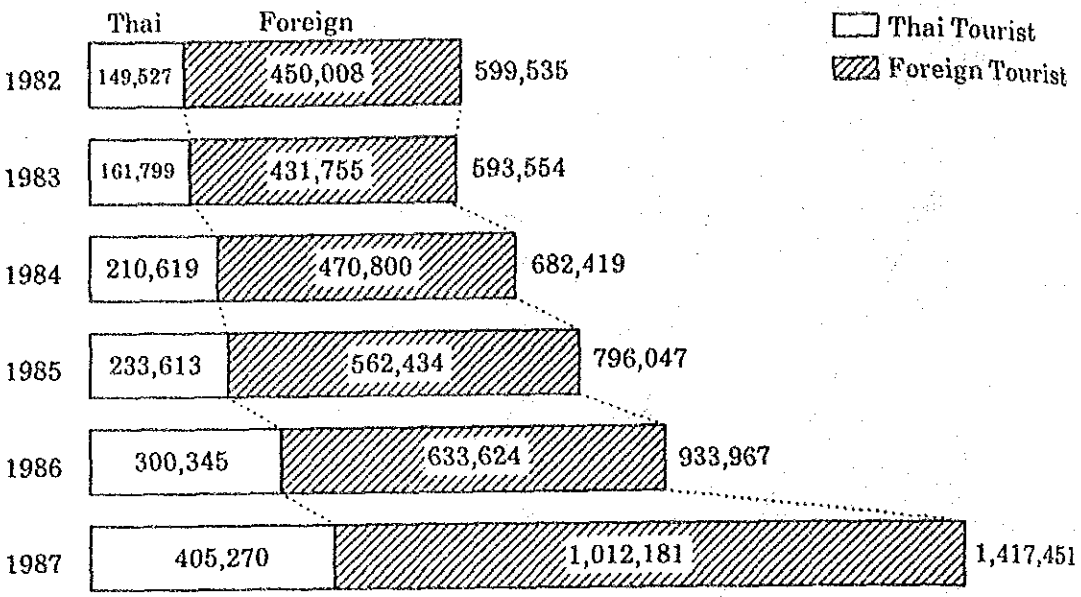


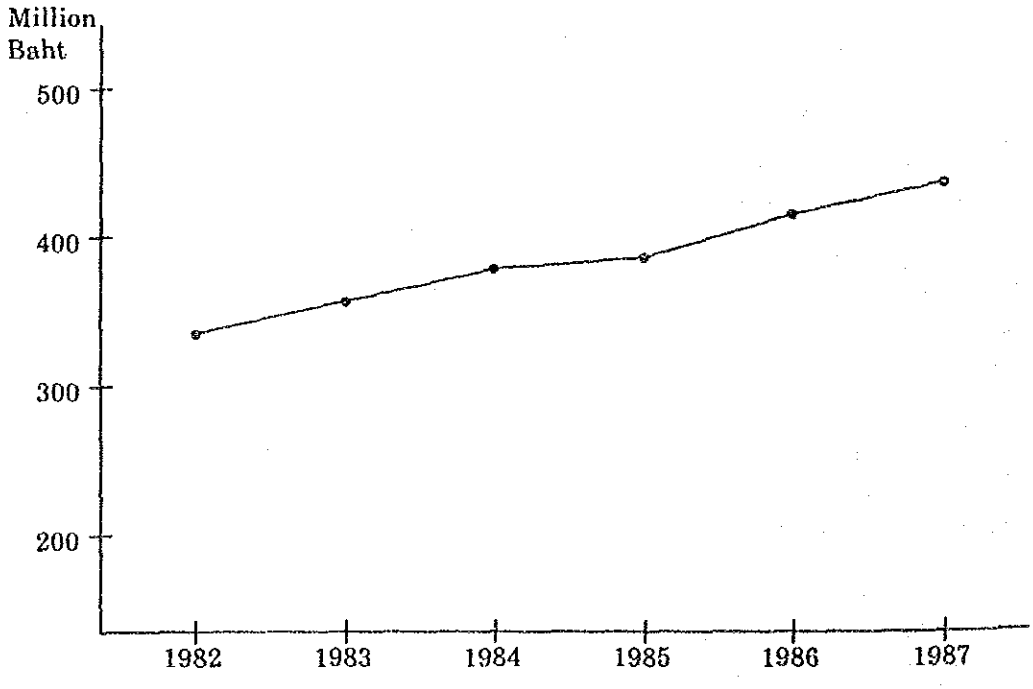
Fig. 3.4.1 Water supply and Demand Balance in the Study Area



VISITORS TO PHATTHAYA

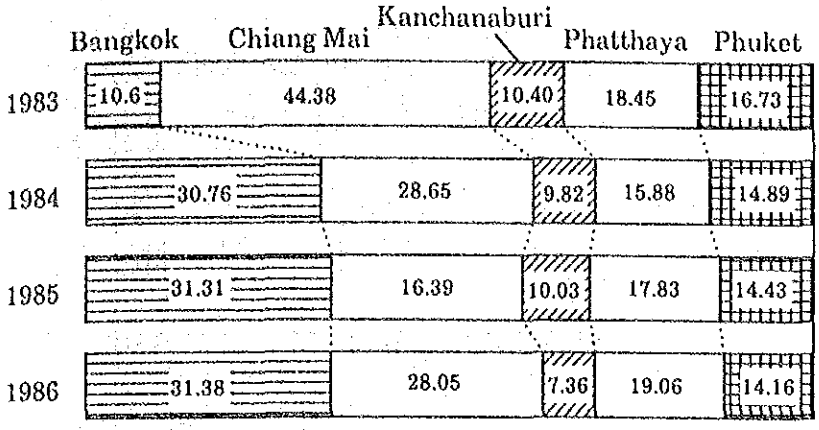
Source : TAT Statistics

Fig. 3.4.2 Thai Tourists Arrived to Phatthaya



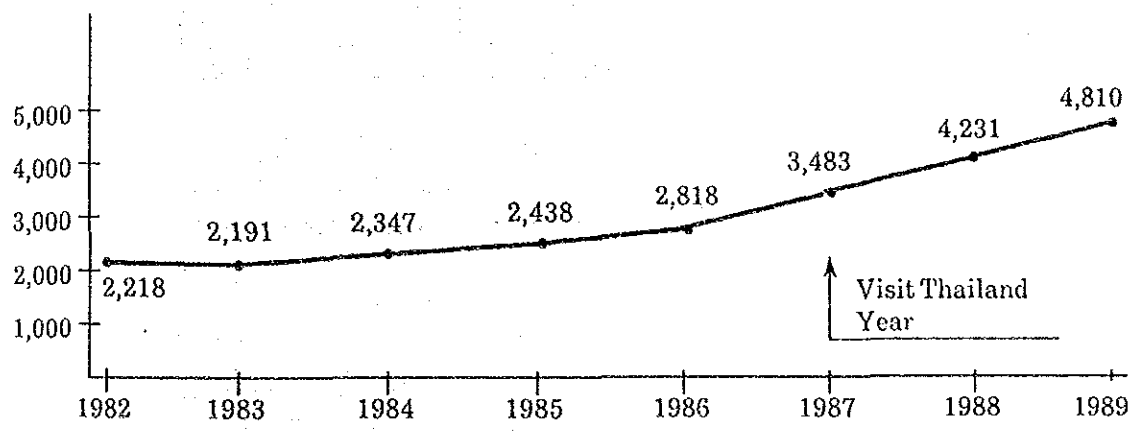
Source : NESDB Statistics

Fig. 3.4.3 Gross Domestic Product of Thailand



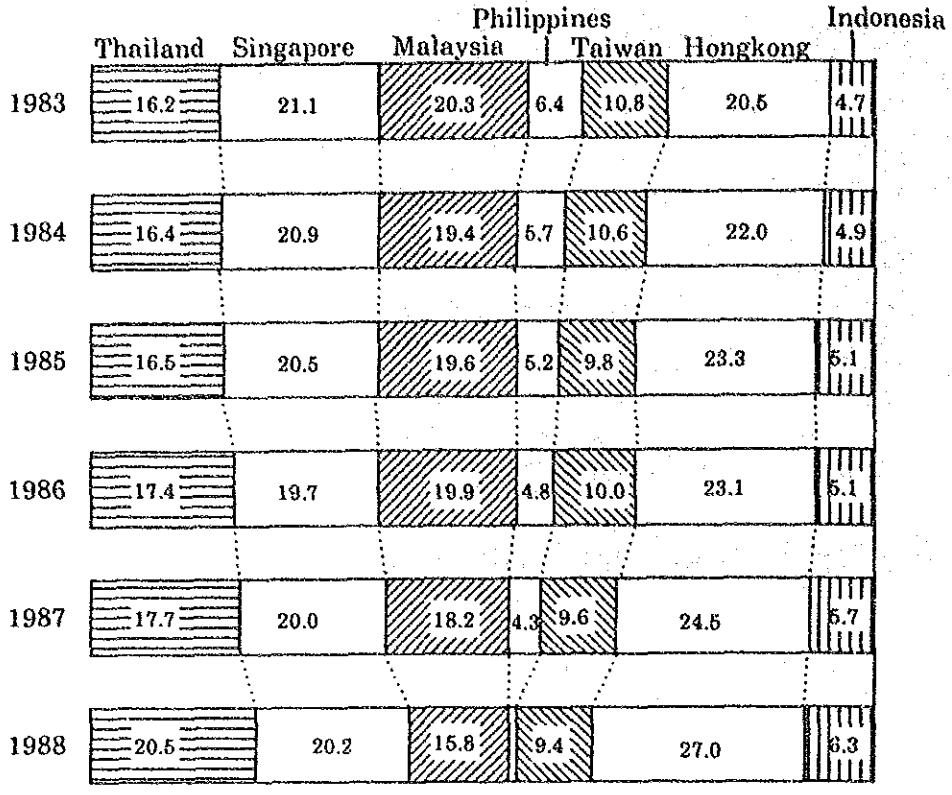
Source : TAT Statistics (Unit : in percent)

Fig. 3.4.4 Share of Phatthaya in Domestic Market



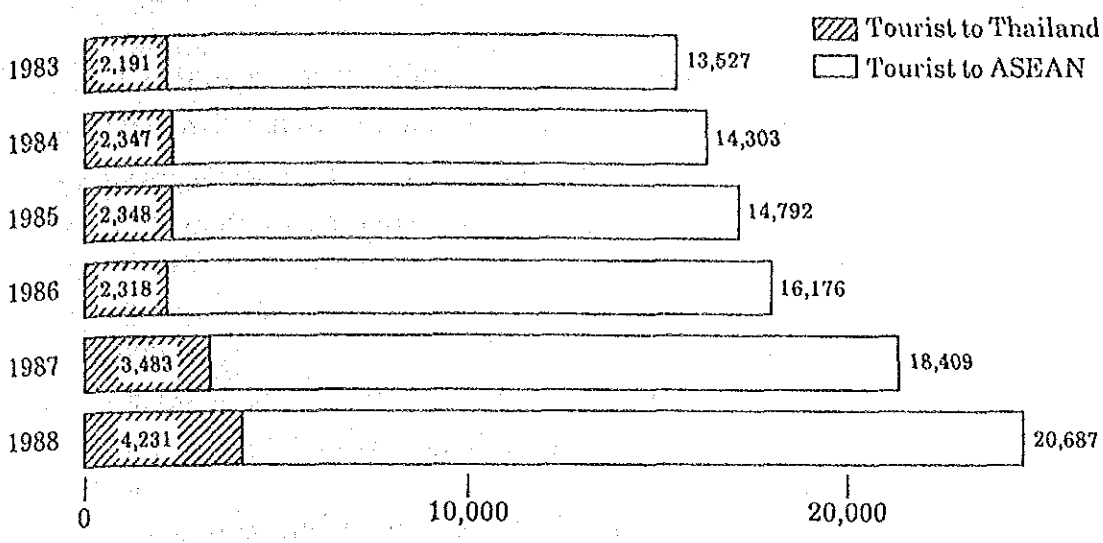
Source : TAT Statistics (Unit : in thousand persons)

Fig. 3.4.5 Growth of Tourists Arrivals in Thailand



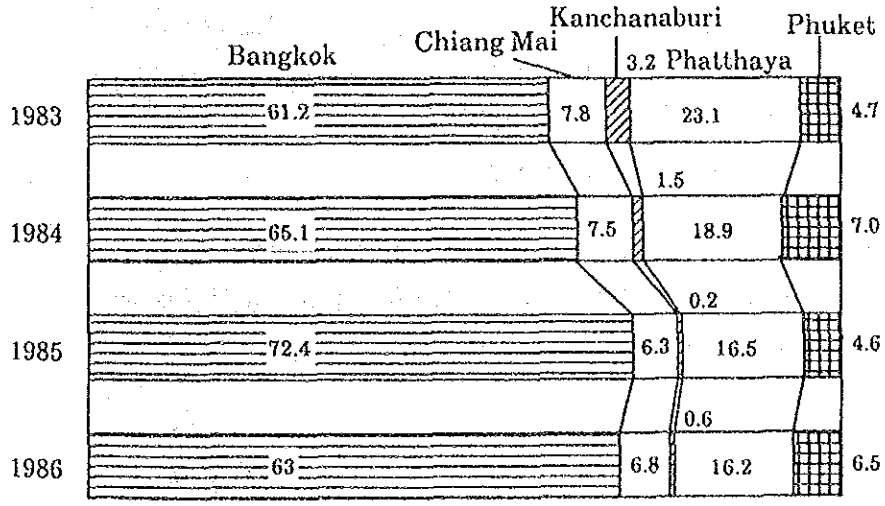
Source : WTO, MOT Statistics (Unit : in percent)

Fig. 3.4.6 Tourists Arrivals in ASEAN Countries



Source : WTO, TAT Statistics (Unit : in thousand person)

Fig. 3.4.7 Tourist Arrivals in Thailand Among ASEAN Countries



Source : TAT Statistics (Unit : in percent)

Fig. 3.4.8 Foreign Visitors to Major Destinations in Thailand

3.4.3 Population Growth Framework

The population in the Phatthaya City in 2006 was estimated based on the projection of employment and the "employed-population/total-population ratio". The employment in the Phatthaya City in 2006 was estimated for tourist related industries, non-tourist related industries and Eastern Seaboard Development related industries as follows.

- tourist-related industries : 60,000
- non-tourist-related industries: : 30,200
- Eastern Seaboard Development related industries : 5,000

Employment in tourist-related industries amounting to 60,000 was derived under the following assumptions.

- Present number of tourist-related employment : 29,800
  including (employment in service sector) : (28,000)
  (employment in transport sector) : (1,800)

- Average annual growth rate : 4.2%/year
  (equivalent to growth rate of guest arrivals from $1,611 \times 10^3$ in 1989 to $3,241 \times 10^3$ in 2006)

Employment in non-tourist related industries was assumed to grow independently of the tourism growth. The employment in 2006 was estimated under the following assumptions.

- Present number of non-tourist related employment : 20,200

- Average annual growth rate : 2.4%/year
  (half the growth rate of registered population between 1982 and 1989)

Employment in Phatthaya to be generated by regional development in the Eastern Seaboard Area was estimated by Eastern Seaboard Study to be 5,000 in 2001. This figure was adopted in the Study.

Population in Phatthaya in 2006 was estimated based on the projected employment explained above, the employed-population/total population ratio of 0.493.

$(60,000 + 30,200 + 5,000)/0.493 = 193,100$

As planning framework, total population of the Study Area excluding Tha Farang Area and Bang Sare is set at 200,000 in 2006.

Population in Tha Farang Area and Bang Sare is assumed to increase only slightly in the study period. The population in these areas is assumed to be 20,000 in 2006.

Population of Ko Lan is at present 1600. The population growth of Ko Lan is estimated to be much lower than that of Phatthaya City as a whole because of resources constraints in particular water. The conservation policy of natural environment restrict the tourism facility development which generate increase of water consumption and human discharge. Therefore, the population forecast of Ko Lan is as follows:

	(Unit : in persons)
1989	1,600
1996	1,800
2006	2,000

Total population of the Study Area in 2006 is, therefore, set at 220,000.

4. INTEGRATED DEVELOPMENT PLAN

4.1 Land Use and Sea Use Plans

4.1.1 Land Use Development Directions

Five distinctive courses of development are conceivable in terms of land use development in the Study Area.

1) Maximum Use of Existing Facilities

For places where existing facilities are well developed and adequate for expected demand more intensive use of existing facilities should be encouraged for those such as lodging facilities, commercial facilities, urban infrastructure, etc.

2) Selective Use of Natural Attraction

For places where natural attraction has already been taken advantage of for development, natural attraction such as seashore, landscape, etc., should be selectively promoted to further develop the place while avoiding adverse effects such as pollution.

3) Improvement of Infrastructure

For places where deficient infrastructure is the impediment to development, improvement of infrastructure should be promoted.

4) Conservation of Natural Resources

For places where unspoiled natural environment is important not only as the tourism attraction to the area but also for the well being of the areas surrounding it, natural resources should be conserved as much as possible.

5) Restrained Use of Unused Resources

For places where much of the land is under-utilized, unused land and other natural resources should be utilized more intensively with due care against undesirable effects.

