

タイ国
下水道研修センター・プロジェクト
巡回指導調査団報告書

平成10年12月

国際協力事業団
社会開発協力部

序 文

タイ王国では都市化による環境汚染が深刻化の一途をたどり、主要河川の大部分と河口の海岸部においては大腸菌などの値が基準値を大幅に超えて、早急な対応策が求められている。その主な汚染源は都市生活排水であるため、内務省公共事業局（PWD）とバンコク首都圏庁（BMA）は全国規模の公共下水道整備を進めているが、大規模な下水道・処理施設整備の結果、下水道事業の計画・設計・建設・運営・維持管理にあたる多数の技術者育成が急務になってきた。そのためPWDは、既存の技術研修所（TTI）のなかに下水道研修センター（TCSW）を新たに設置してPWD、BMA及び地方都市の下水道技術者の養成、レベルアップを図るため、我が国にプロジェクト方式技術協力を要請してきた。

この要請を受けた国際協力事業団は、事前・長期・実施協議調査を重ねた上で、1995年8月1日から5年間にわたる技術協力を開始している。

今般、協力の中間点を迎えたのを機に、当事業団は1998年（平成10年）11月19日から同月28日まで、建設省土木研究所研究調整官 京才俊則氏を団長とする巡回指導調査団を現地に派遣し、プロジェクトの活動状況の調査や確認、先方技術者や日本側専門家との協力を通じて必要な指導・助言を行った。

本報告書は、同調査団の調査・協議結果を取りまとめたもので、今後の技術協力の進展に広く活用されることを望むものである。ここに調査団の各位をはじめ、ご協力頂いた外務省、建設省、在タイ日本大使館など、内外関係各機関の方々に深く感謝するとともに、今後も一層のご支援をお願いする次第である。

平成10年12月

国際協力事業団

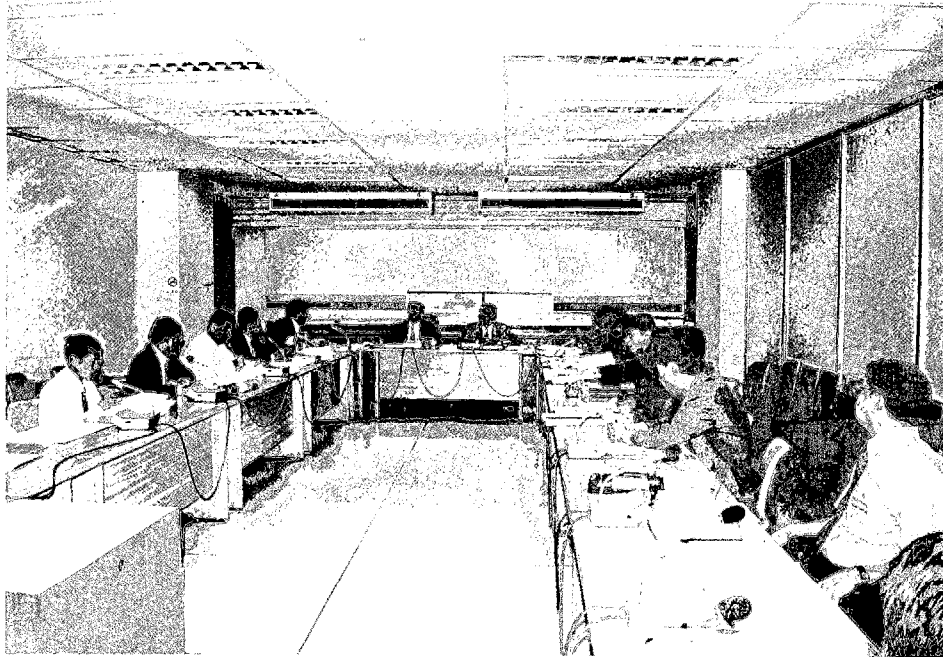
社会開発協力部部長 加藤圭一



ミニッツ署名式



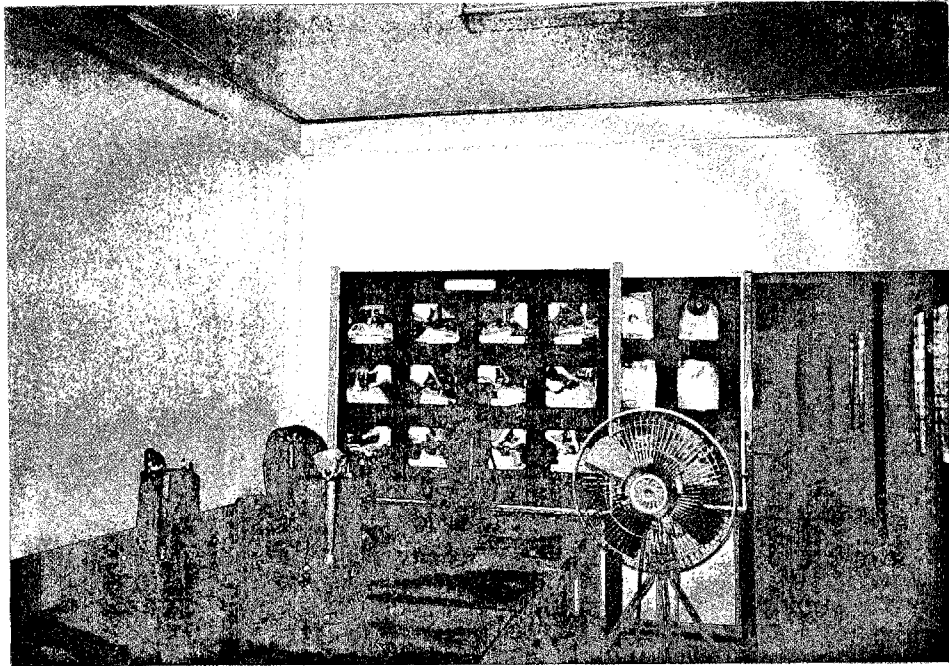
合同調整委員会



内務省公共事業局（PWD）との協議



バンコク首都圏庁（BMA）との協議

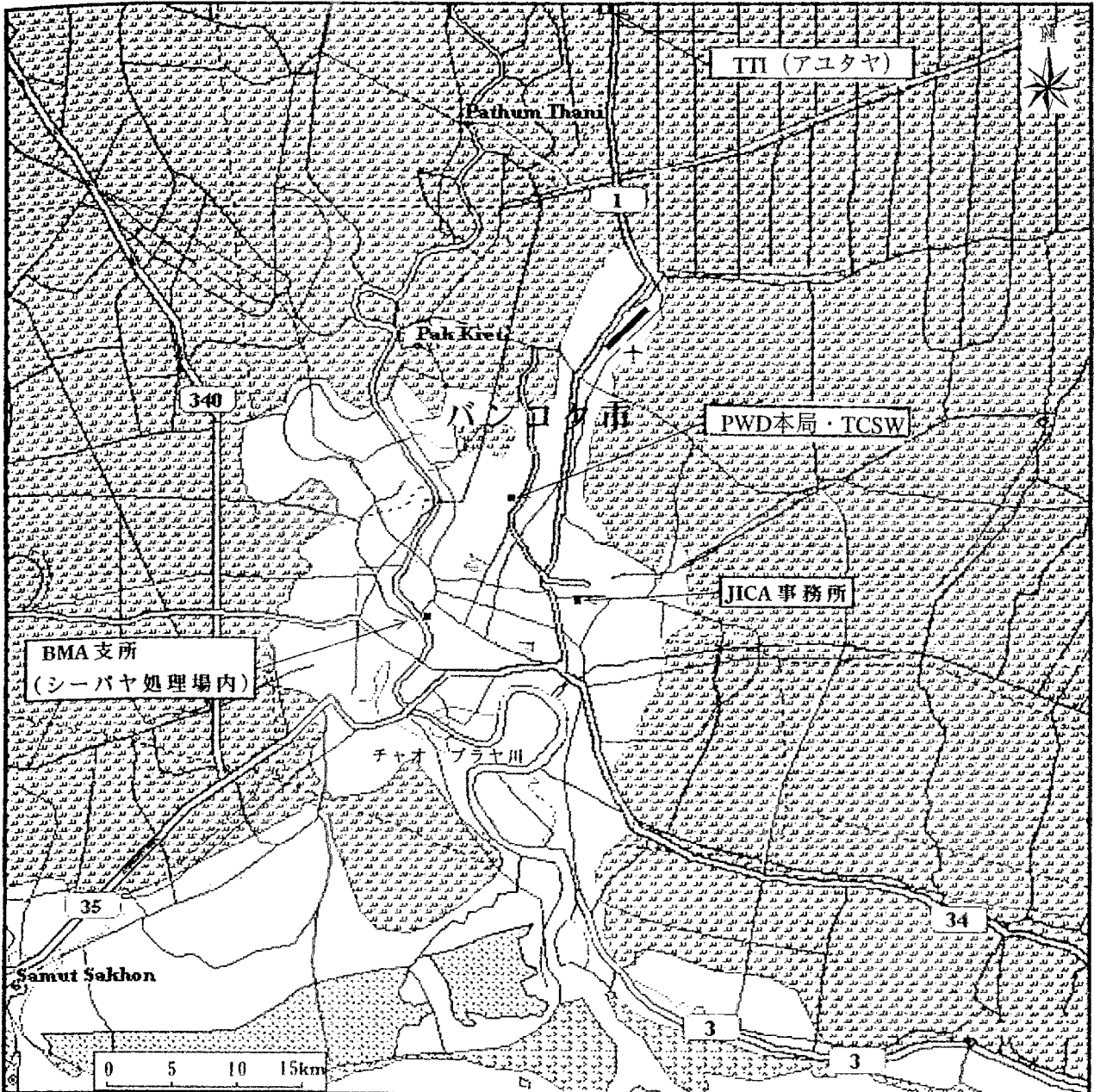


Operation and maintenanceコース
ポンプ組立実習室（BMAシーパヤ処理場）



日本人専門家チーム執務室（PWD本局内）

プロジェクトサイト位置図



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1 . 巡回指導調査団の派遣

1 - 1 調査団派遣の経緯と目的

タイ王国では都市化による環境汚染問題が深刻化の一途をたどっており、なかでも主要河川の大部分の河口の海岸部においては大腸菌などの値が基準値を大幅に超え、早急な対応策の検討が必要とされている。その主な汚染源は都市下水道・処理施設体系の未整備による都市生活排水とされているが、その対策として、内務省公共事業局(PWD)とバンコク首都圏庁(BMA)は全国規模の公共下水道整備を進めている。こうした大規模な下水道・処理施設整備の結果、下水道事業の計画・設計・建設・運営・維持管理にあたる多数の技術者の育成が急務とされてきた。そのため、PWDは既存の技術研修所(TTI)の拡充・整備を行うとともに、TTIのなかに下水道研修センター(TCSW)を新たに設置し、PWD、BMA及び地方都市の下水道技術者の養成、レベルアップを図ることとし、我が国に対しTCSWに対するプロジェクト方式技術協力を要請してきた。

この要請に基づき実施した事前調査及び長期調査の結果を踏まえ、1995年6月に実施協議調査団が派遣され討議議事録(Record of Discussions: R/D)が締結された。1996年9月には、プロジェクトの進捗状況及び問題点を把握し、プロジェクトの円滑な運営を図るために計画打合せ調査団が派遣された。

今般、協力開始から3年あまりが経過したところで、下記3項目を主な調査内容として、巡回指導調査団が派遣された。

- (1) これまでに実施した協力を当初計画と比較しながら、プロジェクトの活動実績、管理・運営状況、カウンターパートへの技術移転状況等について日本、タイ合同で中間評価を行う。また、計画どおり進捗していない点については、問題点を協議し、改善に向けて善処するようタイ側に申し入れる。
- (2) 上記評価結果を念頭においた上で、協力終了までの残り約2年間の全体活動計画及び1999年度活動計画について日本人専門家チーム、タイ側双方と協議する。
- (3) タイの下水道事業の政策決定権がPWDからタイ科学技術環境省(MOSTE)へ移管されたのに伴い、タイ側の下水道事業の政策決定権をPWDが持つというプロジェクト開始時の前提条件が崩れているか否かを調査し、その結果本プロジェクトにどのような影響が出ているか確認の上、場合によってはプロジェクト内容の変更(Master Plan、PDMの変更等)の可能性についてタイ側と協議する。

1 - 2 調査団の構成

担当分野	氏名	所属
総括	京才 俊則	建設省土木研究所研究調整官
機械工学	平野 祥三	横浜市下水道局総務部技術開発担当課長
土木工学	石井 宏和	日本下水道事業団本社計画部設計課
水質分析	小森 行也	建設省土木研究所下水道部水質研究室主任研究員
協力企画	村上 雄祐	国際協力事業団社会開発協力部社会開発協力第一課職員

1 - 3 調査日程

日順	月日	行程	移動及び業務
1	11 / 19 (木)	東京 バンコク	移動、日本人専門家チームとの協議
2	11 / 20 (金)	バンコク	午前 JICA事務所打合せ 午後 総理府技術経済協力局 (DTEC)、 内務省公共事業局 (PWD) 表敬、 日本人専門家チームとの協議
3	11 / 21 (土)	バンコク	資料整理
4	11 / 22 (日)	バンコク	日本人専門家チームとの協議
5	11 / 23 (月)	バンコク	午前 PWD及び日本人専門家チームとのプロジェクトの全体状況に関する協議 午後 科学技術環境省汚染対策局 (MOSTE・PCD) とのタイ下水道行政所管に関する協議、同省環境対策計画局 (OEPP) とのタイ下水道行政所管に関する協議
6	11 / 24 (火)	バンコク	午前 バンコク首都圏庁 (BMA) 表敬、BMA及び日本人専門家チームとのプロジェクトの全体状況に関する協議 午後 下水道公団 (WMA) とのタイ下水道行政所管に関する協議
7	11 / 25 (水)	バンコク	午前 PWD、BMAとのプロジェクトの全体状況に関する合同協議 午後 BMAシーバヤ支所、PWD技術研修所 (TTI) アユタヤ施設を視察
8	11 / 26 (木)	バンコク	午前 合同調整委員会 (JCC) 午後 ミニッツ署名・交換
9	11 / 27 (金)	バンコク	午前 JICA事務所報告、日本大使館報告 午後 日本人専門家チームとの協議結果の取りまとめ
10	11 / 28 (土)	バンコク 東京	移動

1 - 4 主要面談者

< タイ側 >

(1) 内務省公共事業局 (Ministry of Interior, Public Works Department : PWD)

Dr. Voravit LERTLAKSAMA	Director General
Mr. Rajatin SYAMANANDA	Deputy Director General
Dr. Vicharn VONGVIVAT	Senior Chief Engineer
Mr. Pornsak JEVASUWON	Director, TCSW
Mr. Thirapan THONGPRAVATI	Chief Engineer
Mr. Supol SRIPAN	Director, Sanitary Engineering Division : SED
Mr. Chamin THIPARAT	Director, Planning Division
Ms. Chitra BULYALERT	Director, Personnel Division
Mr. Wanchai SUTHIWORACHAI	Director, Procurement Division
Mr. Thanade DAWASUWAN	Director, Land Acquisition Division

(2) バンコク首都圏庁 (Bangkok Metropolitan Administration : BMA)

Mr. Thongchai KLANKRONG	Deputy Director General, Department of Drainage and Sewerage: DDS
Mr. Chanchai VITONPANYAKIJ	Director, Water Quality Management Division
Ms. Apinan JARUCHAIYAKUL	Chief, Water Quality Management Division

(3) タイ科学技術環境省汚染対策局 (Pollution Control Department, Ministry of Science, Technology, and Environment : PCD, MOSTE)

Dr. Yuwaree IN-NA	Director, Water Quality Management Division
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(4) タイ科学技術環境省環境対策計画局 (Office of Environmental Policy and Planning, Ministry of Science, Technology, and Environment : OEPP, MOSTE)

Mr. Surin VIVAJSIRIN	Director, Urban Environmental and Area Planning Division
Ms. Suree UMMARALIKIT	Chief, Urban Environmental Management Sub-division

(5) 下水道公団 (Wastewater Management Authority : WMA)

Mr. Anothai UTENSUTE	Director
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Mr. Pinetr PUSAPATANAKUL Director of Planning and Project
Development Department

Mr. Suchai JANEPOJANAT Chief of Coordinating Division

(6) 総理府技術経済協力局 (Department of Technical and Economic Cooperation,
Office of Prime minister : DTEC)

Mr. Banchong AMORNCHEWIN Chief, Japan Sub-Division

< 日本側 >

(1) BMA 長期個別専門家

飯島 豊 JICA 長期専門家

(2) 在タイ日本大使館

荒川 辰雄 二等書記官

(3) JICA タイ事務所

岩口 健二 事務所長

梅崎 裕 次長

上垣 素行 所員

2 . 要 約

本調査は、1995年8月1日から5年計画で実施しているタイ国の下水道研修センター（TCSW）に対するプロジェクト方式技術協力が3年3か月経過した時点で進捗状況を把握・評価し、プロジェクト終了までの協力計画について協議するためのもので、1998年1月19日から10日間にわたって実施された。この期間、調査団はタイ国の関係機関、日本大使館、JICA事務所、我が国から派遣されている専門家チーム等と意見交換を行い、それらの結果の主要部分をミニッツとして取りまとめて署名を取り交わした。

(1) 下水道研修センターの活動状況

技術協力内容である研修の実施、データベースシステムの準備、研究開発の準備は、ほぼ予定どおりに進められている。

1) 研修： 予定されている6分野、11コースのうち、これまでに4分野、6コースについて計14回の研修が実施されている。タイの経済危機のため予定されていた研修コースの実施回数のうち11回が中止されたが、各回の研修生を増やすことによって研修生の数の確保に努めた。これまでの研修生は303名である。

2) データベース： タイの下水道関係の書類（300冊）、写真（1,000枚）、研修教科書（25冊）を、タイ側のコンピューターに入力している。将来のデータベースシステムのあり方についてタイ側と専門家チームで検討されている。

3) 研修開発： 課題の設定などを含む研究開発活動のあり方についてタイ側と専門家チームの間で検討されている。

(2) プロジェクトの評価

1) 効率性・目標達成度： 研修生評価結果によると、研修内容はおおむね満足されていた。基本からの出発であるデータベース、研究開発は、タイ側と専門家チームで検討を重ねる中で、タイ側にもその重要性が認識されてきている。

2) 計画の妥当性： 今後急速な展開が予測されるタイの下水道事業を支える下水道関係者の数や経験は絶対的に不足しているので、本プロジェクトの必要性は変わらず大きい。

3) 持続性、自立発展性： これまで技術研修所の1組織であった下水道研修センターを独立組織にするなど、プロジェクト終了後も下水道研修センター業務をタイ独自で継続発展させていくよう、準備されつつある。

(3) プロジェクト終了までの計画

- 1) 1995年6月14日にタイ側と実施協議調査団によって結ばれた討議議事録(R/D)に基づいて、プロジェクトを終了時まで推進することを再認識した。
- 2) データベース・研究開発： 更に協議を進めて内容を深めていく予定である。

(4) その他

- 1) 下水道研修センターの活動を更に高度にし拡張していくために、タイ側から本プロジェクト終了後のプロジェクト方式技術協力に対する要望が出された。
- 2) 科学技術環境省からの研修要望： タイの下水道整備は下水道研修センターが所属している内務省のほか、科学技術環境省も所掌している。下水道関係者の不足は科学技術環境省においても同様に深刻であることから、科学技術環境省及び関連機関の担当者から、職員を下水道研修センターで研修させたいとの要望が出された。

3 . プロジェクト活動実施上の諸問題

3 - 1 組織・機構の整備、人員配置、予算確保の状況

(1) 組織・機構の整備

プロジェクトの当初下水道研修センター（TCSW）はタイ国政府内務省（Ministry of Interior）公共事業局（Public Works Department : PWD）技術研究所（Technical Training Institute : TTI）内に設置されていたが、1997年9月にTTIから独立し、PWD内の内部組織として位置づけられている。その組織は図3-1に示すとおりである。

TCSW所長は1996年9月に任命されたMr. Pornsakが引き続き務めている。また、1998年10月の人事異動により、Chief Engineerの1人（TTI担当）であるMr. Rajatinが副局長に昇格し、TCSWを担当することになった。同氏は局長に代わり調査団滞在中も団長の実質的なカウンターパート（C/P）として、合同調整委員会の司会を務めた。両氏ともTCSWプロジェクトの重要性については十分な理解を持っている。TCSWがTTIから独立したことにより、図3-1のようにPWD局長（副局長代行） - TCSW所長というラインが確立し、従前に比べて組織体制は充実してきた。

今回調査団訪問時にタイ側にTCSWの組織について質問したところ、TCSWがTTIから独立したことに伴い、TCSWのAdministrationを充実する旨の返答があった。TCSWのAdministration部門の組織図を図3-2に示す。同部門の定員は所長を含め15名であるが、現在は所長を含め5名が任命されている。今後のTCSWの円滑な運営のためには、残り10名の迅速な充足が必要となる。

また、プロジェクト当初、TCSWはTTIアユタヤ施設が完成次第、現在のPWD本局（サムセン）からアユタヤへ移転予定であったが、プロジェクト実施上の利便性などを考え現状どおりプロジェクト終了まで、PWD本局（サムセン）にTCSWを置くこととした。

プロジェクト終了後については今後の検討項目とした。

TCSWプロジェクトに対するPWD内の他部局（SED、MRD、DOLR等）との協力体制はおおむね良好である（Working Group参照）。図3-3にPWDの組織体制を示す。

バンコク首都圏庁（BMA）における担当部局は排水下水道局（DDS）であり、TCSW関係業務の実施状況は良好である。図3-4にDDSの組織図を示す。DDS内の担当部局はWater Quality Management Divisionである。

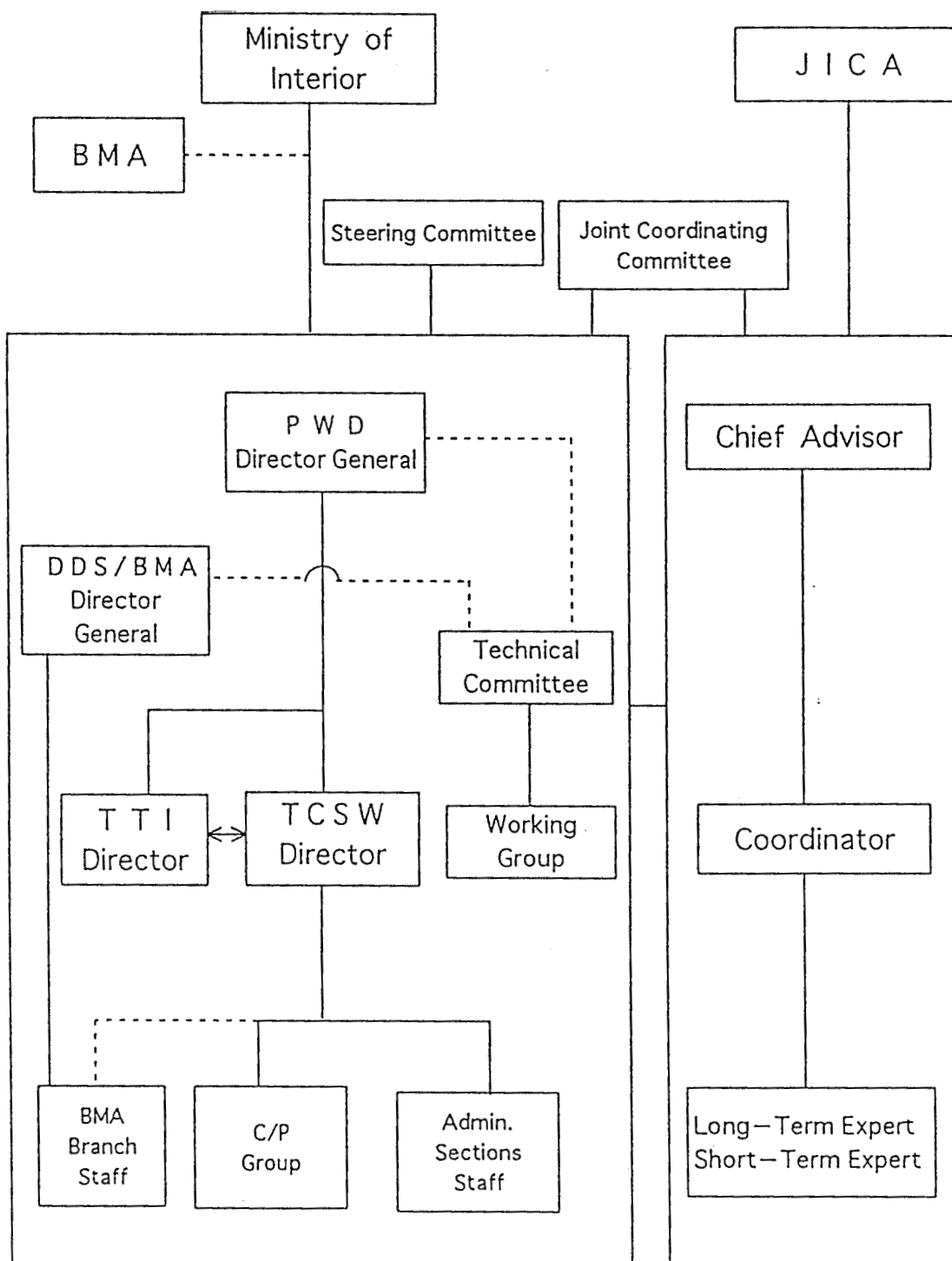


図 3-1 下水道研修センター (TCSW) プロジェクト組織図

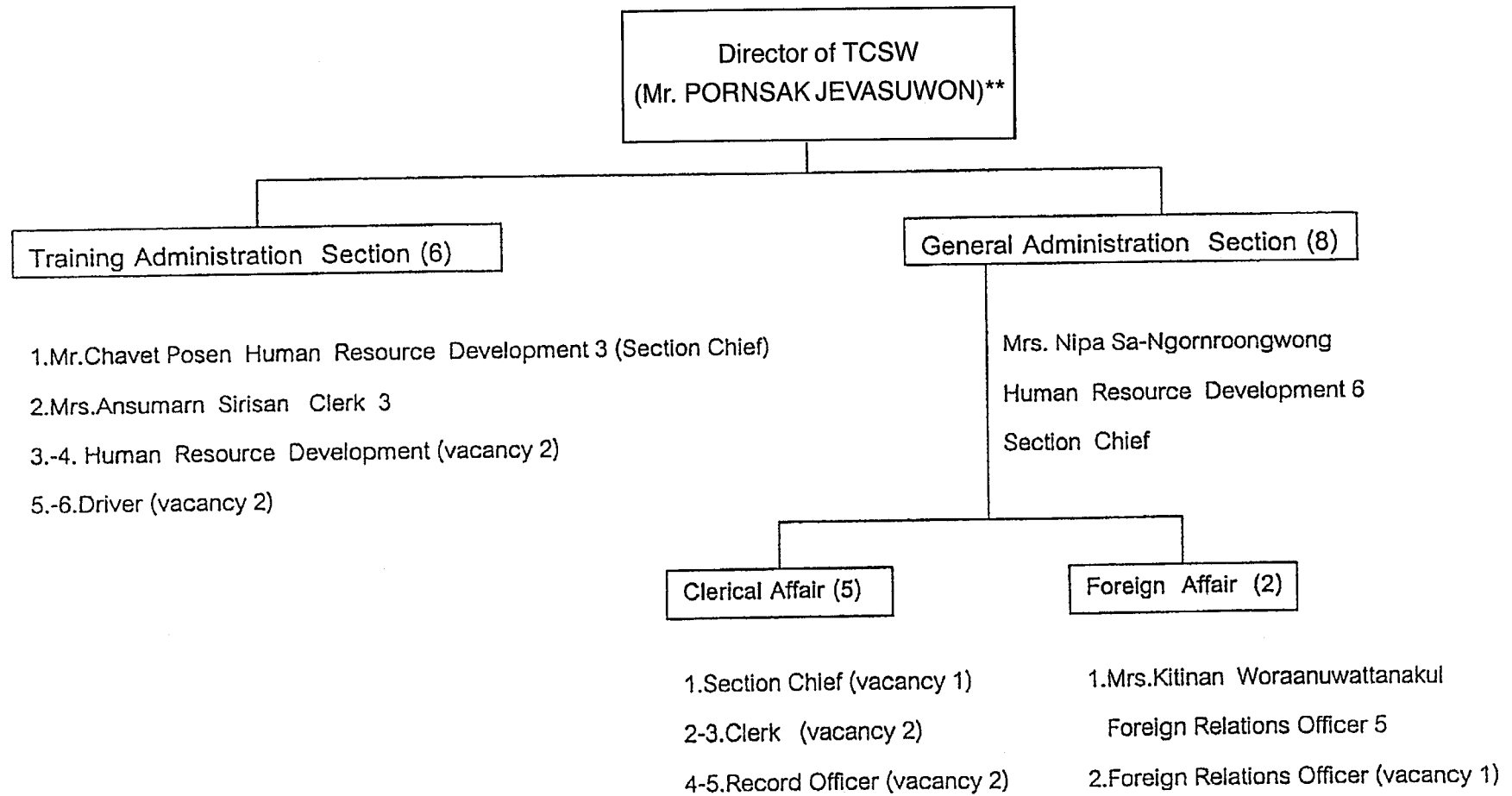


図 3-2 下水道研修センター (TCSW) 組織図

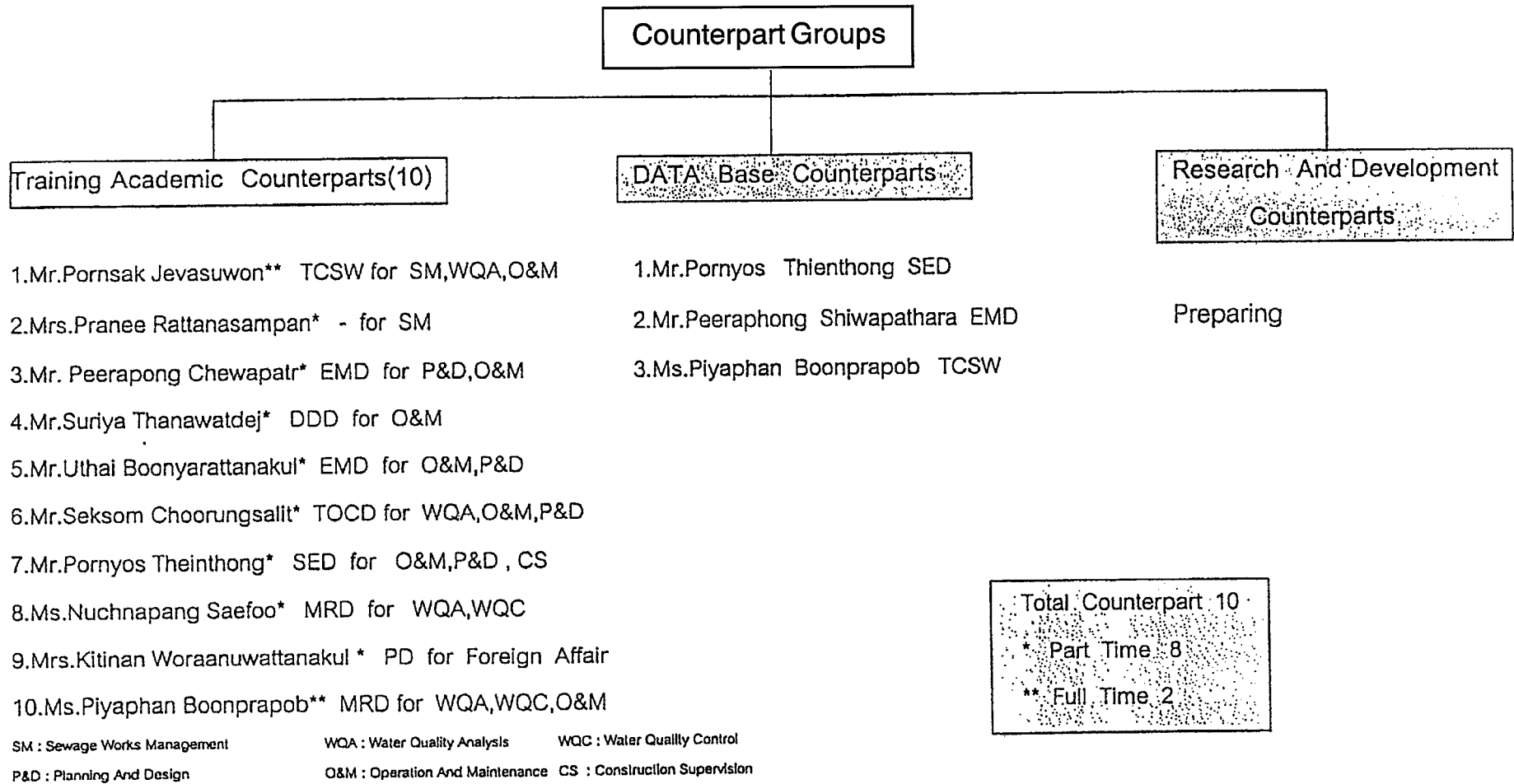


図 3-3 下水道研修センター (TCSW) 組織図

ORGANIZATION CHART OF THE PUBLIC WORKS DEPARTMENT

(23 Nov. 1998)

