

6-4 維持管理費

センターの運営、維持管理費は、表6.1のように推算される。

表6.1 維持管理費

項 目	金 額	比 率
1. センター職員給与 (35 person)	2,352,000 Baht/year	32.7%
2. TOT専用回線利用料金 (25 line)	900,000 Baht/year	12.5%
3. 電 気 料 金	60,000 Baht/year	0.8%
4. 消耗品代 (記録紙、プリンター用紙、他)	1,740,000 Baht/year	24.2%
5. パトロール車維持費	150,000 Baht/year	2.1%
6. 機材点検補修費	2,000,000 Baht/year	27.7%
合 計	7,202,000 Baht/year	100.0%

センターの運営維持管理費は、BMAの予算 (7.105百万Baht/年:1987) に対して 0.1%に相当し、財政的負担は極めて小さい。

なお、センター職員は、現在のBMA (DDS) の職員が充当できるので、実質的なセンター運営のための経費増は、センター職員給与を除き 5百万Baht/年程度と推算できる。

図 6.1 洪水管理センターの D D S 組織内の位置付

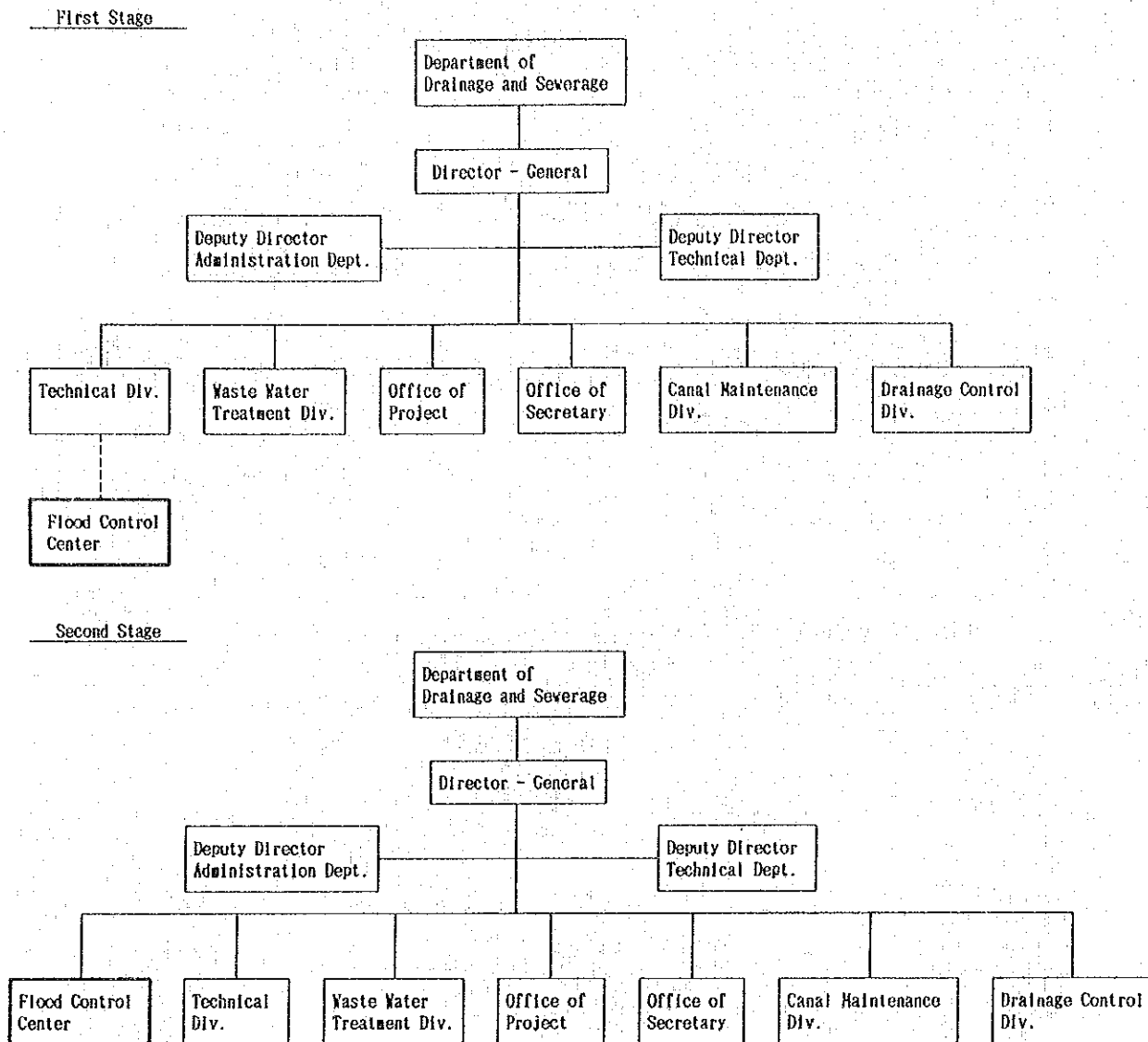


図 6.2 洪水管理センターの組織とその業務内容

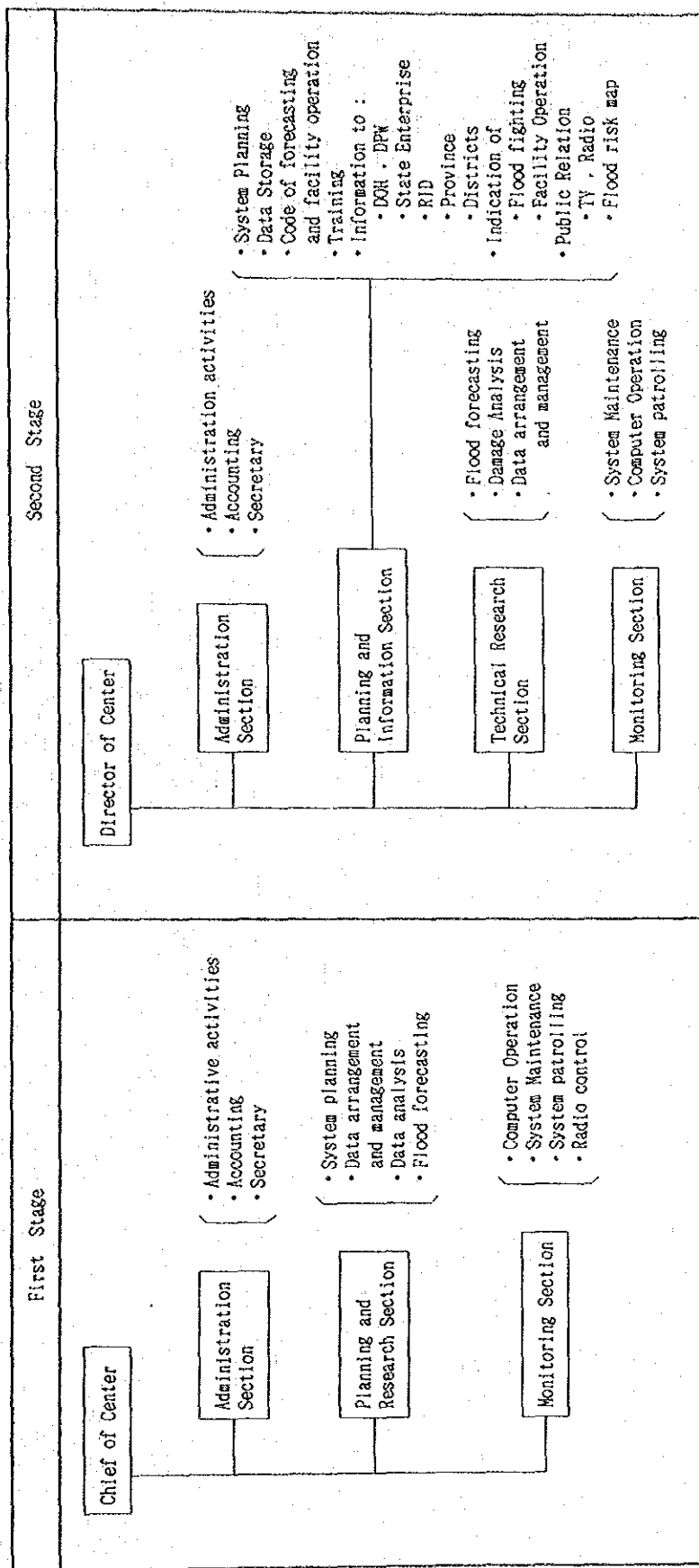


図 6.3 収集データの段階的活用計画

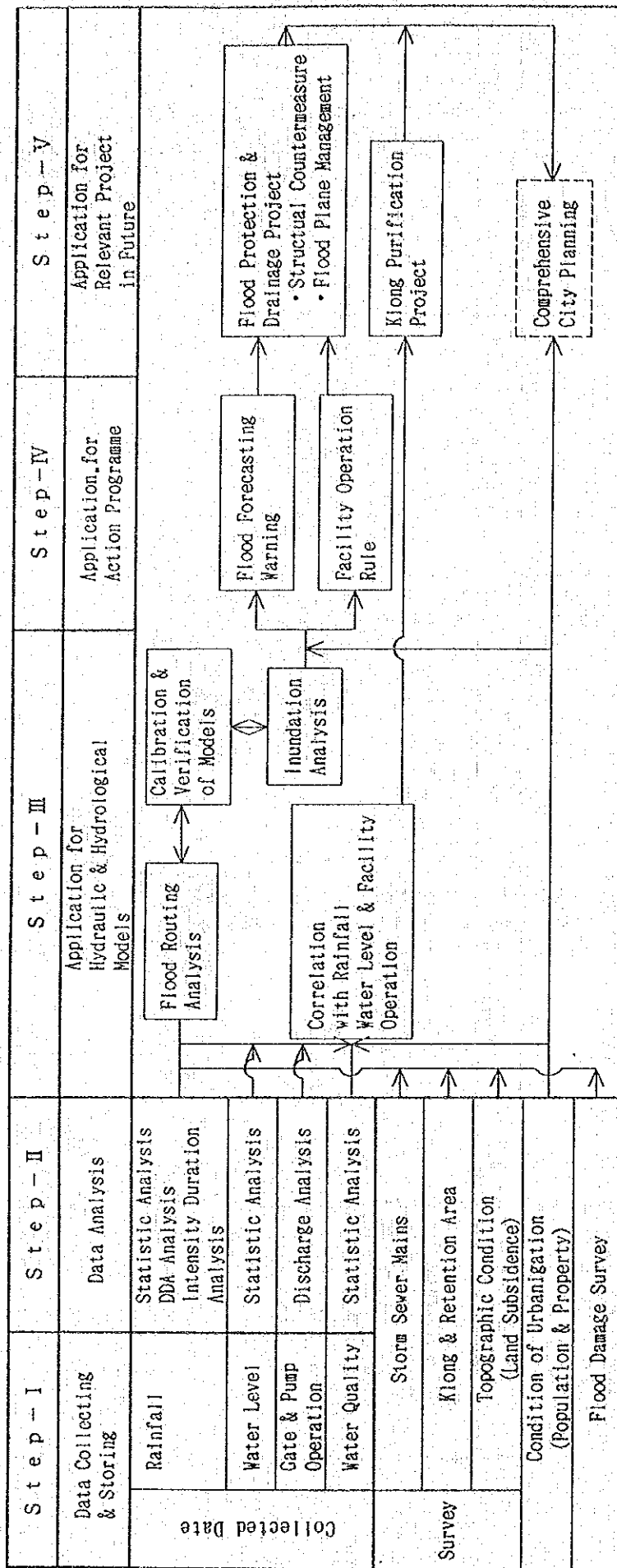


図 6.4 洪水管理センターの要員計画

Function	Position	Job Description	Technical Field (Qualification)	Number of Personnel	
				First Stage	Second Stage
	Director Chief/Deputy Director	Over all management "	Civil or Sanitary Engineering — do —	1	1
Administration	Senior Officer	All administrative activities	Business administration	1	1
	Account Officer	Cash flow administration	— do —	1	1
	Secretary	Assisting superior officer	High school Diploma	1	2
Planning and Information	Senior Engineer	Flood Control Center System Planning	Civil Engineering	1	1
	Engineer	Management of Data Code making for Forecasting and Facility Ope.	Urban Drainage Engineering	1	2
	Engineer	Information and Indication Public Relation	Civil Engineering		2
	Engineer	Water Quality Improvement Planning	Sanitary Engineering		2
	Clerk, Typist	Assisting Engineers	High School Diploma		2
Technical Research	Senior Engineer	Flood Forecasting and Warning Analysis	Urban Hydrological Engineering	1	1
	Engineer	Computer Soft Programming and Simulation Analysis	Hydraulic / Hydrological Engineering	1	2
	Engineer	Flood Damage Analysis	Civil Engineering		2
	Technical Assistant	Data Arrangement	Civil Engineering		2
Monitoring and Maintenance	Senior Engineer	Computer System Maintenance	Computer System Engineering	1	1
	Engineer	Electrical Equipment Maintenance	Electrical Engineering (Telecommunication Engineering)	2	2
	Technical Assistant	Monitoring at Center	Civil Engineering	6 (2person× 3shift/day)	6 (2person× 3shift/day)
