Table 1(3)-9 Continued

Name of Training / Workshop Program	1987												Number of Trainers
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1. Environmental Impact Assessment				2days						2days			140
2. Environmental Management						5days							40
3. Water Pollution		4days											60
4. Preparation of Environmental Impact Assessment Report in Thailand			4days										30
5. Environmental Volunteer Training Project					3days								60
6. Environmental Training program for Environmental Teacher								5days					50
7. Water Pollution - Quality Control/Laboratory Technology	3days												80
8. Air Pollution									4days				60

Name of Training / Workshop Program	1988												Number of Trainees
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1. Environmental Impact Assessment				2days						2days			140
2. Environmental Management							5days						40
3. Water Pollution								4days					60
4. Preparation of Environmental Impact Assessment Report in Thailand					4days								30
5. Environmental Volunteer Training Project		3days											60
6. Environmental Training Programme for Environmetal Teacher									5days				50
7. Coastal Resource Management in Phuket			5days										80
8. University and Coastal Policy: A necessary partnership							1day						60
9. Noise Pollution	5days												20
10. Chemical Safety in Laboratory			2days										140

g) Facilities for Research and Training

1) Facilities for Research

The only Facilities of research for ONEB is at the only one laboratory within the Environmental Quality Standards Division which has the total area of 527 m^2. Due to the limited area of the laboratory, the routine and research activities are conducted together without controlling of the contaminations. In order to get the reliable and accurate result of analysis, the expansion of the facilities for research and training are urgently required.

2) Facilities for Training

As mentioned in 1) the training for the laboratory work is conducted only in the same laboratory research. All of the Trainees are not allowed to utilized the equipments by themselves due to the limited number of equipment. The number of trainees are also restricted.

As for the general training program, the ONEB has limited number of, meeting rooms and audio visual set. It is rather difficult for ONEB to arrange many training programs at the same period.

h. List of Equipments for Research and Training Activities

Table 1(3)-10 Equipments of Research and Laboratory Section (ONEB)

No.	Name of Equipments	Total
1	Infrared Spectrophotometer	1
2	UV- Visible Spectrophotometer	2
3	Spectrofluorometer	1
4	Atomic Absorption Spectrophotometer	2
5	Gas Chromatograph	2
6	High Performance Liquid Chromatograph	1
7	Mercury Analyzer	1
8	pH Meter	5
9	DO Meter	3
10	Analytical Balance	2
11	Water Sampler	4
12	Grab Sampler	2
13	Oven	3
14	Incubator	3
15	Refigerator	5
16	Rotary Evaporator	2
17	Shaker	2
18	Total Organic carbon Analyzer	1
19	Hot Plate	5
20	Heating Mentle	5
21	Muffle Furnace	1
22	Centrifuge	1
23	Autoclave	1
24	Water Distillation Unit	1
25	Water Bath	2
26	Ultrasonic Bath.	1

4(3)-10-1(continue)

Table Equipments of Research and Laboratory Section ONEB

No	Name of Equipments	total
27	Pipette Cleaner	1
28	Vacuum Pump	4
29	Humidity Meter	2
30	Current Meter	2
31	Homogenizer	2
32	Microscope	2
33	Turbidity Meter	1
34	SCT Meter	2
35	Blender	1
36	Dry Freezer	1
37	Ice Maker	1
38	Jar Test	1
39	Oil Monitor	1
40	Kjeldahl Apparatus	2
41	Ammonia Distillation Apparatus	2
42	Autometic Dispenser	1
43	Colony Counter	1
44	Tintometer	1
45	Selective Ion Meter	1

1(3)-10-8

Table Equipments of Air and Noise Pollution Section

No.	Name of Equipments	Total
1	High Volume Air Sampler	11
2	CO Analyzer	12
3	HC Analyzer	4
4	NO_2,NO,NO_x Analyzer	8
5	HC (from car) Analyzer	2
6	CO (from car) Analyzer	3
7	CO+HC (from car) Analyzer	4
8	Black-smoke Analyzer	5
9	Balloon for air pollution measuring	1
10	Ozone Analyzer	4
11	SO_2 Analyzer	8
12	Data Locker	9
13	Wind Speed and Wind Direction	8
14	Air Monitoring Mobile Lab.	2
15	Stack Gas Sampling	2
16	Gas Chromatograph	1
17	Meteorological Instrument	1
18	Sound Level Meter (Portable)	6
19	Sound Level Meter (Monitoring)	3
20	Noise Dose (Portable)	3
21	Vibration Meter (Portable)	2
	Total	99

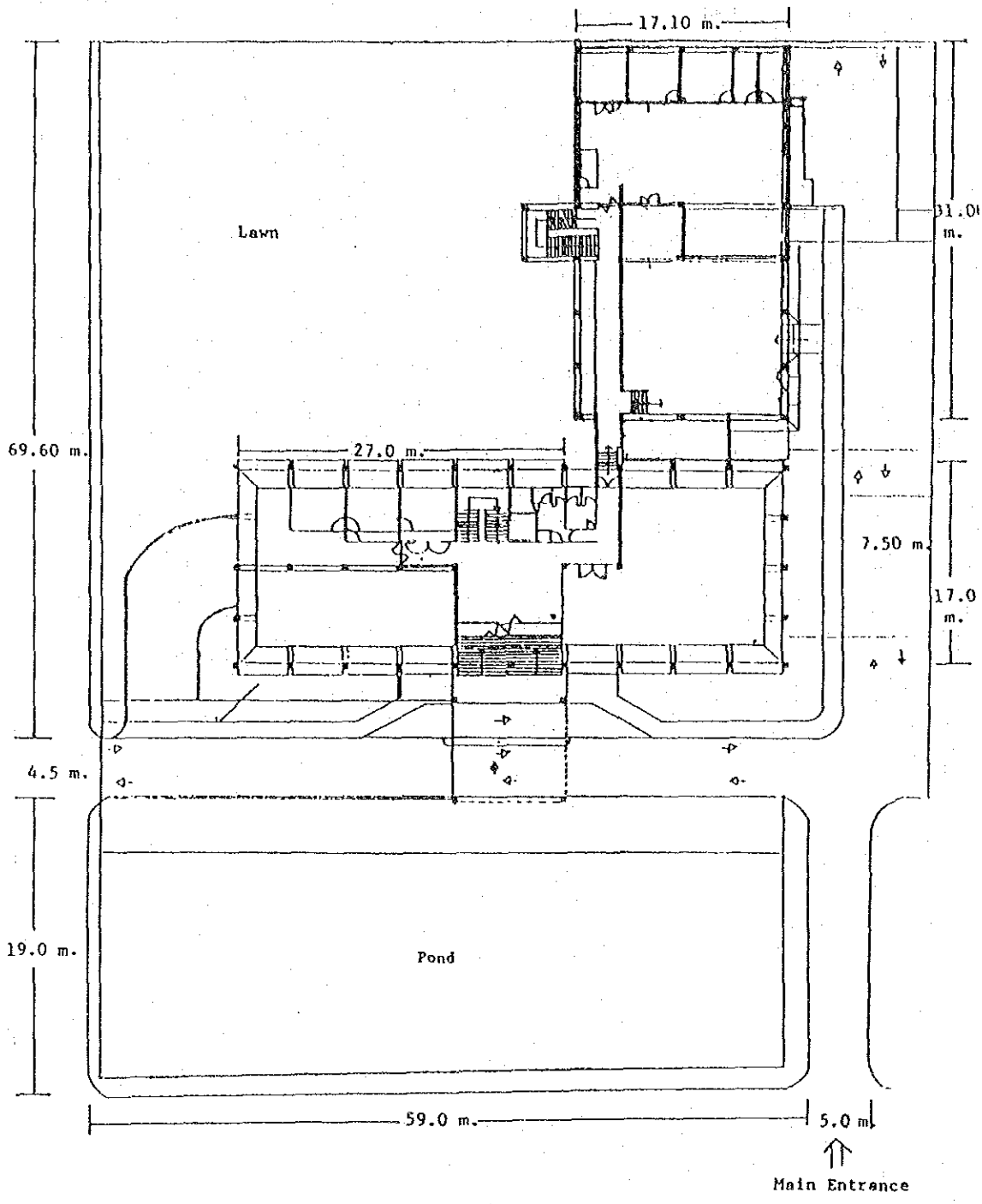
i) Present Operation and Maintenance of Main Facilities and Equipments

The operation and maintenance of main facilities and equipments are managed by the office of secretary of ONEB.

j) Present Maintenance Services System for Facilities and Sophisticated Equipments

Since ONEB has no operators who have experienced in maintaining the sophisticated equipments, all the maintenance services are conducted by the private company.