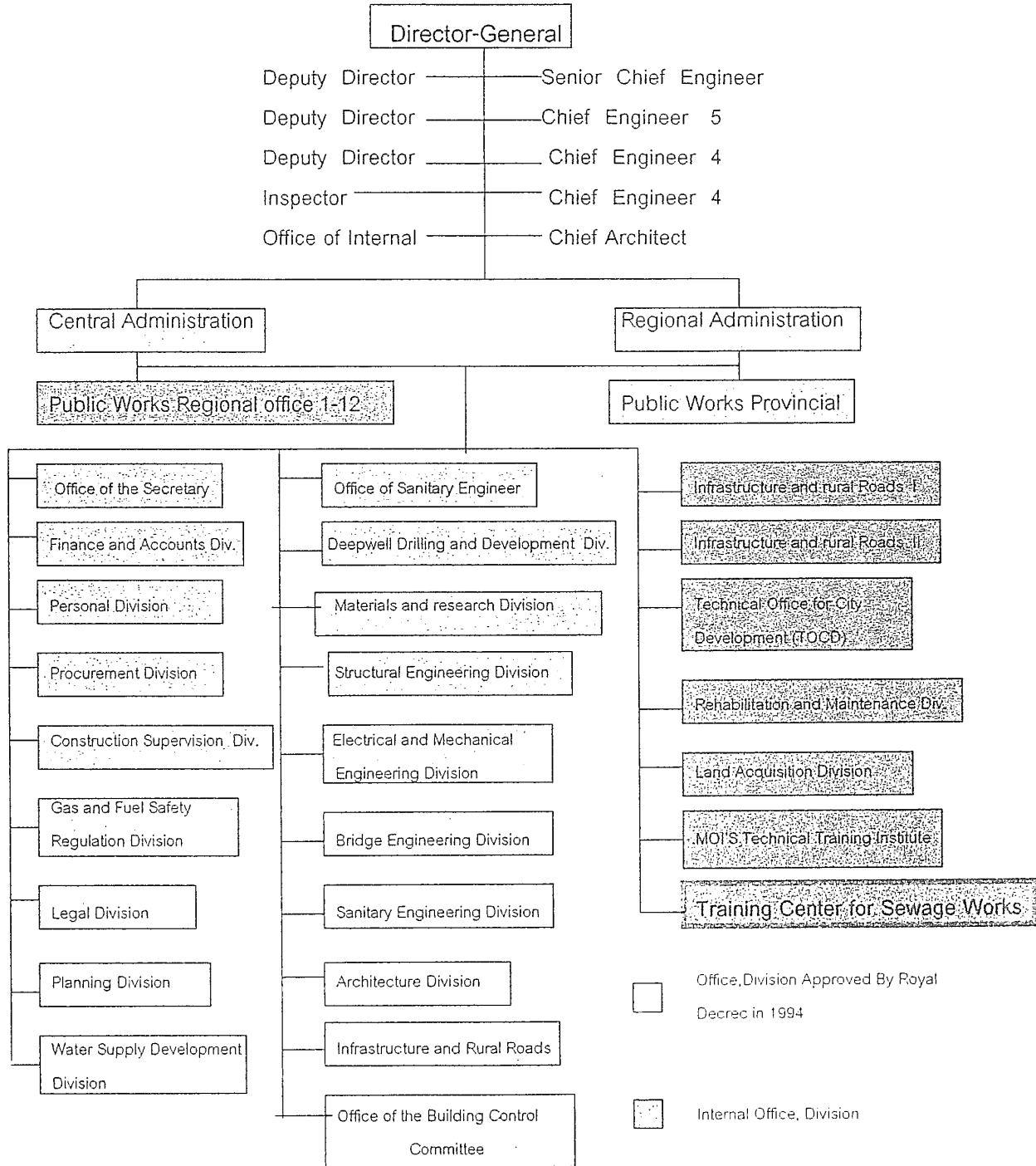


図 3-4 内務省公共事業局 (PWD) 組織図

Department of Drainage and Sewerage

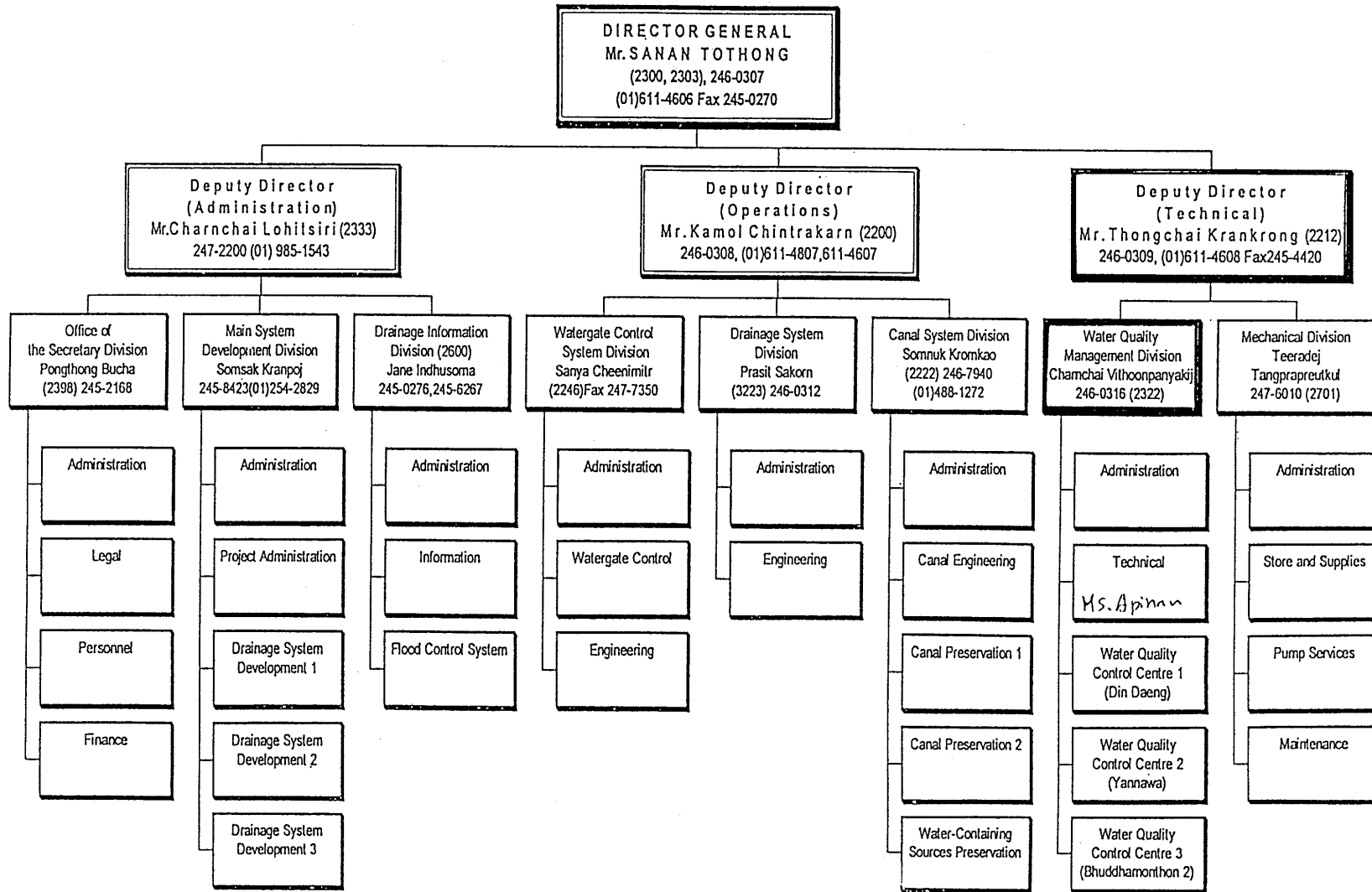


図 3-5 バンコク首都圏庁排水下水道局 (DDS) 組織図

表3-1、表3-2、表3-3にSteering Committee (SC)、Technical Committee (TC)、Joint Coordinating Committee (JCC)のメンバーリストを示す。SCは1998年11月にMr. Rajatinが会議を招集し、TCSWの運営について開催された。(付属資料 - 1 参照)

今後必要に応じ会議が開かれる予定である。また、この会議でDTECの日本課課長よりTCSWのCommitteeに科学技術環境省(MOSTE)の代表も入れ、MOSTE関連官庁の意見も取り入れてはどうかの意見があった。なお、この会議には日本側専門家チームのリーダーも参加している。

TCについては正式に銘打ったものは開かれてはいないが、実質的にコースのテキストづくりを通じて日本側専門家チームとの打合せが行われている。またWorking Group (WG)は表3-4に示すとおり組織されており、テキスト作成済みのコースについては、開講前に講義内容についてWG内で打合せを行っている。

JCCは前回(1996年10月)及び今回の調査団訪問時に開催されている。

(2) 人員配置(カウンターパート)

カウンターパート(C/P)の配置状況については表3-5に示すとおりである。同表からもわかるとおり、PWDからのC/Pは現在9名、BMAからのC/Pは14名となっている。

また、日本国内に受け入れて研修したC/Pのリストを表3-6に示す。これまでに15名のC/Pが日本で研修を受けているが、約半数の7名が退職や転任などにより下水道以外の分野に異動しており、残り8名が講師やWGメンバーとしてTCSWの運営に携わっている。

C/Pの配置に関して日本側は、PWDに対して再度以下の点を申し入れた。

- 1) 日本国内に受入れて研修したC/Pが転任でTCSW関係の職を離れたり退職したりする例が多いので、このようなことのないように努めること。
- 2) C/PのFull time化にはこだわらないが、プロジェクト終了後のTCSWの持続発展性の確保のため、各講義の運営(Management)を任せられるC/Pの配置が必要なこと。

(3) 予算確保の状況

タイ側はタイ会計年度1995年～1998年までに実験室工事(プラトナムパイン本部及びシーパヤ支所)のため約344万バーツを支出し、また13コースの運営費に約58万バーツを支出している。1999年度には今後のコースの開講、データベース及び研究開発のために約80万バーツの予算が確保されているとのことであった。

表 3-1

Member of Steering Committee

(1) Chairperson

-Director General of PWD

(2) Members

-Deputy Director General of PWD

-Director of TCSW

-Deputy Director General of the Department of Local Administration

-Director General of Department of Drainage and Sewerage, BMA

-Chairman of the National Municipal League of Thailand

-Representative of Budget Bureau

-Representative of DTEC

-Director of the Dhmrong-Rajanupard Institute

-Director of the Water Quality Management Division, BMA

-Director of Sanitary Engineering Division, PWD

-Director of Planning Division, PWD

-Director of Electrical and Mechanical Engineering Division, PWD

-Director of Materials and Research Division, PWD

-Director of Techncal Office for City Development, PWD

-Director of Personal Division, PWD

Note : The Chief Advisor may attend the Steering Committee as observer.

表 3-2

Member of Technical Committee

Thai side

1. Mr. Pornsak Jevasuwon Director of TCSW
2. Dr. Kreetha Soykheeree, Sanitary Engineering Division
3. Mr. Nop Roianawanij, Structural Engineering Division
4. Mr. Chatchawal Khumkhamchu, Electrical and Mechanical Engineering Division
5. Mr. Peerapong Ratapana, Electrical and Mechanical Engineering Division
6. Mr. Jiroj Suparbpong, Material and Research Division
7. Ms. Apinan Jaruchaiyakul, Department of Drainage and Sewerage, BMA

Note : The Chief Advisor Other Expert may attend the Technical Committee as observer.

表 3-3

Member of Joint Coordination Committee

(1) Chairpeson

Director General of PWD

(2) Members

Thai side

- 1) Director General of PWD
- 2) Deputy Director General of PWD
- 3) Director of TCSW
- 4) Director General of Department of Drainage and Sewerage, BMA
- 5) Representative of the Department of Technical and Economic Cooperation
- 6) Director of Technical Training Institute, TTI
- 7) Director of the Water Quality Management Division, DDS/BMA
- 8) Director of Sanitary Engineering Division, PWD
- 9) Director of Planning Division, PWD
- 10) Director of Electric and Mechanical Engineering Division, PWD
- 11) Director of Materials and Research Division, PWD
- 12) Director of Technical Office For City Development, PWD
- 13) Director of Personal Division, PWD
- 14) Other Persons concerned

Japanese side

- 1) Chief Advisor (Head of Japanese side)
- 2) Coordinator
- 3) Other Experts
- 4) Representative of the JICA Thailand Office
- 5) Other Persons concerned

Note : Official(s) of the Embassy of Japan may attend the Joint Coordinating Committee as observer(s)

表 3-4 Member List of Working Groups

Course	* Organization	Name	Profession
1 Water Quality Analysis	MRD MRD BMA BMA CU DIW HD	1. Mr. Pornsak Jevasuwon 2. Ms. Uthai Sanginampong 3. Mr. Somchai Sornvane 4. Ms. Chanthana Rirattanapong 5. Mr. Thavat Srisatit 6. Ms. Mari Vijiitjanyakul 7. Ms. Narumon Tapaneeyakul	Scientist Scientist Scientist Scientist
2 Water Quality Control	MRD MRD BMA BMA BMA DIW	1. Mr. Pornsak Jevasuwon 2. Ms. Uthai Sangiampong 3. Ms. Apinan Jaruchaiyakul 4. Mr. Sirilak Leerasing 5. Ms. Busmaporn Chaiwanichaya 6. Mr. Teerapon Kuttawat 7. Mr. Chanchai Kanchanapan	Scientist Scientist Scientist Scientist Scientist Scientist
3 Operation and Maintenance	MRD EMD EMD BMA BMA SED SED PYM	1. Mr. Pornsak Jevasuwon 2. Mr. Peerapong Chevapatr 3. Mr. Thodsaphon Loypetch 4. Mr. Supis Kraimark 5. Mr. Chanin Vichayanont 6. Mr. Tosporn Suddhajinda 7. Mr. Monthon Sutprasert 8. Mr. Montri Chalittaporn	Scientist Electric Engineer Mechanical Engineer Mechanical Engineer Industrial Engineer Sanitary Engineer Sanitary Engineer
4 Planning and Design	EMD EMD BMA SED SED SED	1. Mr. Peerapong Ratthapana 2. Mr. Chatchawal Kunkumcho 3. Ms. Chanthana Rirattanapong 4. Mr. Tosporn Suddhajinda 5. Mr. Kreetha Soikiri 6. Mr. Thepchai Sereeaumnuay	Electric Engineer Mechanical Engineer Scientist Sanitary Engineer Sanitary Engineer Sanitary Engineer
5 Construction Supervision	BMA BMA SED SED SED EMD EMD	1. Mr. Thammanus Chuansanua 2. Mr. Surat Thirakul 3. Mr. Tosporn Suddhajinda 4. Mr. Somkid Chaiwaranurak 5. Mr. Somchai Matawattarakul 6. Mr. Somchai Arunratamut 7. Mr. Chatchawal Kunkumcho	Civil Engineer Civil Engineer Sanitary Engineer Sanitary Engineer Sanitary Engineer Electric Engineer Mechanical Engineer
6 Sewage Works Management	BMA DIW DOLA PYM SED SED SED MRD	1. Mr. Chantong Opatsririwit 2. Mr. Mongkon Putwattana 3. Ms. Atchara Wongate 4. Mr. Montri Chalittaporn 5. Mr. Tosporn Suddhajinda 6. Ms. Somchit Piyasilpa 7. Mr. Pornyot Thienthong 8. Mr. Pornsak Jevauwon	Sanitary Engineer Sanitary Engineer Sanitary Engineer Environmental Engineer Scientist

* MRD : Materials and Research Division/PWD

EMD : Electrical and Mechanical Engineering Division/PWD

DIW : Department of Industrial Works/Ministry of Industry

HD : Health Department/Ministry of Public Health

DOLA : Department of Local Administration Ministry of Interior

SED : Sanitary Engineering Division/PWD

BWA : Bangkok Metropolitan Administration

CU: Chulalongkorn University

PYM : Pattaya Municipality

表 3-5 List of counterparts

1. PWD

Name	Position
Mr. Pornsak Jevasuwon	TCSW Director
Mr. Panee Rettanasampan	Human Resource Development Officer
Mr. Peerapong Chewapatr	Electrical Engineer
Mr. Suriya Thanawatdej	Mechanical Engineer
Mr. Uthai Boonyarattanakul	Electrical Engineer
Mr. Seksom Choorungsalit	Civil Engineer
Mr. Pornyot Thienthong	Environmental Engineer
Ms. Nuchapang Saefoo	Scientist
Ms. Piyaphan Boonprapob	Scientist

2. BMA

Name	Position
Mr. Chanin Vichayanon	Industrial Engineer
Mr. Supis Kraimark	Dip in Mechanical Engineer
Mr. Opas Seangtongprakai	Sanitary Scientist
Mr. Pracha Keawprang	Sanitary Scientist
Mr. Rodhpol Jturapreuk	Industrial Engineer
Ms. Apinan Jaruchaiyakul	Sanitary Scientist
Ms. Busmaporn Chaiwanichaya	Sanitary Scientist
Ms. Sermsuk Pakkudtung	Sanitary Scientist
Mr. Teerapon Kuttawas	Sanitary Scientist
Mr. Somchai Sornvanee	Sanitary Scientist
Ms. Sirilak Leerasing	Sanitary Scientist
Ms. Chantana Pirattanapong	Scientist
Mr. Arsa Sukkhang	Electrical Engineer
Mr. Vinus Maneewonges	Mechanical Technician

表 3-6 List of Counterparts in Japan

	Name of Counterparts	Organization	Field of Training	Duration	Role in TCSW
1	Vijit Santipatanckili	PWD	Operation and Maintenance for Sewage Facilities	17/8/1995 to 19/10/1995	
2	Panee Ratanasampan	PWD	Training Management	16/1/1996 to 7/2/1996	下水道経営 (C/P)
3	Pornsak Jevasuwon	PWD	Sewage Works Management	14/10/1996 to 27/10/1996	TCSW所長
4	Somchal Sorrvanee	PWD	Sewage Technology	20/8/1996 to 20/11/1996	工事監督 (WG)
5	Rodhpol Jturapreuk	BMA	Operation and Maintenance for Sewage Facilities	12/8/1996 to 13/10/1996	
6	Apinan Jaruchaiyakul	BMA	Sewage Works Management	14/10/1996 to 27/10/1996	BMA窓口、水質分析 (WG)
7	Sitti Honghathai	PWD	Training Management	2/31/1997 to 14/3/1997	
8	Busmaporn Chaiwanichaya	BMA	Industrial Waste Water Treatment Technique	21/7/1997 to 4/12/1997	
9	Ophat Seagtongprakai	BMA	Operation and Maintenance for Sewage Facilities	11/8/1997 to 13/10/1997	維持管理 (講師)
10	Peerapong Chavapatr	PWD	Sewage Technology	24/11/1997 to 12/12/1997	維持管理 (WG)
11	Chokechai Tantanawat	PWD	Sewage Technology	24/11/1997 to 12/12/1997	
12	Medhi Hongsuoi	PWD	Sewage Technology	1/10/1998 to 15/10/1998	
13	Sirilak Leerasiri	BMA	Domestic Waste Water Treatment Technique	15/8/1998 to 14/12/1998	
14	Sekson Churangsarit	PWD	Waste Water Management	1/8/1998 to 21/8/1998	計画・設計、維持管理 (講師)
15	Supis Kraimark	BMA	Operation and Maintenance for Sewage Facilities	15/8/1998 to 14/10/1998	維持管理 (講師)

3 - 2 プロジェクト活動の進捗状況

(1) 研修活動

1) 研修コースの開催状況

研修コースは、1997年2月のWater Quality Controlに始まり、1998年11月のPlanning and Design (Basic) まで4分野6コース14回が開催され、これまでに研修を終了した研修生数は303名に達している。

1996年10月の計画打合せ調査団時の各コース開講計画と1998年11月までの実績は以下のとおりであった。

Planning and Design (Basic): 計画3回 / 実績3回

Planning and Design (Intermediate): 計画1回 / 実績1回

Operation and Maintenance (Basic 1): 計画7回 / 実績4回 (3回減少)

Operation and Maintenance (Basic 2): 計画2回 / 実績1回 (1回減少)

Water Quality Analysis (Basic): 計画3回 / 実績2回 (1回減少)

Water Quality Control : 計画8回 / 実績3回 (5回減少)

Planning and Design (Advanced): 未開講

Construction and Supervision : 未開講

Water Quality Analysis (Advanced): 未開講

Management of Sewage Works : 未開講

当初計画と実績が異なるのは、1997年7月以降のタイ国金融危機の影響で、タイ国政府予算が大幅に削減されたことによるもので、3分野4コースで開講が中止となっている。このためTCSWでは1コース当たりの受講者人数を増やして対応している。

表3-7に内務省公共事業局(PWD)本部、PWD地方事務所、バンコク首都圏庁(BMA)、地方自治体から各研修コースに参加した研修生の数をまとめて示す。

研修生の参加者数の内訳を比較するとBMAからは56名とPWDからの参加者に比べて少ない。(特にWater Quality Analysisコース、Operation and Maintenanceコース及びWater Quality Controlコース)

この点についてBMAのChanchai部長に聞いたところ以下の回答があった。

1997年にBMAは庁内の組織が改正され、BMA内の区(District)が37区から50区に増え、区役所職員の増員のため、下水排水局(DDS)の職員の一部が区役所へ異動した。このため当初研修に参加させる予定の人員を派遣できなかった。

BMAでは今後2年から3年のうちに複数の下水処理場が供用を開始する。このため維持管理人員の確保と技術向上が当面の課題である。また1997年度、大規模オフィスやホテル等の事業所排水の水質規制実施権がBMAより科学技術環境省汚染対策局(PCD/MOSTE)

に移行した。しかしPCD/MOSTEには水質分析・規制を行うスタッフが十分ではなく、BMAにPCD/MOSTEから協力要請があった。BMAとしてはこの協力要請に応えるつもりであり、水質分析・規制のスタッフを養成する必要がある。以上のことから、BMAとTCSWの研修に期待するところが多く、今後はできる限り研修生をTCSW研修に参加させるとのことであった。

表3-7 PROJECT ACTIVITIES (TRAINING COURSES)

1.Planning and Design(Basic)Course

				1				2				3				4				Total			
DURATION				24/2/1997-7/3/1997				6/1/1998-16/1/1998				9/11/1998-19/11/1998											
No. of TRAINEE				17				25				26								68			
PWD 1	PWD 2	BMA	LOCAL	0	12	2	3	9	10	3	3	11	3	7	5					20	25	12	11

PWD 1 : PWD HEAD OFFICE

PWD 2 : PWD PROVINCIAL OFFICE

2.Planning and Design(Intermediate)Course

				1				2				3				4				Total			
DURATION				17/8/1998-28/8/1998																			
No. of TRAINEE				22																22			
PWD 1	PWD 2	BMA	LOCAL	4	9	6	3													4	9	6	3

PWD 1 : PWD HEAD OFFICE

PWD 2 : PWD PROVINCIAL OFFICE

3.Operation and Maintenance(Basic 1)Course

				1				2				3				4				Total			
DURATION				17/3/1997-26/3/1997				2/6/1997-13/6/1997				23/3/1998-3/4/1998				18/5/1998-29/5/2998							
No. of TRAINEE				18				19				23				17				77			
PWD 1	PWD 2	BMA	LOCAL	0	4	0	14	0	3	0	16	5	3	9	6	1	4	6	6	6	14	15	42

PWD 1 : PWD HEAD OFFICE

PWD 2 : PWD PROVINCIAL OFFICE

4.Operation and Maintenance(Basic 2)Course

				1				2				3				4				Total (BASIC1+2)			
DURATION				3/8/1998-14/8/1998																			
No. of TRAINEE				28																105			
PWD 1	PWD 2	BMA	LOCAL	3	5	1	19													9	19	16	61

PWD 1 : PWD HEAD OFFICE

PWD 2 : PWD PROVINCIAL OFFICE

5.Water Quality Analysis(Basic)Course

				1				2				3				4				Total			
DURATION				24/2/1997-7/3/1997				20/4/1998-1/5/1998															
No. of TRAINEE				13				30												43			
PWD 1	PWD 2	BMA	LOCAL	0	6	0	7	4	18	4	4									4	24	4	11

PWD 1 : PWD HEAD OFFICE

PWD 2 : PWD PROVINCIAL OFFICE

6. Water Quality Control Course

				1				2				3				4				Total			
DURATION				10/2/1997-14/2/1997				23/6/1997-27/6/1997				15/6/1998-19/6/1998											
No. of TRAINEE				18				26				21								65			
PWD 1	PWD 2	BMA	LOCAL	0	5	3	10	0	8	5	13	2	4	10	5					2	17	18	28

PWD 1 : PWD HEAD OFFICE

PWD 2 : PWD PROVINCIAL OFFICE

GRANO TOTAL				Total			
No. of TRAINEE				303			
PWD 1	PWD 2	BMA	LOCAL	39	94	56	114

PWD 1 : PWD HEAD OFFICE

PWD 2 : PWD PROVINCIAL OFFICE

これまで開講された、Planning and Design (Basic) 同 (Intermediate) Operation and Maintenance (Basic 1) 同 (Basic 2) Water Quality Analysis (Basic) Water Quality Control のカリキュラムを表 3-8 に示す。

2) 研修生の講義に対する評価

Planning and Design (Intermediate) コース、Operation and Maintenance (Basic 2) コース及び Water Quality Control コースの講義内容に対する研修生の評価例 (理解度) を図 3-6 に示す。

研修生の評価はおおむね良好であり、他の講義についても同様の結果であった。

表3-8 各コースカリキュラム

(1) Planning and Design Basic Course Curriculum

DAY	AM		PM
1ST	OPENING CEREMONY	ORIENTATION	SEWAGE WORKS IN BANGKOK [Mr. Chanchai(BMA)]
2ND	BASIC KNOWLEDGE OF SEWERAGE SYSTEM AND FACILITIES (history, purpose, sewer, pumping station, treatment plant) [Mr. Pisut(PWD)]		
3RD	SEWERAGE SYSTEM PLANNING (MP, FS, DD, explanation of example) [Mr. Thosseporn(PWD)]		
4TH	DESIGN OF DRAINAGE SYSTEM (Basic design of storm sewer and pumping station) [Ms. Somchit(PWD)]		
5TH	SEWERAGE SYSTEM ESTIMATION (cost estimate) [Mr. Monton(PWD)]	SEWERAGE SYSTEM MANAGENENT (maintenance cost) [Mr. Jane(BMA)]	
6TH	CASE STADY (explanation of Chantaburi sewage system) [Mr. Kreetta(PWD)]	SITE VISIT (Bangkok •• Sri Racha •• Chantaburi)	
7TH	SITE VISIT (Chantaburi) [Mr. Kreetta(PWD)]	(Chantaburi •• Bangkok)	
8TH	SITE VISIT (Huay Khwang treatment plant, Construction of Ratanakoshin project) [Mr. Narong, Ms. Suthimon(BMA)]		
9TH	SEWAGE WORKS IN THAILAND [Mr. Supol(PWD)]	CLOSING CEREMONY	

(2) Planning and Design Intermediate Course Curriulum

DAY	AM		PM
1ST	OPENING CEREMONY	ORIENTATION	PROCEDURE OF SEWERAGE PLANNING AND DESIGN [Mr. Thossaporn(PWD)]
2ND	DESIGN OF SEWER(I) (II) (Determination of the quality & quantity of wastewater & stormwater) PRACTECE (Population estimation, etc.) [Mr. Pornyot(PWD)] use of Computer system		
3RD	DESIGN OF SEWER(III) (Capacity of sewer, sewer foundation, manhole, diversion chamber) [Mr. Thossaporn(PWD)]		
4TH	DESIGN OF EXERCISE OF SEWER PRACTICE (Calculation of flow calculation table, Drawing the vertical section) use of Computer system		
5TH	[Mr. Kreetta(PWD), Mr. Meguro(JICA)]		
6TH	DESIGN OF PUMPING STATION [Ms. Somchit(PWD)]	BASIC ELECTRICAL ENGINEERING [Mr. Uthai Jitsee(PWD)]	
7TH	DESIGN OF STABILIZATION POND [Ms. Somchit(PWD)]	PRACTICE Capacity calculation of SP	
8TH	DESIGN OF AERATED LAGOON [Mr. Montomo(PWD)]	PRACTICE Capacity calculation of AL	
9TH	SITE VISIT (Rayong project) [Ms. Somchit(PWD)]		
10TH	CLOSING CEREMONY		

(3) O & M(Basic-1)Course Schedule

Date	a.m. (3Hr)	p.m. (3Hr)
1ST	Opening (PWD, Samsen)	Basic technology of wastewater treatment(1/2) (PWD Samsen) Mr. Sakesom
2ND	Basic technology of wastewater treatment(2/2) (TTI) Mr. Sakesom	Stabilization Pond and Aerated Lagoon system (TTI) Mr. Sakesom
3RD	Site Visit to Nakornrajchasma(SP)	
4TH	Collection system (TTI) Mr. Monton	Operation and maintenance of pipe (TTI) Mr. Monton
5TH	Site Visit to Hua Hin(OD)	
6TH	Pumping Station (TTI) Mr. Uthai	Safety (TTI) Mr. Supisl
7TH	Practice of Pump maintenance (Sri Praya) Mr. Chanin & Mr. Supist	
8TH	Site Visit to Thai Numtip Prathumthani (Soft Drinks Factory)	
5/28 (THU)	Water Quality Analysis (Sri Praya) Mr. Ophas	
9TH	Closing Ceremony	

(4) O & M (Basic-2) Course Schedule

Date	a.m. (3Hr)		p.m. (3Hr)	
1ST		Opening (PWD. Samsen)	Operation (Activated Sludge & Oxidation Ditch(1/2) (PWD Samsen) Mr. Kreta	
2ND	Operation (Activated Sludge & Oxidation Ditch(2/2) (TTI) Mr. Yamamoto		Electric equipment for sewage works (1/2) (TTI) Mr. Uthai & Mr. Supis	
3RD	Electric equipment for sewage works (2/2) (TTI) Mr. Uthai & Mr. Supis		Trouble shooting (TTI) Mr. Pornsak	
4TH	Practice of Electrical Equipment (TTI) Mr. Uthai & Mr. Supis			
5TH	Site Visit(OD) (Sri racha)			
6TH	Practice of Pump Operation (TTI) Mr. Uthai & Mr. Supis			
7TH	Site Visit(Sludge Treatment Plant) (AM : Sipraya PM : Huaykwang)			
8TH	Practice of Dewatering Machine (TTI) Mr. Uthai & Mr. Supis			
9TH	Sludge treatment and equipment (PWD Samsen) Mr. Sekson		Sewage Works in Thailand (PWD Samsen) Mr. Supol	Closing (PWD Samsen)

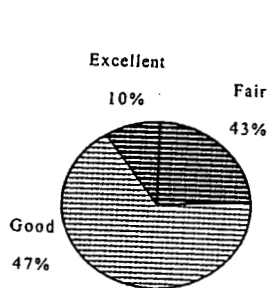
(5) Wqa Curriculum

	AM		PM
1ST	REGISTRATION/ OPENING CEREMONY	FUNDAMENTALS OF CHEMISTRY (Ms. Piyaphan)	FUNDAMENTALS OF BIOLOGY (Ms. Nuchnapang)
2ND	BASIC TECHNOLOGY OF WASTEWATER TREATMENT (Mr. Seksom)		TROUBLESHOOTING IN WATER QUALITY MANAGEMENT (Mr. Pornsak)
3RD	FUNDAMENTALS OF WATER QUALITY ANALYSIS (Mr. Somchai* et a,)		LABORATORY WORK-Transparency, pH, SS- (Mr. Pornsak et al)
4TH	FUNDAMENTALS WATER QUALITY ANALYSIS (Mr. Somchai* et a,)		LABORATORY WORK-BOD, COD- (Ms. Chantana* et al)
5TH	SITE VISIT TO PATTAYA(Mr. Pornsal el al)		
6TH	FUNDAMENTALS OF WATER QUALITY ANALYSIS (Mr. Somchai* et a,)		LABORATORY WORK-Col i forms, BOD- (Ms. Chantana* et al)
7TH	FUNDAMENTALS OF WATER QUALITY ANALYSIS (Mr. Somchai* et a,)		LABORATORY WORK-Col i forms, Microscopy, MLSS- (Ms. Chantana* et al)
8TH	DATA PROCESSING(Mr. Somchai*)		PARAMETERS AND PLANT OPERATION (Mr. Pornsak)
9TH	SITE VISIT TO SRI PHRAYA (Mr. Somcai* et al)		
10TH	DISCUSSION ABOUT WATER QUALITY ISSUES(Mr. Pornsak et al)		EVALUATION/CLOSING CEREMONY

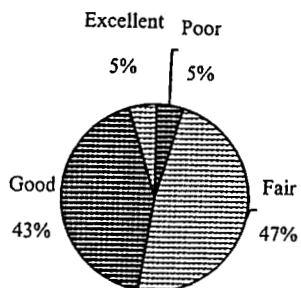
(6) Wqc Currivulum

	AM		PM
1ST	REGISTRATION/ OPENING CEREMONY	LAW OF WATRE QUALITY CONTROL (Mr. Apinan*)	WASTEWATER TREATMENT TECHNOLOGY (Mr. Pisut)
2ND	WASTEWATER TREATMENT TECHNOLOGY (Mr. Pisut)		INSPECTION PROCEDUER (Ms. Sirirak*)
3RD	PREPARATION FOR INSPECTION (Mr. Spinan et al*)		SITE VISIT TO A BEER FACTORY (Mr. Theerapol et al*)
4TH	SITE WISIT TO HAUY KWANG (Ms. Sirirak et al*)		SITE VISIT TO HOSPITAL (Mr. Theerapol et al*)
5TH	DISCUSSION ABOUT INSPECTION (Ms. Sirirak*)		CONCLUSION/ CLOSING CEREMONY