The Study Area was divided into seven zones in terms of existing land use as shown in Section 2.2.2. Development of the Study Area will follow a course as a

mixture of the courses as explained above. Each zone, however, should be developed with different emphasis on each of the above five courses. Table 4.1.1. summarizes the proposed directions of development for each of the seven zones as mixture of the courses with different weights on each courses.

Fig. 4.1.1. shows graphically principal directions of development for each zone of the Study Area. The characteristic of each zone is summarized hereunder.

(1) Phatthaya Beach Area

* Na Klua town zone

  The tourism development is being expanded to this zone. It is recommended to restrict further development in this zone to protect the life of the local community.

* North Phatthaya zone and South Phatthaya zone

  Environment is relatively well maintained in the North Phatthaya zone and it is suitable for long stay family resort. The development in the zone shall be directed to create the pleasurable environment and conserve it for the family resort.
  The South Phatthaya zone is the most characteristic face of Phatthaya. Downtown atmosphere and entertainments attracts many tourists and invite to this zone. It is recommended to guide those entertainment industries to a desirable conditions and developed as a commercial area of centralized tourism relating industries.

(2) Khao Phatthaya area

This area has the best environment in Phatthaya because of existing high classed facilities and access. The de-lux hotels have been used for a facilities to accommodate the international events and the guests.

(3) Jomtien area

The basic direction of the development is to create the attractive natural and urban environment in this area. The urban control measure for building height, style, colour, signboard etc., improvement of breach road, the "Visitors Centre" and the others will create a new tourism core in addition to Phatthaya Beach.

(4) The Farang Beach area

Direction of tourism development in this area is to restrict further development and preserve the nature as a tourism resource. Strict guidance of Chonburi government shall be required.

(5) Bang Sare area

Bang Sare has been developed as the fisherman's town and is renowned as a base of game fishing. Tourism potential of this area will be "marine leisure base", such as marina, base of the fishing boat.

(6) Ko Lan

Ko Lan will be developed as a day-trip beach resort area. Because of the shortage of water resource on this island, the overnight facilities shall be restricted to save the water consumption.

(7) Inland area

North part of the inland area will be developed for new requirements of the tourism and urban functions. Land use for business, events (trade fair), new town and tourism development will be proposed because of relative lower land price. On the other hand, the south of inland area will be preserved for the water resources conservation and the future development.

DTCP prepared a land use plan of Phatthaya for its General Plan with its target year of 2006. Actual land and real estate development in Phatthaya has already shown a considerable departure from the DTCP's land use plan, which is due to be reviewed in three years time. A revision of DTCP's lands use plan was made in this study taking into account land use strategies as explained in the following sections. The revised land use plan is shown in Fig. 4.1.2.

Table 4.1.1 PRIORITIES IN DEVELOPMENT TYPES BY ZONE

DEVELOPMENT TYPE / AREA	A) MAXIMUM USE OF EXISTING RESOURCES	B) SELECTIVE USE OF NATURAL ATTRACTION	C) IMPROVE-MENT OF IN-FRASTRUC-TURE	D) CONSERVATION OF NATURAL RESOURCES	E) RESTRAINED USE OF UNUSED RESOURCES
1) PHATTHAYA BEACH AREA	◎	○	◎	—	—
1-1 Na Klua Town Zone	○	△	◎	—	—
1-2 North Phatthaya Zone	◎	○	◎	—	—
1-3 South Phatthaya Zone	◎	○	◎	—	—
2) KHAO PHATTHAYA AREA	○	◎	◎	○	△
3) JOMTIEN BEACH AREA	△	◎	◎	○	△
4) THA FARANG BEACH AREA	—	◎	◎	○	△
5) BANG SARE AREA	—	○	○	○	△
6) KO LAN AREA	—	◎	○	◎	○
7) INLAND AREA	—	○	○	◎	◎

Remarks: ◎ Top Priority
○ Second Priority
△ Third Priority
— Forth Priority

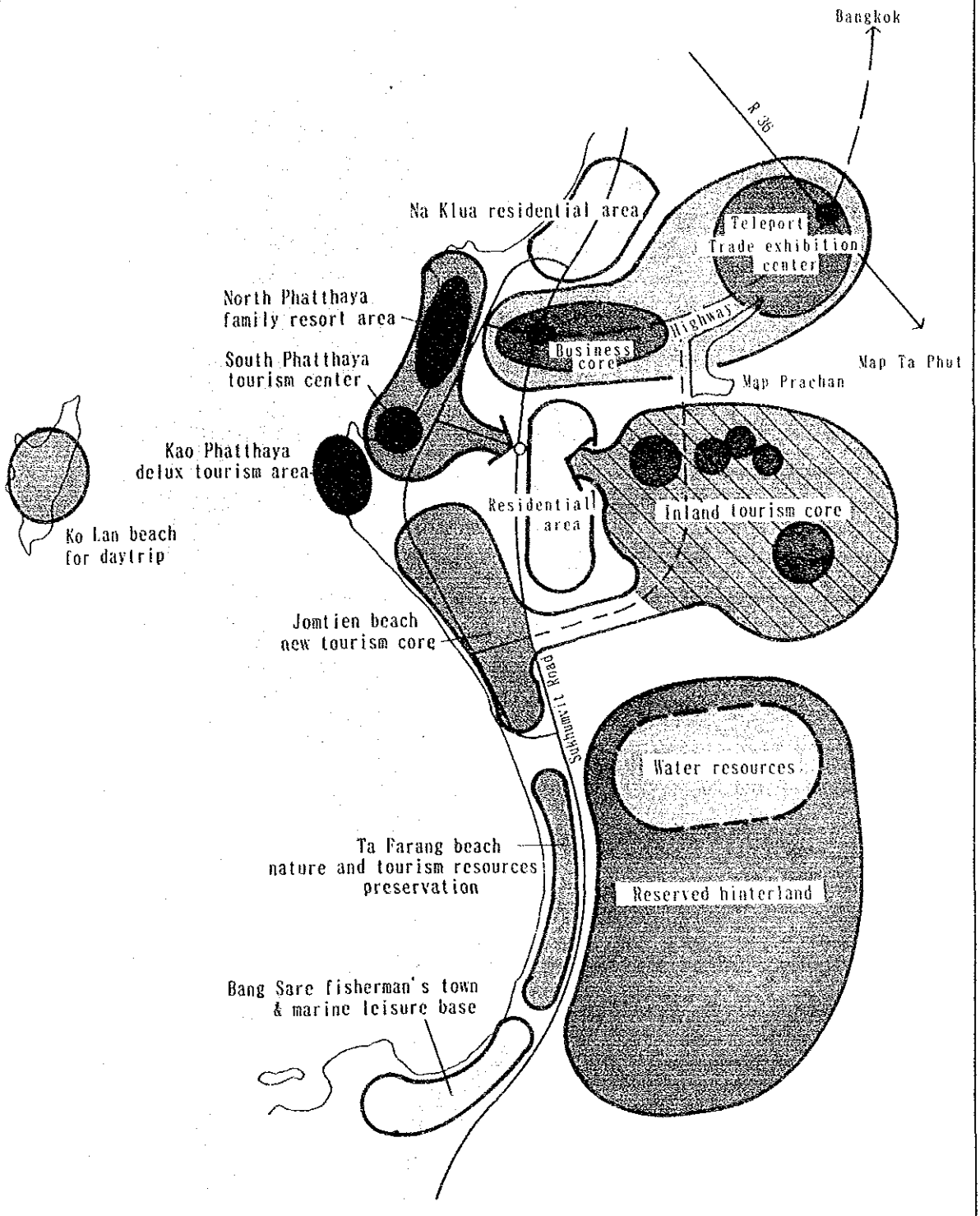


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Fig. 4.1.1
Phatthaya Land Development Concept

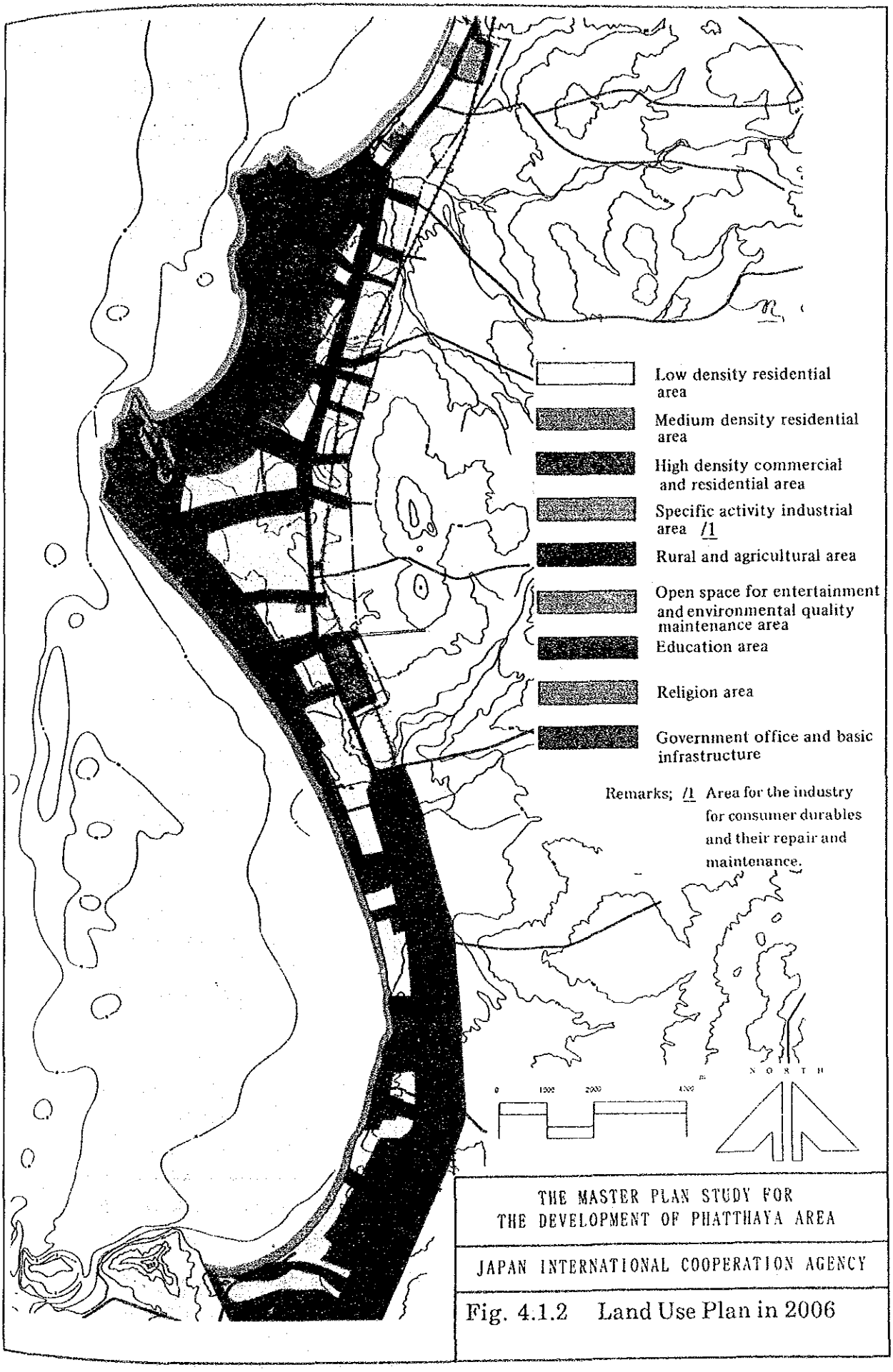

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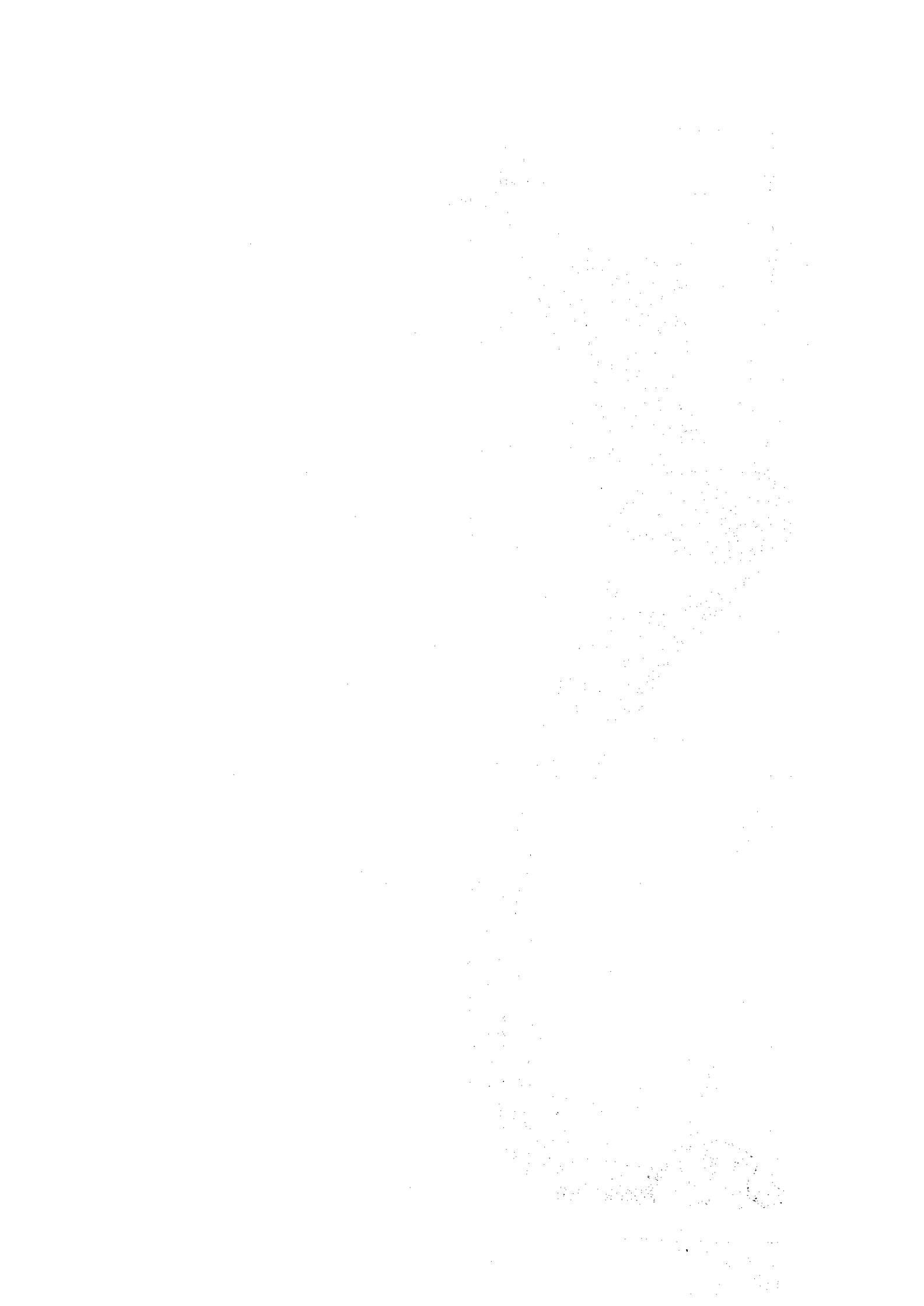
Fig. 4.1.2 Land Use Plan in 2006



4.1.2 Phatthaya Town Area Land Use Strategies

1) Development Trends

Following trends are characterized in Phatthaya town area.

- A plan is being advanced to redevelop South Phatthaya area by land reclamation and intensification of commercial area.
- There is a first indication of the formation of a business core in the north inland area, e.g. construction of the new city hall (10 rai), construction of private business building including a product exhibition and trade center and a Thai arts and culture center.
- Many new establishments are being located along Phatthaya 2 Road upto Khao Phatthaya including hotels, condominiums, and entertainment centers.
- New villas and housing projects are being established behind those above.
- Road sides along Central Phatthaya Road and South Phatthaya Road are already fully occupied by shophouses and restaurants.
- Many shophouses have been built in the past two years along Na Klua Road and many condominiums are under construction along the Na Klua shoreline.

2) Land Use Strategies

Four major strategies are proposed for the land use plan of Phatthaya town.

a. Renewal of South Phatthaya Area

South Phatthaya commercial area should be redeveloped by urban renewal and beautification.

b. Forming of Northern Business Core

- In the initial stage a business core in North Phatthaya should be formed aiming at the public sector, tourism businesses (airline offices, travel agents, arts and crafts) and service industries related to Laem Chabang and Map Ta Phut industrial estates, including finance,

information processing, communications, transportation, and industrial services and supply.

- However, in the long run Phatthaya should become an intelligent city with high quality and capacity information processing capabilities, which will be needed as the economic development of the Eastern Seaboard progresses. Inland area behind Sukhumvit Highway should be developed into an international business area including teleport and international trade center function in order to absorb some of the relocated functions of Hong Kong after 1997.

c. Development of the Area Behind Phatthaya 2

The area between Phatthaya 2 and Sukhumvit Highway should be developed to accommodate additional hotels, condominiums, and villas. The area facing the proposed Phatthaya 3 Road should be the most favorable area.

d. Re-organization of Land Use

At present many inland type tourist facilities such as Elephant Krall and Mini Siam are located at random. It is desirable to avoid mixed land use and they should be re-located in designated areas such as in the vicinity of Siam Country Club, Panarak Park, and Rio Range, or in the hinterland area of Jomtien Beach.