Design of the present ONEB building



SESSION 2 : BACKGROUND INFORMATION ON ENVIRONMENTAL ADMINISTRATION IN THAILAND

2. Background Information on Environmental Administration in Thailand

(1) A list of laws and regulations concerning environmental pollution control and natural resources management

A. Public Health Act

(i) Content

Chapter I : Sanitation (A.6-30)
- Part 1 Rubbish, Filth and Dirt
- Part 2 Commercial Undertaking which are Objectionable or Likely to be Industries to Health
- Part 3 In Sanitary Premises
- Part 4 Latrines, Night Soil Receptacles and Urinals
- Part 5 Nuisances

Chapter II : Hair Dressing (A 31)

Chapter III: Animal which are the Cause of Nuisance and are Likely to be Dangerous to the Public (A.32-33)

Chapter IV : Water (A.34-41)

Chapter V : Trading in Food, Ice and Other Articles (A.42-58)
- Part 1 Public Markets
- Part 2 Private Markets
- Part 3 Stall
- Part 4 Hawker
- Part 5 Private Premises

Chapter VI : Power of Inspection (A.51-58)

Chapter VII : Miscellaneous (A.59-64)

Chapter VIII: Transitory Provisions (a.65-66)

Chapter IX : Penalties (A.67-78)

(ii) Major Provisions

(Article 6) Garbage and Night Soil

The disposal of rubbish, filth and dirt in the area of any locality shall be within the sole competency of the authority of that locality ; but the local authority may authorize any person to carry out this work under his control and, in order to give effect to this section, the local authority shall have the power to issue local government bye-laws or rules, as the case may be, as follows :

(1) providing receptacles for rubbish and filth at public places and private premises ;

(2) prescribing procedure for the collection and removal of rubbish and filth ;

(3) fixing the scale of fees for the collection and removal of rubbish and filth ;

(4) prohibiting the laying , pouring , throwing or causing to be deposited on public roads and places any rubbish , filth and dirt which is likely to impair health or cleanliness ;

(5) taking any other measure which is deemed necessary in order to confirm to sanitary conditions.

(Article 19) Nuisances

The local official shall have the duty to remove , prohibit and abate nuisances in public or private places which tend to impair or are likely to be prejudicial to the health, safety or right and liberty to the public, and shall look after and keep free from nuisances all streets , roads , watercourse , gutters , trenches , canals and other places within his district.

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For the purposes of this Act, nuisances are :

(1) Any premises or part thereof such a construction or in such a state as to impair or likely to be dangerous to health or safety.

(2) Any cistern, pool, water bed, ditch, drain, channel, watercourse or low marshy ground , bathing place , latrine, urinal, night-soil receptacle, sewer, gutter, dung or ash-pit which is situated in an unsuitable spot, or which is or is likely to become a breeding place for mosquitoes or flies, or which is such as to impair or likely to be injurious to health.

(3) Animals which are kept in such place or in such manner or in such number as to impair or likely to be injurious to health.

(4) Any accumulation , steeping deposit of anything or leaving any premises or thing in a disorderly state which give offensive smell or tends to impair or is likely to be injurious to health , or which is or is likely to become a breeding place for mosquitoes or flies.

(5) Any factory, workshop or working place, which :

a) is not kept free from effluent arising from any sewer, gutter, latrine, night-soil receptacle, urinal or from any other cause;

b) is not sufficiently ventilated so that any gases, vapors, dust or other impurities , arising from the work carried on therein , as may be rendered so harmless as not to impair or likely to be injurious to health ;

c) is over-crowed while work is being carried on so as to impair or likely to injurious to the health to those working therein.

(6) Any building, hut or shed used for human habitation or for keeping animals or for other purposes, which, by reason of its proximity to each other, or want of drainage or difficulty of removing rubbish or filth or by any reason, impairs or is likely to be injurious to health.

5.1

(7) Any water bed , trench or canal , which is used by the people or the water from which is likely to be used for human consumption or for domestic purposes or for manufacturing articles for human consumption , that is or is likely to be so dirty as to impair or likely to be injurious to health.

(8) Any fire-place, furnace or chimney sending forth smokes or unconsumed combustible matters in such large quantity as to interfere with the neighbors or to impair or likely to be injurious to health.

(9) Any brick field, earth-pit, sand-pit or excavation for any purpose which interfere with the neighbors or impairs or is likely to be injurious to health.

(10) Any smell, sound, vibration, dust, or ash which interferes with the neighbors or impairs or is likely to be injurious to health.

(Article 20-30) Procedure to Remove Nuisances

(Article 34) Restriction on Water

The local authority shall have the power to issue local government by laws or rules, as the case may be, for the control of the procurement of water for the use of the public, and the local official shall have the power to close, fill up or prohibit the use of water in any poll or water bed which is or is likely to be injurious to health.

(Article 38) Protection of Water Sources

No person shall bathe or work himself, wash cloths or anything or wash animal, make allow filth to flow into or by any means foul the pool, well, cistern or watercourse or reservoirs which from part of local waterworks.

B. Factory Act

(i) Content

Chapter I : Establishment and Operation of Factory (A.8-33)

Chapter II : Control of Factory (A.34-38)

Chapter III : Suspension and Revocation of License (A.40-42)

Chapter IV : Penal Provisions (A.43-50)

Chapter V : Transitory Provisions (A.51-55)

(ii) Major Provisions

(Article 4) scope of Application

This Act shall not apply to factories owned by official authorities, operated by the official authorities for the benefit of the security or safety of the nation, but such factories shall comply with the Ministerial Regulations concerning the site of factory, the prevention or curtailment of hazards which may occur or occurring to person or property or of disturbances, the removal of sewage, the drainage or the ventilation.

(Article 5) Definition

"FACTORY" means a building, place or conveyance using machine of totaling two horsepower upwards or equivalent, or employing workers numbering seven persons upwards, whether any machine is used or not, for the purpose of manufacturing, producing, assembling packing, repairing, maintaining, testing, adjusting, altering or demolishing anything, provided that it shall come under any of the categories or kinds of factories to be specified by a Ministerial Regulation :

(Article 8) Establishment of Factory

A factory may be established only when a license to establish a factory

has been obtained from the Under-Secretary of State or his deputy.

In issuing a license to establish a factory, the period for completion of its establishment for operation shall be prescribed therein.

The rules, procedures, conditions and forms of applying for a license to establish a factory and of issuing such a license shall be prescribed by a Ministerial Regulation.

(Article 12) Operation of Factory

The person who obtains a license to establish a factory shall, upon completion of the establishment of the factory and before the factory is to be open for work, file an application for a license to operate the factory with the Under-Secretary of State or his deputy within thirty days from the date the establishment of factory has been complete.

Upon receipt of the application under the first paragraph, the Under-Secretary of State of his deputy shall order the competent official to inspect the factory and machine. If it appears that such factory or machine is not in accordance with the licensed plans and speculations, the competent official shall order the person obtaining a license to establish a factory to rectify it within the determined period. If such period is insufficient, the person obtaining a license to establish a factory may apply for the extension thereof to the Under-Secretary of State or his deputy who shall give the order to that effect as he may think fit.

