replacing the present house and land tax. Property tax should be a local tax.

(4) Introduction of Capital Gain Tax

Recommendation

To enhance the finance of the governments, it may be advisable that capital gain tax for the real estate should be introduced. By applying higher tax rates for these tax payers who have held the estate for short period, reduction of the transaction of land and buildings on speculation may also be expected.

5.2.3 Legal

1) Enactment of Laws, Royal Decrees and Ordinances

In order to materialize and support the institutional and financial reforms recommended in this Study, amendments of the existing legal framework should be made, if the Government of Thailand so decides. In some cases, enactment of new laws and other legal actions should be taken. The relevant laws would include:

i) Enhancement and Conservation of Natural Environmental Quality Act, B.E. 2518

ii) Public Health Act, B.E. 2484

iii) Town Planning Act, B.E. 2518

iv) Building Control Act, B.E. 2522

v) Administration of Phatthaya City Act, B.E. 2521

vi) Municipal Act, B.E. 2496

vii) Royal Decree of Municipal Officials, B.E. 2519

viii) Municipal Revenue Act, B.E. 2497

ix) House and Land Tax Act, B.E. 2475

x) Local Development Tax Act, B.E. 2508

2) Specific Recommendations

Careful and in-depth study should be carried out on the necessity and the way to amend the current legal setting of Phatthaya and the country in order to upgrade the present environmental conditions of Phatthaya and to realize its integrated development effectively.

These laws directly concerned with the institution and financial recommendations should accordingly be amended.

Hereunder several specific recommendations are made.

(1) Enhancement and Conservation of Natural Environmental Quality Act

Recommendation 1

It is recommended that the types and sizes of projects or activities requiring Environmental Impact Assessment (EIA) report to be submitted under the Act regarding the measures for the prevention of and remedy for the adverse effect on the environmental quality should include hotels and resort facilities with less than 80 rooms.

Recommendation 2

It is recommended that the level of fines against the violation of the Act should be examined so that it reflects the value of violation, i.e., the benefit which violator could get and the value of damage caused. The power of promoting and maintaining the environmental quality and natural resources should be given to the Phatthaya City.

(2) Public Health Act

Recommendation

It is recommended that the solid waste and nightsoil collection fees should be raised by revising the Regulation of the Ministry of Public Health, B.E. 2528 issued under this Act so that certain level of cost recovery as well as the principle of beneficiary-to-pay should be attained.

(3) Town Planning Act, B.E, 2518

Recommendation 1

In order to expedite the expropriation of land or immovable property in the enforcement of the Specific Plan, the compensation to be paid to the owner or the occupier of the property to be expropriated should be prescribed according to the fair price of the property as of the date of the enforcement of the Town Planning Act enforcing the Specific Plan, instead of the date of the enforcement of the Royal Decree prescribing the area of land for the making of the Plan.

Recommendation 2

It is recommended that the penalty prescribed in the Act should be strengthened in order to make its enforcement more effective. The amount of the fines should be based on the benefit derived from using the land or modifying or altering the immovable property differently from that prescribed in the Act enforcing the Specific Plan or Ministerial Regulation enforcing the General Plan.

(4) Making of a General Plan for the Study Area

Recommendation

In order to guide the rapid development which is in progress at present and expected to continue in the coming years in the Study Area, it is recommended that a General Plan should be prepared and made for Jomtien, Tha Farang, Bang Sare and Ko Lan which are not covered by the existing General Plan for Phatthaya. A Ministerial Regulation should be declared subsequently to enforce the Plan. If deemed appropriate, the present General Plan should also be revised so that it is in harmony with the new Plan.

(5) Making of a Specific Plan

Recommendation

In order to achieve the orderly and efficient development as well as to secure the public safety and security and environmental conservation, it is recommended that a Specific Plan should be prepared and made for the Study Area, keeping consistency with the General Plan. The Specific Plan should

be effected by enacting an Act subsequently. It is worth consideration that the Specific Plan should be made without making of a General Plan for the area where a General Plan has yet to be made, in order to expedite the making of a Specific Plan.

(6) Building Control Act, B.E. 2522

Recommendation 1

In order to meet the objective of the land classification stipulated in the General Plan and Specific Plan, the following control measures should additionally be provided through the modification of the Building Control Act.

- Building coverage ratio
- Floor area ratio
- Absolute height
- Other measures appropriate for better town planning

Recommendation 2

It is also recommended that types of buildings should be regulated in the Building Control Act, which are allowed to be constructed in the tracts where alternative land use other than specified in the General Plan is allowed by the Town Planning Act.

Recommendation 3

With a view to more effective execution and enforcement of the Act, it is recommended that the Local Competent Officer, City Manager in the case of the Phatthaya City, who is authorized to issue a building licence or give disapproval order thereof should also be empowered or at least involved to consider and impose fines against violations for which penalty is a fine only.

(7) Building Permit with Stronger Coordination with Infrastructure Development

Recommendation

In order to avoid the discrepancy between building construction and infrastructure development and provision of public services, due consideration should be paid in the execution of Building Control Act for the

resulting requirement for public services, when the licence is issued for building construction and modification. Strong coordination should be maintained particularly between the local competent officer and the Office of the Buildings Control Committee as well as the departments and authorities in charge of providing public services.

(8) Promotion of Favorable Development

Recommendation

It is recommended that preferential treatment should be given to these well-fit to the development policy of Phatthaya. The preferential measures may include :

- Legal measures such as the easement of the control measures including building coverage ratio, floor area ratio and absolute height.
- Financial incentives including the preferential tax treatment including exemption and reduction of taxes.

5.3 Other Relevant Recommendations

1) Taking Population Census

Recommendation

It is strongly recommended that a comprehensive population census should be carried out as soon as possible by the Central Government in cooperation with PCG in order to improve the accuracy of infrastructure development as well as to upgrade the institutional and financial strength of the Phatthaya City, considering that there exists a big gap between the registered and actual population figures as well as the existence of considerable number of seasonal and temporary workers in Phatthaya.

2) Survey of the Number of Day Trippers

Recommendation

It is recommended that a survey should be carried out to confirm the number and characteristics of day trippers for Phatthaya by means of roadside interview both during peak and off tourist seasons.

VI. PRIORITY PROJECTS

The principal features of the short - list projects (hereafter called priority projects) are given hereunder.

6.1 South Phatthaya Land Reclamation and Port Facilities

6.1.1 General

It is proposed that the sea should be reclaimed at South Phatthaya to construct piers as well as buildings and facilities thereon. The objectives are :

i) To create a precious tract of coastal land which is currently in short supply with high land price and thereby to contribute to the further development of Phatthaya.

ii) To assemble the various government offices including TAT office and the Tourist Police Department which are scattered at present to provide better service to the public and tourists.

iii) To alleviate the sea water pollution at South Phatthaya by collecting the effluent to the sewage treatment plant from the existing illegal restaurants and shops located along the sea as well as by filling up the polluted mud at the seabed.

iv) To provide the piers for the tourists for sea transportation together with a terminal building and parking area.

v) To enhance the cultural and artistic environment of Phatthaya by providing a concert hall and a theater, etc.

vi) To upgrade the social services by providing parks, library, children house, etc.

vii) To promote events in Phatthaya by event hall and event square.

viii) To render better service for the tourists by providing a duty - free shop and souvenir shops.

ix) To strengthen the commercial activities of Phatthaya by constructing commercial buildings and restaurant.

6.1.2 Project Description

1) Reclamation Plan

The proposed reclaimed area will occupy a total length of approximately 1,900 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 Phatthaya canal and the Siam Bayshore Hotel it will be 300m wide. The shape of the reclamation land is designed paying due attention to the following aspects:

- to ensure adequate water depth for vessels with relatively small width of the reclamation land,
- to limit the change of shoreline configulation to minor extent in order to avoid the possible coastal erosion.

The total area reclaimed will be about 19 hectares. The project plan is shown in Fig. 6. 1. 1.

2) Sources of Sand Fill

Two inland sources of sand for reclamation have been identified within reasonable transportation distance of Phatthaya. Sand is available at Nong Ko and also at Map Prachan. Examination of sand samples and grain size distribution curves from laboratory tests indicated that both sources can provide reclamation fill of good quality with a very low fines content, well below the 15% limit.

In order to avoid road traffic congestion and environmental nuisance in Phatthaya City, the use of marine equipment for reclamation is advisable. If sand from a land source is used, it will be necessary to transport it to a loading point on the coast (probably Laem Chabang) for transfer to marine plant and transport by sea to Phatthaya.

The costs of double handling incurred by this method could be avoided if a suitable offshore source for dredged sand were located. A key aspect of the feasibility study for the reclamation project would be site investigations to search for offshore deposits of sand within reasonable sea transport distance from Phatthaya.

3) Tourist Port

The type of facility proposed is a port with a number of berths where excursion boats would moor for periods sufficient only for passengers to disembark and embark. No boat would stay at a berth for a longer period : instead it would vacate the berth after completing passenger disembarkation/embarkation, and at busy periods each berth would be occupied by a number of boats in rotation. Essentially the facility would be similar to a multi - user bus terminal.

Excursion boats anchor in Phatthaya bay or Ko Lan at night or during the day when not in use. For an existing and future projected total of 180 - 200 boats, it would not be a practical or economic proposition to provide moorings at berths for the full vessel fleet. Besides, as the construction of breakwaters to provide sheltered conditions should be avoided (in order to minimize capital costs and potential coastal engineering problems) the most effective method for boats to cope with occasional bad weather is to lie at anchor, aligned to the prevailing winds and waves.

4) Land Use of Reclaimed Land

Integrated land use plan is worked out in compliance with the objectives of the land reclamation as shown in Fig. 6.1.2 and Table 6.1.1. A perspective figure of the reclaimed land is shown in the head of this report and the activity in port piers is imaged in Fig. 6.1.3.

5) Environmental Impact

Until now, numerous reclamation projects were undertaken in the world. Japan, which is surrounded by sea on every side, has long and vast experience in this field. According to her experience, reclamation projects with such size and configulation as South Phatthaya Land Reclamation would not impose major environmental problems including coastal erosion and EIA (Environmental Impact Assessment) is not legally required for the reclamation with less than 50 ha of area.

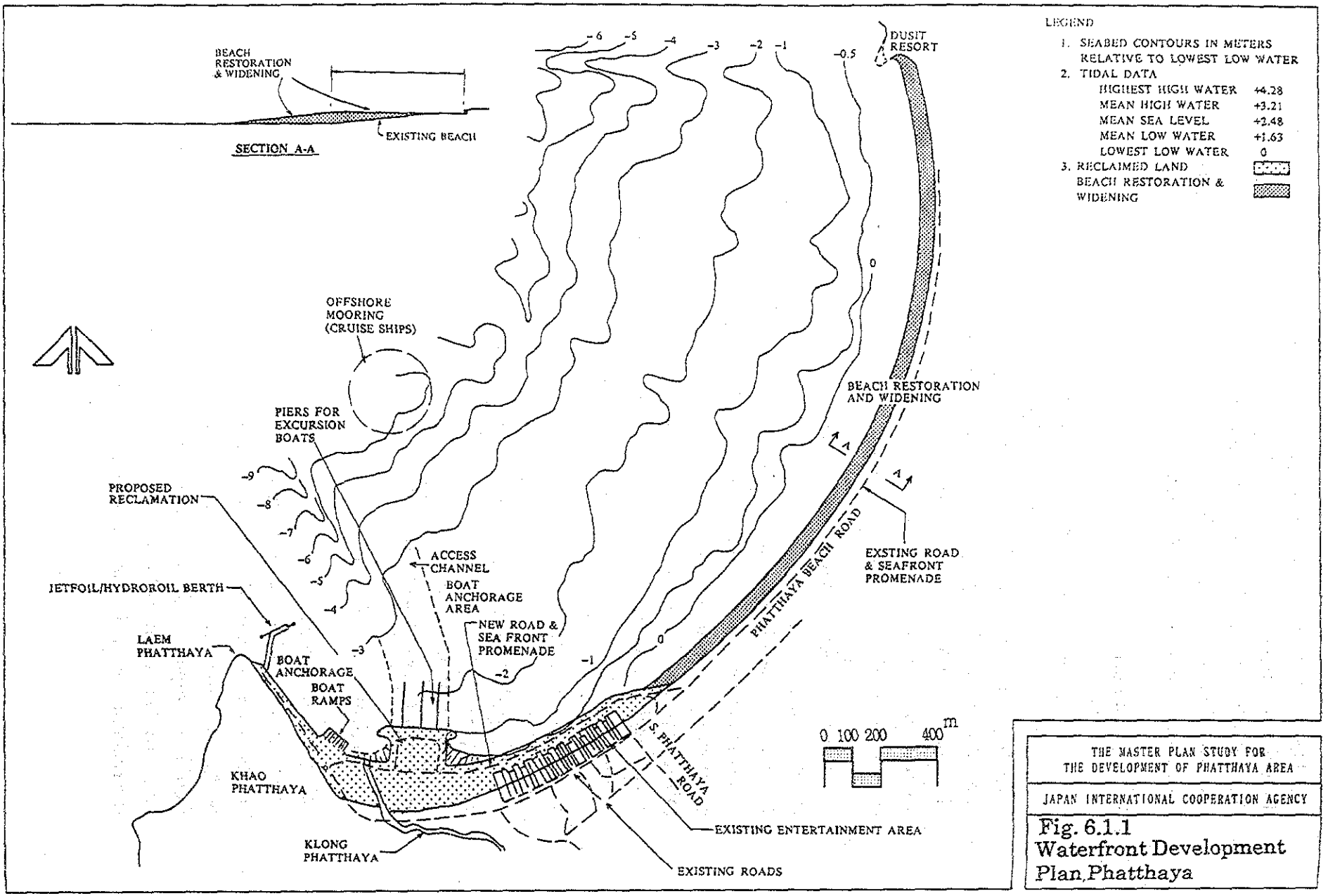

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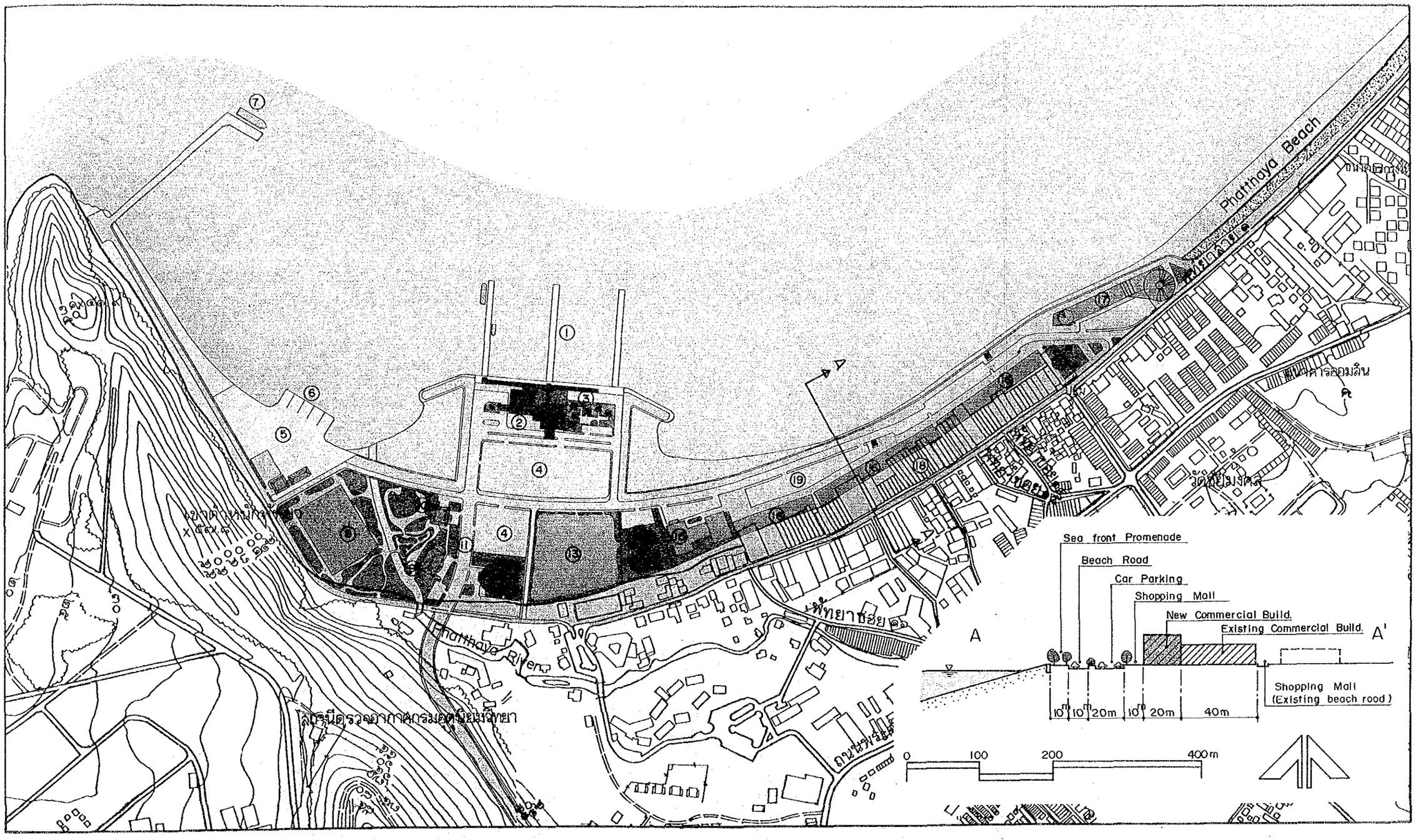
Fig. 6.1.1
Waterfront Development Plan, Phatthaya