	Technician	System Patrolling	Civil Engineering	2	4
Total				19	35

第7章 事業評価

第7章 事業評価

7-1 事業実施の効果

洪水管理センターの効果は、教育プロジェクトや保健プロジェクトのケースと同様に定量評価がしにくいいため、経済的分析を適用することがむずかしい。しかし実際には、バンコク首都圏は、毎年慢性的な洪水被害が発生している。とくに1983年の洪水のように約3ヶ月間も浸水すると、バンコクにおける都市機能は著しく阻害され、社会経済活動に与える影響は図り知れないものがある。これらの被害を軽減させることに洪水管理センターは大きな効果を発揮するものと考えられる。

すなわち、洪水管理センターは、降雨・水位の状況およびゲート、ポンプの開閉、稼働状況の情報を適確に把握することにより、水防、救援活動及び各施設の運転の効果的な実施を可能とし、災害の防止、公共の福祉増進に重要な役割を果たす。とくに人命に関しては洪水時の危険に対してこのシステムは大きな役割を果たすであろう。

さらに、開発計画、洪水対策事業を促進させ、個人及び公共資産を増加させる等の間接効果、勤労意欲の向上を期待することができる。しかも、センター完成までに要する時間、費用は治水工事に比し、はるかに少なく、一定の効果が上がるという点にもこのプロジェクトの特徴がある。

具体的な効果としては、

- * 民生安定と保健衛生上の効果が期待できる。
- * 浸水予測が可能となり、先行待機のポンプ、ゲート運転管理を行なうことで、被害の抑制ができる。
- * 住民への事前洪水予報が発令できる。
- * 雨期のゲート開閉に伴うトラブルを防げる。
- * 乾期の低水管理が容易となる。
- * 水質管理計画への情報提供が可能となる。
- * 将来の洪水防御排水計画の増強計画への情報提供が可能となる。
- * 都市計画（土地利用）への情報提供が可能となる。

7-2 事業実施の妥当性

1) 事業実施主体の管理能力

事業実施主体であるDDSの職員は459人(1987年)であり、その内、技術者は、土木40人、電気6人、機械9人、衛生6人の計61人が在籍している。

本事業の資機材のシステム運用、及び収集データの活用に関する技術的基礎能力は、上記技術者陣に十分に備わっている。今後は、この基礎能力を、実際のOn the Job Trainingを行ないながら、技術力の向上を図り完全な管理能力を備えることが短期間で可能であろう。

2) 財政的負担の妥当性

洪水管理センターの運営維持管理費は720万Baht/年である。これをBMA、DDSの1987年予算と対比してみると、つぎのようになる。

BMA予算	7.105百万Baht/年	…	維持管理費の比率	0.1%
(DDS予算)	645百万Baht/年	…	維持管理費の比率	1.1%

実際は、センター職員は、現有のBMA(DDS)の職員を充当でき、職員給与を控除すると、実質な運営維持管理費は、5百万Baht/年程度であろう。

第 8 章 結論と提言

第8章 結論と提言

8-1 結論

都市に於ける洪水対策は単に構造的な対策施設（ポンプ場、水門、堤防）の増強のみでは不十分で、これ等施設の運転管理の良し悪しが洪水被害のレベルを左右することに十分留意すべきである。

このために今回計画された洪水管理センターの水防テレメータリング・システムの導入は、既存の洪水対策施設の効果的、効率的運転管理のために必要不可欠な要件であることが判明した。

結論として、洪水管理センターの設立のために必要な資機材整備事業を無償資金協力案件として実施することは、考えられるあらゆる角度から正当化され、従ってここに強く、その実施を提案するものである。

8-2 提言

- 一 当該事業は、機材調達契約から工事の完了まで約13ヶ月を要する。従って、交換公文（E/N）以降早期に設計事業管理契約をコンサルタントと結び、機材調達契約をできるだけ早い時期に行なう必要がある。
- 一 機材の運転管理及び収集データの活用について、段階的なトレーニング計画立案が必要である。
このためには、日本の技術協力が当面1～2年は必要で、その後は、独自運用が十分可能であると思慮される。
- 一 基礎能力を有するDDSセンター職員の技術的な運営能力の向上のために、①専門家派遣による技術協力、②機材サプライヤーとのスポット維持管理契約を行なう必要がある。
- 一 地盤沈下が著しいので、各観測所の水準測量を1年毎に、DDSの職員が行う必要がある。（水位の補正のため）。

付 属 資 料

APPENDIX-A : 調査団の構成・調査日程・面談者リスト

APPENDIX-B : 協議議事録 (March 24, 1988)

APPENDIX-C : 協議議事録 (June 14, 1988)

APPENDIX-D : 協議議事録 (September 9, 1988)

