2.5.2 Utilities

1) Water supply

(1) Present conditions

Population including unregistered residents and annual guest arrivals to Phatthaya area are projected in this study as follows:

		1989	1996	2006
Domestic population	(× 1000)	100	161	220
No. of guest arrivals	(1000/y)	1,610	2,280	3,240

About 12,000 consumers are connected to the public water supply system, operation and maintenance of which is the direct responsibility of the Provincial Waterworks Authority (PWA). Its service covers the majority of highly populated areas. Its service area extend Ban Rong Po in the north and Jomtien beach in the south. Rain water, shallow wells and tanker water are also supplemental water sources of these area. PWA system takes a share of about 42% of the total water supply in Phatthaya city area, in 1986 (previous JICA report).

The remaining part of the study area, including inland of Phatthaya city and Jomtien beach. Tha Farang beach, Tha Farang beach, Bang Sare and Ko Lan are left in a poor service level. The water source of these area depends on private and independent systems such as private ground water facilities, direct storage of rain water and water vender.

Tourism and commercial activities, recent years, extends considerably to these adjacent areas which are in low population density and lightly developed. Stable water supply for these areas in anticipated in the future.

PWA, at present, (fiscal year 1989) is supplying about 30,000 - 37,000 cu m of water per day by means of:

- Map Prachan reservoir (storage capacity of 16.6MCM/y)
- Treatment plant (capacity of 24,000 cu m/d)
- Distribution pipeline (total length of about 150 Km)
- Booster pump station and Khao Phatthaya distribution reservoir (2000 cu m ground storage reservoir) for high area.

The water demand has been rapidly increasing for the last 3 - 4 years, owing to high tourist influx and rise in living standards.

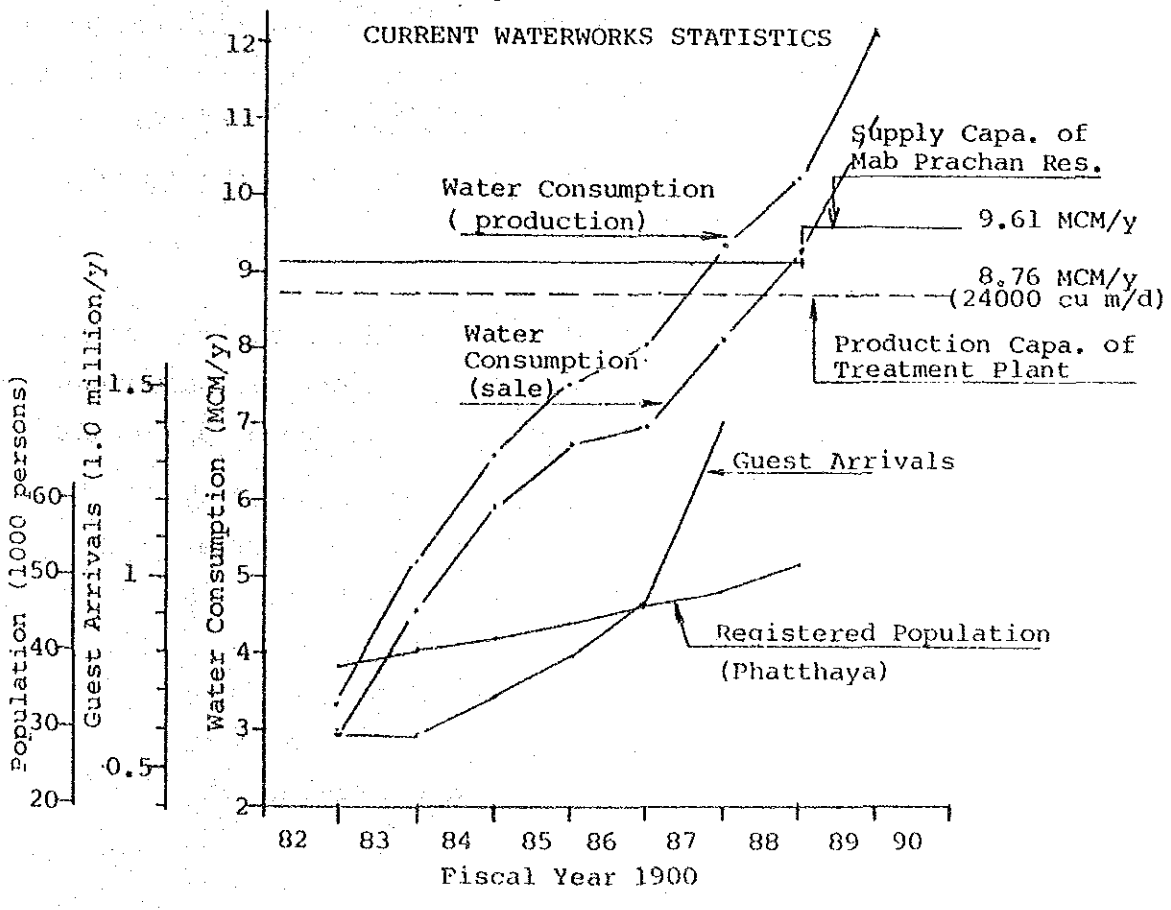
To cope with increasing demand, the following improvement works have been carried out.

- Distribution pipeline has been extended from a total length of about 100 km in 1985 to 150 km in 1989.

- The crest of the spillway of Map Prachan dam was raised by 50 cm. Storage capacity of the reservoir was increased from 14.8 to 16.5 MCM.

- A supplemental reservoir (storage capacity of 0.2 MCM) was constructed in the up stream of Huay Yai river. This reservoir is estimated to be capable of diverting raw water into Map Prachan reservoir for 2 - 3 MCM/y.

For all the efforts, since 1987, the water supply has been under an overloaded operation of the treatment plant, and the demand has reached to the limit of supply capability of the existing water source reservoirs as shown in the figure below.



Source : TAT, PWA and JICA previous report

Map Prachan reservoir, the only raw water source of Phatthaya waterworks, was found to be insufficient to meet the increasing demand in the future. RID has specified a plan for constructing four reservoirs to secure the raw water source and to solve the water shortage problem in Phatthaya area;

- Nong Klong Dong reservoir, capacity of 7.60 MCM, expected to be completed in Oct. 1990 and will start storing water in May 1990.
- Huay Chuk Nok reservoir, capacity of 7.40 MCM, expected to be completed by the end of 1991 and will start storing water in Oct. 1990.
- Huay Sapan reservoir, capacity of 5.12 MCM, will start construction in 1990.
- Huay Khun Jit reservoir, capacity of 4.93 MCM, will start construction in 1990.

Recently, as acute shortage of the raw water, however, has occurred owing to the increase of water consumption and little rain fall especially in 1989. PWA is restricting the water supply from 37,000 cu m/d in August (yearly average of 33,000 cu m/d in 1989) to within 27,000 cu m/d at present. Storage volume of water source reservoir began decreasing from January 1989 and came to 5.56 MCM (1/3 of full storage) in November 1989, that is, a lower level than previous year by 50%.

(2) Present development plan

JICA conducted a study relative to Phatthaya waterworks in March 1987 for the purpose of formulating a development master plan and a feasibility study. The conclusions and proposals of the study are summarized below:

		Stage 1	Stage 2
Target year		2,000	2,010
Population		92,000	114,000
Service ratio	(%)	65	76
Water demand	(cu m/d)	48,900	61,800 (additional 12,900)
New water source		Laem Chabang receiving well	
New treatment plant	(cu m/d)	20,100	Extension by 12,900
Transmission main		500 & 600 × 11 km	Additional 500 & 600 × 11 km
Distribution main		100 - 600 × 78 km	Additional 100 - 500 × 32 km
Construction cost (mil. Baht)		*381	216
Remarks		Feasibility study	Master plan

* Include rehabilitation and modification works of existing facilities

After 2 years considering significant changes in development conditions, some programs were come to be implemented based on the recommendations of the above JICA study, that is:

- Expansion work of existing treatment plant by the capacity of 500 cu m/h

- Detailed design with the modified basic concept that:

  * Service area to be expanded through Jomtien to Bang Sare.
  * Water demand is recommended to be reviewed according to steep development trend especially in southern coastal area and to recent water consumption.
  * The water from Nong Kho reservoir which is selected for the water source of Phatthaya, at present, shall exclusively be allocated to Laem Chabang and Phatthaya shall have independent water source which is described as potential dam-sites in the vicinity.

Urgent development plans to solve confronting problems on water shortage, especially becoming serious in 1989, have been commenced instead of the above program. The outliners are as follows:

- Plan phase 1.
  * To solve the confronting problem by drawing the raw water form Nong Kho reservoir
  * Lay pipe along the railway line for spending raw water to branch off from the existing Nong Kho-Laem Chabang water pipe, using 600 mm diameter × approx. 16 km length until Phatthaya - Na Klua waterworks office. (operated by PWD)
  * Construct mobile type treatment plant, capacity of 700 cu m/h, at the site of Phatthaya - Na Klua waterworks office. Pump the clear water into the existing distribution network. (operated by PWA)
  * Construction cost is approx. 148.4 mil. Baht.
  * Construction is to be completed within April 1990.

- Plan phase 2. step 1
  * Use the raw water from Nong Klong Dong reservoir.
  * Construct a treatment plant, capacity of 1000 cu m/h, in the land of Social Welfare Dept. at the vicinity of Sukhumvit Road.
  * Lay raw water pipe, 600 mm diameter × approx. 8 km length, from the treatment plant to Na Klua market.
  * Construction cost is approx. 225.3 mil. Baht.
  * Implementation period, Nov. 1989 - Oct. 1990.

- Plan phase 2. step 2
  * Use the raw water from Huay Chuk Nok reservoir.
  * Construct a treatment plant, capacity of 1000 cu m.
  * Lay raw water pipe, 600 mm diameter × approx. 3 km length, from the treatment plant to distribution network.
  * Construction cost is approx. 108.4 mil. Baht.
  * Implementation shall be made after step 1 works.

- Plan phase 2. step 3
  * It is specified to use two water reservoirs (Huay Sapan and Huay Khun Jit reservoir)
  * Connect the outlet pipers of three reservoirs which are Huay Sapan, Nong Klong Dong and Huay Khun Jit reservoir.
  * Construct a treatment plant, capacity of 1000 cu m/h, at the vicinity of Nong Klong Dong reservoir.
  * Lay clear water pipe from the treatment plant to the distribution network..
  * Construction cost is approx. 159.1 mil. Baht

(3) Necessity of long term development plan

The water supply will be increased to estimated approx. 31.6 MCM/y (6.1 MCM/y from Nong Kho and 25.5 MCM/y from reservoirs including existing Map Prachan reservoir) when the present development plan under construction is completed by the end of 1992 as scheduled. However, as described in the following subsections, water resource of the Phatthaya area is not always abundant. Further, the water demand is anticipated to increase more than two times as large as the present level to 30.2 MCM/y in 1996 and further to 47.5 MCM/y in 2006.

Existing development plans are not sufficient to meet the long term water requirement and additional water must be conveyed from other river basins. The development and expansion programs other than existing one including provision of raw water source are needed and must be partially completed until the middle of 1990's, to cope with the future water demand increase as forecasted at present.

Water supply projects must be planned about:

- Distribution systems for the inside of the area correspond to the present development plan. (target year 1996, first phase)

- Transmission facilities of raw and clear water, treatment plant and distribution systems for the stage depended on additionally diverted water. (target year 2006, second phase).

(4) Administrative aspects

The waterworks business of Phatthaya and surrounding area is managed by Phatthaya-Na Klua Waterworks office of Provincial Waterworks Authority (PWA).

The office is in the site of Na Klua booster pump station and is organized with 3 sections which have roles of;

- Production section is responsible for operation and maintenance of water production facilities and for control water quality.
- Service section provides service of setting, checking and maintenance of meters.
- Administration section takes charge of reading meters, collecting the charge, book keeping of customers accounts, financing, record keeping of waterworks income and expenditure and other administrative matters.

For operating and maintaining urban waterworks and providing technical guidance to rural waterworks across the country PWA has 10 Regional Offices which directly supervise these urban waterworks and assist rural waterworks in technical aspects.

PWA has a competency in the activity of supplying drinkable water to provincial town areas and is a state enterprise operating under the supervision of the Board of Directors within the framework of Ministry of Interior.

2) Sewerage

(1) Introduction

Pollution and environmental degradation in many forms is emerging as a potential threat to the future prosperity of the tourist industry, particularly the international tourist industry, in the Phatthaya area. One of the major sources and causes of pollution is sewage and the lack of adequate wastewater management facilities to deal with it. Problems are particularly evident in:-

- Phatthaya beach area where degradation of the beach and bathing waters has occurred over a period of time and where under some conditions raw sewage can be seen discharging directly across the beach to the sea.
- South Phatthaya where Phatthaya river suffers gross contamination from both sewage and solid wastes which finally discharge to Phatthaya bay.
- Na Klua where Na Klua river also suffers from gross domestic sewage and solid waste pollution and also carries untreated wastes from the fishing industry and partially treated industrial discharges, from two tapioca factories.

(2) Legislative and Regulatory Background

The existing legislation relating to sanitation and sanitary practice and control includes the following acts, their amendments and by-laws.

- Public Health Act B.E. 2484 (1941)
- Act for the Cleanliness and Orderliness of the Country B.E. 2503 (1960)
- Building Control Act. B.E. 2522 (1979)

In respect of human waste disposal these Acts basically require that all buildings, dwellings, etc. be provided with septic tank or cesspool facilities. This requirement is, however, largely conceptual and no specific standards, or performance requirements are laid down. The Acts

do lay down scales of charges for municipal septage services which are periodically reviewed.

Notification of the Ministry of Industry (MOInd) issued under the Factories Act B.E. 2512 (1969)

This notification requires factories to make arrangements for dealing with the wastewater they generate. Subsequent Notifications under the Act, No. 10, B.E. 2521 (1978), No. 12, B.E. 2525 (1982) and No. 13, B.E. 2525 (1982), lay down standards for industrial effluent discharges and regulate their control and enforcement.

The "Enhancement and Conservation of Natural Environment Quality Acts" B.E. 2518 (1975) and B.E. 2521 (1978).

These Acts created the National Environment Board (NEB) and require that categorized Projects submit Environmental Impact Statements (EIS) to the Office of the National Environment Board. Statements are required for large developments, e.g. hotels and condominiums of 80 rooms or more in environmentally sensitive areas. These statements must include, details of provisions for dealing with the wastewaters that the proposed development will generate.

Surface Water Quality Classifications and Standards developed by the NEB have been enacted by Notification of the Ministry of Science, Technology and Energy B.E. 2529 (1986).

The NEB has also developed and published draft standards for domestic effluent discharges for different community groups.

Phatthaya City By- Laws:

Phatthaya City enacted by-laws and regulations concerning wastewater treatment and control in B.E. 2530 (1987) and B.E. 2531 (1988). These comprise a full definition of terms and the powers and duties of the city's officers, regulations regarding connection to the city sewers (including wastewater standards, connecting pipework materials and sizes and rates of discharge), connection charges and fees and provisions for enforcement and penalties. Additional announcements also prescribe discharge standards for the sewage treatment works and define the area of Phatthaya City which is

served by foul sewers and subject to the particular provisions of the by-laws.

(3) Existing Provisions

Existing sewerage and sanitation facilities comprise three main elements.

a) The general provision of cesspools or septic tanks coupled with soakaways and/or the drainage system.

b) Special provisions made by large hotels/developments etc, and for industrial wastewaters.

c) Sewage and sewage treatment and disposal facilities serving a limited beachfront catchment area in Phatthaya town.

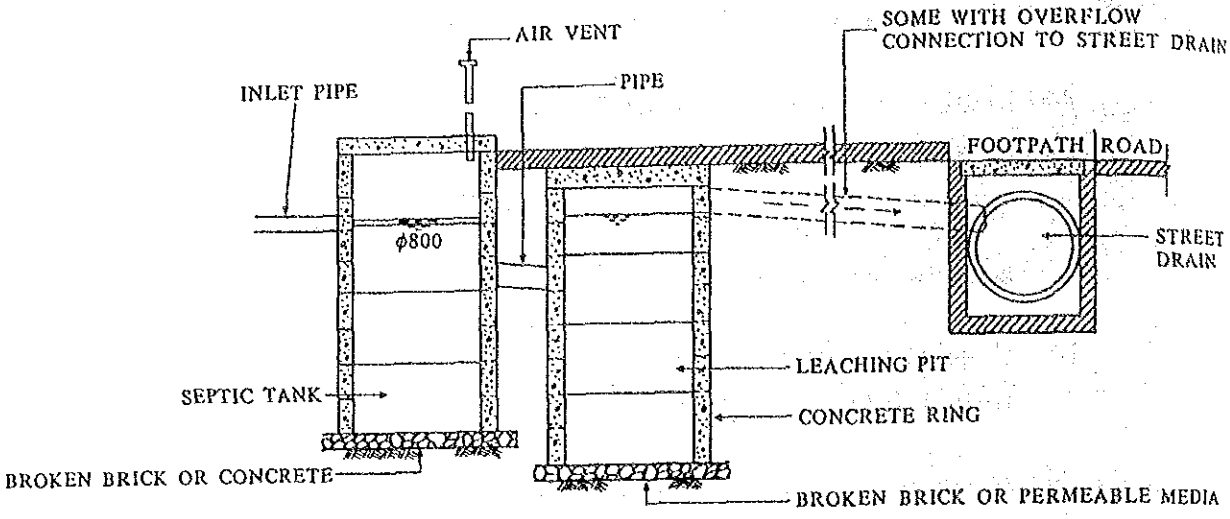
a) The General Provisions

Most domestic toilet installations comprise pour-flush squat plates. There is a trend towards use of western-style flush toilets, particularly in more expensive houses and in restaurants, etc., catering for international tourists. Western-style arrangements are predominant in the better hotels.

In a number of locations some domestic sewage and wastewaters from some restaurants, bars, etc., are illegally discharged directly to watercourses or to the foreshore and sea. These localized areas adjoin the Na Klua and Phatthaya rivers, Na Klua, South Phatthaya and Ban Sare waterfronts and the Ko Lan fishing village waterfront. This is an unacceptable wastewater disposal practice.

In the majority of the study area toilet wastes discharge to septic tanks or cesspools while kitchen, bathing and laundry wastes discharge, often without grease or solids traps, direct to open ground and/or the drainage system. Cesspools are not, generally, a satisfactory answer to the human waste disposal problem, however, on-site collection, partial treatment and disposal systems such as leaching pits or septic tanks with soakaways often are an appropriate solution. It is noted, however, that a large proportion of existing septic tank/soakaway installations are of inadequate design, are not operated properly, or both. In many cases effluent from these

facilities either overflows or is directly disposed to the surface water drainage system.



Typical Detail of Septic Tank/Leaching Pit Arrangement

The drainage and street drain systems have generally not been 'designed' as such and, in the extended dry season particularly, flows are haphazard and slow giving rise to stagnation and septicity. In low density semi-rural areas the unlined drainage ditch system partially absorbs wastewater, however, the residual flow finally discharges its pollution load to natural watercourses. In the more densely populated urban areas of Phatthaya town and Na Klua where solid waste and road grit accumulations in the street drains are commonplace and polluted wastewater flows are greatest, generally unhygenic conditions prevail throughout the system. These wastewaters are not subject to any treatment and ultimately discharge their heavy pollution load to the sea either directly across the beach or indirectly via the natural watercourses of the Phatthaya and Na Klua river systems.

Despite the above problems it is expected that on-site disposal systems will continue to play an important role in wastewater management planning in the study area.

b) Special Provisions by Hotels, Industry etc.:

Environmental Impact Statements (EIS), including details of wastewater disposal arrangements, are understood to have been submitted by thirty six (36) developments (hotels, condominium, etc) in Phatthaya City. Of these thirty (30) have been approved and five (5) are recently submitted and are under consideration. Four (4) developments on Tha Farang beach to the South of Phatthaya City boundary, have approved EIS and a number of others are under consideration.

In addition to the above a further forty four (44) developments within Phatthaya City, including hotels, condominiums, hospitals and department stores etc. of over 2000 m^2 floor area (at July 89) have registered details of their wastewater disposal arrangements with Phatthaya City administration.

Of the above eighty developments in Phatthaya City, 47 (59%) have installed some form of sewage treatment process., typically:- anaerobic filters, activated sludge plants and small scale extended aeration or aerated lagoons, with effluent disposal by either irrigation or to the drainage system. Two number are connected directly to the public wastewater sewers in Phatthaya and 28 (35%) utilize large or multiple septic tank and seepage arrangements, some of which undoubtedly overflow to, or are connected to, the drainage system.