Table 6.1.1 LAND USE OF RECLAIMED LAND

ITEM	AREA			REMARKS
	(m^2)	(Rai)	%	
1. Port terminal area				
① Terminal building	9,200	5.5		Symbol tower are included.
② Administration area	4,100	2.5		
③ Main access road	1,400	0.8		
④ Sub road	4,700	2.8		
⑤ Pedestrian way	5,600	3.4		
⑥ Car parking	16,000	9.6		Bus terminal is
Sub total	41,000	24.6	21.7	included.
2. Commercial build	9,500	5.7	4.8	Building area only.
3. Restaurant	5,000	3.0	2.7	Car parking area shown in below 10 is exclusive.
4. Art center	6,500	3.9	3.4	Car parking ($1,500m^2$) is included.
5. Concert hall, Theater	6,000	3.6	3.2	
6. Event hall	5,000	3.0	2.7	
7. Event square	13,300	8.0	7.1	
8. Park	29,200	17.5	15.6	Library, (building area $1,000m^2$), children club (building area $400m^2$) and river ($1,800m^2$) are included.
9. Boat yard	14,200	8.5	7.5	Ramp yard is included.
10. Road				
① Access main	3,400	2.0		Improvement of 720m from 2nd beach road to entrance will be additionally needed.
② Sub road	20,000	12.0		
③ Pedestrian	18,400	11.0		
④ Car parking	8,900	5.3		
Sub total	50,700	30.3	26.9	
11. Spot park	3,200	1.9	1.7	
12. Others	5,000	3.0	2.7	
Total	188,600	113.0	100.0	

Remarks : Area of piers of excursion boat and jetty of jetfoil are not included.



Legend

① Piers for excursion boat
② Terminal building & operation building
③ Governmental office
④ Car parking & bus terminal
⑤ Boat yard
⑥ Ramp
⑦ Pier for jetfoil (open piled construction)
⑧ Park
⑨ Library
⑩ Children house
⑪ Main access road
⑫ Concert hall & theater
⑬ Event square
⑭ Event hall
⑮ Art center (Craft souvenir center)
⑯ New commercial building
⑰ Restaurants
⑱ Existing commercial building
⑲ Car parking
⑳ Spot park

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Fig. 6. 1. 2

Land Use Plan of Reclaimed Land

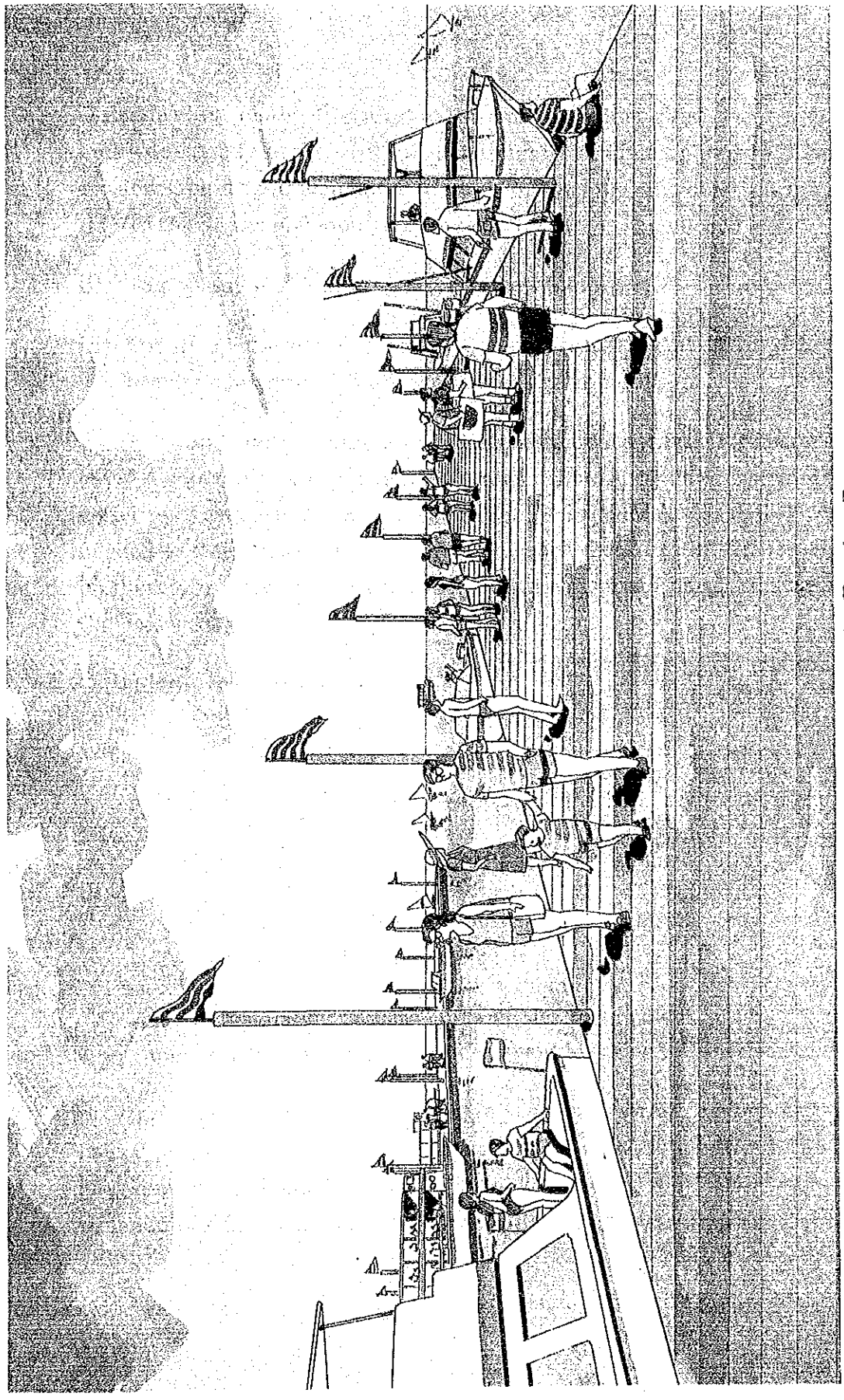

Fig. 6.1.3 Activity in the Tourist Port

6.2 Phatthaya Beach Restoration

6.2.1 General

Restoration of the Phatthaya Beach which has been narrowed down badly due partly to the road construction and probably partly to the coastal erosion should be implemented to serve for the following objectives :

i) To revive the precious tourism resource of the sand beach.

ii) To prevent or at least alleviate the coastal erosion.

iii) To fill up the polluted mud at the seabed in front of the Phatthaya beach and thereby to improve the sea water pollution.

The landside promenade in Phatthaya beach road is too narrow to enjoy a shopping stroll for tourist. In addition to the sea front promenade which was constructed a few years ago, a landside pedestrian way are needed to create a safe and comfortable beach front in Phatthaya beach. It is, therefore, proposed that a wide pedestrian should be constructed along the beach road.

6.2.2 Project Description

1) Beach Restoration

Factors favouring beach restoration at Phatthaya are :

- mild wave climate
- naturally occurring beach sand which is reasonably coarse and thus stable at a fairly steep slope (1 : 10)
- rocky headlands at both ends of the bay which confine longshore movement within the bay and prevent losses to the north or south.

It is proposed that the existing beach, which at present has a backshore of width varying form 0 to 15 m along the length of Phatthaya bay, should be widened to provide a backshore of 50 m uniform width. The widened beach would follow the natural curve to the coastline so that the

characteristic spiral shape of the bay is maintained as shown in Fig . 6. 1. 1. Fig. 6.2.1 shows the sketch of the widened beach.

Two land sources, at Map Prachan and Nong Ko for the supply of sand have been identified. The material at Mab Prachan is coarser and is more likely to be stable than from Nong Ko. Visual inspection of the Phatthaya beach materials suggests that reasonable matching would be achieved by the use of Mab Prachan sand but this should be checked by laboratory testing of bulk samples taken from Phatthaya beach.

There are no known offshore sources and an offshore investigation to find a suitable deposit, from which sand could be taken without detriment to the surrounding environment, would be a key item for study of project feasibility including and accurate cost estimate.

2) Phatthaya Beach Promenade

The follwing projects are proposed to be implemented

- A wide pedestrian way in landside along beach road in order to serve for tourists as a comfortable shopping mall.
- Some safety crossing points in beach road considering of traffic volume and car speed.

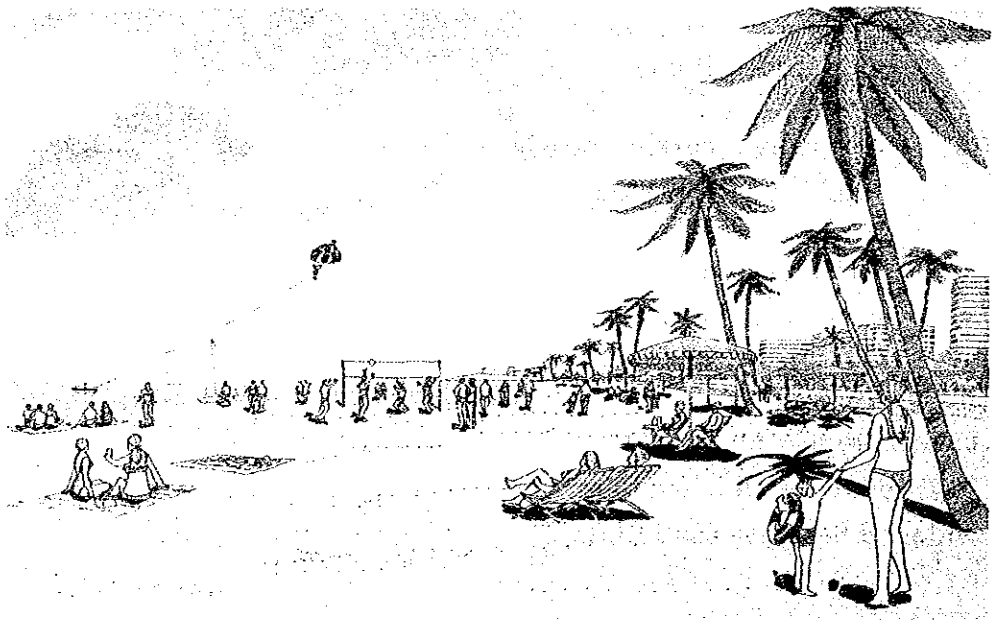

Fig. 6.2.1 Widened Phatthaya Beach

6.3 Ta Van Pier

6.3.1 General

The only fixed facility for berthing small boats at Ko Lan is a pier offshore of Ban Ko Lan, the fishing village on the east side of the island. The three public beaches, which are all on the island's western coast, have no piers for passenger embarkation and disembarkation. It is proposed that a pier should be constructed on Ta Van beach, which is currently the most developed beach on the island and which also has access to the interior.

6.3.2 Project Description

A design for a pier at Ta Van has already been prepared by PWD for PCG. Considering this, the plan shown in Fig. 6.3.1 is proposed to be implemented.

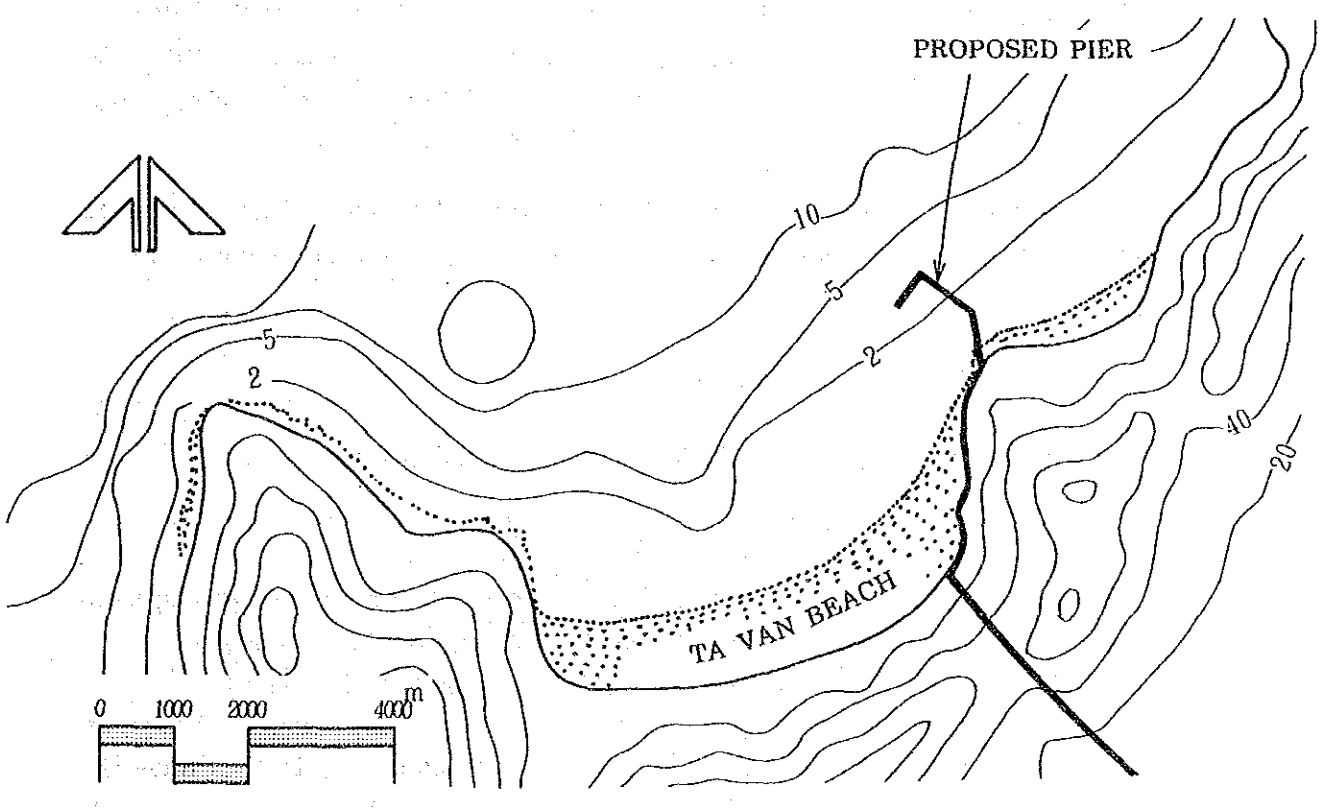

Fig. 6.3.1 Location and Configuration of Ta Van Pier

6.4 Sewerage

Due to the effluent discharge, which is not treated or inadequately treated, into the water body including the rivers and the sea, water has been seriously degraded in Phatthaya. Together with other environmental problems, the reputation of Phatthaya as an international resort has been in danger. As the tourists and the resident population increase, the situation would further be aggravated. Sewerage development including sewage treatment faulities should, therefore, urgently be implemented.