APPENDIX-E : 現地調査収集リスト

APPENDIX-F : カントリーデータ

APPENDIX - A : 調査団の構成・調査日程
面談者リスト

資料A・1 …… 調査団の構成

基本設計調査団は、下記の通り9名で構成された。

担 当	氏 名		
団長／総括	馬場 紘一	建設省河川局防災課 災害対策調査室長	
都市排水計画	高橋 春城	日本下水道事業団 計画部設計課	
電気通信	江州 秀人	建設省北陸地方建設局 電気通信課	
計画管理	生井 年緒	国際協力事業団 無償資金協力計画調査部	
洪水管理計画	松尾 和幸	(株)パシフィックコンサルタンツ インターナショナル	
モニタリングシステム	大塚 彦六	同	上
伝送システム	後藤 治行	同	上
処理・表示システム	岡山 茂久	同	上
施設計画	浜元 康裕	同	上

資料A・2 調査行程

日順	月日	曜日	行程	訪問先・調査内容
1	1988 6/6	(月)	東京→BKK	JL 717便
2	6/7	(火)		JICA事務所、日本大使館、DDS & TOT 表敬 I/R説明、協議
3	6/8	(水)		MEA、TOT 視察、協議 DDS 局長表敬 現地踏査 (Green Belt)
4	6/9	(木)		BMA、CAT 表敬、協議 DDS 新庁舎、視察 DDS 第2回 Meeting
5	6/10	(金)		一班 TOT、PTD、BMA 協議 二班 現地踏査
6	6/11	(土)		団内打合せと資料整理
7	6/12	(日)		団内打合せと資料整理 M/D 案作成
8	6/13	(月)		DDS 第3回 Meeting (M/Dについて) TOT、PTD 協議
9	6/14	(火)		M/D 署名 大使館、JICA事務所報告
10	6/15	(水)	官側調査団、帰国 (TG 740)	現地踏査、北西～西地区 6ヶ所
11	6/16	(木)		現地踏査、西地区 7ヶ所
12	6/17	(金)		現地踏査、南地区～中央地区 9ヶ所
13	6/18	(土)		現地踏査、東地区～北地区 7ヶ所
14	6/19	(日)		
15	6/20	(月)		MDとRID の施設視察、協議
16	6/21	(火)		資料整理
17	6/22	(水)		資料整理
18	6/23	(木)		資料整理
19	6/24	(金)		収集データの活用法についての意見交換 資料整理、既存Pump Operation Panel 状況視察
20	6/25	(土)		Technical Note作成 コピー作業

日順	月日	曜日	行 程	訪 問 先 ・ 調 査 内 容
1	6/26	(日)		
2	6/27	(月)		DDS 第4回 Meeting 資料調整
3	6/28	(火)		TOT 協議
4	6/29	(水)		資料整理 Technical Note追加作業
5	6/30	(木)		DDS 第5回 Meeting New office Build視察
6	7/ 1	(金)		JICA大使館挨拶 DDS 挨拶、資料パッキング
7	7/ 2	(土)		帰国後のスケジュール調整
8	7/ 3	(日)	BKK→東京	TG 740
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資料A・3 …… 面談者リスト

{バンコク首都圏庁 (BMA) }

Mr. Wicha Jiwalai	Deputy Governor
Mr. Anuchit Sodsathit	Director General of Policy and Planning

{BMA排水下水道局 (DD S) }

Mr. Sante Thrachoo	Director General
Mr. Siri Prempee	Deputy Director Administration Dept
Mr. Mana Noppun	Deputy Director Technical Dept
Mr. Somchitt Kottiyavaro	Chief Technical Division

{ Counterpartのメンバー }

Mr. Somporn Wangwongwiroj	Civil Engineer Drainage Control Division
Mr. Phisit Jenkeitfu	Sanitation Engineer Drainage Control Division
Mr. Anuchit Thitikavin	Civil Engineer Drainage Control Division
Mr. Vitoon Kongkasuwanna	Electrical Engineer Wastewater Treatment Division
Mr. Jane Varaha	Mechanical Engineer Drainage Control Division
Mr. Wichai Somboon	Civil Engineer Technical Division
Ms. Aungsna Duangkaew	Statistician Technical Division
Mr. Sacha Watanasarnvejkul	Civil Engineer Control Maintenance Division
Mr. Kriangkrai Phamornpol	Electrical Engineer Technical Division

(TOT)

Mr. Kaitboon	Manager Customer Service Center
Mr. Pattanawit Khosittham	Chief. Metropolitan Commercial Service Div.
Mr. Tanadkit Karnpech	Senior Engineer Customer Service Center Section

(CAT)

Mr. Karoom	Chief. Customer Service Center
Mrs. Rapeebhan	Chief. Administration Section

(PTD)

Mr. Rianchi Reowilaisk	Chief. Frequency Assignment Section
Mr. Thongtaweep Khantikul	Senior Engineer

(RID)

Mr. Suphot	Chief. Computer Section
Mr. Chairat	System Manager Computer Section
Mrs. La-Ong	Chief. Data Bank Section
Mr. Virat	Water Management Div. Operation & Maintenance Section

(MD)

Mr. Tawatchai Jempairote	Chief. Data Processing Section Computer Center Climatology Div.
Mr. Preecha Tanittiraporn	Chief. System Development Section

(MEA)

Mr. Bandit Tawanawong	Chief. Relay Communication and Telemeter Div. Power System Maintenance Dept.
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(J I C A 専 門 家)

金 井 重 夫
長 谷 川 清
関 岡 英 明

B M A (都 市 排 水 計 画)
B M A (水 処 理 計 画)
R I D (情 報 処 理 計 画)

(日 本 大 使 館)

松 田 秀 夫

一 等 書 記 官

(J I C A タ イ 事 務 所)

斉 藤 勉
日 野 卓 人

所 長
所 員

APPENDIX - B : 協議議事録 (March 24, 1988)

MINUTES OF DISCUSSIONS

ON

THE PRELIMINARY STUDY ON THE PROJECT FOR THE PROCUREMENT OF
EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY

IN

THE KINGDOM OF THAILAND

In response to the request made by the Government of the Kingdom of Thailand for grant aid for the Project for the Procurement of Equipment for Flood Control Center in Bangkok and its Vicinity (hereinafter referred to as "the Project"), the Government of Japan decided to conduct a Preliminary Study on the Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent a Preliminary Study Team headed by Mr. Hozumi NISHIDA, Assessor for Restoration, Disaster Protection and Restoration Division, River Bureau, Ministry of Construction from March 16 to 25, 1988.

The Team had a series of discussions with the authorities concerned of the Government of the Kingdom of Thailand and conducted a field survey in Bangkok and its Vicinity. As a result of the study, both parties have agreed to recommend to their respective Governments that the major points of understanding reached between them as attached herewith should be examined towards the realization of the Project.

Bangkok, March 24, 1988

Hozumi Nishida

Mr. Hozumi NISHIDA
Leader,
The Preliminary Study Team
Japan International Cooperation
Agency (JICA)

Sante Thrachoo

Mr. Sante Thrachoo
Director General,
Department of Drainage and Sewerage
Bangkok Metropolitan Administration

ATTACHMENT

1. The objectives of the Project is to provide necessary equipments for the introduction of a new monitoring and data management system for Flood Control Center which is "Telemetering" and "On-Line System" for Flood protection and drainage operation in Bangkok and its Vicinity.
2. The Bangkok Metropolitan Administration (BMA) is responsible for the administration and execution of the Project.
3. The Japanese Study Team will convey to the Government of Japan the desire of the Government of the Kingdom of Thailand that the former takes necessary measures to cooperate by providing the equipments listed in Annex I within the scope of Japanese economic cooperation programme in grant form.
4. The Requested Master Station and Monitor Stations of the Project are located in Bangkok and its Vicinity areas which are shown in Annex II.
5. The Thai side has understood Japan's Grant Aid System explained by the Team which includes a principle use of a Japanese Consultant Firm and a Japanese Contractor for the implementation of the Project.
6. A Basic Design Study Team will be sent at an earlier date in order to collect further data and information and to make the Basic Design of the Project which is regarded as practicable through the report of the Preliminary Study.

H.N.