Figure 4.1.3. shows schematically principal land use directions of each part of Phatthaya Beach area.

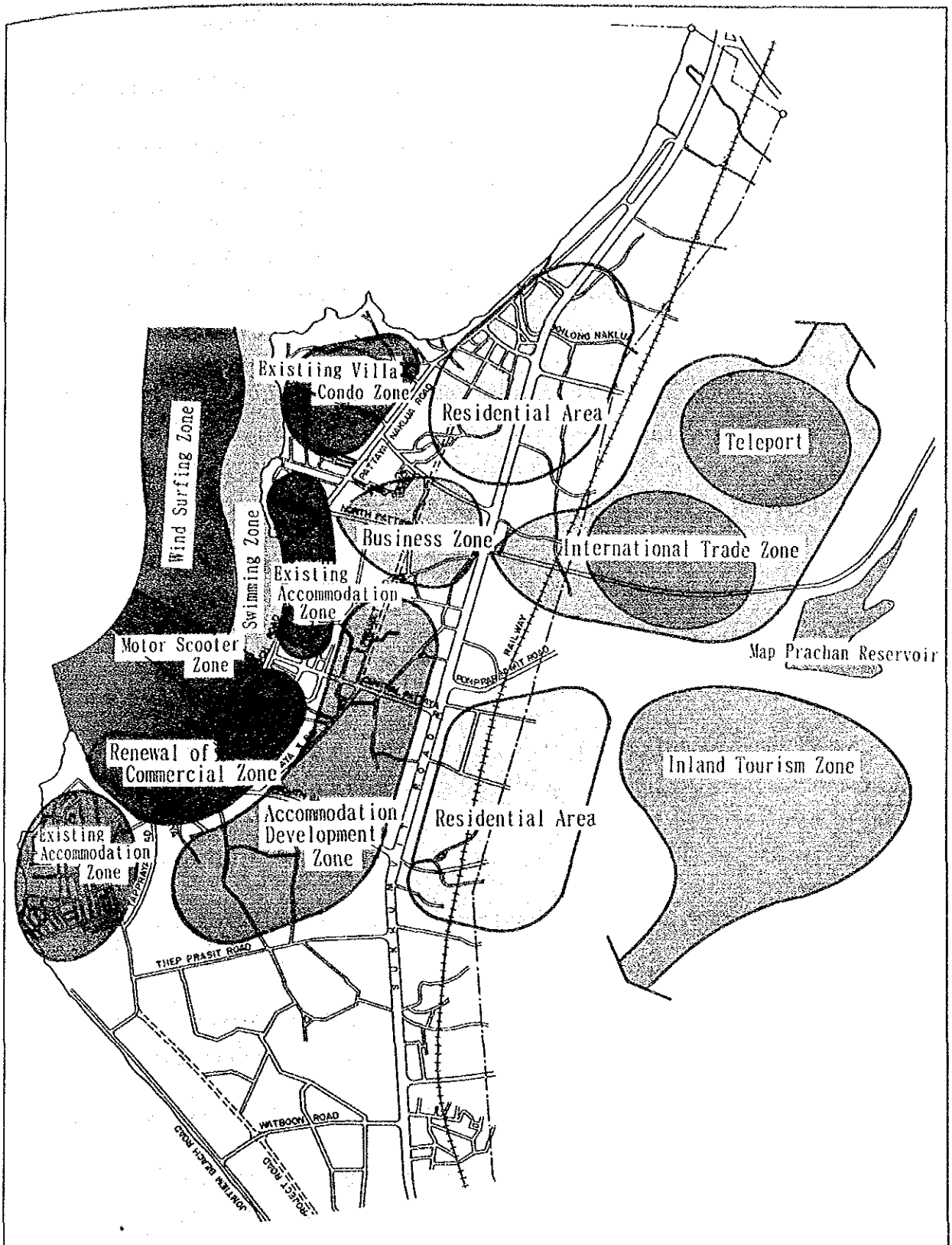


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Fig. 4.1.3 Land Use and Sea Use Concept in Phatthaya Beach

4.1.3 Jomtien Area Land Use Strategies

1) Development Trends

Existing land use as of late 1989 is shown in Figure 4.1.4. The area along the beach appears to be in a state of construction boom of condominiums, shophouses, restaurants, hotels, etc. Many more are waiting to be implemented or under planning. Due to the lack of any other roads except for a new access roads from Sukhumvit Highway virtually all activities are concentrated along the beach road, and vacant land along the road is rapidly disappearing.

Although the Jomtien Beach can claim clean sea water suitable for swimming and attract many sun-bathers and marine sports lovers, underdeveloped infrastructure may cause rapid deterioration of this popular beach when a rapid tourism development is disorderly realized in the area.

2) Land Use Strategies

a. Protection of the Beach

- The Beach is the most valuable resource of Jomtien area.

  A considerable amount of beach sand has already been lost due to the construction of abatements to facilitate pavement expansion in some areas. Protection of the beach should be given the highest priority.

- Construction of a pararelling road, Jomtien 2 Road, should be done in order to ease pressure on Beach Road.

- Re-development of Beach Road should be done in such a way that will not jeopardize the protection of the beach sand.

b. Provision of Infrastructure

- Roads, sewerage and water supply should be provided not only as the basic urban infrastructure but also as a way to guide development.

c. Controlled Development

- Jomtien area should be developed as a quiet, comfortable but convenient resort of foreigners and Thais alike, maintaining its already established reputation. To do so, it is necessary to tighten

the control over the kind and site of development as the land use, particularly at water front, becomes more intensive. Otherwise, its quietness, comfort, and convenience will all be lost.

d. Introduction of Focus

- Public focal facilities should be introduced such as a beach center complex and a theme park as a way to give orderliness to the development.

3) Demarcation of Sea Use

Although sea use demarcation was already designated by Phatthaya City Government, some adjustments are proposed as follows.

- Enlargement of swimming zone

  It is desirable to demarcate all beach and sea in front of accommodation as the swimming zone.

- Strict demarcation of motor scooter and motor boat zone

  Motor scooters and motor boats should be strictly controlled in the limited zone to secure the safety of the swimmers and drivers.

Figure 4.1.5 shows proposed land use plan for Jomtien Beach.

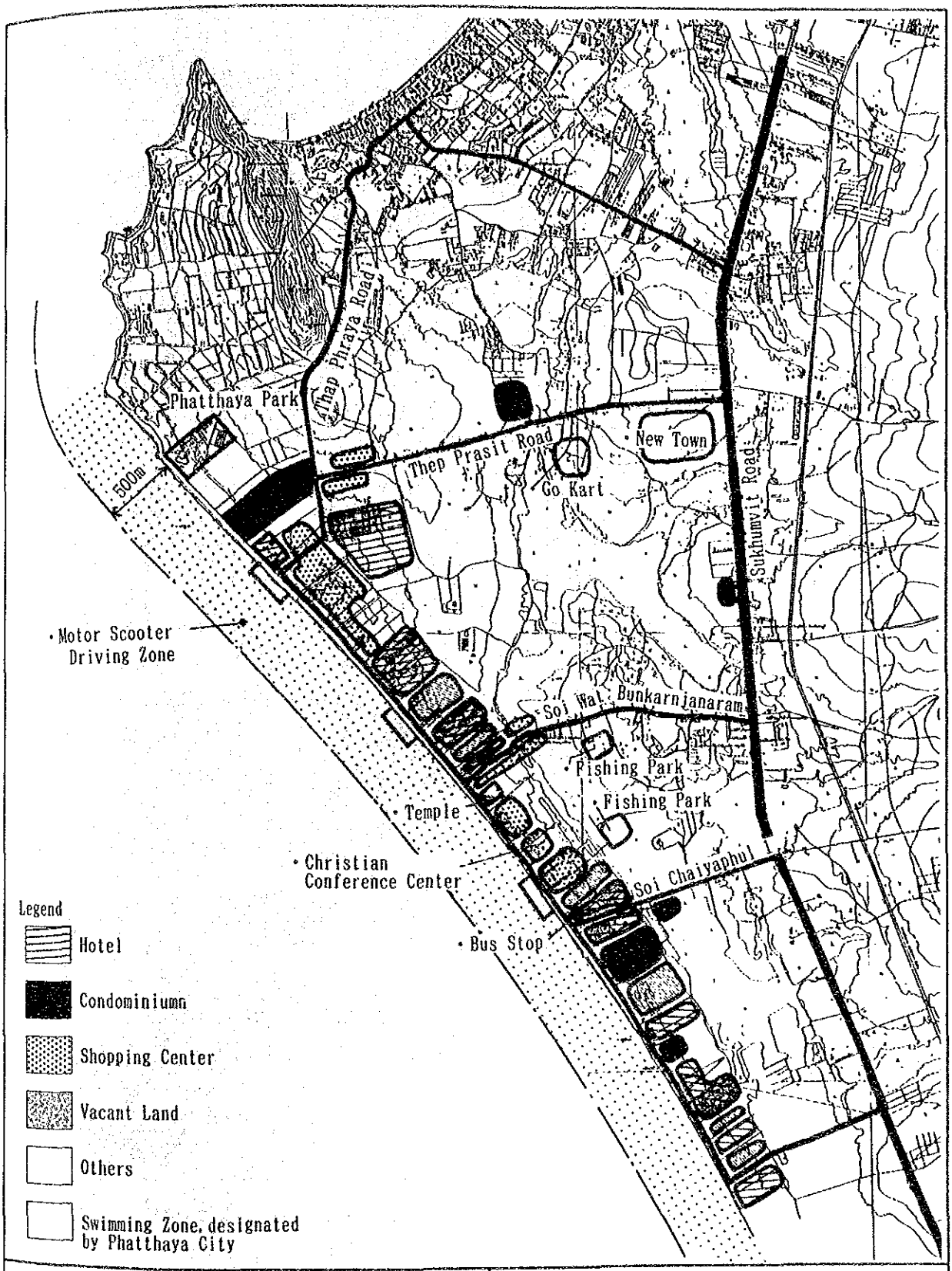

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Fig. 4.1.4 Present Land Use & Sea Use in Jomtien Beach

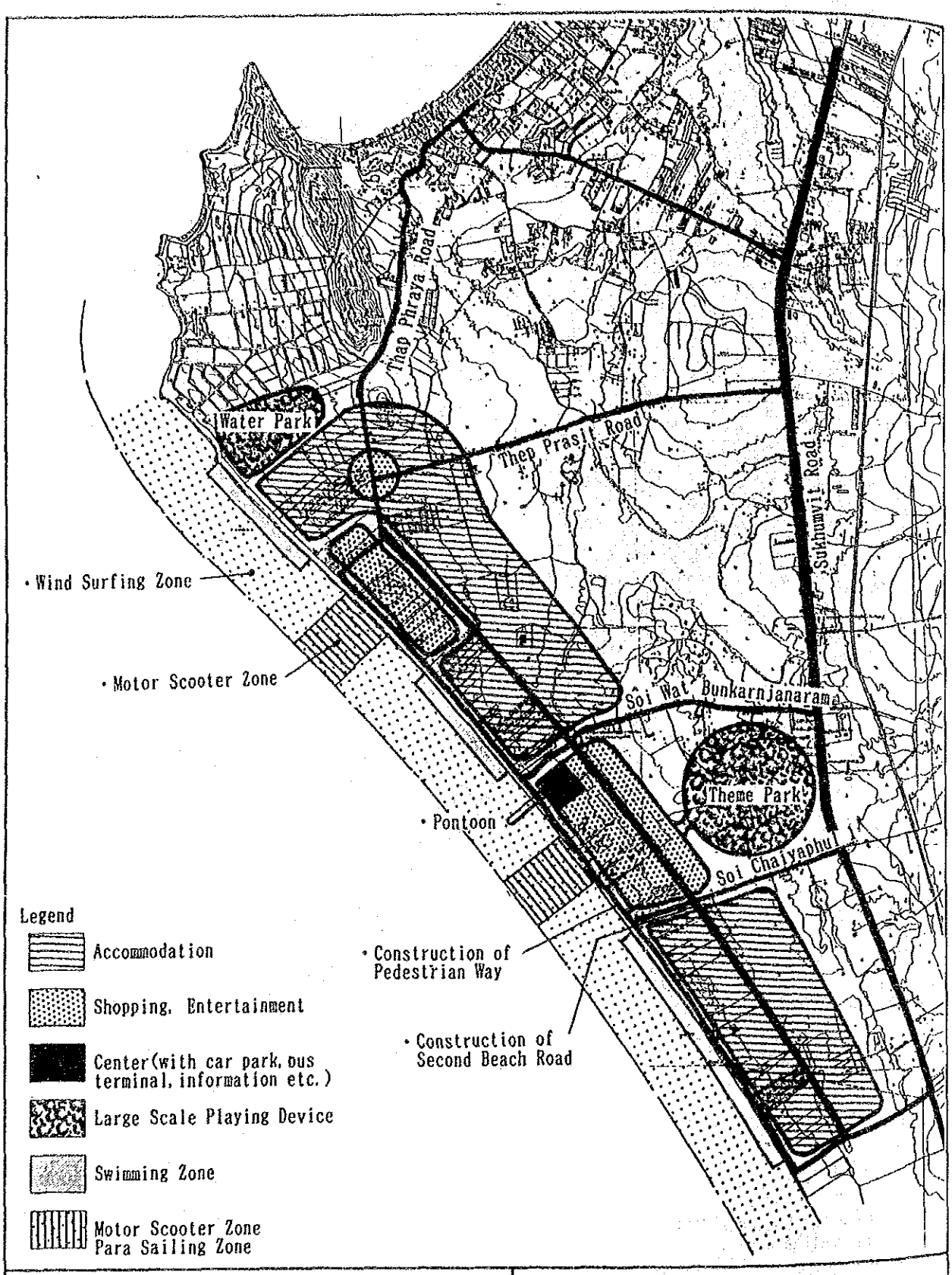

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Fig. 4.1.5 Proposed Land Use Plan for Jomtien Beach

4.1.4 Ko Lan Land Use Strategies

1) Development Trends

Visitors to Ko Lan has rapidly increased in recent years partly due to the rapid deterioration of Phatthaya Beach as a beach for swimming. Hastily built rest-houses and souvenir shops line some of its beaches.

2) Basic Direction

It is desirable to develop Ko Lan in a necessary minimum scale. Aggressive development and construction of large scale facilities are not desirable considering the limit on water-supply, maintenance of fishing village community, and preservation of natural environment. Ko Lan should be developed as a recreation and tourist place for domestic as well as foreign tourists staying in Phatthaya Beach or visiting as day-trippers to enjoy swimming, sun-bathing, diving, and marine sports.

3) Improvement Plans by Zone

(1) Ta Van Beach

This beach attracts the highest number of tourists in Ko Lan. A disorderly sea use is progressing and is feared to become a second Phatthaya Beach. Following plans are desirable to be implemented aimed at a comfortable and safe beach.

① Construction of a Pier

A pier is planned for this beach in order to keep good transportation with the mainland, to enhance safety of swimmers, and to avoid confusion in sea use caused by disorderly pleasure boats mooring.

② Service Facilities Improvements

Rest-houses and souvenir shops built along the beach should be improved in appearance to match the environment and to have appealing character. Foods and souvenirs require improvements. A waste water treatment facility is needed to preserve the beautiful sea, the lifeline of this inland. Change rooms, showers, toilets, lockers all require improvements. Pedestrian decks along inner sides of headlands at both sides of the bay may add attractions such

as fishing, scuba diving, strolling, etc. as long as they do not spoil the natural scenery.

(2) Tien Beach

Visitors to this beach are less than those to Ta Van Beach. It is desirable to construct a pier in this beach and improve services as described for Ta Van Beach.

(3) Sa Mae Beach

No facility exists in this beach because of the danger of land slide. It is not desirable to use this beach for tourism purpose since this beach can be used only two month period of November and December due to high wind and wave.

(4) Nuan Beach

Hotel Ko Lan Island Resort is established in this beach. Guest composition varies depending on the season but is roughly 40% Europeans, 50% Thais, and 10% others. Access to this hotel is limited to by rented motorcycle or on foot from Ban Ko Lan on a dirt road. It is desirable to improve the existing dirt road to gravel or paved road.

(5) Ban Ko Lan

Ban Ko Lan village is a fishermen's village and is populated most in this island. Required improvements are:

- pier usable all time regardless tide level
- waste water treatment facility
- solid waste disposal
- clinic
- village meeting hall

Establishment of a seafood restaurant can be conceivable utilizing fresh sea catches.

Figure 4.1.6 shows proposed land use concept for Ko Lan.