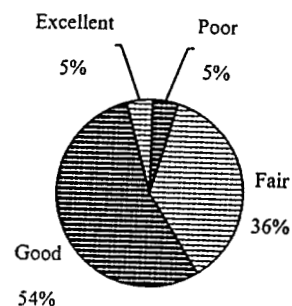
1. Planning and Design (Intermediate) コース (1998年8月)



下水管渠の設計

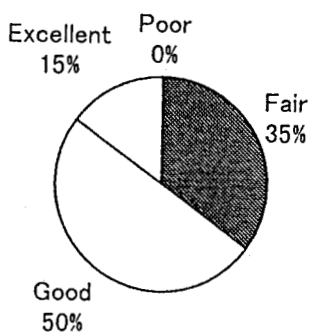


ポンプ場の設計

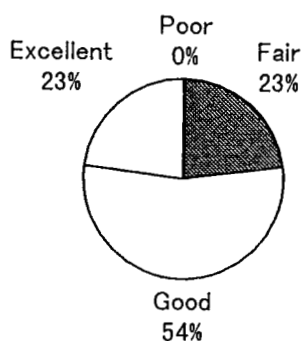


下水処理場の設計

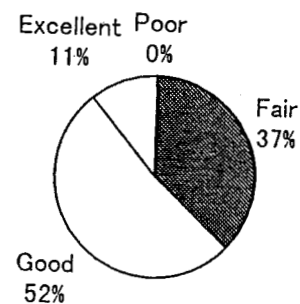
2. Operation and Maintenance (Basic 2) コース (1998年8月)



ポンプ維持管理実習

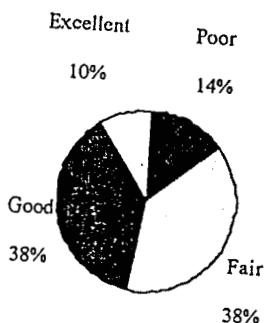


処理場の維持管理



電気設備の概要

3. Water Quality Control コース (1998年6月)



事業所排水規制の関連法規



水質分析実習



問題分析

図5-0 研修生の講義内容に対する理解度の評価

(2) データベース作成

既存の設計資料等の収集、分類を行っている。これまで収集した資料のリストを表3-9に示す。現在までに300冊の文書、1,000枚の下水処理場の写真及び13コースのテキスト(英文)、12コースのテキスト(タイ語)を収集し、内容をパソコンに入力してデータベース化し、パソコン画面に呼び出すことにより、研修用テキストの作成や研修資料として利用が可能となっている。写真-1にデータベース化した下水処理場の写真の例を示す。

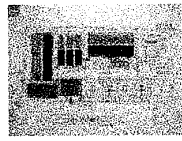
表3-9 TCSW 収集データベース

項 目	内 容
参考図書	300冊
タイ国の下水道施設の写真	約1,000枚
タイ語研修テキスト(コースごと)	12冊
英文研修テキスト(コースごと)	13冊

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写真 - 1 データベース化した下水処理場

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(3) 研究開発

研究開発活動は当初計画どおり 1998 年 10 月から開始しており、現在、研究課題について専門家と C/P で協議を実施している。1997 年度、調査研究の可能性を探るために実施した短期専門家による予備的調査研究を基に、水質分野を中心に問題点の洗い出しを行い、いくつかの研究課題を整理しつつある。専門家 C/P で協議している暫定的な研究課題の例を下記に示す。

1) PWD の研究課題

海水中の塩分が活性汚染処理に及ぼす影響

安定化池の植物プランクトンの状態判断

トイレトペーパーの下水中での分解

グレイウォーターの自浄化用

インターセプター越流水の水質

2) BMA の研究課題

下水の生分解性に及ぼす糞尿の影響

運河の懸濁物質が硝化に及ぼす影響

底泥中の重金属が硝化に及ぼす影響

塩素消毒が微生物群集に及ぼす影響

廃水中の脂肪を分解する微生物の探索

3 - 3 供与機材の利用状況

(1) 施設

技術研修所 (TTI) 内の下水道研修センター (TCSW) プラトナムパイン本部及びバンコク首都圏庁 (BMA) シーパヤ下水処理場内の TCSW シーパヤ支所施設は講義が開始された 1997 年 2 月までに整備が終了している。

1) プラトナムパイン本部の施設は以下のとおり。

講義室

専門家執務室

実験室

研修棟

2) シーパヤ支所

講義室

実験室

(2) 施設

プロジェクトで購入することを要望された機材のうち、1995年以來これまでに供与した機材のリストを表3-10に示す。供与された機材は講義の開講にあわせて使用され、良く管理されていた。(写真-2～写真-7)一方、水質分析機器の一部にまだ使用されていないものがあった。これは、コースが未開講であったり、研究開発活動がまだ本格化していないこと、またタイ国経済危機によるタイ側の予算カットで1998年度(タイ会計年度)に分析用の備品など(試薬やカラム等)が確保できなかったためである。

また、シーパヤ支所に供与された水質分析器の一部がBMA本部の水質実験室に移設されていた。この点についてBMA側に質問したところ以下の回答があった。

- 1) 分析要員が常駐し、分析用試薬などの消耗品が完備されているBMA本部の水質実験室の方が、ガスクロマトグラフ、TOC分析器、原子吸光分析計等の高度な分析機器の維持管理が容易である。
- 2) WQCなど研修の一部はBMA本部で行う予定であり、問題はない。
- 3) 移設についてはTCSWの了解を得ている。

以上のことから、水質分析機器の移設については特に問題はないと考えられる。

表 3-10 供与機材リスト

List of the Machinery and Equipment (1)

EQUIPMENT LIST OF JAPANESE F.Y. 1995

1. EQUIPMENT FOR LABORATORY

No.	Item	Model	Quantity	
			PWD	BMA
1-1	FUME HOOD WITH EXHAUST FUN	YAMATO / FHC-150PZ	2	2
1-2	CONSTANT TEMPERATURE OVEN	YAMATO / DN-610	1	1
1-3	LOW TEMPERATURE INCUBATOR	YAMATO / IN-800	1	1
1-4	INCUBATOR	YAMATO / IN-600	1	1
1-5	DRYING STERILIZER	YAMATO / SG-600	1	1
1-6	AUTOCLAVE WITH ACCESSORY	YAMATO / SM-32	1	1
1-7	WATER BATH WITH TRANSFORMER	YAMATO / BS-65	1	1
1-8	VACUUM PUMP	YAMATO / PD-102	1	1
1-9	GLASS DESICATOR	SIMEX / ϕ 30cm	2	2
1-10	ACRYL DESICATOR	YAMATO / FH-1	2	2
1-11	COD METER WITH ACCESSORIES	CENTRAL KAGAKU / HC-407	1	1
1-12	MUFFLE FURNANCE	YAMATO / FM-48	1	1
1-13	CENTRIFUGE WITH ACCESSORIES	HITACHI / CT6L	1	1
1-14	AUTO-STILL	YAMATO / WG-710	1	1
1-15	MANIFOLD TEST SET	SEKIYA / SA-3	3	-
1-16	ASPIRATOR	YAMATO / WP-25	3	-
1-17	OXYGEN METER	YSI / 59	1	1
1-18	TEST TUBE MIXER WITH TRANSFORMER	YAMATO / MT-51	2	-
1-19	WATER SAMPLER	GEM / 410	-	3
1-20	ANALYTICAL BALANCE	SARTORIUS / BP 300S	1	1
1-21	ELECTRONIC BLANCE	SARTORIUS / BP 1200	1	1
1-22	MAGNETIC STIRRER WITH HEATING ELEMENT	FRANZ MORATE / M21/1	2	2
1-23	COD REACTOR WITH REAGENT	HACH /	-	1
1-24	SERIAL DISTILLATION APPARATUS	GERHARDT / KI 12/36	-	1
1-25	SERIAL DIGESTION APPARATUS	GERHARDT / KI 11/26	-	1
1-26	FAT DETERMINATION APPARATUS	GERHARDT / EV 6A II/16	-	1
1-27	BALANCE TABLE	LOCAL MADE / BT50	1	1
1-28	LABORATORY TABLE		-	1
1-29	BOTTLE CABINET		-	1
1-30	SPECTROPHOTOMETER	SHIMADZU / UV-1601PC	1	1
1-31	SPECTROPHOTOMETER	HACH / DR 2000	-	1
1-32	MICROSCOPE WITH ACCESSORIES	OLYMPUS / BX40	1	-
1-33	pH METER WITH ACCESSORIES	HORIBA / D-12	1	1
1-34	GLASS/PLASTIC WARES etc.		1	-

2. EQUIPMENT FOR OPERATION AND MAINTENANCE TRAINING

No.	Item	Model	Quantity	
			PWD	BMA
2-1	CLAMP ADAPTER	EXTECH /	1	1
2-2	MEGGER TESTER	KYORITSU / 3301	1	1
2-3	TACHOMETER(DIRECT TYPE)	DIGICON / DT250TP	1	1
2-4	TACHOMETER(STROBOSCOPIC TYPE)	DIGICON / SB-15	1	1
2-5	VIBRATION METER	SPM / VIB-10	1	1
2-6	PORTABLE THERMOMETER	UNIVERSAL / DT20	1	1
2-7	PORTABLE DO METER	HORIBA / OM-14	1	1
2-8	PORTABLE MLSS METER	KRK / SS-1Z	1	1

List of the Machinery and Equipment (2)

3. AUDIOVISUAL & COMMON EQUIPMENT

No.	Item	Model	Quantity	
			PWD	BMA
3-1	ELECTRONIC BOARD	PLUS / BF-050	3	1
3-2	COPY MACHINE WITH ACCESSORIES	XEROX / CDV450	1	-
3-3	BOOKLETMAKING SYSTEM	GESTETNER / DBM100	1	-
3-4	COLLATING SYSTEM	GESTETNER / DC-10	1	-
3-5	VIDEO DATA PROJECTOR	SONY / VPH-1252 QM	1	-
3-6	INTERFACE UNIT	SONY / IFU-1271 M	1	-
3-7	VIDEO PLAYER	SONY / SLV-X831PS	1	-
3-8	DISC PLAYER	SONY / MDP-A800K	1	-
3-9	CASSETTE DECK	TEAC / W-800R	1	-
3-10	SLIDE PROJECTOR	ELMO / 253AF	1	-
3-11	VISUAL PRESENTER	ELMO / EV-550AF	1	-
3-12	SCREEN	BRETFORD / 9001 M 200"	1	-
3-13	MIXING CONSOLE	TOA / CX-124	1	-
3-14	POWER AMPLIFIER	TOA / P-1060D	1	-
3-15	GRAPHIC EQUALIZER	TOA / E-1231	2	-
3-16	SPEAKER	TOA / 300SP	2	-
3-17	DYNAMIC MICROPHONE	TOA / J-1	2	-
3-18	WIRELESS PRE-AMPLIFIER	TOA / WT-770	1	-
3-19	WIRELESS TUNER UNIT	TOA / WTU-770	2	-
3-20	WIRELESS MICROPHONE (LAVALIERE)	TOA / WM-370	1	-
3-21	WIRELESS MICROPHONE (HAND-HELD)	TOA / WM-270	1	-
3-22	WHIP ANTENNA	TOA / YW-600	1	-
3-23	INTERFACE SWITCH	SONY / PC-1271M	1	-
3-24	SCAN BOARD	SONY / IFB-3000	1	-
3-25	CONNECTION CABLE	SONY / SIC-10	1	-
3-26	CONNECTION CABLE	SONY / SIC-22	1	-
3-27	BOARD	SONY / IFB-20	1	-
3-28	INSTALLATION FOR AUDIOVISUAL SYSTEM		1	-

4. VEHICLES

No.	Item	Model	Quantity	
			PWD	BMA
4-1	BUS	HINO / AK176KC BUS	1	-
4-2	MICRO BUS	TOYOTA / LH112R-EBMRS	1	-

List of the Machinery and Equipment (3)

EQUIPMENT LIST OF JAPANESE F.Y. 1996

1. EQUIPMENT FOR THE OPERATION & MAINTENANCE TRAINING

No.	Item	Model	Quantity	
			PWD	BMA
1-1	BELT TYPE PRESSURE DEHYDRATOR TEST UNIT	TSK ENGINEERING CO., LTD	1	-
1-2	TRAINING UNIT FOR ELECTRIC POWER DISTRIBUTION	TSK ENGINEERING CO., LTD	1	-
1-3	TRAINING UNIT FOR THE PUMP OPERATION	TSK ENGINEERING CO., LTD	1	-
1-4	TRAINING UNIT FOR INSTRUMENTATION	TSK ENGINEERING CO., LTD	1	-
1-5	TRAINING UNIT FOR SEQUENCE CONTROL	TSK ENGINEERING CO., LTD	1	-
1-6	TRAINING UNIT FOR EARTHING	TSK ENGINEERING CO., LTD	1	-
1-7	SPARE PARTS & MANUAL FOR EACH TRAINING UNITS	TSK ENGINEERING CO., LTD	1	-
1-8	BUTTERFLY VALVE	KITZ / G-10AJME4	5	-
1-9	GLOVE VALVE	KITZ / 10FCJ4	5	-
1-10	CHECK VALVE	KITZ / 125FC04	5	-
1-11	GATE VALVE	KITZ / 10FCL4	5	-
1-12	BALL VALVE	KITZ / T2"	5	-
1-13	PUMP SET	TSURUMI / TOK3-4POT	5	-

2. EQUIPMENT FOR LABORATORY

No.	Item	Model	Quantity	
			PWD	BMA
2-1	ATOMIC ABSORPTION SPECTROPHOTOMETER	SHIMADZU / AA-6701F	1	-
2-2	MICROSCOPE WITH CCD CAMERA	OLYMPUS / BX40	-	1
2-3	DO METER WITH BOD PROBE	YSI / 52	5	5
2-4	ANALYTICAL BALANCE	SARTORIUS / AC211S	2	2
2-5	pH METER	TOA / HM-7E	3	3
2-6	pH METER	TOA / HM-12P	2	2
2-7	HIGH PERFORMANCE LIQUID CHROMATOGRAPH SYSTEM	SHIMADZU / LC-10ATVP	1	-
2-8	SPECTROFLUOROPHOTOMETER	SHIMADZU / RF-5301	1	-
2-9	REFLECTED LIGHT FLUORESCENCE	OLYMPUS / BX-FLA4-E02	1	-
2-10	AUTOMATIC PHOTOMICROGRAPHY SYSTEM	OLYMPUS / PM20-3SDX1	1	-

3. AUDIOVISUAL & COMMON EQUIPMENT

No.	Item	Model	Quantity	
			PWD	BMA
3-1	VIDEO PROJECTOR WITH SCREEN	SANYO / PLC-250	-	1
3-2	PERSONAL COMPUTER SET	ARMAS DASH / 166HMX PENTIUM	-	1
3-3	COLOR LASER PRINTER	HP / COLOR LASER JET 5	-	1
3-4	COLOR SCANNER	HP / SCAN JET 4C	-	1
3-5	DIGITAL CAMERA	KODAK / DC-50 ZOOM	-	1

List of the Machinery and Equipment (4)

EQUIPMENT LIST OF JAPANESE F.Y. 1997

1. EQUIPMENT FOR LABORATORY

No.	Item	Model	Quantity	
			PWD	BMA
1-1	ATOMIC ABSORPTION SPECTROPHOTOMETER	SHIMADZU / AA-6701F	-	1
1-2	GAS CHROMATOGRAPH	SHIMADZU / GC-14B	1	1
1-3	ANALYTICAL BALANCE	SARTORIUS / AC 211 S	1	1
1-4	SPECTROPHOTOMETER	SHIMADZU / UV-1601PC	1	1
1-5	FAT EXTRACTION APPARATUSES			
	1)SOX THERM FAT EXTRACTION	GERHARDT / S306 AK	1	-
	2)ROTARY EVAPORATOR	RESONA / B300X / SW200	2	-
1-6	TOTAL ORGANIC CARBON ANALYZER	SHIMADZU / TOC-5000A	1	1
1-7	NITROGEN DETERMINATION APPARATUSES			
	1)KJELDA THERM DIGESTION SYSTEM	GERHARDT / KB20S/TR	1	-
	2)SCRUBBER	GERHARDT / TUR/K	1	-
	3)DISTILLATION SYSTEM	GERHARDT / VAP 30	1	-

2. PERSONAL COMPUTER SET

No.	Item	Model	Quantity	
			PWD	BMA
2-1	PERSONAL COMPUTER	HP / VECTRA VL 5/200MMX	4	-
	ACCESSORIES FOR NETWORK		1	-
2-2	LASER PRINTER	HP / LASERJET 4V	1	-
2-3	PLOTTER	HP / DESIGNJET 750	1	-
2-4	SOFTWARE			
	1)MS OFFICE 97 PROFESSIONAL		4	-
	2)VISIO TECHNICAL 4.5		4	-
	3)AUTO CAD R1.4		4	-
	4)NORTON ANTIVIRUS SOFT V.2.0		4	-
2-5	PROJECTOR(WITH SCREEN AND LASER POINTER)	SONY / VPL-S500M	1	-
2-6	UPS	POWERLINK / 650VA	4	-

3. VEHICLE

No.	Item	Model	Quantity	
			PWD	BMA
3-1	FOUR-WHEEL DRIVE CAR	TOYOTA / VZJ95R-GKPNKW	1	-

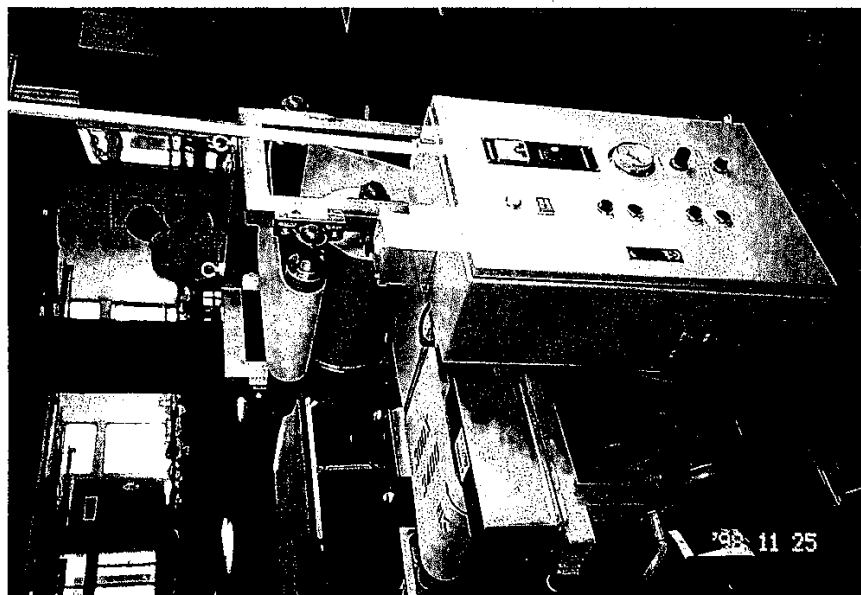
写真-2
TCSW分析室
プラトナムパイン
(アユタヤ) 研修所



写真-3
分析機器
プラトナムパイン
(アユタヤ) 研修所



写真-4
実習機器 (脱水機)
プラトナムパイン
(アユタヤ) 研修所



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写真-5
分析機器
シーパヤ支所



写真-6
実習用ポンプ
シーパヤ支社

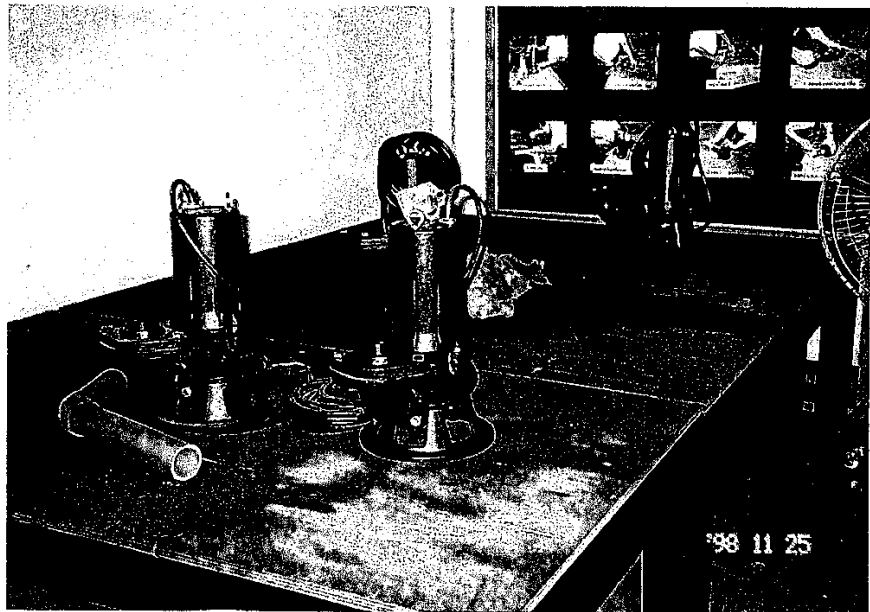
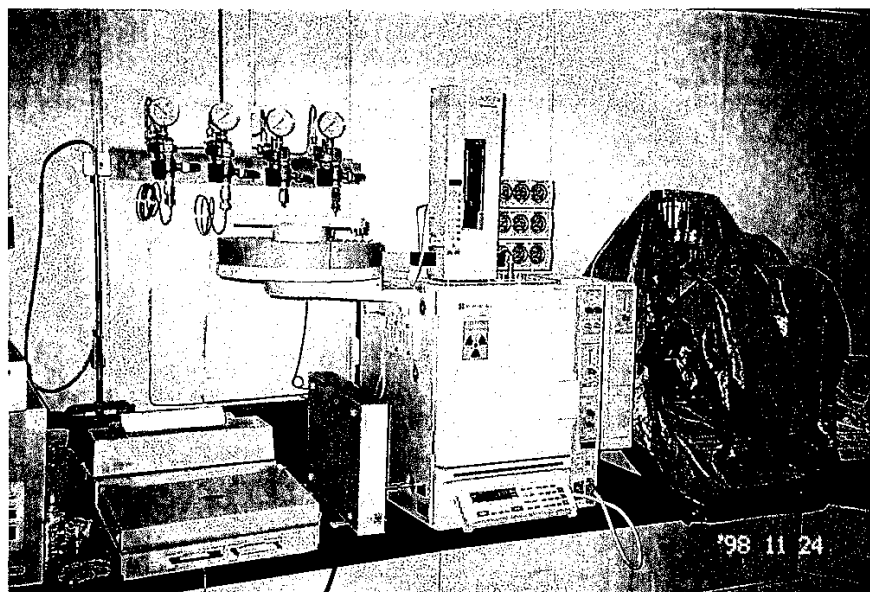


写真-7
分析機器
(ガスクロマトグラフ)
BMA本部水質実験室に
移設分



白ページ

3 - 4 専門家派遣

1995年8月のプロジェクトスタート以来、派遣された専門家は表3-11のとおりである。これまでに長期専門家9名、短期専門家が延べ32名派遣されており、おおむね順調に技術移転を実施してきている。

表3-11 専門家派遣実績

(1) 長期専門家派遣

氏名	指導課目	所属先	派遣期間(年月日)
大嶋 吉雄	チーフアドバイザー	建設省	95.08.21 ~ 98.03.20
中村 芳男	機械工学	日本下水道事業団	95.08.21 ~ 98.03.20
桐原 隆	土木工学	横浜市下水道局	95.08.21 ~ 97.08.20
山田 俊雄	業務調整	(社)協力協会	95.08.02 ~ 99.08.01
名川 忠志	水質分析	東京都下水道局	95.10.16 ~ 98.03.15
目黒 亨	土木工学	横浜市下水道局	97.09.01 ~ 99.08.31
竹内 準一	水質分析	東京都下水道局	98.03.02 ~ 00.03.01
山本 博英	機械工学	日本下水道事業団	98.03.08 ~ 00.03.07
宮原 茂	チーフアドバイザー	建設省	98.04.01 ~ 00.03.31

(2) 短期専門家

氏名	指導課目	所属先	派遣期間(年月日)
金子 哲郎	電気工学	横浜市下水道局	96.02.20～96.03.13
水口 忠行	排水指導	東京都下水道局	96.03.04～96.04.30
持永 雅之	水質分析	大阪市下水道局	96.02.11～96.02.24
三浦 春好	下水道事業(セミナー)	東京都下水道局	96.03.25～96.04.12
鮫島 和夫	下水道事業(セミナー)	日本下水道事業団	96.03.25～96.04.06
佐々木邦利	機械工学	日本下水道事業団	96.04.09～96.04.30
中川 仁志	機械工学(ME)	大阪市下水道局	96.08.07～96.09.13
大坂 進一	土木工学(CE)	日本上下水道設計(株)	96.08.12～96.08.23
武田 晴雄	事業場排水指導(WQC)	東京都下水道局	96.08.08～96.10.07
鎌田 寛子	水質分析(WQC)	千葉市下水道局	96.07.24～96.08.14
大坂 進一	衛生工学	日本上下水道設計(株)	96.11.26～96.12.04
安田 一男	機械工学(NE)	日本下水道処理施設管理業協会	97.01.23～97.04.05
照沼 誠	電気工学(EE)	日本下水道事業団	97.02.03～97.02.28
岩本日出男	下水道事業(セミナー)	東京都下水道局	97.02.04～97.02.12
曾小川久貴	下水道事業(セミナー)	建設省下水道部	97.02.05～97.02.08
井上 一也	下水道事業(水質分析)	東京都下水道局	97.02.08～97.04.07
上野 修作	オーデイト・画像	日本上下水道設計(株)	97.03.10～97.03.29
上野 修作	衛生工学	日本上下水道設計(株)	97.05.26～97.06.14
木村 茂雄	電気工学(EE)	東京都下水道局	97.07.07～97.10.03
竹内 準一	水質分析(WQA)	東京都下水道局	97.08.20～97.10.19
斉藤 精一	機械工学(ME)	東京都下水道局	97.09.24～97.12.23
上野 修作	衛生工学	日本上下水道設計(株)	97.11.28～97.12.19
岸 寛治	土木工学(CE)	東京都下水道局	98.01.06～98.03.07
松田 初弘	水質分析(WQA)	東京都下水道局	98.02.08～98.03.01
飯田 精一	水質規制(WQC)	札幌市下水道局	98.02.10～98.03.20
小杉 敏行	電気工学(EE)	東京都下水道局	98.02.17～98.03.21
工藤 修一	土木工学(CE)	福岡市下水道局	98.02.17～98.03.21
上野 修作	下水道経営	日本上下水道設計(株)	98.03.02～98.03.20
上野 修作	衛生工学	日本上下水道設計(株)	98.06.02～98.06.23
金子 重夫	下水道経営	日本下水道事業団	98.07.12～98.07.25
竹重 弘巳	電気工学(EE)	東京都下水道局	98.08.05～98.10.03
平川 正道	土木工学(CE)	東京都下水道局	98.09.07～98.11.28

3 - 5 タイ国下水道の所掌問題

タイ国の下水道事業の所掌問題については、バンコク首都圏庁（BMA）を含めたタイ国政府の部署により若干説明が異なるところがあるが、かなり明確な説明を受けた部署もある。以下に調査団がヒアリングした内容を記述するが、所掌部署から説明が受けられず、他からの情報を交えたものもある。

(1) 内務省公共事業局（PWD）

Mr. Pajation Deputy Director General, Dr. Viharn Senior Chief Engineer, Mr. Pornsak Director, TCSW, Mr. Supol Director, SED、との面談により以下項目につき確認した。

1) PWDの技術研修所（TTI）下水道研修センター（TCSW）の間の連携については、組織図（図3-7、3-8）に示すとおり明確化されていて業務上何ら問題はない。ただし、宿舍、教室、車の問題があるので両者プロジェクトが重なることがないようにスケジュール調整はしなければならない。

2) 日本側専門家とTCSWの事務所をアユタヤのTTI内に移すかどうか話し合った結果、次のような理由でサムセンから動かないことにした。

BMAやSED、EMD等タイ国の各部署の職員と協力しながら仕事を進めているのでサムセンの会議室を使うのに便利であること。

日本人専門家がサムセンの8階にデータベースシステムをセットしていること。

3) PWDはパソコン首都圏と環境保全地域を除くタイ国内のすべての県において下水処理プラントの設計、施工等下水道事業を担当してきた。その後、1992年制定の環境基準法により科学技術環境省（MOSTE）に下水道事業の所管が移ることになった。しかしながらPWDは下水道事業については経験豊富であり技術者の数もMOSTEより多く、（下水道事業をどちらが担当するか）結論は明確になっていない。1999年度はMOSTEに予算がついているが2000年以降のことについては政府の考えであり、ここでは応えることができない。

4) PWD所管の下水処理場の一覧表を表3-12、-13に示す。

表 3-12 PWD 所管の下水処理場
DATA of Waste Water Treatment Plant

Complete Project					
No.	Municipalities Districts	Type of System	Capacity (m ³ /Day)		Starting year
			Now	All Project	
1	CHANTABURI	SP	10,000	22,000	1997
2	CHIANGMI	AL	55,000	55,000	1998
3	NORTH SAEN SUK	OD	14,000	14,000	1996
4	SOUTH SAEN SUK	OD	9,000	12,000	1995
5	PATTAYA (N&S)	RBC	13,000	5,000 & 8,000	1994 / 1990
6	NA-CHOMTHEIN	OFF & AS	20,000	20,000	1995
7	KHON KAEN	SP	26,000	46,300	1989
8	AKORN RATCHASIM	SP	32,000	38,000	1986
9	SRI RACHA	OD	18,000	24,000	1997
10	ANG THONG	AL	8,000	8,200	1998
11	SAKONNAKHON (1&2)	SP	8,000	8,200	1998
12	PANUS NIKOM	SP	2,000	3,400	1991
13	PHUKET	OD	12,000	36,000	1998
14	PATONG/PHUKET	OD	5,250	9,000	1989
15	UBONRACHATHANE	AL	22,000	22,000	1998
16	PHACHUPKHIRIKHA	AL	8,000	8,500	1998
17	HUA HIN(1)	RBC	8,000	8,000	1993
18	PICHIT	SP (AL)	6,000	12,000	1997
19	LEAM CHABANG	OD	25,000	25,000	1998
20	NAKHON PATHOM	SP	25,500	60,000	1994

表 3-13 PWD 所管の下水処理場
DATA Waste Water Treatment Plant

Will Start up Project					
No.	Municipalities Districts	Type of System	Capacity(m ³ /Day)		Starting year
			Now	All Project	
21	TRANG	SP	20,100	24,000	1999
22	PA-YAO	SP	8,000	8,000	1999
23	NAKHON AYUTTAYA	OD	22,500	24,000	1999
24	PATHUM-THANI	OD	9,800	11,000	1999
25	CHAI NART	SP	3,500	6,000	1999
26	POTHARAM	OD	4,000	4,000	1999
27	BAN-PONG	SP	6,000	6,000	1999
28	CHACHENSAO	OD	12,000	24,000	1999
29	HUA HIN(2)	AS	8,250	33,000	
30	KRA-PI	AL	10,300	12,000	
31	PATTANE	SP	21,000	28,920	
32	SONGKHLA	AL	26,000	36,630	
33	CHUMPORN	SP	12,000	12,000	
34	PRACHANVATE	AS	38,500	38,500	
35	RA-YONG	AL	56,000	56,000	
36	BAN-PARAYONG)	OD	7,100	8,000	
37	KO SAMU I	OD	11,100	2,400 & 78,700	
38	SUPANBUR(1)	SP	12,500	12,600	
39	AUTHONG(SUPANBUR I)	SP	6,000	6,000	
40	CHA-AM	AL	12,000	12,000	
41	CHONBURI	OD	26,500	26,500	
42	KRANGANABURI	OD	24,000	24,000	
43	SARABURI	OD	24,000	24,000	
44	PATCHABURI	SP	20,000	20,000	
45	SUNGBURI	AL	4,500	4,500	
46	CHIANG-RAI	AL	15,000	15,000	
47	BURIRUM	AL	13,000	13,000	
48	PITSANULOK	SP	15,000	15,000	
49	SUPANBUR I (2)	SEWER PIPE SYSTEM	-		

(2) BMA

Mr. Chanchai Director Water Quality Management Division、Ms. Apinan Chief Water Quality Management Division との面談により以下項目につき確認した。

1) BMA の排水下水道局 (DDS) の担当は以下のとおりである。

都市排水計画

排水施設の建設、改善、運転及び維持管理

運河の水質改善と収集

運河の水質改善と監視

下水道計画

下水道施設の建設、改善、運転及び維持管理

工場を除く事業場の排水水質規制 (BMA 独自の基準はない)

2) 現状での DDS 内の汚水の収集・処理及び運転管理の組織は暫定的である。住宅公社 (NHA) から移管された小規模な水処理施設は DDS の水質管理部 (Water Quality Management Division) の技術者が管理している。また 1994 年から運転されている規模の大きいシーパヤ処理場 (能力的にはまだ余裕がある) には 7 名が運転管理で詰めている。処理場の主任は DDS 内にいる上司に報告書を提出する。BMA 所管の処理施設の一覧表を表 3-14 に示す。

3) 下水道公団 (WMA) は 1995 年の Royal Decree により MOSTE の公団として集中方式の水処理と汚泥処理を行うため設立された。重要なことは、WMA は民間資本を受入れ、行政区を越えて汚水・汚泥の処理ができるということである。WMA は中央地域の水処理を経済的に進めるサービスを提供するために設立された。汚水処理地域はバンコクを含む中央地域であると政府官報で公布されている。

表 3-14 BWA 所管の処理施設

Summarizes the scope and current status of the
Wastewater Treatment Projects in Bangkok at present

Works Sogn No. Description	Si Phraya (1)	Ratanakosia (2)	BKK Cetral (STAGE 1) (3)	Yannawa (STAGE 2) (4)	Nong Khaean (STAGE 3) (5)-1	Ratburaoa (STAGE 3) (5)-2	Chatucbak (STAGE 4) (6)
Catchment Area (km ²)	2.7	4.1	37.8	28.5	42.9	42.5	33.4
Sewered Poputation (1000 persens)	120	160	1,080	580	418	346	433
Treatment Process	Aeilvated Studge-Contacy Stabillization	Two Stage Activated Studge	Extended Activated Studge	Recveted-Activated Studge	Recycled Activated Studge	Recycled Activated Studge	to be proposed By Biddes
Plant Area (ha)	0.30	0.64	2.72	3.20	8.32	1.41	1.12
Capacity (m ³ /d)	30,000	40,000	341,500	200,000	157,000	65,000	150,000
Constraction Cost (100 MB)	4.6	8.8	64	47 (Include, C/E 1.6)	29	19	(40) (Includ, C/E 1.5)
Constraction Period* Service Start	17/9/1991 13/12/1993 /01/1994	30/9/1993 28/12/1995	1/11/1993 31/12/1997	24/7/1995 23/7/1999	19/9/1996 19/9/1999		Under Bidding (36 months)
Budget Composition	BMA 100%	Subsidy 100%	Subsidy 75% BMA 25%	Subsidy 60% BMA 40%	Subsidy 60% BMA 40%	Subsidy 60% BMA 40%	Subsidy 60% BMA 40%
Contract	Non-Ternkey	Non-Ternkey	Ternkey	Ternkey	Ternkey		Ternkey
Status	Coplecte	Under Comstruction	Under Construction	Under Comstruction	Under Construction		Tendered

* Note: These construction perriods include 1 years of operation by the contractor.