These private sewage treatment plants are generally being operated, however, monitoring and supervision of their performance, although in accordance with the requirements and conditions of their EIS approvals, is limited and it is believed that in many cases discharge standards are not always being met. The imposed performance recording requirements typically include for the analysis of spot or grab samples of influent and treated effluent at three monthly intervals, the analyses to be performed by an approved laboratory at the request and cost of the treatment plant owner. These records are submitted to ONEB, but copies are not required to be furnished to the Phatthaya City administration.

It is expected that such provisions will continue to feature as an element of wastewater management planning in the study area, however, strengthening of the performance monitoring and enforcement provisions is necessary.

The only major industrial wastewater discharge in the study area is generated by the tapioca starch processing industry. As a result of rising land and operating costs, the economics of the industry in the area have changed dramatically and centers of production and processing have been established elsewhere. Of the twenty two factories, functioning in the area ten years ago only two now remain operational. One of these is a grade one factory the other a grade two factory. Both are located to the east of Sukhumvit Road in the Na Klua area and both have wastewater treatment facilities, comprising stabilization ponds, which discharge their effluent to the Na Klua river system. Monitoring of performance of the treatment plants has been limited to periodic testing/inspections by the MOInd. Both factories are expected to close down in the near future, the grade two factory this year.

c) Sewerage and Sewage Treatment and Disposal:

The existing municipal sewerage and sewage treatment provisions are limited to serving an area of approximately 104 ha (650 Rai) of the beachfront development in Phatthaya town. These facilities, designed by the PWD, were completed, commissioned and handed over to Phatthaya City for operation in January 1986. See Fig. 2.5.5.

The works include:-

- a separate sewerage system comprising lateral sewers in minor sois (lanes) connecting to collector sewers in Phatthaya Beach Road from where the flow is pumped to a sewage treatment works in Soi Kazem Suwan. Sewer construction is generally shallow to limit construction and infiltration problems from groundwater. There are six submersible pump in the system. Five of these pumping stations act as intermediate forwarding stations and the sixth finally forwards all flow to the treatment works.

- a sewage treatment works at Soi Kazem Suwan comprising; coarse screening, and primary sedimentation with secondary treatment, utilizing rotating biological contractors (RBC) and final sedimentation tanks, and effluent chlorination. The works, designed for a hydraulic capacity of approximately 4,000 cu m/day average flow (6,000 cu m/day peak flow rate), discharges treated effluent by gravity to the sea via a box culvert. Sludge treatment/disposal is by drying beds and utilization as a soil conditioner by the City Parks Department. Laboratory facilities are provided. See Figure 2.5.6.and Fig. 2.5.7.

It is estimated that the sewerage network effectively collects approximately 75% of the foul sewage generated within its catchment area with most major discharges being connected to it. The balance, about 25%, is disposed either via septic tanks/seepage or after local pre-treatment, at some hotels, to irrigation. There are a number of unplanned illegal surface water drainage connections to the system and a small number of septic tanks must undoubtedly continue to overflow to or be connected to the drainage system.

There are no reports of serious operational problems such as heavy siltation, blockages, etc, occurring in the sewers, however, the main collector sewer in Beach Road periodically suffers from surcharging often resulting in flooding of Beach Road between its northern end near the Orchid Lodge Hotel and its connection with Central Phatthaya Road. The principal cause of this periodic surcharging and flooding, which generally occurs at weekends when hotel occupancy rates and tourist numbers are highest, is the connection of 'undesigned for' sewage flows generated outside the designated catchment area. No serious operational problems with the sewage pumping stations have emerged, however, replacement of corroded galvanized mild steel guide rails was necessary after about two years of service, these should have been specified as stainless steel, and the pump seating duckfoot in some stations was not adequately secured at construction. This resulted in vibration problems in delivery pipework which were resolved by introducing a flexible coupling in the pipework, however, the root cause of the problem remains unattended and future problems with the

integrity of the pump seatings and pump stability are foreseen. Regular inspections and monitoring of these installation is undertaken.

The sewage treatment process selected is generally satisfactory and appropriate although there are a number of variations and additional features which would have given improved operational efficiency. Operational problems occurring include; development of blockages in the hydrostatic sludge draw-off pipes from the sedimentation tanks, these pipes are dia 100mm and should have been dia 150mm a commonly adopted minimum, limited area of sludge drying beds, and a recurring problem with the drive mechanism on one of the rotating biological contractors. It is also noted that the works regularly suffers from hydraulic overloading requiring operation of an overflow facility at the inlet works to prevent drowning of the sedimentation tank weirs. This particularly occurs at weekends when hotel occupancy rates and tourist numbers are highest and in wet weather. The principal cause of this is the growth of flow to the works including additional 'undesigned for' connections, however, it is considered that the peak flow rate, of 1.5 times average flow designed for would have been better specified as 2.5 times average flow to account for diurnal peak flows combining with peak flow days related to the seasonal nature of the tourist industry.

Finally constant monitoring and evaluation of performance is a essential tool in the efficient and economic operation of sewage treatment facilities. This is particularly important in Thailand where sewage treatment works operational experience is limited and a comprehensive wastewater treatment data bank has not yet been established. The provision of continuous flow chart recorders/integrators to monitor all flows to (or from) the works, and of composite sampling equipment would assist greatly in works operations management and would provide essential background data for future wastewater treatment planning.

(4) Immediate Future - Implementation and Planning

Implementation - Sewerage Extensions Project

A second stage of sewerage development in the Phatthaya town area shall be implemented October 1989 - October 1990. The works comprise, trunk sewerage systems to serve an additional 240 ha (1,500 Rai) of the developed areas of the town, (See Figure 2.5.5) doubling of the capacity of the existing sewage treatment works at Soi Kazem Suwan to

approximately 8,000 cu m/day average flow and the equipping and completion of a second sewage treatment works at Soi 17 in South Phatthaya having a hydraulic capacity of approximately 5,000 cu m/day average flow.

In designing the extensions to the sewerage system the PWD have concluded that a modified combined sewerage system is the most practical and economical way of preventing pollution loads discharging to natural watercourses and the sea. The system, which shall operate in parallel with the already existing separate sewerage system, comprises a series of interceptor sewers designed to 'capture' the vast majority of wastewater flows currently being discharged to the drainage system and/or directly to the Phatthaya river system. Advantages of the system are that it will effect a considerable and immediate reduction in the volume of untreated wastewater discharging to the beach and bathing waters at minimum sewer construction cost and that it lends itself to incremental development and improvement towards a more separate system with time and changing conditions. Disadvantages are that; some diluted raw sewage will overflow under storm conditions, there is potential for septic conditions to develop in the sewers, particularly in the combined sewers in the dry season, and that a heavy commitment to operation and maintenance will be vital to its successful management.

The PWD project will extend the treatment works at Soi Kazem Suwan by doubling the existing sewage treatment facilities and modifying sludge treatment to include sludge consolidation/digestion prior to sludge drying on an increased (by 67%) area of drying beds. It is noted that some operational problems may arise due to changes in the characteristics of the raw sewage arriving at the works. In particular the increase in grit loadings that can be expected in the sewage from the new combined sewerage arrangements is likely to exacerbate the desludging problems already being experienced with the primary sedimentation tanks. It may be found necessary to introduce grit removal facilities in the inlet works. See Figures 2.5.6. and 2.5.8.

The Project shall also equip and complete a second sewage treatment works at Soi 17 South Phatthaya. This works will utilize the same basic treatment process (RBC) but to conserve space the sedimentation tanks shall be rectangular upward flow units instead of circular radial flow

units as installed at Soi Kazem Suwan. Provision has been made for grit removal, flow balancing and sludge consolidation/digestion at this works. See Figure 2.5.9. It is considered that some difficulties with sedimentation tank operation and desluding will be experienced at this works and that the works as a whole may have a limited operational life of, say, ten years. The works will, however, quickly provide a treatment service in the South Phatthaya area where pollution is most serious and it is therefore a good intermediate step pending implementation of a long term solution.

The works being implemented under this Project should not be considered as the complete answer for the areas they are designed to serve.

Planning - Current Sewerage Planning

The Government of Thailand through the MOI (Interior)/PWD has initiated a feasibility study/detailed design agreement with the Thai Institute of Scientific and Technological Research (TISTR) aimed at addressing the problems of sewerage and wastewater management in the rest of the Phatthaya City area and particularly the Jomtien and Na Klua areas. The scope of this study includes a review of all drainage aspects including problems arising from wastewater discharges to the drainage system and seeks solutions for all areas outside those already served by the existing and planned facilities. It also includes; a review of existing package sewage treatment facilities at hotels, consideration of all operations and maintenance problems and needs, and a review of tariff structures and cost-recovery mechanisms. Importantly, however, it does not specifically include a detailed review of the existing and planned sewerage and treatment/disposal facilities or an evaluation of their performance, performance potential, operational life or their role in an overall long term wastewater management plan for the Phatthaya town area.

(5) Institutional and Management Aspects

Existing arrangements for the management and control or wastewater in the Phatthaya City area requires inputs from three Divisions of the city administration:-

- City Planning and Construction Division
- Public Health Division
- Finance Division

The City Planning and Construction Division is responsible for management and maintenance and operation of the municipal sewage treatment works and the sewage pumping stations. They are also responsible for incidental maintenance and repairs to the drainage and sewerage systems. Management is effected through the Engineering Section of the Planning sub-division and operations and maintenance activities are undertaken by the various specialist sections, sewage treatment operations electrical, mechanical and public buildings, of the Civil Works sub-division. See Figure 2.5.10.

Operational and maintenance requirements are generally within the capability of the Division, however, a lack of operational experience and insufficient breadth in some specialist skill areas, coupled with a division in the lines of responsibility leads to some problems and delays.

The Public Health Division is responsible for all city cleaning activities including cleansing of drainage and sewer networks and provision, operation and maintenance of the municipal septage service. These services are effected through the city cleansing section of the Public Health Administration sub-division. The Division is also responsible for sanitation and hygiene advice, sanitary inspection of premises e.g. restaurants, factories etc., and enforcement of relevant by-laws and regulations through the Sanitation and Environmental Hygiene section of the Public Health Administration sub-division. See Figure 2.5.10.

Phatthaya City currently owns and operates three suction tankers. They are utilized for general municipal cleansing work and to provide a septage service throughout the municipal area. The septage service operates on request for a standard volumetric fee. There is no designated septage disposal site and disposal, generally to agricultural land is uncontrolled and haphazard. The number of illegal privately operated suction tankers that supplement the municipal service has been variously advised at between three and five. There is no control over private operators or where they discharge their loads.

The Finance Division is responsible for the collection of all fees, charges, tariffs and fines that may be due to the City in respect of sanitation and sewerage services or enforcement orders.

Details of Charges and Fees:

Municipal Septage Service:
Scale changes currently levied by Phatthaya City are:-

For 1 cu m to less than 2 cu m	Baht 75
For less than 0.5 cu m	Baht 50

(greater than 0.5 cu m fee charged as for 1cu m)

No details of collection efficiency or of operational costs for the service were available. (ie included in general cleansing budget)

Sewerage Service Tariffs
No tariff system is in operation . Properties connecting to the sewer system are required to pay a fee for permit issuance and annual renewal based on the square meter floor area of their premises. Special fees apply to special buildings. See following tables.

No details of fee collection efficiency were available.

FEES AND CHARGES FOR ISSUANCE FOR PERMIT

ITEM	FEES	PERMIT ISSUANCE CHARGES
	BAHT/FL. AREA/SQ.M.	BAHT/FL.AREA/ SQ.M./YEAR
- Drawings of connection to surface water drainage	1.20	1.20
- Drawings of wastewater connection pipe	12.-	60.0
- Drawings of wastewater disposal system	12.-	-
- Drawings of sewage treatment system	12.-	-

Remarks : Dwelling houses are to be charged 1/6 of the ordinary rate.

(SPECIAL BUILDING)

SPECIAL BLDG.	ITEM	FEES	PERMIT ISSUANCE CHARGES
		DAILY PRODUCTION	BAHT/KG. OF DAILY PRODUCTION
- Dry fish factory	Drawings of connection to surface water drainage	26	26
- Dry squid factory	Drawings of connection to wastewater pipe	40	40
- Sugar Refinery	Drawings of wastewater disposal system	10	10
- Noodle factory	Drawings of sewage treatment system	7	7

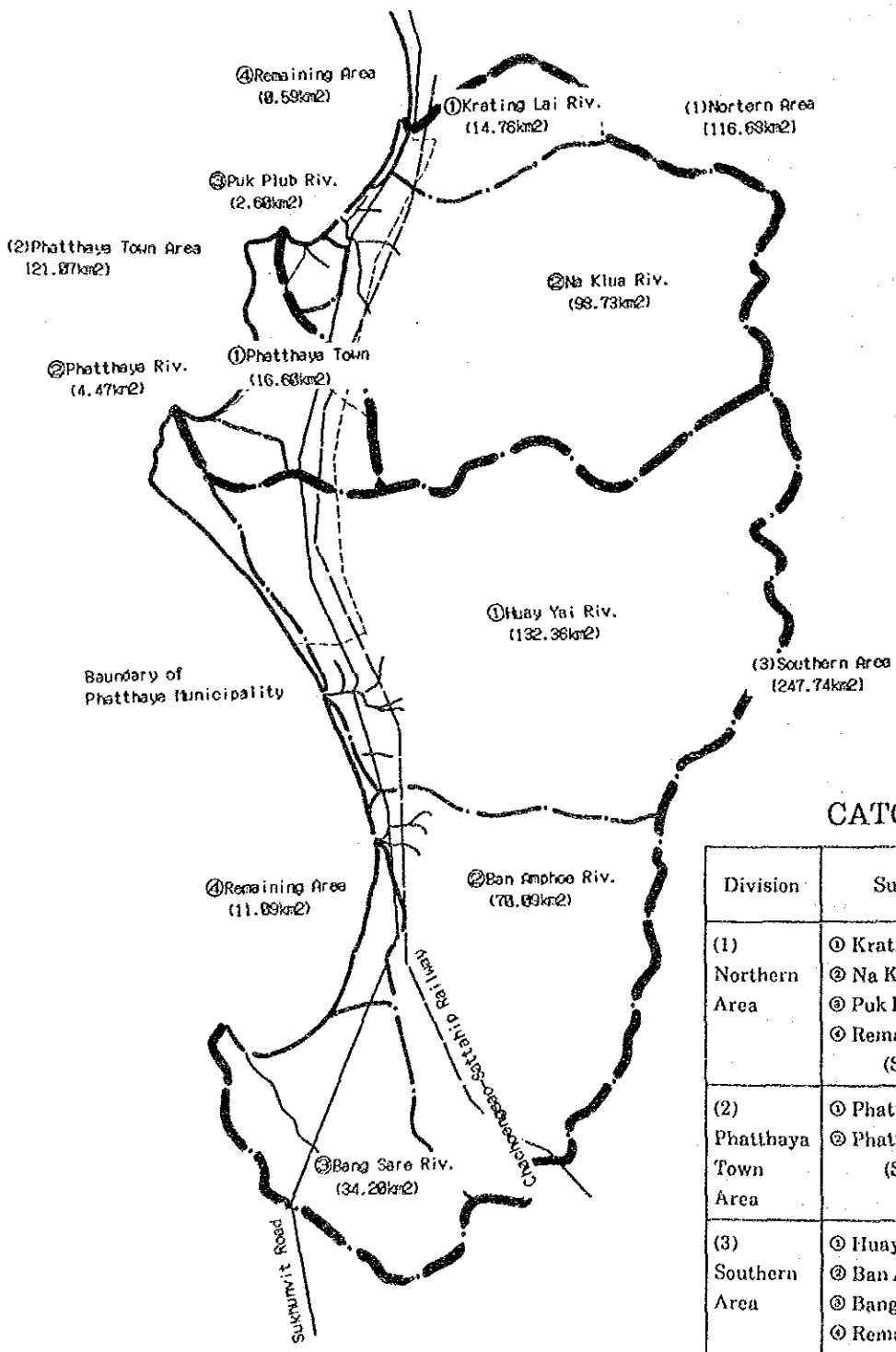
3) Drainage

(1) Present Conditions

① Division of the Study Area

Study Area and its catchment area were divided into three divisions for the study purposes and each division consists of several sub-divisions.

Divided area and its catchment area are shown below.



CATCHMENT AREA

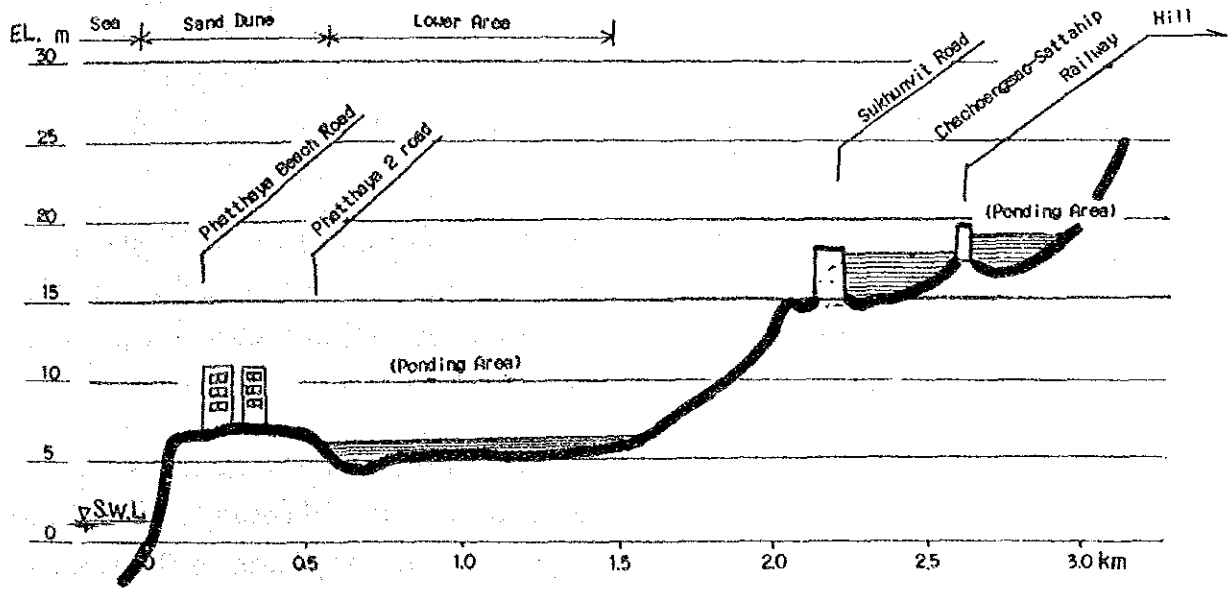
Division	Sub-division	Catchment Area (km²)	Lower Area
(1) Northern Area	① Krating Lai Canal	14.76	1.00
	② Na Klua Canal	98.73	10.29
	③ Puk Plub Canal	2.60	2.60
	④ Remaining Area	0.59	0.59
	(Sub total)	(116.68)	(14.48)
(2) Phatthaya Town Area	① Phatthaya Town	16.60	12.56
	② Phatthaya Canal	4.47	4.47
	(Sub total)	(21.07)	(17.03)
(3) Southern Area	① Huay Yai Canal	132.36	16.30
	② Ban Amphoe Canal	70.09	1.78
	③ Bang Sare Canal	34.20	34.20
	④ Remaining Area	11.09	11.09
	(Sub total)	(247.74)	(63.37)
Total		386.49	94.88

② Topographical Characteristics

Sand dune area which is higher than hinter area extends along the seashore. The first stage of development was made in this area.

Behind sand dune, there extends lower area which has a function of retardation. Flood from upstream area is first retarded in this lower area resulting in protection of downstream area from flood damage. At present, development and reclaimation is remarkable especially in this lower area.

Sukhumvit Road and railway were constructed behind the lower area by raising the gound level and have a kind of levee function for flood from upstream area.