6.4.1 Na Klua Area Sewerage and Sewage Treatment Project

1) General

For sewerage and sanitation purposes the Na Klua catchment area is defined as the area within Phatthaya City boundaries to the north of the line of the watershed between Na Klua and Phatthaya town.

The project works will include construction of the sewage treatment plant and all major interceptor sewers, connections to them from existing drainage and the necessary overflow and sewage pumping arrangements required to eliminate all unacceptable wastewater discharges to natural watercourses and the sea.

Average daily flow in peak season for the Phase I * works to be completed by 1996 is set at 12,500 m^3/day. Required sewage treatment capacity is shown in Fig. 6.4.1.

2) Alternative Schemes and Selection

Two alternative schemes are studied and compared as follows :

Scheme A

Scheme A assumes that a site for a sewage treatment works is acquired alongside the Na Klua River to the east of Sukhumvit Road, that the

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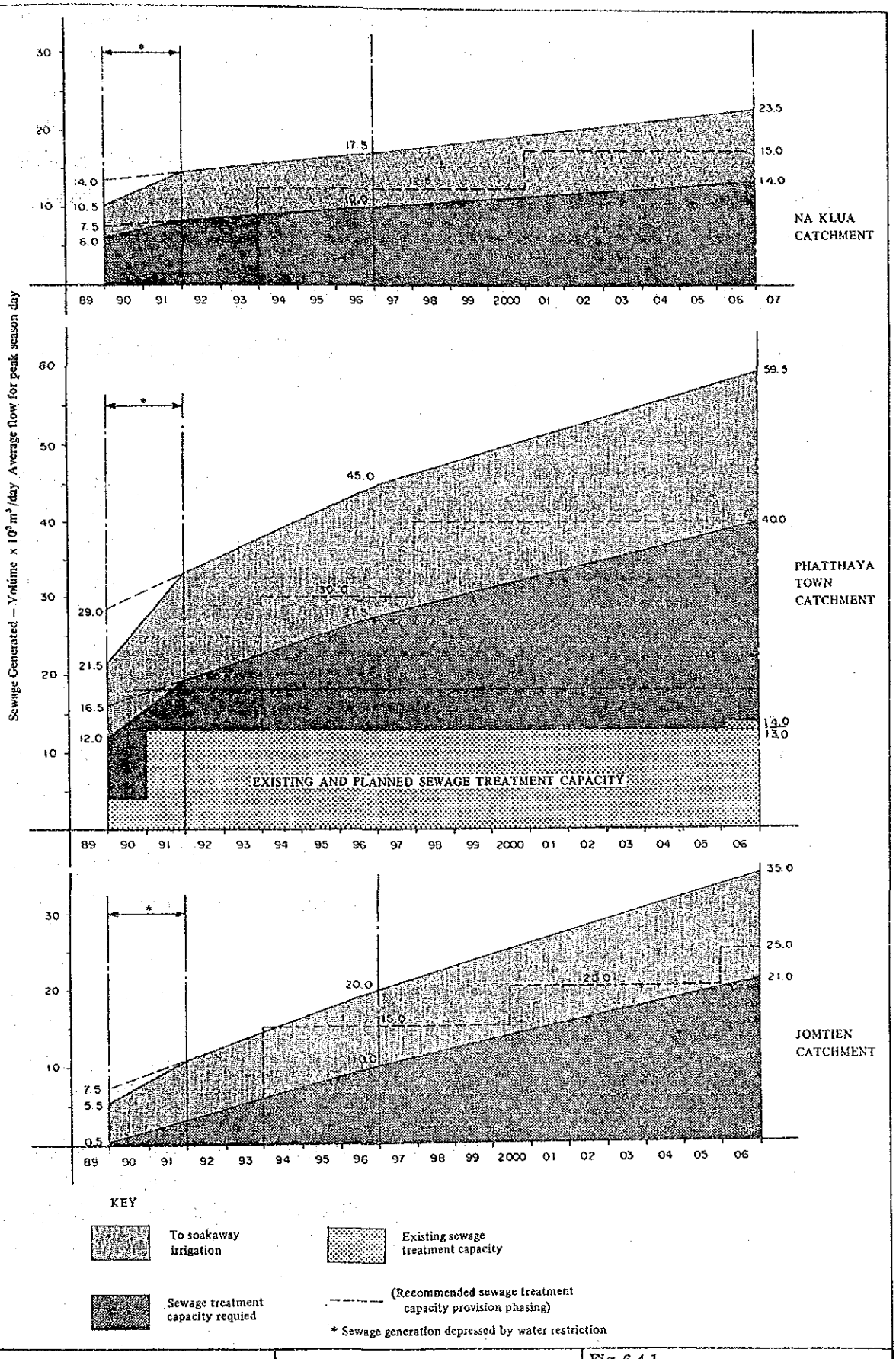
* Although priority projects are these to be carried out by 1996 (Phase I), Phase II projects have relevance particularly to the comparison and selection among the alternatives and would be referred to when necessary.



THE MASTER PLAN STUDY FOR THE DEVELOPMENT OF PHATTHAYA AREA	JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 6.4.1 Sewage Treatment Demand

sewerage system is designed to convey sewage to this site and that treated effluent is disposed to the Na Klua River.

Scheme B

Scheme B assumes that a site for a sewage treatment works is reclaimed in the south eastern corner of Bang Lamung Bay and that the sewerage system is designed to convey sewage to this site.

Total costs of the alternative schemes are given in Table 6.4.1.

Table 6.4.1 SEWERAGE AND SEWAGE TREATMENT WORKS
SUMMARY OF TOTAL COSTS
NA KLUA

(Unit : 1,000 Bahts)

Element	Sewage Treatment Alternatives			
	Oxidation Ditch	Activated Sludge	RBC Plant	Long-Sea Outfall
Scheme A				
1. Total Phase I costs				
a) Excluding land costs	102,011	106,078	124,793	-
b) Including land costs	114,311	116,328	132,583	-
2. Total Phase II costs	28,039	28,039	28,039	-
3. Total overall cost including	142,350	144,367	160,622	-
Scheme B				
1. Total Phase I costs				
a) Excluding land costs	100,941	100,406	118,461	351,587
b) Including land costs	139,191	132,281	142,686	370,712
2. Total Phase II costs	28,039	28,039	28,039	28,039
3. Total overrall cost	167,230	160,320	170,725	398,751

From the above analysis, it can be seen that there is a little difference between the construction costs for Scheme A and Scheme B but it is rather small. The choice of scheme is therefore governed by the practicalities and costs of land acquisition and land reclamation. If sufficient land can be acquired for scheme A at a price of less than 1,000 bahts/m^2, Scheme A will be cheaper overall. If a site cannot be acquired (as the price is greater than 1,000 bahts/m^2), Scheme B would be essential (or more attractive). Bearing in mind the urgency of the conditions it is recommended that the government proceed on the basis of Scheme B under which they have control of the land reclamation works and costs. Details for Scheme B is shown in Fig. 6.4.2.

Among the sewage treatment alternatives, the three except long - sea outfall are about the same in terms of capital cost and final selection should be made at the feasibility study / detailed design stage. However, with lesser commitment to running costs and technical management, an oxidation ditch plant may be a preferred option.

6.4.2 Jomtien Area Sewerage and Sewage Treatment Project

1) General

For sewerage and sanitation planning purposes, the Jomtien catchment area is defined as the area within Phatthaya City boundaries to the south of the line of the watershed between Phatthaya town and Jomtien and includes the Khao Phatthaya area. It is proposed that sewage treatment functions be developed on the already acquired site at Wat Boon Road and that the sewage system be designed accordingly. Project details are shown in Fig. 6.4.3.

Average daily flow in peak season is set at 15,000m^3 / day for the phase I Works to be completed by 1996. Required sweage treatment capacity is shown in Fig. 6.4.1.

2) Sewage Treatment Works Options and Selection

The sewage treatment works options considered for this Project are, oxidation ditches, conventional activated sludge process and rotating biological contactor plant. Cost comparison is made in Table 6.4.2.

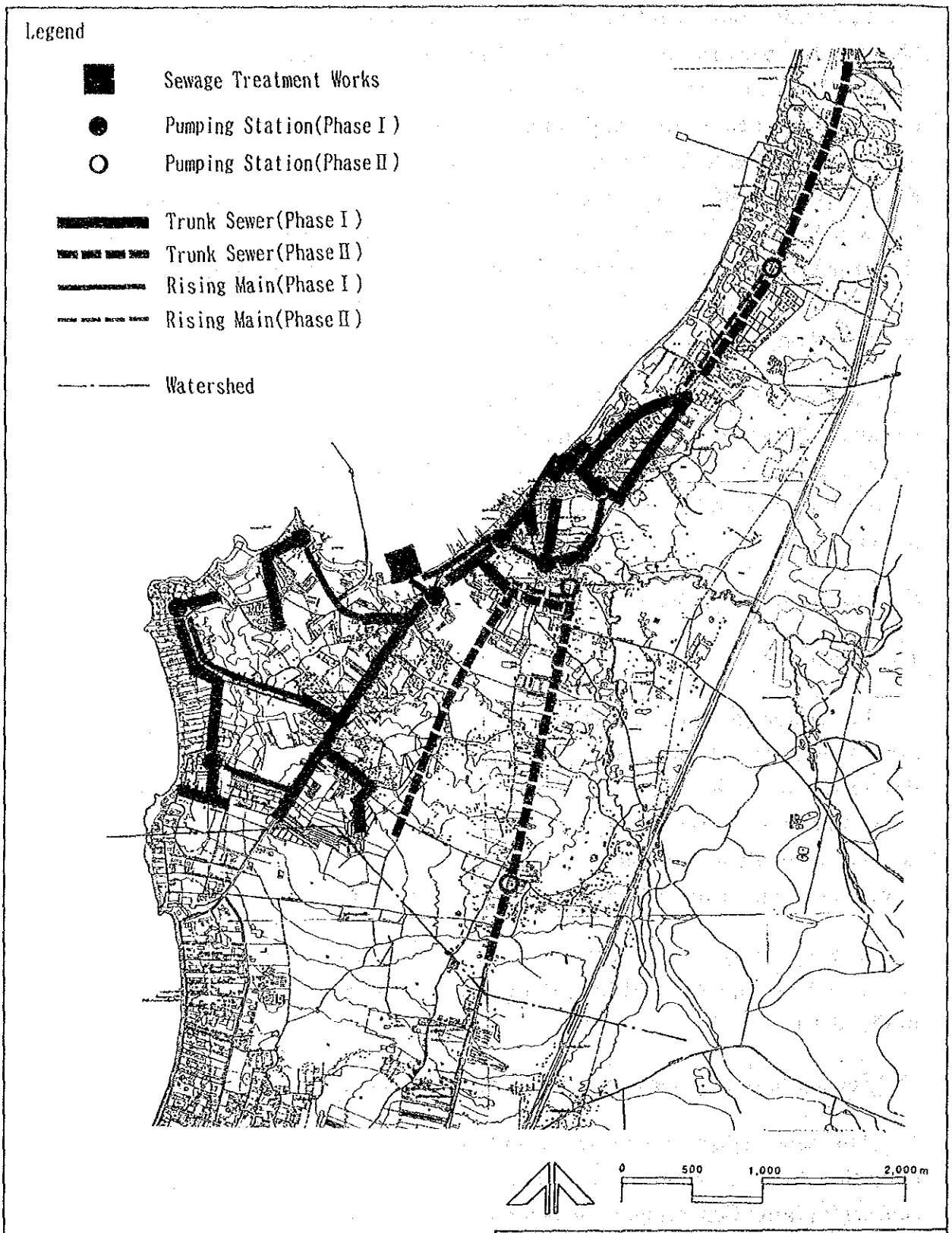


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Fig. 6.4.2 Na Klua Catchment Area Details for Scheme B

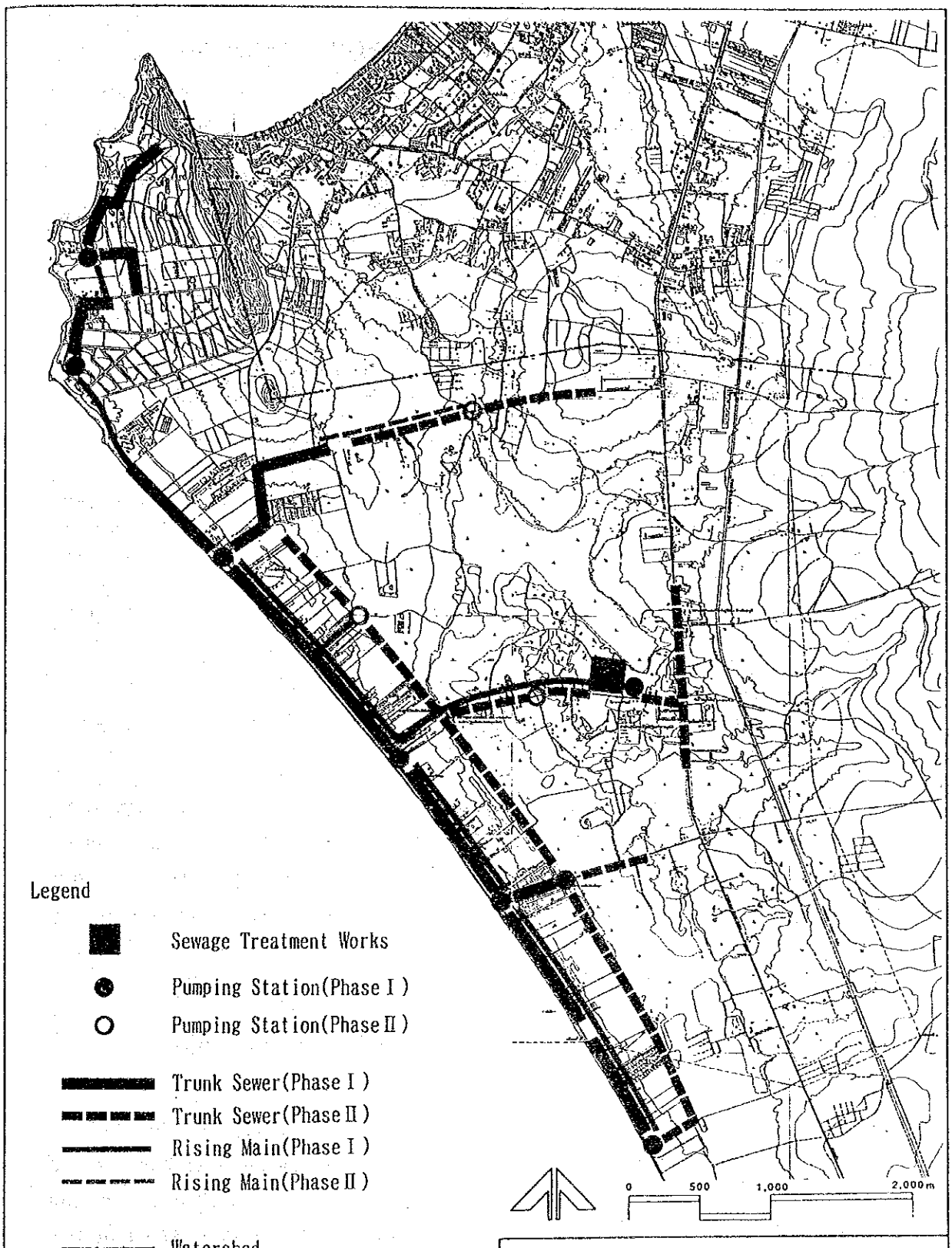

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Fig. 6.4.3 Jomtien Catchment Area Project Details