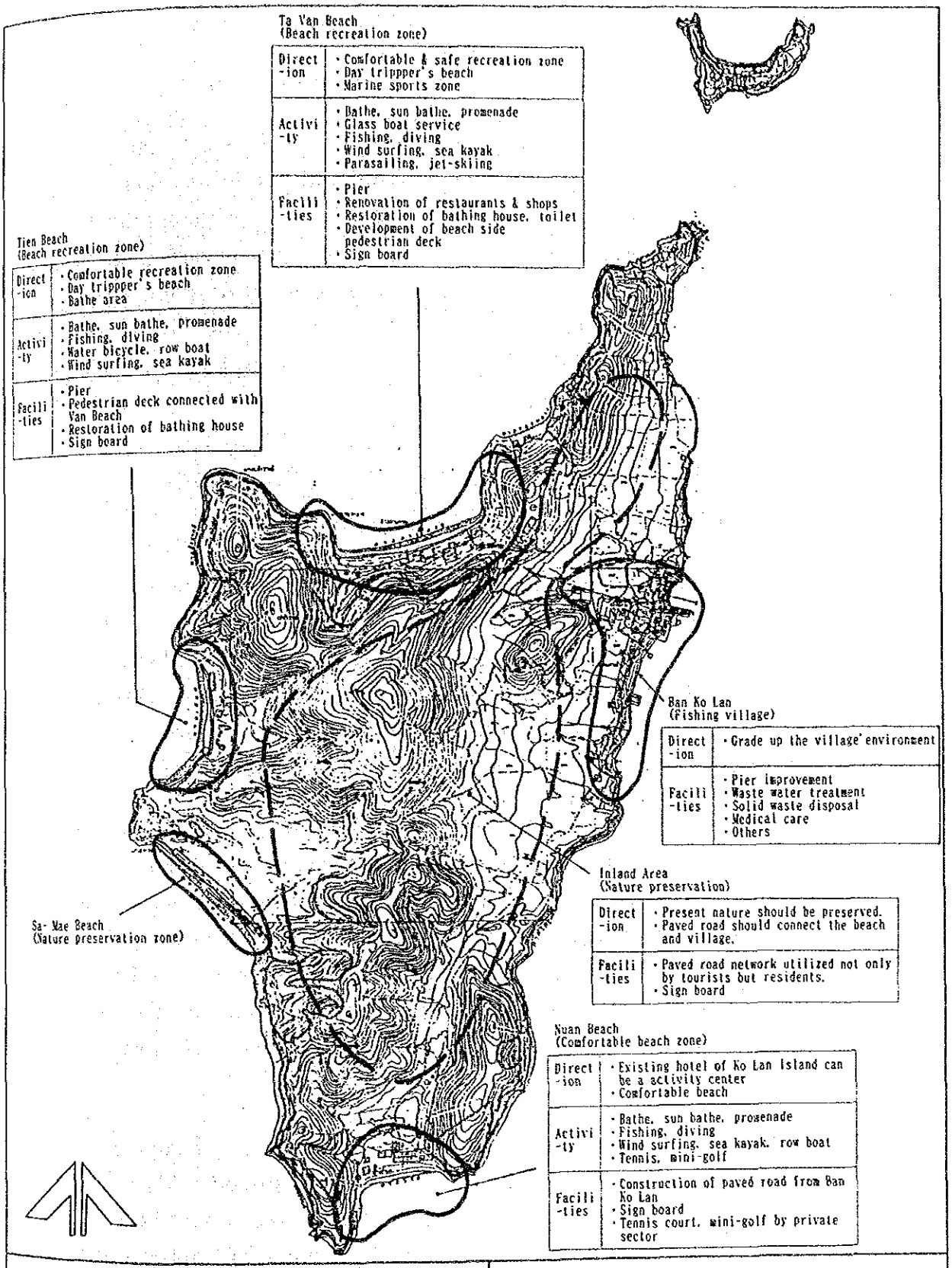

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Fig. 4.1.6 Ko Lan Land Use Concept

4.1.5 Beach and Sea Use

1) Introduction

Beach and sea use development planning is to be considered in the context of Phatthaya's current role as a major tourist resort and potential regional center for the Eastern Seaboard development area. In this role the principal functions in terms of coastal use are likely to be as a recreation and tourism resort, as a link in the passenger sea transport chain and also in its traditional function serving the fishing industry. It is probable that recreation and tourism will continue to dominate, but in Phatthaya's developing role there should also be adequate provision for the other two functions.

2) Objectives of Development Policy

The development policy objectives are defined thus:

- To improve Phatthaya's beaches and nearshore sea areas so that its image as a sea resort attractive to visitors is restored and enhanced. Achievement of this objective requires effective planning and development control, corrective action where beach and sea deterioration has already taken place and positive measures to prevent similar conditions occurring in areas which are now being developed.

- To cater for existing excursion vessels and also encourage the development of Phatthaya as a small passenger port for regional sea transport. This requires the provision of suitable marine facilities for berthing and mooring of excursion vessels, a terminal for jetfoil/hydrofoil or other fast passenger service to Bangkok and other regional ports, and the allocation of offshore moorings (or a potential marine terminal site) for cruise ships and the larger passenger vessels if they come to Phatthaya.

- To improve operating conditions for the local fishing industry so that productivity may rise and pollution is minimized. This requires extension of existing piers to deeper water so that vessel berthing and movement are not tidally restricted, and provision of improved facilities for fuel supply and waste disposal.

3) Improvement and Control of Beach and Sea Use

Beaches In principle, the basic requirement of a good recreational beach is that the coastal built-up area and road traffic should be separated by a buffer zone from the beach where visitors can relax, sun-bathe or walk towards the sea to swim. The buffer zone may be provided by a strip of undeveloped land with natural vegetation or by a coastal promenade having a pedestrian side-walk and landscaping with trees, shrubs and suitable promenade facilities. Construction of wave-reflecting structures which cause sand loss and coastal erosion must be avoided within the buffer zone. It is recommended that this "buffer zone" principle should be applied to all beaches in the study area.

Some parts of the Phatthaya shoreline have already developed to a stage where buffer zones can only be created by corrective works including changes to existing facilities and structures. Nevertheless, it is considered essential that such action be taken in order to prevent further coastal erosion and retain or improve recreational amenities. Phatthaya's beaches can be considered in three categories:

category

I. where extensive or unsuitable developments have already taken place,

II. where deterioration has started or appears imminent

III. where the coastline is either undeveloped or where developments are at an acceptable level.

The locations of beaches in each category, brief descriptions and action required are tabulated below:

	Beach Location	Description	Action required
I	Phatthaya beach	Extensive over-development, existing promenade was built by encroaching beyond natural shoreline, coastal erosion now occurring.	Restore and widen beach by placing sand fill to replace sand lost by erosion, thus protecting the coastline and providing better beach for recreation. Improve promenade and facilities as buffer zone.
	Jomtien beach (at South end only)	Coastal road encroaches on shoreline, narrow and eroding beach.	Remove existing sea wall and re-align coastal road to arrest further coastal erosion
II	Jomtien beach (north and central sections)	North end of beach is sited well. Road is set back sufficient distance from shoreline. Trees, shrubs and bushes provide shade and shelter, and plant roots prevent erosion. Central section less satisfactory	Prohibit construction of any sea walls or other structures. Maintain existing vegetation and ensure that any small facilities (changing rooms, kiosks etc) are sited between vegetation and set back from shoreline. Improve central section in similar manner, as far as possible.
	Ta-Van beach, Ko Lan	Random development of shops and kiosks on sea shore, likely to spread.	Do not permit any new structures seaward of existing building line. Space in front of buildings to be utilized for portable facilities only (sun shelters, deck chairs, etc.)
	Wong Amat beach (main beach north of Phatthaya headland)	Recently constructed properties have boundary walls which reflect waves and cause erosion	Remove existing sea walls which encroach on to beach, and prohibit further such construction.
III	Beaches between Jomtien and Bang Sare	Mainly undeveloped (except Ambassador City Hotel)	Control all new developments to maintain buffer zone. Remove offending terrace at Ambassador City and restore sand lost by erosion.
	Beaches near Laem Phatthaya	Beaches developed in a satisfactory manner with adequate buffer zone	Continue present policy
	Ko Lan beaches (except Ta-Van)	Small-scale development only	Control all new developments to preserve natural beach line

Two examples at Phatthaya of well planned developments and good coastal usage are the beaches of Phatthaya Park and the Royal Varuna Yacht Club. These illustrate how undeveloped parts of the study area, such as the coastline between Jomtien and Bang Sare, could be used to provide recreational and residential facilities which enhance the area's appeal and do not lead to progressive deterioration of natural features. At these two beaches, all structures are set well back from the shoreline and the land in between is landscaped effectively with shrubs, grass and trees which complement the sea and sandy beach. It is recommended that this type of buffer zone should be included in any new coastline developments in the Study Area.

Sea Use Effective zoning and control of sea surface use is an essential requirement of recreational beach management at Phatthaya where the number of users, already large, is expected to increase. At present Phatthaya bay, which is the most congested area, is occupied by excursion boats, boats for water sport (scooters, water-skiing parasailing) and swimmers. Existing zoning regulations (described in 2.2.2) are difficult to implement due to general congestion and the conflicting requirements of these activities. Action necessary to control sea surface use is outlined below - this includes the construction of some facilities to encourage orderly boat usage and separation of activities. Although swimmers (actual and potential) out-number other sea users, at present their enjoyment of the sea is hindered by inconsiderate boat owners whose activities need to be controlled, and restricted if necessary.

Action Required

Excursion boats	:	Implement tourist port project. (See 4.2.2). Encourage use of piers by all boats, restricting beach landing of passengers to beaches near the port only. Define anchorage areas for excursion boats and enforce their use.
Boats for water sport	:	Provide storage areas and launching ramps for boats in South Phatthaya. Prohibit launching of water scooters from the beach generally, except at a few designated locations. Enforce the use of existing boat operation zones.

Swimming : Increase the size and/or number of swimming areas. Promote their use by exclusion of all boats, provision of lifesaving services and beach facilities, improvement of water quality (better sewerage scheme, exclusion of boat movements)

In general the measures proposed amount to a strengthening of existing regulations which are satisfactory in principle but require the construction of certain essential facilities to make them effective. Sea areas should be patrolled to enforce the regulations and penalties for breaches should be increased. Additional equipment (pollution control and life saving gear on suitable vessel) and staff training for the coastguard will be necessary.

Zoning and control regulations already exist for Jomtien and Ko Lan (Ta-Van beach) and similar measures, additional equipment and training as proposed above will contribute to their effective implementation. At both these locations steps should be taken to protect the interests of swimmers. At Ko Lan, it is also necessary that all excursion vessels and speed boats should be excluded from the coral reefs, and penalties imposed for casting of anchors in the reef area.

The level of activity at other beaches not covered by existing regulations is at present sufficiently low not to require immediate action, but conditions should be assessed periodically and controls introduced as necessary. A beach likely to require zoning control soon is Wong Amat beach, which is developing rapidly.

4) Marine Transportation - Berthing and Mooring Facilities

The necessity for berthing and mooring facilities for the following types of vessels should be assessed in relation to the study area to cater for recreation, regional transport and the fishing industry:

recreation	° excursion boats (travel to nearby islands)
	° yachts and powered craft
regional transport	° jet foil, hydrofoil, catamaran or other fast passenger transport vessels
	° inter-regional passenger vessels
	° cruise ships
fishing	° fishing vessels

It is estimated that 180 - 200 boats operate between Phatthaya and the offshore islands, mainly Ko Lan. Fixed facilities for passenger embarkation/disembarkation are required at Phatthaya and the Ta-Van beach (the popular beach) at Ko Lan. These are high priority projects for which there is already a commitment for execution; details of these projects are included in 4.2.2. Many of the existing larger yachts and powered craft, which are privately owned, currently utilize the facilities of the Ocean Marina located south of Jomtien beach. This private marina has berthing facilities for 700 boats which are not yet fully utilized, so there is no immediate need for additional berthing. The marina is a well-designed facility with breakwater protection for yachts. Since this location already has one yachting marina, it is proposed that the area should be committed to pleasure boats and any further development - if and when warranted by additional demand for such facilities - could be carried out by the private sector in the immediate vicinity of the existing marina. It would be most undesirable for new marinas to proliferate at random along the length of the study area coast, for planning reasons as well as coastal stability.

The immediate requirement for regional passenger transport is a terminal for hydrofoil or jetfoil services and it is possible that a service may already be in operation before this report is submitted. In that case the private operator may have obtained a terminal site and commenced development already. If the operator does not implement the proposed service, it is recommended the marine terminal be integrated with the tourist port and related development in South Phatthaya described in 4.2.2.

Inter- regional passenger ships do not at present call at Phatthaya and cruise ships call infrequently. Phatthaya is an unfavorable location for large vessels as deep water is distant from shore and construction of berthing facilities would be expensive. There appears to be no justification for committing public funds to the provision of such facilities in the immediate future, and a suitable procedure would be for vessels to moor offshore and transfer their passengers to smaller boats which would berth at the piers of the tourist port. If regional passenger transport by sea using larger vessels (draft say 5 - 6 m or greater) develops, these vessels could berth at Sattahip or Laem Chabang and passengers travel onwards by road to Phatthaya. Alternatively, a long term proposal would be to develop a terminal on the east side of Ko Lan, which is a suitable sheltered location with adequate water depth close to shore. Passengers embarking or disembarking at this terminal could be transferred by speed boat to the port in Phatthaya.

The requirements of the fishing industry are considered in 5) below.

5) Fishing Industry

Fishing vessels operate from Na Klua and Bang Sare. At both these locations, but particularly at Na Klua, water depths sufficient for unrestricted operation are at some distance from shore and the fishing piers do not extend far enough. Extension of the fishing pier at Na Klua is one of the proposed projects described in 4.2.2.

As the boat repair and building yards provide an essential service to the fishing industry (and to excursion boat operators) their development should be encouraged by improvements to the infrastructure, particularly access roads, electrical and water supply. Improvements within the yards can be left to the private sector.

6) Beach and Sea Use Plan

A beach and sea use plan based on the requirements described above for recreation, marine transport and fishing is shown in Fig. 4.1.7.

The proposed plan recognizes the importance of tourism and recreation to the local economy of Phatthaya and large areas are allocated accordingly. However, for the specific requirements of sea transport and fishing, allocation of defined zones is proposed where general recreation is excluded and these functions can develop efficiently. The key features of the plan are:

- The south part of Phatthaya bay is allocated for sea transport - for the tourist port for excursion vessels, a jetfoil/hydrofoil berth and an offshore mooring for larger vessels. At Ko Lan, provision is made for piers to receive small vessels. The locations proposed either have existing structures or are suitable sites (in terms of coastal engineering) for the proposed facilities.

- The central part of Jomtien/Bang Sare in the vicinity of Ocean Marina is allocated for yachting marinas and as a secondary location for high-speed scheduled services - the operator of the proposed hydrofoil service, whose reported intention is to construct a privately owned terminal at Jomtien, should if possible be persuaded to locate his terminal here. The

area allocated is sufficiently large to accommodate a substantial expansion of yachting facilities and one or more terminals, if required.

- Na Klua and Bang Sare serve the fishing industry and are zoned accordingly. Space is available for expansion but on present trends it seems that fishing activities will remain static or might even decline as industrial development takes place in the Eastern Seaboard.

- Other areas are designated for recreation, where the coastal environment should be protected and no structures extending from the shoreline built. Small boats will continue to be stored on land and launched from the shore, as for example at the Royal Varuna Yacht Club and at some locations at South Phatthaya.

- Provision is also made for possible long-term developments e.g. marine terminal at Ko Lan, deep sea fishing base at Bang Sare.

7) Beach Zone Management

The study area needs an active program of beach zone management to direct future developments within the framework of an overall beach and sea use plan (Fig. 4.1.7), to prevent construction encroaching on to the beaches and causing erosion, and to extend or modify sea use zoning controls as new hotels and residential housing are built and the number of visitors and permanent residents increases. Associated issues are the extension of accident and sea-rescue services as recreational activities spread to remoter parts of the shoreline, and also the control of activities of the many boats moored near Phatthaya.

At present a number of Authorities have jurisdiction over these matters. Another factor is that the study area is split for administrative purposes - the Phatthaya City boundary stops south of Jomtien beach and the Provincial Administration is responsible for Tha Farang beach and Bang Sare. Effective control of the beaches and sea is unlikely to be achieved, as Phatthaya grows rapidly, without effective coordination between the responsible authorities.

A problem of increasing significance at Phatthaya is coastal erosion caused by construction encroachment. The first step in controlling this problem is to make Building Control Departments and property owners aware of the permanent loss of coastal land (the beach) and damage to structures which will occur if sea walls and other wave-reflecting structures are constructed too close to the natural shoreline. It is understood that at present the Harbour Department is

responsible for approval of any structure extending seaward of the high water line but not inshore of it. Land owners may thus construct a wall or other structure quite close inshore of the high water line after obtaining building control approval - Harbour Department approval is not required. However, large waves that travel beyond the high water line in severe weather will be reflected by the structure and erosion will result, as sand is transported away by sea currents. Eventually the shoreline will recede locally till the high water line is at the foot of the offending structure. It will now be within the Harbour Department's jurisdiction, but at this stage the practical solution to prevent further erosion is to demolish the structure and remove it. Alternatively, the lost sand could be replaced, but the cost would be high. This situation could be avoided if all potential wave-reflecting structures were located a safe distance (say 20m) from the shoreline.

Most of the other major problems in Phatthaya - for example the discharge of untreated sewage in to the bay which causes pollution - although having serious immediate effects, can be solved with determined efforts and time. The loss of the beaches due to erosion is a permanent loss of one of the study area's prime assets.