If such factory or machine is, or is rectified, in accordance with the licensed plans and specifications, the Under-Secretary of State of his deputy shall grant the issue of a license to operate the factory.

In issuing a license to operate the factory, the condition determined under Section 9 shall be prescribed therein.

A license to operate the factory shall be in accordance with the form prescribed by Ministerial Regulation.

(Article 16) Valid Term of License

A license to operate the factory shall be valid until the last day of the third calendar year reckoning from the year of issuing the license.

(Article 17) Renewal of License

In applying for renewal of the license to operate the factory, the person obtaining the license to operate the factory shall, before the expiration of such license, file an application in accordance with the form and procedure prescribed by a Ministerial Regulation so that the factory and machine shall be first inspected by the competent official. Upon filing the said application, the operation of such factory may be continued until an order not granting the renewal of the license has been given.

In the inspection of the factory or machine, if it appears that the factory is not in accordance with Article 39, or the machine used in the factory is not in a safety condition, the compelent official shall order the person obtaining a license to operate the factory to comply with Article 39, or to rectify, change or modify such factory or machine to be in a safety condition.

If the person applying for renewal of the license complies properly with Article 39, or rectifies, changes or modifies the factory or machine in accordance with the order of the competent official, the Under-Secretary of State or his deputy shall grant permission for the renewal of the license.

(Article 21) Enlargement of Factory

The person obtaining a license to operate the factory shall be prohibited to enlarge the factory unless a license has been obtained from the Under-Secretary of State or his deputy.

(Article 34) Restriction of Location

When industrial zone has been determined under the law on city planning in any locality, the Minister shall have the power to notify in the Government Gazette fixing the area in such the area in such industrial zone

within which certain category or kind of factory shall or shall not be granted to establish.

(Article 35) Suspension of Factory

In case where any factory may cause a great danger to the public, the Under-Secretary of State or his deputy shall order the person obtaining a license to operate the factory to suspend temporarily the whole work or part thereof, and to rectify such factory within the prescribed period.

(Article 36) Power of Competent Official

For the execution of this Act, the competent official shall have the following power and duties :

(2) to enter any factory during working hours for inspecting the conditions of factory, building, office, machine, compound of the factory or building, and other things so as to render protection against disturbance or danger which may occur to any person or property ;

(4) to give order in writing to the person holding a license to operate the factory to cease the whole operation of the factory or apart thereof until the rectification shall has been made to the factory so as to ensure safety or to be in compliance with the notification of the Minister, in case where the continued operation of the factory may be hazardous to person or property or in case where the person holding a license to operate the factory does not eliminate disturbance, remove sewage, not providing drainage or ventilation systems in accordance with the notification of the Minister.

(Article 39) Duty of Person to Operate Factory

The person obtaining a license to operate the factory shall have following duties :

(6) to make an arrangement for the removal of sewage, the drainage and ventilation ;

(13) to make an arrangement, subject to the law governing such and such matter, for the safe storage and use of poisonous, chemical, inflammable or explosive material, or other material which is likely to cause danger or produce dust, heat, light or sound to which the performance of duties in dealing with such material is dangerous, as well as to provide a method and mean of protection against danger for workers performing such duties ;

(14) to carry out the work on factory without causing any disturbance under the Public Health Act ;

(16) to provide other service as may determined by the Minister.

(Article 40) Suspension and Revocation of License

Whenever it appears that the person obtaining a license to operate the factory violates of fails to comply with the provisions of this Act, Ministerial Regulations, notifications issued or imposed under the provisions of this Act, or fails to comply with the order given be the competent official under this Act, the Under-Secretary of State or his deputy shall have the power to give order suspending the license to operate the factory for such a period as he think fit.

In the case as mentioned in the first paragraph, if such violation or non-compliance is in a serious manner, the Under-Secretary of State or his deputy may give order revoking the license to operate the factory.

(iii) Major Regulation of the Ministry of Industry

(1) Ministerial Regulation No.2 (June 4, 1969)

(Article 8) Waste Water Treatment

The factory with a drainage must provide a correct and suitable waste water treatment process for which a plan and explanation in detail thereof must be made to show that it may not cause danger, damage or any disturbance.

(iv) Major Notifications of the Ministry of Industry

(1) Ministerial Notification No.2 (June 24, 1970)

By virtue of Article 39 of the Factories Act, the Minister of Industry hereby prescribes rules and procedures which license to operate factory of whatever category or kind is under a duty to comply with, as follows :

(Article 19) Refuse Disposal

Must always keeps the factory clean and clear of refuse and must provide refuse receptacle or disposal according to the necessary and suitability.

(Article 20)

Must separate refuse or unusable material which contains mixture of poison, or cotton wool, cloth or piece of cotton stained with flammable material, in different receptacle with proper lid, and must provide special disposal of the above mentioned by following safety procedure and without causing annoyance.

(Article 21) Drainage

Must maintain drainage system in good condition and efficiency.

(Article 22) Effluent Standard

Waste water shall not be drained from the factory, excepl one or more shall have been applied, but not through the means of dilution, to turn waste to become as follows (hereafter omitted)

(2) Ministerial Notification No.4 (August 11, 1971)

- the addition to Ministerial Notification No.2-

(Article 75) Prevention of Nuisance

The smell, noise, vibration, dust, fume and ash caused by the factory shall be got rid of so not as to cause nuisance or harm to the health of the those living near.

(Article 76)

The sound proof system, exhaust pipe, or the muffler of the prime mover shall be properly looked after and maintained in good conditions at all times.

(Article 77) Emission Standard

The factory which use the oven or other machinery causing smoke to the atmosphere shall release the smoke through the chimney having suitable height. The blackness of the smoke shall not be more than 40% of Ringleman Standard, except for the short period while the oven is lit or the machine started to blow the ash or smoke, or there is an obstruction to such system to get rid of the smoke.

(3) Ministerial Notification No.22 (August 31, 1985)

By virtue of Article 39 (16) of the factory Act, the Minister of Industry hereby issues a Notification stipulating the principles and procedures, for the license to operate a factory to perform duties as follows :

(Cause 1) The following types of factory shall have a supervisor and operator being responsible for the system of protection of environment, pollution who shall have qualification as specified under Clause 2.

1.1) The factory discharging waste water from the volume of 60 cubic meter per hour (except for cooling water) or having BOD/load of influent from 100 Kg./Day upwards.

1.2) The factory using heavy metal in the production process with volume of waste water from 50 cubic meter per day upwards, and having volume

of heavy metal in waste water from the factory as follows :

1.2.1 Zinc from 250,000 mg. per day upwards.

1.2.2 Chromium from 25,000 mg. per day upwards.

1.2.3 Arsenic from 12,500 mg. per day upwards.

1.2.4 Copper from 50,000 mg. per day upwards.

1.2.5 Mercury from 250 mg. per day upwards.

1.2.6 Cadmium from 1,500 mg. per day upwards.

1.2.7 Barium from 50,000 mg. per day upwards.

1.2.8 Selenium from 1,000 milligram per day upwards.

1.2.9 Lead from 10,000 mg. per day upwards.

1.2.10 Nickel from 10,000 mg. per day upwards.

1.2.11 Manganese from 250,000 mg. per day upwards.

1.3) The factory carrying out activity concerned with iron and steel as follows :

1.3.1 Factory having annealing furnace or which user acid or substance which may be harmful to environment in the production process and having production capacity from 100 tons per day upwards.

1.3.2 Factory having iron furnace having total capacity from 5 tons per batch upwards.

1.4) Factory carrying out activity concerned with petrol-chemical, using raw material which is the by-product from the oil refinery, in the production process in the volume of 100 tons per day upwards.

1.5) Factory carrying out activity concerned with natural gases of all sizes, which extracts or transform natural gases.