The dates are as originally proposed, and do not show actual progress.

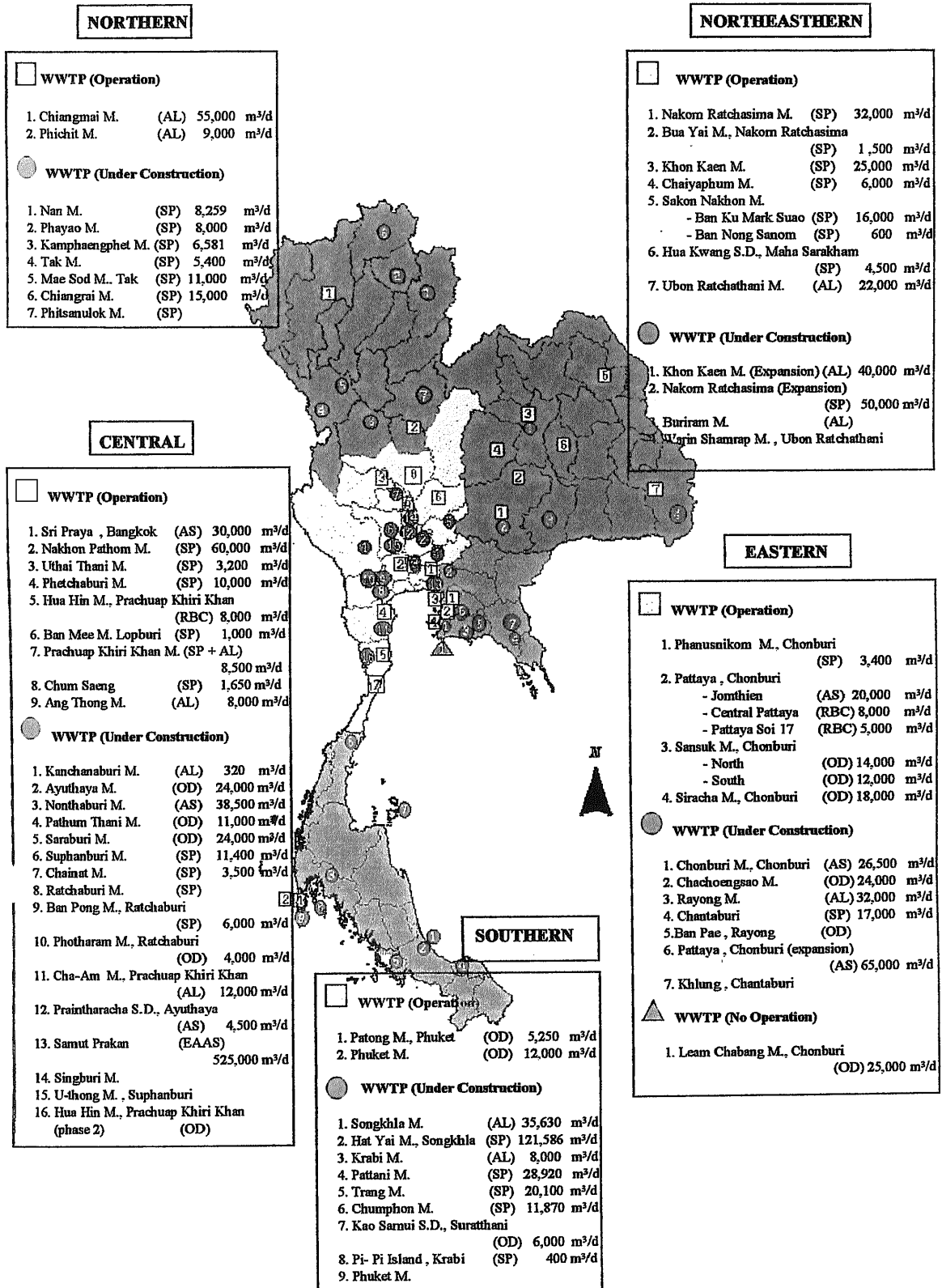
(3) 科学技術環境省汚染対策局 (PCD/MOSTE)

Dr. Yuwaree IN-NA, Ph.D Director, Water Quality Management Division との面談により以下項目を確認した。

- 1) PWDの下水道事業は、各地方自治体にはあまり関与せずに中央指導型で事業を進めてきた。
- 2) 1992年制定の環境基準法の中でタイ国内全県による地域環境管理計画が決定された。このプランは下水道事業、ゴミ処理事業その他に分類される。
- 3) これに基づき科学技術環境省環境対策計画局(OEPP/MOSTE)により下水道事業を必要とする都市が選定され、毎年予算がOEPPが各自治体へ配分されることになった。さらに各自治体は自治体自身が工事の発注者となり、業者と直接契約を結ぶことが可能となった。

しかしながらこれを科学技術環境省汚染対策局(PCD/MOSTE)さらにはPWDに依頼することも(制度上)可能である。

- 4) さらに 1996 年の閣議決定により、タイの下水道の政策決定権は MOSTE に移管されることになった。これ以降 PWD に対する新規事業の予算はなくなる。しかしながら下水道事業はおおむね 4 年かかり、それまで継続していた事業については引き続いて PWD で実施することになる。タイの下水道事業プロジェクトの一覧を図 3-7 に示す。
- 5) PCD は所管地域として公害防止地域(バンコク市と周辺 5 県)と環境保全地域の下水道事業を担当している。
- 6) 今年度の PCD の下水道事業で新規事業はなく、継続のサムットプラ坎県の事業だけである。
- 7) MOSTE では河川水質のモニタリングを実施している。25 の河川で年 2 回モニタリングを実施している。これについては MOSTE の直営である。
- 8) MOSTE では処理場の放流水質基準を設定しようとしている(20mg/l)。処理場のモニタリングも直営で実施し、結果については新聞で公表する予定である。
- 9) MOSTE では事業所排水規制を Building Effluent Standards (付属資料 3) により実施している。しかしながら十分なスタッフがいないため、実際には Standard A にあたる施設の規制しか行っていない。また MOSTE は水質の分析をするだけで、結果については警察に通報し、警察が取り締まることになっている。
- 10) MOSTE では処理場の放流水質基準の設定後、地方自治体の職人に対して Monitoring Control Inspector の養成を行う予定である。この制度は環境保全強化法 Section 80 に基づくものであり、研修により Monitoring Control Inspector のライセンスを与えることができる。この資格の取得は昇進の要因になる。また民間人も資格を取得することができる。



Sewerage Projects in Thailand

図 3-7 タイの下水道事業プロジェクト

白ページ

(4) OEPP

Mr. Surin Director, Urban Environmental and Area Planning Division, Ms. Suree Chief, Urban Environmental Management Sub-division, Ms. Sukanya Fund Management Group, Office of Environmental Fund との面談により以下項目を確認した。

1) OEPP の 1999 年の新規事業はない。政府の方針としてここ 2 ~ 3 年は新規事業はない見込みである。継続事業として予算上 1999 年に認可されているのが次の 11 都市である。

Samut Prakan (PCD 所管) Tak, Warin Shamarap, Maesod, Khlung, Phuket (Phase II), Kamphaengphet, Nan, Khon Kaen (Phase II), Praintharacha, Nakom Ratchsime (Phase II)

2) 下水道施設の維持管理に対する指導指針については特にない。

3) パタヤ市の料金徴収の事例を表 3-15 に示す。また現在 7 都市で料金徴収について検討中である。

4) 環境基金の利用については現在のところ Samut Prakan しかない。その他については検討中である。

表 3-15 Rate of Wastewater Service Fee for PATAYA

No.	Classification	Units	Service Fee		Connection Fee Baht/Unit	
			Sewage Baht/Unit	Effluent Baht/Unit	Sewage	Effluent
1.	Hotel	Room	672.00	67.20	50.00	50.00
2.	Condominium/Flat	Room	360.00	36.00	50.00	50.00
3.	Restaurant, Food & Drink Establishment	Area, m ²	36.00	3.60	2.00	2.00
4.	Commercial building	Area, m ²	6.00	0.60	2.00	2.00
5.	Residential building House for rent	Area, m ²	3.60	0.36	2.00	2.00
6.	Household Industries such as food manufacturing, sugar cane industry ect.	Kg of product per day	40	26	40	26

(5) WMA

Mr. Anothai Director of Wastewater Management Authority.

Mr. Pinetr Director of Planning & Project Development Department WMA.

Mr. Suchai Chief of Coordination Division Wastewater Management Authorityとの面談により、以下項目を確認した。

1) WMAは1996年8月15日に設立されたMOSTEの公団である。WMAの業務は以下に要約される。組織図を図3-8に示す。

バンコク市、Nonthaburi, Prathumthani, Samut Prakar, Samut Sakhon, Nakorn Prathomの5県及び閣議決定により公布されたその他地域の集中式下水処理システムの調査、測量、設計、運転、管理を行うこと(既存の下水処理システムの評価を含む)

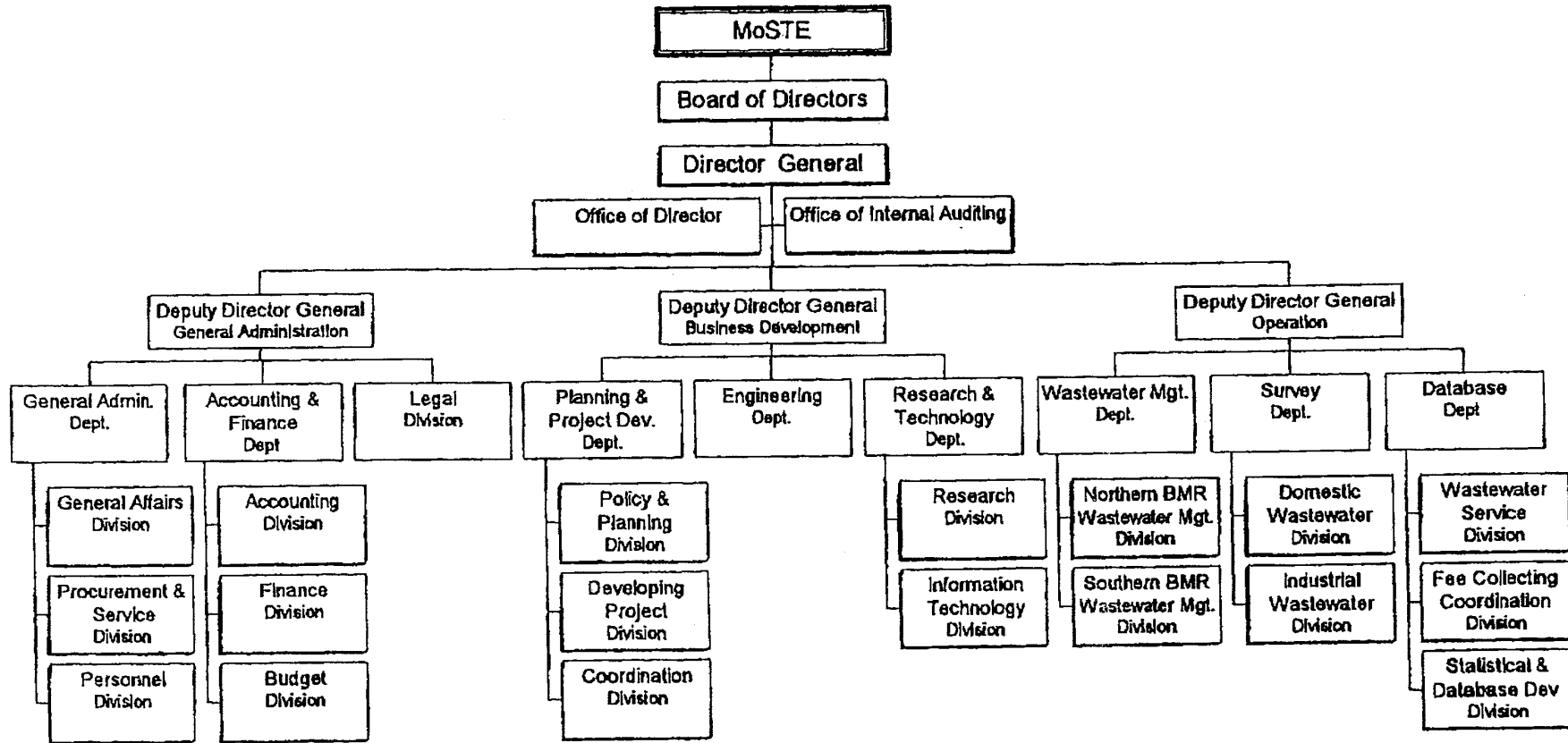
1992年のEnhancement and Conservation of Environmental Quality Act and the agreement(付属資料4)による処理水の再利用と下水の保有エネルギーの利用

下水道料金を徴収すること

WMAの全般的な目的の達成のため、公立私立、国内国外を問わず他の機関とコーディネートすること。この目的のための設立する株式会社又はLimited Public CompaniesへのWMAの出資比率は30%以下とする。

しかし現在のところ、出資に応じた民間企業はない。これは投資資金の回収の重要な要素である住民からの下水道使用料金の徴収が法律規制の不備などもあり、かなり難しいことによる。

2) ここ数年来PWD及びMOSTEの管理下で66の処理場が建設されている。これらは66施設のうち29施設は運転の段階にあり、程度の差はあれ、それらは運転管理の問題を抱えている。それゆえWMAは、民間企業とともにそれら施設の運転管理を引き受けなければならないだろう。WMAは既にSaen Sook, Chachergsao, Angthongの3市から運転管理の依頼を受けている。



☒ 3-8 Organization Chart

4 . 指導内容

4 - 1 研修活動

(1) 未開講コースの扱い

これまで未開講の Construction and Supervision コースと Management of Sewage Works コースについては短期専門家の応援も得て現在テキストを作成中であり、1999 年度（タイ国会計年度）中の開講を予定している。また Operation and Maintenance(Advanced) と Water Quality Analysis(Advanced) については 2000 年度（タイ国会計年度）開講を目的に講義内容について今後タイ側と協議の予定である。

(2) 今後の研修スケジュール

今後の研修スケジュール（1999 年度、2000 年度）について、タイ側と打ち合わせた結果を表 4-1 に示す。今後、プロジェクト終了（2000 年 7 月）までに 6 分野 11 コースすべてについて 26 回開講し、698 名の研修生の参加を予定し、プロジェクト期間の 5 年間に総勢 1,001 名に研修を行うことに合意した。

4 - 2 データベース作成

現在、複数のパソコンをネットワークで結び、収集データの共有化をできるように計画している。しかし、ネットワーク化によるデータの共有化を実施するにあたっては、タイ側でシステムのメンテナンスのための費用及び人員の確保が必要となる。

さらに、現在構築中のデータベースを今後とも有効に活用するためには、プログラムのメンテナンス計画策定をできる（C/P）の育成及び必要な予算の確保が重要な課題となる。現在この点について、専門家とタイ側の間で協議中である。

4 - 3 研究開発

これまでに協議している下記研究課題は、水質に関するものであるが、下水道全体について問題点を洗い出し、水質分野以外の研究課題についても協議していく必要がある。

(1) PWD の研究課題

- 1) 海水中の塩分が活性汚泥処理に及ぼす影響
- 2) 安定化池の植物プランクトンの状態判断
- 3) トイレトペーパーの下水中での分解
- 4) グレイウォーターの自浄作用

5) インターセプター越流水の水質

(2) BMA の研究課題

- 1) 下水の生分解性に及ぼす糞尿の影響
- 2) 運河の懸濁物質が硝化に及ぼす影響
- 3) 底泥中の重金属が硝化に及ぼす影響
- 4) 塩素消毒が微生物群集に及ぼす影響
- 5) 廃水中の脂肪を分解する微生物の探索

4 - 4 供与機材

供与された機材は講義などに使われていた。しかし、これらの機器が今後継続して使われるためには以下のような課題が残る。

(1) 交換部品や分析機器用試薬等の消耗品の確保

1998年度は分析用試薬や交換部品(カラム等)の消耗品の予算が確保できなかったために研究開発テーマに着手できなかった。機器の性能を生かすためにも、十分な消耗品(予算)を確保することが重要である。

(2) 機器の維持管理要員の確保

供与機材が講義時に順調に動くためには、定期的(1月に1回程度)に機器を作動する必要がある。O&Mコースの場合、開講頻度は年に3回~4回であるため、定期運転の頻度としては不足する。現在専門家が月に1回程度の頻度でならし運転を実施し、異常をチェックしている。また水質分析用機器についても点検のための定期運転が必要である。

今後は各コースのC/Pが機器の定期運転及び補修部品の手配・修理等のメンテナンスを独自にできるようにする必要がある。

供与機材が効果的に永続的に使われるためにも上記2点を今回タイ側に要望した。

5 . TCSW の将来像

タイ国における下水道事業の所管問題については、3 - 5 「タイ国下水道の所掌問題」の部分でも述べられたとおり、1996年10月の閣議決定により下水道事業の政策決定権は従来の内務省公共事業局（PWD）から科学技術環境省（MOSTE）に移ることとなった。しかしながら、下水道処理施設建設などの下水道事業は完成までおおむね4年かかるため、1996年10月以前に決定されPWDが実施していた事業（建設済み及び建設中の50箇所下水道処理施設の管理・建設を実施中）は2000年まで引き続きPWDが担当するとのことである。一方、MOSTEには下水道技術者が20から30名程度しかおらず、現状単独で事業を実施できる状態ではなく、またMOSTEが直接所管している事業はサムットプラカン下水道プロジェクト1つだけであり、他は地方自治体がコンサルタントに施工管理を委託し、事業実施している例（パタヤ市等）がほとんどである。

将来的な動向については、タイの関係各機関に状況を聴取した結果では、2000年まではPWDとMOSTEが各々並行して下水道事業を実施する状態が続き、2000年以降については現時点では明言できないというものであった。

これらから、共通して言えることは、地方自治体が下水道事業の実質的な実施主体として重要な役割を果たすということである。しかし、現状では下水道事業の施工管理、運転管理等を実施できる技術者が地方自治体においては大幅に不足しており、これらの技術者の育成、訓練は今後ますます重要性を増してくると考えられる。

例えば、MOSTEでは下水処理場放流水水質規制の実施に伴い、地方自治体の職員及び民間を対象にした下水処理場の放流水水質維持のための Monitoring Control Operator の養成及びそのライセンス制度確立を計画中であるが、MOSTEの環境汚染対策局（PCD）局長のアイデアとして、このライセンス取得のための訓練コースを下水道研修センター（TCSW）で開くことも可能性として考えられるということが紹介された。

技術研修所（TTI）の役割としては、内務省のすべての関係する技術部局、中央省庁及び地方自治体の技術訓練の実施や技術セミナーの開催を行うと規定されている。またPWD局長の権限で民間企業に対する研修も門戸を開いていることから、2000年以降も下水道事業技術者の育成、訓練は、他の公共事業分野の技術者の育成、訓練と同様に引き続きPWDが実施することが予想され、TCSWの役割がさらに高まると予想される。

6 . 合同調整委員会

合同調整委員会は1998年11月26日午前に開催された。この合同調整委員会の目的は、ミニッツ（付属資料1）の署名交換である。すなわち、今回調査では日・タイ合同で、プロジェクトの活動実績、管理・運営状況、カウンタパートへの技術移転状況などの中間評価した。その評価結果を念頭において11月23日には内務省公共事業局(PWD)と、また同24日バンコク首都圏庁(BMA)と個別協議を行い、プロジェクト協力終了までの残り約2年間の全体活動計画及び1999年度活動計画が協議された。これら個別協議の内容をミニッツに取りまとめ、日・タイ双方が合意のうえ、署名を取り交わしたものである。本委員会に先立ち、1998年11月25日にPWD、BMAと合同でミニッツ案について打合せを行い、事前に基本的な合意が日・タイ双方で形成されていたため、本委員会ではミニッツの内容について非常にスムーズに合意が得られた。

本委員会の席上タイ側から要望のあった事項の中には、研究開発分野を柱としたフェーズプロジェクトをぜひ実施して欲しいというものがあった。しかし、本調査団は現在実施中の本プロジェクトの協力期間前半の活動、成果を評価し、その結果を協力期間の後半にフィードバックして全体の活動計画を見直し、大局的見地から助言・指導をすることが主な目的であり、フェーズを議論する調査団ではない旨説明し、タイ側も了承した。ただし、タイ側の強い希望もあり、ミニッツはタイ側からフェーズ実施の要望があったという表現の一文を記載した。

付 属 資 料

- 1 . ミニッツ
- 2 . TCSW Steering Committee 議事録 (98 年 11 月 11 日開催)
- 3 . Building Effluent Standards
- 4 . Enhancement and Conservation of National Environmental Quality
Act B. E. 2535

THE MINUTES OF DISCUSSIONS
BETWEEN
THE JAPANESE ADVISORY TEAM
AND
THE CONCERNED AUTHORITIES OF THE GOVERNMENT OF
THE KINGDOM OF THAILAND ON THE JAPANESE TECHNICAL COOPERATION
FOR
THE TRAINING CENTER FOR SEWAGE WORKS PROJECT

The Japanese Advisory Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Dr. Shunsoku Kyosai visited the Kingdom of Thailand from November 19th to November 28th, 1998. During the stay, the Team had a series of discussions and evaluated the achievement of the Training Center For Sewage Works Project (hereinafter referred to as "the Project") and exchanged views on the possible technical cooperation program to be further implemented to fulfill the Master Plan of the Record of Discussions signed on June 14th, 1995 (hereinafter referred to as "the R/D").

As a result of the discussion, the Team and Thai sides agreed upon the matters referred to in the documents attached hereto.

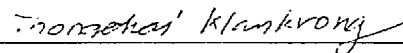
Bangkok, November 26th, 1998

京 牙 俊 剛

Dr. Shunsoku KYOSAI
Leader,
Advisory Team
Japan International Cooperation Agency
Japan



Dr. Voravit LERTLAKSANA
Director General
Public Works Department
Ministry of Interior
The Kingdom of Thailand



Co-Signer
Mr. Thongchai KLANKRONG
Deputy Director General
on behalf of
Director General
Department of Drainage and Sewerage
Bangkok Metropolitan Administration
The Kingdom of Thailand

THE ATTACHED DOCUMENT

I. INTRODUCTION

Thai side and the Team had a series of discussions and each member of the Team interviewed and discussed with Thai officials concerned and Japanese experts to review the progress of the Project. Based on the result of the review, mid-term evaluation was carried out in terms of "Efficiency", "Effectiveness", "Rationale" and "Sustainability".

II. IMPLEMENTATION OF THE PROJECT

1. The organization chart of Training Center for Sewage Works (hereinafter referred to as "TCSW") is revised as shown in Annex 1.
2. The Thai side and the Team agreed to hold the Joint Coordinating Committee (JCC) meeting at least once a year and whenever the need arises. The members of the JCC is shown in Annex 2.
3. The Thai side and the Team agreed to hold the Steering Committee (SC) meeting whenever the need arises. The members of the SC is shown in Annex 3.
4. The Thai side and the Team agreed to hold the Technical Committee (TC) meeting whenever the need arises. The members of the TC is shown in Annex 4.
5. The Thai side and the Team agreed to hold the Working Group (WG) meeting whenever the need arises. The members of the WG is shown in Annex 5.

III. REVIEW OF PROGRESS

1. There has been inputs since the inception of the Project as below;

(1) Japanese side

1) Dispatch of Experts

In accordance with the Record of Discussions signed on the 14th of June 1995, the Japanese side dispatched nine (9) long-term experts and thirty two (32) short-term experts to the Project for technical transfer.

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JICA expert list is shown in Annex 6.

2) Training of Counterpart Personnel in Japan

The Japanese government received fifteen (15) counterpart personnel for technical training in Japan. The list of counterpart training in Japan is shown in Annex 7.

3) Provision of Machinery and Equipment

The Japanese government provided machinery and equipment necessary for the smooth implementation of the Project. Its total expenditure is approximately 200 million yen. The list of machinery and equipment is in Annex 8.

(2) Thai Side

1) Budgetary allocation

Thai side allocated approximately 4,019,971 Baht directly used for the Project from Thai fiscal year 1995 to 1998. (see Annex 9)

In addition, budget has been allocated for indirect use from PWD, BMA, DTEC and other related agencies.

2) Allocation of counterpart personnel

Twenty three (23) counterpart personnel have been assigned for conducting project activities. (see Annex 10)

2. Project activities and outputs from the Project

(1) Training Courses

The result of the Project activities of training courses in Annex 11. *Thongchai*

From the inception of the Project, fourteen (14) courses have been implemented in six (6) fields : Planning and Design (basic), Planning and Design (intermediate), Operation and Maintenance (basic 1), Operation and Maintenance (basic 2), Water Quality Analysis (basic) and Water Quality Control. Ten courses planned to be carried out from the inception of the Project were canceled by the influence of economic crisis in Thailand. Thai side has coped with the decreasing the number of the courses by increasing the number of participants in each course. *R. J. J. J.*

In these courses, a total number of 303 participants has been trained. The *140*

curriculum and text books have been developed in each field as part of the activities. (see Annex 12)

(2) Database System

300 books, 1,000 photographs and content of 25 textbooks for training courses concerning sewage works in Thailand were inputted to Thai side's computers. (see Annex 13)

Thai side and the Japanese experts team have discussed the development of database system.

(3) Research and Development

Thai side and the Japanese experts team have discussed research and development activities on schedule.

IV. Project Evaluation

1. Efficiency of the implementation of the Project activities

It is found that the implementation of the Project has been efficient. According to questionnaires to trainees, content of training courses were satisfied.

2. Effectiveness in achieving the Project purpose

In general, the Project purpose has been effectively achieved. This is due to increasing recognition of Thai side on the importance of the training, database system and research and development in sewage works field.

3. Rationale

Even after the inception of the Project, there has been continuous needs for technical and managerial staff who have sufficient knowledge for applying advanced and appropriate technology to Thai sewage works, because sewerage system in Thai is in an early stage and the number of staff related to sewage works is insufficient now. Therefore the purpose of the Project has been important as well.

4. Sustainability

Thai responsibility to plan and carry out the TCSW activities has been recognized

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well for the sustainability after the Project. Thai side and the Team agreed to make even greater efforts of Thai and Japan to ensure the sustainability.

V. Implementation Schedule of the Project

1. The Project has been implemented in accordance with the Project Design Matrix (PDM) shown in Annex 14.
2. As a result of the request from Thai side and the evaluation by the Team, both sides agreed to revise the Plan of Operation for the Whole Period shown in Annex 15. And both sides agreed on the training courses schedule shown in Annex 16.

VI. Issues Discussed

1. Thai side requested the Phase II Project for upgrading and enlarging TCSW activities.
2. For the success of the Project, Thai side and the Team reconfirmed to sincerely carry out the Project based on the R/D which was signed on June 14th, 1995.