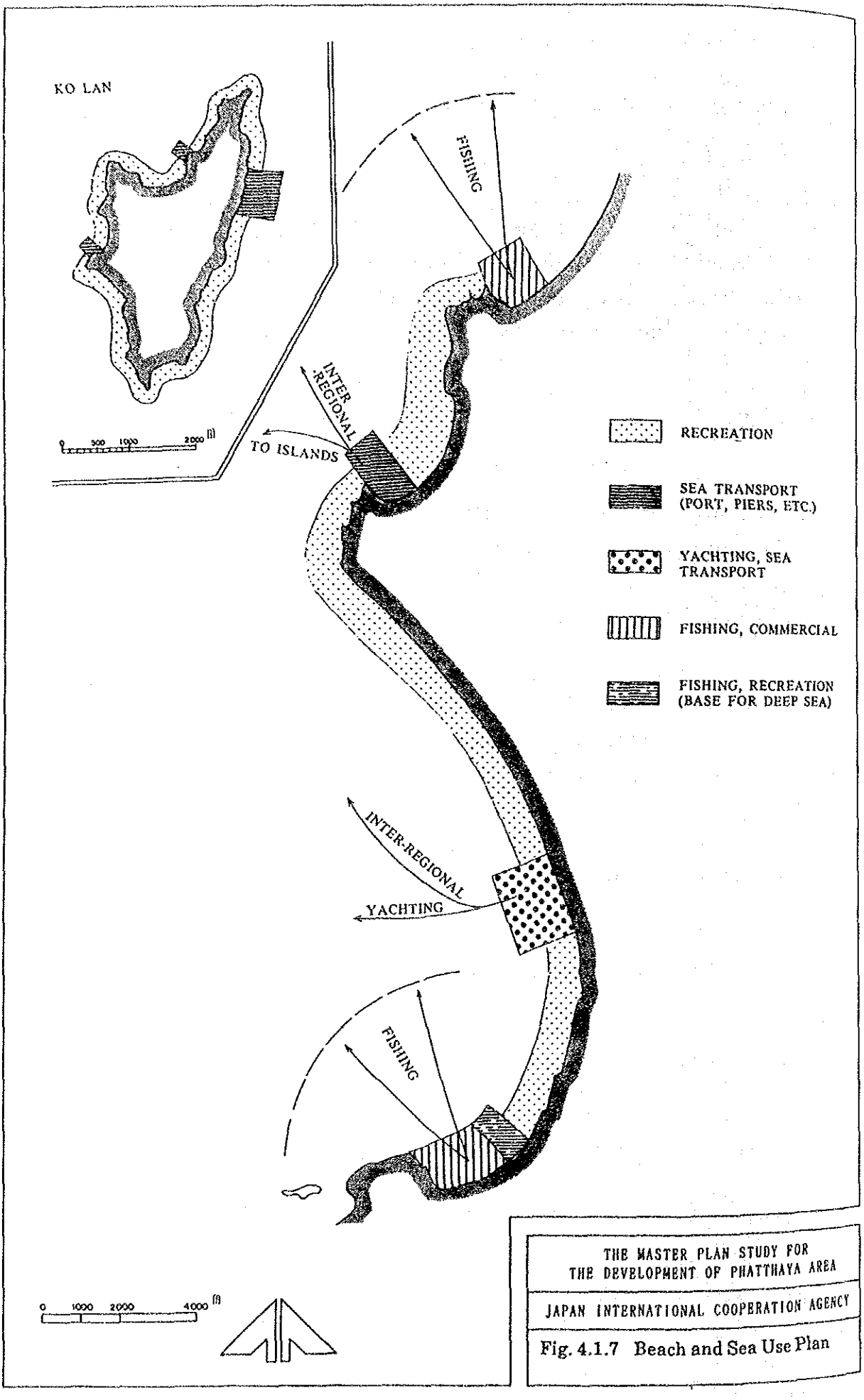
This issue is stressed amongst the many coastal problems because local administrations seem insufficiently aware of the consequences of construction encroachment. These organizations have themselves carried out public works which encroach on to the beaches, such as the Phatthaya beach promenade and the south Jomtien beach road. Efforts are needed to guide and advise officials who control construction in the study area. An essential first step, to identify locations where erosion is occurring would be to carry out regular surveys of the shoreline and beaches.

It is recommended that a Phatthaya Beach Zone Management Group should be instituted, with the following representation:

- Phatthaya City Administration - Tech. and Planning Div.
  - Coast Guard
- Provincial Administration - Building Control Dept.
- Harbour Department (local office)
- Marine Police (local office)

- TAT (local office)
- Phatthaya hoteliers' association

The Group would meet at regular intervals, the purpose being to inform about current and potential coastal problems, to exchange information on proposed developments and bring about an increased awareness of coastal issues. The Group might also initiate any extension of controlled areas or revisions to regulations. Responsibility for approvals and enforcement action would rest with the appropriate authority, the Group's function being to coordinate and advise only.



THE MASTER PLAN STUDY FOR THE DEVELOPMENT OF PHATTHAYA AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 4.1.7 Beach and Sea Use Plan

4.2 Sectoral Plans and Long-List Projects

4.2.1 Sectoral Coordination and Identification of Projects

Overall planning framework was determined as described in Chapter 3. Growth of tourism in Phatthaya in the years to come was estimated after a careful examination of Phatthaya's advantages and constraints, growth of tourism in Asia and relative positions of Thailand within Asia, and Phatthaya within Thailand. Growth of population of Phatthaya was estimated in relation to the growth of tourism and the Phatthaya's increasing role as the center of the Eastern Seaboard region.

Development plans presented in the ensuing sections were prepared following the planning framework set as above. For most of the sectors physical requirements such as type, network configuration, size and capacity of facilities were determined by the projected number of hotel rooms by sub-area or zone and population by zone.

Care was taken to ensure consistency across various sectoral plans while making them conform with the overall development framework as described in Chapter 3.

Figure 4.2.1 illustrates the process.

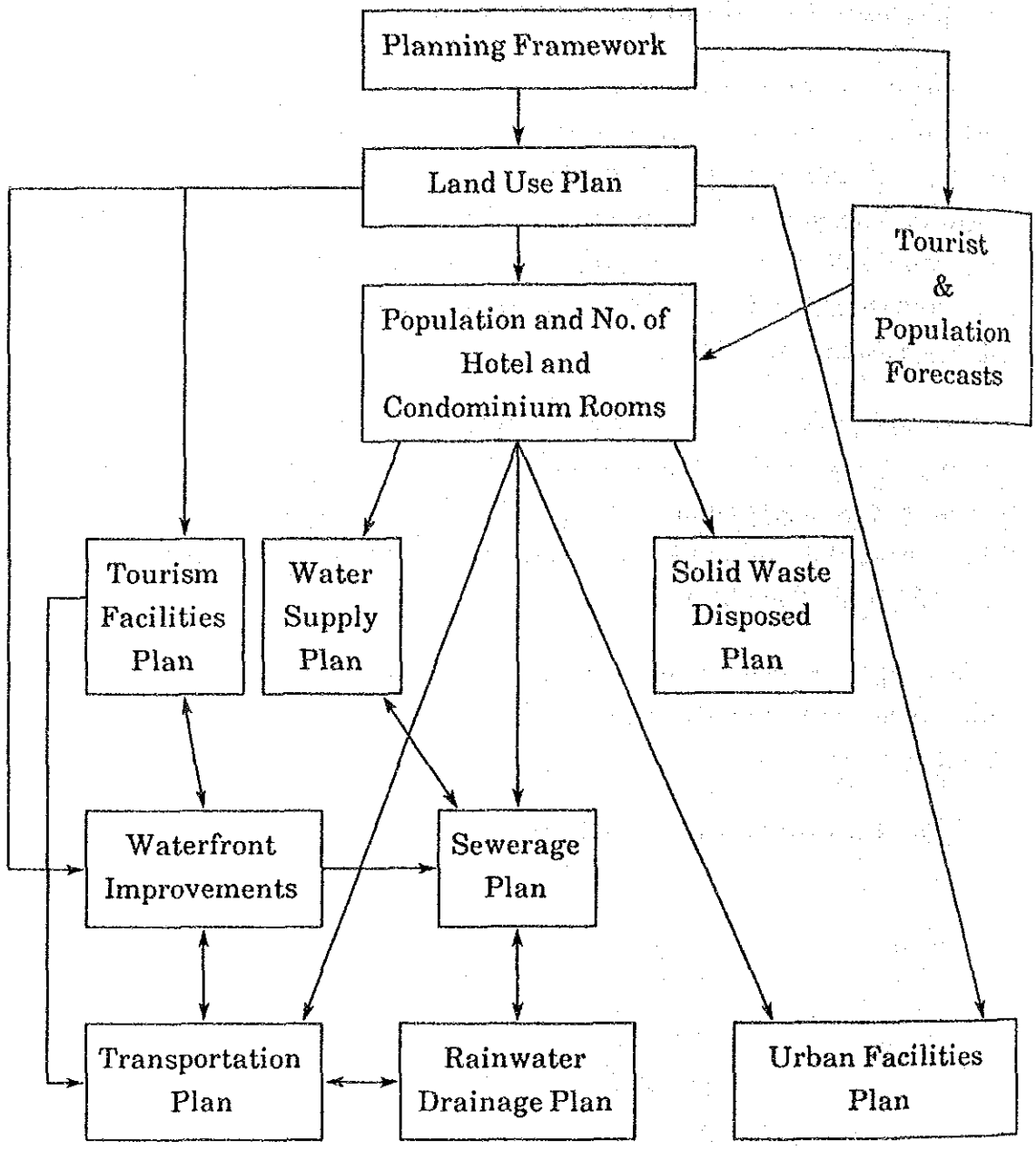


Fig. 4.2.1 Coordination of Sectoral Plans

4.2.2 Waterfront Improvements

1) General

A strategy for overcoming current coastal problems and planning future developments was outlined in 4.1.5 and a beach and sea use plan use proposed (Fig. 4.1.7) which allocates areas of the coastline to essential marine activities (sea transport, fishing) and to recreation. Effective management action is needed to implement these proposals so that the coastal environment is protected while acceptable developments are carried out.

Coupled with planning and administrative action to regulate beach and sea use, various waterfront projects are required either to provide essential facilities which are currently lacking or to improve existing inadequate facilities, and to counteract erosion and deterioration of the waterfront which have already occurred. A summary of key details of proposed waterfront projects is included in Table 4.2.1. The projects are categorized either as high priority projects for completion by 1996, or as desirable projects to be completed by 2006 (final year of the master plan).

Since the marine sector serves many interests the background, purpose and details of some projects differ appreciably from others. However, the technical feasibility of all the proposed waterfront projects is influenced by common coastal engineering considerations which are described in 2). This is followed by descriptions of individual projects.

2) Coastal Engineering Considerations

(1) Bathymetry and Shoreline Topography

The study area coastline from Na Klua to Bang Sare has a shallow nearshore zone and the distance from the coast of the −5 m. depth contour (/1) varies from 500 m. to 2,000 m. Sandy beaches such as Phatthaya and Jomtien have a fairly steep foreshore (for a short distance of about 20 m.) at a slope of 1:10 from above the high water mark to approximately +1.5 m. level. From this point the seabed level falls as a shallow slope of 1:100 to 1:200 or even flatter.

Around Ko Lan Island deeper water exists closer to the coastline and the −5 m. depth contour is generally 200 m. to 300 m. from the shore. There are a number of sandy beaches principally on the west, south-west and south of the island. Between the beaches and elsewhere the coastline is rocky, with some rock outcrops down to sea level.

Between Ko Lan island and the Phatthaya coast there is a deep navigation channel with water depths up to 25 m.

(2) Winds

The Gulf of Thailand experiences monsoon conditions which influence wind speeds and directions in the study area. The southwest monsoon prevails from mid May to mid October and the northeast monsoon from mid October to mid February. A meteorological station was built at Phatthaya in 1980 and recent wind records are thus available. However, this station is on the slopes of Khao Phatthaya where it is partially sheltered by higher ground, and the wind records are probably affected by topography. For considering offshore winds which generate waves, records for Ko Si Chang and Sattahip to the north and south of Phatthaya should be used since, for these stations, records exist for a longer period than at Phatthaya. Wind roses for Ko Si Chang and Sattahip are shown in Fig. 4.2.2. For comparative purposes wind roses for the Phatthaya station (1981~88) are also included. The study area experiences light to moderate winds and stronger winds only occur exceptionally.

/1 Seabed depths are relative to lowest low water (LLW)

At the Ko Si Chang station - which is considered most relevant to the Phatthaya Area - 95% of recorded winds do not exceed 16 knots (8.2 m/sec), or force 4 on the Beaufort scale, classified as a "moderate breeze". Winds in excess of 25 knots (12.9 m/sec) are estimated to have a frequency of occurrence of 0.05 % only.

The detailed wind records for Phatthaya for the last three years (1986~1988) were examined for comparison with the Ko Si Chang data. Recordings in excess of 25 knots comprised 0.07% of total recordings. This figure, although of limited statistical value because of the short period of 3 years considered, is consistent with the Ko Si Chang frequency of occurrence mentioned above.

(3) Waves

No wave recordings have been made in Phatthaya Bay but wave heights may be estimated by hindcast techniques using wind records. It is noted in Fig. 4.2.2 that 95% of winds do not exceed 16 knots. A persistent offshore wind of 16 knots in the upper Gulf of Thailand (effective fetch 100 km.) is estimated to generate offshore waves of 1.2m. significant wave height only and the region generally experiences modelate wave action.

The study area coastline is affected by offshore waves approaching from the sector SSW to NNW and the southwest monsoon is the dominant influence. Previous estimates (/2), using Sattahip wind records, for overall and directional offshore wave height frequency are shown in Fig. 4.2.3. Waves generated offshore are affected by shallow water effects and refraction as they approach the coastline, and wave heights are reduced. Fig. 4.2.3 also shows wave height frequency near the south corner of Phatthaya Bay. The estimates show that at this sheltered location, which is the proposed site for port facilities, 95% of waves should not exceed 0.5 m. significant wave height. Significant wave periods range from 3~5 sec. and seldom exceed 5 sec.

These estimates are generally confirmed by studies for Laem Chabang Port which is only 15 km. north of Phatthaya. The nearshore wave climate study (/3) included the results of wave recordings over a one-year period

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/2 JICA Feasibility Study, 1978

study (/3) included the results of wave recordings over a one-year period using a waverider buoy. The wave rider buoy was installed at a mean water depth of 12 m. in the north part of Ao Bang Lamung which is exposed to prevailing southwesterly waves. The percentage exceedance graph in Figure 4.2.4 is based on an analysis of the wave records. It shows that 90% of waves did not exceed 0.5 m. significant wave height, and 0.9 m. or larger waves occurred less than 1% of total time. These records are consistent with the Phatthaya estimates using wind hindcast methods.

Wave height frequency estimates are required for assessing the suitability of port locations and the need for protective breakwaters. Additionally, an estimate of extreme wave height is required for marine structure design. Although southwesterly winds and waves predominate, extreme winds tend to blow from the west and generate the highest waves. The following extreme wave condition is proposed, based on an extreme wind speed of 29 knots (15 m./sec.) and an effective fetch of 100 km. from the west:

Hs = 2.6 m.
Ts = 6.4 sec.

The likely site of marine structures in Phatthaya Bay is in the southern part, which is exposed to the northwest but relatively sheltered to the west and southwest. Design wave heights for any structure will be adjusted by an appropriate coefficient (to allow for refraction and diffraction effects) which will depend on the position in the bay of that structure.

Wave heights are being recorded during the construction of Laem Chabang port which is currently in progress. In due course these records should be analyzed to confirm or refine the wave height estimates proposed above.

(4) Tides and Currents

As there is no tide gange at Phatthaya, records from Ko Si Chang and Laem Chabang may be used to provide tidal information relevant to the study area. At Ko Si Chang the tidal characteristics are:

/3 Delft Hydraulics Laboratory Report, 1985

	to MSL	to LLW
Highest High Water (HHW)	+1.80 m	+4.28 m
Mean Higher High Water (MHHW)	+0.95 m	+3.43 m
Mean High water (MHW)	+0.73 m	+3.21 m
Mean Sea Level (MSL)	±0	+2.48 m
Mean Low Water (MLW)	−0.85 m	+1.63 m
Mean Lower Low Water (MLLW)	−1.32 m	+1.16 m
Lowest Low Water (LLW)	−2.48 m	±0

Laem Chabang tidal levels obtained by a harmonic analysis of recordings from Jan.~Jun 1985 differ fractionally from the above levels, by 0.05~0.1 m. only. (/4)

Tidal currents were recorded at Phatthaya in August 1977 (/2) and also, from Jan.~Jun. 1985, at four locations near Na Klua and North Phatthaya. The 1985 measurements were made to determine the environmental impact of construction of the new port on Phatthaya. Tidal currents were also recorded by the Hydrographic Department of the Royal Thai Navy in 1973 at a location between the Phatthaya coast and Ko Lan Island.

In general, tidal currents flow in an approximate north-south direction, the flood current being north going and the ebb current to the south. The maximum velocities recorded in 1985 near Na Klua and north Phatthaya are shown in Fig. 4.2.5.

Apart from tidal currents, the area experiences a constant current flowing southwards but this is generally very weak : in the range 0.03~0.05 m./sec. only.

After consideration of the data from the various investigations referred to above, the following maximum current speed is proposed for the design of structures :

maximum current speed : 1.25 knots (0.65 m./sec.)