1.6) Factory carrying out activity concerned with chlor-alkaline using cooking salt (NaCl) as raw material in the production of soda ash (Na_2CO_3) caustic soda (NaOH), chloric acid (HCl), chlorine (Cl_2) and bleaching powder (NaOCl), having production capacity for each or in combination from 100 tons per day upwards.

1.7) Factory carrying out activity concerned with production of cement of all sizes.

1.8) Factory carrying out activity concerned with refining or casting metal with capacity of 50 tons per day upwards.

1.9) Factory carrying out activity concerned with production of paper pulp from 50 tons per day upwards.

1.10) Factory carrying out activity concerned with crude oil refinery of all sizes.

(Clause 2) The supervisor, the operator who is responsible for the system for protection of environment pollution, shall have qualifications as follows :

2.1) The supervisor shall be a qualified Bachelor of Engineering or Bachelor of Science or other field who has experience in environmental control, as approved by the Department of Industrial Works, For the case of Engineering Consultant Firm, there shall be person of above qualification.

2.2) The operator shall have qualification of junior high school and shall be the person mentioned under 2.1.

2.3) Persons under 2.1 and 2.2 shall be registered with the Department of Industrial Works, according to the regulations and procedures as specified by the Department of Industrial Works.

(Clause 3) This Notification shall come into force after the lapse of

ninety days from the date of publication in the Government Gazette.

(Clause 4) Factories mentioned in Clause 1.1 to 1.10 must prepare Poisonous Substances Analysis Reports and submit them to the Department of Industrial Works every 3 months on the form and according to the procedures prescribed by the Department of Industrial Works, The analysis of the quantities of poisonous substances must be performed by a government analysis laboratory or a private analysis laboratory approved by the Department of Industrial Works. In accordance with the regulations and procedures prescribed by the Department of Industrial Works.

Laws for Enhancement and Conservation of Environment issued during 1983-1984.

There is at present only one law directly governing enhancement and conservation of the environment. This is the Enhancement and conservation of National Environmental Quality Act, B.E. 2518. In addition, there are more specific laws concerned with environmental protection and conservation; namely, the Animals Preservation and Protection Act, B.E. 2503 ; the National Parks Act, B.E. 2504 ; the National Forests Conservation Act, B.E. 2507 ; the Toxic Substances Act, B.E. 2520 ; and the Buildings Control act,. B.E. 2522. During 1983-1984, the following laws for the promotion and conservation of environment were enacted under various provisions :-

(i) Under the provisions of the Enhancement and Conservation of National Environmental Quality Act, B.E. 2518 (as amended in B.E. 2521 and 2522), the following laws were enacted :-

In 1983 :

- Ministry of Science, Technology and Energy issued a notification prescribing the standards and methods of testing sea water quality in the area of Maingarm Peninsula, Karon Bay and Poo Island, Changwat Phuket. This law aims at conservation of sea water to ensure its quality for swimming, water sports , and the conservation of coral reefs within 500 meters of the shore.

In 1984 :

- Ministerial Regulation No.2 (B.E. 2527) was issued to prescribe concepts of application involving issuance, suspension, revocation and control of licenses for qualified persons capable of composing EIA reports.

(ii) By virtue of the provisions of the Wild Animals Conservation and Protection Act, B.E. 2502, the following laws were enacted. (1)

In 1983 :

A Royal Decree prescribing the boundary of Omkoi Forest Reserve, in Tambon Yangpiang, Tambon Monjong, Amphoe Omkoi, Tambon Moodka, Amphoe Doi Tao, Changwat Chiang Mai, and the area around Maetoon forest in Tambon Maetoon, Tambon Sammoon, Amphoe Maeramad, Tambon Baanna, Amphoe Samngao, Changwat Tak, were reserved for conservation of wild animals. Emphasis was placed on natural resources conservation.

A Royal Decree was passed for the expansion of reserved areas for wild life in the Salawin Forest in Tambon Saohin, Amphoe Mae Sariang, Changwat Mae Hong Son for natural forest resources preservation. There is an abundance of wild animals in these areas.

In 1984 :

- Royal Decree prescribing Doiluang Forest area in Amphoe Song of Changwat Phrae as a forest reserve in order to conserve wild animals and their habitat, and to protect watershed forests.

- The Ministry of Agriculture and Cooperatives issued 5 Notifications on non-hunting areas covering the areas of Kao Yai National Park, Kao Napatang, Kao Taoprom, King Amphoe Thongsaenkhan, Amphoe Tron, Changwat Uttaradit, and Lamchan canal area. Amphoe Muang Trang, Changwat Trang, Parangkai public land, Amphoe Panare, Changwat Pattani, Palaen area, east Pakpanang, Palaen Kohchai and Palaen at the end of Taloompook Peninsula, Amphoe Pak Phanang, Changwat Nakhon Si Thammarat, Mae Lao and Mae Sae forests, Amphoe Mae Taeng, Changwat Chiang Mai.

(1)

(iii) By virtue of the provision of the National Parks Acts, B.E. 2504, the following laws have been enacted :

In 1983 :

- Two Royal Decrees prescribing the boundary of national parks in areas covering 3 changwats. The areas around Soon Peninsula, and nearby islands in Tambon Rajkrud, Amphoe Muang Ranong, Tamboon Muangkland, Tambon Kapoe, Tambon Banghin, Tambon Naka, Tambon Kampuan, Amphoe Kapoe, Changwat Ranong, Tambon kura, Amphoe Khura Buri, Changwat Phangnga and the area around Hoi Jedsibhalarmpi Shoal, P.P Islands, and the nearby islands, in Tambon Nongthaley, Tambon Saithai, and Tambon Paknam, Amphoe Muang Krabi, Changwat krabi, for conservation of the natural resources. Their natural characteristics are to remain unchanged, so that they may be used as recreational centers by the people.

In 1984 :

- Royal Decree prescribing 2 other national parks covering the areas around Puhin Rongkla Forest, Bor Pho King Amphoe, Nernperm King Amphoe, Ban Yaeng King Amphoe, Nakhon Thai Amphoe, Changwat Phitsanulok, Kok Sathon King Amphoe, Dan Sai Amphoe, Changwat Loei, and the areas around Phetra Island, Kao Yai Island, and the nearby group of islands, in Kok Sukorn King Amphoe, Palien Amphoe, Changwat Trang, Khon Khlan King Amphoe, Thung Wah Amphoe, Laemson Kong Amphoe and Pak Nam King Amphoe, Langu Amphoe, Changwat Satun. They are to be used for conservation of natural resources, and their natural character is to be maintained so that they may be used as recreational centers by the people.

(iv) By virtue of the provisions in the National Forest Reserves Act, B.E. 2507, the following laws have been enacted.

In 1983 :

- The Ministry of Agriculture and Cooperatives issued 28 Ministerial Regulations prescribing the national forest reserve areas for conservation of forests, forest products, and other natural resources, covering forest areas in various provinces of the Northeast, the East, the

West, the South and the North. The total land area covered under the Ministerial Regulations is 2,930,000 rai.

In 1984 :

The Ministry of Agriculture and Cooperatives issued 48 Ministerial Regulations to prescribe expansion of natural forest reserves. This is one measure to maintain the forests, forest products, and other natural resources, The total land area covered in the various provinces of the Northeast, the East, the West, the South and the North is 6,902,959.25 rai.

(v) By virtue of the provisions of the Toxic Substances Act, B.E. 2510 the following laws have been enacted:

In 1983/84 :

- The Ministries of Public Health and Industry each issued notifications in which toxic substances are classified into two main categories, namely; ordinary and lethal. Under these notifications, most of the chemical compounds known to be toxic and harmful to human health and the living environment are specified for the sake of prevention and mitigation measures.

(vi) By virtue of the provisions of the City Planning Act, B.E. 2518, the following laws have been enacted.