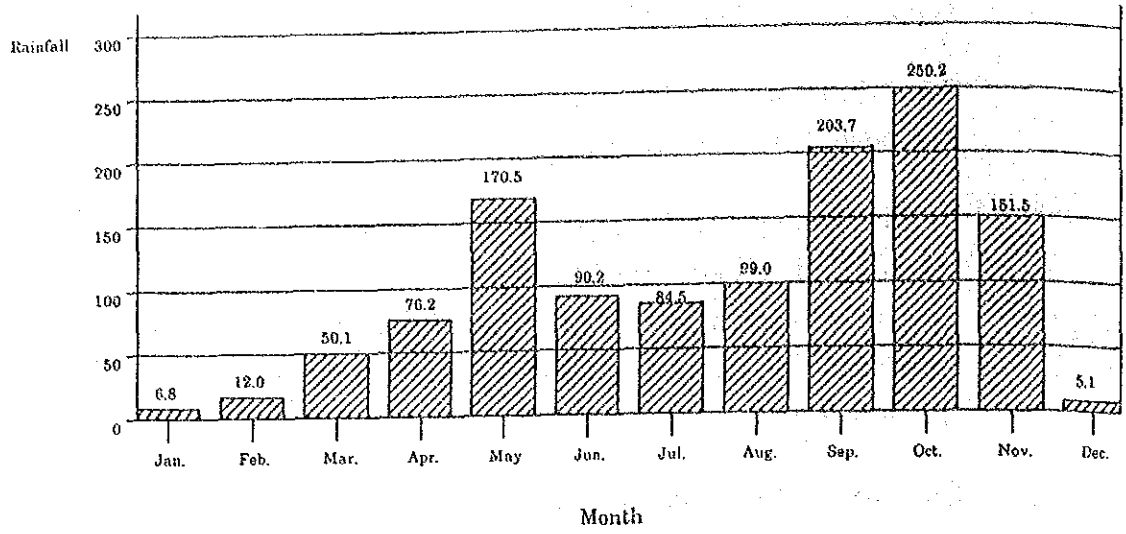


Typical Cross Section of Phatthaya City Area

③ Rainfall Characteristics

Annual rainfall in Phatthaya area ranges from 815 mm to 1630 mm. Annual average rainfall is about 1,200 mm.

Concerning the seasonal rainfall, Phatthaya area has much rainfall from September to November. Forty percent of annual rainfall concentrates in these three months.



Monthly Mean Rainfall
[unit: mm/month]

④ Floor-prone area

Flood problem in the Study Area concentrates on Phatthaya City area. Phatthaya City, especially in the lower area behind Phatthaya 2nd Road, had flood damage several times before as shown in Fig.2.5.11.

According to the information acquired from Phatthaya City, serious flood damage had occured around South Phatthaya area in 1983. Traffic in this area had stopped several days due to the flood which overflowed on the road.

(2) Existing drainage facilities

Main rivers in Phatthaya city are Na Klua canal, Puk Plub canal and Phatthaya canal. Among these canals, discharge capacity of Na Klua canal is bigger than the other two.

Rainwater drainage pipes and channels are constructed by Phatthaya City Hall along main streets of the town. Along Phatthaya beach, six outlets of pipe or box culvert were constructed already (Fig. 2.5.12).

Discharge capacity of these facilities are rather small in comparison with catchment area.

Installment of new rainwater drainage facilities without considering the discharge capacity of downstream sometimes causes serious flooding in the downstream area.

(3) Existing drainage plan

Two future drainage plans exist for Phatthaya City area. One is planned by Phatthaya City Hall and the other is planned by PWD.

Except Phatthaya City area, no future drainage plan exists for the Study Area (See Fig. 2.5.13).

① Drainage plan by Phatthaya City Hall

Phatthaya City has a drainage plan to install drainage pipes and channels along the roads. These facilities are planned mainly for South Phatthaya area and Jomtien Beach area.

② Drainage plan by PWD

PWD made a rainwater drainage plan as a combined system with sewerage. This project will start construction in October 1989.

In this project, PWD plans to construct rainwater drainage pipes with diameter of 1.0 m or 1.2 m along Phatthaya Second road, and connect them with the existing rainwater drainage pipes. Adopted design return period is two years.

(4) Problems and needs

Among three divisions in the Study Area described before, Phatthaya Town area has or will have serious rainwater drainage problems. Northern Area and Southern Area have a little problem.

Serious problems in Phatthaya Town area are considered as follows:

① In the present situation, flooded area extends mainly in South Na Klua Area (Puk Plub canal catchment area) and Central ~ South Phatthaya Area.

Because of small discharge capacity of existing drainage facilities, it is thought that these areas will easily get flood damage when heavy rainfall occurs.

② Development and reclaimation of the lower area behind sand dune, which has a function of retarding to protect downstream area from flood, is remarkable recently. Decrease of the lower area by reclaimation causes increase of flood damage to the downstream area. The tendency of development and reclaimation in the lower area will be thought to continue still in the future. Unless construction of drainage facilities, serious flood damage will be occur in Phatthaya Town area in the future.

Therefore, to protect Phatthaya Town area from flood damage construction of rainwater drainage facilities for this area is very urgernt and indispensable.

PROBLEMS AND SUBJECTS OF RAINWATER DRAINAGE PLAN IN PHATTHAYA CITY AREA

(1) Present Conditions
① Existing flood prone area extend mainly in South Na Klua area (Puk Plub canal area) and Central ~ South Phattaya area. ② Development and reclamation in lower area is remarkable.

(2) Problems
① Main part of Phatthaya City area had flood damage several times in the past and have a strong possibility in the near future. ② Discharge capacity of drainage facilities and channels are small. ③ Decrease of retarding functions in the lower area by reclaimation will cause serious flood problem around area. ④ Development of the lower area results increase of damage potential.

(5) Administrative frame work of rainwater drainage

Rainwater drainage works are carried out by PWD and Phatthaya City Hall.

PWD has a role of making design of and constructing main facilities. On the other hand, Phatthaya City Hall has a role of making branch facilities. However, these roles are not clear actually.

ADMINISTRATION CONCERNING RAINWATER

Administration	Contents of works
(1) PWD Planning Division Sanitary Engineering sub division	Planning and Designing
(2) PCH ① City and Public Works Planning Dept. ② Public Health and Sanitation Dept.	Planning and Designing Maintenance

* PWD : Public Wrok Department
* PCH : Phatthaya City Hall

4) Solid Waste

(1) Service Area

The Service area is set as urbanized area in the Study Area.

(2) Quantities and qualities of solid waste

Three surveys were carried out as follows:

a. Previous JICA study (1978)

- Domestic waste generation : 0.72 kg/capita/day
- Waste generation of hotels : 6 ~ 8 kg/room
- Average waste generation : 3.1 ~ 4.6 ℓ/capita/day
- Moisture content : 49 ~ 53% (July)
- Density : 0.3
- Composition : garbage : 39 ~ 57%

b. Eastern Seaboard – Regional Environmental Management Plan (REMP) (1986)

- Waste generation for urban area : 0.66 ~ 0.84 kg/capita/day
- Average waste generation : 1.3 kg/capita/day
- Moisture content : 55%
- Density (in collection vehicle) : 0.335
- Composition : Largest portion : garbage
  second largest : paper

c. Survey of Phatthaya City

- Waste generation : 67 ton/day (Sept. 1987)
  102 ton/day (Oct. 1988)

Actually 110 ~ 120 ton/day of solid waste seems to be collected.

(3) Collection

Collection service by Phatthaya City covers the whole City area (see Fig. 2.5.14), which is divided into 3 areas and 11 sub-areas.

Fourteen shifts are operated including 3 night-shifts.

The way of discharge for collection is as follows; the percentage was obtained from REMP.

60 liter plastic bag	50%
200 liter drum	30%
50 liter baskets and small cans	20%

The collection crew consist of 1 driver and 4 workers and typically 2 workers lift 200 liter drum and 2 workers receive and empty it in a side loader.

- Average number of trips 2.6 (Phatthaya City)
- Frequency of collection 1 (~2) times/day

Twenty side loaders and 2 open tippers are used for collection. As the number of vehicles is not enough, 6 vehicles are planned to be procured.

	Present	Purchase Plan	Total
Side loader			
3.0 cu.m	3		3
4.0 cu.m	3		3
7.6 cu.m	2		2
9.1 cu.m	4	2	6
11.4 cu.m	8	3	11
Dump truck	2	1	3
Backhoe	1	1	2

Side loader

Truck station is in the South Phatthaya Area with only simple shelter where collection vehicles are checked and recorded.

(4) Final Disposal

The existing disposal site is located approximately 12 km from the center of the city and the area is 35 rai (5.6 ha).

The City has intention and plan to carry out sanitary landfilling, but actually open dumping has been conducted.

The management and control at the site is weak. The previous contract of civil works for landfilling was not carried out. At present, excavation has been conducted by a new private contractor and the city.

Pollution of groundwater in the vicinity of the site has been occurring and the residents getting water from wells are suffering gastrointestinal diseases.

(5) Street sweeping

Sixty five percent of workers for solid waste are street sweepers. Assignment per street sweeper seems small.

(6) Recycling

Private sector is conducting recycling having storage facility. In the final disposal site, scavengers pick up reusuable materials. Recycling is advantagions for reduction of waste amount and effective use of resources, however, scavenging in the disposal site is not sanitary.

(7) Disposal of solid waste in Ko Lan

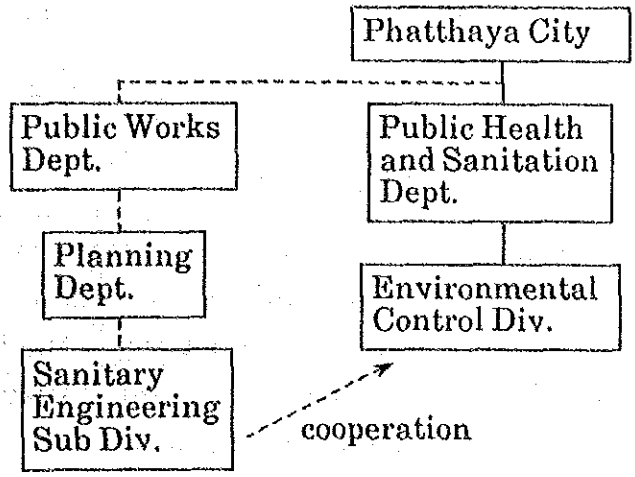
In principle, solid waste is conveyed by a boat owned by the city to the main land with drum. This is not efficient and hard work. At Ta Van beach, solid waste is dumped at the end of the beach.

(8) Institutional Aspect

Local administrations are to have full responsibility to solid waste management by the Public Health Act. Littering or dumping waste at public space is prohibited, punishable by penalty of fine.

To use land outside the local administration boundary for disposal of waste, it must be accepted by the local committee.

Public Health and Sanitation Department of Phatthaya City is responsible for solid waste management in Phatthaya City and Public Works Department carry out engineering matters of solid waste such as planning of disposal site. None of the officials have specially been trained for solid waste management. Ban Sare Sanitary District manages solid waste of their villages. No collection is conducted in Na Jomtien where it will become Sanitary District in 1990. After that collection service will be begun.



(9) Cost recovery

In 1988, 10,372,408 bahts was disbursed but fee collection met only 9% of the expenditure.

(10) Problems and needs

- Final disposal site

  As mentioned at (4), the present disposal manner should be improved to minimize pollution to the environs.
  New disposal site will be required soon.

- At Ta Van beach of Ko Lan, solid waste is dumped at the end of beach.

- Collection

  Collection vehicles are not sufficient.
  Maintenance facilities for collection vehicles to support regular operation should be provided.

- Management

  Special staff for solid waste management should be increased, that including an engineer for sanitary landfilling.

- Cost recovery

  Necessary budget for adequate operation of solid waste management in the long term should be secured. Cost recovery should be improved.

5) Electricity and Telecommunications

(1) Electricity

(a) Power transmission system

The power is supplied from the power stations of EGAT (Electricity Generating Authority of Thailand) – mainly at Bang Pa Kong by 115 kv transmission line in the network. The line is also connected with a small 12 MW hydro-electric plant at Huay Saphan Hin. At Ao Phai two 600 MW thermal plant will be provided in 1990. (Fig. 2.5.15)

(b) Substations

115 kv electric power is stepped down to 22 kv distribution voltage at the substations. Most of the study area is supplied from Bang Lamung substation which has two 50 MVA transformers.

Ban Sare village is specially supplied by Navy.

(c) Feeder lines

22 KV electric power is distributed by PEA (Provincial Electricity Authority). Eight feeder lines are distributing electricity to Phatthaya - South Jomtien.

	Capacity (MVA)	
Feeder 1	6.4	First class hotels in the South Phatthaya
Feeder 2	15.0	Second class hotels
Feeder 3	5.5	Outside Phatthaya City (to the east)
Feeder 4	16.1	First class hotels in the North Phatthaya
Feeder 5	14.2	North Jomtien
Feeder 6	10.1	Na Klua
Feeder 7	15.1	North-east Phatthaya
Feeder 8	14.4	South Jomtien

(d) Existing plan of PEA

- The following new substations will be provided in the future.

1989	Jomtien 1	25 MVA
1991	Phatthaya Tai	2×40 MVA(South Phatthaya Area)
Future	Jomtien 2	2×25 MVA (only concept at this stage)

(e) Administrative frameworks

The Electricity Generating Authority of Thailand (EGAT) provides a national grid consisting of a network of power stations, main transmission lines and regional interconnecting substations, at voltages of 230,115 and 69 KV at a frequency of 50 hertz.

The Provincial Electricity Authority (PEA) is responsible for the local distribution system to consumers at voltages of 22 KV, 220/380 V or 220 V.

(2) Telecommunication

(a) Authorities

Telephone Organization of Thailand (TOT) is responsible for domestic telephone service.

Communications Authority of Thailand (CAT) is responsible for international telephone service, telex service, radio service, leased circuit service, and telegraph service.

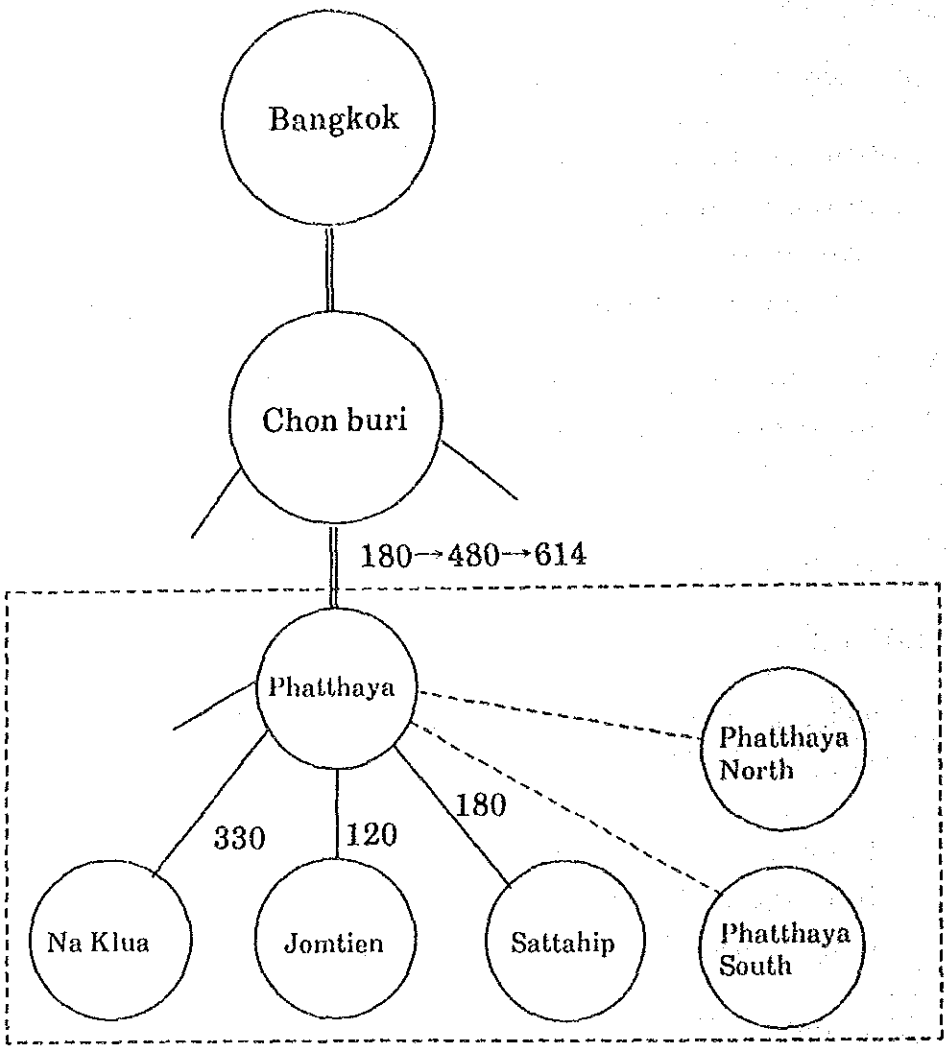
(b) Telephone system

(b-1) Service system

The Phatthaya exchange station covers the Study Srea, having branches of Na Klua, Na Jomtien and Sattahip. For long distance calls, the Phatthaya exchange station is linked with Chon Buri and Bangkok.

The present service is as follows.

	Phatthaya	Na Klua	Na Jomtien
No. of lines (line capacity)	9,216	1,536	2,048
Subscriber lines installed	7,468	704	704
Primary pairs	10,800	1,600	2,200



Telephone Exchange Network

(b-2) Existing Plan of TOT

TOT has the following plan of which final year is 1992.

The number of trunks between Phatthaya and Chonburi will increase to 614 from present 180 until 1992.

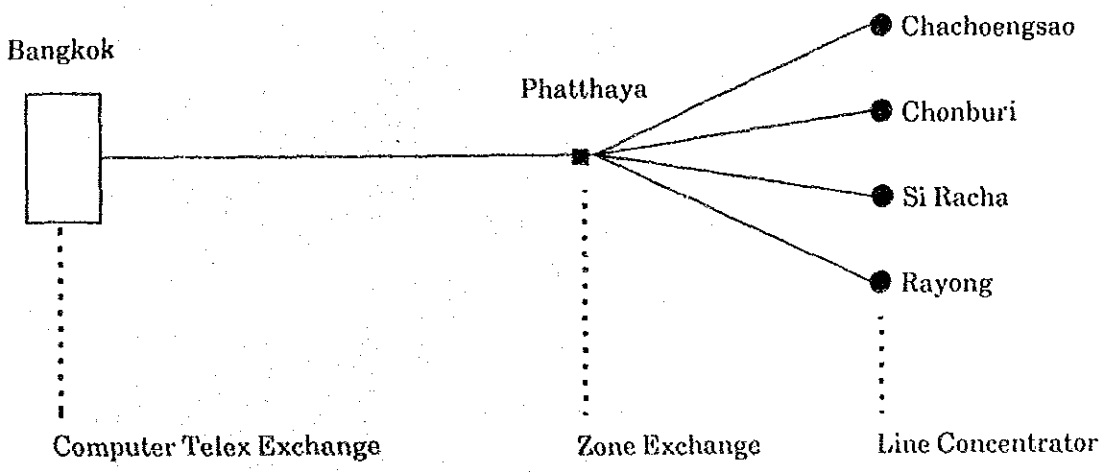
	Phatthaya	Na Klua	Na Jomtien	North Phatthaya (New)	South Phatthaya (New)	Total
No. of lines	13,312	1,536	2,048	1,024	2,048	19,968
Primary pairs	14,060	2,000	2,400	NA	NA	NA

(c) Telex

The following table shows telex service plan of CAT until 1992.