Table 6.4.2 SEWAGE TREATMENT WORKS OPTIONS
JOMTIEN

Element	Option Costs - Baht (× 1000)		
	Oxidation Ditch	Activated Sludge	RBC Plant
I. Land			
Land Required (Ultimate)	4.2 Ha	3.3 Ha	2.7 Ha
Land Cost		Site already acquired	
II. Treatment Works			
a)Phase I Works construction	32,550	37,367	56,982
b)Phase II Works construction	10,850	12,456	18,994
c)Effluent disposal	17,983	17,983	17,983
Total cost sewage treatment works	61,383	67,806	93,959
III. Total Cost of Sewage			
Treatment and disposal Phase 1	50,533	55,350	74,965

The overall range of treatment works option costs is within the estimating accuracy of this study and the final selection of the treatment works process should be made at feasibility study / detailed design stage. However, the above analysis suggests that an oxidation ditch plant is the first choice secondary treatment works option, and this treatment option is, subject to any site constraints, recommended for the works at Jomtiem.

6.4.3 Phatthaya Town Sewerage and Sewage Treatment Project

1) General

For sewerage and sanitation planning purposes, the Phatthaya town catchment area is defined as the area within Phatthaya City boundaries, to the south of the Na Klua / Phatthaya town watershed and to the north of the Jomtien / Phatthaya town watershed. The most difficult to resolve problem in developing the sewerage and sewage treatment works capacity to a level adequate to meet future demands in the Phatthaya town area is the

availability and cost of land. Number of alternative schemes are therefore examined including ; expansion of the existing works at Soi Kazem Suwan, establishment of a new inland treatment works to serve the future needs of the whole catchment area and development of either, full sewage treatment facilities with short sea outfall or the necessary headworks to serve a long sea outfall on land to be reclaimed under the proposed South Phatthaya Reclamation Project or on land to be reclaimed for treatment plant construction.

Average daily flow in peak season is set at 30,000m^3 / day for the Phase I works to be completed by 1996. Required sewage treatment capacity is shown in Fig. 6.4.1.

2) Alternative Schemes and Selection

Three alternative schemes are studied and compared as follows :

Scheme A

Acquire additional and adjacent to the existing treatment works at Soi Kazem Suwan and progressively improve and expand the sewage treatment plant and sewerage system to convey and treat all sewage in the catchement area (30,000 m^3/day). The Soi 17 sewage works would be abandoned by 1996 and its site released for other use / redevelopment.

Scheme B

Assemble and acquire a suitable inland site for a new sewage treatment works with the capacity of 30,000 m^3/day. All sewerage would be diverted to this site. Both existing treatment works would be abandoned and the sites would be released for other use / redevelopment.

Scheme C

Develop either, full sewage treatment works with a short sea outfall, or preliminary and primary treatment works with effluent disposal via a long sea outfall, on part of the proposed land reclamation project in South Phatthaya Bay or of the land to be reclaimed for the construction of the sewage treatment. In case of long sea outfall option, the treatment plant capacity will be 30,000 m^3/day, abolishing the both existing plants

considering the scale economy of the long sea outfall facility. In the other options, the capacity will be 22,000 m^3/day, utilizing the 8,000 m^3/day capacity of the Soi Kazem Suwan plant.

Table 6.4.3 shows the total sewerage and sewage treatment works / effluent disposal costs for each of the treatment options. As shown in the table, activated sludge option of Scheme C (ground level type) is the least costly even with the unit land cost of 1,275 bahts per m^2.

Of the two alternative types of treatment plant for Scheme C, i.e., ground level type and underground type, underground type requires an additional cost of about 111 million bahts over the ground level type due to extra cost for foundation and others. However, by putting the plant structure underground, the precious tract of waterfront land of about 4.4 ha would be released for beneficial use, unit land value of which may be in the order of 50,000 bahts per m^2. Further, underground plant could overcome the problems of aesthetic objection and unagreeable smell. Fig. 6.4.5 shows an example of land use on the top of underground plant and Fig. 6.4.6 shows an smell prevention facilities.

Considering these, it is proposed that underground treatment plant should be adopted.

The principal features of Scheme C is given in Fig. 6.4.4.

3) Alternative Development Scenario for Sewage Treatment Plant

Instead of the development program for the treatment plant construction explained in the foregoing section, the following alternative program can be conceived. Namely Soi 17 treatment plant would continue to be in operation beyond 1996 (See Fig. 6.4.7). Advantage of this alternative is the reduction of the plant capacity by 5,000 m^3/day and corresponding investment cost while disadvantage is the loss of the benefit which would be accrued from the development of the Soi 17 site for the purpose of commercial, residential or other uses after its abolition. Considering rather short service period of the Soi Kazem Suwan Treatment Plant after installation, it will continue to work after 2006 in this scenario.

Considering the sizable budget requirement of sewerage development in Phatthaya, it may be more advisable to adopt this scenario.

Table 6.4.3 COMPARISON OF ALTERNATIVE SCHEME COSTS PHATTHAYA TOWN

(Unit : 1,000 Bahts)

Element	Oxidation Ditch 5.5 ha	Activated Sludge 4.4 ha	RBC Plant 3.8 ha	Long-Sea Outfall
Scheme A				
1.Land costs (5,200B/m^2)	239,200	182,200	150,800	93,600
2.Phase I construction costs	144,720	147,312	176,236	365,401
3.Total construction costs (Phase I + II) excl. land costs	239,033	237,925	261,322	434,306
4.Total overall costs incl. land costs	478,233	420,125	412,122	527,906
Scheme B				
1.Land costs (1,600B/m^2)	88,000	70,400	60,800	-
2.Phase I construction costs	180,765	183,357	212,281	-
3.Total construction costs (Phase I + II) excl. land costs	249,750	248,692	285,189	-
4.Total overall costs incl. land costs	337,750	319,092	345,989	
Scheme C				
1.Land costs (850B/m^2)	46,750	37,400	32,300	22,950
(1,275B/m^2)	70,125	56,100	48,450	34,425
2.Phase I construction costs	161,374	156,130	183,054	364,461
3.Total construction costs (Phase I + II) excl. land costs	266,500	250,595	283,208	433,130
4.Total Overall costs incl. land costs				
a) Land costs 850 B/m^2	313,250	287,995	315,508	456,080
b) Land costs 1,275 B/m^2	336,625	306,695	331,658	467,555
5.Extra costs for "underground"		111,475	111,475	76,350
6.Underground excl. land costs (Phase I + II)		362,070	394,683	509,480

Remarks ; B stands for Thai bahts.

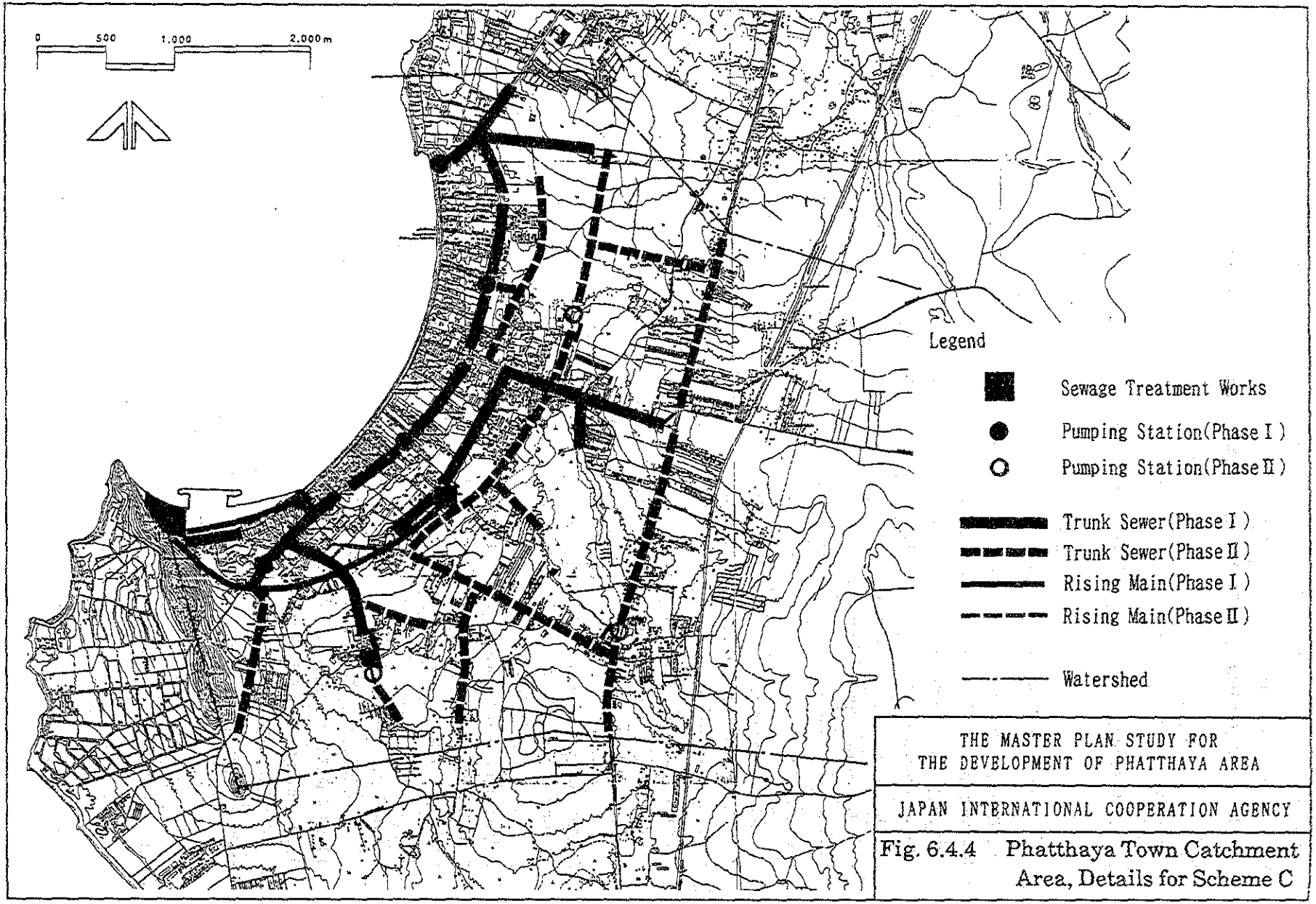


Fig. 6.4.4 Phatthaya Town Catchment Area, Details for Scheme C

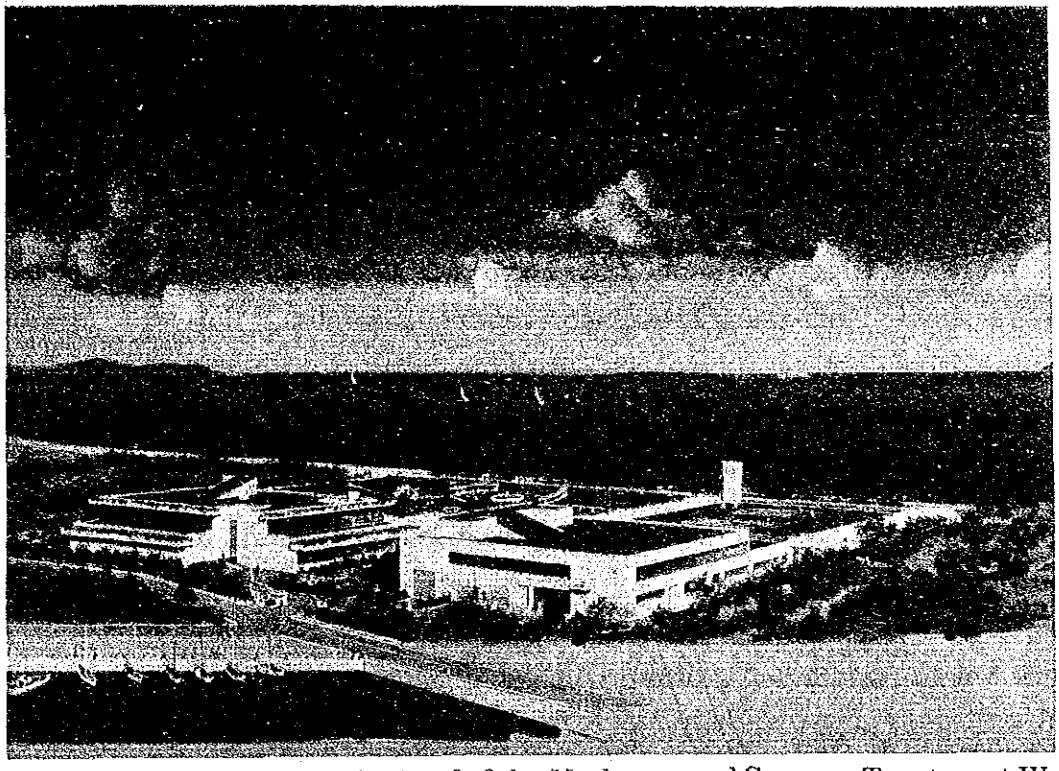


Fig. 6.4.5 Land Use of the Roof of the Underground Sewage Treatment Works

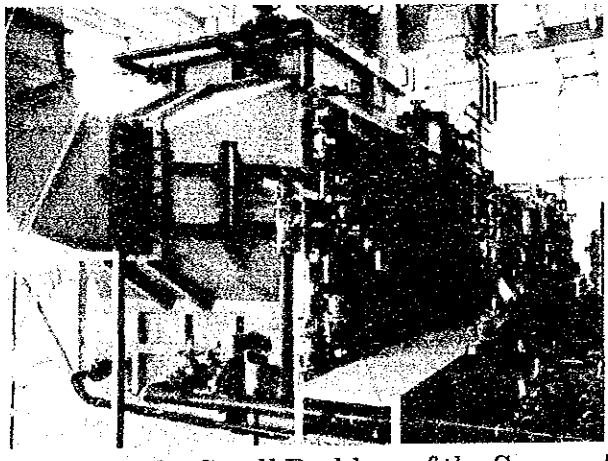


Fig. 6.4.6 Countermeasure for Smell Problem of the Sewage Treatment Works
(Chemical Flushing Method: Acid + Alkaline, Sodium Hypochlorite)