/4 Laem Chabang Port Project. Final Design Report April 1986 PAAS Consortium

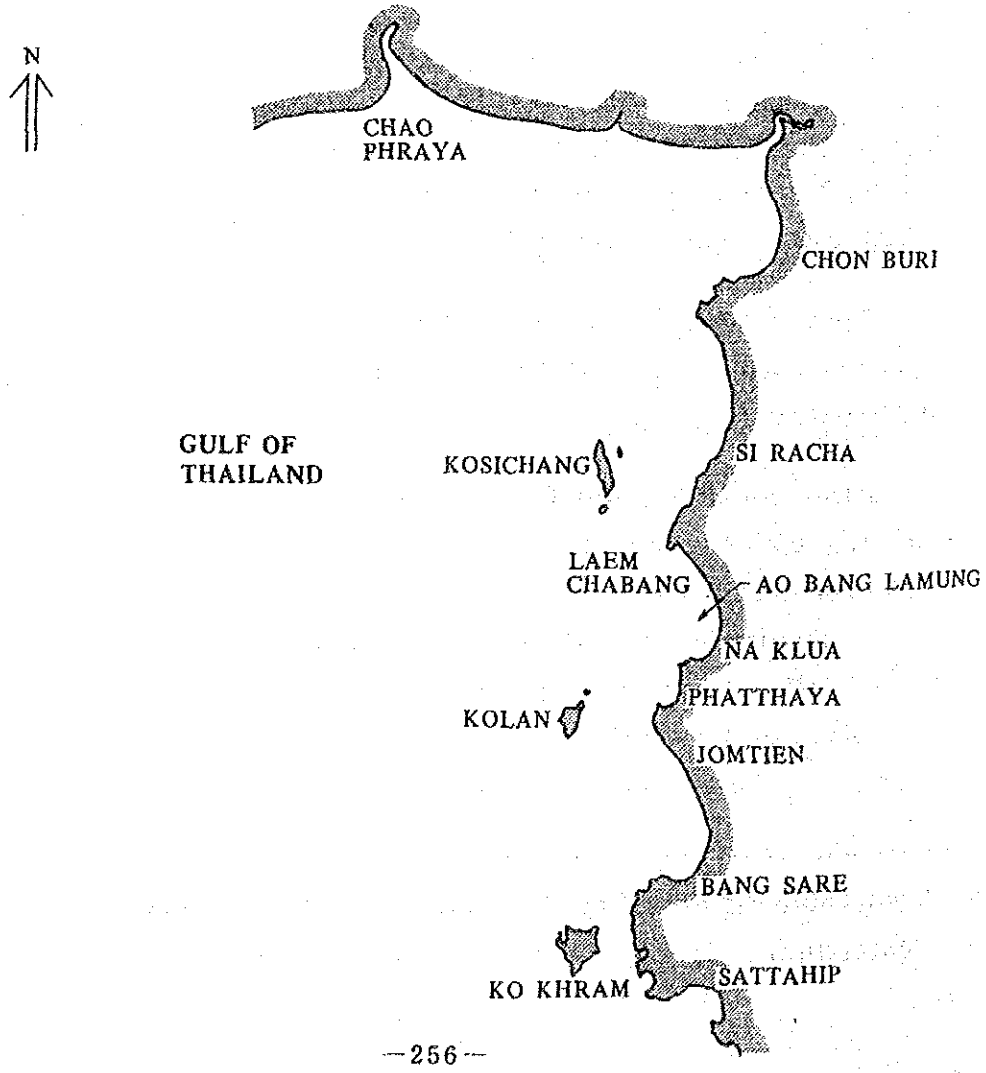
(5) Subsoil

As mentioned before, the study beaches at Phatthaya and Jomtien have a fairly steep foreshore at a slope of 1:10. Beach material is medium to coarse sand, d50 size about 0.5 mm. Beyond the steep foreshore the flatter part of the beach which is exposed at low tide has a top layer of gray to black loose fine silty sand, about 1~2 m. thick. This is underlain by residual weathered soils consisting of alternating layers of stiff to hard clay or sandy clay, and dense sand or clayey sand.

Boreholes were drilled to depths of 10~15 m. but bedrock was not found to these depths.

(6) Coastal Stability

The east coast of the upper Gulf of Thailand from Chonburi to Sattahip consists of a number of large and small curved bays between rocky headlands. All these bays have a characteristic spiral shape (see figure below) which is determined by the prevailing southwesterly wave direction.



In general the upper (northern) part of the bay, which is slightly curved, is transverse to the direction of wave approach while the tightly curved spiral is in the lower (southern) part. The orientation of the bays is generally north-south, Bang Lamung bay and Jomtien/Bang Sare bay to the north and south of Phatthaya being typical examples. Phatthaya Bay has the same characteristic shape but the orientation is north northeast - south southwest : this small variation from the general pattern is probably due to presence of Ko Lan Island which modifies the angle of approach of the predominant southwesterly waves.

The eastern seaboard coastline is subject to littoral drift and beach material is transported along the coast, the direction of movement changing seasonally. However, although seasonal changes in the shoreline will occur with beaches advancing or receding locally, over a period of time there should be no net loss or gain of land providing there is no human interference with coastal processes.

The volume of beach material which moves seasonally is influenced by the angle and severity of wave attack which cause longshore currents for soil transport. Although all parts of the coast experience seasonal movement, larger movements occur at the east-west coastline between Rayong and Sattahip. At the coastline north of Sattahip, volumes transported are correspondingly less and in the neighborhood of Phatthaya and further north, wave attack is nominal and the coastline is basically stable. In other words, not only will there be no net change in the position of the shoreline over a period of years, any seasonal changes that occur cause the coastline to advance or recede by small distances only.

Shoreline changes can occur, however, if the natural balance is altered by human action such as :

- encroachment of construction beyond the coastline, which results in wave reflection and loss of beach material which is carried offshore.
- interference with supply of sediment which is transported by rivers and discharged into the bays.

Such action may cause permanent erosion and a net loss of land. Changes in the coastline can also occur if a solid structure such as a breakwater is constructed out from shore. This will arrest longshore movement of material, leading to accretion on one side of the structure and erosion on the other. As there is no net loss of beach material, arresting of longshore drift can be

allowed for by a sand by-passing scheme or by sand nourishment on the eroding side.

The effect of port construction on the shape of the shoreline was studied for the new ports at Map Ta Phut and Laem Chabang, and volumes of sand arrested were estimated as follows :

Map Ta Phut	:	35,000 cu.m./year	(/5)
Laem Chabang	:	3,000 cu.m./year	(/4)

These estimates show the relative difference between the east-west coastline (Map Ta Phut) and the north-south coastline (Laem Chabang) of the Eastern Seaboard. The estimated quantity for Laem Chabang is indicative of likely longshore movement at Phatthaya. The quantity is small and compensation by sand supply, if port structures are constructed, is thus feasible.

As described in Section 2.2.2, 2), (4), erosion at Phatthaya has been observed due to extensive encroachments of new construction beyond the natural shoreline. This is the prime cause of erosion which has already occurred, and corrective action is necessary. Based on the factors influencing coastal stability described above, the following guidelines are proposed for any new coastal works in the study area :

(i) New construction for promenades, terraces, buildings and boundary walls etc. should not encroach beyond the natural shoreline. Any sea walls or other structures should be located a sufficient distance behind the foreshore, taking account of extreme high water levels and wave run-up during severe weather.

(ii) The characteristic spiral shape of the natural bays should be maintained if reclamation, artificial beaches or similar works are proposed.

(iii) As construction of port structures is likely to arrest longshore movement in an area where the beaches are already narrow, extra sand should be supplied to compensate for potential erosion adjacent to the structures.

/5 Map Ta Phut Port Project - Wave and Sediment Studies July '85

3) Land Reclamation in Phatthaya Bay

(1) Background

The existing waterfront at Phatthaya is congested and the north and central parts of the bay have a narrow promenade on which are located a few public buildings and a restaurant. At the south end of Phatthaya bay, there is no promenade at the waterfront; instead the area is occupied by restaurants, bars, night clubs, shops etc. which are built over the water. The refuse and liquid waste arising from these activities is often discharged directly to the sea.

The size of existing public buildings on the promenade for organizations such as the Marine Police, Tourist Police, TAT, Coast Guard and Sea Rescue Service is restricted by available space and there is no room for expansion. Phatthaya also lacks civic amenities such as public parks, sport fields and a community hall. All these facilities would require land which is not available in the central area of Phatthaya City.

A reclamation project in South Phatthaya has been proposed as a means of providing additional land and also improving conditions around the "entertainment area". Some of the benefits of the proposed reclamation are:

- the unplanned, shack-like and ugly structures of the entertainment area would be contained by creating a new, well-planned seafront with a coastal road, promenade and landscaping.
- waste collection systems would be installed to minimize discharge to the sea.
- some land would be provided for essential public facilities.
- land would also become available for commercial use, thus providing funds to finance the reclamation project and other amenities.

(2) Project Description

The proposed reclaimed area will occupy a total length of approximately 1900 m., measured along the existing curved coastline. It will be tapered at the two ends near the junction of Phatthaya Beach Road/South Phatthaya road and Laem Phatthaya respectively, but at its widest portion between Khlong Phatthaya and the Siam Bayshore Hotel it will be 180 m. wide. The total area reclaimed (excluding the additional

piece which provides the operational area of the tourist port described in 5)) will be 19 hectares.

An integrated waterfront development plan which includes land reclamation and other waterfront projects in Phatthaya Bay is shown in Fig. 4.2.6. These projects are all classified as priority projects. A full project description and land use proposals for the reclamation are included in Part II of this report.

4) Beach Restoration - Phatthaya Beach

(1) Background

The beach at Phatthaya is rather narrow and recreational activities are restricted by the small strip of sand which is available at high tide. Visual observations suggest that the beach is eroding, the southern part of the beach being particularly affected. At certain times of the year when seasonal longshore sand movement is towards the north, the vertical face of the sea wall in front of the Phatthaya Beach Road/South Phatthaya Road junction is exposed to a height of 1.5 m and waves reflected by the wall in high seas cause sand erosion near the base of the wall. Furthermore, a few structures (such as a restaurant terrace) encroach beyond the general line of the sea wall and at such locations there is a serious local problem, as these structures block longshore movement and also cause beach erosion in front of the structure. (See photographs 2.1 to 2.3 in Section 2.2.2)

Phatthaya Bay is inherently stable and it is likely that the erosion problems now occurring were caused by the construction of the seawall and promenade too close to the natural shoreline. Erosion could be arrested if the road and other facilities were shifted landwards and the beach reinstated, but this is no longer practical or economic because of the extensive commercial and hotel development on the other side of the Beach Road. The realistic alternative is nourishment and widening of the existing beach, to replace sand which has been lost and create a new shoreline seaward of the present one.

Corrective measures are considered necessary if progressive deterioration and possible collapse of the seawall and other sea facing structures are to be avoided. Beach nourishment using suitable sand

would help to protect the existing promenade by reducing erosion, and would also provide a widened beach for recreational purpose - a valuable amenity for a popular sea resort.

(2) Project Outline

The existing beach, which has a level area of sand (the backshore) of width 0 to 15m, will be widened along the central and northern part of the bay to a uniform width of 50m. The proposed widened beach will extend from the Dusit Resort Boundary up to the edge of the proposed reclamation, a total length of 2700m. the location is shown in Fig. 4.2.6.

A full project description is included in Part II.

(3) Demand for Beach Facilities

Although the principal function of beach nourishment at Phatthaya is to protect the coastline and stop further erosion, it will also provide additional beach area for the projected number of visitors to Phatthaya.

The demand for beach facilities and beach are available per visitor is assessed as follows:

- At present (because of water pollution in Phatthaya bay) a few visitors use Phatthaya beach but others transfer to Jomtien (Table 4.2.2).
- More than 70,000 visitors per day are expected to use Phatthaya beach in 2006 (Table 4.2.3) after better sewerage and other anti - pollution measures have improved water quality.
- The present area of Phatthaya beach is 4 hectares (width = 15m, length = 2,700m) which would give 1.4m2 per person in 2006.

$$40{,}000\text{m}^2 \div \frac{70{,}000}{2.5^*} = 1.4\ \text{m}^2/\text{visitor}$$

This is far less than the desirable standard (5 ~ 20 m^2) which is adopted for recreational planning.

- The proposed widened beach will have an area of 13 hectares (width = 50m, length = 2,700m) and 4.6 m^2 will be available per visitor.

$$130{,}000\text{m}^2 \div \frac{70{,}000}{2.5^*} = 4.6\ \text{m}^2/\text{visitor}$$

(* assuming that visitors arrive and leave the beach at the rate of 2.5 visitors per day)

5) Tourist Port

(1) Background

No fixed facility exists at present for the safe embarkation and disembarkation of passengers travelling on excursion vessels between Phatthaya and Ko Lan or other islands. Depending on the state of the tide at the time of travel and size of excursion boat, passengers board from the beach or transfer via long-tailed boats. This is inconvenient, uncomfortable and sometimes dangerous for travellers, particularly the old and infirm. Vessels operate from all parts of the bay and there is considerable disorder. Construction of a port for excursion vessels would provide a number of benefits which include the following:

- Safe embarkation and disembarkation of passengers
- Boat movements not restricted by tides, more rapid turnaround, delays reduced.
- Provision of an efficient facility for passenger transport will introduce order into beach use and safer conditions for other activities.
- Fuel supply and waste collection for disposal concentrated at single location, more efficient control and less pollution risk.
- Centralized/more efficient port operation, rescue services, ticketing services and amenities for passengers.

(2) Demand for Port Facilities

(i) Passenger Traffic

A preliminary estimate of the number of passengers using excursion boats may be based on the projected number of visitors to Phatthaya.

No. of visitors/year (1978)	=	1,400,000	
Projected no. of visitors/year (2006)	=	3,200,000	(N)
% of visitors visiting islands*	=	30%	(R)
Number of voyages, round-trip (N×R)	=	960,000	(V)
Average daily total (V÷365)	=	2,600	(A)
Peak daily total (2×A)	=	5,200	(P)

* average for foreign and Thai visitors from tourist survey

The normal pattern of travel is that visitors usually make day-trips, leaving Phatthaya in the morning and returning later the same day.

Peak hourly volume (0.25×P) = 1,300 passengers/hour

(ii) Excursion Boat Operation

The analysis of current boat ownership and usage (see 2.5.1) indicates that the total number of excursion boats has stayed almost constant since 1978 (previous JICA Study). It is assumed that this situation will continue. A summary of estimated totals is :

	Registered boats	Actual No. (estimated)
1978	167	180
1986	145	
1989		180~200
2006		200

As mentioned earlier, the size and passenger capacity of excursion boats has tended to increase and the increase in the number of visitors has been accommodated by increases in the number of passengers carried and more frequent utilization of available boats. In 1978 the average number of passengers/boat was 9 ; the analysis of the results of the excursion boat operators' survey (see 2.5.1) indicated the average number of passengers/boat in August 1989 was 35. Most operators stated that they made 30 trips/month, and more in the peak season by making 2 trips/day at weekends. On the basis of the above figures the current annual number of passengers carried is :

=No. of boats × trips/months×12 months×av. no. of passengers
=180×30×12×35=2,268,000 passengers/year

This estimate is clearly unrealistic as it exceeds the current annual number of visitors. It should be noted that:

- the survey sample was biased towards the larger boats (which indicates the future trend in boat size)
- the average numbers of passengers carried and numbers of trips per month which were given by operators in verbal interviews were optimistic over-estimates, reflecting boat utilization as they would like it to be, rather than the actual situation.

The following estimate of the current situation is therefore proposed:
180 boats×15 trips/month×12×15 passengers/trip
=486,000: which correlates with 30% of 1,400,000 visitors/year, (current no.) making excursion trips.

The survey results suggest that the total number of boats are unlikely to increase. Instead, it may be assumed that the current trend of building and using larger boats (able to carry 100 or more passengers) will continue. The potential annual and peak daily total capacity corresponds to projections quoted in (i), on the following basis.

Projected annual total (2006)=960,000 round-trips/year or 180×20 trips/month×12×22 passengers/trip (average)
Peak daily total (2006)=5,200 round-trips/day or 150 boats utilized×1 trip/day×35 passengers/trip (average)
The number of passengers carried per boat is assumed to vary between 5 for speed boats to 100 for the larger excursion vessels.

It is apparent that there is sufficient existing capacity to transport the projected (year 2006) peak daily total of 5,200 passengers. The survey sample of 31 boats included 15 large boats, 9 medium-sized boats, 3 speed boats and 4 other boats (mainly fishing boats). The passenger capacity for the survey sample was:

Boat size/type	Number	Total capacity	Average capacity
Big	15	2040	136
Medium	9	296	33
Speed	3	47	15
Other	4	78	19

As mentioned earlier the survey sample was biased to the larger boats. The total capacity of 180 existing boats is estimated below, using a realistic distribution :

Boat type/size	Proportion	Number of boats	Capacity	
			per boat	total
Big	10%	18	136	2,448
Medium	50%	90	33	2,900
Speed	25%	45	15	675
Other	15%	27	19	513
Total	100%	180		6,536

The estimated maximum existing capacity is already 25% greater than the projected peak and with the trend for new boats being built to be larger than the ones they replace, the proportion of big boats and hence total capacity is likely to increase. For operational reasons - to allow for some boats being out of service or under-utilised - it is desirable that maximum capacity should be 50% ~60% greater than the projected peak daily total of passengers. This would be achieved if the proportion of big boats increased to 18~20% of the total. The indications are that operators and boat builders will supply larger vessels, providing public demand warrants it.