In 1983 :

- The Ministry of Interior issued two Ministerial Regulations for use as a comprehensive city plan in the areas of Thup Ma, King Amphoe, Nam Dok, King Amphoe, Chernern, King Amphoe, Nern Phra, King Amphoe, Tha Pradoo King Amphoe, and Pak Nam King Amphoe, Muang Rayong Amphoe, Changwat Rayong, and in Naklua King Amphoe, Nongprue King Amphoe and Huay Yai King Amphoe, Bang Lamung Amphoe, Changwat Chon Buri. This plan would be used as a guideline for development and maintenance of cities and related areas, or for proper utilization of natural resources, communications and public transport, public services in rural reas. The plan would also integrate environmental planning with the amphoe-level development around the Eastern

seaboard, which is designated as a principal industrial base according to National Economic and Social Development Plans.

In 1984 :

- Royal Decrees specified the land to be surveyed for city planning for three provinces including Amphoe Muang, Changwat Chon Buri, Amphoe Sampran, Changwat Nakhon Pathom, and Amphoe Muang Mukdaharn, Changwat Mukdaharn.

- The Ministry of Interior issued two Ministerial Regulations for use as a comprehensive city plan in two provinces, covering Amphoe Muang Chiang Mai, and Amphoe Santsai, Changwat Chiang Mai and Amphoe Muang Khon Kaen, Changwat Khon Kaen for use as guidelines, for development of Chiang Mai and Changwat Khon Kaen as the Primary cities in the North and Northeast respectively according to the National Economic and Social Development Plan. The plans also assist with efficient land-use planning with due consideration for community expansion, socio-economic conditions and public service networks in the future.

(vii) Under the provision of the Artesian Wells Act, B.E. 2520, the following laws have been enacted:

In 1984 :

- Ministerial Regulation No.4 (B.E. 2527) contains important provisions prescribing fees for use of artesian wells, and for the control of artesian well usage. Previously there had been prescribed rates for water usage and for charging the water usage fees from licenses. This caused the licensees to drill wells and use water uneconomically, and the overuse of ground water resources has led to land subsidence.

(viii) By virtue of the provisions of the Buildings Control Act, B.E. 2522, the following laws have been enacted:

In 1983 :

- The Ministry of Interior issued Ministerial Regulation No.1 with important provisions for prescription of the standards, methods, and criteria for construction, renovation, demolition and removal, usage or a change in the usage of a building. There are also provisions for durability, safety, fire-prevention, public health, conservation of the environment, city planning, architectural style, traffic facilities, and other necessities.

- Two Royal Decrees were issued to control expansion of building construction, and urban growth in the municipal areas of King Amphoe Ban Phai, Amphoe Ban Phai, Changwat Khon Kaen, and in King Amphoe Thangkwen, Amphoe Klaeng, Changwat Ranong, in the interests of stability, safety, fire-prevention, public health, environmental conservation, city planning, architectural design, and transportation facilities.

(ix) In 1984, a Traffic Notification for the Kingdom ordered measurement of smoke and noise emissions from vehicles in order to abate pollution problems and maintain public health and the environment. This notification specified motor vehicle emission and noise standards.

(2) Major National Policies on Pollution Control in the Field of Water, Air, Noise, Solid Waste and Toxic Substances

(A) Policy and Implementation Measures on Water

Increasing degradation of surface water resources reduces the available supply of water, hence results in significant damage to social and economic development. Policies and measures have been designed to avert such damage as follows:

(a) Conservation of Surface Water Resources (Policy 1)

To conserve surface water resources the following measures will be utilized:

(i) Resources will be classified, stipulating the different beneficial purposed for which water may be used.

(ii) Water quality standards will be formulated for various beneficial uses, appropriate for use in Thailand.

(iii) All important water resource areas will be regularly monitored to maintain a continuing record on the status of water quality and effects from pollution or other causes.

(iv) Plans for increased coordination between operating agencies on water pollution issues will be developed.

(v) Control measures to prevent water deterioration will be formulated.

(vi) Research projects will be encouraged for developing appropriate technology for protection of water quality.

(b) Improvement of Degraded Water Resources (Policy 2)

(i) For residential areas, excessive disposal of sanity wastes from residential areas will be prevented; water quality standards will be formulated; and solid waste management systems will be planned and implemented to protect water quality.

(ii) For industrial areas, industries will be required to treat wastes properly prior to discharge; industrial estates will be promoted including use of comprehensive systems for management of liquid and solid wastes; existing laws to prevent and reduce water pollution generated by industry will be strictly enforced; and the use of water recycling systems in industry will be encouraged.

(iii) For mining industries, measures to control waste substances from mining will be required and will be regularly monitored; the disposal systems to be required will prevent discharge of damaging amounts of silt, heavy metals, and other contaminants; and use of water recycling systems will be encouraged.

(iv) For agriculture, the use of pesticides and fertilizers will be controlled, and appropriate technology will be developed and applied to prevent damaging pollution from agricultural sources.

(B) Policy and Implementation Measures on Groundwater

The policy is to conserve groundwater quality and to maintain the supply of these resources. To achieve this objective the following measures will be used:

(a) Well construction and operation will be controlled to prevent contamination of the aquifers from surface drainage.

(b) Excreta disposal methods will be improved to prevent groundwater contamination.

(c) Solid waste management will be improved to prevent groundwater pollution.

(d) Industrial sewage discharges will be controlled to prevent groundwater pollution.

(e) Agricultural activities will be regulated to prevent groundwater pollution, including control of agricultural chemicals, control of animal wastes, and control of return irrigation flows.

(f) Studies and research into ways to prevent water resource deterioration will be encouraged and supported.

(g) Withdrawal of groundwater resources will be controlled as well as the purposes for which it is to be used.

(C) Policy and Implementation Measures on Coastal Marine

(a) Conservation of Water Quality and Natural Scenery (Policy 1)

Coastal water quality and scenic values will be preserved utilizing the following measures:

(i) Coastal areas will be reserved for their most optimal development purposes, including tourism and aquaculture.

(ii) Seawater resources will be conserved through planning and use of more effective pollution control measures.

(iii) Plans will be formulated to prevent the deterioration of seawater resources by:

(1) Preventing spills from gas and oil drilling

activities.

(2) Preventing leakage of toxic chemical substances.

(3) Placing controls on discharges of cooling water.

(4) Preventing the disposal of radioactive substances.

(5) Placing controls on the water waste released by industries.

(iv) Before developing any program, the impact on environment will be taken into account including use of the environmental impact assessment process.

(v) Regular surveys for monitoring of seawater quality will be conducted.

(b) Rehabilitation of Degraded Water (Policy 2)

Where seawater quality has been seriously degraded, corrective measures will be undertaken as follows:

(i) The disposal of waste from industrial, commercial, and agricultural activities will be controlled by means of efficient treatment and disposal systems which will furnish adequate environmental protection.

(ii) Water quality will be regularly surveyed to get relevant data for long-term prevention programs.

(c) Standards of Water Quality (Policy 3)

As part of the overall program for control of seawater pollution, appropriate water quality standards will be formulated using the following measures:

(i) Water quality parameters for all usage purpose for all usage purposes will be standardized.

(ii) Seawater resources and coastal zone areas, to be set

aside for conservation and developmental purposes, will be delineated and classified.

(iii) Coordination and cooperation between agencies concerned with water deterioration problems, plus the prevention and the preservation of water quality, will be encouraged.

(iv) Research into stabilizing water quality will be supported.

(v) International cooperation and coordination on the subject of seawater pollution control will be sought.

(D) Policy and Implementation Measures on Air Resources

(a) To implement this policy the following measures will be used: Current laws, legislation, and ministry rules and regulations will be amended to obtain an effective overall program of air pollution prevention and control.

(b) The powers of the agencies responsible for air pollution control will be strengthened to achieve greater compliance with the law.

(c) The agencies responsible for the above will be reorganized so they do not have overlapping burdens.

(d) Air quality standards will be formulated and enforced.