Sante Thrachon

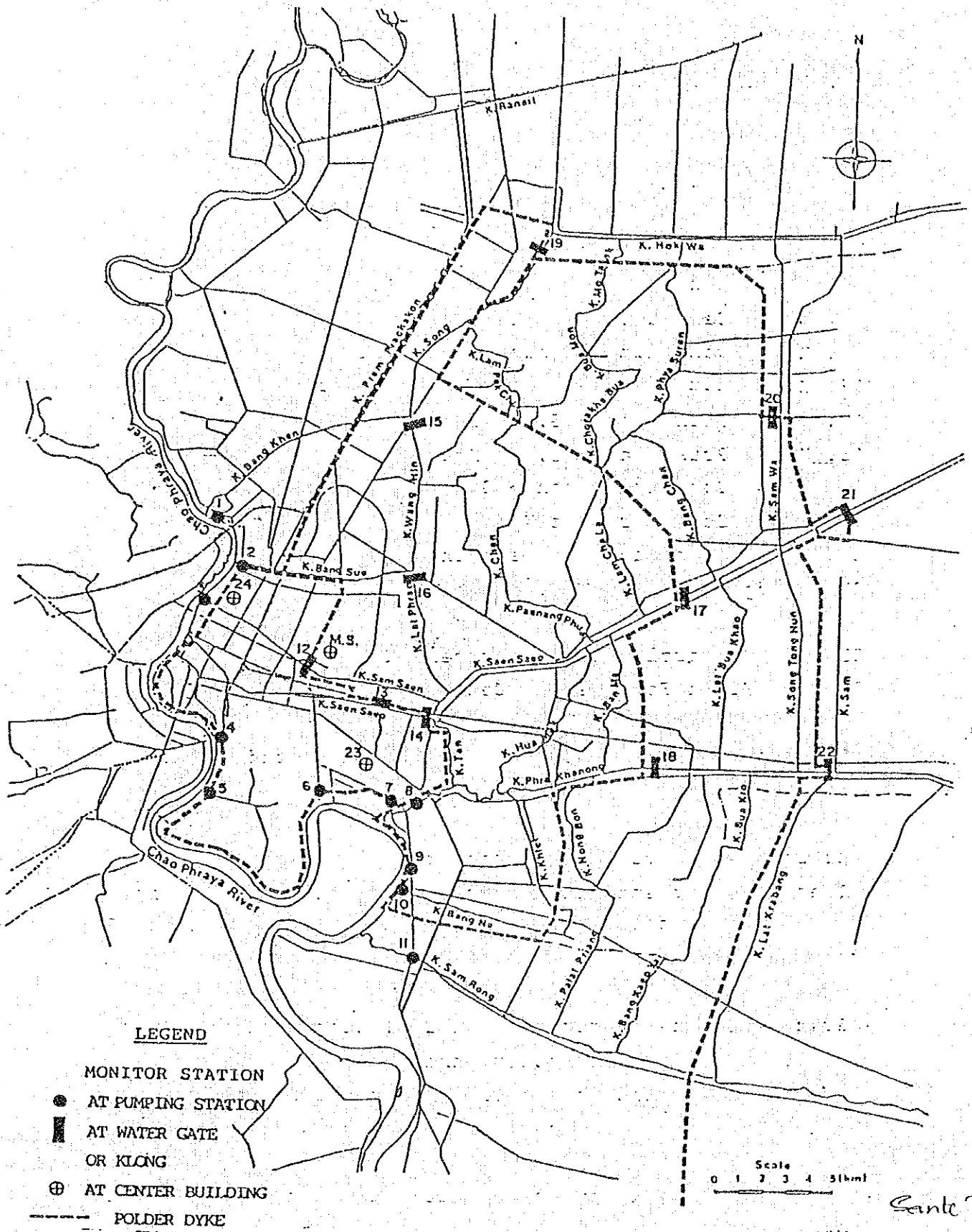
Annex I Requested Equipments

1) Master Station		
* Main Computer	1	set
* Transmission Equipment	1	set
* Uninterruptible Power Supply Unit	1	set
* System/Application Software	1	set
* Man/Machine Interface Sub-System	1	set
* Cables	1	set
* Free Access Floor	1	set
2) Monitor Stations (22 stations)		
* Out Station Terminal Unit (O.T.U.)& Cabinet	22	sets
* O.T.U. Software	22	sets
* Power Supply Unit	22	sets
* Modification of Existing Panel	1	set
* Rain-Gauge	20	sets
* Water-Level-Gauge	44	sets
* Cables	1	set
* O.T.U. House	22	sets
3) Monitor Stations at Royal Irrigation Department (RID) and Meteorological Department (MD)(2 stations)		
* O.T.U. and Cabinet	2	sets
* O.T.U. Software	2	sets
* Power Supply Unit	2	sets
4) Others		
* Spare Parts	1	set
* Test Equipment	1	set
* TOT Telephone Line	1	set

H.N.

Sante Thirachit

Annex II Location Map of Master Station and Monitor Stations



H.K.

APPENDIX - C : 協議議事録 (June 14, 1988)

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT FOR THE PROCUREMENT OF
EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY
IN
THE KINGDOM OF THAILAND

In response to the request made by the Government of the Kingdom of Thailand for grant aid for the Project for the Procurement of Equipment for Flood Control Center in Bangkok and its Vicinity (hereinafter referred to as "the Project"), the Government of Japan decided to conduct a Basic Design Study on the Project and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Thailand the Basic Study Team headed by Mr. Koichi BABA, Director, Office of Disaster Protection, Disaster Protection and Restoration Division, River Bureau, Ministry of Construction from June 6 to July 3, 1988.

The Team had a series of discussions with the authorities concerned of the Government of the Kingdom of Thailand and conducted a field survey in Bangkok and its Vicinity.

As a result of the study, both parties have agreed to recommend to their respective Governments that the major points of understanding reached between them as attached herewith should be examined towards the realization of the Project.

Bangkok, June 14, 1988

Koichi Bata

Mr. Koichi BABA
Leader
The Basic Design Study Team
Japan International Cooperation Agency
(JICA)

Sante Thrachoo

Mr. Sante Thrachoo
Director General
Department of Drainage and Sewerage
Bangkok Metropolitan Administration
(BMA)

ATTACHMENT

1. The objective of the Project is to provide necessary equipment for the introduction of a new monitoring and data management system for Flood Control Center which is "Telemetry and On Line System" for flood protection and drainage operation in Bangkok and its Vicinity.
2. The principal terms concerned to the Master Station, Monitoring Stations and data transmission procedures between the Master Station and RID and MD are as follows.
 - 2-1. Tentative layout plan of the Master Station in New DDS building is shown in Annex I.
 - 2-2. Location map of Monitoring Stations (OTU) will be finalized by July 1, 1988 considering Requested Equipment shown in Annex II, imaged location map shown in Annex III and conclusion of site survey.
 - 2-3. Data transmission procedures between the Master Station and RID and MD are utilizations of Facsimiles, but the on line system should be studied by the team and the result will be incorporated in the final report.
3. The activities of the Flood Control Center are as follows:
 - 3-1. Collection of flood information.
 - 3-2. Analysis, prediction, warning, data supply for operation of the Flood Control and Drainage Facilities.
 - 3-4. Storage of flood information.
 - 3-5. Public relations
 - 3-6. Collection of water quality data, establishment of operational rules for water quality control.
 - 3-7. Training for staff in the Center.
4. The Bangkok Metropolitan Administration (BMA) is responsible for the administration and execution of the Project.
5. The proposed data transmission line for the Project is determined to utilize the leased line of TOT. This determination was considered based on following items.
 - 5-1. Utilization of radio line is in danger of radio hindrance with high-rized buildings due to rapidly urbanization of Bangkok City.
 - 5-2. Existing TOT's network is considered to easy use for the Project based on the site survey and discussion with TOT's technicians.