	No. of telex lines	No. of customers	No. of additional customers 1988-1992	No. of customers at the end of 1992
Phattaya	200	72	36	110

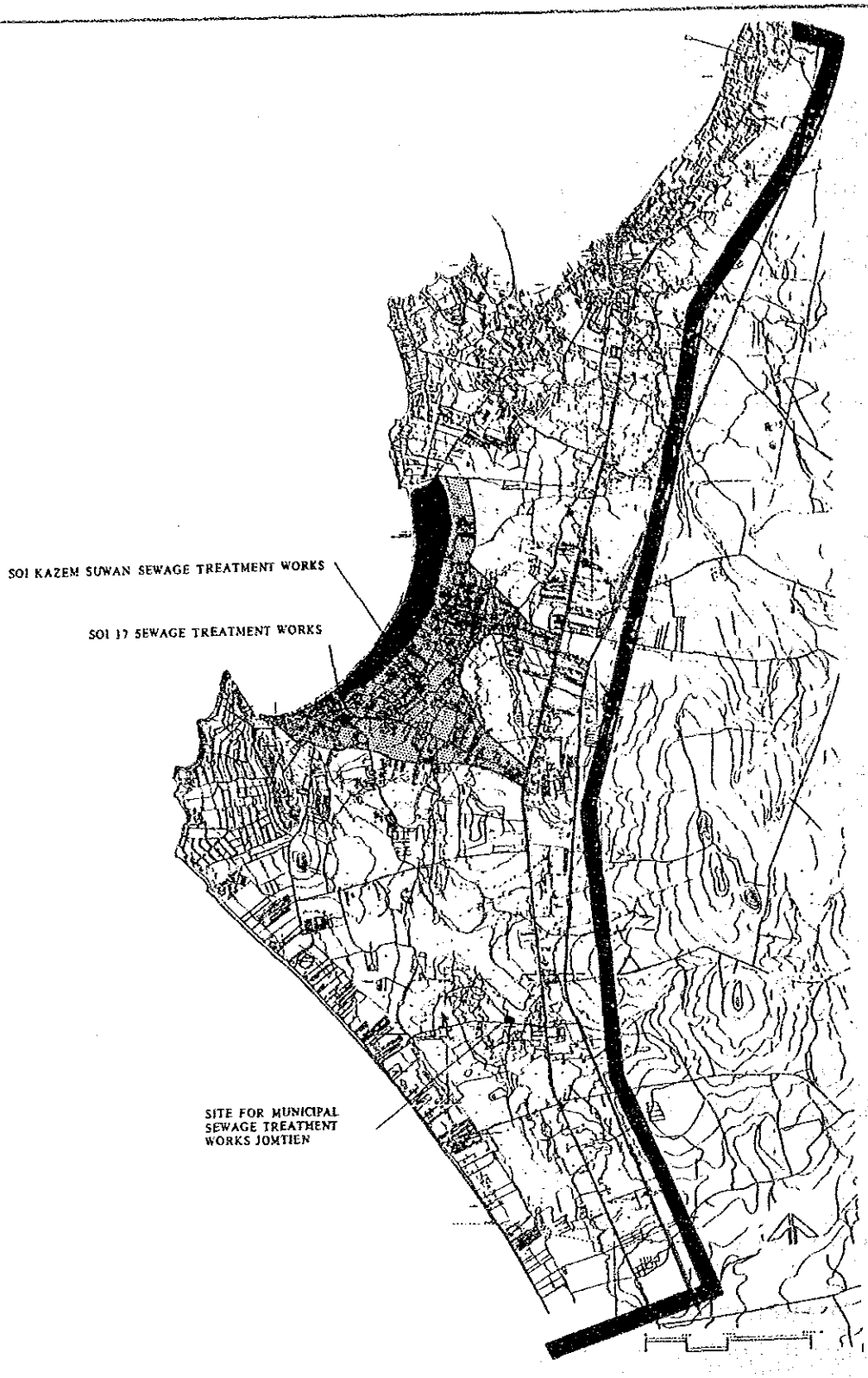
Phatthaya have 200 telex lines and this is expected to be enough for several years.



Telex Network in ESB Area

(d) Problems and needs

The number of lines is sufficient at present. According to CAT's plan, about 4,000 lines will be increased until 1992, which will cover the increase of telephone demand, also number of trunks. Telex is sufficient at present and in future.



LEGEND

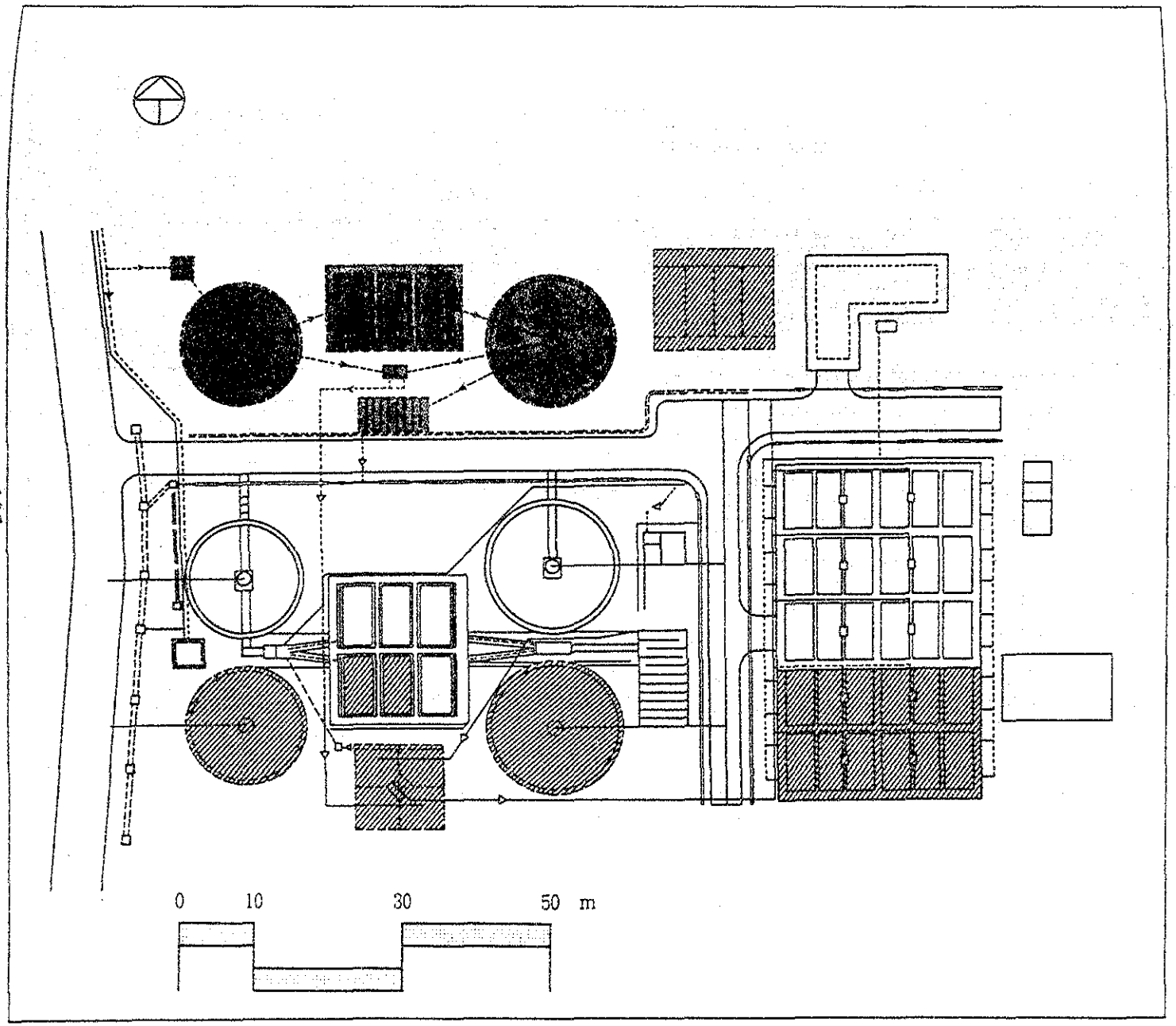
- AREA SERVED BY EXISTING SEWERS (104 Ha)
- AREA TO BE SEWERED OCT. '89 – OCT. '90 (240 Ha)
- AREA UNDER FEASIBILITY STUDY/DETAILED DESIGN AGREEMENT (56 Sq km)

THE MASTER PLAN STUDY FOR
THE DEVELOPMENT OF PHATTHAYA AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 2.5.5

Existing and Planned Sewerage



Legend

- OLD (PHASE 1) 1984 – 1989
- CONSTRUCTED & INSTALLED (PHASE 2) 1989 – 1999
- FUTURE (PHASE 3) 1999 →

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THE DEVELOPMENT OF PHATTHAYA AREA

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Fig. 2.5.6

Wastewater Disposal System Project Phase 2

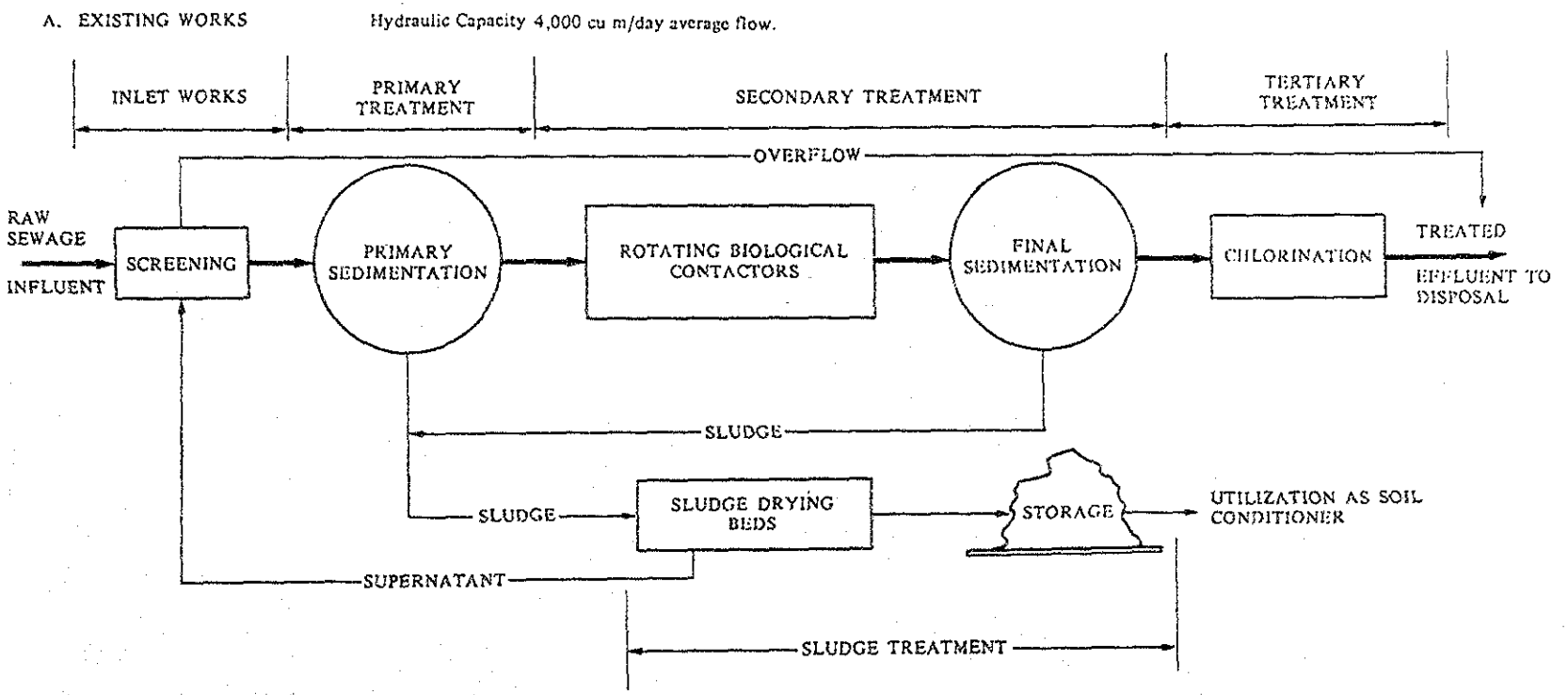

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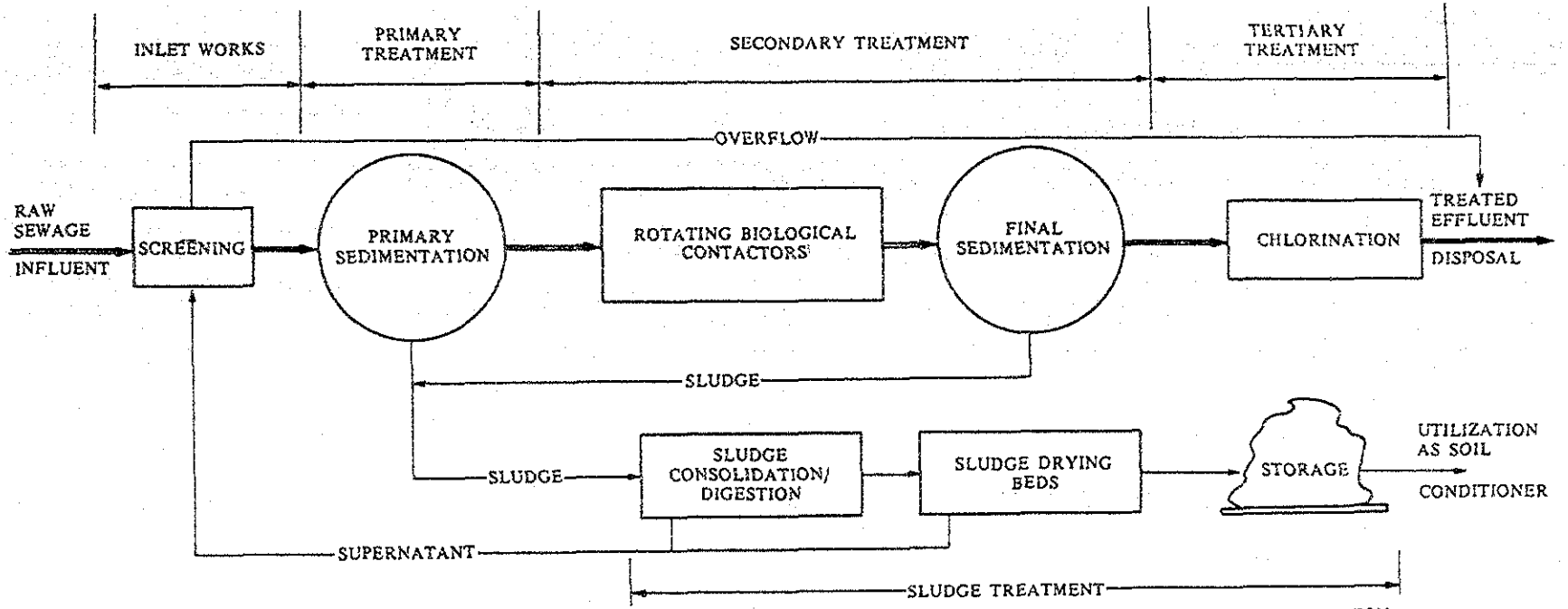
Fig. 2.5.7

Soi Kazem Suwan Sewage Treatment Works
- Schematic 1989

B. WITH PLANNED EXPANSION Hydraulic Capacity 8,000 cu m/day average flow



COARSE SCREENS

2 NO RADIAL FLOW SEDIMENTATION TANKS WITH ROTATING BRIDGE SCRAPERS
DIA: 13 m
DEPTH: 2.75 m

PLUG FLOW ROTATING BIOLOGICAL CONTACTORS
2 LANES OF 3 UNITS
(1 NO STANDARD DENSITY
2 NO HI-DENSITY MEDIA
PER LANE)
UNIT DIA.: 3.6 m

SLUDGE CONSOLIDATION TANK: 12 m x 12 m

2 NO RADIAL FLOW SEDIMENTATION TANKS WITH ROATING BRIDGE SCRAPERS
DIA.: 15 m
DEPTH: 2.75 m

SLUDGE DRYING BEDS
30 NO 3.5 m x 7.0 m

CHLORINATION CONTACT TANK
12 m x 6 m x 1.2 m DEEP

THE MASTER PLAN STUDY FOR THE DEVELOPMENT OF PHATTHAYA AREA

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Fig. 2.5.8

Soi Kazem Sewage Treatment Works
- Schematic 1990

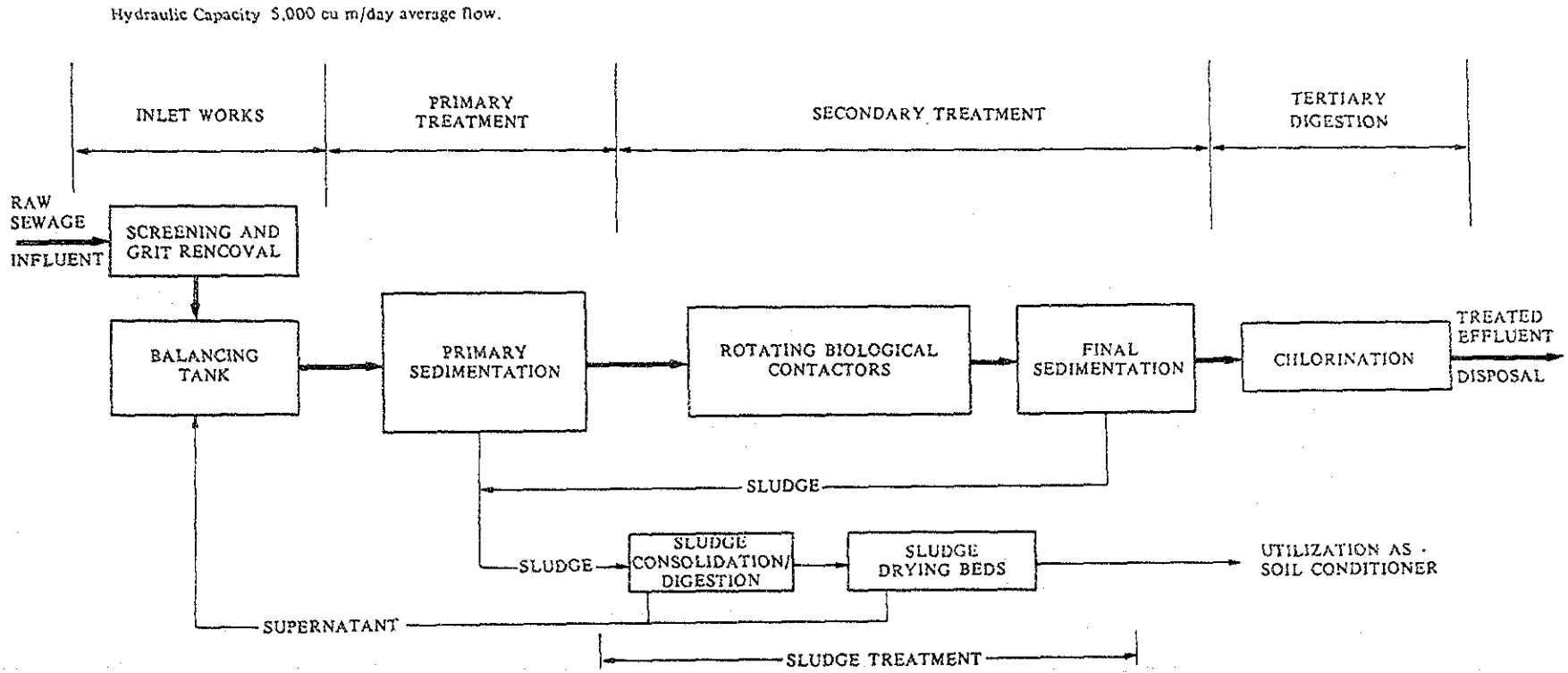

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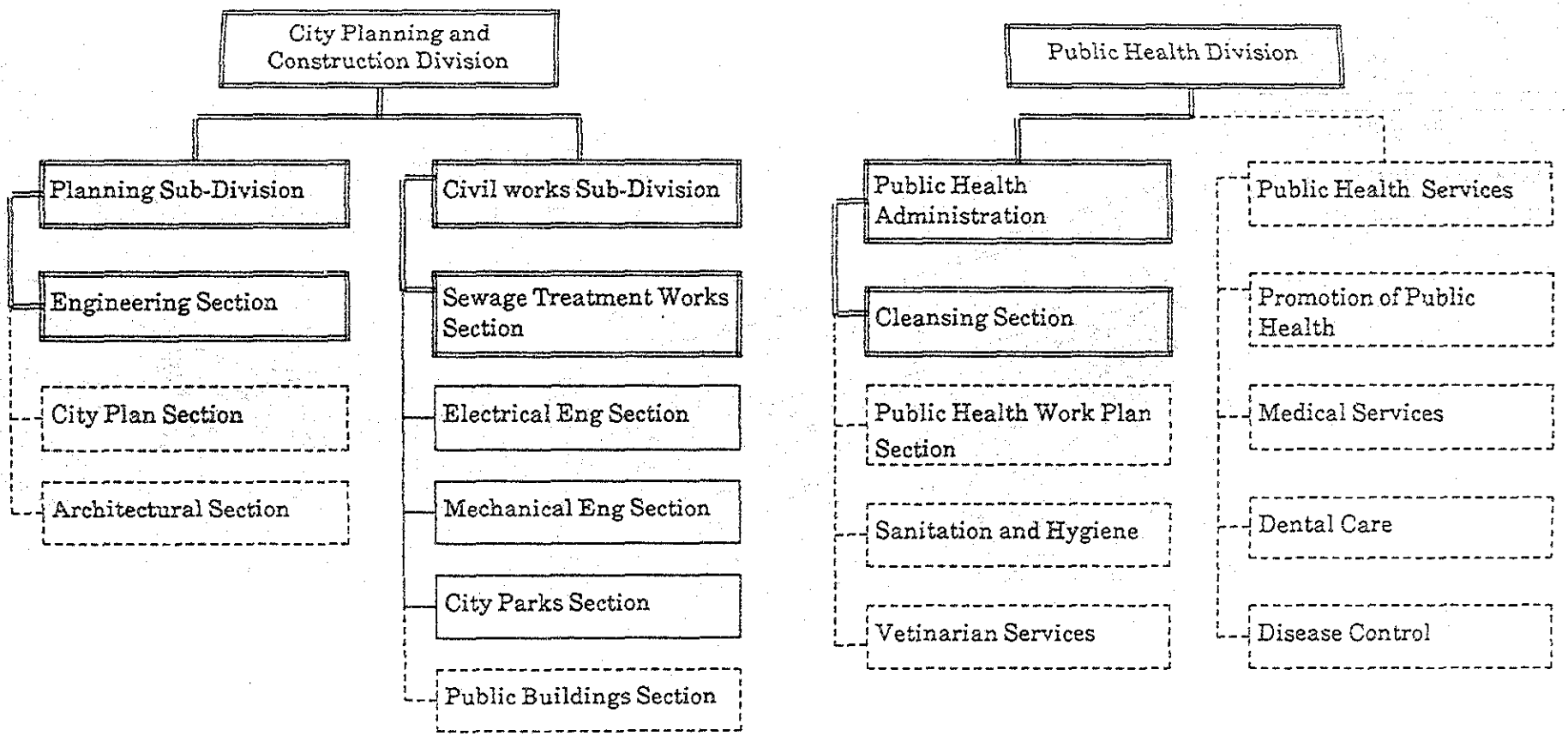
Fig. 2.5.9