(e) The air quality and the diversity of pollutants in significant source areas will be surveyed and analyzed.

(f) Air pollution standards will be improved to be appropriate to achieve protection within affordable limits.

(g) The increasing trend toward private car ownership will be curbed, while at the same time extensions to existing public

mass transportation facilities will be encouraged.

(h) Issuing of smog approval licenses to the private sector will be encouraged. However, the public agencies involved must approve their suitability.

(i) An effective air pollution prevention system will be proposed for all sources of pollution including the construction sector.

(j) Studies, research, and seminars concerning air pollution issues will be supported with the people informed of important recommendations.

(E) Policy and Implementation Measures on Noise

Policy Prevention and Control of Noise and Vibration

Noise and vibration will be controlled to levels which impose no harmful treat to health and socio-economic development.

Implementation Measures

This policy will be implemented using the following measures:

(a) Legislation, rules, and regulations for noise and vibration prevention and control will strengthened as needed to obtain an effective control program.

(b) Agencies will be established to implement control measures according to these laws, and their responsibilities of various agencies will be clearly set out and redefined.

(c) Appropriate noise and vibration standards will be formulated.

(d) Noise and vibration conditions will be monitored at various sources and populated areas.

(e) Noise and vibration checking techniques will be improved to fit the circumstances.

(f) Noise measuring license will be issued to private companies with the adequacy of their control facilities approved by concerned public agencies.

(g) Public places such as universities, schools and hospitals will be protected from excessive disturbing noise and vibration.

(h) Noise and vibration control measures for building and road construction and maintenance will be formulated to suit specific needs.

(i) Studies, research, and seminars on noise and vibration pollution control topics will be encouraged and the people made aware of the harmful effects of excessive noise and vibration.

(F) Policy and Implementation Measures on Solid Waste

Policies

(a) Government Involvement (Policy 1)

Government involvement must be increased to solve the solid waste disposal problem because this has a direct impact on public health and on the country's progress generally.

(b) Adequate priorities (Policy 2)

Support local administration with appropriate budget, manpower and technology, giving priority to Bangkok and the major secondary city areas.

Implementation Measures

To accommodate these policies, the following measures will be implemented

(a) Legislation relating to waste disposal issues will be strengthened

(b) Studies and research on categories, volumes, and constituents of solid waste will be encouraged to furnish a better basis for understanding the problem and to facilitate proper disposal planning.

(c) Existing problems and constraints involving solid waste collection and disposal activities will be carefully examined to develop guidelines for short-term and long-term planning strategies.

(d) Studies and research into promising new techniques of both waste disposal and waste recycling systems will be supported.

(e) Waste generated by industrial activities will be controlled, especially those involving toxic substances.

(f) A long-term plan to cope with waste disposal problems in Bangkok and the larger secondary cities will be formulated to develop appropriate methods with consideration being given to technology, economic, social, environmental, and public health impacts.

(g) Equitable service charges by municipal administrations will be introduced to increase their revenue improving operations.

(h) The people will be made aware of the problem and effects relating to solid waste management and will be called upon to make a cooperative effort to help solve the problems.

(i) Waste reduction methods will be specified:

(1) Product standards will be stipulated.

(2) Waste from production processes will be controlled.

(3) Use of degradable materials will be promoted to replace use of non-degradable.

(G) Policy and Implementation Measures on Toxic Substances

Policies

(a) Basic Data (Policy 1)

Study and observation of effects of toxicity should be strengthened.

(b) Sharing of Responsibility (Policy 2)

Encourage both the public and private sector to share responsibility for toxic substances usage control.

(c) Adequate Support (Policy 3)

Support the introduction of sufficient manpower, operational equipment as well as operational expenses to prevent and solve toxicity problems.

(d) Public Education (Policy 4)

Educate the people from a young age to appreciate the benefits as well as the harmful effects of toxicity on public health and the environment.

Implementation Measures

To implement these policies the following measures will be used:

(a) General Measures

(i) The agencies to become involved in toxic substance control will be identified. Facilities at educational and research institutions will be surveyed and investigations carried out to determine which chemical substances are most hazardous to public health.

(ii) Systematic guidelines will be developed for primary data collection.

(iii) Existing laws will be reviewed and improved to match technology advancement and environmental change.

(b) Specific Measures

(i) Use of toxic substances for agricultural and public utility purposes will be appropriately controlled.

(1) Law and regulations relating to proper examination and identification of toxic substances will be studied and reviewed. This may subsequently be revised and strengthened to prevent environmental deterioration from toxic substances by :

- Formulating strict control procedures concerning the import, production, packing, distribution, purchasing, and storage of toxic materials.

- Stipulating appropriate measures on toxic material usage especially those in the slow degradation categories.

(2) The people will be attuned to the usefulness, dangers, and impact on health relating to use of toxic substances. This will be achieved by public relations and by the use of educational institutes and other public and private agencies.

(3) Analysis and research related to the study of toxic and other dangers substances will be encouraged.

- A toxic substances data center will be established to accumulate documents and information from internal and external sources. Its functions will include the exchange of data and documents from other members of the United Nations Environmental Program.

- Agencies involved in toxic substance analysis will be encouraged to incorporate supporting manpower and equipment into their activities.

(ii) Controls will be strengthened relating to toxic substances found in consumer articles and public utilities.

(1) The maximum residue limit in commercial crops, meats, and consumer products will be stipulated.

(2) Both public and private enterprise involved in food quality maintenance will be encouraged to check consumer products in a timely manner.

(3) Responsibility will be delegated to agencies involved in food quality control in conjuntion with giving them the power to take action when set standards are violated.

(4) Food quality control legislation will be revised as well as ministerial acts which should be adapted to fit changing circumstances.

(5) Food quality standards will be maintained by educating people on the meaning of standards and procedures to follow regarding chemical additives

and harmful substances. This will be achieved by public relations activities through the media.

(iii) control of use of toxic substances for industrial purposes will be strengthened.

(1) the report formal for factories will be standardized to protect the security and health of workers. These includes:

- air standards in industry and mining.

- Standards formulated in relation to levels of toxic smoke and dust present in the atmosphere and the levels of toxic substances in discharged water.

- Machine quality standards.

- Worker health standards stipulating acceptable levels of toxic substances in the body, including criteria by which to assess sickness conditions and the outlining of the minimum requirements for sanitary services to workers in factories or mining operations.

(2) Industrial estate zones will be clearly identified to effectively control factory operations and reduce environmental disturbances.

(3) Studies of toxicology technology will be supported at higher education and post-graduate levels for government officials involved in the toxicology control program, including :

- At the government level, officials who are responsible for protecting the workers' health preventing environmental deterioration.

- At the owners' and administrative level or at related positions, those who are responsible for the workers' and social welfare.

- Workers concerned with the technology of self-protections from toxicological hazards.

(4) Procedures will be followed to examine and revise the laws, to formulate standards and measures to protect the environment, and to prevent health hazards regarding toxicity. Amendments will be made and provisions added to fit the circumstances.

(5) Medical facilities will be established for the specific purpose of treating toxicity victims for chemically induces allergic diseases, hypersensitivity and other toxicity-related illnesses.

(6) the agencies responsible for control of industries and for protection of workers will be supported by:

- Increasing their staffs.

- Upgrading the employee educational level.

- Introducing more accurate and efficient measuring equipment for testing the safety of working conditions.

(7) Measures will be taken to promote coordination between the Ministry of Industry, Ministry of Public Health, Ministry of Interior, Bangkok Metropolitan Administration, Ministry of Agriculture and Cooperatives, the National Environment Board, and other concerned agencies to help carry out these policies.

(iv) Effect of Radioactivity

(1) Surveys will be made to determine the concentration of radioactive substances in the air and water resources which may introduce radiation into the environment.

(2) The effects of radiation surrounding radioactive usage areas such as hospitals and factories will be studies.

(3) Radiation levels in the bodies of those working with radioactive materials will be regularly checked and recorded.