K. Babas

cc: Mr. Babas

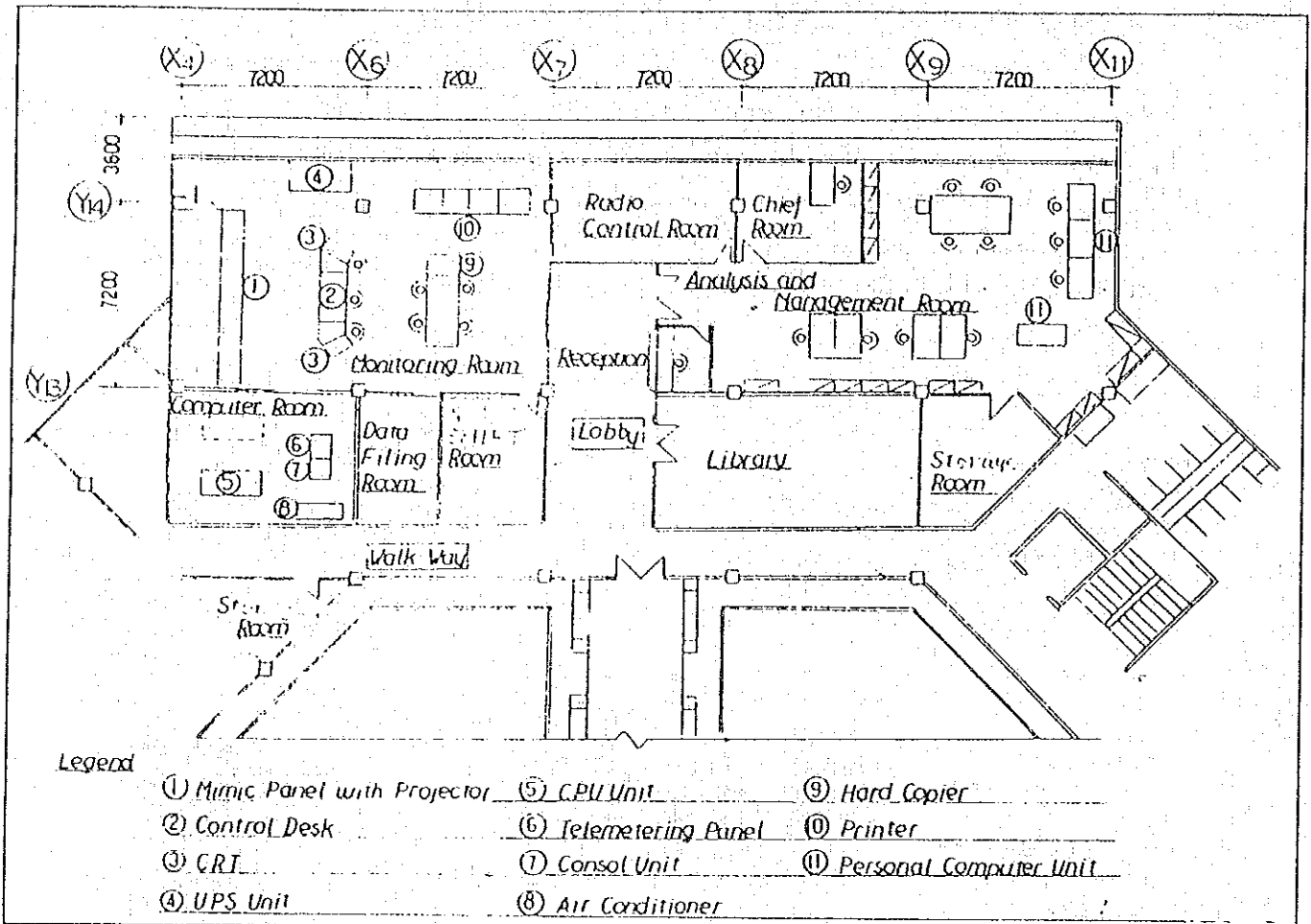
6. Grant Aid Program

- 6-1. The Thai side has understood Japan's Grant Aid System explained by the Team which includes a principle use of a Japanese Consultant Firm and Japanese Contractor(s) for the implementation of the Project.
- 6-2. The Japanese Study Team will convey to the Government of Japan the request of the Government of the Kingdom of Thailand that the former take necessary measures to cooperate by providing the equipment listed in Annex II within the scope of Japanese economic cooperation program in grant form.
- 6-3. The Government of the Kingdom of Thailand will take necessary measures listed in Annex IV on condition that the Grant Aid would be extended to the Project.

K. Baba

Shanku Thairachon

Annex 1: Tentative Layout Plan of the Master Station



K. Bata

Sande Thacker

Annex II: Requested Equipment

1) Master Station

* Main Computer	1 set
* Transmission Equipment	1 set
* Uninterruptible Power Supply Unit	1 set
* System/Application Software	1 set
* Man/Machine Interface Sub-system	1 set
* Air conditioner	1 set
* Cables	1 set
* Free Access Floor	1 set

2) Monitoring Stations (26 stations)

* Out Station Terminal Unit(O.T.U.) & Cabinet	26 sets
* O.T.U. Software	26 sets
* Power Supply Unit	26 sets
* Modification of Existing Panel	1 set
* Rain-Guage	21 sets
* Water-Level-Gauge	46 sets
* Cables	1 set
* O.T.U. House	26 sets
* DO and Water conductivity meter	2 set

3) Others

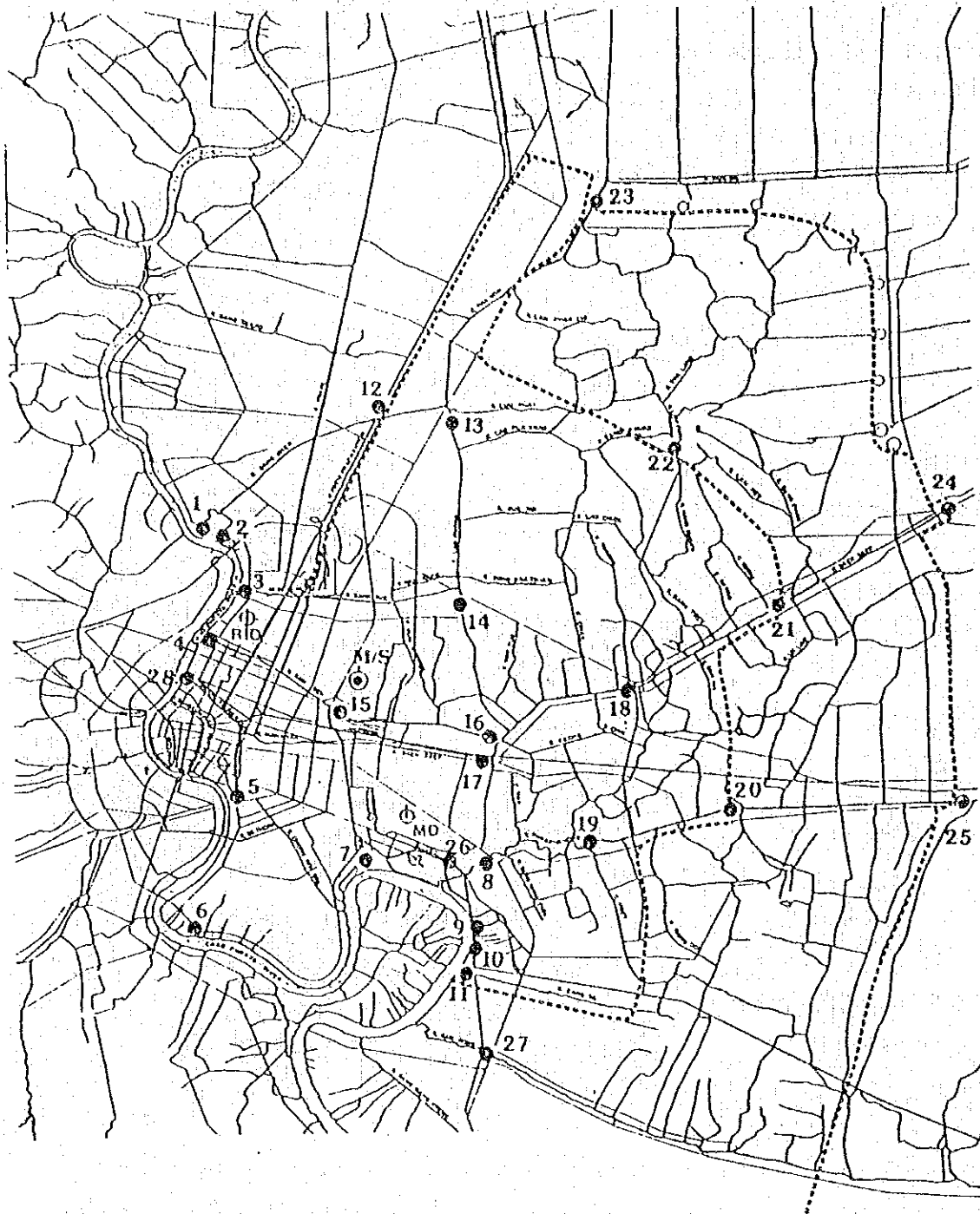
* Spare Parts	1 set
* Test Equipment	1 set
* TOT Telephone Line	1 set
* Personal computer	1 set
* 4WD-Vehicle(for Patrol and Inspection)	2
* Facsimile	4 sets
* Copymachine	1 set

NOTE: Quantities of requested equipment concerned to Monitor Stations are not determined yet, and will be finalized during field survey by July 1, 1988.

K. Bata

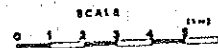
Santa Thimelon

Annex III: Imaged Location Map of Monitoring Stations



LEGEND:

- Imaged Monitoring Station
- ⊙ Master Station
- ⊕ RID (Royal Irrigation Department)
- ⊕ MD (Meteorological Department)
- Polder Dyke



K. Bata

Carli Thader

Annex IV: Undertakings by the Government of Thailand

- 1) To acquire the required site for installation of Monitoring Stations (OTU).
- 2) To prepare and clear for installation of required equipment to existing facilities managed by RID.
- 3) To provide facilities for distribution of electricity, telephone line, and other incidental facilities to the Project site.
 1. Electricity distributing line to the site.
 2. Leased telephone line to the site.
- 4) To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
- 5) To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.
- 6) To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Thailand and stay therein for the performance of their work.
- 7) To ensure the proper and effective operation and maintenance of equipment under the Grant.
- 8) To bear all the expenses other than those to be borne by the Grant, necessary for the transportation and installation of the equipment at Monitoring Stations.

K. Bata

Sruti Thirakorn

APPENDIX-D : 協議議事録 (September 9, 1988)

MINUTES OF DISCUSSIONS
ON
THE DRAFT FINAL REPORT OF THE BASIC DESIGN STUDY
ON
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT
FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY
IN
THE KINGDOM OF THAILAND

In response to the request of the Government of Thailand, the Government of Japan decided to conduct a basic design study on the Project for the Procurement of Equipment for Flood Control Center in Bangkok and its Vicinity (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Thailand the basic design study team from June 6 to July 3, 1988.