SOI 17 SOUTH PHATTHAYA SEWAGE TREATMENT WORKS – SCHEMATIC – PLANNED 1989/90



Note: 1. Engineering Section - 1 Engineer Acting as sewerage planner and sewage treatment works manager

2. Sewage Treatment Works section - 1 Scientist and ten works labour

Note Cleansing Section: 3 No suction tankers and crews. Supervisory staff and labour crews for drain and sewer cleansing

Fig. 2.5.10 Phatthaya City Administrative Divisions Concerned with Wastewater Management and Control

LEGEND

Once

Several times

The area of flood damage concentration

S=1:50,000

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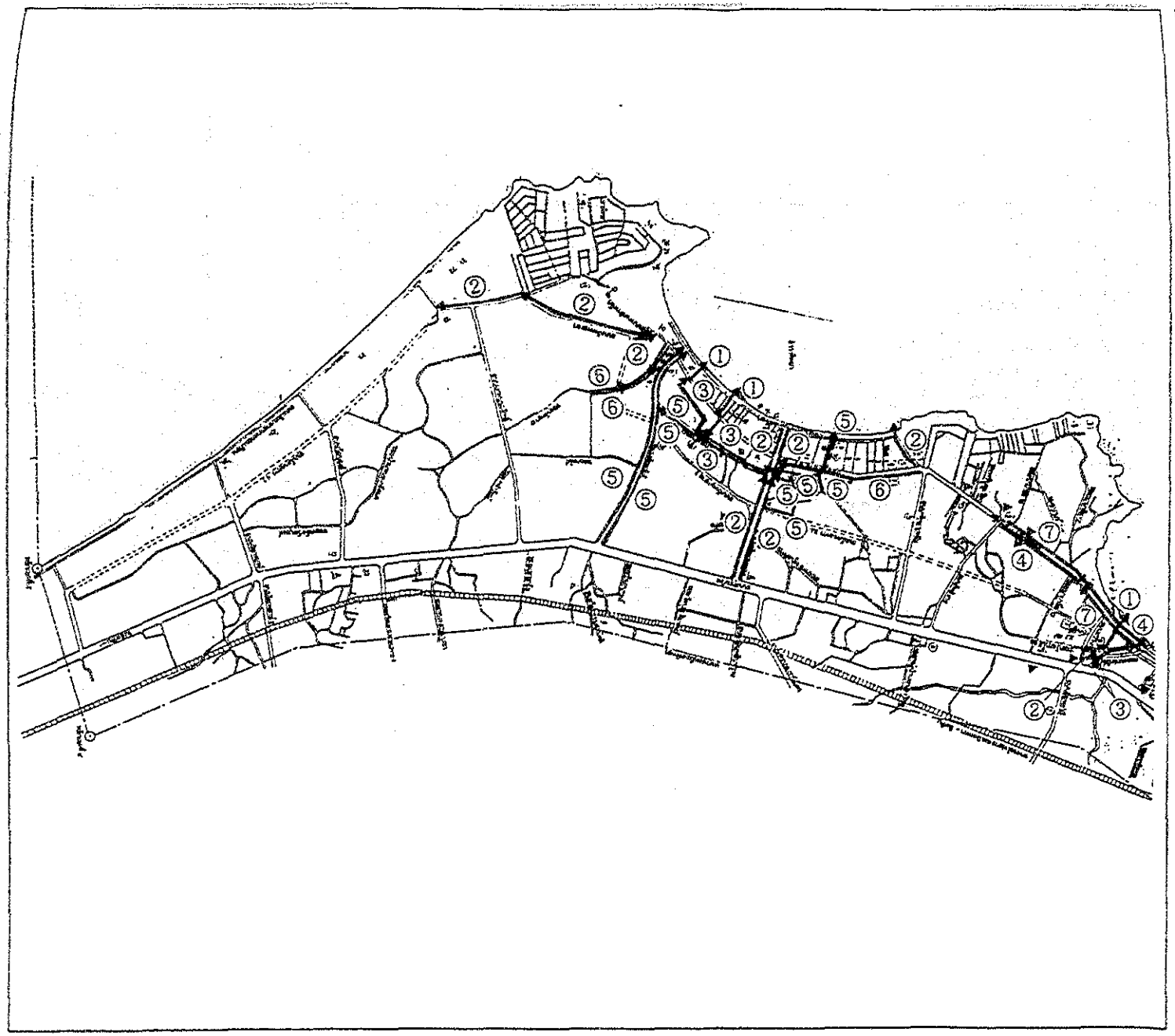
Fig. 2.5.11 Flood Prone Area



LEGEND

① Pipe ROCLA

② Open channel U1.00×1.00

③ Open channel U0.80×1.20

④ Open channel V

⑤ Pipe φ 0.80

⑥ Open channel U0.30×0.40

⑦ Open channel U0.30×0.60

S=1:50,000

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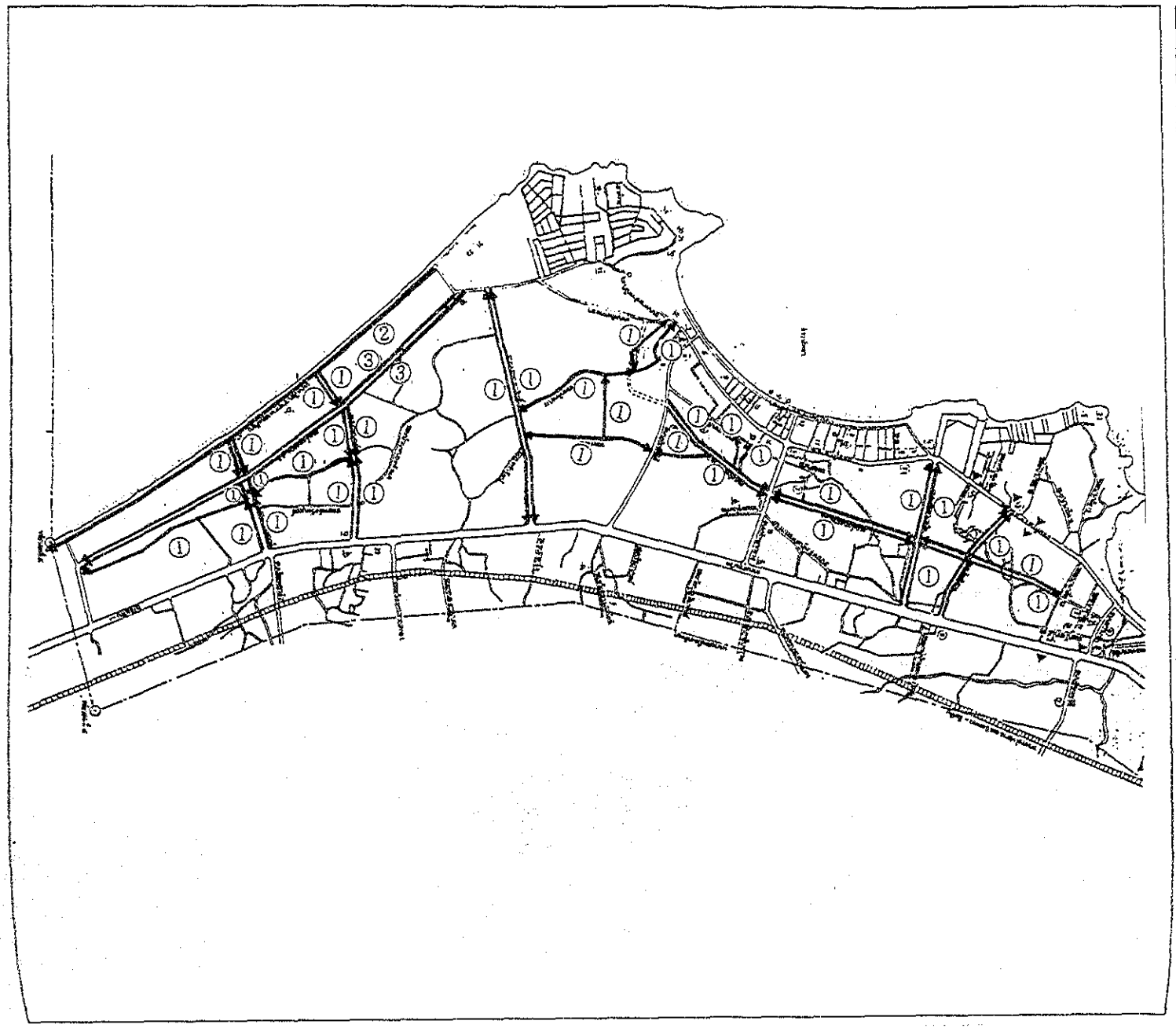
Fig. 2.5.12 Existing Drainage Facilities



LEGEND

① Pipe φ0.80

② Pipe φ0.60

③ Pipe φ1.20

S=1:50,000

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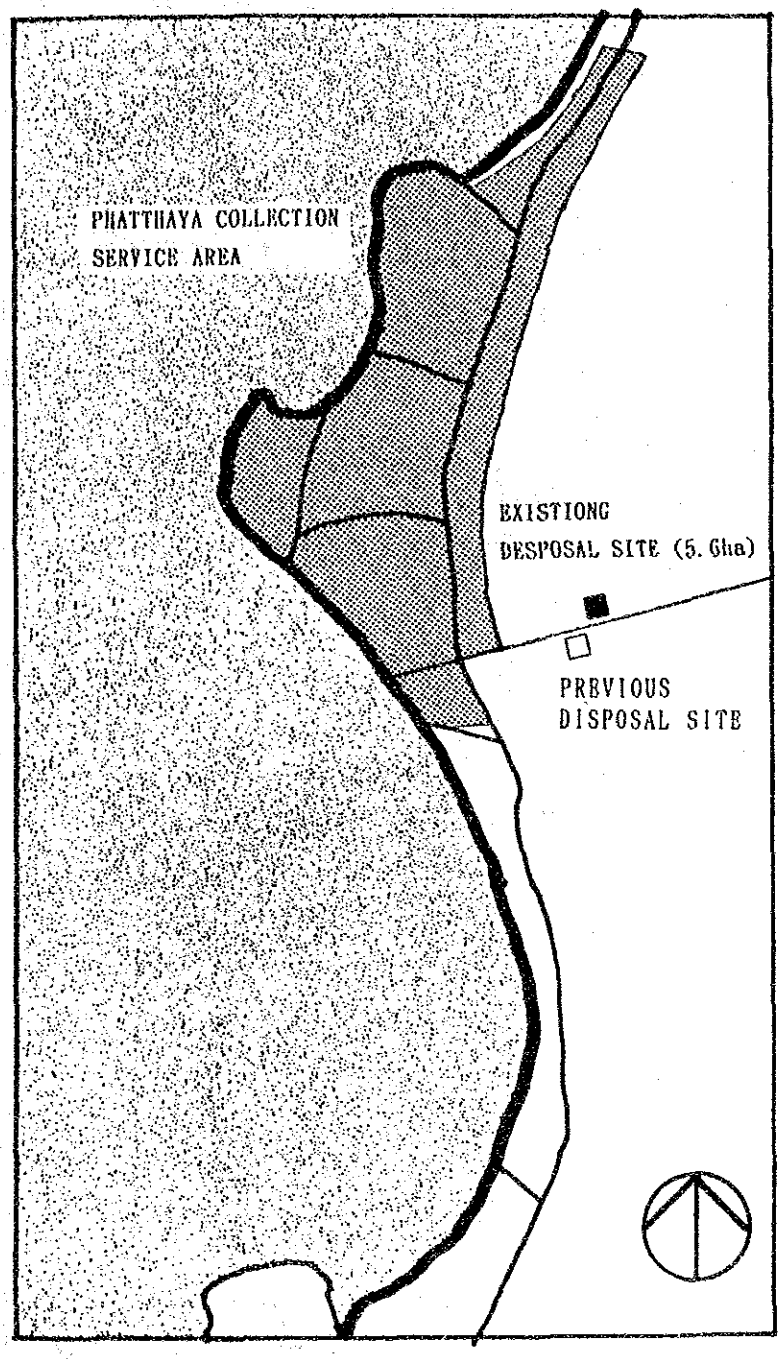
Fig. 2.5.13
Current Plan for Drainage by Phatthaya City



LEGEND

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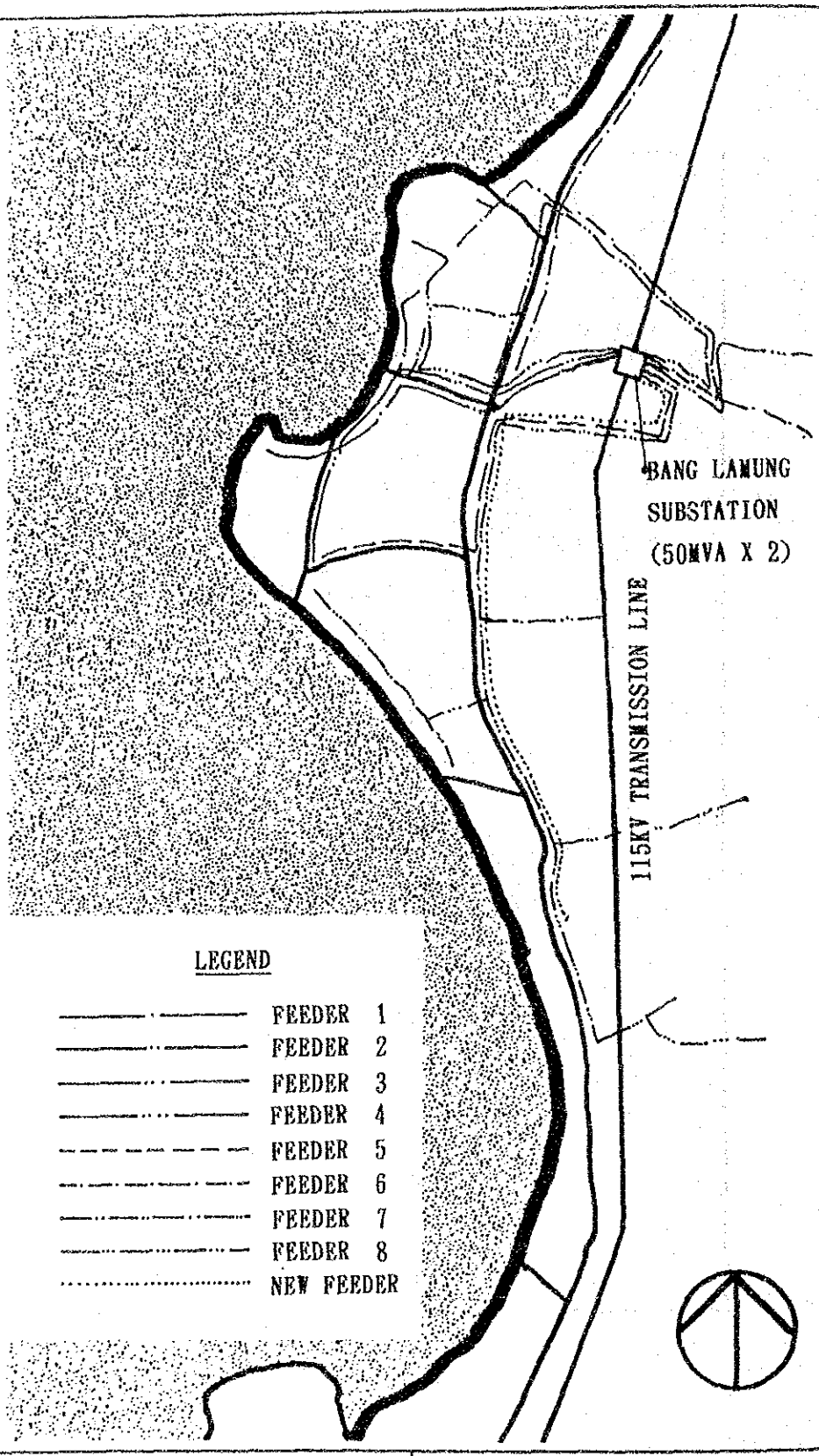
Fig. 2.5.14
Collection Area and Location of Disposal Site



LEGEND	THE MASTER PLAN STUDY FOR THE DEVELOPMENT OF PHATTHAYA AREA
	JAPAN INTERNATIONAL COOPERATION AGENCY
	Fig. 2.5.15 Existing Electricity Distribution System

2.5.3 Urban Facilities

1) General

The locations of the existing urban facilities are shown in Fig. 2.5.16.

2) Educational Facilities

Primary school education is compulsory education in Thailand

Phatthaya city is responsible for schools inside the city and the central government is responsible for those in Bang Lamung District outside Phatthaya city. In addition there are some private schools.

In Phatthaya city, there are 9 public primary schools and one in Ko Lan. The number of pupils is 6,147 and the site areas are about 19 ha. in total. There are 9 private primary schools having 4,743 pupils.

There are two governmental secondary schools having 3,713 students in the city. In Ban Sare village, there are one governmental primary school and one private.

	Primary School		Secondary School	
	No. of School	No. of Students	No. of School	No. of Students
Phatthaya City				
Public	10	6,147	2	3,713
Private	9	4,743	-	-
Bang Lamung District (Outside Phatthaya City)				
Public	43	6,016	1	231
Private	4	N.A.	N.A.	N.A.

3) Health/Medical Facilities

The following facilities are available in Phatthaya city and Bang Sare village.

		Phatthaya	Bang Sare
Hospital	Public	1 (60 beds)	-
	Private	1 (50 beds)	-
		(Two is under construction)	
Clinic		40	5
Dental clinic		11	-
Public health center		3	1

4) Park and Recreational Facilities

There are following parks in Phatthaya, however, no playground nor sports facilities for citizens are provided.

- Along the beach, a promenade is prepared.
- In South Phatthaya, there is a royal "fitness" park in the middle of the hill. It is beautifully prepared on the slope, with fitness equipments, and offering recreation space for the citizens.
- In Na Klua, a playground is along the sea near the market area. A part of this place is used for solid waste collection of the market and the park is not in good condition. It does not seem to be well utilized.
- Near air-conditioned bus terminal, a green area is in the middle of the road. This place can be converted into a pocket park or playground, if so desired.

5) Slaughterhouse

According to the Municipality Codes, animals killed outside of designated slaughterhouse can not be brought into the municipality. However, only a part of the existing meat consumption in Phatthaya is met by the existing public

slaughterhouses with its limited capacity, the rest by illegal smuggling on illegal slaughter.

The existing slaughterhouse is located just outside of the boundary of Phatthaya city near Na Klua. Some ten small sheds are clustered in an area of approximately 900 m^2. There is no wastewater treatment facility and the wastewater is discharged into a pool and pumped out to a natural stream. The groundwater is said to be polluted.

Phatthaya City has a plan to construct a new slaughterhouse, which will be layer and cleaner. It is expected to have a capacity of processing 100 pigs and 50 cattle in a day. Public Heath Department, the responsible agency, proposed to construct a new 2.5 million Baht facility on their own land at the entrance to Mab Prachan Reservoir at a site 900m east of Sukhumvit Road in 1987. However, DTCP objected to locate on the ground that the proposed site is within zone classified as "low density residential area". Public Health Department is looking for an alternative site at the moment.

6) Fresh Markets

Fresh markets are in the central and south Phatthaya and in Na Klua. The existing fresh market in Na Klua is facing the same situation as the slaughterhouse. It is too small and not clean. There is also a Sunday market in an old wooden building located in Sawangpha Road. Phatthaya City has a plan to provide a new fresh market at the site of this Sunday market by replacing the existing structure with a wide 2-storey concrete building to be opened in 1991.

7) Civic Facilities

The existing city hall is located in the center of North Phatthaya. A new city hall is under construction on the North Phatthaya road.