(3) Major Monitoring Programs on Environmental Quality in Thailand

a) Detail of each monitoring program in the field of water, air noise and toxic substances are shown in Table ๔(3)-๑ ,-๒

b) Number of staff involved, methods of analysis, technical level of staff engaged are shown in table ๔(3)-๓ ,-๔ ,-๕

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Table 2(3)-1-1 Chao Praya River Water Quality Monitoring Program: 1986

Station	No. of Station	1985			1986									Parameter	No. of Parameter
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
1. Lower Chao Praya Station No. 1-5 kilometer 2-58 high tide and low tide	5	←	→		←	→			←	→			←	DO,BOD,COD,Coliform, pH Conductivity, total-P, NO_3^-, Cl^- kjeldahl-N, NH_3-N, Alkalinity phenol, Heavy Metal (Hg)	14
	5		←	→					←	→				Pesticide (Org.-Cl), CN^-,Cd, Ni, Zn,Cu,Cr.Pb,Mn, SS	10
2. Lower Chao Praya Station No.6-10 kilometer 82-4-142.6 Low Tide	5	←	→		←	→			←	→			←	DO,BOD,COD, Coliform, NO_3 Total-P,Cl^-, Kjeldahl NH_3-N, Alkalinity, phenol, HM(Hg) Conductivity, pH	13
	5	←	→						←	→				Pesticide (Org-Cl),CN^-, Cd, Ni,Zn,Cu,Cr,Pb,Mn, SS.	10
3. Higher Chao Praya Station No.11-17 kilometer 160-333			←	→					←	→				DO,BOD,COD, Coliform,Total-P NO_3^-, Cl^-, kjeldahl-N,NH_3-N, Alkalinity, phenol, HM (Hg), Detergent (MBAS), pesticides (Org-Cl),CN, Cd, Ni,Zn,Cu,Cr,Pb,Mn, SS, Conductivity, pH	25
4. Canal area surwaytion which linking the river and water quality at above of canal					←	→		←	→		←	→		DO, BOD, SS, pH	4

Table 2(3)-1-1 (continue) Chao Praya River Water Quality Monitoring Program : 1987

Station	No. of Station	1986			1987									Parameter	No. of Parameter
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
1. Lower Chao Praya Station No. 1-5	5		⟷			⟷			⟷			⟷		pH, Conductivity, A/W temperature Alkalinity, Cl^-, Coliform, Fecal Bacteria, DO, BOD, COD TKN, NH_3, NO_3, TOC Total-P, Salinity, Hg, phenol	18
High tide and low tide	5													Heavy Metal, Pesticide (Org-Cl) CN^-, SS	4
2. Lower Chao Praya Station No. 6-10	5		⟷			⟷			⟷			⟷		pH, Conductivity, A/W temperature Alkalinity, Cl^-, Coliform, Fecal Bacteria, DO, BOD, COD TKN, NH_3, NO_3, TOC Total-P, Salinity, Hg, Phenol	18
	5		⟷						⟷					Heavy Metal, Pesticide (Org-Cl) CN^-, SS	4
3. Higher Chao Praya Station No.11-17	7		⟷						⟷					pH, Conductivity, A/W temperature Alkalinity, Cl^-, Coliform, Fecal Bacteria, DO, BOD, COD, TKN, NH_3, NO_3, TOC Total-P, Salinity, Heavy metal Pesticide, CN^-, Phenol, SS	18
4. Canal area surwaytion and water quality mornitoring	9		⟷						⟷					DO, SS, BOD, pH, Heavy Metal (Cd, Zn, Pb, NP, Hg)	5

Table 2(3)-1-1 (cont.) Chao praya River Water Quality Monitoring Program: 1988

Station	No. of Station	1987 OCT	NOV	DEC	1988 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Parameter	No. of Parameter
1. Lower Chao Praya	5		←	→		←	→		←	→		←	→	pH, Conductivity, A/W Temperature alkalinity, Cl^-, Coliform Fecal Bateria, DO, BOD, COD, TKN NH_3, NO_3, TOC, Total-P, Salinity, Hg, Phenol	18
High tide and low tide	5		←	→		←	→		←	→		←	→	Heavy Metal, Pesticide (Org-Cl) CN^-, SS	4
2. Lower Chao Praya Station No.6-10	5		←	→		←	→		←	→		←	→	pH, Conductivity, A/W temperature alkalinity, Cl, Coliform Fecal Bacteria, DO, BOD, COD, TKN, NH_3, NO_3, TOC, Total-P Salinity, Hg, phenol	18
	5		←	→		←	→		←	→		←	→	Heavy Metal, Pesticid (Org-Cl) CN^-, SS	4
3. Higher Chao Praya Station No.11-17	7		←	→					←	→				pH, Conductivity, A/W temperature alkalinity, Cl^-, Coliform, Fecal Bacteria, DO, BOD, COD, TKN, NH_3, NO_3, TOC, Total-P Salinity, Heavy Metal, Pesticide, CN^-, Phenol, SS	21
4. Canal area surwaytion and water quality mornitoring	9		←	→					←	→				DO, SS, BOD, pH Heavy Metal (Cd, Zn, Pb, NP, Hg)	

Table 2(3)-1-2 Ta-Chin river Water Quality Monitoring Program : 1986

Station	No. of Station	1985 Oct	1985 Nov	1985 Dec	1986 Jan	1986 Feb	1986 Mar	1986 Apr	1986 May	1986 Jun	1986 Jul	1986 Aug	1986 Sep	Parameter	No. of Parameter
1. Ta-Chin River (Tc) Station : Tc 1 - 9 (High tide and Low tide) Tc 10 - 21)	30		→		→		→		→		→		→	Temperature pH, Salinity , Conductivity, BOD, COD , DO, Alkalinity, Cl^-	9
2. Ta-Chin River (Tc) Station : Tc 1,3,5, 9,11,14,17, 19,21	10		→				→				→			Total-P,Total- -N,Org-N;NO-N_3 NO_2-N, Phenols Cyanide, Pes- -ticides	5

2(3)-1-2 (continue)

Table Thachin River Water Quality Monitoring Program : 1987

Station	No. of Station	1986 Oct	1986 Nov	1986 Dec	1987 Jan	1987 Feb	1987 Mar	1987 Apr	1987 May	1987 Jun	1987 Jul	1987 Aug	1987 Sep	Parameter	No. of Parameter
1. Thachin River (TC)															
Station: TCL 0-9 (Low tide)	32		⟷		⟷		⟷		⟷		⟷		⟷	Temp.,pH,Salinity, Conductivity,alka-linity,Cl,BOD,COD, DO,Hardness,Colif-	
TK 1 = Klong Mahachai TK 2 = Klong Oamyai TK 3 = Klong Sentprato TK 4 = Klong Jadibucha TK 5 = Klong Bangpla TK 6 = Klong Prayabunlur	18		⟷				⟷				⟷			orm,TS,SS	13
2. Thachin River (TC) Station : TC 11 (N)	1		⟷		⟷		⟷		⟷		⟷		⟷	Temp.,pH,Salinity, BOD,DO,Coliform, Conductivity	7
3. Thachin River (TC)			⟷				⟷				⟷			N-group,(NH_3-N,NO_3-N,	
Station : TC 0,1,3,5,9,11, 13,14,17,19,20	11													NO_2-N,Org-N),Total-P, cn,Phenol,Pesticide,	6
TK1-TK6 (2)	12		⟷				⟷				⟷			Heavy Metal(Cu,Hg,Zn, Mn,As)	
4. Thachin River (TC)			⟷				⟷				⟷			Pesticide,Heavy Metal	
Station : TK1-TK6 (2)	12													(Cu,Hg,Zn,Mn,As)	2