As a result of the study, JICA prepared a Draft Final Basic Design Report on the study and dispatched a mission, headed by Mr. Kouichi Baba, Director of Office of Disaster Protection, River Bureau, Ministry of Construction to explain and discuss it from September 4 to 10, 1988.

The team had a series of discussions on the Project with the officials concerned of the Government of the Kingdom of Thailand headed by Mr. Sante Thrachoo, Director-General of Department of Drainage and Sewerage, Bangkok Metropolitan Administration.

After clarifying its contents, both parties have agreed to recommend to their respective Governments that the major points of understanding reached between them, as attached herewith, should be examined towards the realization of the Project.

September 9, 1988
Bangkok, Thailand

Kouichi Baba

Mr. Kouichi Baba
Leader,
The Basic Design Study Team
Japan International Cooperation Agency
(JICA)

Sante Thrachoo

Mr. Sante Thrachoo
Director General,
Department of Drainage and Sewerage
Bangkok Metropolitan Administration

ATTACHMENT

Major Points of Understanding :

1. The Thai side agreed in principle to the basic design proposed in the Draft Final Report.
2. The Thai side understood the system of Japan's Grant Aid Program and confirmed the measures to be taken by the Thai side towards realization of the Project as agreed upon in the "Minutes of Discussions" signed on June 14, 1988.
3. For Project Implementation under the system of Japan's Grant Aid Program, the boundaries of responsibility for the Project Construction are shown in Annex I.
4. Fifty (50) copies of the Final Report on the Project will be submitted to the Kingdom of Thailand.

K. Baba

Genle Thuechon

Annex I The Boundary of Responsibility for Project Construction

I-1: Undertakings by the Japanese Side

- 1) Design of telemetering system.
- 2) Provision and installation of equipment necessary for the telemetering system.
- 3) Facility construction necessary for installing monitoring station equipment.
- 4) Room interior work for installing master station equipment.
- 5) Partial modifications to the existing pump's operation panels to pick up pump operation signals.
- 6) Shipping of Project equipment via sea and land to the Project sites.
- 7) Provision of consulting services for Project equipment procurement and facility construction.

I-2: Undertakings by the Thai Side

- 1) Acquisition of the required site for the installation of the Flood Control Center (master station).
- 2) Securing of sufficient space, prior to the commencement of the construction work, necessary for Project facility construction.
- 3) Securing of access roads necessary for transporting the construction materials and equipment.
- 4) Exemption of taxes and taking necessary measures for obtaining customs clearance, at the port of disembarkation, for the materials and equipment being brought into Thailand for Project use.
- 5) Conduction leveling surveys necessary for water level gauge installation.
- 6) Establishment of the maintenance and management structure for all Project facilities.
- 7) Taking appropriate measures necessary for smooth Project implementation.
- 8) Immediate establishment of the organization of Flood Control Center Project.

K. Baba

S. Thirachit

MEMO OF DISCUSSIONS
ON
SEPTEMBER 7, 1988 MEETING
AT
DDS EXHIBITION ROOM

- (1) Map of major west side BMA area of Chao Phraya River shall be shown on the mimic panel as discussed.
- (2) Master Station main computer shall be backed up at leased 60 minutes by Uninterruptible Power Supply Battery instead of 30 minutes on the draft final report.
- (3) Zero point of water level shall be used Mean Sea Level (M.S.L). Only for Printer output reporting, Zero point shall be selectable M.S.L or DDS zero point by operator. DDS zero point means M.S.L plus 35.03 meter and print out 4-digit as XX.XX m.
- (4) BMA Public Related operation such as extra display output to Director's Room will not be included this time and shall be planed at future stage.

A. Baba

Smita Bhattacharya

APPENDIX-E : 現地調査収集リスト

資料 …… 収集資料リスト

1. 地形図

- ① 1:10,000地形図 A = 2,000 *kaf* 青焼図面一式
(ドラフト原図の青焼図)
- ② 1: 4,000地形図 A = 300 *kaf* 青焼図面一式
(今回対象域より小さい)

2. TOT関係資料

- ① Telephone Exchange Station Location Map
- ② Telephone Line Route Map(Flood Control Center to Monitoring Stations)
- ③ Statistic Table of Telephone Line Repairs
- ④ Annual Report -1986-
- ⑤ その他質問状に対する回答資料

3. PTD関係資料

- ① Ministerial Regulation (B.E.2498)
- ② Supplementary Details for Requesting radio Frequencies

4. MD関係資料

- ① 新設Computer System に関する資料
- ② MD所管雨量計配置図 (民間のボランティアによる計測)

5. MEA関係資料

- ① Brochure of SCADA System

6. RID関係資料

- ① 既設ポンプ場水門の平面図, 断面図
 - Phrakhanong P.S K.Song W.G
 - Sam Rong P.S K.Phrakhanong(Lat Khrvan)W.G
 - Bang Khen North P.S
 - Bang Khen South P.S
 - Sam Sen P.S

- ② I E C. コンピューターに関する図面
 - Outline drawing of each Computer
 - Block Diagram of Computer Configuration
 - Operating time record data of each Computer

7. DDS 関係資料

- ① 既設ポンプ場水門の平面図, 断面図
 - Bang Na P.S Krung Kasem P.S
 - Bang On P.S Navigation Lock at upstream of Krung Kasem
 - Bang Chak P.S
 - Bang Chak P.S
- ② Pump Operation Panelに関する資料
- ③ 現在使用無線機の周波数リスト
 - F₁ ...155.80 MHz
 - F₂ ...155.85 " モトローラ製 4CH 切換使用
 - F₃ ...155.90 "
 - F₄ ...155.95 "
- ④ 現在使用マイクロコンピューターのリスト
- ⑤ Master Plan 平面図 First Stage & Second Stage
(Flood Protection and Drainage at Thonburi and Samut Phrakan West)
- ⑥ Rin Daen New Office Building 6F 平面図
(Flood Control Center 予定階)
- ⑦ Statistical Profile of The Bangkok Metropolitan Administration -1986-
- ⑧ DDS 年次別予算書
- ⑨ DDS 所管のチャオピア川沿施設地点での水文観測データ

APPENDIX-F : カントリーデータ

MACRO ECONOMIC TARGETS OF THE SIXTH PLAN COMPARED
WITH RESULTS OF THE FOURTH AND FIFTH PLANS

Item	Fourth Plan (1977-1981) (Actual)	Fifth Plan (1982-1986) (Actual)	Sixth Plan (1987-1991) (Targets)
1. Real Economic Growth (%) (Average Rate Per Annum)			
1.1 GDP	7.1	4.4	5.0
1.2 Agriculture	3.5	2.1	2.9
1.3 Manufacturing	8.7	5.1	6.6
1.4 Mining	10.1	6.1	6.4
1.5 Electricity	11.7	8.0	6.1
1.6 Construction	9.5	3.6	5.1
1.7 Services	8.2	5.6	5.3
2. Real Expenditure Growth (%) (Average Rate Per Annum)			
2.1 Consumption			
- Private Sector	5.5	4.3	3.7
- Public Sector	10.2	3.3	5.3
2.2 Investment			
- Private Sector	8.6	-0.8	8.1
- Public Sector	12.9	1.8	1.0
3. Export & Import of Goods			
3.1 Real Growth Rate Per Annum (%)			
- Export	20.0	8.4	10.7
- Import	24.8	2.9	9.5
3.2 Average Value Per Annum (Current Prices)			
- Export (Million Baht)	-	177,500	290,700
- Import (Million Baht)	-	233,100	326,700
3.3 Trade Deficit (Million Baht)	45,000	55,600	36,000
4. Current Account Deficit (Average Value Per Annum)	37,400	36,000	11,800
5. Government Finance/GDP (%)			
5.1 Revenue	14.2	14.6	15.2
5.2 Expenditure	17.5	18.2	17.3
5.3 Financial Deficit	3.3	3.6	2.1
6. Population Growth Rate Per Annum (%)			
6.1 Whole Country	-	1.7 /1	1.3 /2
6.2 Bangkok Metropolitan Area	-	2.7 /1	2.5 /2
6.3 Other Areas	-	1.4 /1	0.8 /2
7. Consumer Price Escalation Per Annum (%)	10.6	2.9	2.3
8. Per Capita Income (Baht)	-	21,395 /1	27,783 /2

Note: /1 In 1986.
 /2 In 1991.

Source: Summary of the Sixth National Economic and Social Development
Plan (1981-1991), NESDB.