A fire station is located in Na Klua. It is accessible to North Jomtien area by Sukhumvit road within 10 minutes.

Police station, tourist police and marine police are located along the beach road. A public library is also on the beach road.

8) Public housing

(1) NHA Development in Phatthaya

A new town which comprises the site area 42 ha and 426 units for the first phase is being developed by NHA in the inland of Jomtien Area.

	Site Area (m^2)	Type of housing	Number of units
Phase - 1	42	Low to medium	426
Phase - 2	28	Medium to high	n.a.
Phase - 3	36	Medium to high	n.a.
Total	106	–	–

Source: NHA

The housing unit had been supplied as the following cost in phase 1, however, it has become impossible to keep this price level because of remarkable increase of land price in following phase and it is planned that the project will be changed to the high-rise condominium project.

Housing types in Phase - 1

Type	Housing Type	Site Area (m2)	Floor Area (m2)	Acquisition Cost (Bahts)	Rental Cost (Bahts/months)
A	Terrace house (1 storey)	84	25.2	111,000	1,400
B	Terrace house (1 storey)	84	25.2 +16.8	134,000	1,685
C	Terrace house (1 storey)	84	42	158,000	1,865
D	Terrace house (2 storey)	84	74	253,000	3,010
E	Semi detached	200	112	399,000	4,370
I	Row house with shop	–	189	595,000	–

(2) Slum Condition

There are nine slums in Phatthaya according to slum survey shown as follows.

Present Slum Community in Phatthaya

(Jan. 1990)

Name	Population			No. of Household	No. of Family
	Male	Female	Total		
1. Islam Community	65	78	143	11	25
2. Match Factory	27	25	52	14	16
3. Koh Phai	60	60	120	31	33
4. Wat Tham Samalee	190	187	377	78	94
5. Khlong Plub	93	97	190	31	46
6. Sowmill	72	74	146	30	35
7. Krathing Lai	169	216	335	75	88
8. Soi Nori	88	103	191	43	53
9. Khlong Naklua	183	215	398	72	87
Total	947	1,055	2,002	325	477

Source : Slum survey, Phatthaya City

Each slum has its own original characteristics and typical two types presented below.

Khlong Na Klua Slum		Soi Nori Slum	
Area :	4 Rai	1	Rai
Household :	72	43	
Family :	87	53	
Male :	183	88	
Female:	215	103	
Ave. person/household :	5.53	4.44	
Ave. person/family :	4.57	3.60	

Khlong Na Klua Slum

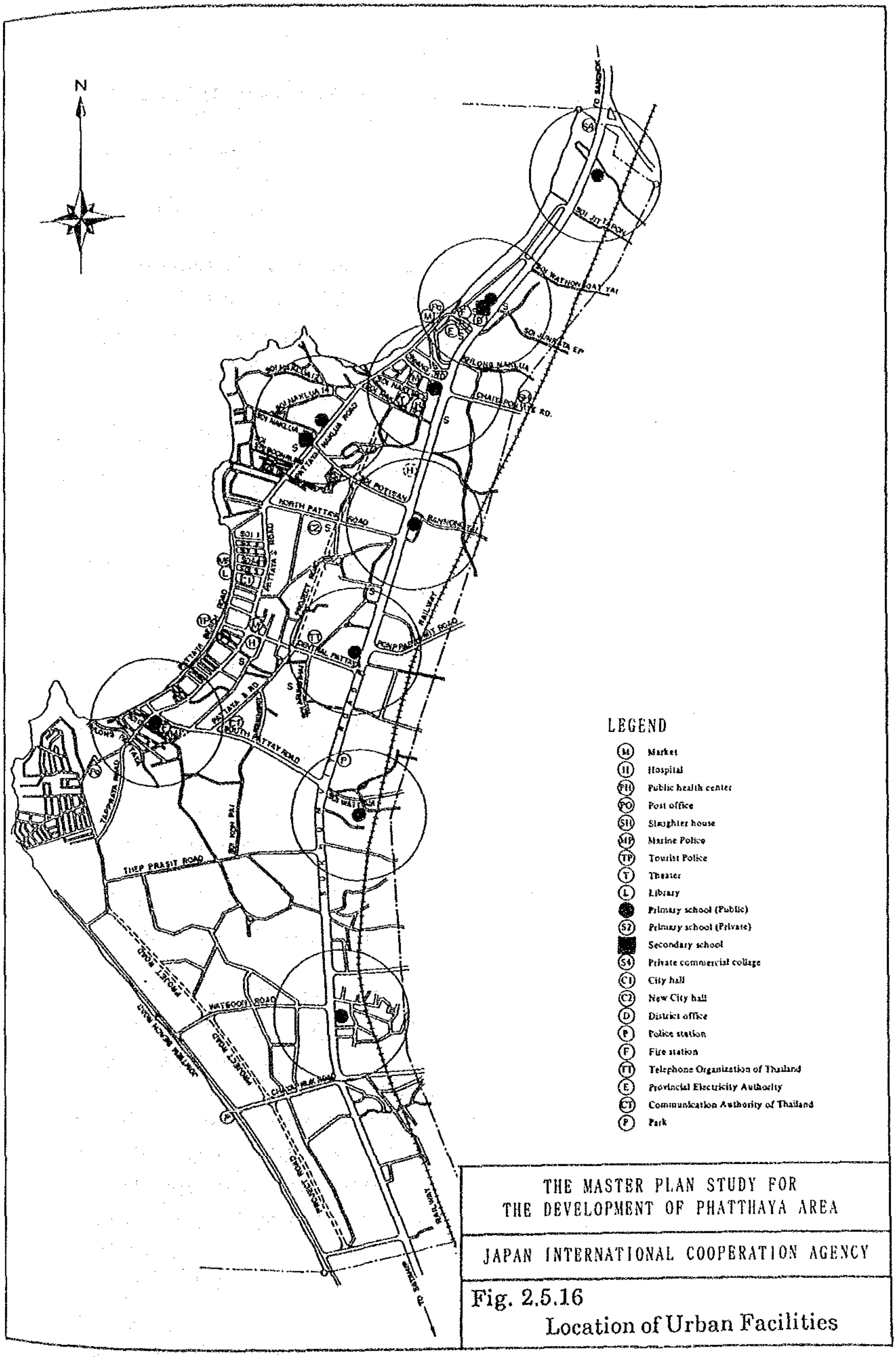
It is medium size of slum in Phatthaya. The people living here are local people has been stayed long hour ago. The original people are fisherman and the current occupation of people are as follows :

- Official	6	(1.5%)
- Marchant	72	(18.1%)
- Employee	120	(30.2%)
- Housewife	20	(5.0%)
- Student	75	(18.8%)
- No work	51	(12.8%)
- No work with supporting	35	(8.8%)
- Fisherman	13	(3.3%)
- Private (Soldier)	6	(1.5%)

Soi Nori Slum

It is small slum located beside Phatthaya - Naklua Road. Most of the people living here immigrate from other area for working. The current occupation of people are as follows :

- Official	0	
- Marchant	20	(10.5%)
- Employee	60	(31.4%)
- Housewife	14	(7.3%)
- Student	38	(19.9%)
- No work	25	(13.1%)
- No work with supporting	30	(15.7%)
- Fisherman	4	(2.1%)



THE MASTER PLAN STUDY FOR
THE DEVELOPMENT OF PHATTHAYA AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 2.5.16
Location of Urban Facilities

3. PLANNING FRAMEWORK

3.1 National Development Policies and Relayed Plans

3.1.1 National Level

1) Sixth National Five Year Plan

The principal objective of "THE SIXTH NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN, 1987-1991" (hereinafter called the Sixth Plan) is the restructure of the process of national development and the actualization of higher economic growth than during the Fifth National Economic and Social Development Plan. It is emphasized to take balanced policies towards trade deficit, fiscal problems, employment conditions, deterioration of the country's natural resources and environment and declining economic conditions of farmers.

The guidelines and methodology for development mentioned in the Sixth Plan include participation of investments by the private sector. Provision of products and services of high quality and efficiency at low cost is emphasized to attract domestic and foreign investors for increase of revenue to Thailand. The following measures are proposed to implement the Sixth Plan.

1) Formulation of clear and practicable economic and social policies and regulations.

2) Coordination among the government agencies, and government and private sector.

3) Revision of rules and regulations which hinder the development in compliance with the Sixth Plan.

4) Promotion of the private sector, development of human resources in order to make them fully participate in national economic and social development.

5) Upgrading of quality of human resources to progress the society towards peace and justice which would contribute to country's overall development while maintaining the national identity, culture and system of values and improvement of the quality of life.

As the mid-term of the Six Plan period approaching, it became clear that the overall economic performance of Thailand had exceeded the Plan targets. Problems, however, remain such as income disparity among geographical regions and between social classes, particularly the widening gap between Bangkok and the rest of the country.

2) Eastern Seaboard Development Plan

(1) Background of the Development Plan

The Eastern Seaboard Development Plan was started in 1973 with the discovery of a commercially explainable natural gas field. In December 1980, the Committee to Develop Basic Industries on the Eastern Seaboard was organized and issued a report for development titled "Study in Primary Industry Development and Deep Sea Port on the East Coast" in March 1981. The policed proposed by the study was taken into the Fifth National Development Plan and carried over to the Sixth National Development Plan.

(2) Objectives of the Development Plan

The major objectives are to:-

- Accelerate the already robust industrial growth rate of the country.
- Offer an alternative for industrial expansion out of the Bangkok area, and promote regional growth.
- Develop infrastructure to enhance international competitiveness for the Thai economy, to promote new industries and to attract foreign investment.
- Provide jobs and facilities that will encourage urban development away from Bangkok.

(3) Development Strategies

① The Royal Thai Government's (RTG) role in the development program includes:-

- The provision of the infrastructure to support the development i.e. ports, roads, railways, water and electricity supply, telephone and telecommunications etc.

- The planning of urban areas and the establishment of Industrial Estates and Export Processing Zones.
- The selection and promotion of the major industries needed to start the development. In some cases, the Government will hold equity in industrial projects.

② The Government has prepared an integrated plan of operations which provides a clear but flexible framework to the program. The implementation process can be adjusted to meet the changing conditions, emerging needs of Thai economy, or particular requirements of investors.

The already enthusiastic response from the private sector, from both Thai and international business community shows that this ambitious scheme is well adapted to the present economic trend of the country.

(4) Designated Areas

The Eastern Seaboard area consists of three Changwats (provinces), namely, Chachoengsao, Chonburi and Rayong, with a total area of about 13,215 square kilometers and a total population of about 2 million people.

Initially two main locations are promoted for industrial activities:

- Laem Chabang (Chonburi Province), 125 kms east of Bangkok is designed for light, non-polluting and labour intensive industries, adjacent to the major container deep sea port of Thailand.
- Map Ta Phut, (Rayong Province) is being developed as a major heavy industrial pole with gas related industries for the first stage, supported by an industrial port.

In addition, the City of Phatthaya is to become the center of trade and services for the region, backed by the provincial capitals of Chonburi, a thriving business center, and Rayong which is to become a base for education and technological research.

The existing Sattahip port and U Tapao airport will be part of a prime transportation network, including upgraded road and railway

connections that will bring development far beyond the target areas and stimulate economic activity in the Eastern and Northeastern regions.

(5) Outline of the Project

① Laem Chabang Area

Profile

Situated half way down the eastern gulf coast, only 125 kms southeast of Bangkok and 15 kms north of the international resort city of Phatthaya, the Laem Chabang complex will have a commercial deep-sea port, an industrial estate and export processing zone backed up by a completely new urban community and essential infrastructure. The Thai Government is actively implementing these facilities. Improvements to the already substantial communications network will provide first class infrastructure and efficient link for port cargo and industrial raw material through new highway and railway networks. The planned industries in Laem Chabang will be primarily small-scale labour-intensive and non-polluting. Connections to the hinterlands will ensure easy supply of the raw materials for agro-industrial activities.

② Map-Ta-Phut Area

Profile

Map Ta Phut, lying to the west of Rayong City, is becoming a large gas-related and heavy industrial complex. The Thai Government has planned for an industrial deep-see port to be built adjacent to an 870 ha industrial estate, presently under construction together with full supportive infrastructures and utilities. In addition, the government has taken charge of providing an urban area with housing and complete social services. Public agencies will ensure pollution control and strict enforcement of safety regulations on industrial plants.

③ Infrastructures

As described elsewhere in this chapter.

(6) Financial Sources for Development

The financing of infrastructure development was estimated at 10 billion Baht (approximately US$40 million), 70% of which coming from foreign soft-term loan and the rest from government funds.

(7) Government Organizations

The Government organizations concerned with directing the Eastern Seaboard Development Program are:

- The Eastern Seaboard Development Committee, which is chaired by the Primed Minister and has an its members ministers and other senior officials of implementing agencies.
- The office of the Eastern Seaboard Development Committee is under The Office of the National Economic and Social Development Board (NESDB) for planning the development operation as well as coordinating and monitoring the implementation programs of all concerned government agencies. It is also the Secretariat Office of the Eastern Seaboard Development Committee.
- Various Government agencies, such as Port Authority of Thailand, Industrial Estate Authority of Thailand, National Housing Authority, etc.

3) Expected Role of Phatthaya Area

The role of Phatthaya City in the existing national and regional plans are defined as follows.

The Sixth National Economic & Social Development Plan aims at, among others. to alleviate over-accumulation of population and economic activities in Bangkok Metropolitan Region, by the decenterlization of activities to Eastern Seaboard Sub-region,, to reach well-balanced development of the supra-region which includes Bangkok as well.

In order to achieve the above purpose, it allocate the following role and directions of development to the priority areas of Eastern Seaboard Sub-region.

Phatthaya : A business, commercial and tourism center

Chonburi : A center of business and governmental administration; growth center of the Eastern Region

Rayong	:	A service center and a base for education & technological research
Map Ta Phut	:	A major heavy industrial estate adjacent to the deep sea port. The base of heavy industries using natural gas as a raw material
Laem Chabang	:	An industrial estate for export and non-pollution industries Small & Medium scale export-oriented industries The principal commercial port of primary gateway for containerized cargo.

The Eastern Seaboard Development Program cites the following roles of each of the areas.

Phatthaya	:	The center of trade, tourism, service industries and event for the region, backed by the provisional capital of Chonburi. International resort city
Chonburi	:	A business and administration centre of the province.
Rayong	:	A base for education and technological research Administration centre of the province
Map Ta Phut	:	A large gas-related and heavy industrial complex, supported by an industrial deep sea port
Laem Chabang	:	Light, non-pollution export-oriented and labour intensive industries, adjacent to the commercial deep-sea port.

3.1.2 Local Level

The DTCP prepared a Land use plan for Phatthaya with a target year of 2007 (called General Plan). After several public leasing it was approved by the Cabinet and took effort as a law in 1988. The City Hall was them empowered with legal authority to implement the General Plan although actually practicable means available to the City Hall in limited to the insurance of building permits. General Plan is required to be reviewed every five years in compliance with the Town Planning Art. The City of Phatthaya prepared a

Phatthaya City Five Year Development Plan following the General Plan in more specific terms.

1) Phatthaya City General Plan

This General Plan contains the policy and measures for organizing and regulating efficient land use capable of absorbing and meeting the community growth in the future and promoting and developing economy and social service system in essence as follows:

1) To designate the desirable land use to promote urbanization and preserve the natural environment quality.
2) To designate the allocation of the urban road network.
3) To develop social services, public utility and facility system in adequate proportion and in acceptable standard; and

The General Plan specifies a network of greatly improved roads within the area and a number of specific projects to be implemented.

2) Phatthaya City Five-Year Development Plan

More concrete guidelines of the Phatthaya development are described in this plan. And the main contents about them can be summarized as follows:

Purpose for Long-Term Development of Phatthaya City	Proposals for Development Guideline
Physical and environmental category	Physical and environmental category
1. It is a city with an orderly growth in accordance with the Phatthaya General Plan with a good and suitable environment.	1. Improve the various conveniences in public utility-facility consisting of sewerage water disposal system, irrigation system, road-pedestrian system, bridges, jetty landings, electrical and water supply system including garbage disposal system to correspond with and suitable to the international tour city.
2. It is the city with a perfect regional linkage on communication land telecommunications.	2. Control the land use and development of the city in accordance with the Ministerial Regulations enforcing the General Plan of Phatthaya.
	3. Construct and improve the environment within the city area to become a suitable tour source corresponding with the natural condition.
	4. To improve the communication and telecommunications system within the city and the nearby vicinities to be more convenient and more throughout including the improvement and extension of the network to link between the Regions

Purpose for Long-Term Development of Phatthaya City	Proposals for Development Guideline
Economy and tourism development category	Economy and tourism development category
1. It will become an international standard tour source and a seaside resort.	1. To promote, support and attract both Thai and foreign tourists to visit the place and to increase the days of accommodation.
2. It will be the centre of business and service and a standardrized residential area to cope with the development of the Eastern Seaboard.	2. Provide facilities in giving service both by land and sea, to the tourist.
3. It will be the Regional Center for goods and handicrafts.	3. Control the use of sea surface along the beaches in an orderly manner by considering from its capability and nature both on land and in the sea
	4. Develop Koh Lan to remain a tour source
	5. Give facilities and safetiness in life and property to the tourists.
	6. Improve the public relations system and data/information system to the tourists.
	7. Control and take care in giving the justified service to the tourists.
	8. Arrange for a tax free shop.
	9. Construct and improve standardized housing project to be proportionate with the growth from development of the Eastern Seaboard Area.
	10. Promote the private sector to invest in the activities which will support the roles of Phatthaya City.
	11. Promote the production/marketing and the export of handicraft goods.
Social development category	Social development category
1. It will be the city where the people have a good way of life with good conscience and responsibility towards the society.	1. Develop and promote so that the people would be conscious of his/her duties as a good citizen with orderliness.
2. It will be the city with a throughout public health service.	2. Promote, revive the cultural arts and the Thai custom.
3. It will be the centre for vocational education which would support tourism.	3. Improve and increase public health service so that the service would be throughout.
	4. Publicize the knowledge on health to the people including the promotion.
	5. Educate the people to understand about their health.
	6. Arrange and promote vocational education to the students and the general people.

Purpose for Long-Term Development of Phatthaya City	Proposals for Development Guideline
Political development and administration 1. It will be the city capable of giving an efficient service to the tourists suitable with the growth of the city. 2. It will be the city which has been promoted and developed on incomes including the Municipal business so that the income would be sufficient to develop the local area and become self-dependent.	Political development and administration 1. Promote, improve and develop the structure of administrative system, manpower, equipment to respond to the adeministration and the society in an efficient manner. 2. Promote and support the increasing roles of population to understand and participate in the democratic administration 3. Implant and promote the attitude of the people in giving co-operation in the development of Phatthaya City. 4. Improve the relevant rules in the Law to correspond with the power and duty of population. 5. The prevention and increasing safety measures in life and propertyof the people. 6. Support in having the law to arrange the orderliness relevant to tour industry. 7. Promote the income from Municipal business and improve the Acts and Law relevant to taxation and fees. 8. Arrange to construct and improve the business which are the sources of income of Phatthaya City by emphasizing on a joint venture with the private sector.

3.2 Status of Previous Plans

3.2.1 Previous JICA Study

1) Status of Projects and Measures Proposed

Among the projects and measures proposed by the previous JICA Study, some were materialized but many still remain to be implemented. Most of the causes, however, are rather external including the change of economic and social environment and policy with regard to the Phatthaya area than internal defects and unsuitableness of the proposals.

(1) Implemented Projects and Measures

A. Physical Projects

① Tourism Projects

The following were materialized by the private sector, though locations are different from the previous proposals:

The following were materialized by the private sector, though locations are different from the previous proposals:

- Two elephant villages (1979 and 1987)
- Nong Nooch village (1980); Orchid garden, Elephant show
- Open zoo in Khao Kheow (governmental) in 1984
- Siam country club (golf)
- Reo Range (horse riding) in 1979
- Camping park (Panarak park) in 1979
- Kart speedway in 1988
- Fishing park in 1987
- Marine museum in Bang Sare (governmental 1984)
- Mini Siam (1989)

- Hill tribe village (suspending of business)

② Transport Projects

- Beach Promenade (public)
- Upgrading of Sukhumvit highway to a 4 lane road (public)
- Terminal facilities for public bus (public)
- Utilization of railroad as a tourists transportation (operating for pack-tour at weekend) (public)
- Utilization of U-tapao military airport for civil aviation (operating for charter flights from Hong Kong, Singapore, etc.) (public)
- Airline offices (undertaken by travel agents) (private)
- Roads in Ko Lan; Paved road between Ban Ko Lan and Ta-Van beach was constructed in 1986 by Phatthaya City/Government following to F/S.
- Traffic control system; One way system was introduced in 1985.