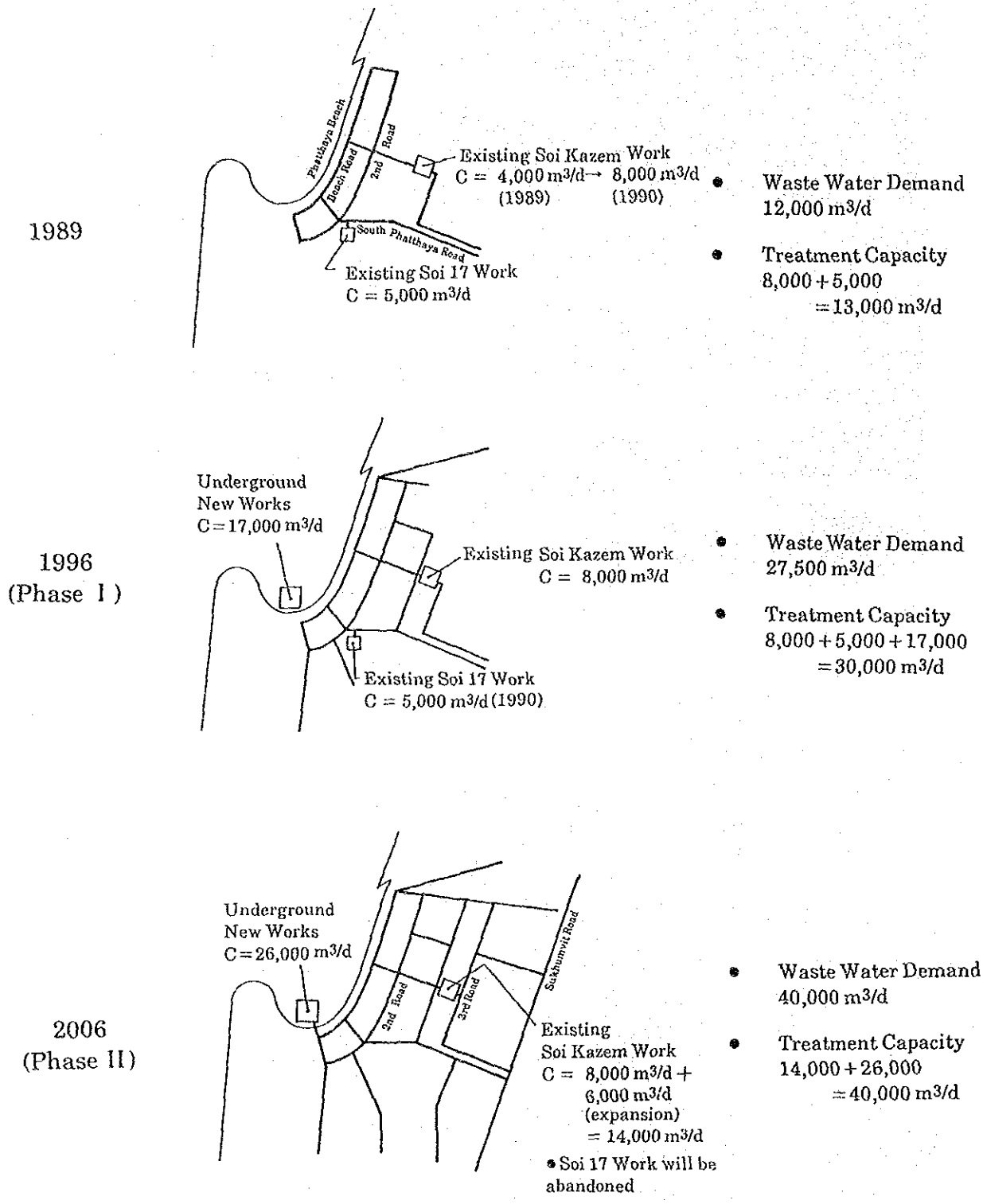


Fig. 6.4.7 Development Scenario of Sewage Treatment Works
(Phatthaya Town Area)

6.5 Rainwater Drainage

6.5.1 General

The downstream reach of the Puk Plub canal lies in the high density area along the Phatthaya - Na Klua road. Discharge capacity of the box culvert constructed under the road is small and often causes inundation. In the low - lying area behind the developed area, new development has been in progress, reducing the retarding function of the low - lying area which worsens the drainage condition of the area.

The rapid development within the low - lying area also threatens the Phatthaya town area with flood damage. The southern part of the town which is the most densely developed area in Phatthaya is threatened by flooding due to the insufficient discharge capacity of the Phatthaya canal flowing through the area together with the reduction of the retarding function of the low - lying area.

To alleviate the problems, it is proposed that effective countermeasures comprising the improvement of the canals and construction of new box culverts should be implemented.

6.5.2 Project Description

1) Puk Plub Canal Improvement Project

Canal improvement of more than 400m will be carried out in this project from the mouth to the low-lying area which extends behind Phatthaya - Na Klua road. Open channel system will be applied basically, however, box culvert will be constructed under Phatthaya - Na Klua road.

Principal dimensions of the project is as follows :

①	Catchment area	2.6km^2
②	Return period	5 years
③	Design discharge	25m^3/s
④	Drainage facilities	
	- Open channel	400m (upper width 6.5 m)
	- Box culvert	50m (width 7.2 m)

2) Phatthaya Town Box Culvert Project

Principal dimensions of the project is as follows :

①	Catchment area	14.2km^2
②	Return period	5 years
③	Design discharge	22m^3/s
④	Drainage facilities	
	- Box culvert behind Phatthaya 2 road	2,150m (width 6.0 m)
	- Box culvert under South Phatthaya road	1,000m (width 6.0 m)

3) Phatthaya Canal Improvement Project

Principal dimensions of the project is as follows (See Fig. 6.5.1):

①	Catchment area	4.5km^2
②	Return period	5 years
③	Design discharge	24m^3/s
④	Drainage facilities	
	- Open channel	1,150m (upper width 7.5 m)

4) Jomtien Box Culvert Project

Principal dimensions of the project is as follows :

①	Catchment area	3.5 km^2	
②	Return period	5 years	
③	Design discharge	11m^3/s	(Box Culvert-A)
		10m^3/s	(Box Culvert-B)
		7m^3/s	(Box Culvert-C)
		4m^3/s	(Box Culvert-D)
④	Drainage facilities		
	- Box culvert-A	400m	(width 2.5m)
	- Box culvert-B	500m	(width 2.5m)
	- Box culvert-C	500m	(width 2.0m)
	- Box culvert-D	350m	(width 2.0m)

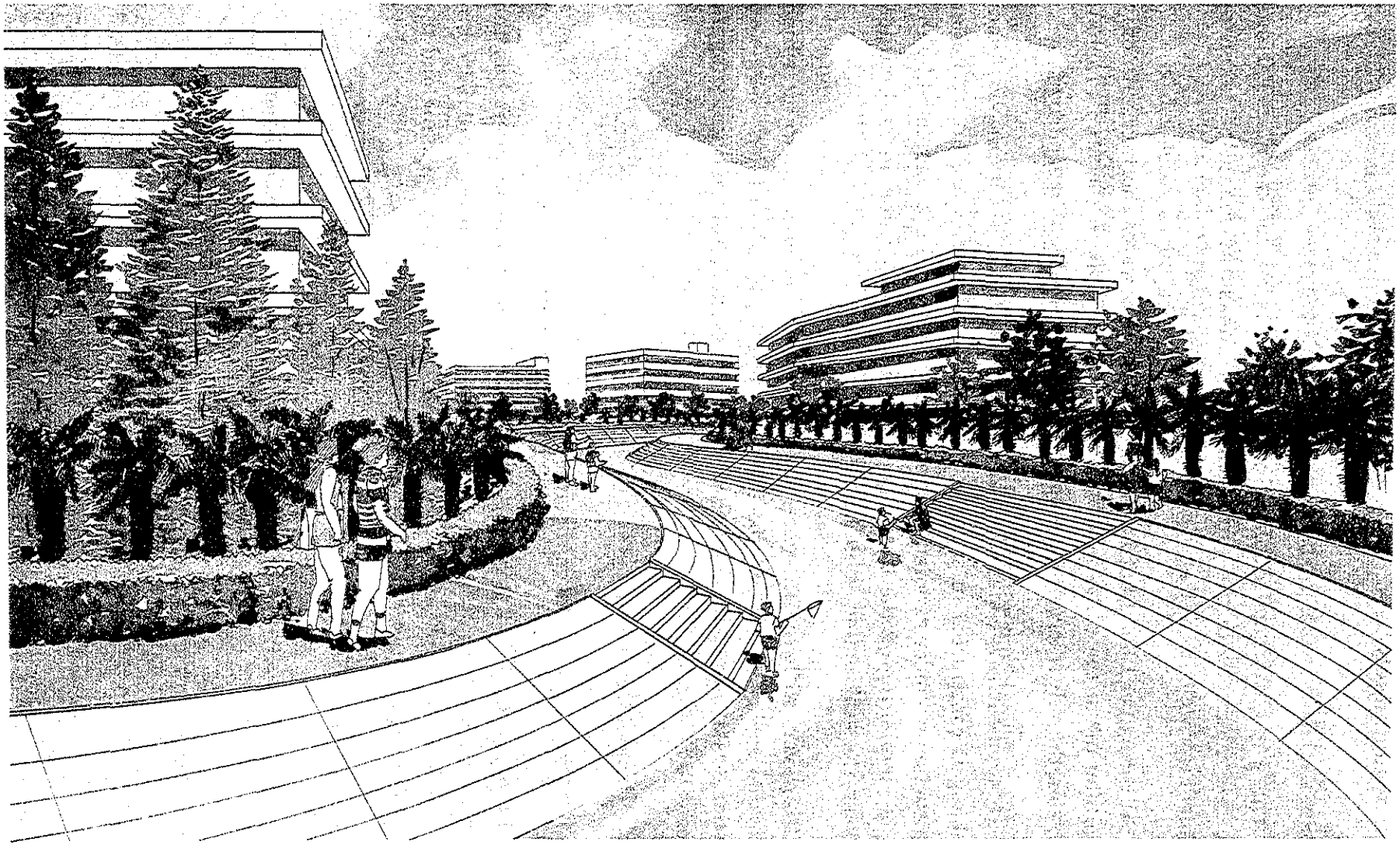


Fig. 6.5.1 Phatthaya Canal Improvement Plan

6.6 Water Supply

6.6.1 General

The water shortage problem in Phatthaya is one of the most serious problems ranking with the water pollution. Measures should be taken to augment raw water as well as to expand the service area.

At the end of 1989, Phatthaya faced serious raw water shortage with only 5.6million m^3 of the water or 34% of the capacity, left in the Map Prachan reservoir, the only reservoir for supplying raw water for Phatthaya.

To augment raw water, a pipeline from Nong Kho reservoir via Laem Chabang is constructed in 1990 by PWD and 4 reservoirs are either under construction or under detailed design by RID. When all are completed by the end of 1992, bringing the total supply capacity of raw water to 31.6 million m^3/year, the situatuation would be improved.

However, with the increase of the service ratio of piped water which estimated at 49% as of 1989 for each area of Na klua, Phatthaya town and Jomtien, water demand is forecasted to be increased sharply and would again exceed after the year of 1996.

6.6.2 Project Description

1) Raw Water Transmission Pipeline

Proposed pipeline from Nong Kho reservoir to treatment plant has the capacity of 15.9 million m^3/year and the total length of about 27.7 km which is laid beside existing Nong Kho - Laem Chabang pipeline and the projected highway.

2) Pump Station

— Location : 7.3 km from the junction with Nong Kho - Laem Chabang pipeline

— Design flow : 28 cu m/min

3) Treatment Plant

The existing treatment plant site located at Map Pracham reservoir comprises four independent treating units and phased construction would be carried out, meeting the increase of demand, to the final capacity of 66,700 cu m/d. One fourth of the capacity as of 17,000 cu m/d is proposed to be developed as the priority project.

4) Distribution Facilities

Distribution Pipeline

Fig. 6.6.1 shows the distribution pipeline with the total length of 245.7 km (diameter 100 - 700mm).

Na Klua Booster Pump Station

Existing booster pump station for supplying to the high land area must be reinforced.

Distribution Reservoir at Khao Phatthaya

The capacity of distribution reservoir is planned to be 3,300m^3.

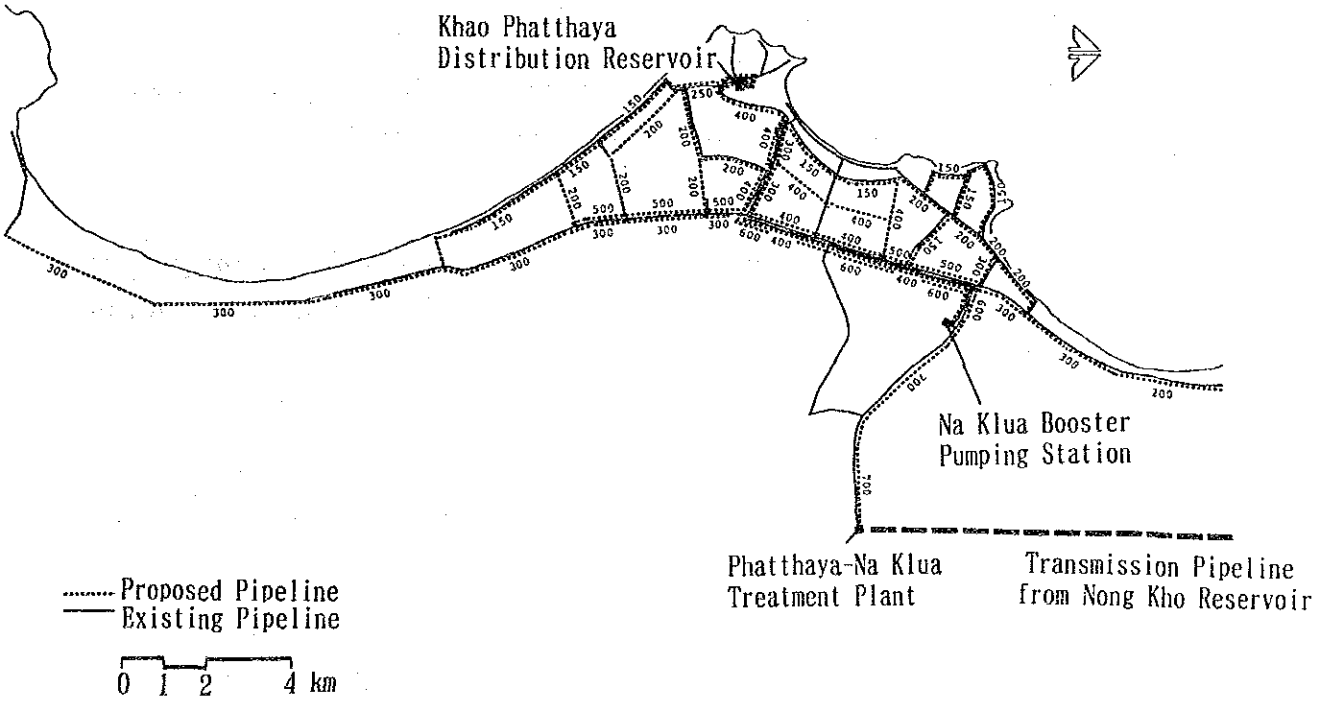


Fig. 6.6.1 Plan of Water Supply System

6.7 Solid Waste Disposal

6.7.1 General

Though solid waste collection service is being provided by PCG for the Phatthaya City area, final disposal is by open dumping, posing serious environmental problem in the vicinity of the disposal site. Further the present site will be filled up within two years. Under these circumstances, it is proposed that measures should urgently be taken.