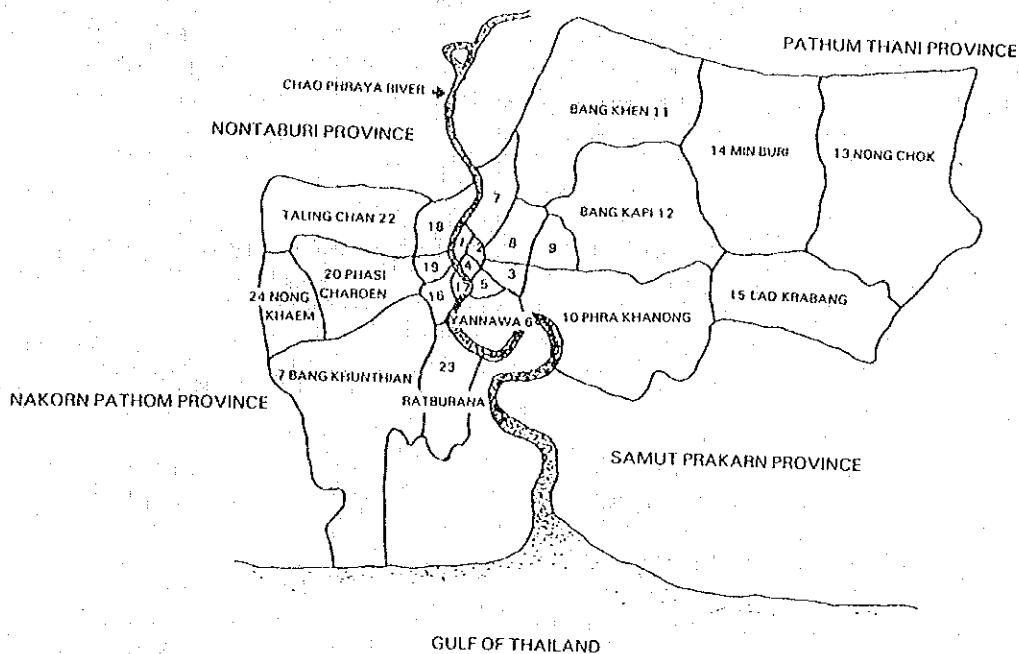
GROSS DOMESTIC PRODUCT AND GROSS NATIONAL PRODUCT
AT CURRENT MARKET PRICES (1981-1985)

Unit: Million Baht

Industrial Origin	1981	1982	1983	1984	1985
Agriculture	187,886	188,742	204,443	193,438	182,279
Mining and Quarrying	13,373	14,807	16,480	21,291	29,279
Manufacturing	158,272	164,659	176,200	196,793	207,691
Construction	42,008	43,040	47,129	52,772	53,758
Electricity and Water Supply	10,743	14,454	16,319	18,884	21,645
Transportation and Communications	57,281	63,133	73,708	83,588	96,254
Wholesale and Retail Trade	150,293	159,849	165,812	181,993	190,676
Banking, Insurance and Real Estate	52,025	61,021	71,722	80,577	89,751
Ownership of Dwellings	8,441	9,912	11,210	12,337	13,706
Public Administration and Defence	30,645	37,349	42,551	43,182	47,058
Services	75,229	89,170	98,680	106,704	115,467
Gross Domestic Product (GDP)	<u>786,166</u>	<u>846,136</u>	<u>924,254</u>	<u>991,559</u>	<u>1,047,564</u>
Net Factor Income	-21,787	-26,376	-25,370	-31,776	-37,081
Gross National Product (GNP)	<u>764,379</u>	<u>819,760</u>	<u>898,884</u>	<u>959,783</u>	<u>1,010,483</u>
Per Capita GNP (Baht)	16,096	16,906	18,174	19,044	19,697

Source: Statistical Yearbook 1985-1986, National Statistical Office

POPULATION DENSITY IN BANGKOK BY DISTRICTS 1986



Bangkok Statistics of the year 1986

No. of Districts	No. of Sub-districts	Area sq. km.	No. of Population	No. of Houses	Density Population/Km ²	No. of Slums
1. Phra Nakhon	12	5.536	111,875	22,562	20,209	14
2. Pom Prab Sattru Pai	5	1.931	87,955	16,895	45,548	7
3. Pathumwan	4	8.365	143,199	25,743	17,111	12
4. Sampantawong	3	1.416	51,121	14,509	36,102	2
5. Bang Rak	5	5.536	90,672	23,818	16,379	5
6. Yan Nawa	8	34.315	415,703	69,882	11,263	45
7. Dusit	6	22.210	562,990	54,996	25,348	65
8. Phya Thai	5	21.110	359,604	42,632	17,035	15
9. Huai Khwang	4	19.500	255,774	43,933	26,924	26
10. Phra Khanong	9	143.559	629,386	131,721	4,384	75
11. Bang Khen	9	169.310	548,078	88,501	3,237	32
12. Bang Kapi	8	158.781	409,785	99,233	2,581	15
13. Nong Chok	8	236.261	57,704	7,562	244	-
14. Min Buri	7	174.331	74,052	12,056	425	2
15. Lad Krabang	6	123.850	59,070	12,578	477	2
16. Thon Buri	5	8.626	274,176	40,114	31,785	23
17. Klong San	4	6.051	143,719	26,302	23,751	20
18. Bangkok Noi	8	23.304	294,938	59,784	12,656	42
19. Bangkok Yai	2	6.180	106,732	20,842	17,271	15
20. Phasi Charoen	10	53.947	228,202	44,372	4,230	23
21. Bang Khun Thian	7	181.156	265,453	46,928	1,465	16
22. Taling Chan	8	79.698	90,135	16,339	1,131	5
23. Rat Burana	4	42.874	148,166	25,773	3,456	16
24. Nong Khaem	3	48.282	60,426	11,851	1,251	2
Total	24	1568.737	5,468,915	958,926	3,486	479

Population

Since it was established as a capital city in 1782 up to 1900, Bangkok Metropolis grew slowly. The population was only 600,000 and the urbanized area was about 18 square kilometres. After the Second World War, the city was boomed with heavy public investment in national infrastructure and public utilities throughout the city. The rate of growth in population and urbanized area can be seen from the following table:

Year	Population ('000)	Urbanized Area (Km ²)
1900	600	18.3
1936	650	43.1
1945	800	55.0
1953	960	66.8
1958	1,622	96.4
1971	3,075	183.7
1977	4,800	220.7
1980	5,200	270.0
1984	5,300	290.0
1986	5,468	

Population in Bangkok By Districts 1982 - 1986

District	1982	1983	1984	1985	1986
1. Phra Nakhon	117,649	113,376	112,332	114,124	111,875
2. Pom Prab Sattru Pai	189,207	92,950	89,330	89,539	87,955
3. Pathumwan	233,978	114,820	157,330	155,868	143,199
4. Sampantawong	75,581	53,504	52,816	52,397	51,120
5. Bang Rak	141,667	88,869	88,197	91,088	90,672
6. Yan Nawa	386,843	392,279	396,420	410,288	415,703
7. Dusit	546,868	550,369	558,832	565,339	562,990
8. Phya Thai	520,507	346,319	357,726	360,603	359,604
9. Huai Khwang	231,069	235,739	239,742	247,274	255,774
10. Phra Khanong	559,812	578,541	594,902	614,854	629,386
11. Bang Khen	429,977	457,544	483,717	520,861	548,078
12. Bang Kapi	314,780	335,171	356,033	386,005	409,785
13. Nong Chok	51,799	54,011	54,952	56,863	57,704
14. Min Buri	61,349	64,266	66,966	70,289	74,052
15. Lad Krabang	45,303	48,836	50,541	56,023	59,070
16. Thon Buri	268,662	267,767	267,616	273,542	274,176
17. Klong San	139,310	139,736	139,444	142,590	143,719
18. Bangkok Noi	388,325	283,296	285,265	291,035	294,938
19. Bangkok Yai	103,365	104,024	104,716	107,486	106,732
20. Phasi Charoen	196,138	207,409	211,125	219,606	228,202
21. Bang Khun Thian	223,388	232,532	240,835	254,597	265,453
22. Taling Chan	72,608	78,995	81,349	85,559	90,135
23. Rat Burana	122,614	127,726	131,550	140,245	148,166
24. Nong Khaem	47,487	50,248	52,946	57,303	60,426
Total	5,468,286	5,018,327	5,174,682	5,363,378	5,468,915

Source: Local Administration and Registration Division, Department of Permanent Secretary for BMA

Canals and Sewers under the responsibility fo BMA in 1986

Districts	Canals (number)	Length (metres)	Sewers Length (metres)
Phra Nakhon	7	5,372.80	24,877
Pom Prab Sattru Pai	7	5,149.00	12,559
Pathumwan	14	16,095.00	17,612
Sampanthawong	2	2,780.00	15,388
Bang Rak	7	1,971.00	26,500
Yan Nawa	59	49,244.00	28,049
Dusit	57	86,422.00	62,837
Phya Thai	12	24,625.00	112,151
Huai Khwang	11	28,527.00	154,032
Phra Khanong	59	132,076.00	260,706
Bang Khen	27	104,005.00	171,667
Bang Kapi	54	171,732.00	172,020
Nong Chok	107	233,595.00	3,547
Min Buri	59	160,034.00	4,123
Lad Krabang	36	110,795.00	3,127
Thon Buri	62	38,809.00	34,363
Klong San	22	21,159.00	19,006
Bangkok Noi	58	56,239.00	58,350
Bangkok Yai	41	37,279.00	23,529
Phasi Charoen	59	111,577.00	34,570
Bang Khun Thian	12	6,370.00	17,201
Taling Chan	26	92,850.00	4,240
Rat Burana	67	80,707.00	27,217
Nong Khaem	28	63,585.00	13,345
Sewer-Line Maintenance Section 1-3			810,935
Total	893	1,640,997.00	2,111,851