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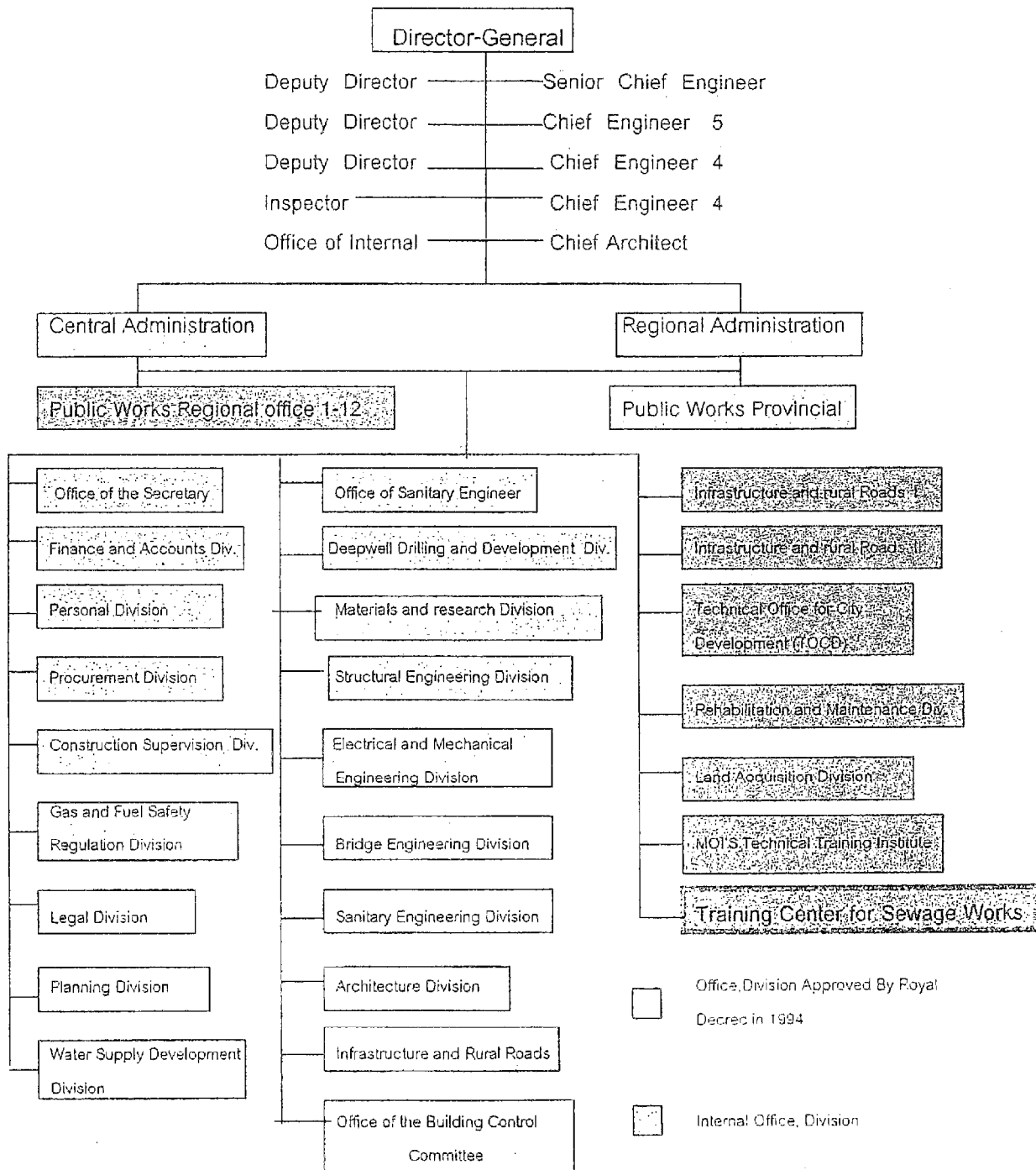
ANNEX LIST

ANNEX 1	Organization chart of TCSW
ANNEX 2	Member of the JCC
ANNEX 3	Member of the SC
ANNEX 4	Member of the TC
ANNEX 5	Member of the WG
ANNEX 6	JICA expert list
ANNEX 7	List of counterpart training in Japan
ANNEX 8	List of the machinery and equipment
ANNEX 9	Budgetary allocation of Thai side
ANNEX 10	List of counterpart in Thailand
ANNEX 11	Project activities
ANNEX 12	Curriculum of training course
ANNEX 13	List of database collection
ANNEX 14	Project design matrix
ANNEX 15	Plan of operation for whole period
ANNEX 16	Training course schedule

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ORGANIZATION CHART OF THE PUBLIC WORKS DEPARTMENT

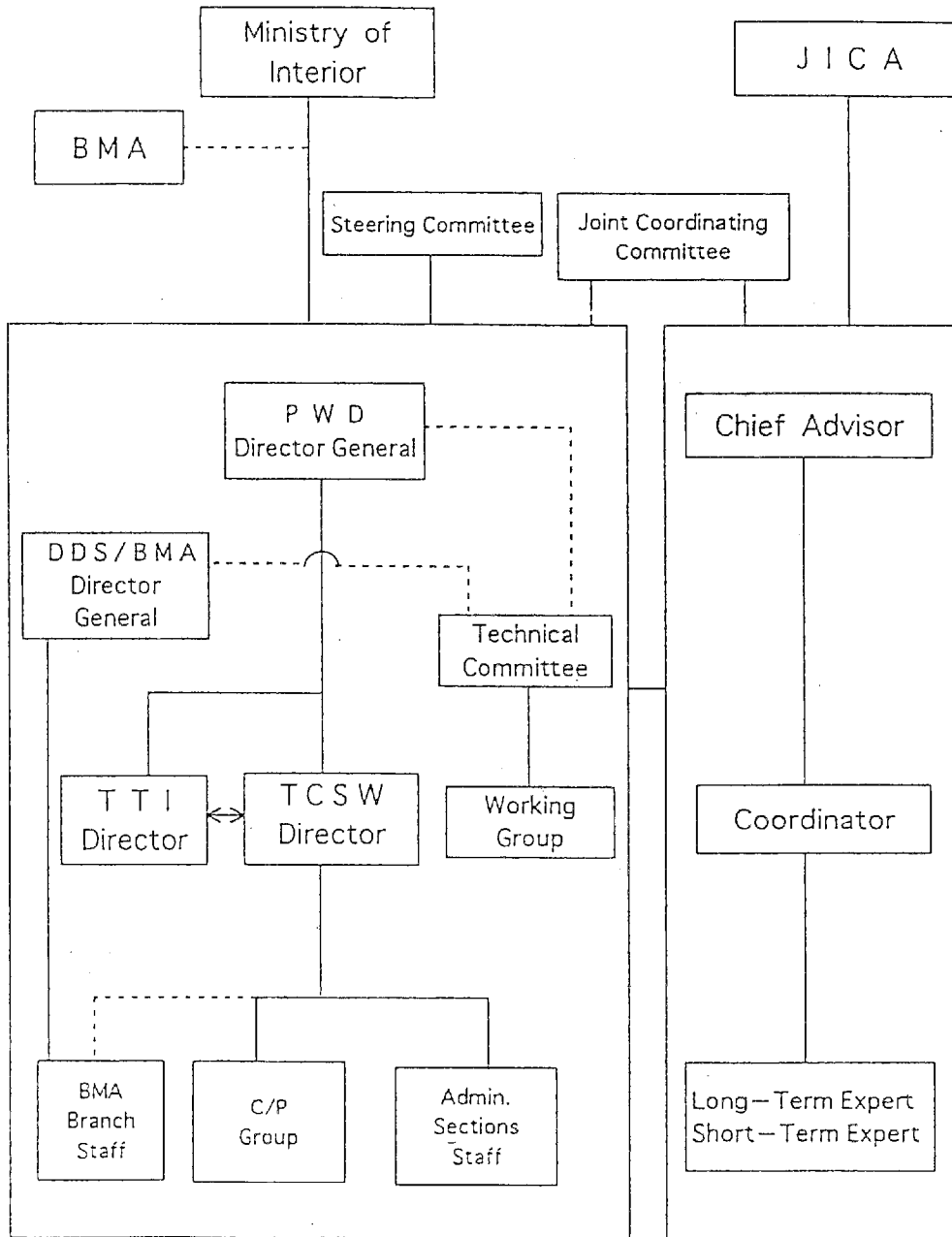
(23 Nov. 1998)



□ Office, Division Approved By Royal Decree in 1994
 ■ Internal Office, Division

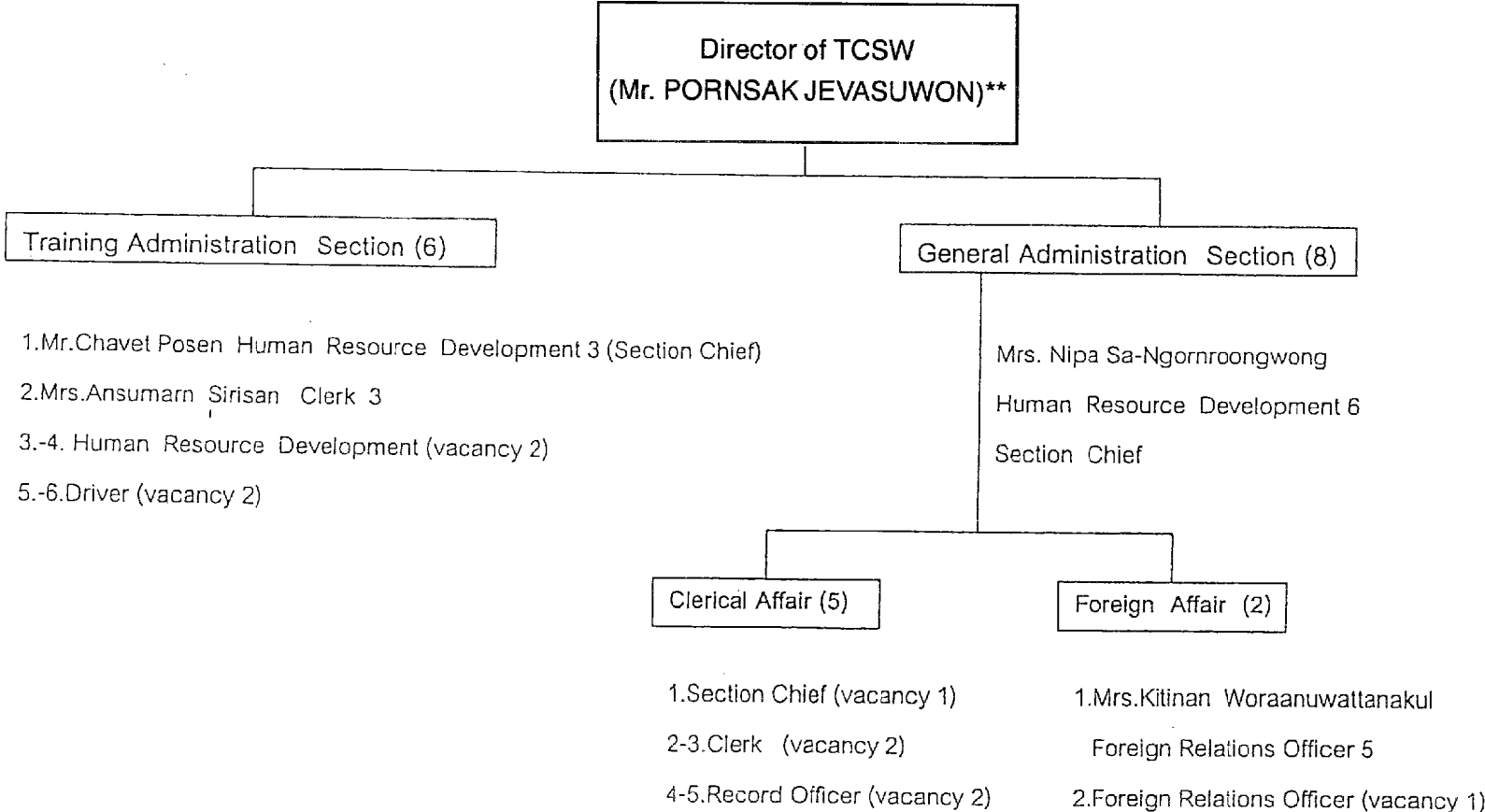
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ORGANIZATION OF THE PROJECT



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Organization of TCSW (1)



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Organization of TCSW (2)

Counterpart Groups

Training Academic Counterparts(10)

- 1.Mr.Pornsak Jevasuwon** TCSW for SM,WQA,O&M
- 2.Mrs.Pranee Rattanasampan* - for SM
- 3.Mr. Peerapong Chewapatr* EMD for P&D,O&M
- 4.Mr.Suriya Thanawatdej* DDD for O&M
- 5.Mr.Ulhai Boonyarattanakul* EMD for O&M,P&D
- 6.Mr.Seksom Choorungsalit* TOCD for WQA,O&M,P&D
- 7.Mr.Pornyos Theinthong* SED for O&M,P&D ,CS
- 8.Ms.Nuchnapang Saefoo* MRD for WQA,WQC
- 9.Mrs.Kitiran Woraanuwattanakul * PD for Foreign Affair
- 10.Ms.Piyaphan Boonprapob** MRD for WQA,WQC,O&M

SM : Sewage Works Management
P&D : Planning And Design

WQA : Water Quality Analysis
O&M : Operation And Maintenance

WQC : Water Quality Control
CS : Construction Supervision

DATA Base Counterparts

- 1.Mr.Pornyos Thienthong SED
- 2.Mr.Peeraphong Shiwapathara EMD
- 3.Ms.Piyaphan Boonprapob TCSW

Research And Development Counterparts

Preparing

Total Counterpart 10
* Part Time 8
** Full Time 2

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Piyaphan
Layo*

Member of Joint Coordination Committee

(1) Chairperson

Director General of PWD

(2) Members

Thai side

- 1) Director General of PWD
- 2) Deputy Director General of PWD
- 3) Director of TCSW
- 4) Director General of Department of Drainage and Sewerage, BMA
- 5) Representative of the Department of Technical and Economic Cooperation
- 6) Director of TTI
- 7) Director of the Water Quality Management Division, DDS/BMA
- 8) Director of Sanitary Engineering Division, PWD
- 9) Director of Planning Division, PWD
- 10) Director of Electric and Mechanical Engineering Division, PWD
- 11) Director of Materials and Research Division, PWD
- 12) Director of Technical Office For City Development, PWD
- 13) Director of Personal Division, PWD
- 14) Other Persons concerned

Japanese side

- 1) Chief Advisor (Head of Japanese side)
- 2) Coordinator
- 3) Other Experts
- 4) Representative of the JICA Thailand Office
- 5) Other Persons concerned

Note : Official(s) of the Embassy of Japan may attend the Joint Coordinating Committee as observer(s)

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Member of Steering Committee

(1) Chairperson

-Director General of PWD

(2) Members

- Deputy Director General of PWD
- Director of TCSW
- Deputy Director General of the Department of Local Administration
- Director General of Department of Drainage and Sewerage, BMA
- Chairman of the National Municipal League of Thailand
- Representative of the Budget Bureau
- Representative of DTEC
- Director of the Dhmrong-Rajanuparb Institute
- Director of the Water Quality Management Division, BMA
- Director of Sanitary Engineering Division, PWD
- Director of Planning Division, PWD
- Director of Electrical and Mechanical Engineering Division, PWD
- Director of Materials and Research Division, PWD
- Director of Technical Office for City Development, PWD
- Director of Personal Division, PWD

Note: The Chief Advisor may attend the Steering Committee as observer.

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Member of Technical Committee

Thai side

1. Mr.Pornsak Jevasuwan, Director of TCSW
2. Dr. Kreetha Soykheeree, Sanitary Engineering Division
3. Mr. Nop Rojanawani, Structural Engineering Division
4. Mr. Chatchawal Khumkhamchu, Electrical and Mechanical Engineering Division
5. Mr. Peerapong Ratapana, Electrical and Mechanical Engineering Division
6. Mr. Jiroj Suparbpong, Material and Research Division
7. Ms. Apinan Jaruchaiyakul, Department of Drainage and Sewerage, BMA

Note : The Chief Advisor and/or Other Expert may attend the Technical Committee as observer

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MEMBER LIST OF WORKING GROUPS

Course	*Organization	Name	Profession
1 Water Quality Analysis	MRD	1.Mr. Pomsak Jevasuwon	Scientist
	MRD	2.Ms. Uthai Sangiampong	Scientist
	BMA	3.Mr. Somchai Somvane	Scientist
	BMA	4.Ms. Chanthana Rirattanapong	Scientist
	CU	5.Mr. Thavat Srisatit	
	DIW	6.Ms. Mari Vijiitjanyakul	
	HD	7.Ms. Narumon Tapaneeyakul	
2 Water Quality Control	MRD	1.Mr. Pomsak Jevasuwon	Scientist
	MRD	2.Ms. Uthai Sangiampong	Scientist
	BMA	3.Ms. Apinan Jaruchaiyakul	Scientist
	BMA	4.Mr. Sirilak Leerasiri	Scientist
	BMA	5.Ms. Busmaporn Chaiwanichaya	Scientist
	BMA	6.Mr. Teerapon Kuttawat	Scientist
	DIW	7.Mr. Chanchai Kanchanapan	
3 Operation and Maintenance	MRD	1.Mr. Pomsak Jevasuwon	Scientist
	EMD	2.Mr. Peerapong Chevapatr	Electric Engineer
	EMD	3.Mr. Thodsaphon Loypetch	Mechanical Engineer
	BMA	4.Mr. Supis Kraimark	Mechanical Engineer
	BMA	5.Mr. Chanin Vichayanont	Industrial Engineer
	SED	6.Mr. Tosporn Suddhajinda	Sanitary Engineer
	SED	7.Mr. Monthon Sutprasert	Sanitary Engineer
	PYM	8.Mr. Montri Chalittaporn	
4 Planning and Design	EMD	1.Mr. Peerapong Rathapana	Electric Engineer
	EMD	2.Mr. Chatchawal Kunkumcho	Mechanical Engineer
	BMA	3.Ms. Chanthana Rirattanapong	Scientist
	SED	4.Mr. Tosporn Suddhajinda	Sanitary Engineer
	SED	5.Mr. Kreetha Soikiri	Sanitary Engineer
	SED	6.Mr. Thepchai Sereeamnuay	Sanitary Engineer
5 Construction Supervision	BMA	1.Mr. Thammanus Chuansanua	Civil Engineer
	BMA	2.Mr. Surat Thirakul	Civil Engineer
	SED	3.Mr. Tosporn Suddhajinda	Sanitary Engineer
	SED	4.Mr. Somkid Chaiwaranurak	Sanitary Engineer
	SED	5.Mr. Somchai Matawattarakul	Sanitary Engineer
	EMD	6.Mr. Somchai Arunratamut	Electric Engineer
	EMD	7.Mr. Chatchawal Kunkumcho	Mechanical Engineer
6 Sewage Works Management	BMA	1.Mr. Chantong Opatsririwit	Sanitary Engineer
	DIW	2.Mr. Mongkon Putwattana	
	DOLA	3.Ms. Atchara Wongate	
	PYM	4.Mr. Montri Chalittaporn	
	SED	5.Mr. Tosporn Suddhajinda	Sanitary Engineer
	SED	6.Ms. Somchit Piyasilpa	Sanitary Engineer
	SED	7.Mr. Pomyot Thienthong	Environmental Engineer
	MRD	8.Mr. Pomsak Jevasuwon	Scientist

*MRD: Materials and Research Division/PWD

EMD: Electrical and Mechanical Engineering Division/PWD

DIW: Department of Industrial Works/Ministry of Industry

HD: Health Department/Ministry of Public Health

DOLA: Department of Local Administration/Ministry of Interior

SED: Sanitary Engineering Division/PWD

BMA: Bangkok Metropolitan Administration

CU: Chulalongkorn University

PYM: Pattaya Municipality

Thongchai
Piyasilpa
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JICA EXPERT LIST

Name of Expert	Field of Specialization	Duration
LONG-TERM EXPERT		
1 Toshio Yamada	Coordinator	2/8/1995 to 1/8/1999
2 Yoshio Oshima	Chief Advisor	21/8/1995 to 20/3/1998
3 Takashi Kirihara	Civil Engineering	21/8/1995 to 20/8/1997
4 Yoshio Nakamura	Mechanical Engineering	21/8/1995 to 20/3/1998
5 Tadashi Nagawa	Water Quality Analysis	16/10/1995 to 15/3/1998
6 Toru Meguro	Civil Engineering	1/9/1997 to 31/8/1999
7 Junichi Takeuchi	Water Quality Analysis	2/3/1998 to 1/3/2000
8 Hakuei Yamamoto	Mechanical Engineering	8/3/1998 to 7/3/2000
9 Shigeru Miyahara	Chief Advisor	1/4/1998 to 31/3/2000
SHORT-TERM EXPERT		
1 Masayuki Nagamochi	Water Quality Analysis	11/2/1996 to 24/2/1996
2 Tetsuro Kaneko	Electrical Engineering	11/2/1996 to 13/3/1996
3 Tadayuki Minakuchi	Water Quality Control	4/3/1996 to 30/4/1996
4 Haruyoshi Miura	Seminar	25/3/1996 to 12/4/1996
5 Kazuo Samejima	Seminar	25/3/1996 to 6/4/1996
6 Kunitoshi Sasaki	Mechanical Engineering	9/4/1996 to 30/4/1996
7 Hiroko Kamata	Water Quality Analysis	27/7/1996 to 14/8/1996
8 Hitoshi Nakagawa	Mechanical Engineering	7/8/1996 to 13/9/1996
9 Haruo Takeda	Water Quality Control	8/8/1996 to 7/10/1996
10 Shinichi Osaka	Civil Engineering	12/8/1996 to 23/8/1996
11 Shinichi Osaka	Sanitary Engineering	26/11/1996 to 4/12/1996
12 Kazuo Yasuda	Mechanical Engineering	23/1/1997 to 30/3/1997
13 Makoto Terunuma	Electrical Engineering	3/2/1997 to 28/2/1997
14 Hideo Iwamoto	Electrical Engineering	4/2/1997 to 12/2/1997
15 Hisataka Sokawa	Sanitary Engineering	5/2/1997 to 8/2/1997
16 Kazuya Inoue	Water Quality Analysis	8/2/1997 to 7/4/1997
17 Shusaku Ueno	Audio Visual Aids	10/3/1997 to 29/3/1997
18 Shusaku Ueno	Sanitary Engineering	26/5/1997 to 14/6/1997
19 Shigeo Kimura	Electrical Engineering	7/7/1997 to 3/10/1997
20 Junichi Takeuchi	Water Quality Analysis	20/8/1997 to 25/10/1997
21 Seiichi Saito	Mechanical Engineering	24/9/1997 to 23/12/1997
22 Shusaku Ueno	Sanitary Engineering	25/11/1997 to 19/12/1997
23 Kanji Kishi	Civil Engineering	6/1/1998 to 7/3/1998
24 Hatsuhiko Matsuda	Water Quality Analysis	8/2/1998 to 1/3/1998
25 Seiichi Iida	Water Quality Control	10/2/1998 to 20/3/1998
26 Toshiyuki Kosugi	Electrical Engineering	10/2/1998 to 20/3/1998
27 Shuichi Kudo	Civil Engineering	17/2/1998 to 21/3/1998
28 Shusaku Ueno	Sewage Works Management	2/3/1998 to 20/3/1998
29 Shusaku Ueno	Sanitary Engineering	2/6/1998 to 23/6/1998
30 Shigeo Kanai	Sewage Works Management	12/7/1998 to 25/7/1998
31 Hiromi Takeshige	Electrical Engineering	5/8/1998 to 3/10/1998
32 Masamichi Hirakawa	Civil Engineering	7/9/1998 to 28/11/1998

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LIST OF COUNTERPARTS TRAINING IN JAPAN

	Name of Counterparts	Organization	Field of Training	Duration
1	Vijit Santipatanekiji	PWD	Operation and Maintenance for Sewage Facilities	17/8/1995 to 19/10/1995
2	Panee Ratanasampan	PWD	Training Management	16/1/1996 to 7/2/1996
3	Ponsak Jevasuwon	PWD	Sewage Works Management	14/10/1996 to 27/10/1996
4	Somchai Somvane	PWD	Sewage Technology	20/8/1996 to 20/11/1996
5	Redhpol Jitrapreuk	BMA	Operation and Maintenance for Sewage Facilities	12/8/1996 to 13/10/1996
6	Apinan Jaruchaiyakul	BMA	Sewage Works Management	14/10/1996 to 27/10/1996
7	Sitú Honghathai	PWD	Training Management	2/3/1997 to 14/3/1997
8	Busmaporn Chaiwanichaya	BMA	Industrial Waste Water Treatment Technique	21/7/1997 to 4/12/1997
9	Ophat Seagtongprakai	BMA	Operation and Maintenance for Sewage Facilities	11/8/1997 to 13/10/1997
10	Peerapong Chevapr	PWD	Sewage Technology	24/11/1997 to 12/12/1997
11	Chokechai Tantarawat	PWD	Sewage Technology	24/11/1997 to 12/12/1997
12	Medhi Hongnoi	PWD	Sewage Technology	1/10/1998 to 15/10/1998
13	Sirilak Leerasing	BMA	Domestic Waste Water Treatment Technique	15/8/1998 to 14/12/1998
14	Sekson Churangsarit	PWD	Waste Water Management	1/8/1998 to 21/8/1998
15	Supis Kraimark	BMA	Operation and Maintenance for Sewage Facilities	15/8/1998 to 14/10/1998

The request
 Reply
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LIST OF THE MACHINERY AND EQUIPMENT

EQUIPMENT LIST OF JAPANESE F.Y. 1995

1. EQUIPMENT FOR LABORATORY

No.	Item	Model	Quantity	
			PWD	BMA
1-1	FUME HOOD WITH EXHAUST FUN	YAMATO / FHC-150PZ	2	2
1-2	CONSTANT TEMPERATURE OVEN	YAMATO / DN-610	1	1
1-3	LOW TEMPERATURE INCUBATOR	YAMATO / IN-800	1	1
1-4	INCUBATOR	YAMATO / IN-600	1	1
1-5	DRYING STERILIZER	YAMATO / SG-600	1	1
1-6	AUTOClave WITH ACCESSORY	YAMATO / SM-32	1	1
1-7	WATER BATH WITH TRANSFORMER	YAMATO / BS-65	1	1
1-8	VACUUM PUMP	YAMATO / PD-102	1	1
1-9	GLASS DESICATOR	SIMEX / ϕ 30cm	2	2
1-10	ACRYL DESICATOR	YAMATO / FH-1	2	2
1-11	COD METER WITH ACCESSORIES	CENTRAL KAGAKU / HC-407	1	1
1-12	MUFFLE FURNANCE	YAMATO / FM-48	1	1
1-13	CENTRIFUGE WITH ACCESSORIES	HITACHI / CT6L	1	1
1-14	AUTO-STILL	YAMATO / WG-710	1	1
1-15	MANIFOLD TEST SET	SEKIYA / SA-3	3	-
1-16	ASPIRATOR	YAMATO / WP-25	3	-
1-17	OXYGEN METER	YSI / 59	1	1
1-18	TEST TUBE MIXER WITH TRANSFORMER	YAMATO / MT-51	2	-
1-19	WATER SAMPLER	GEM / 410	-	3
1-20	ANALYTICAL BALANCE	SARTORIUS / BP 300S	1	1
1-21	ELECTRONIC BLANCE	SARTORIUS / BP 1200	1	1
1-22	MAGNETIC STIRRER WITH HEATING ELEMENT	FRANZ MORATE / M21/1	2	2
1-23	COD REACTOR WITH REAGENT	HACH /	-	1
1-24	SERIAL DISTILLATION APPARATUS	GERHARDT / KI 12/36	-	1
1-25	SERIAL DIGESTION APPARATUS	GERHARDT / KI 11/26	-	1
1-26	FAT DETERMINATION APPARATUS	GERHARDT / EV 6A II/16	-	1
1-27	BALANCE TABLE	LOCAL MADE / BT50	1	1
1-28	LABORATORY TABLE		-	1
1-29	BOTTLE CABINET		-	1
1-30	SPECTROPHOTOMETER	SHIMADZU / UV-1601PC	1	1
1-31	SPECTROPHOTOMETER	HACH / DR 2000	-	1
1-32	MICROSCOPE WITH ACCESSORIES	OLYMPUS / BX40	1	-
1-33	pH METER WITH ACCESSORIES	HORIBA / D-12	1	1
1-34	GLASS/PLASTIC WARES etc.		1	-

2. EQUIPMENT FOR OPERATION AND MAINTENANCE TRAINING

No.	Item	Model	Quantity	
			PWD	BMA
2-1	CLAMP ADAPTER	EXTECH /	1	1
2-2	MEGGER TESTER	KYORITSU / 3301	1	1
2-3	TACHOMETER(DIRECT TYPE)	DIGICON / DT250TP	1	1
2-4	TACHOMETER(STROBOSCOPIC TYPE)	DIGICON / SB-15	1	1
2-5	VIBRATION METER	SPH / ViB-10	1	1
2-6	PORTABLE THERMOMETER	UNIVERSAL / DT20	1	1
2-7	PORTABLE DO METER	HORIBA / OM-14	1	1
2-8	PORTABLE MLSS METER	KRK / SS-1Z	1	1

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LIST OF THE MACHINERY AND EQUIPMENT

3. AUDIOVISUAL & COMMON EQUIPMENT

No.	Item	Model	Quantity	
			PWD	BMA
3-1	ELECTRONIC BOARD	PLUS / BF-050	3	1
3-2	COPY MACHINE WITH ACCESSORIES	XEROX / CDV450	1	-
3-3	BOOKLETMAKING SYSTEM	GESTETNER / DBM100	1	-
3-4	COLLATING SYSTEM	GESTETNER / DC-10	1	-
3-5	VIDEO DATA PROJECTOR	SONY / VPH-1252 QM	1	-
3-6	INTERFACE UNIT	SONY / IFU-1271 M	1	-
3-7	VIDEO PLAYER	SONY / SLV-X831PS	1	-
3-8	DISC PLAYER	SONY / MDP-A800K	1	-
3-9	CASSETTE DECK	TEAC / W-800R	1	-
3-10	SLIDE PROJECTOR	ELMO / 253AF	1	-
3-11	VISUAL PRESENTER	ELMO / EV-550AF	1	-
3-12	SCREEN	BRETFORD / 9001 M 200"	1	-
3-13	MIXING CONSOLE	TOA / CX-124	1	-
3-14	POWER AMPLIFIER	TOA / P-1060D	1	-
3-15	GRAPHIC EQUALIZER	TOA / E-1231	2	-
3-16	SPEAKER	TOA / 300SP	2	-
3-17	DYNAMIC MICROPHONE	TOA / J-1	2	-
3-18	WIRELESS PRE-AMPLIFIER	TOA / WT-770	1	-
3-19	WIRELESS TUNER UNIT	TOA / WTU-770	2	-
3-20	WIRELESS MICROPHONE (LAVALIERE)	TOA / WM-370	1	-
3-21	WIRELESS MICROPHONE (HAND-HELD)	TOA / WM-270	1	-
3-22	WHIP ANTENNA	TOA / YW-600	1	-
3-23	INTERFACE SWITCH	SONY / PC-1271M	1	-
3-24	SCAN BOARD	SONY / IFB-3000	1	-
3-25	CONNECTION CABLE	SONY / SIC-10	1	-
3-26	CONNECTION CABLE	SONY / SIC-22	1	-
3-27	BOARD	SONY / IFB-20	1	-
3-28	INSTALLATION FOR AUDIOVISUAL SYSTEM		1	-

4. VEHICLES

No.	Item	Model	Quantity	
			PWD	BMA
4-1	BUS	HINO / AK176KC BUS	1	-
4-2	MICRO BUS	TOYOTA / LH112R-EBMRS	1	-

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LIST OF THE MACHINERY AND EQUIPMENT

EQUIPMENT LIST OF JAPANESE F.Y. 1996

1. EQUIPMENT FOR THE OPERATION & MAINTENANCE TRAINING

No.	Item	Model	Quantity	
			PWD	BMA
1-1	BELT TYPE PRESSURE DEHYDRATOR TEST UNIT	TSK ENGINEERING CO., LTD	1	-
1-2	TRAINING UNIT FOR ELECTRIC POWER DISTRIBUTION	TSK ENGINEERING CO., LTD	1	-
1-3	TRAINING UNIT FOR THE PUMP OPERATION	TSK ENGINEERING CO., LTD	1	-
1-4	TRAINING UNIT FOR INSTRUMENTATION	TSK ENGINEERING CO., LTD	1	-
1-5	TRAINING UNIT FOR SEQUENCE CONTROL	TSK ENGINEERING CO., LTD	1	-
1-6	TRAINING UNIT FOR EARTHING	TSK ENGINEERING CO., LTD	1	-
1-7	SPARE PARTS & MANUAL FOR EACH TRAINING UNITS	TSK ENGINEERING CO., LTD	1	-
1-8	BUTTERFLY VALVE	KITZ / G-10AJME4	5	-
1-9	GLOVE VALVE	KITZ / 10FCJ4	5	-
1-10	CHECK VALVE	KITZ / 125FC04	5	-
1-11	GATE VALVE	KITZ / 10FCL4	5	-
1-12	BALL VALVE	KITZ / T2"	5	-
1-13	PUMP SET	TSURUMI / TOK3-4POT	5	-

2. EQUIPMENT FOR LABORATORY

No.	Item	Model	Quantity	
			PWD	BMA
2-1	ATOMIC ABSORPTION SPECTROPHOTOMETER	SHIMADZU / AA-6701F	1	-
2-2	MICROSCOPE WITH CCD CAMERA	OLYMPUS / BX40	-	1
2-3	DO METER WITH BOD PROBE	YSI / 52	5	5
2-4	ANALYTICAL BALANCE	SARTORIUS / AC211S	2	2
2-5	pH METER	TOA / HM-7E	3	3
2-6	pH METER	TOA / HM-12P	2	2
2-7	HIGH PERFORMANCE LIQUID CHROMATOGRAPH SYSTEM	SHIMADZU / LC-10ATVP	1	-
2-8	SPECTROFLUOROPHOTOMETER	SHIMADZU / RF-5301	1	-
2-9	REFLECTED LIGHT FLUORESCENCE	OLYMPUS / BX-FLA4-E02	1	-
2-10	AUTOMATIC PHOTOMICROGRAPHY SYSTEM	OLYMPUS / PM20-3SDX1	1	-

3. AUDIOVISUAL & COMMON EQUIPMENT

No.	Item	Model	Quantity	
			PWD	BMA
3-1	VIDEO PROJECTOR WITH SCREEN	SANYO / PLC-250	-	1
3-2	PERSONAL COMPUTER SET	ARMAS DASH / I66HMX PENTIUM	-	1
3-3	COLOR LASER PRINTER	HP / COLOR LASER JET 5	-	1
3-4	COLOR SCANNER	HP / SCAN JET 4C	-	1
3-5	DIGITAL CAMERA	KODAK / DC-50 ZOOM	-	1

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LIST OF THE MACHINERY AND EQUIPMENT

EQUIPMENT LIST OF JAPANESE F.Y. 1997

1. EQUIPMENT FOR LABORATORY

No.	Item	Model	Quantity	
			PWD	BMA
1-1	ATOMIC ABSORPTION SPECTROPHOTOMETER	SHIMADZU / AA-6701F	-	1
1-2	GAS CHROMATOGRAPH	SHIMADZU / GC-14B	1	1
1-3	ANALYTICAL BALANCE	SARTORIUS / AC 211 S	1	1
1-4	SPECTROPHOTOMETER	SHIMADZU / UV-1601PC	1	1
1-5	FAT EXTRACTION APPARATUSES			
	1)SOXTHERM FAT EXTRACTION	GERHARDT / S306 AK	1	-
	2)ROTARY EVAPORATOR	RESONA / B300X / SW200	2	-
1-6	TOTAL ORGANIC CARBON ANALYZER	SHIMADZU / TOC-5000A	1	1
1-7	NITROGEN DETERMINATION APPARATUSES			
	1)KJELDAHERM DIGESTION SYSTEM	GERHARDT / KB20S/TR	1	-
	2)SCRUBBER	GERHARDT / TUR/K	1	-
	3)DISTILLATION SYSTEM	GERHARDT / VAP 30	1	-

2. PERSONAL COMPUTER SET

No.	Item	Model	Quantity	
			PWD	BMA
2-1	PERSONAL COMPUTER	HP / VECTRA VL 5/200MMX	4	-
	ACCESSARIES FOR NETWORK		1	-
2-2	LASER PRINTER	HP / LASERJET 4V	1	-
2-3	PLOTTER	HP / DESIGNJET 750	1	-
2-4	SOFTWARE			
	1)MS OFFICE 97 PROFESSIONAL		4	-
	2)VISIO TECHNICAL 4.5		4	-
	3)AUTO CAD R1.4		4	-
	4)NORTON ANTIVIRUS SOFT V.2.0		4	-
2-5	PROJECTOR(WITH SCREEN AND LASER POINTER)	SONY / VPL-S500M	1	-
2-6	UPS	POWERLINK / 650VA	4	-

3. VEHICLE

No.	Item	Model	Quantity	
			PWD	BMA
3-1	FOUR-WHEEL DRIVE CAR	TOYOTA / VZJ95R-GKPNKW	1	-

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Budgetary Allocation of Thai Side
in Thai Fiscal Year from 1995 to 1998

TOTAL 4,019,971 Baht

1.PWD

(1) Construction and Improvement Laboratory 1,760,000 Baht

(2) Training 13 times 582,971 Baht

2.BMA

(1) Improvement Laboratory and Classroom 1,677,000 Baht

*Thongchai
Ripthir
14/10*

List of counterparts

1. PWD

Name	Position
Mr. Pornsak Jevasuwon	TCSW Director
Mr. Panee Rattanasampan	Human Resource Development Officer
Mr. Peerapong Chewapatr	Electrical Engineer
Mr. Suriya Thanawatdej	Mechanical Engineer
Mr. Uthai Boonyarattanakul	Electrical Engineer
Mr. Seksom Choorungsalit	Civil Engineer
Mr. Pornyot Thienthong	Environmental Engineer
Ms. Nuchapang Saefoo	Scientist
Ms. Piyaphan Boonprapob	Scientist