6.7.2 Project Description

1) Sanitary Landfill Site Project

The sanitary landfill is proposed as the final disposal method for the Phatthaya City except Ko Lan while the incineration plant is not recommended considering its high investment cost as well as operation and maintenance costs.

Based on the study on the comparative costs of land acquisition and transport, the site located approximately 12km from the city center or 3km from the Sukhumvit road, which is at present plain field, is preliminarily proposed for sanitary landfill site (See Fig. 6.7.1).

Principal dimensions of the Project is as follows :

①	Service area	Whole of Phatthaya city except for Ko Lan
②	Landfill capacity	668,000 tons (829,000m^3)
③	Site area	135 Rai (22.5 ha)

In order to prevent the groundwater contamination in its vicinity, it is proposed that leachate treatment facilities should be provided including leachate piping and leachate pond.

2) Incineration Project for Ko Lan

Considering the land availability of Ko Lan and the stable disposal of the solid waste to be generated in the island as well as the total volume, it is proposed that an incinerator should be constructed in Ko Lan. The principal dimensions of the project is as follows :

①	Service area	Whole island
②	Site area	1 rai (1.667m2) /1
③	Capacity	0.5 tons/hour

Remarks ; /1 : Including the landfill site for residues

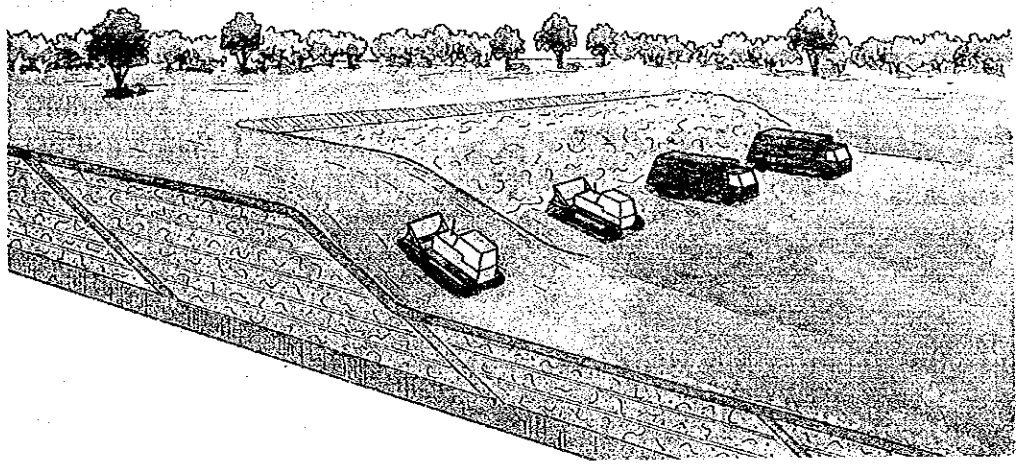


Fig. 6.7.1 Plan of Sanitary Landfill Site

6.8 Road

6.8.1 General

As the rapid development in Phatthaya town area and Jomtien proceeds, the improvement of Phatthaya 2nd Road alone will not be enough to serve the future traffic demand. Therefore, Phatthaya 3 should be extended to completely to connect north Phatthaya, Phatthaya town area and Jomtien.

6.8.2 Project Description

The principal dimensions of the Phatthaya 3 road is given below ;

Section	Length	Project Description
1 North - Central Phatthaya	1,900	New 4 lane
2 Central - South Phatthaya	1,750	Windenning to 4 lane
3 South - Mountain Rd.	1,500	New 4 lane
4 Mountain Rd. - Reclamation Area	800	Windenning to 4 lane
5 Soi 17	1,400	Windenning to 4 lane

VII. IMPLEMENTATION PLAN OF PRIORITY PROJECTS

7.1 Target of Plan Implementation

Target of plan implementation is to solve the prevailing pollution probiems and restore clean and healthy environment and enhance amenity for the residents as well as for the visitors to Phatthaya by the year 1996. More specifically, "to revive healthy water for swimmers by 1996" is one of the principal objectives of the plan implementation.

7.2 Implementation Schedule

Implementation schedule of the priority projects (short-list projects)are worked out considering particularly the urgency, schedules of the already committed projects, interdependency among the projects, time constraint with regard to land acquisition as well as time required for study and engineering works. More specifically, the followings are taken into consideration.

① Phatthaya Tourist Jetty

The Phatthaya Tourist Jetty Project which has been committed by TAT will be completed by the middle of 1993 as the first phase of the Tourist Port Project. Second phase development which comprises a excursion boat pier, a terminal building, a jetfoil pier and a boat yard will be commenced at the beginning of 1995 and completed by the middle of 1996, considering the growth of demand for excursion boat piers.

② Reclaimed land in South Phatthaya

Engineering services should be started now as soon as possible. The reclamation work could be finished during 1992 and 1993 and the infrastructure and building works could be carried out during 1993~1995. Stagewise development should be carried out in the reclamation work so that the infrastructure work and building construction can follow on the partly completed land.

③ Ta Van Pier

Ta Van Pier in Ko Lan should be completed by the middle of 1993 when the implementation of the first phase tourist jetty in South Phatthaya will be finished.

④ Phatthaya Beach restoration

Beach restoration should be accomplished in the same period as for the South Phatthaya reclamation work, considering the efficiency of the works.

⑤ Sewerage project

Na Klua sewerage and Jomtien sewerage projects are already committed by PWD and expected to be completed during 1992 and 1993.

Further expansion of the sewerage systems for the Phatthaya town area should be commenced as soon as possible and be implemented during the same year as for the above projects in order to achieve the efficient improvement of sea water contamination in Phatthaya Beach.

⑥ Rainwater drainage projects

Phatthaya town box culvert project and Phatthaya river improvement should be started from 1992 and 1993 and completed by 1994. Puk Plub River improvement would take more years to start because of the land acquisition problems.

⑦ Water supply projects

Water shortage is already serious and the water supply projects should be among the top priority projects. In order to follow the construction of four reservoirs which are already committed by RID/PWA and expected to be implemented by the end of 1992, the new distribution pipelines should be constructed in the Study Area. Its completion will be around the end of 1994.

In addition to the four reservoirs, the construction of transmission pipeline from the existing Nong-Kho reservoir which is scheduled to be connected with Nong Pla Lai reservoir in of 1994 should be commenced as a new water resources for Phatthaya. Construction of transmission pipeline and pump station as well as the second phase of distribution pipelines will be finished by the end of 1996.

⑧ Solid waste project

A new sanitary landfill site should be ready by the begging of 1992 when existing site is expected to be filled up.

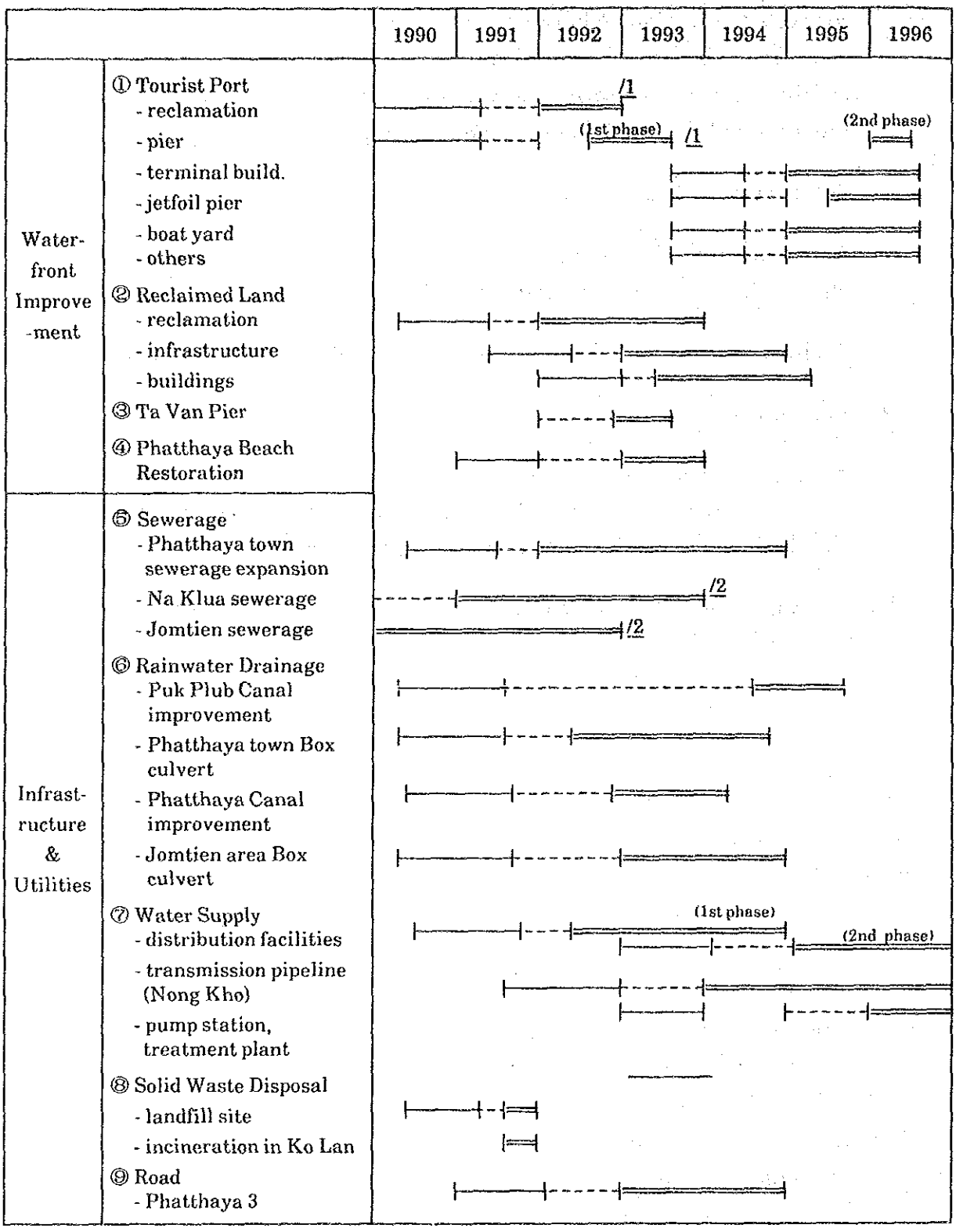
An incinerator should be installed in Ko Lan during the same period.

⑨ Road projects

Among the two priority projects for road improvement, tender has already been called for the widening of Phatthaya 2 road. Phatthaya 3 should be constructed subsequent to Phatthaya 2 before 1995.

The recommended implementation schedule is shown in Table 7.2.1.

Table 7.2.1. IMPLEMENTATION SCHEDULE OF PRIORITY PROJECTS



Remarks: /1 Project committed by TAT.
/2 Project committed by PWD

Legend: ——— Engineering Design, Environmental Impact Acessment, etc.
- - - - - - - Approval, contract
═══ Construction

7.3 Investment Cost

The investment costs are estimated based on the unit costs and corresponding work quantities in the constant price of December 1989. The investment cost required for the implementation of the priority projects amounts to 3,538 million bahts comprising 1,742 million bahts or about half of the total, of foreign currency component and 1,796 million bahts of local currency component as summarized below:

(Unit: Million Bahts)

	Project	FC	LC	Total
Waterfront Improvement	1. Tourist Port (Port, Jetfoil berth, Boat Yard)	122	143	265
	2. Reclaimed Land (hinter land)	249	518	767
	3. Ta Van Pier	14	12	26
	4. Phatthaya Beach Restoration	79	41	120
	Sub total	464	714	1,178
Infrast-ructure & Utilities	5. Sewerage	411	240	651
	6. Rainwater Drainage	147	103	250
	7. Water Supply	645	376	1,021
	8. Solid Waste Disposal	40	95	135
	9. Road	35	268	303
	Sub total	1,278	1,082	2,360
	Total	1,742	1,796	3,538

Remarks; FC stands for "foreign currency component" and LC for "Local currency component"

The cashflow of the investment costs are given in Table 7.3.1.

Table 7.3.1 CASHFLOW OF INVESTMENT COSTS OF OVERALL PRIORITY PROJECTS

(million Bahts)

		1990	1991	1992	1993	1994	1995	1996	FC	LC	Total
Water-front Improve-ment	① Tourist Port - reclamation - pier	5.6	2.8	71.8	17.0	0.5	16.3	24.9	83.8	55.1	138.9
	- terminal build. - jetfoil pier - boat yard - others	-	-	-	5.2	5.1	72.7	43.0	438.1	87.9	126.0
	② Reclaimed Land - reclamation	8.5	8.5	105.8	105.9	-	-	-	137.2	91.5	228.7
	- infrastructure	-	3.6	1.8	33.4	33.4	-	-	26.0	46.2	72.2
	- buildings	-	-	34.7	107.8	215.6	107.9	-	85.6	380.4	466.0
	③ Ta Van Pier	-	-	-	26.4	-	-	-	14.5	11.9	26.4
	④ Phatthaya Beach Restoration	-	9.0	-	111.3	-	-	-	79.4	40.9	120.3
	Sub-Total	14.1	23.9	214.1	407.0	254.6	196.9	67.9	464.6	713.9	1,178.5
Infrast-ructure & Utilities	⑤ Sewerage - Phatthaya town sewerage expansion	3.5	8.8	80.5	89.5	82.6	-	-	158.9	106.0	264.9
	- Na Klua sewerage	-	50.7	76.0	63.8	-	-	-	123.4	67.1	190.5
	- Jomtien sewerage	27.5	71.4	71.4	25.6	-	-	-	128.4	67.5	195.9
	⑥ Rainwater Drainage - Puk Plub Canal improvement	0.3	0.2	-	-	7.3	3.4	-	4.4	6.8	11.2
	- Phatthaya town box culvert	6.9	7.0	43.1	86.2	43.1	-	-	111.8	74.5	186.3
	- Phatthaya Canal improvement	0.5	0.5	-	11.6	-	-	-	7.6	5.0	12.6
	- Jomtien area box culvert	1.5	1.5	-	9.3	28.1	-	-	24.2	16.2	40.4
	⑦ Water Supply - distribution facilities	8.8	13.3	55.2	110.4	118.8	52.6	52.6	240.0	171.7	411.7
	- transmission pipeline (Nong Kho)	-	12.1	24.0	-	150.0	150.0	150.0	325.7	160.4	486.1
	- pump station, treatment plant	-	-	-	9.1	-		113.8	78.8	44.1	122.9
	⑧ Solid Waste Disposal						-				
	- landfill site	1.3	131.9	-	-	-		-	38.4	94.8	133.2
	- incineration in Ko Lan	-	1.3	-	-	-	-	-	1.2	0.1	1.3
	⑨ Road - Phatthaya 3	-	3.2	-	149.8	149.7	-	-	34.8	267.9	302.7
	Sub Total	50.3	301.9	350.2	555.3	579.6	206.0	316.4	1,277.6	1,082.1	2,359.7
Total		64.4	325.8	564.3	962.3	834.2	402.9	384.3	1,742.2	1,796.0	3,538.2

7.4 Overall Implementation Plan

7.4.1 Implementation Principle

Considering the urgency of project implementation, the implementation plans are worked out so that the existing administrative framework and financial facilities in hands are utilized as much as possible. Namely, the establishment of new organizations and the measures which necessitate the enactment of new laws that require substantial time period are not sought.