In terms of operating efficiency there is scope for a reduction in the total number of boats. This could be encouraged by the introduction of regular scheduled services which achieve good utilization of available seating, attracting passengers by charging a low fare. However the present system with a number of competing commercial operators provides flexibility for meeting the different needs of tourists, day-trippers etc. and it is realistic to assume that this

system will continue. The port facility will be planned on the assumption that most of the berths will be operated on a multi-user basis, but two berths will be allocated for potential use by regular scheduled services.

(3) Project Outline

Plans for the tourist port are based on a peak total of 1300 passengers/hour (year 2006) departing for or returning from the offshore islands. The port is a priority project and a full project description is included in Part II. Key elements of the project are:

- Three piers each 130 m long which provide a total of 30 berths with 2m water depth (at low water) at seaward end of piers.
- 3 hectares of reclaimed land, seaward of the general reclamation described in 3), for port operations and terminal buildings, passenger amenities, roads, car parking etc.
- Access channel with marker buoys and navigation aids
- Lighting, electrical power, drainage, sewerage and other utilities

Fig. 4.2.6 shows the integrated waterfront development plan for Phatthaya Bay which includes the tourist port.

(4) Project Coordination and Phasing

The tourist port is a committed project and the feasibility study, which is being executed by consultants to the TAT, has commenced recently. The feasibility study will be followed by detailed design and construction. The proposed land reclamation project, which is also a priority project keenly supported by PCG, has a significant impact on the tourist port proposals, and in master planning terms the two projects have been integrated as-described in PartII of this report, to provide the optimum overall scheme.

It is recommended that the tourist port project now underway should be carried out so that the land reclamation can be executed later as the second part of a phased development.

6) Jetfoil/Hydrofoil Berth

(1) Project Outline

The proposed berth location is offshore Laem Phatthaya where the - 4 m depth contour is reasonably close to shore. The structure would be of open-piled construction, comprising a 160 m long approach trestle and a 40 m long berthing head. Access to the trestle would be provided by a coastal road at the foot of Laem Phatthaya. The location is indicated in Fig. 4.2.6.

Further details of the project are included in Part II.

7) Piers on Ko Lan Island

(1) Background and Necessity

The three popular beaches on Ko-Lan - Ta Van, Tien and Sa Mae beaches - are all located on the west side of the island. Beach usage varies according to sea conditions and wave direction, as Ta Van is exposed to the north, Tien to the west and Sa Mae to the south west. Ta Van is the largest and most popular of the three beaches. Sa Mae is exposed to the prevailing south westerly seas and can only be used for a few months during the year.

At present there are no piers at any of the beaches for passenger embarkation and disembarkation, and passengers transfer via long tailed boats or directly onto the sandy shore. There is one pier on the east side of the island which serves residents of Ban Ko Lan, but it has insufficient water depth for vessels to berth at low tide.

Coupled with the proposed development of a tourist port at Phatthaya there is also a need for improved facilities at Ko Lan for vessels travelling between Phatthaya and Ko Lan. Because of the hilly terrain of Ko Lan, travel overland between the beaches and village is difficult and, ideally, an independent facility is needed at each location. Taking account of current and potential use of new or improved facilities, the following projects are proposed :

Priority project	- construction of pier at Ta Van beach
Desirable projects	- extension of pier at Ban Ko Lan to provide 2 m (minimum) water depth at low tide.
	- construction of pier at Tien beach

Of the projects listed above, the PWD has already designed and prepared a cost estimate on behalf of Phatthaya City for the proposed pier at Ta Van beach. It is understood that construction bids have not yet been invited and the implementation schedule is uncertain.

(2) Project Outline

The locations of the proposed pier construction and extension projects are shown in Fig. 4.2.7 and principal details are tabulated below :

Project	Location	Length	Construction Type
(i) Ta Van Pier	Off east headland of Ta Van bay	292 m	rock causeway (185 m) + concrete deck on piles (107 m)
(ii) Ban Ko Lan pier extension	Ban Ko Lan village	50 m extension	concrete deck on piles
(iii) Tien pier	Off south headland of Tien bay	200 m	rock causeway + concrete deck on piles

8) Extension of Na Klua Fishing Pier

(1) Background and Necessity

The seabed offshore of Na Klua fishing village consists of a shallow mud flat which falls at a very gradual slope to the −1 m seabed contour. The existing Na Klua fishing pier although of 825 m overall length does not have sufficient water depth, even at its seaward end, for unrestricted operation of fishing vessels at low tide. The pier, which has already been extended once, requires a further extension in order to permit vessels to berth at all states of the tide, thus improving operational efficiency.

(2) Project Outline

The original pier consisted of a 200 m long rock causeway, a concrete piled approach trestle 453 m long and a concrete piled pier head 16 m wide by 30 m long. Later, a 152 m long timber piled extension was added.

The proposed extension will increase the pier length seawards by 300 m so that the tip of the pier is beyond the −1 m seabed contour. Construction

details would be similar to the existing pier extension, consisting of pairs of concrete or timber piles which support a timber deck, with timber fender piles to permit vessels to berth on both sides of the extended pier.

The existing pier and the proposed extension are shown in the figure below.

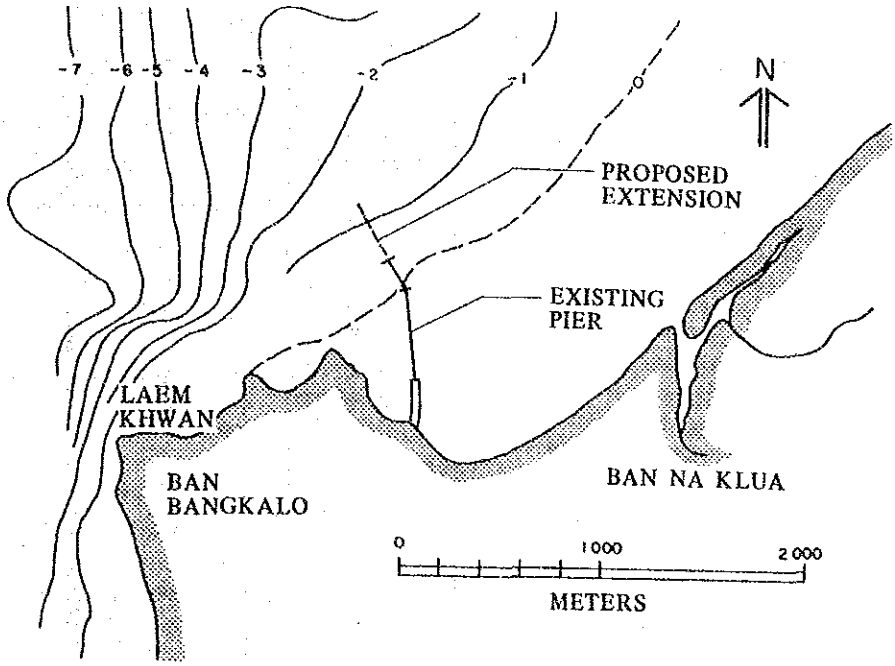


Table 4.2.1 WATERFRONT PROJECTS

Ref. No.	Project	Location	Purpose	Priority	Outline Description
1	Land Reclamation	South part of Phatthaya Bay	To provide additional land for development, control pollution and improve appearance of waterfront	High	Reclaimed area 18 hectares (excluding tourist port), overall length 1900m, width varies - maximum 180m
2	Beach Restoration	North and Central parts of Phatthaya Bay	To arrest coastal erosion and provide a wider recreation beach	High	Beach widened by deposition of sand from offshore or inland source. Overall length 2700m, width 50m
3	Tourist Port	South Phatthaya	To provide embarkation, disembarkation and associated facilities for excursion boats and other small vessels	High	3 Piers, each 130m long, total number of berths = 30. Reclaimed area (3 hectares) for passenger terminals, port buildings, approach road etc.
4	Jet foil/Hydrofoil Berth	Offshore of Laem Phatthaya	Berthing for Bangkok-Phatthaya service	High (if not already implemented by private sector)	40m long berth, located near −4m depth contour, 160m long approach trestle
5	Piers on Ko Lan Island				
	a) Ta Van Pier	West coast, Ko Lan	Embarkation/disembarkation of boat passengers	High	292m long pier
	b) Ban Ko Lan pier extension	East coast Ko Lan	Embarkation/disembarkation of boat passengers	Desirable	50m long pier extension
	c) Tien pier	West coast, Ko Lan	Embarkation/disembarkation of boat passengers	Desirable	200m long pier
6	Na Klua fishing pier extension	Offshore of Na Klua Village	To improve berthing facilities for fishing boats	Desirable	300m long pier extension

Table 4.2.2 PRESENT DISTRIBUTION OF TOURISTS BY BEACH

Beach	No. of rooms		No. of Tourists				Modified No. of Tourists	
	Hotel	Condo	Overnight Tourist /1	Day tripper /3	Total		No. of Tourists on Beach /5	
① Na Klua	2,504	361	5,800	0	5,800		(400)	5,400
② Phatthaya	10,410	69	19,000	16,800	35,800	/4	(1,100)	2,700
③ Kao Phatthaya	1,839	639	5,600	-	5,600	(32,000)	(300)	5,300
④ Jomtien	1,076	194	2,600	4,200	6,800		(200)	38,600
⑤ Tha Farang Bang Sare	3,296	205	6,700	-	6,700		-	6,700
⑥ Others	56	-	100	-	100		/6	100
⑦ Ko Lan	-	-	-	-	-		2,000	2,000
Total	19,181	1,468	39,800	21,000/2	60,800			60,800

Remarks:

/1 Overnight tourist, hotel rooms × 1.8 occupants + Condo rooms × 3.6 occupants

/2 No. of day trippers per annum = 700,000
No. of day trippers per peak day = 700,000 × 0.03 = 21,000

/3 Day trippers are distributed on Phatthaya beach and Jomtien beach in the same ratio as the number of overnight tourists.

/4 Assumed that 90% of tourists on Phatthaya beach shift to Jomtien beach because of water contamination in Phatthaya bay.

/5 Tourists visit Ko Lan from Na Klua, Phatthaya beach, Kao Phatthaya and Jomtien beach.

/6 Visitors to Ko Lan : 1,400,000 × 30% × 0.5% (peak day ratio: JICA previous study)
= 2,000

Table 4.2.3 FUTURE DISTRIBUTION OF TOURISTS BY BEACH

(in 2006)

	No. of rooms		No. of Tourists			Modified No. of Tourists	
	Hotel	Condo	Overnight Tourist /1	Day tripper /3	Total	/4	No. of Tourists on Beach
① Na Klua	3,004	1,368	10,300	-	10,300	(600)	9,700
② Phatthaya	12,249	3,038	33,000	45,000	78,000	(2,200)	75,800
③ Kao Phatthaya	2,514	3,310	16,500	-	16,500	(1,000)	15,500
④ Jomtien	7,367	1,672	19,300	27,000	46,300	(1,200)	45,100
⑤ Tha Farang Bang Sare	4,656	1,163	12,600	-	12,600		12,600
⑥ Others	556	-	1,000	0	1,000	/5	1,000
⑦ Ko Lan	-	-	-	-	-	5,000	5,000
Total	30,756	10,551	92,700	72,000/2	164,700		164,700

Remarks:

/1 Overnight tourist, hotel rooms × 1.8 occupants + Condo rooms × 3.6 occupants

/2 No. of day trippers per annum = (1,374,000(Thai overnight tourist in 2006) ÷ 405,000 (Thai overnight tourist in 1987)) × 700,000 (Thai day trippers in 1987) = 2,400,000 (Thai day trippers in 2006)
No. of day trippers per peak day = 2,400,000 × 0.03 = 72,000

/3 Day trippers are distributed on Phatthaya beach and Jomtien beach in the same ratio as the number of overnight tourist.

/4 Tourists visit Ko Lan from Na Klua, Phatthaya beach, Kao Phatthaya and Jomtien beach.

/5 Visitors to Ko Lan : 3,200,000 × 30% × 0.5% (peak day ratio) = 5,000

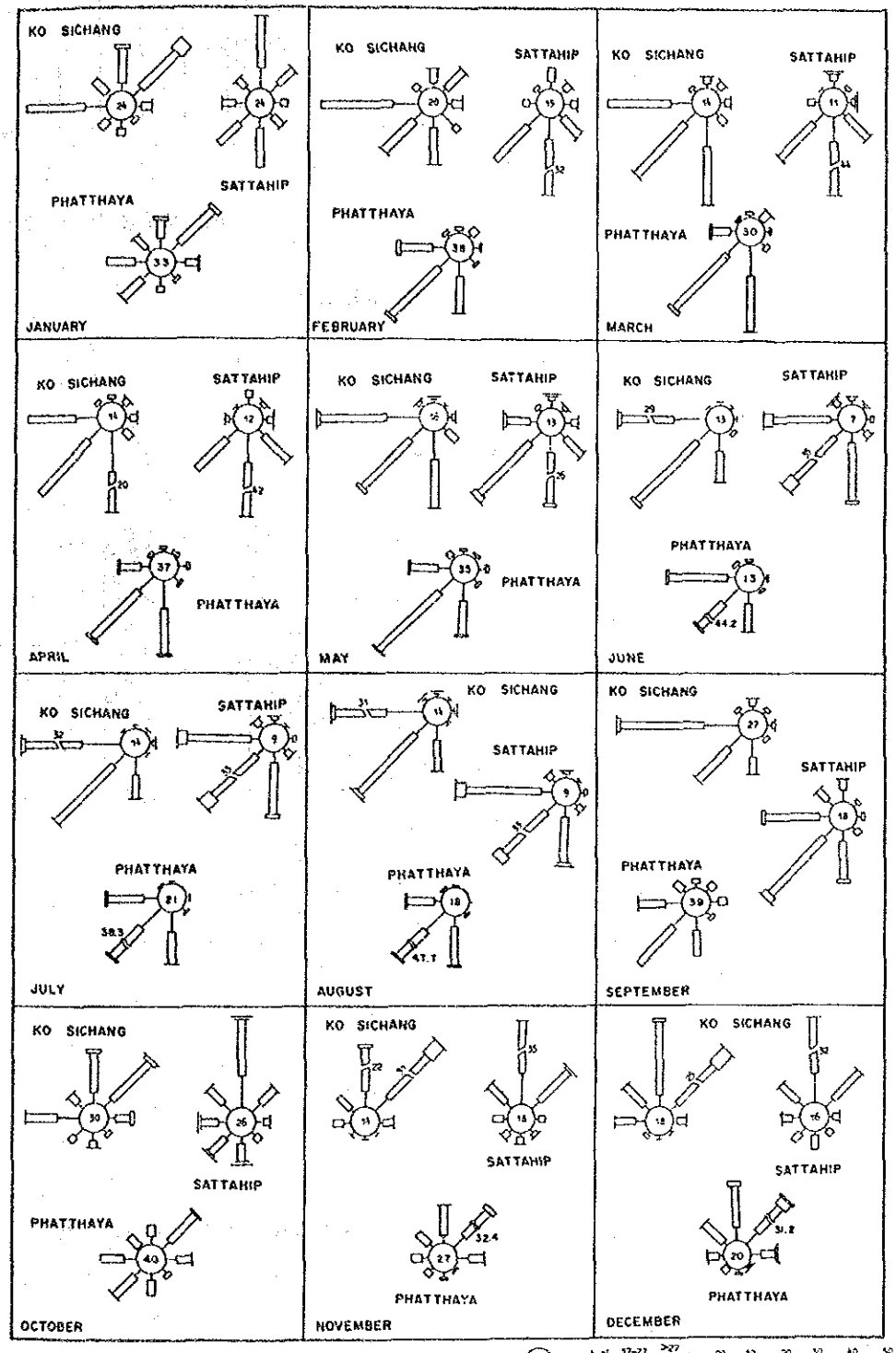


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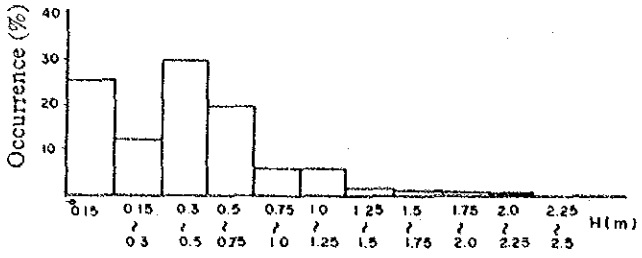
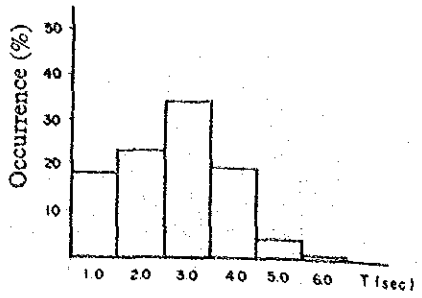
Fig. 4.2.2 Wind Speeds and Directions