2. BMA

Name	Position
Mr. Chanin Vichayanon	Industrial Engineer
Mr. Supis Kraimark	Dip. in Mechanical Engineer
Mr. Opas Seangtongprakai	Sanitary Scientist
Mr. Pracha Keawprang	Sanitary Scientist
Mr. Rodhpol Jturapreuk	Industrial Engineer
Ms. Apinan Jaruchaiyakul	Sanitary Scientist
Ms. Busmaporn Chaiwanichaya	Sanitary Scientist
Ms. Sermsuk Pakkudtung	Sanitary Scientist
Mr. Teerapon Kuttawas	Sanitary Scientist
Mr. Somchai Sornvane	Sanitary Scientist
Ms. Sirilak Leerasiri	Sanitary Scientist
Ms. Chantana Rirattanapong	Scientist
Mr. Arsa Sukkhang	Electrical Engineer
Mr. Vinus Maneewonges	Mechanical Technician

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PROJECT ACTIVITIES (TRAINING COURSES)

1.Planning and Design(Basic) Course

		1				2				3				4				TOTAL					
DURATION		24/2/1997-7/3/1997				6/1/1998-16/1/1998				9/11/1998-19/11/1998													
No. of TRAINEE		17				25				26								68					
PWD 1	PWD 2	BMA	LOCAL	0	12	2	3	9	10	3	3	11	3	7	5					20	25	12	11

PWD 1: PWD HEAD OFFICE PWD 2: PWD PROVINCIAL OFFICE

2.Planning and Design(Intermediate) Course

		1				2				3				4				TOTAL					
DURATION		17/8/1998-28/8/1998																					
No. of TRAINEE		22																22					
PWD 1	PWD 2	BMA	LOCAL	4	9	6	3													4	9	6	3

PWD 1: PWD HEAD OFFICE PWD 2: PWD PROVINCIAL OFFICE

3.Operation and Maintenance(Basic 1) Course

		1				2				3				4				TOTAL					
DURATION		17/3/1997-26/3/1997				2/6/1997-13/6/1997				23/3/1998-3/4/1998				18/5/1998-29/5/1998									
No. of TRAINEE		18				19				23				17				77					
PWD 1	PWD 2	BMA	LOCAL	0	4	0	14	0	3	0	16	5	3	9	6	1	4	6	6	6	14	15	42

PWD 1: PWD HEAD OFFICE PWD 2: PWD PROVINCIAL OFFICE

4.Operation and Maintenance(Basic 2) Course

		1				2				3				4				TOTAL(BASIC1+2)					
DURATION		3/8/1998-14/8/1998																					
No. of TRAINEE		28																105					
PWD 1	PWD 2	BMA	LOCAL	3	5	1	19													9	19	16	61

PWD 1: PWD HEAD OFFICE PWD 2: PWD PROVINCIAL OFFICE

5.Water Quality Analysis(Basic) Course

		1				2				3				4				TOTAL					
DURATION		24/2/1997-7/3/1997				20/4/1998-1/5/1998																	
No. of TRAINEE		13				30												43					
PWD 1	PWD 2	BMA	LOCAL	0	6	0	7	4	13	4	4									4	24	4	11

PWD 1: PWD HEAD OFFICE PWD 2: PWD PROVINCIAL OFFICE

6.Water Quality Control Course

		1				2				3				4				TOTAL					
DURATION		10/2/1997-14/2/1997				23/5/1997-27/6/1997				15/6/1998-19/6/1998													
No. of TRAINEE		18				26				21								65					
PWD 1	PWD 2	BMA	LOCAL	0	5	3	10	0	8	5	13	2	4	10	5					2	17	18	28

PWD 1: PWD HEAD OFFICE PWD 2: PWD PROVINCIAL OFFICE

GRAND TOTAL

		TOTAL					
No. of TRAINEE		303					
PWD 1	PWD 2	BMA	LOCAL	39	94	56	114

PWD 1: PWD HEAD OFFICE PWD 2: PWD PROVINCIAL OFFICE

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PLANNING AND DESIGN BASIC COURSE CURRICULUM

DAY	AM	PM
1ST	OPENING CEREMONY	ORIENTATION SEWAGE WORKS IN BANGKOK [Mr. Chanchai (BMA)]
2ND	BASIC KNOWLEDGE OF SEWERAGE SYSTEM AND FACILITIES (history, purpose, sewer, pumping station, treatment plant) [Mr. Pisut(PWD)]	
3RD	SEWERAGE SYSTEM PLANNING (MP, FS, DD, explanation of example) [Mr. Thossaporn(PWD)]	
4TH	DESIGN OF DRAINAGE SYSTEM (Basic design of storm sewer and pumping station) [Ms. Somchit(PWD)]	
5TH	SEWERAGE SYSTEM ESTIMATION (cost estimate) [Mr. Monton(PWD)]	SEWERAGE SYSTEM MANAGEMENT (maintenance cost) [Mr. Jane(BMA)]
6TH	CASE STUDY (explanation of Chantaburi sewage system) [Mr. Kreetta(PWD)]	SITE VISIT (Bangkok→Sri Racha →Chantaburi)
7TH	SITE VISIT (Chantaburi) [Mr. Kreetta(PWD)]	(Chantaburi→Bangkok)
8TH	SITE VISIT (Huay Khwang treatment plant, Construction of Ratanakosin project) [Mr.Narong, Ms. Suthimon(BMA)]	
9TH	SEWAGE WORKS IN THAILAND [Mr. Supol(PWD)]	CLOSING CEREMONY

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PLANNING AND DESIGN INTERMEDIATE COURSE CURRICULUM

DAY	AM	PM
1ST	OPENING CEREMONY	ORIENTATION PROCEDURE OF SEWERAGE PLANNING AND DESIGN [Mr. Thossaporn(PWD)]
2ND	DESIGN OF SEWER(I) (II) (Determination of the quality & quantity of wastewater & stormwater) PRACTICE (Population estimation, etc) use of Computer system [Mr. Pornyot(PWD)]	
3RD	DESIGN OF SEWER(III) (Capacity of sewer, sewer foundation, manhole, diversion chamber) [Mr. Thossaporn(PWD)]	
4TH	DESIGN EXERCISE OF SEWER PRACTICE (Calculation of flow calculation table, Drawing the vertical section) use of Computer system	
5TH	[Mr. Kreeta(PWD), Mr. Meguro(JICA)]	
6TH	DESIGN OF PUMPING STATION [Ms. Somchit(PWD)]	BASIC ELECTRICAL ENGINEERING [Mr. Uthai Jitseree(PWD)]
7TH	DESIGN OF STABILIZATION POND [Ms. Somchit(PWD)]	PRACTICE Capacity calculation of SP
8TH	DESIGN OF AERATED LAGOON [Mr. Monton(PWD)]	PRACTICE Capacity calculation of AL
9TH	SITE VISIT (Rayong project) [Ms. Somchit(PWD)]	
10TH	CLOSING CEREMONY	

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O & M (Basic-1) Course Schedule

Date	a.m.(3Hr)	p.m.(3Hr)
1ST	Opening (PWD.Samsen)	Basic technology of wastewater treatment (1/2) (PWD Samsen) Mr. Sakesom
2ND	Basic technology of wastewater treatment (2/2) (TTI) Mr. Sakesom	Stabilization Pond and Aerated Lagoon system (TTI) Mr. Sakesom
3RD	Site Visit to Nakornrajchasma (SP)	
4TH	Collection system (TTI) Mr. Monton	Operation and maintenance of pipe (TTI) Mr. Monton
5TH	Site Visit to Hua Hin (OD)	
6TH	Pumping Station (TTI) Mr. Uthai	Safety (TTI) Mr. Supist
7TH	Practice of Pump maintenance (Sri Praya) Mr. Chanin & Mr. Supist	
8TH	Site Visit to Thai Numtip Prathumthani (Soft Drinks Factory)	
5/28 (THU)	Water Quality Analysis (Sri Praya) Mr. Ophas	
9TH	Closing Ceremony	

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O & M (Basic-2) Course Schedule

Date	a.m.(3Hr)	p.m.(3Hr)	
1ST		Opening (PWD.Samsen)	Operation (Activated Sludge & Oxidation Ditch)(1/2) (PWD.Samsen) Mr. Kreta
2ND	Operation (Activated Sludge & Oxidation Ditch)(2/2) (TTI) Mr. Yamamoto	Electric equipment for sewage works (1/2) (TTI) Mr. Uthai & Mr.Supis	
3RD	Electric equipment for sewage works (2/2) (TTI) Mr. Uthai & Mr.Supis	Trouble shooting (TTI) Mr. Pornsak	
4TH	Practice of Electrical Equipment (TTI) Mr. Uthai & Mr. Supis		
5TH	Site Visit (OD) (Sriracha)		
6TH	Practice of Pump Operation (TTI) Mr. Uthai & Mr.Supis		
7TH	Site Visit (Sludge Treatment Plant) (AM : Sipraya PM : Huaykwang)		
8TH	Practice of Dewatering Machine (TTI) Mr. Uthai & Mr.Supis		
9TH	Sludge treatment and equipment (PWD Samsen) Mr. Sekson	Sewage Works in Thailand (PWD Samsen) Mr. Supol	Closing (PWD Samsen)

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WQA CURRICULUM

	AM		PM
1ST	REGISTRATION /OPENING CEREMONY	FUNDAMENTALS OF CHEMISTRY (Ms. Piyaphan)	FUNDAMENTALS OF BIOLOGY (Ms. Nuchnapang)
2ND	BASIC TECHNOLOGY OF WASTEWATER TREATMENT (Mr. Seksom)		TROUBLESHOOTING IN WATER QUALITY MANAGEMENT (Mr. Pornsak)
3RD	FUNDAMENTALS OF WATER QUALITY ANALYSIS (Mr. Somchai* et a.)		LABORATORY WORK -Transparency, pH, SS- (Mr. Pornsak et al)
4TH	FUNDAMENTALS OF WATER QUALITY ANALYSIS (Mr. Somchai* et a.)		LABORATORY WORK -BOD, COD- (Ms. Chantana* et al)
5TH	SITE VISIT TO PATTAYA (Mr. Pornsak et al)		
6TH	FUNDAMENTALS OF WATER QUALITY ANALYSIS (Mr. Somchai* et a.)		LABORATORY WORK -Coliforms, BOD- (Ms. Chantana* et al)
7TH	FUNDAMENTALS OF WATER QUALITY ANALYSIS (Mr. Somchai* et a.)		LABORATORY WORK -Coliforms, Microscopy, MLSS- (Ms. Chantana* et al)
8TH	DATA PROCESSING (Mr. Somchai*)		PARAMETERS AND PLANT OPERATION (Mr. Pornsak)
9TH	SITE VISIT TO SRI PHRAYA (Mr. Somchai* et al)		
10TH	DISCUSSION ABOUT WATER QUALITY ISSUES (Mr. Pornsak et al)		EVALUATION / CLOSING CEREMONY

The report

Project 140

WQC CURRICULUM

	AM		PM
1ST	REGISTRATION /OPENING CEREMONY	LAW OF WATER QUALITY CONTROL (Ms. Apinan*)	WASTEWATER TREATMENT TECHNOLOGY (Mr. Pisut)
2ND	WASTEWATER TREATMENT TECHNOLOGY (Mr. Pisut)		INSPECTION PROCEDURE (Ms. Sirirak*)
3RD	PREPARATION FOR INSPECTION (Ms. Apinan et al*)		SITE VISIT TO A BEER FACTORY (Mr. Theerapol et al*)
4TH	SITE VISIT TO HAUY KWANG (Ms. Sirirak et al*)		SITE VISIT TO A HOSPITAL (Mr. Theerapol et al*)
5TH	DISCUSSION ABOUT INSPECTION (Ms. Sirirak*)		CONCLUSION / CLOSING CEREMONY

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TCSW Database Collection

Item	Count
Book List	300books
Photograph of Sewage Works in Thailand	1000Pics
Training Text Book (English)	13books
Training Text Book (Thai language)	12books

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PROJECT DESIGN MATRIX

TRAINING CENTER FOR SEWAGE WORKS

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>Overall Goal</p> <p>Appropriate sewage works technology is established and sewage works are properly planned, designed, constructed, operated and maintained</p>	<p>1. Number of sewage treatment plant 2. Number of sewage engineers/scientists/technicians</p>	<p>- Related statistics of the field of SW - Survey report of the Project</p>	
<p>Project Purpose</p> <p>Functions and activities of TCSW are established</p>	<p>1. Number of participants in each course 2. Number and subjects of training courses implemented 3. Number of trainers</p>	<p>- Annual report and related statistics of TCSW</p>	<p>- The Thai Government keeps its policy to push forward with the sewage works development - Trained personnel do not leave SW sector</p>
<p>Outputs</p> <p>1. Management of TCSW is established 2. Engineers, scientists, technicians and managers are trained 3. Data-base system(including library use) is prepared 4. Research and development (R&D) activity is set up</p>	<p>1. Number of management personnel for TCSW 2. -Results of examination for training course attended -Number of graduates of each course 3. Number of data/records collected for Data-base 4. Number of R&D subject matters</p>	<p>- Annual report and related statistics of TCSW - Trainees examination record</p>	<p>- Trained trainers remain at TCSW - Budget for each course is continued to be secured</p>
<p>Activities</p> <p>T (J) : to be executed by the Thai (Japanese) side</p> <p>1-1 (T) Set up Steering Committee 1-2 (T) Recruit staff for TCSW 1-3 (T) Personnel management 1-4 (T) Financial management</p> <p>2-1 (T) Recruit trainers 2-2 (JT) Train trainers 2-3 (JT) Set up training programs 2-4 (JT) Develop training curriculum 2-5 (JT) Develop training materials 2-6 (T) Train engineers, scientists technicians and managers</p> <p>3-1 (JT) Plan the data-base system(including library use) 3-2 (T) Collect documents / data 3-3 (JT) Categorize the documents 3-4 (T) Serve for proper use</p> <p>4-1 (JT) Develop R&D program 4-2 (JT) Prepare R&D facilities</p>	<p style="text-align: center;">Inputs</p> <p>Thai side</p> <p>Necessary personnel to implement the project</p> <p>TCSW building and facilities</p> <p>Necessary expenses to implement the project</p> <p>Japanese side</p> <p>Chief Advisor</p> <p>Coordinator</p> <p>Experts in the field of civil engineering, mechanical engineering, water quality science/engineering and others</p> <p>Equipment for training</p> <p>Counterpart training in Japan</p>	<p>- PWD and BMA continue to cooperate with each other - Equipment is supplied in time</p> <p>Pre-conditions</p> <p>- Documents and data exist - Capable candidates for trainees are available</p>	

The majority of Projects large

PLAN OF OPERATION FOR WHOLE PERIOD

PROJECT: TCSW

PROJECT PURPOSE: FUNCTIONS AND ACTIVITIES OF TCSW ARE ESTABLISHED

OUTPUT	Activities (J): TO BE EXECUTED BY THE THAI (JAPANESE) SIDE	YEAR	1995		1996		1997		1998		1999		2000		Responsible Person in Project Team	Input *	
		MONTH	7	10	1	4	7	10	1	4	7	10	1	4			7
		FY (JAPAN)	1995		1996		1997		1998		1999		2000				
FY(THAI)	1995	1996		1997		1998		1999		2000							
Management of TCSW is established	1.Set up Steering Committee(T) 2.Recruit staff for TCSW(T) 3.Personnel management(T) 4.Financial management(T)		finished											Chief Advisor TCSW Director	TCSW Director Counterparts Admi. Staff		
Engineers, scientists, technicians and managers are trained	1.Prepare trainers(T) 2.Train trainers(J&T) 3.Set up training programs(J&T) 4.Develop training curricula(J&T) 5.Develop training materials(J&T) 6.Train engineers, scientists, technicians and managers(T)													Chief Advisor TCSW Director	Chief Advisor Japanese Experts TCSW Director Counterparts Technical Staff related S/W Necessary Equipment		
Database system (incl. library use) is prepared	1.Plan the D-base system(J&T) 2.Collect documents and data(T) 3.Categorize the documents(J&T) 4.Serve for proper use(T)													Chief Advisor TCSW Director	Chief Advisor Japanese Experts TCSW Director Counterparts Technical Staff related S/W Necessary Equipment		
Research and development (R&D) activity is set up	1.Develop R&D program(J&T) 2.Prepare R&D facilities(J&T)													Chief Advisor TCSW Director	Chief Advisor Japanese Experts TCSW Director Counterparts Necessary Equipment		

* Person, equipment and other input necessary for implementing the activities

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付屬資料 2 TCSW Steering Committee 議事錄 (98年11月11日開催)

Minutes of meeting
TCSW steering committee meeting
1/1998

Date: Wednesday 11 November 1998 at 09:30 a.m.

Attendants

1 Mr. Rajatin syamananda	Deputy Direct general of PWD	Chairman
2. Mr. Alonkot Paipalu	DOLA	Committee
3. Ms. Visakorn Sathongkom	Bureau of Budget	Committee
4. Mr. Banjong Armorcheewin	DTEC	Committee
5. Mr. Vinai Boipradit	Dumrongravhanupap Institute	Committee
6. Mr. Chanchai Vitupanyakit	WQM	Committee
7. Mr. Surapong Punpipat	Planning division	Committee
8. Mr. Songpol Vasayangkru	Bureau of Budget	Committee
9. Mr. Chokechai Tanthanawat	EMD	Committee
10. Mr. Pornsak Jeewasuwan	TCSW	Committee and secretary

Absent people

1. Office of drainage, BMA	Committee
2. National Municipality of Thailand	Committee
3. SED	Committee

Attendants

1. Mr. Shigeru Miyahara	Chief Advisor of TCSW Project
2. Mr. Toshio Yamada	Coordinator TCSW Project
3. Mr. Seksom Churangsarit	TOCD
4. Mr. Nipa Sa-Nguanrungwong	TTI
5. Ms. Nuchnapanf Sae Foo	MRD
6. Ms. Piyaphan Boonprapob	MRD
7. Ms. Praveena Sangpradis	TCSW
8. Ms. Pornnapa Jiravisitkul	TCSW

The meeting started at 9:30 a.m.

Agenda 1 the subject, which informed by chairman

Chairman: Informed the background of committees, which were appointed from Minister of Interior ministry on 30 November 1994

Committees had an authority as follows:

1. Determine plan, project, course and the training method of TCSW.
 2. To suggest, comment, explain to TTI committee about TCSW proceeding
- Then informed that PWD was the first department of Thailand, which proceeded about wastewater treatment, had experienced and had personnel. So JICA accepted PWD to be a main department for training personnel about wastewater treatment. .

Resolution: Acknowledged

Agenda 2: TCSW Project

Mr. Pornsak: Informed about TCSW Project

Chairman: Informed additionally that JICA helped about personnel both engineer and scientist. And the importance of the committee is to help analysis, improving and developing TCSW. TCSW has tendency of developing to be International center.

Mr. Pornsak: Continued informing about TCSW project and cooperation of Thai government and Japanese government, which the period of project was 5 years from 1 August 1995 – 31 September 2000

According to determination of Japanese government, which had to be prepared as follows:

1. Arrange JICA expert
2. Arrange device and equipment
3. Arrange training in Japan for Thai officer

According to determination of Thai government, which had to be prepared as follows:

1. Thai government would find a method to proceed the project effectively and stable in both cooperation period and after the project finish.

2. Thai government would look for a method to transfer technology and knowledge from Japanese cooperation, which develop economy and society of Thailand.
3. According to topic 4, 5, 6 of Agreement were Project Administration, evaluation together, privilege of JICA expert in sequence. Thai government would give privilege to JICA expert in 2-1.
4. According topic 8 of agreement, Thai government would arrange to have rule of receiving and using equipment, which was delivered by JICA according to 2 – 2 and 2-1
5. Thai government would find a measure, which could make advantage of sending Thai officer to attend the training in Japan, could apply the knowledge and experience to use for the project effectively.
6. Thai government arranged counterpart and administrator indicating in annex 4.
7. Thai government arranged office and facilities as its show on annex 5.
8. Thai government had to prepare expense for device, materials, equipment, spare part and other necessary things, which has to use in the project beside the equipment from JICA according to 2-2. .
9. Thai government would prepare budget, which is necessary for proceeding the project.

Resolution: Acknowledged

Agenda 3: Result of TCSW proceeding

3.1 Reported TCSW operation

Mr. Pornsak: Informed the result of TCSW proceeding, which already trained, 13 courses from 25 courses according to the plan. Because of lacking budget, the number of trainees of WQC it not enough for arrange the training. However, TCSW solved the problem by decrease coursed but increase number of trainee.

BMA: In case BMA couldn't send-people to attend the training in WQC because of Act of PCD. So BMA didn't have authority to examine water quality and then lack personnel in this field.

And now it's during improving the act to make BMA have an authority to examine discharged water. Expect that the time left, BMA will be able to send officer to attend the training as the goal.

3.2 TCSW Plan in 1999

Mr. Pomsak: Informed training plan in 1999. TCSW would open 9 training courses, total trainees is 180.

Resolution: Acknowledged

Agenda 4: Others

Bureau of budget: Informed that Thailand had a limit budget, request TCSW to proceed according to goal of the project by emphasizing on local trainees.

Dumrongrathanupap Institute: Suggest about R & D, which the result might be brought to develop the courses. Next course would emphasis more on local development.

DOLA: Asked about training course whether it included about collecting user charge or not.

Chairman: Informed that user charge was not clear at present. Law would give authority to local to collect user charge. Because of politics problem, government regarded and looked for a measure to solve but still no conclusion. PCD had a duty to collect wastewater user charge, so should active about it. And it should have a way to do Privatization

BMA: Asked about evaluation of training course.

Chairman: Informed that TCSW realized the importance in this point because would like trainees to operate it real. But nowadays the evaluation was not successful, as it should be. TCSW would improve about it.

DTEC: Informed that:

1. Economy crisis made the budget insufficient. Japanese government prepared a budget 100 million Yen to help several project of JICA in Thailand, which TCSW might ask for this budget.
2. Ministry of science, technology and environment arranged Environment research training center, which is an international having course similarly

to TCSW, including R&D. TCSW might ask to exchange data so it would not be the same.

3. Suggested having a representative from environment committee.
4. Suggested private to join because of environmental problem must cooperate from every division
5. Lecturer gave knowledge of technology to others when having promotion or removal.

Chairman: Accepted the suggestion from DTEC to proceed

1. Improve committee to have representative from Ministry of science, technology and environment
2. Cooperate with “Environment research and training center” Department of Environmental Quality Promotion about R&D and training course.
3. Let private to participate in training more.
4. Support personnel to have role in operation more.

Emphasis on vision of local administrator to select officer to operate the system; must have knowledge, ability to operate and analyze technology that is suitable for its local and should have solution about operation of officer.

Mr. Miyahara: Informed that TCSW has proceeded for 3 years between Thai and Japanese officers. The project would finish next 2 years. Thai side should realize about the project how to go on.

Chairman: Concluded that after the project finish, Thai side would proceed everything by ourselves but would like to extend for phase 2, which the way of Japanese cooperation would increase R & D and database. Asked Bureau of Budget to accept PWD opinion about the necessary of budget. This project was one part to help environment control. Committees were very important to support. Every department should support and know the problem and go on the cooperation.

Resolution: Acknowledged

The meeting closed at 11:30 a.m.

Reported by Ms. Praveena Sangpradit

Approved by Ms. Nuchnapang Sae Foo

付属資料 3 Building Effluent Standards

Building Effluent Standards

1. Notification of the Ministry of Science, Technology and Environment on effluent standards from buildings of certain types and sizes.
2. Notification of the Ministry of Science, Technology and Environment on types of building to be designated as pollution sources which require effluent control.

Definition

“Building” means building structure whether constructed as a single building or a group of buildings located in the same area and whether using a single wastewater collection pipe or several connecting pipes between buildings

“Effluent” means treated wastewater meeting building effluent standards established in the Notification

“Wastewater” means liquid waste including pollutants contained in it

“Public Waters” means water bodies for general public use and including public wastewater collection pipes

“Wastewater Treatment” means the process of treating wastewater to meet effluent standards established in the Notification.



a. Building Effluent Standards*

Parameters	Unit	Range or Maximum Permitted Value for These Categories				
		A	B	C	D	E
1. pH		5-9	5-9	5-9	5-9	5-9
2. BOD	mg/l	20	30	40	50	200
3. Solids						
3.1 SS	mg/l	30	40	50	50	60
3.2 Settleable Solids	ml/l	0.5	0.5	0.5	0.5	-
3.3 TDS**	mg/l	500	500	500	500	-
4. Sulfide	mg/l	1.0	1.0	3.0	4.0	-
5. Nitrogen as TKN	mg/l	35	35	40	40	-
6. Fat, Oil and Grease	mg/l	20	20	20	20	100

* Issued as prescribed in Section 55 of the Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992)

** These values are in addition to the TDS of the water for normal use.

Source : Notification of the Ministry of Science, Technology and Environment, published in the Royal Government Gazette, Volume 111, Special Section 93, dated February 4, B.E.2537 (1994)

b. Types and Sizes of Building Subject to Effluent Standards

Building Type	Size	Level of Standard	Remarks
1. Condominium	Less than 100 units	C	
	100 but not more than 500	B	
	500 units or more	A ^{**}	
2. Hotels	Less than 60 rooms	C	
	60 but not more than 200	B	
	200 room or more	A ^{**}	
3. Dormitories	From 10 to not greater than 50 rooms	D	
	From 50 to 250 rooms	C	
	250 rooms or more	B	
4. Massage parlors (or equivalent)	From 1,000 m. ² to not greater than 5,000 m. ²	C	
	5,000 m. ² or more	B	
5. Hospitals	From 10 to not greater than 30 beds	B	
	30 beds or more	A ^{**}	
6. Schools, Colleges, Universities or Institutes	From 5,000 m. ² to not greater than 25,000 m. ²	B	
	25,000 m. ² or more	A ^{**}	
7. Government offices, State enterprises, International agencies, Banks, and Office Buildings	From 5,000 m. ² to not greater than 10,000 m. ²	C	Working area only (excluding central service area)
	10,000 m. ² to not greater than 55,000 m. ²	B	
	55,000 m. ² or more	A ^{**}	
8. Department stores	From 5,000 m. ² to not greater than 25,000 m. ² or more	B	
		A ^{**}	
9. Fresh food markets	From 500 m. ² to not greater than 1,000 m. ²	D	
	From 1,000 m. ² to not greater than 1,500 m. ²	C	
	From 1,500 m. ² to not greater than 2,500 m. ²	B	
	2,500 m. ² or more	A ^{**}	
10. Restaurants and food shops or food centers	Less than 100 m. ²	E	Dining area
	From 100 m. ² to not greater than 250 m. ²	D	
	From 250 m. ² to not greater than 500 m. ²	C	
	From 500 m. ² to not greater than 2,500 m. ²	B	
	2,500 m. ² or more	A ^{**}	

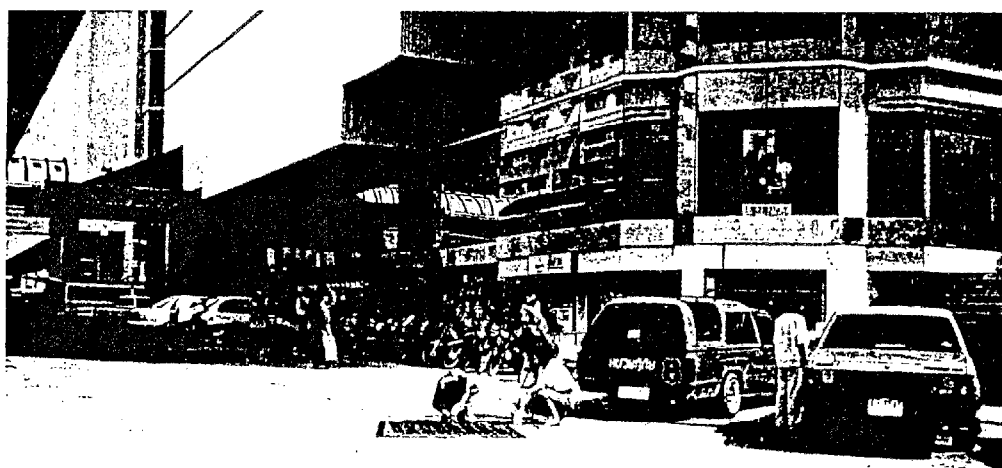
- * Level of Standard refers to the 6 parameters listed in Building Effluent Standards.
- ** This type and size of building will be controlled by the Pollution Control Officer, as specified in Section 69 of the Enhancement and Conservation of National Environmental Quality Act, B.E. 2535 (1992), effective February 5, B.E. 2538 (1995)

Source : Notification of the Ministry of Science, Technology and Environment, published in the Royal Government Gazette Volume 111, Special Section 93, dated February 4, B.E. 2537 (1994)

c. Methods of Examination

Parameter	Method
1. pH	- pH Meter Electrometric Method
2. BOD	- Azide Modification
3. Solids	
3.1 Suspended Solids	- Glass Fiber Filter Disc
3.2 Settleable Solids	- Imhoff cone
3.3 Dissolved Solids	- Evaporation 103-105°C for 1 hr
4. Sulfide	- Titration
5. TKN	- Kjeldahl
6. Fat, Oil and Grease	- Soxhlet Apparatus

Reference : Standard Methods for Examination of Water and Wastewater by APHA, AWWA and WPCF



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ดำเนินงานโดย สมาคมวิศวกรสิ่งแวดล้อมแห่งประเทศไทย

Environmental Engineers Association of Thailand

付属資料 4 Enhancement and Conservation of
National Environmental Quality Act B. E. 2535

**ENHANCEMENT AND CONSERVATION
OF
NATIONAL ENVIRONMENTAL QUALITY ACT
B.E. 2535**



TRANSLATED BY ENVIRONMENT LAW CENTER

PUBLISHED BY DEPARTMENT OF ENVIRONMENTAL QUALITY PROMOTION
MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT

ENHANCEMENT AND CONSERVATION OF NATIONAL ENVIRONMENTAL QUALITY ACT, B.E. 2535

BHUMIBOL ADULYADEJ, REX.

Given on the 29th Day of March B.E. 2535,
Being the 47th Year of the Present Reign

His Majesty King Bhumibol Adulyadej is graciously pleased to proclaim that :

Whereas it is deemed expedient to reform and improve the law on enhancement and conservation of national environmental quality.

Be it, therefore, enacted by the King, by and with the advice and consent of the National Legislative Assembly, acting as the National Assembly, as follows :

Section 1 This Act shall be called "The Enhancement and Conservation of National Environmental Quality Act, B.E. 2535"

Section 2 This Act shall come into effect after the elapse of a period of sixty days from the date following its publication in the Government Gazette.

Section 3 The following Acts shall be repealed :

- (1) The Enhancement and Conservation of National Environmental Quality Act, B.E. 2518.
- (2) The Enhancement and Conservation of National Environmental Quality Act (No. 2), B.E. 2521.
- (3) The Enhancement and Conservation of National Environmental Quality Act (No. 3), B.E. 2522.

Section 4 In this Act,

"**Environment**" means natural things which form the physical and biological conditions surrounding man and man-made things.

"**Environmental Quality**" means the balance of nature, being composed of animals, plants, natural resources and man-made objects which is for the benefit of subsistence of mankind and the sustenance of human-being and nature.

"**Environmental Quality Standards**" means the parameters of quality standards for water, air, noise and other conditions of the environment which are determined as the general criteria for enhancement and conservation of environmental quality.

"**Fund**" means the Environmental Fund.

"**Pollutant**" means wastes, hazardous substances and other polluting substances as well as residues, sediments or remainders of such matters, which are discharged from point sources of pollution or naturally occur in the environment, that have or are likely to have impacts on environmental quality or to cause conditions poisonous or harmful to the health and hygiene of the public, and shall mean to include radiation, heat, light, noise, odour, vibration or other nuisances emanated or

discharged from point sources of pollution.

“Pollution” means the state or environment that has been affected, changed or contaminated by pollutants, resulting in deterioration of environmental quality, such as water pollution, air pollution, soil pollution.

“Point Source of Pollution” means any community, factory, building, structure, vehicle, place of business or activity or any other thing from which pollution is generated.

“Waste” means refuse, garbage, filth, dirt, wastewater, polluted air, polluting substances or any other hazardous substances which are discharged or originated from point sources of pollution, including residues, sediments or remainders of such matters, either in the state of solid, liquid or gas.

“Wastewater” means waste in liquid state including polluting or contaminating substances contained in such liquid.

“Polluted Air” means waste in gaseous state in the form of vapour, steam, exhaust, fume, odour, smoke, gas, dust, soot, ash or other polluting substances in the form of particulate matters that can be suspended in the atmospheric air.

“Hazardous Substance” means explosive substances, inflammable substances, oxidizing and peroxidizing substances, toxic substances, pathogenic substances, radioactive substances, genetic transforming substances, corrosive substances, irritating substances, or other substances whether chemical or not, which may cause danger to human-being, animal, plant, property or the environment.

“Nuisance” means nuisance according to the law on public health.

“Factory” means factories according to the law on industrial plants.

“Building” means buildings according to the law on building control.

“Vehicle” means automobiles or motorcycles according to the law on automobiles, vessels according to the law on Thai vessels and aircrafts according to the law on aviation.