With a view to the efficient and effective implementation of the projects which should serve for the common objective of upgrading the urban environment of Phatthaya and are interdependent each other, the projects should be promoted as one package project.

7.4.2 Institutional Plan

(1) Enhancement of "Working Group for Phatthaya" under ESB Sub-Committee

Considering the serious environmental condition of the Phatthaya City area today, Minister of the Ministry of Interior instructed the appointment of a working group to control/remedy the pollution problem of the water bodies within Phatthaya City communities in March, 1990 under the Sub-Committee for Administering the Development of the Communities, Social and the Environmental Aspects within the Eastern Seaboard under ESB Development Committee. According to the instruction, its scope and function are as follows:

"The Working Group for controlling/remedying the pollution problem of the water bodies of Phatthaya City communities, shall have the power and duties to propose a policy, guideline, work plan, budgetary plan and various measures relevant to the control/remedy of the pollution problem of the water bodies of Phatthaya City communities including the supervision of the implementation, as well as the coordination of the work in remedying the pollution problem of the water bodies of Phatthaya City communities, to correspond with one another in a systematic way, capable of achieving the target set, including the appointment of a Specific Working Group to assist in the performance as deemed necessary, and the outcome of the implementation shall be reported to the Sub-Committee for Administering the Development of the Community, Social and the

Environmental Aspects within the Eastern Seaboard, periodically, according to suitability".

Working Group comprises the representatives of the following ministries and departments with the Under-Secretary of the Ministry of Interior as chairman:

- DOLA, MOI
- PWD, MOI
- LD, MOI
- Policy and Planning Department, MOI
- Regional Waterworks Authority
- NESDB
- NEB
- Ministry of Public Health
- Budget Bureau, MOF
- HD, MOC
- Fishery Department, MOAC
- TAT, Office of the Prime Minister
- Chonburi Provincial Government
- Phatthaya City Government

To eradicate the various problems with water pollution as one major component prevailing in the Phatthaya City and its neighboring areas, it is proposed that the scope of the Working Group should be expanded and its members should be augmented as follows:

Objective Area

Considering that the development has been spreading out of the Phatthaya to the adjacent area, particularly to the south and degradation of environment threatens, the objective area for the Working Group should be enlarged to encompass the neighboring area up to Bang Sare to the south.

Scope and function

Considering the varied nature of the environmental degradation in Phatthaya, scope and function of the working group should be widened to cover the followings:

- Rainwater drainage and flood prevention
- Water supply
- Solid waste disposal
- Road development
- Port and jetty development
- Waterfront development

The following scope should be included:

- Coordination among the central departments and state authorities, among Central, Provincial and Phatthaya City Governments for the efficient execution of the projects.

- Working out the plans to secure private sector involvement including investment and promotion thereof.

- Explanation of the necessity and impacts of the projects, hearing of the opinions and needs of the local community and the people concerned with the Phatthaya development and reflecting them on the implementation of the projects.

- Demarcation of the responsibilities and power of the organizations concerned with regard to the implementation of the projects.

- Confirmation of funding sources including budgets for the projects and coordination among the organizations as well as promotion of additional financial facilities.

Members

Working Group should be augmented corresponding to the widened scope and function with Department of Highway as one additional member. To ensure stronger coordination with the private sector, participation of the representatives of the private sector as observers in the meetings whenever appropriate is recommended.

2) Responsibilities for Execution and Management of the Projects

Considering the urgency of the implementation of the priority projects, it is proposed that the present implementation mechanism should fully be utilized in order to expedite their implementation without altering the current work division among the Central Government Departments, State Authorities and PCG. Responsibilities for the project implementation should be assumed by respective organizations shown in Table 7.4.1.

It is recommended that the reinforced Working Group (Working Group for Upgrading the Environment of Phatthaya) should prepare an authorized implementation plan for the development and upgrading the environment of Phatthaya, based on the proposals and recommendations made in the "Master Plan Study for the Development of Phatthaya Area, JICA, 1990".

The Plan should be approved by the Sub-Committee and ESB Committee and financial arrangements should be made by relevant ministries, departments and authorities. Action should also be taken by the private sector in coordination of the public sector.

It is also recommended that the Working Group under the supervision of the ESB Sub-Committee should take initiative to materialize the priority projects proposed in the JICA Study by setting up guideline and financial plan, working out promotional measures, monitoring and coordinating the progress of the projects.

Table 7.4.1 RESPONSIBLE ORGANIZATIONS FOR PRIORITY PROJECTS

Priority Project	Planning	Design	Const-ruction	O&M and Manage-ment
Waterfront Improvement /1	PCG/ PWD/2	PCG/ PWD/2	PCG/ PWD/2/ PRV	PCG/ PRV
Phatthaya Beach Restoration	PCG (TAT)/ PWD/2	PCG (TAT)/ PWD/2	PCG (TAT)/ PWD/2	PCG
Ta Van Pier	TAT/ HD	TAT	TAT/ PWD/2	PCG
Sewerage ° Sewers ° Treatment plants	PWD/ PCG	PWD/ PCG	PWD/ PCG	PCG
Drainage ° River improvements ° Box culverts	PWD/ PCG	PWD/ PCG	PWD/ PCG	PCG
Water Supply: ° Water transmission facilities	PWD	PWD	PWD	PWD
° Distribution facilities	PWA	PWA	PWA	PWA
Solid Waste ° Sanitary landfill site ° Ko Lan incinerator	PCG	PCG	PCG	PCG
Roads ° Phatthaya 3	DOH/ PCG	DOH/ PCG	DOH/ PCG	DOH/ PCG

Remarks; /1 For adopted case
/2 Technical assistance

7.4.3 Financial Arrangement

In total, 3,538 million bahts will be required to finance the implementation of the priority projects during 1990~1996 period.

It is proposed that the infrastructures and utilities including these for the reclaimed land should be financed by the budgets of the respective Government Departments and State Authorities as well as PCG according to their responsibilities given in Table 7.4.1. For financing the waterfront project, i.e., tourist port and reclaimed land development at South Phatthaya, private sector should be encouraged to be involved, details of which will be given in the subsequent section.

Financial arrangement for the priority projects are proposed as follows:

(Unit : Million Bahts)

Organizations	Infrast-ructures /1	Tourist Port & Reclamation at South Phatthaya /2	Ta Van Pier	Phatthaya Beach Restoration	Total
PCG	437.2 /4	306.2	–	120.3 /5	863.7
Central					
- PWD /3	838.3	11.6	–	–	849.9
- PWA /3	1,084.2	8.5	–	–	1,092.7
- TAT	–	138.9	26.4	–	165.3
Sub-total (Central)	1,922.5	159.0	26.4	–	2,107.9
Sub-total (Central + PCG)	2,359.7	465.2	26.4	120.3	2,971.6
Private	–	566.6	–	–	566.6
Total	2,359.7	1,031.8	26.4	120.3	3,538.2

Remarks ; /1 : Excluding these in the reclaimed land.
/2 : Including the infrastructures.
/3 : Project costs for water supply is assumed to be financed by PWA, which may partly be financed by PWD.
/4 : Comprising the costs for Phatthaya 3 road and solid waste disposal facilities.
/5 : Possibly financed by TAT.

In total, 2,108 million bahts should be financed through the budget allocation of the Central and State Authorities for Phatthaya during 1990~1996 period, or 301 million bahts per annum on the average. This would necessitate the substancial increase of the allocation for Phatthaya. This seems, however, justifiable considering the big contribution of Phatthaya to the national economy as well as to the Central Government finance in terms of foreign exchange earnings and generation of tax revenues.

PCG would be required to finance 864 million bahts in total or 123 million bahts per annum on the average. Subtracting the investment costs for the land reclamation, i.e., 229 million bahts, the fund for which is to be borrowed from the private sector and will fully be recovered by granting concession right to use the land within a few years, the total fund to be raised by PCG would be reduced to 635 million bahts or 91 million bahts per annum on the average.

It is proposed that the requirement should be met by augmenting the special grant to the Phatthaya City which is currently about 30~40 million bahts a year.

7.5 Waterfront Improvement Project

1) General

The Waterfront Improvement Project or the tourist port/land reclamation at the South Phatthaya is the first large-scale reclamation project ever carried out in Thailand and there exists some ambiguity in the legal proceedings required for its implementation. Before the implementation of the Project, detailed study should be carried out for the appropriate legal proceedings as well as the in-depth study on the technical and financial viability of the Project. In this Master Plan Study, preliminary study is conducted to work out possible alternatives together with the study on the legal proceedings and institutional and financial arrangements.

At present, TAT is carrying out a feasibility study on the Phatthaya Tourist Jetty for which TAT budget has already been secured for implementation. The feasibility study results, however, is not available at the time of preparing the Final Report of this Master Plan Study. This Master Plan, therefore, has prepared a project plan : Waterfront Improvement Project,

which encompassed a tourist jetty as one component based on the preliminary discussion and exchange of views with TAT.

2) Alternatives

There may exist various alternatives for implementing the Project. Three possible alternative plans are worked out and presented in this study, however, considering the possibility and practicability for implementation from the viewpoints of legal proceedings, institutional setting and financial arrangement.

Alternative A

Waterfront Development Project will be prepared by a committee comprising representatives of Phatthaya City and relevant agencies, such as National Environment Board, Public Works Department, Tourism Authority of Thailand, Harbour Department, Ministry of Interior. Then the Phatthaya City submits the project to Minister for Interior through Chon Buri Provincial Government for being initially approved with the consent of the Minister for Communication and the National Environment Board. After the initial approval, the Minister for Interior will submit the project to be approved by the Cabinet. After the Cabinet approval, application will be submitted by PCG for filling the sea to the Director-General of Harbour Department. After the approval, reclamation works will be started with a private investment through specific agreement with PCG.

After the completion of the reclamation, PCG will make a request to the Land Department to draft a Royal Decree for withdrawing the public domain status of the reclaimed land. The draft of the Royal Decree will be submitted to be issued by the King through MOI, Cabinet and Parliament, respectively.

After the issuance of the Royal Decree, the Phatthaya City will request the Land Department to draft the Ministerial Regulation for transferring the responsibility and power to use and acquire benefit of the reclaimed land to the Phatthaya City. The Ministerial Regulation will then be issued by the

Minister for Interior. A concession right for the use of the land will be given to the private investor who made the investment on the reclamation.

Construction works will be executed for the reclaimed land along the principles specified in the said Ministerial Regulation. TAT will construct the tourist jetty using her budget. Infrastructures and utilities will be constructed by the Central Government Departments, State Authorities and PCG by means of their budgets. The rest of the building and facilities will be constructed by the private investor.

Alternative B

A project preparation committee will be formed for the effective implementation of the Waterfront Project. After the approval of the Cabinet, application will be submitted by PCG for filling the sea to the Director-General of Harbour Department. Up to this stage, the proceedings are the same as these of Alternative A.

After the approval by Harbour Department, reclamation works will be commenced using the budget of PCG allocated for the Project.

After the completion of the reclamation, the Phatthaya City will make a request to the Treasury Department to draft a Ministerial Regulation for transferring the power and responsibility to use and acquire benefit of the reclaimed land to the Phatthaya City. The Ministerial Regulation will then be issued by the Minister for Finance, which also prescribes the rules and procedures for giving concession, grant or making available for use as well as the principles for the use of the land. In compliance with the rules and procedures, Phatthaya City will call tender and award a concession right to the private investor, whose land development plan is best fit for the purpose of local development of Phatthaya.

Construction of the buildings, tourist jetty, infrastructures and utilities and other facilities will be carried out in the same manner as for Alternative A.

Alternative C

Legal proceedings and institutional arrangement are the same as of Alternative B until the power and responsibility to use and acquire benefit

of the reclaimed land are transferred to the Phatthaya City. Instead of giving a concession right of using the land to a private investor, the Phatthaya City will construct all the buildings and facilities except the tourist jetty and pertinent facilities to be executed by TAT and the infrastructures and utilities to be executed by the respective public organizations.

3) Comparison of the Alternatives

(1) Assessment Criteria

The alternative implementation plan are examined and compared from the practicability of implementation comprising the following viewpoints:

i) Certainty and time required for clearing the legal proceedings ;

ii) Certainty for fund raising ;

iii) Securing the coordination and cooperation of the organizations and parties concerned and people affected by the Project ;

iv) Institutional capacity for the execution and management of the Project

(2) Comparison and Adoption of an Alternative for Case Study

The assessment of the alternatives are given below :

Practicability \ Alternative	Alternative A	Alternative B	Alternative C
Legal Proceedings	D	E	F
Fund Raising	E	F	F
Coordination/Cooperation	D	F	E
Institutional Capacity	E	F	D
Overall Rating	2	1	2

Remarks: E: Excellent, F: Fair, D: Some difficulty

Alternative B is assessed the best among the three conceived ones with one "excellent" without "some difficulty" and adopted for the case study. Legal proceedings and institutional framework for Alternative B is shown in Fig. 7.5.1.

4) Case Study for the Adopted Alternative

(1) Strengthening of PCG

Among the divisions of PCG, "Public Works Division" and "Finance Division" are most concerned with the implementation of the Waterfront Project, which are staffed with 41 officials and 143 employees and 30 officials and 15 employees, respectively as of June 1989. It is proposed that staff should substantially be augmented and enhanced, for the implementation of Waterfront Project taking also into account other requirements for the implementation of the integrated development of Phatthaya.

Alternatively, a section or unit may be proposed to be set up for the preparation and the implementation of the Project, transferring some staff from the relevant divisions as well as recruiting from outside including the private sector.