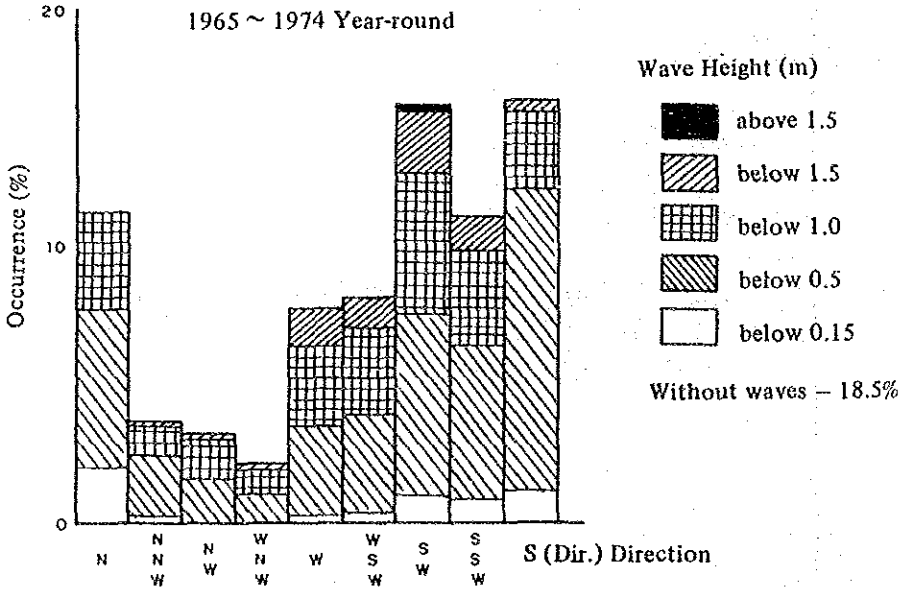


SIGNIFICANT WAVE HEIGHT

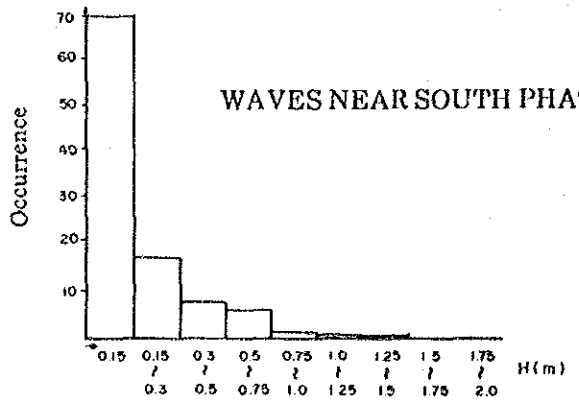


SIGNIFICANT WAVE PERIOD

OFFSHORE WAVES



OFFSHORE WAVES



WAVES NEAR SOUTH PHATTHAYA

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Fig. 4.2.3 Wave Heights and Periods

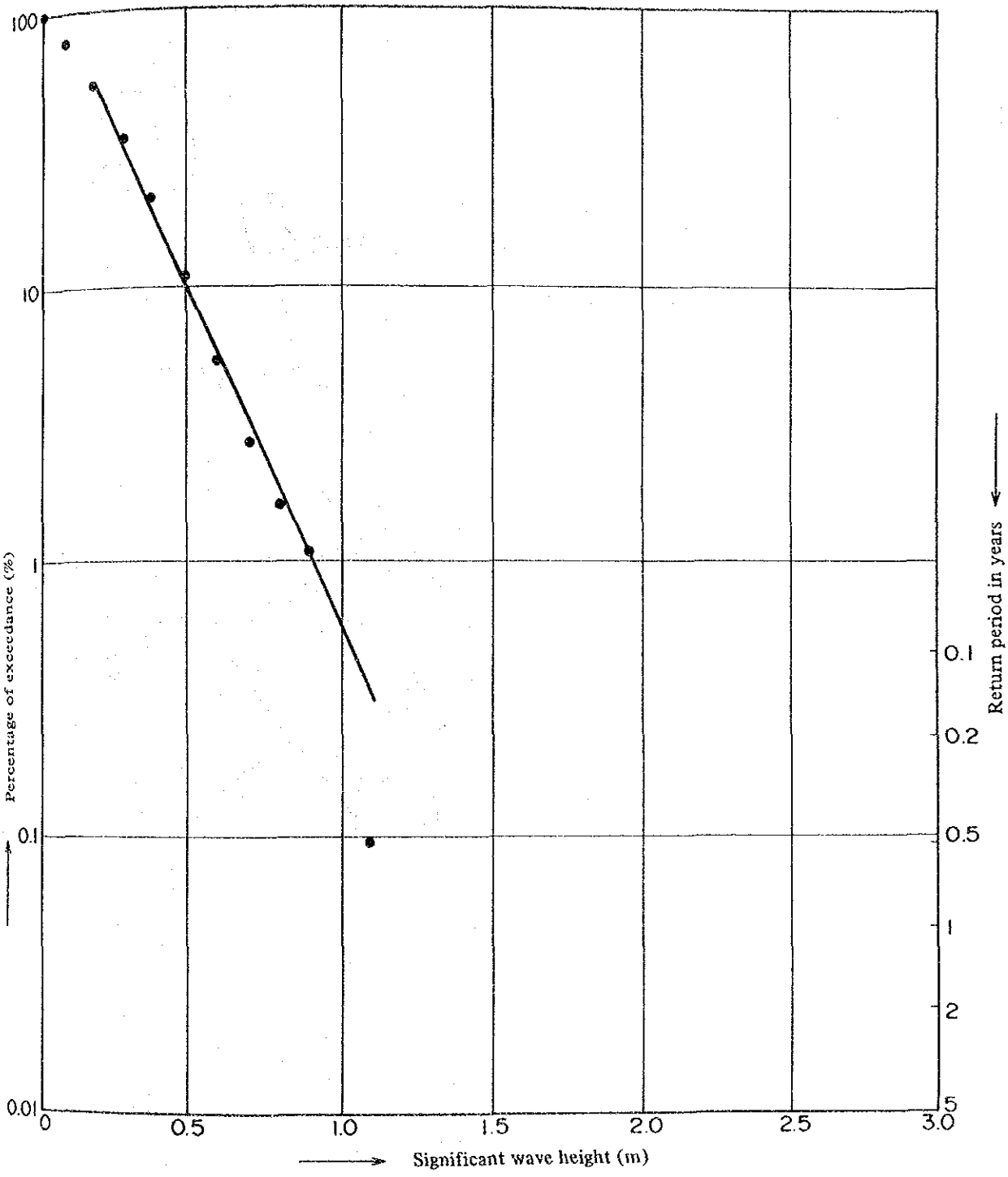

Fig. 4.2.4 Wave Height Exceedance Curve - Laem Chabang

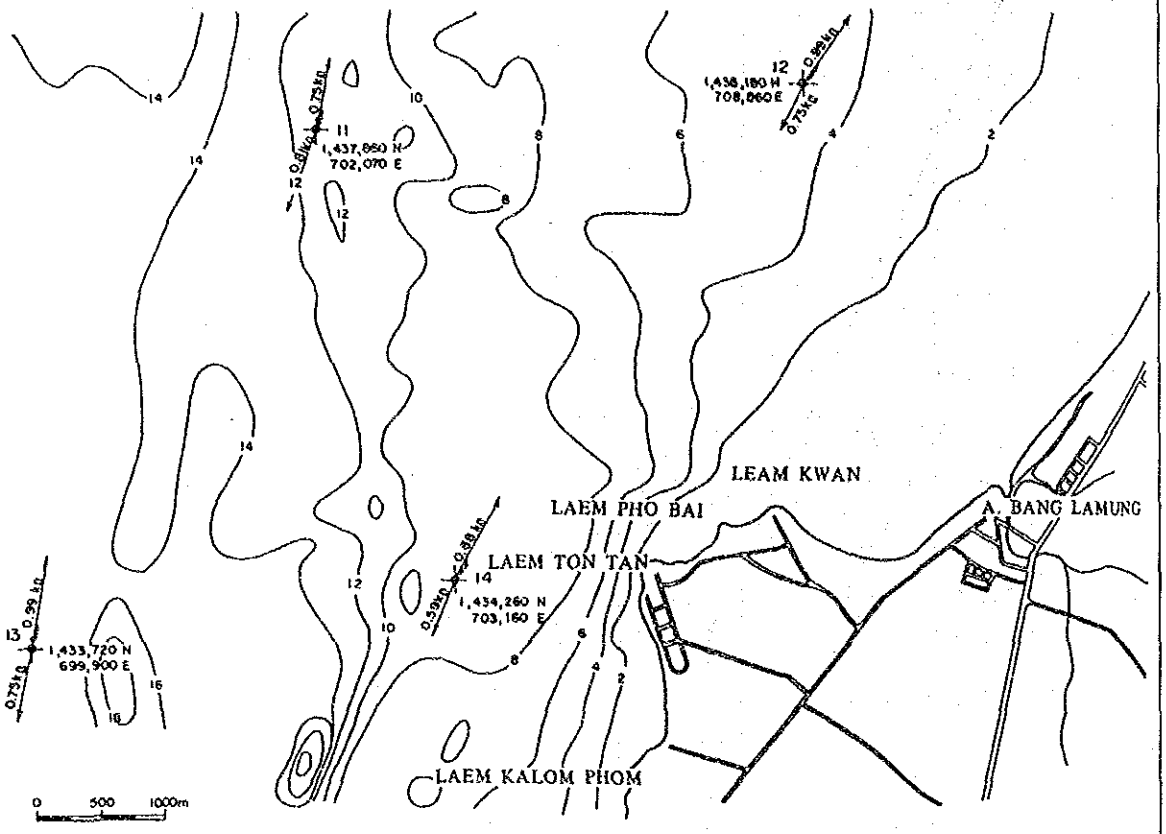

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Fig. 4.2.5 Tidal Currents
- North Phatthaya

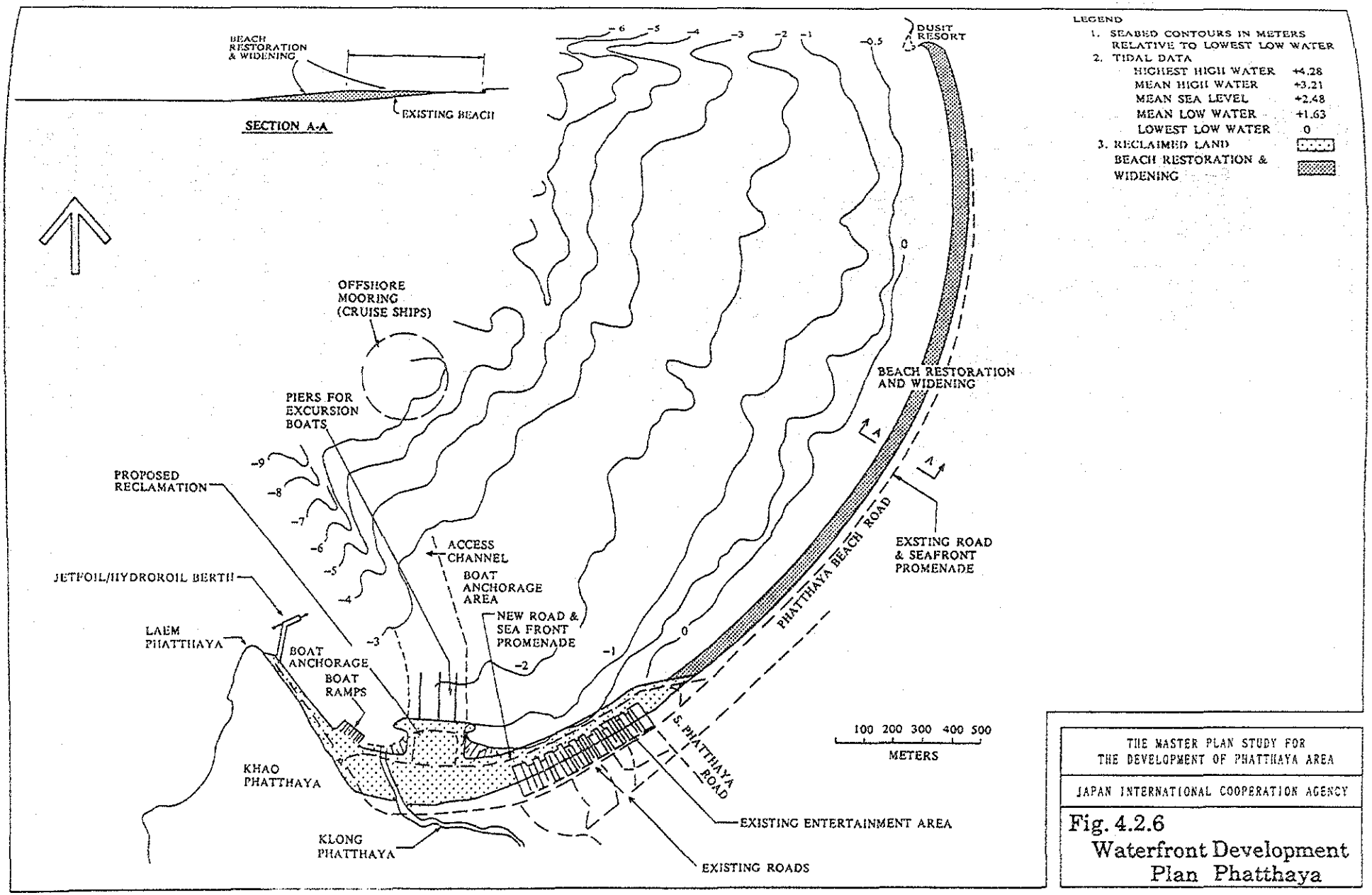

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Fig. 4.2.6
Waterfront Development Plan Phatthaya

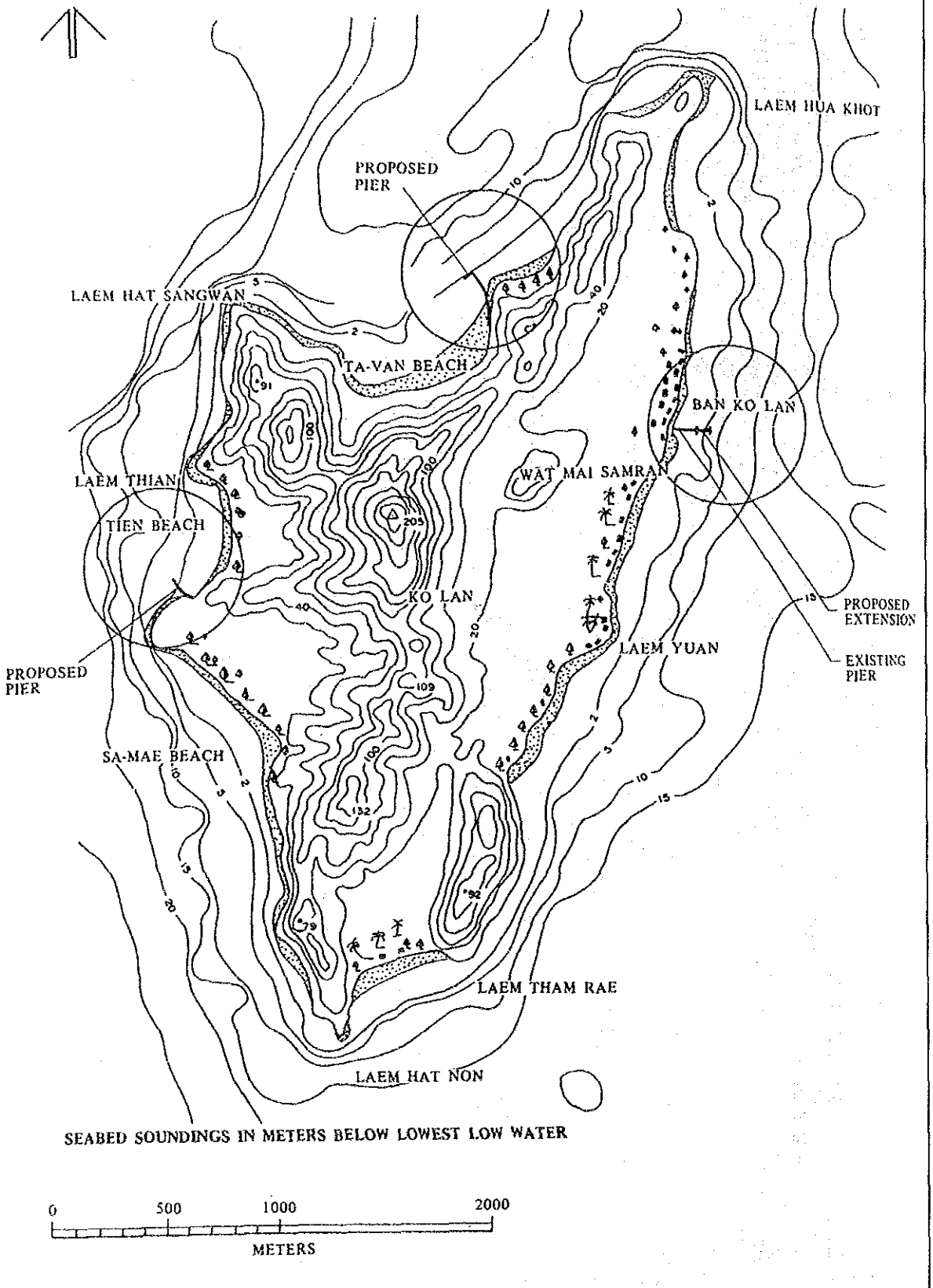

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Fig. 4.2.7 Piers at Ko Lan