“Monitoring Control Operator” means the person licensed to monitor, control, assess, operate and maintain wastewater treatment or waste disposal facility, or equipment, instrument, tools, appliances for control, treatment or disposal of any other pollution, which the owner or possessor of point source of pollution manages to construct and bring into operation by his own investment and expenses for the treatment of wastewaters or disposal of wastes or any other pollutants.

“Service Contractor” means the person licensed to render for hire the services of wastewater treatment or waste disposal or monitoring of environmental quality.

“Conservation Area” means the areas designated as national parks, wildlife reserves, tourism preserve and other protected areas pursuant to the governing laws related thereto.

“Local Official” means

- (1) President of the Municipal Council within a municipality.
- (2) President of the Sanitary District Board within a sanitary district.
- (3) Changwat Governor within a local administration organization.
- (4) Governor of the Bangkok Metropolitan Administration within Bangkok Metropolis.
- (5) Permanent Secretary of Pattaya City Administration within the City of Pattaya.
- (6) Head of local administrator in the administration of the local administration organization other than (1) to (5) above, established by specific law governing thereof, within such local administration organization.

“Pollution Control Official” means the person appointed by the Minister to perform the functions concerning pollution control under this Act.

“Competent Official” means the person appointed by the Minister to have power and duty to take action under this Act.

“Minister” means the Minister of Science, Technology and Environment.

Section 5 In case any provision under this Act refers to Changwat or mandates the power and duty of the Changwat Governor, such reference or mandate shall denote the inclusion of Bangkok Metropolitan Administration or the power and duty of the Governor of Bangkok Metropolitan Administration, as may be the case.

Section 6 For the purpose of public participation in the enhancement and conservation of national environmental quality, the following rights and duties may be accorded to individual person as provided by this Act or governing law related thereto :

(1) To be informed and obtain information and data from the government service in matters concerning the enhancement and conservation of environmental quality, except the information or data that are officially classified as secret intelligence pertaining to national security, or secrets pertaining to the right to privacy, property rights, or the rights in trade or business of any person which are duly protected by law.

(2) To be remedied or compensated by the State in case damage or injury is sustained as a consequence of dangers arisen from contamination by pollutants or spread of pollution, and such incident is caused by any activity or project initiated, supported or undertaken by government agency or state enterprise.

(3) To petition or lodge complaint against the offender in case of being a witness to any act committed in violation or infringement of the laws relating to pollution control or conservation of natural resources.

(4) To co-operate and assist government officials in the performance of duty relating to the enhancement and conservation of environmental quality.

(5) To strictly observe the provisions of this Act or other laws concerning the enhancement and conservation of environmental quality.

Section 7 In order to encourage public participation in the promotion and conservation of environmental quality, non-governmental organizations (NGOs) having the status of a juristic person under Thai law or foreign law which are directly engaged in activities concerning environmental protection or conservation of natural resources without any objective to be involved in politics or to make profits from the engagement in such activities, shall be entitled to register with the Ministry of Science, Technology and Environment as the NGOs for environmental protection and conservation of natural resources in accordance with the rules, procedures and conditions prescribed by ministerial regulation.

Section 8 The NGOs that have been registered pursuant to section 7 may request for government assistance or support in the following matters :

(1) The organization of volunteers to assist in the performance of duty of government officials under this Act or other laws concerning the enhancement and conservation of environmental quality.

(2) Public relations campaign and dissemination of information or data to promote public awareness and proper understanding and knowledge about environmental protection and conservation of nature and natural resources.

(3) Providing assistance to people in certain areas of the country to initiate projects or activities for environmental protection and conservation of natural resources in such areas.

(4) Conducting study and research in respect of environmental protection and conservation of natural resources and bringing to the attention of the Government or agencies concerned on what are the viewpoints and suggestions based upon the outcome of such study and research.

(5) Providing legal aid to people who are in jeopardy of or afflicted by pollution damage caused by leakage of pollutants or contamination as well as acting as representative of such pollution victims to bring lawsuit and litigate claim in court for compensation or damages to which they are entitled as legal remedies.

In case any registered NGOs, in the carrying out of activities indicated in the first paragraph, encounter problems or difficulties and request for help from the National Environment Board, the Prime Minister shall, with the recommendation of the National Environment board, have the power to direct for appropriate recourse or order the government agency or state enterprise concerned to render assistance or facilitation as seen fit under the circumstances.

The Fund Committee, with the approval of the National Environment Board, may consider to allocate grants or loans in support of any activity of the registered NGOs as deemed appropriate.

The registered NGOs may propose for nomination of candidates as representatives of the private sector to be appointed by the cabinet as qualified members of the National Environment Board.

In case any registered NGO's activities are undertaken by causing disturbances or contrary to public order or unsuitable, the Minister shall have the power to revoke the registration of the NGO involving in such activities.

Section 9 In case there is an emergency or public danger arising from natural disaster or pollution caused by contamination and spread of pollutants which will, if left without any remedial actions, seriously endanger the safety of life, body or health of the people, or aggravatedly cause damage to the properties of the people or the State, the Prime Minister shall have the power to order, as deemed appropriate, government agencies, state enterprises or any persons, including the persons who are or may be the victims of such danger or damage, to take prompt action, individually or jointly, in order to be able to control, extinguish or mitigate the adverse effects of such danger or damage. In case any polluters are known and can be identified, the Prime Minister shall be empowered to enjoin such persons from any acts which may aggravate the adverse effects of pollution during the occurrence of such endangering incident.

The Prime Minister may delegate the power to give orders pursuant to the first paragraph to the Changwat Governor to exercise such power and act on his behalf within the territorial jurisdiction of that Changwat. The said delegation of power shall be made by a written order and published in the Government Gazette.

When any order is given by the Prime Minister by virtue of the first paragraph, or by the Changwat Governor acting on behalf of the Prime Minister by virtue of the second paragraph, such order shall be published in the Government Gazette without delay.

Section 10 In order to prevent, remedy, extinguish or mitigate the emergency or danger of pollution envisaged by section 9, the Minister shall determine preventive measures and prepare a contingency plan to rectify the situation in advance.

Section 11 The Prime Minister and the Minister of Science, Technology and Environment shall have charge and control of the execution of this Act, insofar as it is concerned with their respective powers and duties conferred upon them under this Act.

The Minister of Science, Technology and Environment shall have the power to appoint pollution control officials and other competent officials, issue ministerial regulations prescribing fees not exceeding the rates attached hereto and prescribing other activities for the execution of this Act.

The Ministerial Regulations shall come into force upon their publication in the Government Gazette.

Chapter I

National Environment Board

Section 12 There shall be a National Environment Board consisting of the Prime Minister as the Chairman, a Deputy Prime Minister designated by the Prime Minister as the first Vice Chairman, the Minister of Science, Technology and Environment as the second Vice Chairman, the Minister of Defence, the Minister of Finance, the Minister of Agriculture and Cooperatives, the Minister of Transport and Communications, the Minister of Interior, the Minister of Education, the Minister of Public Health, the Minister of Industry, the Secretary-General of the National Economic and Social Development Board, the Secretary-General of the Board of Investment, the Director of the Bureau of the Budget as members *ex officio* and members qualified in environmental matters not more than eight persons of which no less than half shall be representatives from the private sector and the Permanent Secretary of the Ministry of Science, Technology and Environment as member and secretary.

The appointment of qualified members shall be made by drawing from persons who are knowledgeable and known for their expertises, contributions and experiences in the matters concerning the enhancement and conservation of environmental quality.

Section 13 The National Environment Board shall have the power and duty as follows :

- (1) To submit policy and plan for enhancement and conservation of national environmental quality to the cabinet for approval.
- (2) To prescribe environmental quality standards pursuant to section 32.
- (3) To consider and give approval to the Environmental Quality Management Plan proposed by the Minister according to section 35.
- (4) To consider and give approval to the Changwat Action Plan for environmental quality management according to section 37.
- (5) To make recommendations to the cabinet in respect of financial, fiscal, taxation and investment promotion measures for the implementation of the policy and plan for enhancement and conservation of national environmental quality.
- (6) To propose for amendment or improvement of laws relating to the enhancement and

conservation of environmental quality to the cabinet.

(7) To consider and give approval to the action plan for prevention and remedy of danger caused by contamination of pollutants or spread of pollution proposed by the Pollution Control Committee pursuant to section 53 (1).

(8) To consider and give approval to the setting of emission or effluent standards proposed by the Minister pursuant to section 55.

(9) To supervise, oversee and expedite the enactment of royal decrees and issuance of ministerial regulations, rules, local ordinances, notifications, bye-laws and orders which are necessary to ensure systematic operation of the laws relating to enhancement and conservation of environmental quality to the fullest extent possible.

(10) To submit opinion to the Prime Minister for his directions in case it appears that any government agency or state enterprise infringes or refrains from complying with the laws and regulations for environmental protection which may cause extensive damage to the environment.

(11) To specify measures for the strengthening and fostering of co-operation and co-ordination among government agencies, state enterprises and the private sector in matters concerning the promotion and conservation of environmental quality.

(12) To supervise the Fund management and administration.

(13) To submit reports on national environmental quality situation to the cabinet at least once a year.

(14) To perform other functions as may be provided by this Act or other laws to be within the authority of the National Environment Board.

Section 14 A qualified member appointed by the cabinet shall hold office for a term of three years and may be re-appointed for a period of not more than one consecutive term.

In case an additional appointment of qualified member is made during the term of those members who have already been appointed to hold office, the term of additional membership shall be equal to the remainder of the term of those members who have already been appointed before.

Section 15 In addition to the expiration of the term of office according to section 14, a qualified member appointed by the cabinet shall vacate office upon :

(1) death;

(2) resignation;

(3) being a bankrupt;

(4) being an incompetent or quasi-incompetent person;

(5) being punished by a final judgement to a term of imprisonment except for an offence committed through negligence or a petty offence.

(6) Being dismissed by the cabinet for incompetence or misconduct or having vested interests in any activity or business that may have a direct impact on or adversely affect the environmental quality.

When a qualified member vacates office before the expiration of his term of office, the cabinet may appoint another person to fill the vacancy and such person shall hold office only for the remaining

term of his predecessor.

Section 16 In convening the National Environment Board meeting, if the Chairman is absent or unable to perform the function, the first Vice Chairman shall act as the Chairman. If the Chairman and the first Vice Chairman are both absent or unable to perform the function, the second Vice Chairman shall act as the Chairman. If the Chairman and both the two Vice Chairmen are all absent or unable to perform the function, the members who attend the meeting shall elect one of the attending members to act as the chairman of the meeting.

Section 17 A meeting of the National Environment Board requires the presence of not less than one-half of the total member of its members to constitute a quorum.

The decision of a meeting shall be made by a majority of votes. In casting votes, each member shall have one vote. In case of an equality of votes, the Chairman of the meeting shall have an additional vote as a casting vote.

Section 18 The National Environment Board may appoint an expert committee or subcommittee to consider or carry out any matter as may be entrusted by the National Environment Board.

Section 16 and section 17 shall apply *mutatis mutandis* to the meeting of the expert committee or subcommittee.

Section 19 The National Environment Board shall have the power to require government agencies, state enterprises and other persons to deliver documents relating to the examination of impacts on environmental quality and documents or data concerning the projects or workplans of such government agencies, state enterprises and persons for its consideration. For this purpose, the Board may summon persons concerned to give explanation. If the Board is of the opinion that any project or workplan may seriously affect the environmental quality, it shall recommend remedial measures to the cabinet.

In case the documents or data required to be delivered to the National Environment Board pursuant to the first paragraph are relevant to trade secrets in the nature of a patent and protected by the law on patent rights, the National Environment Board shall specify suitable measures and methods for preventing such documents or data from being disclosed to anyone to ensure that they shall only be used strictly for the purpose of this section.

Section 20 In the performance of its function, the National Environment Board, the expert committee or the sub-committee may invite any person to present facts, explanation, opinion or technical advice as it deems fit and may request co-operation from any person with a view to ascertaining any fact or surveying any activity which may have an adverse effect on environmental quality.

Section 21 In the performance of its duties under this Act, the National Environment Board may entrust the Office of Environmental Policy and Planning, the Pollution Control Department or the Environmental Quality Promotion Department under the Ministry of Science, Technology and Environment with the operation or preparation of propositions to be made to the National Environment Board for further actions.

Chapter II

Environmental Fund

Section 22 There shall be established a fund called the "Environmental Fund" in the Ministry of Finance with the following moneys and properties :

- (1) Money from the Fuel Oil Fund in the amount determined by the Prime Minister.
- (2) Money transferred from the Revolving Fund for Environmental Development and Quality of Life established by the Annual Budget for the Fiscal Year of B.E. 2535 Act, B.E. 2535.
- (3) Service fees and penalties collected by virtue of this Act.
- (4) Grants from the Government from time to time.
- (5) Moneys or properties donated by donors in the private sector both domestic and foreign, by foreign governments or by international organizations.
- (6) Interest and benefits accrued from this Fund.
- (7) Other moneys received for the operation of this Fund.

The Comptroller-General's Department, Ministry of Finance, shall keep the moneys and properties of the Environmental Fund and make disbursements from the fund in accordance with this Act.

Section 23 Fund disbursements shall be made for the following activities and purposes :

- (1) As grants to government agency or local administration for investment in and operation of the central wastewater treatment plant or central waste disposal facility, including the acquisition and procurement of land, materials, equipment, instrument, tools and appliances necessary for the operation and maintenance of such facility.
- (2) As loans to local administration or state enterprise for making available of air pollution control system, wastewater treatment or waste disposal facilities to be used specifically in the activities of such local administration or state enterprise.
- (3) As loans to private person in case such person has the legal duty to make available and install an on-site facility of his own for the treatment of polluted air, wastewater or waste disposal or any other equipment for the control, treatment or eliminate pollutants that are generated by his activity or business undertaking, or such person is licensed to undertake business as a Service Contractor to render services of wastewater treatment or waste disposal under this Act.
- (4) As aids or grants to support any activity concerning the promotion and conservation of environmental quality as the Fund Committee sees fit and with the approval of the National Environment Board.
- (5) As expenditures for administering the Fund.

Section 24 There shall be a Fund Committee consisting of the Permanent Secretary of the Ministry of Science, Technology and Environment as the Chairman, the Permanent Secretary of the Ministry of Agriculture and Cooperatives, the Secretary-General of the National Economic and Social Development Board, the Director of the Bureau of the Budget, the Director-General of the Department of Local Administration, the Comptroller-General of the Comptroller-General's Department, the Director-General of the Department of Public Works, the Director-General of the Department of Industrial

Works, the Director-General of the Department of Mineral Resources, the Director-General of the Pollution Control Department, the Director-General of the Environmental Quality Promotion Department and not more than five qualified persons appointed by the National Environment Board as members and the Secretary-General of the Office of Environmental Policy and Planning as member and secretary.

Section 14 and section 15 shall apply *mutatis mutandis* to the holding office of the qualified members of the Fund Committee.

Section 25 The Fund Committee shall have the power and duty as follows :

- (1) To consider on Fund allocation for use in the activities prescribed by section 23.
- (2) To prescribe rules, conditions, procedures and methods concerning application for allocation or loan from the Fund.
- (3) To lay down administrative rules and procedures concerning the power, duties and working methods of the Fund managers according to section 29 and section 30 as well as mechanisms for co-ordination among the Fund Committee, the Comptroller-General's Department and the Fund managers according to section 29 and section 30.
- (4) To lay down rules and procedures for the receipt and disbursement of moneys from the Fund.
- (5) To fix durations for repayment of loans from the Fund according to section 23 (2) or (3) as well as interest rates and securities as necessary and appropriate.
- (6) To determine the ratio and criteria for deduction of service fees and penalties that are required by section 93 to be remitted to the Fund.
- (7) To perform any other functions provided under this Act.

The prescription of rules according to sub-section (2), (3) or (4) and guidelines for action under sub-section (1) or (5) shall be approved by the National Environment Board.

The Fund Committee may appoint a subcommittee to consider or carry out any matter as may be entrusted by the Fund Committee.

Section 26 Section 16, section 17 and section 20 shall apply *mutatis mutandis* to the performance of functions of the Fund Committee and the subcommittee appointed by the Fund Committee.

Section 27 In consideration to allocate money from the Fund for the purpose of section 23 (1), the Fund Committee shall give first priority to the request for allocation under the Changwat Action Plan for environmental quality management according to section 39 to construct or operate the wastewater treatment plant or waste disposal facility, for which certain amount of government budget has been earmarked or revenues of the local administration have been allocated as additional contributions to the Fund allocation.

The proportion between the government budget or contributions from the local revenues and the Fund allocation to be determined by the Fund Committee according to the first paragraph shall be determined in accordance with the rules laid down by the National Environment Board.

Section 28 The Fund allocation as loans to the local administration, state enterprise or private person pursuant to section 23 (2) or (3) shall be determined by the Fund Committee in accordance with the rules and conditions stipulated by the National Environment Board.

In order to encourage compliance with this Act, the Fund Committee may, with the approval of the National Environment Board, allocate from the Fund as an exceptional long-term loan to any local administration, state enterprise, or private person and may determine to reduce the interest rates or make exemption to the payment of such interest as deemed appropriate.

Section 29 The Comptroller-General of the Comptroller-General's Department, Ministry of Finance, shall be the Fund manager in relation to such portion of the Fund to be allocated as grants to the government agency or the local administration for investment in and operation of the central facility for wastewater treatment or waste disposal according to section 23 (1) and those portions of the Fund to be allocated for the purposes other than those provided by section 23 (2) and (3).

Section 30 The Fund Committee may authorize an appropriate financial institution owned by the State or the Industrial Financing Corporation of Thailand to be the Fund manager in relation to such portion of the Fund that will be allocated as loans to the local administration, state enterprise or private person pursuant to section 23 (2) or (3).

In carrying out the management of Fund according to the First paragraph, the Fund manager has the duty to study and analyse the investment and technical feasibility of the project and shall be empowered to enter the loan agreement on behalf of the Fund Committee in the capacity as the lender, to keep and disburse moneys to the borrowers from this portion of the Fund in accordance with the terms and conditions of the loan agreement, to pursue, demand and receive repayments and interest from the borrowers in order to pay back to the Fund, and shall be empowered to lay down rules and procedures, with the approval of the Fund Committee, for such matters.

Under the loan agreement to be entered into according to the second paragraph, there must be a condition stipulated as an essential element of the agreement that the borrower shall have the duty to make use of the loan specifically for the purpose of meeting the requirements with which the borrower has the legal duty to comply under this Act or other related laws.

Section 31 The moneys received into the Fund and kept by the Comptroller-General's Department, Ministry of Finance, shall be managed by deposit in saving or fixed accounts with State-owned financial institutions in order to earn accrued interest.

All moneys earned by the Fund according to section 22 shall be paid into its account for the purpose of uses in the activities indicated in section 23 and shall not be remitted to the Treasury as revenues of the Government.

Chapter III Environmental Protection

Part 1

Environmental Quality Standards

Section 32 For the purpose of environmental quality enhancement and conservation, the National Environment Board shall have the power to prescribe by notifications published in the Government Gazette the following environmental quality standards :

- (1) Water quality standards for river, canal, swamp, marsh, lake, reservoir and other public inland water sources according to their use classifications in each river basin or water catchment.
- (2) Water quality standards for coastal and estuarine water areas.
- (3) Groundwater quality standards.
- (4) Atmospheric ambient air standards.
- (5) Ambient standards for noise and vibration.
- (6) Environmental quality standards for other matters.

The prescription of environmental quality standards pursuant to the foregoing paragraph shall be based upon scientific knowledge, principles, criteria and evidence related thereto and shall also take into account the practicability of such standards from the viewpoint of economic, social and technological considerations.

Section 33 The National Environment Board shall, if deemed reasonable, have the power to prescribe special standards, which are higher than the environmental quality standards prescribed pursuant to section 31, for the protection of areas designated as conservation or environmentally protected area according to section 42, or areas designated according to section 44, or pollution control areas designated pursuant to section 58.

Section 34 The National Environment Board shall have the power to make appropriate modifications and improvements to the prescribed environmental quality standards in the light of scientific and technological progresses and changes in economic and social conditions of the country.

Part 2

Environmental Quality Management Planning

Section 35 The Minister shall, with the approval of the National Environment Board, formulate an action plan called "Environmental Quality Management Plan" for implementation of the national policy and plan for enhancement and conservation of environmental quality determined by virtue of section 13 (1).

The Environmental Quality Management Plan pursuant to the first paragraph shall be published in the Government Gazette.

It shall be the duty of all government agencies concerned to take actions within their powers and functions that are necessary for effective implementation of the Environmental Quality Management Plan and in order to ensure that actions are taken to achieve the objectives and goals as prescribed, it shall be the duty of the Ministry of Science, Technology and Environment to give advice to government agencies and state enterprises which are concerned with the formulation of workplans or the taking of any actions with a view to implementing the Environmental Quality Management Plan.

Section 36 The Environmental Quality Management Plan pursuant to section 35 may be a short, intermediate or long-term plan, as appropriate, and should contain workplans and guidances for action in the following matters :

- (1) Management of air, water and environmental quality in any other area of concerns.
- (2) Pollution control from point sources.
- (3) Conservation of natural environment, natural resources or cultural environment pertaining to aesthetic values.
- (4) Estimation of financing to be appropriated from government budget and allocated from the Fund which is necessary for implementation of the Plan.
- (5) Scheme for institutional arrangements and administrative orders by which co-operation and co-ordination among government agencies concerned and between the public service and private sector could be further promoted and strengthened, including the determination of a manpower allocation scheme which is required for implementation of the Plan.
- (6) Enactment of laws and issuance of regulations, local ordinances, rules, orders and notifications necessary for implementation of the Plan.
- (7) Scheme for inspection, monitoring and assessment of environmental quality by which the results of implementation of the Plan and enforcement of law related thereto can be evaluated objectively.

Section 37 After the Environmental Quality Management Plan has been published in the Government Gazette, it shall be the duty of the Governor of the Changwat, in which there is a locality designated as environmentally protected area according to section 43, or as pollution control area according to section 59, to formulate an action plan for environmental quality management at Changwat level and submit it to the National Environment Board for approval within one hundred and twenty days from the date on which the Governor of that Chanwat is directed by the National Environment Board to prepare the Changwat action plan for environmental quality management. If, however, there is a reasonable ground, the said duration may be extended as appropriate by the National Environment Board.

In preparing a Changwat Action Plan for the pollution control area according to section 59, the Governor shall incorporate into it the action plan for mitigation and elimination of pollution prepared by the local authority pursuant to section 60 and the local action plan shall form an integral part of the Changwat Action Plan.

In case there is any Changwat, in which no locality is designated as an environmentally protected area according to section 43, or as pollution control area according to section 59, that is nevertheless desirous to enhance and conserve the environmental quality within the limits of its territorial jurisdiction, the Governor of that Changwat may prepare a Changwat Action Plan, within the

framework of and in conformity with the requirements of the Environmental Quality Management Plan, and submit it to the National Environment Board for approval.

Section 38 The Changwat Action Plan to be submitted to the National Environment Board shall be an action plan which proposes a system of integrated management of environmental quality in conformity with the guidances specified in the Environmental Quality Management Plan, taking into account the severity of the problems and economic, social and environmental conditions of that Changwat, and should address and contain essential elements in the following matters :

(1) Plan for control of pollution from point sources.

(2) Plan for procurement and acquisition of land, materials, equipment, tools and appliances which are essential for the construction, installation, improvement, modification, repair, maintenance and operation of central wastewater treatment plants or central waste disposal facilities belonging to government agency or local administration concerned.

(3) Plan for collection of taxes, duties and service fees for operation and maintenance of central wastewater treatment plants or central waste disposal facilities referred to in sub-section (2) above.

(4) Plan for inspection, monitoring and control of wastewaters and other waste matters which are discharged from point sources of pollution.

(5) Law enforcement plan for the prevention and suppression of violation or infringement of laws and regulations pertaining to pollution control and conservation of nature, natural resources and cultural environment pertaining to aesthetic values.

Section 39 The Changwat Action Plan for environmental quality management to be given first priority for the consideration of the National Environment Board must propose an estimate of budgetary appropriation and allocation from the Fund for the construction or procurement for the acquisition of a central wastewater treatment plant or a central waste disposal facility pursuant to section 38 (2). In case any Changwat is not ready to take steps for the procurement and acquisition of the central wastewater treatment plant or the central waste disposal facility, it may instead propose a plan to promote private investment in the construction and operation of wastewater treatment or waste disposal facilities in order to make available of such services within its jurisdiction.

The Changwat Action Plan to be prepared according to the first paragraph with a request for budgetary appropriation and allocation from the Fund shall be accompanied by drawings, plans, specifications and an estimated price of the project for construction, installation, improvement, modification, repair, maintenance as well as the process and method for operation of the proposed central wastewater treatment plant or central waste disposal facility.

For the purpose of approving the Changwat Action Plan with a request for budgetary appropriation in accordance with the first paragraph, the Office of Environmental Policy and Planning shall be responsible for the gathering and analysis of the Changwat Action Plans for environmental quality management in order to make a proposal for annual budgets of the Office to be earmarked specifically for this purpose.

Section 40 In case the management of environmental quality in any matters will have to be carried out in an area adjoining the territorial jurisdictions of two or more provinces due to the geographical conditions or the characteristics of the natural ecosystems of that area, or for the

purpose of a sound, systematic and proper management in accordance with the principle of integrated management of environmental quality and natural resources, the Governors of the relevant provinces shall jointly prepare the action plan mandatorily required by section 37.

Section 41 In case any Changwat, which is mandatorily required to prepare the action plan according to section 37, fails or is incapable to evolve such a plan, or has prepared and submitted the plan as required but failed to get the approval of the National Environment Board for any reason, the National Environment Board shall consider the nature of the problems encountered by that Changwat and evaluate whether its environmental quality is adversely affected to such an extent that any action is warrant to rectify the situation. If action is deemed necessary, the National Environment Board shall propose to the Prime Minister to issue an order directing the Ministry of Science, Technology and Environment to prepare the Changwat Action Plan on behalf of the Changwat in question.

Part 3

Conservation and Environmentally Protected Areas

Section 42 Protection and management of areas within the limits of national parks and wildlife reserves shall be in accordance with the Environmental Quality Management Plan effective by virtue of section 35 and governed by the laws related thereto.

Section 43 In case it appears that any area is characterized as watershed area, or characterized by unique natural ecosystems which are different from other areas in general, or naturally composed of fragile ecosystems which are sensitive and vulnerable to destruction or impacts of human activities, or worthy of being conserved due to its natural or aesthetic values or amenities, and such area is yet to be designated as a conservation area, the Minister shall, with the advice of the National Environment Board, be empowered to issue ministerial regulation designating such area as an environmentally protected area.

Section 44 In issuing the ministerial regulation pursuant to section 43, any one or more of the following protective measures shall be prescribed thereunder :

(1) Land use prescriptions for preserving the natural conditions of such area or for preventing its natural ecosystems or its aesthetic values or amenities from being adversely impacted.

(2) Prohibition of any acts or activities that may be harmful or adversely affect or change the pristine state of the ecosystems of such area.

(3) Specifying types and sizes of projects or activities undertaken by government agencies, state enterprises or private entities, to be constructed or operated in such area, which shall have the legal duty to submit reports of environmental impact assessment.

(4) Determination of management approach and method specific to the management of such area including the scope of functions and responsibilities of relevant government agencies for the purpose of co-operation and co-ordination that are conducive to efficient performance of work towards the preservation of natural conditions or ecosystems or aesthetic values and amenities in such area.

(5) Prescriptions of any other protective measures which are deemed proper and suitable to the conditions of such area.

Section 45 In any area, despite having been designated as a conservation area, a master town and country plan area, a specific town and country plan area, a building control area, an industrial estate area pursuant to the governing laws related thereto, or designated as a pollution control area pursuant to this Act, but which nevertheless appears to have been adversely affected by environmental problems which assume a critical proportion to such an extent that an immediate action has become imperative and yet no action is taken by government agencies concerned to rectify the situation due to a lack of clear legal authorization or otherwise failure to do so, the Minister shall, with the approval of the National Environment Board, propose for a cabinet authorization to take any one or several protective measures provided by section 44, as necessary and appropriate, in order to control and solve the problems in such area.

When cabinet authorization is obtained as provided in the first paragraph, the Minister shall, by notification published in the Government Gazette, determine the limits of such area and prescribe in detail the protective measures and the duration for which such measures shall be effectively taken therein.

With the approval of the National Environment Board and the cabinet, the duration of effectiveness specified according to the second paragraph may be extended by notification published in the Government Gazette.

Part 4

Environmental Impact Assessment

Section 46 For the purpose of environmental quality promotion and conservation, the Minister shall, with the approval of the National Environment Board, have the power to specify, by notification published in the Government Gazette types and sizes of projects or activities, likely to have environmental impact, of any government agency, state enterprise or private person, which are required to prepare reports on environmental assessment for submission to seek approval in accordance with section 47, section 48 and section 49.

In the notification issued according to the first paragraph, procedures, rules, methods and guidelines shall be laid down for the preparation of environmental impact assessment report for each type and size of project or activity, including related documents that are required to be filed together with the report.

In case there has been an environmental impact assessment concerning project or activity of any particular type or size, or site selection for such project or activity in any particular area and such assessment can be used as a standard assessment applicable to the project or activity of the same type or size or to the site selection of such project or activity in the area of similar nature, the Minister may, with the approval of the National Environment Board, issue a notification in the Government Gazette exempting such project or activity of the same or similar nature from the requirement of environmental impact assessment, provided that the proponent of such project or activity shall express its consent to comply with various measures prescribed in the environmental impact assessment report which is applicable as the standard for assessment of such project or activity in accordance with the rules and methods specified by the Minister.

Section 47 In case the project or activity which is required to prepare the environmental impact assessment according to section 46 is the project or activity of a government agency or of a

state enterprise or to be jointly undertaken with private enterprise which is required the approval of the cabinet in accordance with official rules and regulations, the government agency or state enterprise responsible for such project or activity shall have the duty to prepare the environmental impact assessment report at the stage of conducting a feasibility study for such project, such report shall be filed with the National Environment Board for its review and comments and then submitted to the cabinet for consideration.

In considering to give approval to the environmental impact assessment report filed according to the first paragraph, the cabinet may as well request any person or institution, being an expert or specialized in environmental impact assessment, to study and submit report or opinion for its consideration thereof.

For project or activity of government agency or state enterprise which is not required to be approved by the cabinet according to the first paragraph, the government agency or state enterprise responsible for such project or activity shall prepare and file the environmental impact assessment report in order to obtain approval prior to the initiation of such project or activity in accordance with the rules and procedures as provided by section 48 and 49.

Section 48 In case the project or activity which is required by section 46 to prepare the environmental impact assessment report is the project or activity which is required by law to obtain permission prior to construction or operation, the person applying for the permission shall have the duty to file the environmental impact assessment report with the permitting authority under such law and with the Office of Environmental Policy and Planning simultaneously. The report to be filed as aforesaid may be made in the form of an initial environmental examination (I.E.E.) in accordance with the rules and procedures determined by the Minister pursuant to section 46, second paragraph.

The official who is legally authorized to grant permission shall withhold the granting of permission for the project or activity referred to in the first paragraph until having been notified by the Office of Environmental Policy and Planning of the result of consideration pertaining to the review of the environmental impact assessment report in accordance with section 49.

The Office of Environmental Policy and Planning shall examine the environmental impact assessment report and related documents filed therewith. If it is found that the report as filed is not correctly made in accordance with the rules and procedures specified by virtue of section 46, second paragraph, or the accompanied documents and data are incomplete, the Office of Environmental Policy and Planning shall notify the person applying for permission who files the report within fifteen days from the date of receiving such report.

In case the Office of Environmental Policy and Planning finds that the environmental impact assessment report together with related documents as filed is duly made and completed with the data as required, or has been duly amended or modified in accordance with the foregoing third paragraph, it shall review and make preliminary comments on the report within thirty days from the date of receiving such report in order that the report together with the preliminary comments shall be referred to the committee of experts for further consideration.

The appointment of the committee of experts according to the foregoing fourth paragraph shall be in accordance with the rules and procedures determined by the National Environment Board. The committee shall be composed of expert members who are qualified or specialized in various fields of related disciplines and the authority legally competent to grant permission for the given project or activity under review, or its representative, shall be included in its membership.

Section 49 The review and consideration by the committee of experts according to section 48 shall be carried out within forty-five days from the date of receiving the environmental impact assessment report from the Office of Environmental Policy and Planning. If the committee of experts fails to conclude its review and consideration within the said period, the report shall be deemed to have been approved by it.

In case the committee of experts approves or is deemed to have given approval to the report, the official legally empowered to grant permission shall accordingly order that the permission be granted to the person who applies for it.

In case approval of the report is denied by the committee of experts, the permitting authority shall withhold the granting of permission to the person applying for it until such person will resubmit the environmental impact assessment report that has been amended or entirely redone in conformity with the guidelines and detailed requirements determined by the order of the committee of experts.

When such person has resubmitted the environmental impact assessment report that has been amended or entirely redone, the committee of experts shall review and conclude its consideration within thirty days from the date of receiving the resubmitted report. If the committee of experts fails to conclude its review and consideration within the said period, it shall be deemed that the committee has approved the report and the permitting authority shall accordingly grant permission to the person who applies for it.