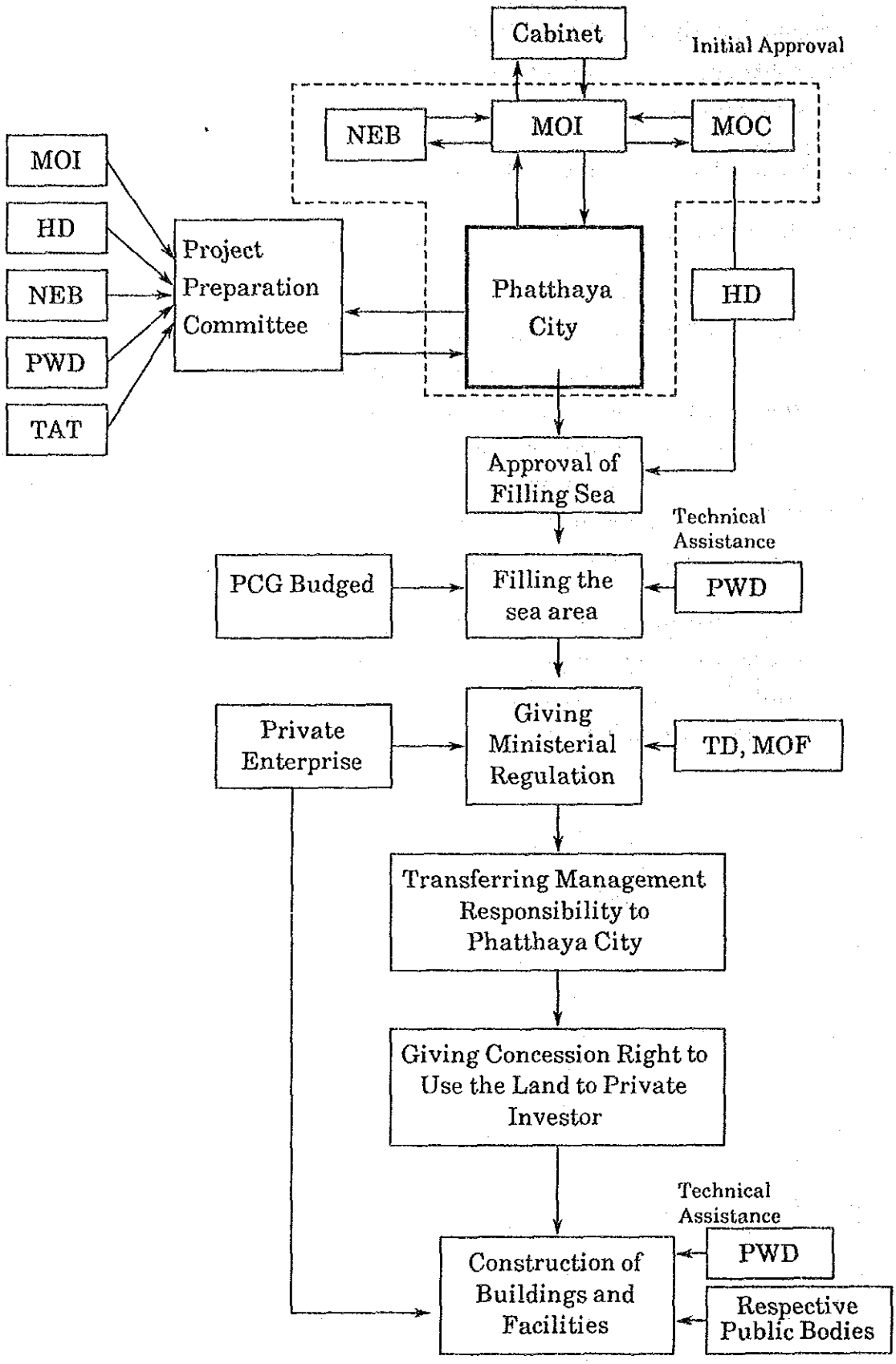


Fig.7.5.1 Legal Proceedings and Institutional Framework for Alternative B

In order to support planning, design as well as technical study, tendering and contracting, assistance of PWD must be secured.

(2) Preliminary Financial Analysis

i) General

Preliminary Financial Analysis is made for Alternative B. Two cases are analyzed, i.e., to implement the Waterfront Improvement Project only and to implement the Waterfront Improvement together with the Phatthaya Beach Restoration as an integrated project.

In conducting the analysis, the following assumptions are made:

① The reclamation works are executed by the allocation of PCG's budget which is financed by borrowing from the private sector. Loan condition is assumed at:

- interest of 15% per annum
- repayment period of 4 years

② Concession right to use and acquire benefit of the land will be given to a Private Enterprise by PCG. The amount for compensation will be equal to the cost of reclamation added with the interest during the reclamation.

③ The construction costs of the buildings and facilities including the tourist jetty and the infrastructures and utilities will be borne as follows:

(Unit : million bahts)

Private Enterprise	566.6
PCG	306.2
TAT	138.9
PWD & PWA	20.1
Total	1031.8

④ Government offices to be constructed on the reclaimed land will be executed and financed by respective governments and departments, and their costs will not appear in the analysis.

⑤ Only the following buildings are profitable:

- Port terminal building
- Commercial buildings
- Restaurant building
- Art center with duty free and souvenir shops

They will be leased to other private enterprises and the revenue for the Private Enterprise will comprise down payments for leasing and monthly rental fees which is assumed equal to the maintenance costs of the buildings.

⑥ OMR (operation, maintenance and replacement) costs of other buildings and facilities are either provided by the government budget or by their revenues without surplus.

⑦ All the costs and revenues are at December 1989 level. If inflation is applied uniformly to the costs and revenues, financial viability would be upgraded.

⑧ Revenues of the buildings are based on these of the buildings which are situated in the seaboard of the South Phatthaya, having the locational advantages equivalent to the buildings proposed in the reclaimed land.

ii) Total investment costs

Total investment costs required for the Waterfront Project is estimated at 1,178.5 million bahts in December 1989 price. The cashflow during the initial investment period, 1990-1996, is shown in Table 7.3.1.

iii) Revenues

The revenue of the Private Enterprise to be derived from the profitable buildings in the form of the down payment of the lease are shown in Table 7.5.1.

Table 7.5.1 REVENUES FROM PROFITABLE BUILDINGS

(unit : million bahts)

Year	1993	1994	1995	1996	Total
① Port terminal Building (3/4 of floor area) 6,900 m^2×18,750 B/m^2=129mB	–	–	26	103	129
② Commercial Build. 38,000 m^2×18,750 B/m^2=712 mB	142	285	285	–	712
③ Restaurant 8,000 m^2×18,750 B/m^2=150 mB	30	60	60	–	150
④ Art center 10,000 m^2×18,750 B/m^2=188mB	38	75	75	–	188
Total	210	420	446	103	1,179

Note : "mB" stands for million bahts.

iv) Fund requirement for the Private Enterprise

The fund requirement for the Private Enterprise, i.e., investment costs less down payments is shown in Table 7.5.2 for without and with Phatthaya Beach Restoration Project cases.

Table 7.5.2 FUND REQUIREMENTS FOR PRIVATE ENTERPRISE

Without Phatthaya Beach Restoration

(unit : million bahts)

	1991	1992	1993	1994	1995	1996	Total
Investment by Private Enterprise /1	0.2	33.6	111.1	214.9	168.6	38.2	566.6
Payment for Concession Right	–	–	289.5	–	–	–	289.5
Gross Fund Requirement	0.2	33.6	400.6	214.9	168.6	38.2	856.1
Downpayment for Lease	–	–	210.0	420.0	446.0	103.0	1,179.0
Net Fund Requirement /2	0.2	33.6	190.6	-205.1	-277.4	-64.8	-322.9

Remarks ; /1 : Terminal building, commercial buildings, restaurant, art center, concert hall, event hall, car parking, event square, jetfoil, hydrofoil / berth and boat yard.
/2 : Minus means surplus

With Phatthaya Beach restoration

	1991	1992	1993	1994	1995	1996	Total
Investment by Private Enterprise /1	9.2	33.6	222.4	214.9	168.6	38.2	686.9
Payment for Concession	–	–	289.5	–	–	–	289.5
Gross Fund Requirement	9.2	33.6	511.9	214.9	168.6	38.2	976.4
Downpayment for Lease	–	–	210.0	420.0	446.0	103.0	1,179.0
Net Fund Requirement	9.2	33.6	301.9	-205.1	-277.4	-64.8	-202.6

Remarks ; /1 : Terminal building, commercial buildings, restaurant, art center, concert hall, event hall, car parking, event square, jetfoil, hydrofoil / berth and boat yard.
/2 : Minus means surplus

v) Financial viability

v - 1) Without Phatthaya beach restoration

The net surplus of the Project for the Private Enterprise will be 322.9 million bahts after the initial investment period of 6 years or 37.7% return on the investment which can be considered as favorable return.

v - 2) With Phatthaya beach restoration

In case the Phatthaya beach restoration should be an integral part of the Project and it is assumed that its cost should also be born by the Private Enterprise, the net surplus of the Project would be reduced to 202.6 million bahts and return on the investment would be 20.7 %, which may still be considered as adequate for private investment.

7.6 Phatthaya Beach Restoration Project

1) Legal Proceedings and Institutional Arrangement

We may interpret that the Local Administration Act gives the power of taking care of and protection of the beach to the District Government. Restoration of the beach should, then, be started from getting approval from the District Government.

It is proposed that either the Phatthaya City or TAT should make a request to the District Government for approval of the restoration of the Phatthaya beach which should be authorized by the Minister for Interior through the Chon Buri Provincial Government. The Environmental Impact Assessment report will be required to be submitted to NEB.

The Phatthaya beach restoration will not change the function of the beach to serve for the benefits of the public. The benefits would rather be enhanced. Furthermore the tourism resource will be upgraded and environmental condition will be improved by filling up the polluted mud on the seabed adjacent to the existing beach.

Difficulty is, therefore, not foreseen legally for the implementation of the Project.

2) Financial Arrangement

The construction cost of the beach restoration is proposed to be financed by either TAT's budget or City's revenue from the special grant. Loan from the Central Government and borrowing from the private sector may be not recommendable, considering that the Project would not generate any direct revenue. If introduced in time, the revenue form the Environment Conservation Tax should also be used for financing the Project.

Alternatively, it is proposed that this project should be included in the Waterfront Project as a component on the condition that the Waterfront Project still can prove profitable including the additional cost of the restoration of the Phatthaya beach.

7.7 Immediate Actions Required

1) General

Feasibility study and detailed design should be carried out as early as possible for each priority project for which no specific actions are yet committed. Among all, sewerage, solid waste disposal and waterfront improvement including jetties are emergent and the following actions are recommended to be taken in particular.

2) F/S and D/D for Sewerage Project

Currently PWD is conducting a feasibility study (F/S) on the sewerage development for Phatthaya including Na Klua and Jomtien. The study is scheduled to be completed around July 1990 and to be followed by detailed design (D/D) for Na Klua and Jomtien. Once completed, it is recommended that the results of the study should be reviewed referring to these of this JICA Study particularly in such aspects as projected population by area, estimated water demands and capacity of the facilities required. In case gap is found in the required capacity, it should be carefully examined and necessary actions should be taken promptly.

It should be noted that the central part of the Phatthaya City or the Phatthaya town area for which expansion works of the existing plant is already completed and a new treatment station is under construction, is not included in the scope of the F/S. According to this JICA Study, however, the following capacity of treatment plant and pertinent facilities will be required for this area beyond the accumulated capacity of the area after the completion of the above projects, assuming Soi Kazem Suwan plant should be expanded to the capacity of 14,000 m^3/day and continue to be in operation after 2006.

(Year)	(Unit: 1,000 m3/day)
1996	17.0
2006	26.0

It is recommended that the facilities development plan proposed by this Study should carefully be reviewed by PWD together with the estimated sewage volume to be generated. If deemed appropriate by PWD, F/S should be carried out to meet the additional requirement in this area to be followed by engineering works, land acquisition and construction of the facilities.

3) F/S, D/D and Land Acquisition for the Sanitary Landfill Site Project

The site where open dumping is currently being conducted will be filled up within the coming 2 years. It is urgently required to conduct a F/S to select the optimum site for sanitary landfill. In this study, emphasis should be placed on the comparative costs of alternative sites, considering the land acquisition cost and transportation cost. After the selection, action should immediately be taken for acquiring the land, taking into account the urgency of project implementation and the sharply increasing land price.

4) Modification of Waterfront Improvement Plan and Conducting a F/S

Currently a F/S is being conducted by TAT for the Tourist Jetty Project, which will be completed .in 1990. The TAT project envisages the construction of a tourist jetty to serve for the excursion boats plying between Phatthaya and Ko Lan while waterfront improvement plan proposed in this Study is a more comprehensive one including large-scale reclamation with various structures

and buildings as well as tourist piers with the same objective as TAT jetty. As soon as TAT's study is completed, the waterfront improvement project should be reexamined to coordinate with the tourist jetty project proposed by TAT and should be modified accordingly.

A F/S should be carried out quickly, paying due consideration for the TAT's Jetty plan with emphases on:

i) Required legal proceedings;
ii) Organizational structure for project implementation;
iii) Financial viability and practicability of private sector involvement;
iv) Availability of proper fill materials.
v) Conducting either a hydraulic model study or computer simulation study on the possible impacts, including coastal erosion of the reclamation project

Upon completion of F/S and if found viable, detailed design and construction works as well as legal proceedings should be started.

ANNEX : STUDY TEAM

1. JICA'S STUDY TEAM

1)	Project manager	:	Mr. T. Yoshimatsu
2)	Regional Development/Land Use	:	Mr. A. Asahi
3)	Financial/Implementation Planner	:	Mr. M. Akagawa
4)	Port-Coast Use Planner	:	Mr. I. Mirchandani
5)	Tourism Development Planner	:	Mr. K. Hosino
6)	Tourism Facilities Planner	:	Mr. I. Asakura
7)	Demand Forecast Expert	:	Mr. H. Yamane
8)	Economist	:	Mr. Y. Kamiya
9)	Environmental Expert	:	Mr. P. Puthipiroj
10)	Transportation Planner	:	Mr. Y. Motomura
11)	Sewerage Planner	:	Mr. M. Wishart
12)	Water Supply Planner	:	Mr. K. Nagayoshi
13)	Rainwater Drainage Planner	:	Mr. M. Hayashi
14)	Public Facilities Planner	:	Mr. N. Minami

2. JAPANESE ADVISARY COMMITTEE

1)	Chairman	:	Prof. Dr. H. Morisugi
2)	Member	:	Mr. T. Nagai
3)	Member	:	Mr. H. Kondo
4)	Member	:	Mr. S. Naruse
5)	Member	:	Mr. S. Miyama

3. EMBASSY OF JAPAN

1)	First Secretary	:	Mr. H. Matsuda
2)	Second Secretary	:	Mr. M. Ito

4. JICA STAFF

1)	JICA Headquarters	:	Mr. Y. Sasaoka
2)	JICA Headquarters	:	Miss R. Inada
3)	JICA Bangkok Office	:	Miss C. Hara

5. STEERING COMMITTEE

Dr. Savit Bhotiwihok	:	Director OESB
Mr. Mana Chotikapanich	:	PWD
Mr. Phaitoon Boonwatana	:	DOLA
Mrs. Jutamas Siriwan	:	TAT
Mr. Sakda Tonguthaisri	:	DTCP
Mr. Wattana Karnbunjop	:	DTCP
Mr. Apai Chantanachulaka	:	Chonburi Province
Mr. Suchai Ruayrin	:	Phatthaya City
Mr. Saksidh Tridech	:	NEB
Mr. Sidhiporn Kachornnetiyudh	:	NEB
Mr. Buncha Vatanasinthu	:	DOH
Mr. Viched Rochanathamkul	:	HD
Mr. Sunsern Vongcha-um	:	NESDB
Dr. Utis Kaothien	:	NESDB
Prof. Kamropluk Suraswadi	:	OESB
Mr. Somchet Taeracoop	:	OESB
Mr. Phatai Metharom	:	OESB

6. WORKING CROUP

Mr. Somchet Taeracoop	:	OESB
Mr. Pathai Metharom	:	OESB
Mr. Voranit Chayavivattanavong	:	PWD
Mr. Leunyos Leelachati	:	DOLA
Mr. Paradech Phayukhavichien	:	TAT
Mr. Anukul Khunavongse	:	Chonburi Province
Mr. Theerapol Noprumpa	:	Phatthaya City
Lt. Col. Vichit Emsawat	:	Phatthaya City
Miss Kannika Boontanonte	:	HD
Mr. Thaneerat Liripachana	:	OESB
Mr. Kriangkrai Boonyayothin	:	OESB
Mr. Termsap Taelakul	:	OESB