Source: Technical Division, Department of Drainage and Sewerage

Statistics on number of Permits of building construction By the year 1982 - 1986

Types of Buildings	1982	1983	1984	1985	1986
1. Commercial and Residential Bldg	24	25	18	25	18
2. Warehouse	-	-	1	8	21
3. Commercial Building	2	5	6	22	14
4. Market	5	10	5	4	5
5. Parking Lot	2	5	6	5	6
6. School	64	50	44	54	67
7. Housing	72	88	95	78	58
8. Factory	30	21	27	20	13
9. Office	26	44	36	49	57
10. Sport Place	13	13	7	16	19
11. Hotel	8	20	20	9	5
12. Cinema	5	5	1	2	1
13. Petrol & Gas Station	28	53	62	85	53
14. Bridge & Dike	9	16	27	27	40
15. Hospital	4	5	2	4	4
16. Crematorium	1	1	-	-	-
Total	293	361	357	408	381

**Statistics on Annual Estimated Budget
Fiscal Year 1982 - 1986**

(Million Baht)

	1982	1983	1984	1985	1986
1. Public Works	952.1	910.0	1,216.13	1,339.8	1,949.0
2. Education	912.3	887.0	936.12	1,007.9	993.2
3. Central Fund	738.1	624.4	598.16	707.9	707.0
4. Administration	519.5	636.2	611.22	639.3	611.0
5. Medical and Health Services	394.3	487.1	611.09	610.7	667.1
6. Public Cleansing	308.2	618.4	569.67	778.1	573.4
7. Drainage and Sewerage	277.2	387.5	752.04	715.3	802.5
8. Social Welfare	116.6	122.6	167.13	207.1	296.8
9. Debt Payment	7.3	3.6	2.17	—	—
10. BMA Commercial	55.5	115.0	183.82	253.7	66.3
Total	4,281.1	4,791.8	5,647.55	6,259.8	6,666.3

Source: Budget Division, Department of Permanent Secretary for BMA

**Per Capita Income By Regions
1981 -1985**

unit : Baht

	1981	1982	1983	1984	1985
Whole Kingdom	16,469	17,359	18,584	19,551	20,263
Northeastern	6,581	7,185	8,107	8,009	8,124
Northern	11,064	11,355	12,375	12,781	13,353
Southern	13,496	13,419	15,058	15,200	15,358
Eastern	21,968	23,284	24,038	25,210	25,603
Western	20,230	21,157	20,055	21,228	21,047
Central	13,327	13,903	14,570	16,146	16,749
Bangkok Metropolitan Region (BMR)	46,891	49,539	52,150	56,092	59,003
Bangkok Metropolis	54,207	57,012	60,073	65,133	68,532

Source: National Accounts Division, Office of The National Economic and Social Development Board

BUDGET OF DDS (FISCAL YEAR)

(million Baht)

No.	I T E M	1983	1984	1985	1986	1987
1	Salary	14.7	15.1	15.8	16.9	18.1
2	Wages (Permanent Employee)	38.4	41.6	44.4	48.0	49.6
3	Wages (Temporary Employee)	12.0	11.2	3.7	4.5	6.4
4	Commission	11.9	15.7	12.3	12.2	11.9
5	General Expense	6.3	12.5	8.8	4.6	7.4
6	Utility Expense	14.3	35.8	27.5	42.5	33.5
7	Material Expense	18.1	14.8	37.4	13.1	17.0
8	Office Supplies Expense	14.7	5.7	12.5	1.8	11.4
9	Land & Construction Expense	60.5	58.2	77.7	258.7	359.5
10	Subsidy	—	231.7	64.7	7.0	16.7
11	Other Expense	25.3	132.1	96.7	57.4	16.0
12	Obligated Expense	45.9	60.0	51.5	37.9	2.5
13	Reserved Fund	25.5	19.2	39.9	40.7	35.5
14	Project Fund	56.3	90.2	27.2	24.1	59.7
	T O T A L	343.8	743.4	520.1	569.4	645.0

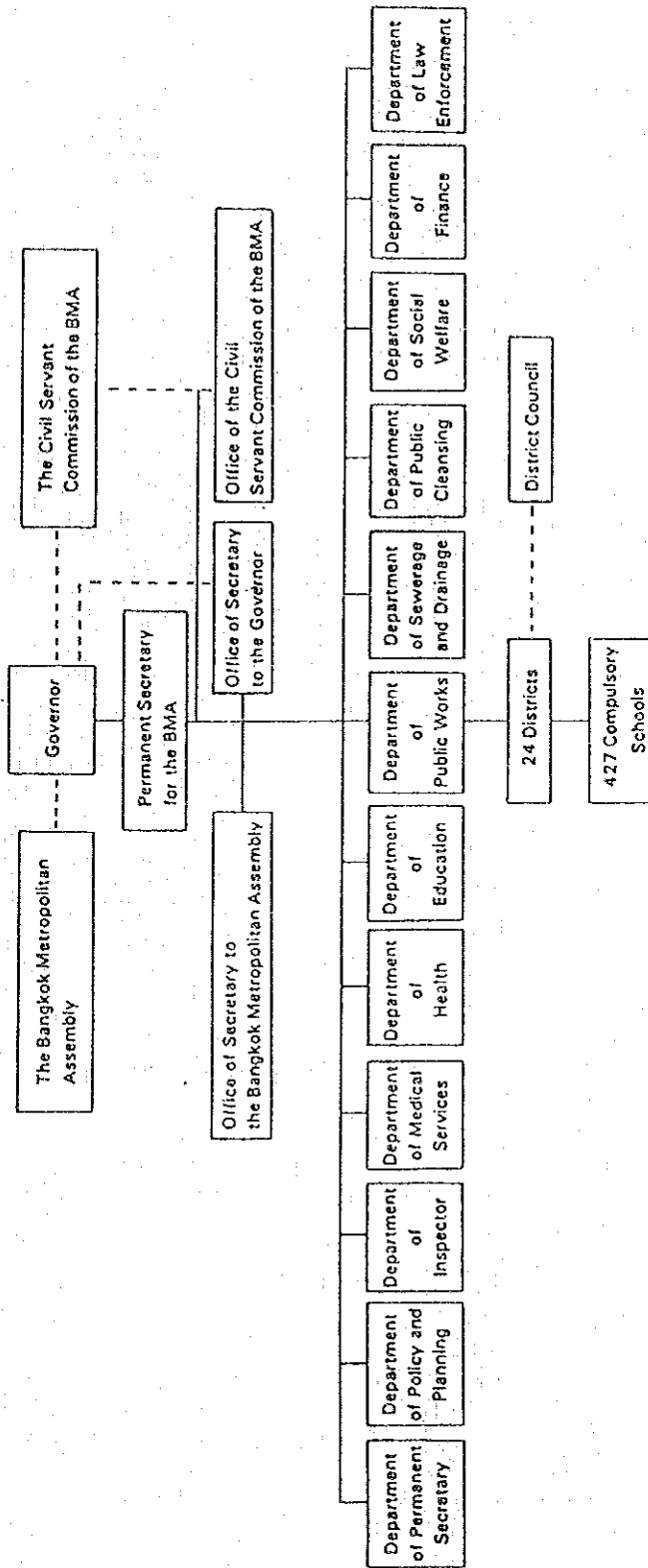
Remark: Summation of item No. 9,10,12,13 and 14 is the cost of flood Protection structures.

B U D G E T O F D D S (1988)

(1,000 Baht)

I T E M	TOTAL	ACTIVITY EXPENSE	SALARY & WAGES	OTHERS	REMARKS
General Administration	8,989	—	5,161	3,828	
General Administration Activity	5,909	—	3,288	2,621	
Technical Activity	3,080	—	1,873	1,297	
Flood Protection & Waste Water Treatment	528,837	322,167	71,365	135,305	
Drainage Control	169,692	35,455	36,732	97,505	
Canal Maintenance	296,626	243,384	28,409	24,833	
Improve Flow Efficiency of Canal Project	42,598	40,500	1,965	133	
Flood Protection & Drainage Project	11,828	11,828	—	—	
Waste Water Treatment Activity	8,090	—	2,303	5,787	
Special Budget (Drainage & Waste Water Treat.)	26,640	26,640	—	—	
T O T A L	564,468	348,807	76,526	139,133	

ORGANIZATION OF THE BANGKOK METROPOLITAN ADMINISTRATION



ORGANIZATION OF THE DEPARTMENT OF DRAINAGE AND SEWERAGE (1988. 6)