In case it is deemed reasonable the Minister may issue notification in the Government Gazette requiring that the project or activity of the type and size specified by the notification issued by virtue of section 46 also file the environmental impact assessment report when the application is made for renewal of permission for such project or activity in accordance with the same procedures as applicable to the application for the permission.

Section 50 For the purpose of review and consideration of the environmental impact assessment report pursuant to section 48 and section 49 and site inspection is deemed appropriate, the committee of experts or the competent official assigned by the committee shall be authorized to inspect the site of the project or activity identified in the report for which approval thereof is sought.

When the committee of experts has approved the environmental impact assessment report pursuant to section 49, the official who is legally competent to grant permission or the renewal of permission shall stipulate as the conditions of permission or renewal thereof all the mitigation measures proposed in the environment impact assessment report and all such conditions shall be deemed the conditions prescribed by virtue of the governing laws on the subject matter.

Section 51 For the purpose of compliance with section 47 and section 48, the Minister may, with the approval of the National Environment Board, require that the environmental impact assessment report as required by section 46 be prepared or certified by the person who is licensed to be a specialist in environmental impact assessment.

Application and issuance of licence, qualifications of specialists who will be eligible to prepare environmental impact assessment reports, control of the licensee's performance, renewal of licence, issuance of certificate in lieu of the licence, suspension or revocation of the licence and fee payments for the application and issuance of licence shall be in accordance with the rules, procedures and conditions stipulated by ministerial regulation.

Chapter IV

Pollution Control

Part 1

Pollution Control Committee

Section 52 For the purpose of pollution control under this Act, there shall be a committee called the "Pollution Control Committee" (PCC) which consists of the Permanent Secretary of the Ministry of Science, Technology and Environment as the Chairman, the Director-General of the Department of Local Administration, the Director-General of the Police Department, the Director-General of the Department of Land Transport, the Director-General of the Harbour Department, the Director-General of the Department of Public Works, the Director-General of the Department of Mineral Resources, the Director-General of the Department of Industrial Works, the Director-General of the Health Department, the Director-General of the Department of Agriculture, the Director-General of the Department of Environmental Quality Promotion, the Secretary-General of the Office of Environmental Policy and Planning, the Permanent Secretary for the Bangkok Metropolitan Administration and not more than five qualified persons appointed by the National Environmental Board as members and the Director-General of the Department of Pollution Control as member and secretary.

Section 14 and section 15 shall apply *mutatis mutandis* to the holding office of the qualified members in the Pollution Control Committee.

Section 53 The Pollution Control Committee shall have the power and duty as follows :

(1) To submit an action plan for prevention or remedy of pollution hazards or contamination to the National Environment Board.

(2) To give opinion and recommend the National Environment Board on proposed amendments to or improvement of any laws concerning the control, prevention, reduction or eradication of pollution.

(3) To propose incentive measures regarding taxation and private investment promotion in relation to pollution control and promotion and conservation of environmental quality to the National Environment Board.

(4) To recommend the National Environment Board on the determination of service fee rates for the central waste water treatment or central waste disposal services of the government.

(5) To give advice to the Minister on the setting of emission or effluent standards under section 55.

(6) To give advice to the Minister concerning the types of point sources of pollution that will be required to comply with section 68 and section 69.

(7) To make recommendation on the issuing of ministerial regulations specifying the types and categories of hazardous wastes under section 79.

(8) To coordinate government agencies, state enterprises and the private sector in their actions to control, prevent, mitigate or eradicate pollution.

(9) To prepare and submit the report on pollution situation to the National Environment Board once a year.

(10) To consider and resolve on the challenge to the order of the pollution control official under this Act.

(11) To perform other functions designated by this Act or other law to be the power and duty of the Pollution Control Committee.

(12) To carry out other matters assigned by the National Environment Board.

The Pollution Control Committee may appoint a subcommittee to consider or carry out any matter as may be assigned by the Pollution Control Committee.

Section 54 Section 16, section 17 and section 20 shall apply *mutatis mutandis* to the performance of functions of the Pollution Control Committee and subcommittee.

Part 2

Emission or Effluent Standards

Section 55 The Minister shall, with the advice of the Pollution Control Committee and the approval of the National Environment Board, have the power to publish notification in the Government Gazette prescribing emission or effluent standards for the control of wastewater discharge, polluted air emissions, or discharge of other wastes or pollutants from point sources into the environment, in order to meet the environmental quality standards set by virtue of this Act for the conservation of national environmental quality.

Section 56 In case there have been standards prescribed by virtue of the other laws concerning wastewater discharges, polluted air emissions, or discharge of other wastes or pollutants from point sources of pollution into the environment and such standards are no less stringent than the emission or effluent standards set by the Minister by virtue of section 55, such standards shall continue to be effective by virtue of the laws related thereto. If however, such standards are less stringent than the emission or effluent standards set by the Minister pursuant to section 55, the government agencies empowered by such laws shall amend such standards in conformity with the emission or effluent standards under this Act. If there is any obstacle preventing from doing so, the National Environment Board shall resolve on such matter and the government agencies concerned shall act in accordance with such resolution.

Section 57 In case any government agency is empowered by the other law to prescribe emission or effluent standards in any matter, but that government agency fails to exercise its power, the Minister shall, with the recommendation of the Pollution Control Committee and with the approval of the National Environment Board, publish notification in the Government Gazette prescribing the emission or effluent standards in question and such standards shall be deemed to have been set by the governing law on such matter.

Section 58 If it is deemed reasonable, the Changwat Governor shall have the power to publish notification in the Government Gazette prescribing a special set of emission or effluent standards applicable to the pollution control area designated by section 59, higher than the standards set pursuant to section 55 or the standards set by virtue of other law which remain in force according to section 56.

Part 3

Pollution Control Area

Section 59 In case it appears that any locality is affected by pollution problems and there is a tendency that such problems may be aggravated to cause health hazards to the public or adverse impact on the environmental quality, the National Environment Board shall have power to publish notification in the Government Gazette designating such locality as a pollution control area in order to control, reduce and eliminate pollution.

Section 60 For the purpose of the Changwat Action Plan for environmental quality management to be prepared according to section 37, the local official in the locality designated as the pollution control area pursuant to section 59, shall prepare and submit an action plan for reduction and eradication of pollution in such area to the Changwat Governor in order to incorporate such plan into the Changwat Action Plan for environment quality management.

In preparing the action plan for reduction and eradication of pollution, steps shall be taken as follows :

(1) to survey and collect data concerning point sources of pollution located within the limits of that pollution control area.

(2) to make an inventory showing the number, type and size of point sources of pollution under survey and collection of data according to (1) above.

(3) to study, analyse and assess the state of pollution, as well as the scope, nature, severity of the problem and impacts on environmental quality in order to specify suitable and necessary measures for mitigation and eradication of pollution in that pollution control area.

The pollution control official shall give advice and assistance to the local official necessary for the preparation of the action plan to reduce and eradicate pollution according to the first and second paragraphs.

Section 61 The action plan for reduction and eradication of pollution in the pollution control area under section 60 shall propose the estimation and request for government budget and Fund allocations for construction or operation of the central wastewater treatment plant or the central waste disposal facility necessary to reduce and eradicate pollution in that pollution control area.

Section 62 In case it is necessary to acquire a piece of land to be used as the site of the central wastewater treatment or central waste disposal facility for any pollution control area but state-owned land is not available, steps shall be taken to select and acquire land for the siting purpose. If there are expenses, the estimate and request for government budget and Fund allocation shall be made in the Changwat Action Plan.

If it is unable to proceed under the first paragraph, suitable land shall be selected and proposed to the Minister in order to take steps to expropriate such land in accordance with the law on expropriation of immovable property.

Section 63 The Changwat Governor shall supervise and oversee the local official's actions under section 59. If no action is taken by the local official within a reasonable time, the Changwat Governor shall have the power to take action on behalf of the local authority upon notification to such

local authority and the National Environment Board.

Part 4

Air and Noise Pollution

Section 64 Usable vehicle shall conform to the emission standards prescribed for such vehicle pursuant to section 55.

Section 65 If it is found that the use of any vehicle is in violation of section 64, the competent official shall have the power to prohibit the use of such vehicle permanently or until it will have been modified or improved to meet the emission standard requirements prescribed pursuant to section 55.

Section 66 In issuing the order prohibiting to use of vehicle according to section 65, the competent official shall make the sign clearly shown by the words "Use Prohibited Permanently" or "Use Prohibited temporarily" or any other sign, known and understood by the general public to have the same meaning, on any part of such vehicle.

The making or removal of the sign under the first paragraph, or the use of vehicle while the said sign is on, shall be in accordance with the rules, methods and conditions specified in the ministerial regulation.

Section 67 In performing his duty under section 65, the competent official has the power to stop and inspect the vehicle, enter into the vehicle or to do any act necessary to check and test the engine and equipment of such vehicle.

Section 68 The Minister shall, with the advice of the Pollution Control Committee, have the power to publish notification in the Government Gazette specifying the types of point sources of pollution that shall be controlled in regard to the emission of polluted air, ray, or other pollutants, in the form of smoke, fume, gas, soot, dust, ash, particle or any other form of air pollutant, to the atmosphere, in conformity with the emission standards prescribed under section 55, or standards prescribed by any government agency by virtue of the other law which remain in force according to section 56, or standards set by the Changwat Governor in special case for the pollution control area according to section 58.

The owner or possessor of the point source of pollution under the first paragraph has the duty to install or bring into operation an on-site facility for air pollution control, equipment or other instrument as determined by the pollution control official in order to control, dispose, reduce or eliminate pollutants which may affect the air quality, unless such facility, equipment or instrument has already been in place and still in a working condition upon the inspection and test by the pollution control official. For the purpose of this section, the pollution control official may also require that the operation of such facility, equipment or instrument be controlled by the Monitoring Control Operator.

The provisions of the first and second paragraphs shall apply *mutatis mutandis* to the point source of pollution which emit or generate noise or vibration in excess of the emission standards set pursuant to section 55, or the standards set by any government agency by virtue the other law which remain in force according to section 56, or the standards set by the Changwat Governor in special case for the pollution control area according to section 58.

Part 5

Water Pollution

Section 69 The Minister shall, with the advice of the Pollution Control Committee, have the power to publish notification in the Government Gazette specifying the types of point sources of pollution that shall be controlled in regard to the discharge of wastewaters or wastes into public water sources or into the environment outside the limits of such point sources, in conformity with the effluent standards set pursuant to section 55, or the standards set by any government agency by virtue of the other law which remain in force according to section 56, or the standards set by the Changwat Governor in special case for the pollution control area according to section 58.

Section 70 The owner or possessor of the point source of pollution under section 69 has the duty to construct, install or bring into operation an on-site facility for wastewater treatment or waste disposal as determined by the pollution control official. For this purpose, the pollution control official may also require that such owner or possessor commission a Monitoring Control Operator to control the wastewater treatment or waste disposal facility that shall be constructed, installed or brought into operation accordingly.

If any point source of pollution has had an on-site facility for wastewater treatment or waste disposal before the date of notification of the Minister under section 69, the owner or possessor of such point source of pollution shall inform the pollution control official to check the functioning system of the facility. If its capability to treat wastewaters or dispose of wastes fails to meet the applicable standards, the owner or possessor has the duty to modify or improve it in conformity with the pollution control official's directions.

Section 71 In any pollution control area or locality where a central wastewater treatment plant or a central waste disposal facility has been brought into operation by the administration concerned, the owner or possessor of the point source of pollution according to section 70, first paragraph, who has not yet constructed, installed or brought into operation the on-site facility for wastewater treatment or waste disposal according to the prescription of the pollution control official, or may not want to construct or make arrangements for such a system, shall have the duty to send the wastewaters or wastes generated by his activities to the central wastewater treatment plant or central waste disposal facility in the pollution control area or in that locality for treatment or disposal and shall have the duty to pay the service fees at the rates fixed by virtue of this Act or the other related laws.

Section 72 In any pollution control area or locality where the central waste water treatment plant or central waste disposal facility has been brought into operation by the administration concerned, the owner or possessor of any point source of pollution, except those under section 69, shall have the duty to send wastewaters or wastes from his source of pollution to the central waste water treatment plant or the central waste disposal facility in that pollution control area or locality for treatment or disposal and shall have the duty to pay service fees at the rates fixed by virtue of this Act or the other related laws, except such point source of pollution has already had its own wastewater treatment or waste disposal facility which is capable to meet the standards prescribed under this Act.

Section 73 No person shall be employed as a Monitoring Control Operator or as a Service Contractor, who renders for hire the services of wastewater treatment or waste disposal, without obtaining the licence from the local official.

Application and issuance of licence, qualifications of the applicant, control of the licensee's performance, renewal of licence, issuance of certificate in lieu of the licence, suspension or revocation of the licence and fee payments for the application and issuance of licence shall be in accordance with the rules, procedures and conditions stipulated by ministerial regulation.

The person who has obtained a licence to be a Service Contractor shall also be deemed to have obtained a licence to be a Monitoring Control Operator.

In rendering the services of wastewater treatment or waste disposal by the Service Contractor according to the first paragraph, the service charges shall not exceed the rates fixed by the ministerial regulation.

Section 74 In any pollution control area or locality where the central wastewater treatment or central waste disposal facility of the public service is yet to be put into operation, but there is nonetheless a Service Contractor who is licensed to render such services within that area, the owner or possessor of the point source of pollution according to section 70 and section 71 shall be required to send the wastewaters or wastes from his point source for treatment or disposal by such Service Contractor in accordance with the rules, regulations, methods and conditions prescribed by the local official, with the advice of the pollution control official.

Section 75 In any pollution control area or locality where the central wastewater treatment or central waste disposal facility is yet to be put into service by the government and there is no licensed Service Contractor rendering services therein, the local official may, with the advice of the pollution control official, determine a temporary method necessary for the treatment of wastewaters or disposal of wastes from point sources of pollution under section 70 and section 71 until the central wastewater treatment or central waste disposal facility will have been constructed, installed and put into operation within such pollution control area or locality.

The temporary method for wastewater treatment or waste disposal according to the first paragraph shall mean to include the collection, transport or conveyance of wastewaters or wastes by whatever appropriate means to be treated or disposed by the central wastewater treatment plant or central waste disposal facility of the government in the other area; or to allow the licensed Service Contractor rendering services in the other area to render the same services in that pollution control area or locality temporarily; or to allow such licensed Service Contractor to collect and transport wastewaters or wastes to treat or dispose by his own wastewater treatment or waste disposal facility located outside that pollution control area or locality.

Section 76 Wastewaters treated by either the central wastewaters treatment plant of the government or by the wastewater treatment facility of the Service Contractor must also have the properties which meet the requirements of the effluent standards prescribed by virtue of section 55, or the standards prescribed by virtue of the other law which remain in force according to section 56, or the standards set by the Changwat Governor in special case for the pollution control area according to section 58.

Section 77 The government agency or the local authority which makes provision for the services of central wastewater treatment or central waste disposal facilities by using government budget, or revenues of the local authority, and Fund allocations under this Act shall be responsible for the management and control of such facilities. In this respect, the responsible agency or local

authority may employ a licensed Service Contractor under this Act to manage and control the operation of such facilities.

Regulations, rules and methods for conveyance, collection and transport of wastewaters or wastes from the point sources of pollution to the central wastewater treatment plant or central waste disposal facility as well as prescriptions, prohibitions, restrictions and other conditions for discharging and draining of wastewaters or wastes from factories and other point sources of pollution under section 72 into the systems of central wastewater treatment or central waste disposal facilities shall be prescribed by the ministerial regulation.

Part 6

Other Pollution and Hazardous Waste

Section 78 The collection, transport and other arrangements for the treatment and disposal of garbage and other solid wastes; the prevention and control of pollution from mining both on land and in the sea; the prevention and control of pollution from the exploration and drilling for oil, natural gas and all kinds of hydrocarbon both on land and in the sea; and the prevention and control of pollution resulting or originated from the discharge of oil and the dumping of wastes and other matters from sea-going vessels, tankers, and other types of vessel, shall be in accordance with the governing laws related thereto.

Section 79 In case there is no specific law applicable thereto, the Minister shall, with the advice of the Pollution Control Committee, have the power to issue ministerial regulation specifying the types and categories of hazardous wastes generated from the production and usage of chemicals or hazardous substances in the production process of industry, agriculture, sanitation and other activities which shall be brought under control. For this purpose, rules, regulations, measures and methods must also be prescribed for the control of collection, storage, safety measures, transportation, import into the Kingdom, export out of the Kingdom, and for proper and technically sound management, treatment and disposal of such hazardous wastes.

Part 7

Monitoring, Inspection and Control

Section 80 The owner or possessor of the point source of pollution, required by virtue of section 68 or section 70, to have his own facility for treatment of polluted air, equipment or instrument for control of the discharge of polluted air or other pollutants or the wastewater treatment or waste disposal facility, shall have the duty to collect statistics and data showing the daily functioning of the said facility or equipment and instrument, and make detailed notes thereof to be kept as recorded evidence at the site of that point source of pollution, and shall submit report summarizing the functioning results of the facility, equipment or instrument to the local official of the locality where such point source is situate at least once a month.

The collection of statistics and data, the making of notes and reports shall be in accordance with the rules, procedures, methods and format specified by ministerial regulation.

In case the facility for treatment of polluted air, wastewaters or waste disposal or equipment and instrument indicated in the first paragraph requires a Monitoring Control Operator as determined

by the pollution control official, the Monitoring Control Operator shall have the duty to act under the first paragraph on behalf of the owner or possessor.

The Service Contractor licensed to render wastewater treatment or waste disposal services shall have the duty to do the same as the owner or possessor of the point source of pollution is required under the first paragraph.

Section 81 The local official shall gather the reports received according to section 80 and send them to the pollution control official, who has jurisdiction over that locality, on a regular basis at least once a month. In doing so, the local official may make comments for consideration of the pollution control official.

Section 82 In order to perform his functions under this Act, the pollution control official is empowered as follows :

(1) To enter into the building, place and site of the factory or point source of pollution or the site of wastewater treatment or waste disposal facility which belongs to any person, between the sun rise and sun set or during the working hours, to inspect the functioning process of wastewater treatment or waste disposal facility, air pollution control system or equipment and other instrument for the control of polluted air or other pollutants, as well as to examine the notes, statistics or data on the functioning of the said facility, equipment and instrument, or when there is a reasonable suspicion that there is a non-compliance with this Act.

(2) To issue an order in writing directing the owner or possessor, the Monitoring Control Operator, or the licensed Service Contractor rendering the services of wastewater treatment or waste disposal, to correct, change, improve or repair the air pollution control, wastewater treatment or waste disposal facility or other equipment and instrument for the control of polluted air or other pollutants. If however, the point source of pollution is a factory, the official under the law on industrial plants shall be notified to take action within his power and duty. If such official fails to do so, the pollution control official shall have the power to take action in accordance with this Act.

(3) To issue a written order directing the owner or possessor of the point source of pollution which is not a factory to pay penalties as provided under section 90, section 91 or section 92. If the point source of pollution is a factory the official under the law on industrial plants shall be notified to order the owner or possessor of such factory to pay the penalties and, in doing so, such official under the law on industrial plants shall be deemed to be the pollution control official under this Act. If, however, such official fails to issue the penalty order within a reasonable time, the pollution control official shall then have the power to issue the order directing the owner or possessor of such factory to pay the penalties.

(4) To issue a written order directing the Service Contractor licensed to render the services of wastewater treatment or waste disposal to stop or shut down his services, or revoking his license in case such Service Contractor violates or does not comply with this Act, or any ministerial regulation, local ordinance, rule, notification or condition issued or stipulated by virtue of this Act, or does not comply with the order of the pollution control official issued by virtue of this Act.

(5) To issue a written order suspending the Monitoring Control Operator under section 68 or section 70 in case such Monitoring Control Operator violates or does not comply with this Act, or any ministerial regulation, local ordinance, rule, notification, or condition issued or stipulated by virtue of this Act, or does not comply with the order of the pollution control official issued by virtue of this Act.

Section 83 In case it is deemed reasonable in the interest of co-ordination of action among agencies concerned, the pollution control official may :

(1) Recommend the official who has the legal power to control the point source of pollution, to close down its operation, to suspend or revoke the license of its owner or operator, or to bar its use or utilization in any way, especially in connection with the point source of pollution under section 68, section 69 or section 74 which has no intention to treat the polluted air, wastewaters or other wastes and illegally discharges the untreated wastes into the environment outside the limits of its site and premise.

(2) Recommend the local official to take legal action against the owner or possessor of the point source of pollution under section 71 or section 72 in order to coerce him to send wastewaters or wastes to be treated or disposed in accordance with this Act.

(3) Give advice and suggestions to the local official or the government agency concerned in connection with the operation and maintenance of the central wastewater treatment plant or the central waste disposal facility under the responsibility of such local official or government agency.

Section 84 In the performance of duty under this Act, the competent official or the pollution control official must produce his identity card at the request of the person concerned.

The identity card of the competent official and pollution control official shall be in such a form as prescribed in the ministerial regulation.

Section 85 The owner or occupier of premises, vehicles or any person concerned shall facilitate the performance of duty under this Act by the competent official or the pollution control official who shall be official under the Penal Code.

Section 86 The performance of duty by the competent official under section 50, first paragraph, or section 65 and the performance of duty by the pollution control official under section 82 (1) shall be done in the presence of the owner or occupier of the premise or vehicles; if such person cannot be found, it shall be done in the presence of at least two other persons requested by the competent official or the pollution control official to attend as witnesses.

Section 87 The owner or possessor of the point source of pollution, the Service Contractor licensed to render services of wastewater treatment or waste disposal, the Monitoring Control Operator or any other person who is not satisfied with the order of the pollution control official under section 82 (2), (3), (4) or (5), is entitled to challenge such order by petition to the Pollution Control Committee within thirty days from the date of receiving the order of the pollution control official.

If the petitioner does not agree with the decision of the Pollution Control Committee, he shall appeal to the Minister within thirty days from the date of receiving notification of the Pollution Control Committee's decision.

The decision of the Minister shall be final.

Part 8

Service Fee and Penalty

Section 88 In any pollution control area or locality where a central wastewater treatment plant of a central waste disposal facility has been constructed and brought into operation as a public utility service, funded by government budget or revenue of the local administration and money allocated from the Fund as provided in this Act, the National Environment Board shall, with the advice of the Pollution Control Committee, fix the rates of service fee to be applicable within the limits of each pollution control area or locality, being the site of and served by the operation of such facility.

The service fee rates fixed according to the foregoing first paragraph shall be notified and published in the Government Gazette.

Section 89 The rates of service fee fixed according to section 88 for treatment of wastewaters or for disposal of wastes emanated from point sources pursuant to section 71 and section 72 may be varied as appropriate.

The owner or possessor of the point source of pollution governed by the provision of section 72, in the category of domestic household, that can be classified as a small-scale user is entitled to be exempted from the payment of service fees in accordance with the rules and conditions stipulated by the National Environment Board, with the advice of the Pollution Control Committee.

Section 90 Any owner or possessor of point source of pollution who avoidedly refrains from sending wastewaters or wastes to the central wastewater treatment plant or the central waste disposal facility as required by section 71 or section 72 and illegally discharges such wastewaters or wastes into the environment outside the limits of the site of the point source owned or possessed by him, or does send the wastewaters or wastes to the central wastewater treatment plant or the central waste disposal facility of the public service for treatment but fails or refuses to make payment for the service fees without being entitled to the exemption as provided by section 89, second paragraph, shall be liable to pay as a penalty four time as much the amount of service fee that he is liable to pay at the rate fixed in accordance with section 88 until the provision of this Act is observed by him.

Section 91 Any owner or possessor of the point source of pollution, required by section 70 to have an on-site facility for wastewater treatment or waste disposal, who illegally discharges wastewaters or wastes into the central wastewater treatment plant or the central waste disposal facility of the public service, shall be liable to pay as a daily penalty four time as much the amount of daily expenses for the normal operation of his on-site facility for wastewater treatment or waste disposal throughout the duration of such illegal discharge and shall also be liable to pay damages if such illegal discharge has caused any damage or defection to the central wastewater treatment plant or the central waste disposal facility of the public service.

Section 92 Any owner or possessor of the point source of pollution subject to the requirements of section 68 or section 70, who refrains from using his on-site facilities or equipment for the control of air pollution, noise pollution and vibrations, or refrains from operating his on-site facilities for the treatment of wastewaters or disposal of wastes and illegally discharges such untreated wastewaters or wastes into the environment outside the limits of the site of the point source of pollution, shall be liable to pay as a daily penalty four time as much the amount of daily expenses for the normal

operation of his facilities, equipment or process for wastewater treatment or waste disposal throughout the duration of such illegal discharge.

Section 93 The local authority or the competent official of the government agency responsible for the operation of the public wastewater treatment plant or waste disposal facility shall have the power and duty to collect service fees, penalties and claim for damages as provided in this Part, particularly in connection with the operation of the central wastewater treatment plant or the central waste disposal facility of the public service which is made available by such local authority or government agency.

The service fees and penalties collectable in accordance with the foregoing first paragraph shall be exempted from being remitted to the Treasury as government revenues, but shall be deducted and remitted to the Fund at the ratio specified by the Fund Committee, whereas the balance therefrom shall be used as expenditures for operation and maintenance of the central wastewater treatment plant or the central waste disposal facility of the local authority or government agency which is responsible to collect such service fees and penalties.

Chapter V

Promotional Measures

Section 94 The owner or possessor of any point source of pollution, who has the duty according to this Act or other related laws to install an on-site facility for treatment of polluted air or wastewaters or for disposal of any other wastes, including the procurement of equipment, instrument, tools, appliances or materials necessary for control of pollution from such point source, or the Service Contractor licensed pursuant to this Act, is entitled to request for promotional supports and assistance from the government service in the following matters :

(1) Request for assistance regarding import duties for the import into the Kingdom of necessary machinery, equipment, instrument, tools, appliances or materials which are not available in the Kingdom.

(2) Application for permission to bring foreign experts or specialists into the country to carry out works concerning the installation, monitoring, control or operation of air pollution control systems, wastewater treatment works or waste disposal facilities in case qualified persons within the Kingdom are not available for recruitment and commissioning to supervise and control machinery, equipment, instrument or tools imported into the Kingdom pursuant to sub-section (1), including application for exemption of income tax that will incur from the performance of work as a supervisor of such person within the Kingdom.

The owner or possessor of the point source of pollution who has no legal duty as referred to in the foregoing first paragraph, but nonetheless wishes to install an on-site facility with his own equipment, instrument, tools or appliances for air pollution control, wastewater treatment or for disposal of other wastes emanated from his activities or business undertakings, is also entitled to request for promotional supports and assistance from the government service in accordance with the foregoing first paragraph.

Section 95 The request for promotional supports and assistance according to section 94 shall be made to the National Environment Board in accordance with the rules, procedures, methods

and formats prescribed by ministerial regulation.

The National Environment Board shall consider and proceed with the request for promotional supports and assistance according to the foregoing first paragraph as it sees fit, taking into account the economic, financial and investment necessities of each individual applicant. In case it is considered appropriate to give assistance to the applicant, the National Environment Board shall recommend the government agencies concerned to act within their powers and functions to render promotional supports and assistance to the applicant accordingly.

Chapter VI

Civil Liability

Section 96 If leakage or contamination caused by or originated from any point source of pollution is the cause of death, bodily harm or health injury of any person or has caused damage in any manner to the property of any private person or of the State, the owner or possessor of such point source shall be liable to pay compensation or damages therefor, regardless of whether such leakage or contamination is the result of a willful or negligent act of the owner or possessor thereof, except in case it can be proved that such pollution leakage or contamination is the result of :

- (1) Force majeure or war.
- (2) An act done in compliance with the order of the Government or State authorities.
- (3) An act or omission of the person who sustains injury or damage, or of any third party who is directly or indirectly responsible for the leakage or contamination.

The compensation or damages to which the owner or possessor of the point source of pollution shall be liable according to the foregoing first paragraph shall mean to include all the expenses actually incurred by the government service for the clean-up of pollution arisen from such incident of leakage or contamination.

Section 97 Any person who commits an unlawful act or omission by whatever means resulting in the destruction, loss or damage to natural resources owned by the State or belonging to the public domain shall be liable to make compensation to the State representing the total value of natural resources so destroyed, lost or damaged by such an unlawful act or omission.

Chapter VII

Penal Provisions

Section 98 Any person who violates or refuses to observe the order issued by virtue of section 8 or obstructs any act done in compliance with such order shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

In case the person who violates or refuses to observe the order or obstructs any act done in compliance with such order is the person who has caused danger or damage arisen from pollution, such person shall be punished by imprisonment not exceeding five years or fine not exceeding five hundred thousand baht, or both.

Section 99 Any person who illegally encroaches upon, occupies, or enters into public land to act in any manner which results in the destruction, loss or damage to natural resources or treasures worthy of being conserved, or causes the occurrence of pollution having impact on the environment within the limits of environmentally protected area designated by virtue of section 43 shall be punished by imprisonment not exceeding five years or fine not exceeding five hundred thousand baht, or both.

Section 100 Any person who violates or refrains from observing the restrictions stipulated by ministerial regulation issued according to section 44 or by notification given by the Minister according to section 45 shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

Section 101 Any person who spreads or disseminates false information about the danger from any point source of pollution with the intention to destroy its reputation or to undermine public trust on the lawful operation of its business or activity shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

If the spread or dissemination of information according to the foregoing first paragraph is done by means of publication, announcement, advertisement or reports through newspaper, radio, television or other forms of mass media, the person who commits such act shall be punished by imprisonment not exceeding five years or fine not exceeding five hundred thousand baht, or both.

Section 102 Any person who violates the order of competent official forbidding the use of vehicle according to section 65 shall be punished by fine not exceeding five thousand baht.

Section 103 Any person who refuses to observe the order given by competent official according to section 67 shall be punished by imprisonment not exceeding one month or fine not exceeding ten thousand baht, or both.

Section 104 Any owner or possessor of the point source of pollution who refrains from observing the provision of section 71, or any person who refrains from observing the provision of section 72, or the rules laid down by the local authority by virtue of section 74 or section 75, first paragraph, or the ministerial regulation issued by virtue of section 80 shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

Section 105 Any person who renders services as a Monitoring Control Operator or as a Service Contractor for wastewater treatment or waste disposal without the license granted according to section 73 shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

Section 106 Any owner or possessor of the point source of pollution or any Monitoring Control Operator or any Service Contractor rendering the services of wastewater treatment or waste disposal, who refrains from collecting statistics or data or from making notes or reports as required by Section 80 shall be punished by imprisonment not exceeding one month or fine not exceeding ten thousand baht, or both.

Section 107 Any Monitoring Control Operator or Service Contractor having the duty to make notes or reports according to this Act, who intentionally makes such notes or reports showing false

information or statements shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

Section 108 Any person who obstructs or refuses to comply with the order of the pollution control official given in the performance of his duty according to Section 82 (2) shall be punished by imprisonment not exceeding one month or fine not exceeding ten thousand baht, or both.

Section 109 Any Service Contractor rendering services for wastewater treatment or waste disposal ordered by the pollution control official to stop or close down his services pursuant to Section 82 (5), or any Monitoring Control Operator whose license has been revoked by the order of the pollution control official pursuant to Section 82 (6), who violates or refuses to comply with such order of the pollution control official or continues to carry on his service in violation of such order shall be punished by imprisonment not exceeding one year or fine not exceeding one hundred thousand baht, or both.

Section 110 Any owner or possessor of the point source of pollution who employs the person, whose license to be a Monitoring Control Operator has been revoked, to supervise and monitor the operation of air pollution control, wastewater treatment or waste disposal facility that he has the duty install and operate according to this Act, shall be punished by fine not exceeding fifty thousand baht.

Section 111 In case the offender who is liable to be punished according to this Act is a juristic person, the directors or managers of such juristic person, or any person who is responsible for the business operation of such juristic person, shall also be punishable by the same penalties prescribed by law for such offence, unless it can be proved that they have no part to play in the commission of such offence.

Interim Provisions

Section 112 In the period during which the National Environment Board is yet to be appointed in accordance with section 12 of this Act, the National Environment Board appointed prior to the date of effectiveness of this Act shall continue to hold office in order to perform its function until the new Board shall be appointed and take over the office.

Section 113 All ministerial regulations, rules, procedures, notifications or orders, issued by virtue of the Enhancement and Conservation of National Environmental Quality Act, B.E. 2518 which remain in force on the date of effectiveness of this Act, shall continue to be effective, insofar as they are not in conflict with or contrary to this Act, unless and until ministerial regulations, rules, procedures, notifications or orders will have been issued in accordance with this Act.

Section 114 The person, who has been holding a licence as an eligible person to prepare reports concerning the study and measures for the prevention of and remedy for the adverse effect on environmental quality by virtue of the Enhancement and Conservation of National Environmental Quality Act, B.E. 2518, shall continue to be eligible to prepare the environmental impact assessment report provided by this Act, until such person is required by the Minister to apply for licence in accordance with this Act.

Section 115 For all the reports concerning the study and measures for the prevention of and remedy for the adverse effect on environmental quality required for any project or activity pursuant to the Enhancement and Conservation of the National Environmental Quality Act, B.E. 2518, that have been filed prior to the date on which this Act shall come into effect and still pending review by the Office of National Environment Board, the review and approval of such reports shall be further proceeded with in accordance with the rules and procedures laid down by virtue of the Enhancement and Conservation of National Environmental Quality Act, B.E. 2518. For this purpose, the power and duty of the Office of National Environment Board in become the power and duty of the Office of Environmental Policy and Planning.

Countersigned by :
Anand Panyarachun
Prime Minister