③ Infrastructure Projects

- Sewege treatment for Phatthaya City (partially implemental) (public)

④ Education Project

- Hotel training school in Ban-Saen (public)

⑤ Sea Surface Use Demarcation

- Swimming areas in front of Royal Cliff Hotel and Phatthaya Palace Hotel are designated by bouy all year round. In peak season, 7 zones in Phatthaya beach, 3 zones in Jomtien beach and 2 zones in Ta-Van beach of Ko Lan are set by Phatthaya City Government.

B. Institutional and Legal Measures

- Reorganization of TOT to TAT (public)
- Establishment of tourist police station (public)
- Establishment of tourist information office (public)

- Restriction of street venders on road and beach (public)
- Zoning of sea area for various activities (public)

(2) Unimplemented Projects and Measures

A. Physical Projects

① Tourism Projects

- Botanical garden (public)
- Nature Park (public)
- Tourism orchard (public/private)
- Multi-purpose hall (public)
- Handicraft center and museum (public)
- Aquarium and marine museum (public)
- Beach facilities (Locker, shower, toilet etc.) (public/private)

② Urban Facilities Projects

- Urban park (public)
- Urban plaza (public)
- Service park and satellite park with snack bar, public toilet etc., along beach road were proposed.

③ Amenity Core

- Northern Amenity Core: 7.4 ha. land for activity center, boat mooring facility, commercial facility etc.
- Main Amenity Core: 25.5 ha. land for a symbol zone, action center together with main pier.

④ Environmental projects

- Maintenance and improvement of the quality of the marine environment: Clearing of beach areas, improving water quality.
  (The quality has deteriorated further, because of greatly increased numbers of tourists and residents in Phatthaya, and lack of proper control)

⑤ Transport Projects

- Bus terminal for public buses and tour buses (a public terminal was implemented) (public)
- Public parking facilities (public)
- Bicycle lane and parking (public)
- Restriction of vehicle traffic on beach road (public)
- Introduction of low speed transportation system (public)
- Main pier in Phatthaya beach: four jetties and service facility with land reclamation of 25,000 m^2
- Construction of port/marina facilities at Phatthaya beach, north and south
- Piers at Ko Lan, Ta-Van and Tien beach
  (Piers at Ko Lan island was constructed, but with insufficient length. None at Ta-Van and Tien beach)
- Widening of second beach road (4 lanes): Southern half of second beach road still remains as 2 lane road
- Introduction of orderly use of sea areas, by designating zones for boat mooring and use as swimming zones etc.
  (Rules have been introduced but a serious problem still remains, because of increased numbers and difficulty in enforcing the rules)
- Facilities for liner services Phatthaya-Bangkok, Songkhla-Hua Hin etc., and for cruise liners.

⑥ Sewerage Project

- Sewege treatment facilities for Na Klua and Jomtien areas (public)

⑦ Drainage Projects

- Improvement of drainage for the Southern Na Klua area
- Improvement of drainage for the Central Phatthaya area
- Open ditch for drainage (public)
- Artificial lake for flood control (used as the public park) (public)

⑧ Solid Waste Management Projects

- Procurement and use of compactor trucks with loading equipment for 0.2 m^3 drum and 1 m^3 container
- Sanitary landfilling of combination of trench method and area method

B. Institutional and Legal Measures

- Enforcement of legal system for control of urban development such as (public):
  * Designation of development zone and preservation zone
  * Control for land use by detailed classification
  * Special control measures (landscape, townscape, colors, style, signboards, fence etc.)
- Zoning of beach area (public)
- Establishment of State Tourism Corporation (public)

(3) Causes of Non-implementation

There existed and still are existing various causes of non-implementaion of the projects proposed by the previous JICA Study (1978).

A. Common Causes

a Because of the local administrative status of Phatthaya, which was not yet a municipality but only a sanitary district, the central government did not pay enough attention to the financial and institutional supports for the implementation of the proposed projects.

b Until 1982, tourism was not yet considered as a major foreign currency earning industry compared with other industry such as rice export in Thailand. Number of tourists visited Phatthaya was only 400,000 in 1976 whereas it was 1,400,000 in 1987. Major allocation of the budget for public investment to Phatthaya area in the past was not made for tourism but sugar cane agriculture.

c Previous Study was mainly oriented to tourism development and the priority of proposed projects were placed accordingly.

d Plans proposed by the Previous JICA Study were not duly integrated into the authorized National and Regional Plans.

e In general, improvement projects were be implemented for short-term purposes as emergency measures rather than in line with a long-term plan such as the previous JICA Study.

f Rise of land price and change of land use by rapid urbanization prevented the acquisition of land for public use and infrastructure development.

g Demarcation of responsibilities among authorities concerned was not clearly identified for the previous proposals.

h Sectionalism among authorities was the one of major constraints against the coordination required in the interministrial projects.

i Lack of capable staff for the planning work in the local administration body.

j Weak financial basis of Phatthaya City Government and inadequate understanding by the Central Government for the urgency of the proposed projects.

k Lack of social consciousness of the people for the implementation of the projects.

l Political considerations sometimes overrode technical and socio-economic requirements.

B. Specific Causes

A list of "present situation", "causes of unimplementation" about the proposed projects is tabulated in Table 3.2.1~5.

3.2.2 DTCP General Plan

Various projects were proposed in the General Plan. Some were implemented and others were not.

1) Implemented Projects

- Health park in commemoration of His Majesty the King 60th Anniversary
- King Taksin Monument Project
- Mini Siam Phatthaya

2) Unimplemented Project

- Construction of modern and hygienic slaughter house
- Muan Phatthaya housing Project
- Road network improvement
- Muan Phatthaya City Hall
- Landing Pier for small vessels

3) Causes of Non-implementation

- Expensive land price and construction cost made the necessary investment far beyond the budget appropriated.
- Difficulty in purchasing necessary land, removing and compensating the buildings existed along both sides of the road.
- Poor supervision system toward land use, and loose regulation against illegal action.

Table 3.2.1 PRESENT SITUATION OF PROPOSED PROJECTS AND CAUSES OF UNIMPLEMENTATION (1/5)

Proposed Projects	Present Situation	Causes of Unimplementation
• Drainage Projects		
[1] Improvement project for the Southern Na Klua Area (Main Open Channel, Box Culvert, Branch Open Channel)	No improvement was done.	There were no land for construction due to rapid development ofhouses and roads.
[2] Improvement project for the Central Phatthaya Area (Main Open Channel, Box Culvert, Spillway, Branch Open Channel, Land Grading of Regulating Pond)	Proposed project was not done. However box culvert under the South Phatthaya Road has constructed instead of proposed project.	There were no land for construction of drainage facilities. The sites of proposed facilities had been developed for houses, shops and restaurants already.
[3] Emergency project near Wat Chaimonkon Area (Pipe Culvert, Main Open Channel)	Proposed project was not done. However box culver had been constructed instead of proposed project.	Same reasons mentioned above.
• Solid Waste Projects		
[4] Collection; Compactor trucks with loading equipment for 0.2 m^3 drum and 1 m^3 container were proposed.	No compactor trucks were procured.	— Maintenance and rapair for hydraulic system was difficult. — Compaction is not suitable for bulky waste such as tree branches. — The cost for hydraulic system is expensive
[5] Final disposal; Sanitarylandfilling in combination of trench method and area method was proposed.	Open drumping has been conducted.	— Management and control has been weak. — The budget has been limited. — Personnel have been insufficient, and not trained.

Table 3.2.2 PRESENT SITUATION OF PROPOSED PROJECTS AND CAUSES OF UNIMPLEMENTATION (2/5)

• Tourism Facility Projects		
[6] Main pier — Four Jetties and service facility with land reclamation of 25,000 M2.	Three old wooden pier remains in South Pattaya (Seven existed in 1978 according to F/S Report). One is still utilized for excursion boats (Pier owner charges boat owners)	Although budget of 5 million Bahts was announced to Pattaya City from TAT after F/S completion, no action was followed.
[7] Pier in Ko Lan (Three piers for excursion boats)	No pier was realized and direct seashore landing system still remains	----------
[8] Roads in Ko Lan	Paved road between Ban Ko Lan and Ta-Waen beach was constructed in 1986 by Pattaya City Government following F/S.	----------
[9] Northern Amenity Core — 7.4 ha. land for activity centre, boat mouring facility, commercial facility etc.	Grand Palace Hotel was constructed in 1982 after F/S, and was changed to be the present Dusit Resort Hotel in October 1987.	— JICA Team proposed amenity core based on the situation that a small hotel and ample vacant field at the time of F/S. — No budget nor action were set after F/S.
[10] Main Amenity Core — 25.5 ha. land for a symbol zone, action centre together with above Main Pier.	— Small hotels, restaurants, shops, bars, school and temple are presently mixed in this area. — Amenity square with night open theater was built in small scale recently (3~4 years ago).	— It was unreasonable proposal to remove existing school and temple because precedure is complicities. — Readjustment of built up area needs manpower and long time.
[11] Roads — Second Beach road ··· 4 lane — North Pattaya road ··· 4 lane — Central Pattaya road ··· 2 lane — South Pattaya road ··· 2 lane	Although North Pattaya road was constructed as 4 lanes road, and Central Pattaya road and South Pattaya Road were both improved, south half of second beach road still remains as 2 lane road.	Delay of second beach road improvement is due to neatly of existing real estate which have been scattering along 2 lane existing road.

Table 3.2.3 PRESENT SITUATION OF PROPOSED PROJECTS AND CAUSES OF UNIMPLEMENTATION (3/5)

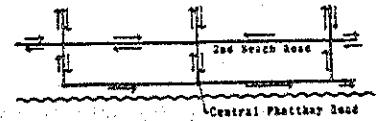
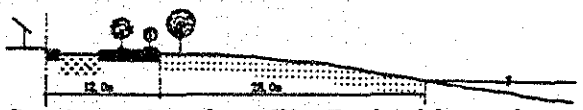
[12]	Traffic control system	One way system was introduced in 1985 	
[13]	Beach road improvement		
a)		a) Existing section of beach road 	
b)	Service park and satellite Park with snack bar, public toilet, etc. along beach road were proposed.	b) Service park, satellite park are not yet built.	City Council did not allow to construct commercial facility in Beach
c)	Road side parking area system	c) Road side parking area was introduced in 1985. There is no public parking lot except road parking . Soi Road is utilized as parking in peak season.	
[14]	New Town — Na Kulua New Town A — Na Kulua New Town B — Northern New Town — Southern New Town (Master plan only)	— Private new towns are scattering which have been built by Private Sector — Low cost houses by NHA in South Pattaya behind Jomtien along Thep prasit road is under construction.	
[15]	Inland amusement — Sports facility — Orchid garden — Zoo — Elephant garden — Parks	Followings have been introduced by private sector, though locations were different from the JICA plan. — Two elephant parks (10 years and 2 years ago) — Nong Nooch Village (1980) — Open Zoo in Khao Kheow (governmental) in 1984 — Siam Country Club (Golf) — Reo Range (Horse riding) in 1979 — Camping park (Panarak park) in 1979 — Kart Speedway in 1988 — Fishing park in 1987 — Marine Museum in Bang Sare (governmental, 1984) — Mini Siam (1989) — Hill Tribe Village (Suspend of busInEss)	

Table 3.2.4 PRESENT SITUATION OF PROPOSED PROJECTS AND CAUSES OF UNIMPLEMENTATION (4/5)

[16]	Hotel Six sites (A~F) were recommended as hotel site to meet the 700 room requirement.	Best site A & B are still vacant. C. . shop house, D. . condominium, E. . small hotel, F. . Royal Palace Hotel.	A, B . . . Due to land owner's decision
[17]	Sea surface use demarcation	A swimming area in front of Pattaya Palace Hotel is designated by bouy in off season. In peak season, 7 zones in Pattaya beach, 3 zones in Jomtien beach and 2 zones in Ko Lan Ta-Waen beach are set by Pattaya City Hall.	
• Port Facility Projects			
[18]	Maintenance and improvement of the quality of the marine environment – clearing of beach areas, improving water quality	The quality has deteriorated further because of greatly increased numbers of tourists and people at Phatthaya, and lack of proper controls.	
[19]	Introduction of discipline and order in the use of sea areas, by designating zones for boat mooring and use, swimming zones etc.	Rules have been introduced but a serious problem of inadequate enforcement still remains	
[20]	Construction of port/marina facilities at Phatthaya Beach, North and South	Not yet constructed	
[21]	Sheltered lagoon/marina at Jomtien Beach	Not yet constructed, but a new marina with breakwater provision was constructed (1988) further south by a private developer	
[22]	Port facilities at Na Klua	A fishing pier has been constructed. However, it is of insufficient length to provide access for fishing boats at all states of the tide.	
[23]	Piers at Ko Lan: Ban Ko Lan, Ta-Van & Tien Beach	Pier at Ban Ko Lan constructed, but of insufficient length. None at Ta-Van & Tien beaches	

Table 3.2.5 PRESENT SITUATION OF PROPOSED PROJECTS AND CAUSES OF UNIMPLEMENTATION (5/5)

[24]	Beach side locker rooms, showers and other facilities at Jomtien Phatthaya & Ko Lan.	Limited facilities have been installed.
[25]	Limiting of number of excursion boats by licencing and introduction of regular scheduled services between Phatthaya and the islands	Number of boats appears to have increased, and there are many competing services but apparently not at regular scheduled service
[26]	Demolition of existing piers, seaside restaurants and shops in South Phatthaya	These unauthorized developments have spread, and demolition does not now appear to be a practical proposition. Alternative solution has to be found.
[27]	Facilities for liner services Phatthaya-Bangkok, Songkhla-Hua Hin etc, and for cruise liners	None provided as yet

3.3 Development Potential

3.3.1 Advantages and Constraints

Advantages

Phatthaya is endowed with a number of advantages for development. The advantages Phatthaya posesses have been working in favor of Phatthaya in the last decade, resulting in its rapid growth. The following are the major advantages of Phatthaya.

1) Good Access both to both Domestic and International Tourism Markets

Phatthaya is located about 150 km from Bangkok to the south. On land Phatthaya is connected with Bangkok by four-lane national highway Route 3. There is frequent passenger bus service between Phatthaya and Bangkok along Route 3 at reasonable price.

The questionnaire survey by the Study Team revealed that nearly two out of three Thai tourists cited "short distance from Bangkok" as an major advantage of Phatthaya. Even among foreign tourists one third cited this factor.

Phatthaya has good access for foreign tourists via Dong Muang International Airport in Bangkok. U-Tapao airport, located about 35 km from Phatthaya, basically serving as a military airfield, is increasingly used for civil chartered flights. Tourists visiting Phatthaya through U-Tapao airport, though still low in number (Tourists arriving at U-Tapao airport numbered 10,870 aboard 98 flights in 1987) are able to reach Phatthaya by bus within 30 minutes.

2) Rich Tourism Resources

Phatthaya's attractiveness is characterized by a variety of tourism resources: from natural beauty to urban amenity. As natural beauty, Phatthaya has nice beaches in Ko Lan, about 10 km offshore, and Jomtien Beach and Tha Farang Beach extending from south of Phatthaya Hill down to Bang Sare as well as Phatthaya beach though this beach has been degraded these years.

A variety of urban amenities also attract tourists to Phatthaya. Opportunities for shopping, dining and sightseeing are all at hand for tourists.

What distinguishes Phatthaya from other beach resorts is that all these different types of attractions are available. Phatthaya is able to meet various types of requirements from tourists. The questionnaire survey revealed that nearly 70% of tourists interviewed answered that what they liked most about Phatthaya was beach followed by recreational facilities (47%) and night entertainment (42%).

3) Well-Established Accommodation Facilities and Service Industry

Phatthaya provides a variety of accommodation facilities from luxurious five-star hotels to economical bungalows and is able to meet various needs of tourists. Tourists have wide choice for accommodation depending on their income level and preference, from hotel-type modern accommodations to bungalow-type more relaxed accommodation.

In terms of quantity, the number of rooms in Phatthaya amounted to 11,262 in 1987. This number was next to that of Bangkok (24,124) and larger than those of other major touristic places in Thailand such as Chiang Mai (7,182) and Phuket (6,551). With present capacity (14,827 rooms in 1989), Phatthaya is able to accommodate more than 2.2 million tourists a year, assuming no seasonal fluctuation.

Well-established service industries such as restaurants, bars and other entertainmeent establishments and souvenior shops are also an essential factor attracting tourists to Phatthaya.

4) Existing Accumulation of Urban Facilities

Phatthaya is not just a marine resort but a well urbanized area with municipality status. Urban and infrastructure facilities including electricity and telecommunication are already in place for supporting economic activities in ESB region. Integrated functions of various facilities will be a strong point of Phatthaya to play the role as a regional centre.

5) Availability of Hinterland Area

Phatthaya has a spacious hinterland suitable for development, although development in the hinterland so far has been limited to some touristic attractions only.

Availability of hinterland is an important factor enhancing Phatthaya's growth potential in terms of tourism development and Eastern Seaboard-related development. Especially availability of inland area ensures the opportunity for Phatthaya to grow into a regional business and commercial center serving Eastern Seaboard.

6) Good Location in Eastern Seaboard

Phatthaya is located in a good position to serve as the regional business and commercial center in Eastern Seaboard region. Laem Chabang is at about 20 km or 10~15 minutes car ride from Phatthaya along Route 3. Phatthaya is connected to Map Ta Phut, about 50 km to southeast, by Route 36 and it is about 30 minutes by car. Easy access to these major development centers of Eastern Seaboard is also a major advantage of Phatthaya.

Constraints

1) Limited Water Resources

Water resources for the Phatthaya area is not abundant. Though potable water is supplied from Map Prachan reservoir (annual water supply volume of 9.6 MCM) currently, water supply falls short of demand. Defecit is met by purchasing water from private water venders. To solve the water shortage problem, development of four additional reservoirs is planned in the Phatthaya area. The total water supply capacity of the five reservoirs including existing Map Prachan reservoir is planned to be 25.5×10^6 m^3 per year. In the event that the Phatthaya area is likely to grow beyond this water limit, additional water should be conveyed from other river basin (e.g., Nong Kho reservoir). During the first survey in Thailand, the Study Team was informed that the government policy is to use water of Nong Kho reservoir exclusively for Laem Chabang, where industrial estate for light industries and commercial port are now under construction, and diversion of water to Phatthaya will not be allowed in the medium term. In this sense, water available for the Phatthaya area will be limited to that from five reservoirs in the Phatthaya area in the medium term, most likely until 1995

or 1996. In the long-run, water resources of Nong Kho reservoir is planned to be augmented by the diversion of water from Nong Pla Lai reservoir in the Rayong River Basin, for which the construction of water source facilities is scheduled to start soon. The water pipeline project connecting Nong Pla Lai reservoir and Nong Kho reservoir is scheduled to be completed by 1994 at earliest. Once these projects are completed, Phatthaya will be able to receive certain portion of water diverted from Nong Pla Lai reservoir to Nong Kho reservoir. In this case, the amount of water possible to be conveyed to Phatthaya will be determined based on the balance of water supply capacity of Nong Kho reservoir and water demand in Laem Chabang and Phatthaya in the future. In the long-run until 2006, therefore, constraint on the development of Phatthaya will be set depending on the amount of water that could be supplied from Nong Kho reservoir.

2) Environmental Constraints

Deterioration of environment in Phatthaya is in a critical situation. The cause of deterioration is the inadequate infrastructure development that can not support the rapid urbanization by private investments. This is the structure of pollution problem generated by the poor financial background of the municipality.

- Sea water contamination is the most notable pollution pointed by 34% of visitors. The major cause is overload of the treatment plant and insufficient collection system. The expansion of the treatment plant is being undertaken by PWD, but much more work is needed.

- Congestion of the vehicle is caused of insufficient road system. Major road network is designated by the General Plan. But the poor financial background has made the implementation of the road development very slow against the rapid increase of the vehicles.

- Rapid urbanization by private investments is the main reason to damage the pleasant natural environment. Insufficient urban development control regulation have tailed to lead private activities to the conservation and creation of favorable and pleasant urban environment.

- Lack of effective control, public consciousness and poor maintenance are the reasons of the noise pollution. Except mechanical reasons, the noise pollution should be abated by public consciousness.

3) Legal, Institutional and Financial Constraints

(1) Institutional

i) Vague demarcation of duties and powers between PCG and the Central Government

Though APCA stipulates the duties of PCG, they are not so clearly defined and the power for supporting the activities are not clear, either with regard to the development and maintenance of public service facilities and to maintaining the order in particular. Combined with the deficiency of financial strength of PCG, major portion of the duties are, in reality, being carried out by the Central Government and state authorities.

ii) Inadequate coordination between PCG and the regional offices of the Central Government

Phatthaya has been developing very fast during the last decade and her growth is expected to continue. The development of infrastructure and utilities could not catch up with the development and environmental conditions has been degraded. In order to reflect the needs of the local society and to solve the current urban problems and improve the situation, the cooperation among the Central Government departments, State authorities including their regional offices in Phatthaya and PCG is essential, particularly for infrastructure development and maintenance of public order and safety.

Under the present administrative framework, however, the Central organizations are independent form PCG, Phatthaya City Manager having no authority over them. Better ordination is much desired.

iii) Inadequate manpower of PCG

As stated in Section 2.3.2. number of PCG staff is determined based on the size of the registered population. It comprised 410 civil servants including teachers and staff of primary schools, 238 permanent employees and 360 temporary employees in 1989. The staff strength may be adequate for a municipality with about 50,000 population but deemed inadequate for a internationally well-known

tourist city with 100,000 residents and more than 1.4 million visitors (1987) annually.

iv) Inadequate personnel authority of PCG

The City Manager, chief executive of PCG, has no authority over amount of work force, appointments, transfer and promotion of the City Staff. To place the positions of level 5 and over including City Manager and his Deputies and Chief Accountant, approval of the Municipal Officials Commission must be seeked. Further senior officials rotates among the local administrations with rather short assignment in an administration. All these make it difficult for PCG to recruit best fit personnel at the desired timing and to conduct personnel reshuffle in order to cope with the rapid development of the responsible area.

v) Inadequate police manpower and lack of power of PCG

Though actual population of the Phatthaya City seems double of the registered population, receiving more than 1.4 million tourists per annum as of 1987 majority of which are foreigners, police force is determined based on the registered population.

In Phatthaya, police, tourist police and marine police are stationed with the duty of maintaining order and safety in the area. But the local administration has no authority to issue order or directly supervise these forces, although maintenance of public order is the principal duty of the PCG.

vi) Inadequate function of city manager system

Although the city manager system was introduced aiming at rendering efficient administration by an experienced administration expert and guaranteeing independence for executive body from the legislative body, the system has not be functioning well up to now. Turnover of city manager since the introduction of the system is quite high, many of them having resigned before completing their terms. The following problems have been pointed out.

- Mayor's power and duties are not clearly defined in APCA and confusion has been observed quite often between the works and activities of Mayor and City Manager.

- Phatthaya City is the only local administration where the city manager system has been practiced. Lack of understanding, therefore, still prevailing among residents and people concerned with the Phatthaya development.

- According to APCA, Mayor shall propose candidates of City manager to the City Council. In the employment of the City Manager, Mayor shall be a party acting on behalf of Phatthaya City. Consequently, Mayor could exert strong influence over City Manager.

- Placing the positions of the officials of the City of level 5 and over is made by Mayor with an approval of the Municipal Officials Commission. Placing the positions of level 4 and under is made by Mayor. Very limited personnel power is given to City Manger.

- High qualification is required for City Manager although his salary is low relative to the private sector.

(2) Financial

i) Inadequate revenue

As given in Section 2.3.2, total revenues of PCG including taxes subsidies from the Central Government, fees and loans 2ere 147.3 million bahts and 147.2 million bahts in 1987 and 1988 respectively. Out of which 53.4% and 60.6% was development expenditures, in 1987 and 1988 respectively. Comparing with the big financial requirement for infrasture development in the City, the revenues seems inadequate.

At present, the number 0of PCG staff is based on the registered population. If the staff is strengthened reflecting the actual size of population and number of tourists, recurrent expenditure would be much increased, necessitating bigger revenue for PCG.

ii) Inadequate autonomous revenues

As given in Section 2.2.2, autonomous revenue including locally levied tax, licenses, fees, fines and property income tax was 39.9 million bahts or 27.1% of the total, the rest being grants and taxes to be allocated by the Central Government. The autonomous revenue is low and should be strengthened in order to enhance the self-government of PCG.

iii) Constraint on the annual expenditure

Municipality Act stipulates that total annual expenditures of any local administration should not exceed 97T of the average revenue of the three previous years, the remaining being kept as provident fund. Although this requirement guarantees sound finance of PCG, it would impose constraint on the public investment on infrastructure development, particularly when the needs are sharply increasing.

(3) Legal

i) Enhancement and Conservation of Natural Environmental Quality Act

The Enhancement and Conservation of Natural Environmental Quality Act B.E.2518 (1975) has the power to force large scale hotels and resort facilities of more than 80 rooms and other specified projects and activities to install the wastewater treatment plants. These do not include the small hotel and resort facilities of less than 80 rooms, restaurants, food shops and residential sites which are found to produce the majority of wastewater. It was found sometime that hotels had been intentionally built with 79 rooms for not being covered by this Act. Furthermore, the Act is given the power to force the specified projects and activities to have the waste water treatment plants, but not given the power to force to use them. There exists possibility, therefore, that after installation the plants are not in operation Phatthaya City, although given the power to promote and maintain the environmental quality and natural resources by APCT, it is not empowered to penalize these who do not comply with this Act and effective enforcement of the Act is difficult.

ii) Town Planning Act

According to the Act, any person who violates or fails to comply with the General plan or specific plan shall be liable to imprisonment for a term not exceeding six months or to a five not exceeding ten thousand bahts or to bath. The degree of the penalty may, however, be high enough to prevent violation, considering the high land value and return on land development investment in Phatthaya.

iii) Administration of Phatthaya City Act

As stated in the previous parts, there exist several problems in the institutional and financial settings of the local administration. In order to realize more effective and efficient administration in Phatthaya, some institutional reforms and financial arrangement revision may be necessitate.

3.3.2 Tourism Development Prospect

In terms of tourism development prospects of Phatthaya, there are two aspects which should be considered: external conditions and internal conditions. External conditions refer to conditions related with countries and areas tourists come from, including such elements as economic conditions, availability of leisure time, etc. in countries and areas where tourists come from. Internal conditions are those advantages and constraints as explains in the foregoing section. While the external conditions are out of control of the planning and implementation bodies of the Thai government, the internal conditions could be controlled and managed by them to some extent.

In the following part, the future prospect of Phatthaya is briefly analyzed by external and internal conditions and probable numbers of guest arrivals to Phatthaya in the year 2006 will be presented.

1) External Conditions

Generally external conditions surrounding Phatthaya are in favor of Phatthaya to grow further as a major resort in Thailand. External conditions are analyzed hereunder for Thailand, Asian Countries and European and American countries.

Thailand

Thai tourists are most reliable and constant source of tourist generation for Phatthaya. Thai tourists are less susceptible to changing political conditions in Thailand and completion of touristic destinations abroad than foreign tourists. A larger number of Thai people are likely to become tourists to visit Phatthaya in the future for the following reasons.

- Future prospect of economic growth is favorable considering sound economic management policies, political stability and high-quality laborforce. Sustained economic growth of Thailand would result in the rise of personal income contributing to the increased opportunities for tourism.

- Growing interest in and acceptance of tourism activities have been a major factor contributing to the increase of Thai tourists to Phatthaya. This trend is likely to be strengthened in the future in parallel with the rise of income level.

Asian Countries

The number of guest arrivals coming from Asian countries numbered about 300,000 or 16% of all tourists visiting Phatthaya in 1987. Among Asian countries, tourists from NIES (Newly Industrializing Economies : Taiwan, South Korea, Hong Kong, Singapore) have shown a rapid increase in 1987.

In the past years, NIES have shown remarkable rates of economic growth and rise of income level resulting in the increase in the number of tourists visiting Thailand and Phatthaya.

It is likely that tourists from these countries will account for large portion of foreign tourists visiting Phatthaya considering the following aspects.

- Prospect of economic growth is bright. By 2006, these countries are likely to have attained or about to attain the per capita GDP level of industrialized countries at present. As a result, there is going to be much larger pool of potential tourists who might visit Thailand and Phatthaya by 2006.

- In accordance with economic growth, people in these countries will have longer time for leisure as experienced by industrialized countries, resulting in increased opportunities for overseas trips.

- Coupled with rising income level, geographical proximity to Thailand would contribute to attracting these potential visitors to Thailand and Phatthaya.

- Ethnical and cultural identity or similarity would help attracting tourists from these countries to Thailand.

- Closer economic ties between Thailand and NIES would contributing to attracting business people to Thailand and Eastern Seaboard.,

As well as NIES, Japan is also a big market expected to grow in the coming years considering the following aspects.

- Since the exchange rate adjustment between 1985 and 1987 and resultant appreciation of the yen, overseas trips became far easier for Japanese. The number of Japanese going abroad consequently rose from $4,948 \times 10^3$ in 1985 to $8,426 \times 10^3$ in 1988, equivalent to the increase of 19.4% per year on average. The present exchange rate structure is likely to remain basically unchanged ensuring constant opportunities for Japanese to make overseas trips.

- There has been growing interest in leisure in general and overseas travel among Japanese. This trend would likely be enhanced resulting in larger time allocated for leisure and tourism.

- As a result of closer economic relation between Thailand and Japan, a larger number of Japanese businessmen are expected to visit Thailand and Eastern Seaboard.

European and American Countries

The number of guest arrivals to Phatthaya from European and North American countries numbered about 490,000 or 33% of all guest arrivals to Phatthaya in 1987 constituting the largest group. These countries have been an important tourism market for Thailand and Phatthaya expected to remain so in the future as well for the following reasons.

- Economic growth prospect of developed countries is favorable in the medium term. (OECD projects average economic growth rate of developed countries at 3.0% per year between 1991 and 1994. The equivalent figure for 1976-1985 period was 2.9% per year.) Good economic performance

would be reflected in the rise of income level leading to increased opportunities for overseas trips.

- Continued promotional efforts by TAT in these countries would keep contributing to attention of people in these countries to Thailand.

- There is a growing trend among Western travellers to shift their destinations from such countries as Hong Kong, Japan and China to Southeast Asian countries such as Thailand, Indonesia and Singapore.

2) Internal Conditions

Internal conditions refer to characteristics inherent in Phatthaya that are to some extent manageable or controllable by planning and implementation bodies. The internal conditions include a number of advantages as positive elements as well as problems faced by Phatthaya City as negative elements. Overall development prospect or possibility of Phatthaya area in the future could be evaluated analyzing both of these positive and negative aspects.

As explained in section 4.1, Phatthaya is endowed with a number of advantages such as follows.

- short distance and easy access from Bangkok and foreign markets
- availability of a variety of touristic attractions
- availability of vast hinterland area
- good location in the Eastern Seaboard

These positive elements of Phatthaya have been working in favor of Phatthaya and have brought about Phatthaya's fast growth in the past decade.

Phatthaya is, however, facing a number of problems which might jeopardize further growth of Phatthaya, unless proper measures for the problems are taken. Among a number of problems facing Phatthaya, the following problems are most serious:

- pollution of seawater
- inadequate capacities of infrastructure facilities such as

- water supply system
- sewerage system
- road system

The problems recognized by hoteliers, for example, are illustrated hereunder. The following table shows the problems of Phatthaya which were pointed out by more than 50% of hoteliers out of all hotels interviewed (59)during the Questionnaire Survey.

	Number of hotels	%
Polluted beach/sea	49	83
Shortage of tap water	42	71
Poor sewage/drainage system	39	66
Impure tap water	38	64
Too low water pressure	37	63
Traffic congestion	34	58

According to this result, more than eight hoteliers out of ten perceive pollution of sea and beach as the problem of Phatthaya. Polluted sea and beach are followed by problems regarding water supply and traffic condition.

Another result of the Questionnaire Survey revealed that Phatthaya's future is not necessarily perceived with a positive image by hoteliers and travel agencies, reflecting seriousness of the problems Phatthaya faces. The following table presents percentage distribution of hotels and travel agencies in terms of the view on future growth prospect of Phatthaya as a resort.

	Hotel		Travel Agent	
	No.	%	No.	%
Phatthaya will prosper more.	24	44	8	32
Phatthaya will remain stable.	13	24	9	36
Phatthaya will decline.	18	33	8	32
Total	55	100	25	100

Those who think Phatthaya will prosper even more as a resort account only for 44% of hotels and 32% of travel agencies. Remaining 57% of hotels or 68% of travel agencies perceive Phatthaya will remain stable or even decline in the coming years. In the face of worsening environmental conditions and defficient infrastructure improvement in recent years, these people have come to have a pessimistic view about Phatthaya's future.

3) Overall Growth Prospect of Phatthaya

Concerning the future growth prospect of Phatthaya, a number of alternative scenarios could be formulated under two different assumptions. One assumption is that actions to be taken by Phatthaya City and the Thai government are limited like until now (Case I). The other assumption assumes that Phatthaya City and the Thai government should take timely and drastic measures to solve the current problems of Phatthaya and create an agreeable environment and amenity (Case II).

Case I

This case assumes that the actions taken by the government are to a moderate extent and do not contribute sufficiently to solving the problems of Phatthaya. As a result, problems of Phatthaya, especially environmental conditions, deteriorate and start to override the attractiveness of Phatthaya so far appreciated by tourists. It is likely that the number of tourists stops growing or even start declining in this case.

Case II

While case I is rather a pessimistic possibility for Phatthaya, there is also another possibility for constant and healthy growth of Phatthaya area in the coming years. This possibility would be realized provided that Phatthaya City and the Thai Government take quick and fundamental measures in an effort to improve deficiencies of infrastructure facilities and enhance attractiveness of Phatthaya from the viewpoints of ensuring constant and healthy growth of Phatthaya in the long-run. In the event that infrastructures are sufficiently provided and new elements of tourism and business and commercial resources suited to needs arising from tourist and business opportunities are added to Phatthaya, the number of tourists visiting Phatthaya is likely to keep rising up to 2006.

To serve as a basis for setting the planning target in the number of guest arrivals to Phatthaya, two cases of projections are presented hereunder as Case II-1 (low case) and Case II-2 (high case). These two cases of the number of tourists visiting and staying overnight in Phatthaya in 2006 were derived based on trend analysis between 1982 and 1987.

The following table summarizes the basic assumptions applied and the derived numbers of guest arrivals to Phatthaya in 2006.

Item	Case II-1	Case II-2
Past period applied		
Thai	1982-87	1982-87
Foreign	1982-86	1982-87
Average annual increase		
Thai	51,000	51,000
Foreign	45,000	112,000
Total	96,000	163,000
Number of guest arrivals in 2006 (10^3)		
Thai	1,374	1,374
Foreign	1,867	3,140
Total	3,241	4,514
Annual growth rate from 1987 (%/year)	4.5	6.3

In both cases, Thai tourists were assumed to increase constantly by 51,000 a year based on the record between 1982 and 1987. This is based on the assumption of rising income level in the coming decades and increased appreciation of touristic activities among Thai people.

Two alternatives were assumed for foreign tourists. In case II-1, 1982-86 period was applied to derive average annual increase of 45,000. The basic assumption is that the growth between 1982 and 1986 was normal and big jump in 1987 was an unusual phenomenon and unlikely to take place again. The derived number of guest arrivals in 2006 is $3,241 \times 10^3$.

In case II-2, 1982-87 period was applied to derive average annual increase of 112,000. The assumption is that external conditions surrounding Phatthaya such as overseas travel boom in market countries or political unrest in competing countries might take place from time to time resulting in jump of the number of foreign tourists visiting Phatthaya. In other words, 1987 phenomenon is assumed to take place every 5 years. The number of guest arrivals in 2006 were derived to be $4,514 \times 10^3$ in this case.

The three cases of guest arrivals (Case 1, II-1 and II-2) in 2006 are illustrated by a graph in Fig. 3.3.1.

4) Comparison with Existing Estimate

The number of guest arrivals to Phatthaya in the two cases were cross-checked with the existing estimate of the international arrivals to Thailand. The following table shows the proportions of the number of foreign guest arrivals to Phatthaya in the cases to the number of international arrivals projected by "The Study on Potential Tourism Development for the Southern Region of Thailand (hereafter JICA South Study)" in 1987 and 2001.

(thousand)

	Item	1987	2001	Annual Growth (%)
a.	Number of foreign guest arrival to Phatthaya			
	Case II-1	1,012	1,777	4.1
	Case II-2	1,012	2,580	6.9
b.	Number of International Arrival to Thailand	3,483 /1	11,240 /2	8.7
c.	a/b (%)			
	Case II-1	29	16	-
	Case II-2	29	23	-

Remarks: /1 Data of TAT
/2 Figure estimated by JICA South Study

The number of guest arrival to Phatthaya was estimated for 2001 based on the assumptions applied the projection for 2006 for the two cases of II-1 and II-2. The number of international arrivals to Thailand was projected by the JICA South Study for 2001.

In either case of II-1 or II-2, the proportions of guest arrivals to total international arrival to Thailand decline from the present level as a result of faster growth of other relatively new resorts in Thailand.

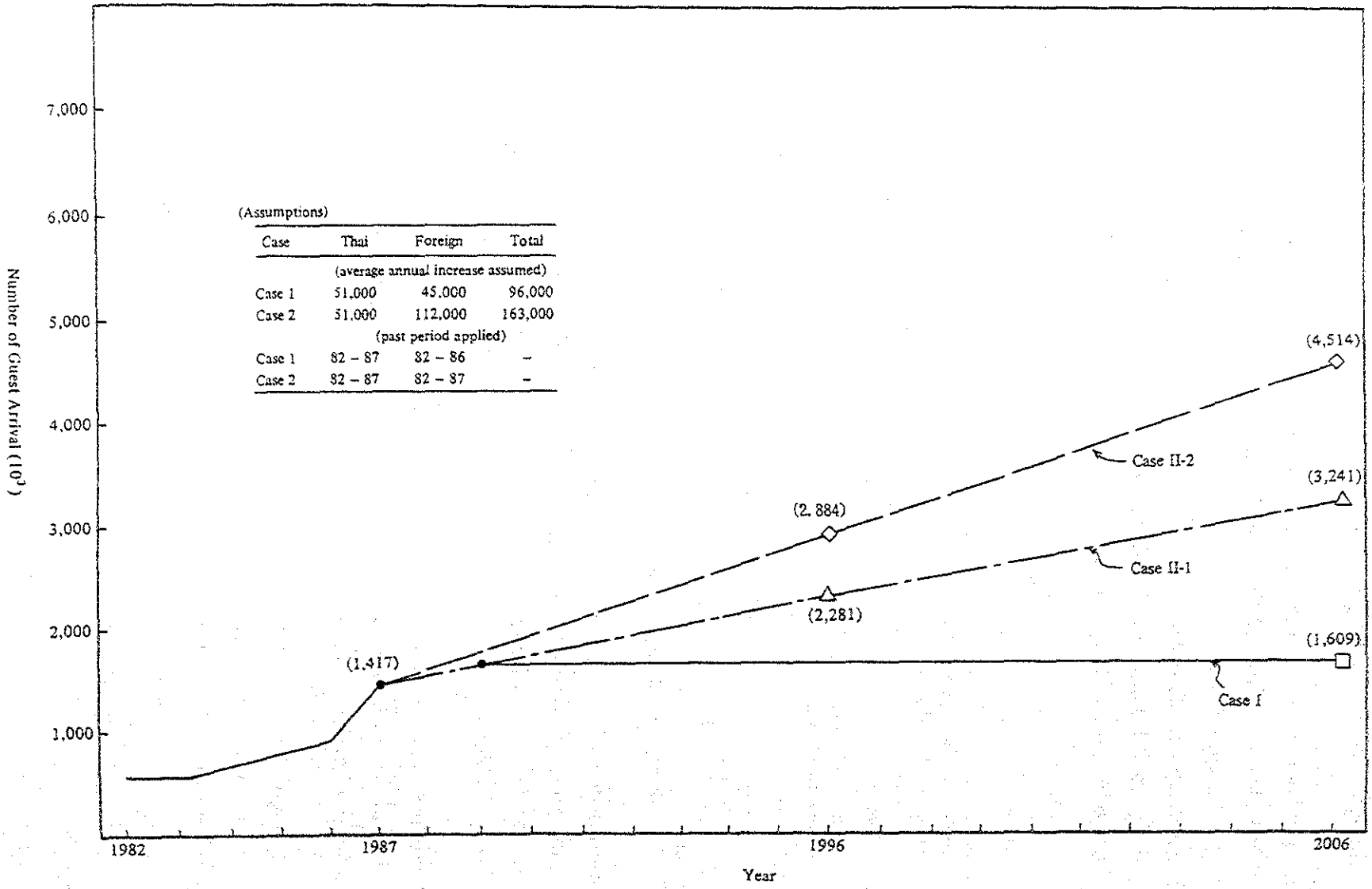


Fig. 3.3.1 Projected Number of Guest Arrivals to Phatthaya in 2006