Table 2(3)-1-2 (cont.) Ta-Chin River Water Quality Monitoring program: : 1988

Station	No. of Station	1987 Oct	Nov	Dec	1988 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Parameters	No. of Parameters
1. Ta Chin River (Ta-R) Station :Ta RH 1-4 (high tide) Ta RL 1-4 (low tide) TaR 5-9	13		←	→			←	→			←	→		Temp ,pH Salinity,Conducti- -vity,Alkalinity, BOD, DO, COD, Hardness, Coliform Fecal Bacteria SS	12
2. Ta Chin River (Ta R) Station: Ta R 1,5,7,9	4		←	→							←	→		N-group (NH_4,NO_2, NO_3, Org. -N) , total - P,Pesticide Heavy Metal	4

2(3)-1-3
Table Mae Klong River Water Quality Monitoring Program : 1986

Station	No. of Station	1985			1986									Parameter	No of Parameter
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
1. Lower Mae Klong (MK) Station : MK 1-7 (km 1-45)	7	←	—	—	—	—	—	—	—	—	—	—	→	PH, DO, BOD, COD, Salinity, Temp, Coliform, SS, TS	9
	7			↔			↔				↔			N-group (NO_3-N, NO_2-N, NH_3-N) Total-P, CN, Phenol, Heavy Metal (Cd, Cr, Cu, Pb, Zn, Hg)	5
2. Higher Mae Klong (MK) Stations : MK 8-12 (km 60-140)	5	←	—	—	—	—	—	—	—	—	—	—	→	pH, DO, BOD, COD, 5%Conductivity, SS, TS, Coliform	9
	5			↔			↔				↔			N-group(NO_3-N, NO_2-N, NH_3-N) Total-P, CN, Phenol, Heavy Metal(Cd, Cr, Cu, Pb, Zn, Hg)	5

ค(3)-1-3 (continue)

Table Mae Klong River Water Quality Monitoring Program : 1987

Station	No. of Station	1986			1987									Parameter	No. of Parameter
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
1. Mae Klong River (MK) Station : MK 1-12 (High tide and Low tide)	19		←		←		←		←		←		→	Temperature,Salinity, pH,Conductivity,alkalinity,Cl,Hardness,DO,BOD, COD,Coliform,TS,SS	13
2. Mae Klong River (MK) Station : MK 1-14 (Low tide)	14				←				←					Temperature,pH,Salinity, Conductivity,BOD,COD,DO, Coliform,TS,SS,Total-P, Total-N,Pesticide	13
3. Mae Klong River (MK) Station : MK 2,5,7,9,10, 11,12	9		←				←				←			Temperature,pH,Salinity, Conductivity,DO,BOD,TS, SS,Benthos Plankton	10
4. Mae Klong River (MK) Station : 1,3,4,5,7,8, 9,10,12 (Low tide)	9		←				←				←			Total-P,Total-N,Phenol, CN,Heavy Metal,Pesticide	6

Table Mae Klong River Water Quality Monitoring Program : 1988
2(3)-1-3 (cont.)

Station	No. of Station	1987			1988									Parameter	No. of Parameter
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
1. Mae Klong River (MK) -High tide station : 1-5 -Low tide station : 1-5 -MK 6,7,8,9,10	15		←		→		←		→		←		→	Temp.,pH,Salinity, Conductivity,DO, BOD,COD,Coliform, Faecal Coliform, SS	10
2. Mae Klong River (MK) Station : 1,3,5,6,7,8,10	7		←		→		←		→		←		→	NH_3-N,Pesticide, Heavy Metal(Hg,Pb, Cu,Cd,Cr,Zn)	3

Table 2(3)-1-4 Bangpakong River Water Quality Monitoring Program : 1986

Station	No of Station	1985			1986									Parameter	No. of Parameter
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
1. Monitoring of Water Quality - Bangpakong River (BPL 1-16) - Praginburi River (BPP 1-4) - Nakornnayuk River (BPN 1-4)	24		←			←			←			←		Temperature, pH,DO Conductivity, Salinity BOD, COD, NO_3-N, NH_3-N Total-P, Fecal Coliform Heavy Metal, Pesticide	8
2. Analysis of Water Quality, the canal with linking Bangpakong River - Bangpai Kl. - Bangtanped Kl. - Jukcherbon Kl. - Jukcherlang Kl. - Sadoa Kl. - Suanyai Kl. - Bangkew Kl. - Bangkla Kl. - Banmoo Kl.	9		←			←			←			←		BOD COD NO_3-N	3

Table 2(3)-1-4 (continue) Bangpakong River Water Quality Monitoring Program : 1987

Station	No of Station	1986			1987									Parameter	No. of Parameter
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
1. Monitoring of Water Quality - Bangpakong River (BPL 1-16) - Praginburi River (BPP 1-4) - Nakornnayuk River (BPN 1-4)	24		←			←			←			←		Temperature, pH,DO Conductivity, Salinity BOD, COD, NO_3-N, NH_3-N Total-P, Fecal Coliform Heavy Metal, Pesticide	8
2. Analysis of Water Quality, the canal with linking Bangpakong River - Bangpai Kl. - Bangtanped Kl. - Jukcherbon Kl. - Jukcherlang Kl. - Sadoa Kl. - Suanyai Kl. - Bangkew Kl. - Bangkla Kl. - Banmoo Kl.	9		←			←			←			←		BOD COD NO_3-N	3

Table 2(3)-1-4 (cont.) Bangpakong River Water Quality Monitoring Program : 1988

Station	No. of station	1987		1988										Parameter	No.of Parameter
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
1. Monitoring of Water Quality - Bangpakong River (BPL 1-16) - Praginburi River (BPP 1-4) - Nakornnayuk River (BPN 1-4)	24		←	→		←	→		←	→		←	→	Temperature, pH,DO Conductivity, Salinity BOD, COD,NO_3-N, NH_3-N Total-P,Fecal Coliform Heavy Metal, Pesticide	8
2. Analysis of Water Quality, the canal with linking Bangpakong River - Bangpai Kl. - Bangtonped Kl. - Jukcherbon Kl. - Jukcherlang Kl. - Sadoa Kl. - Suanyai Kl. - Bangkew Kl. - Bangkla Kl. - Bangmoo Kl.	9		←	→		←	→		←	→		←	→	BOD COD NO_3-N	3

Air

Table Monitoring Program of Pollution in Thailand (1986)

Station	1985			1986									Pollutants Monitored
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Office of the Nat--ional Environment Board	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb CO
Chankasem Teachers,, college	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
		✓	✓				✓	✓	✓	✓	✓	✓	CO
Ban Somdet Teachers college	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓										✓	CO
Rat burana Post Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CO
Queen Saovabha Memorial Institute	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓				✓	✓	✓			CO
The Metiorology Department Su--kumvit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓		✓	✓			✓	✓	✓	CO

Table 2(3)-2-1 (continue)

Station	1985			1986									Pollutants
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Bangna Meteorological Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CO

Table ๒๔๖-๒-๒ Monitoring Program of Air Pollution in Thailand (1987)

Station	1986			1987									Pollutants Monitored
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Office of the National Environment Board	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM CO Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NO_2 O_3
Chankasem Teachers' college	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CO
Ban Somdet Teachers' college	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CO
Rat Burana Post Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CO
Queen Saovabha Memo--rial Institute	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
The Meteorological Department Sukumvit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CO

Table 2(3)-2-2 (continue)

Station	1986			1987									Pollutants Monitored
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Bangna Meteorological Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CO

10.

2(3)-2-3

Table Monitoring Program of Air Pollution in Thailand (1988)

Station	1987			1988									Pollutants Monitored
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Office of the National Environment Board	✓	✓	✓	✓	✓	✓	✓	✓	✓				SPM CO Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓				NO_2 O_3
Chankasem Teachers' college	✓	✓	✓	✓	✓	✓	✓	✓	✓				SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓				CO
Ban Somdet Teachers' college	✓	✓	✓	✓	✓	✓	✓	✓	✓				SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓				CO
Rat Burana Post Off--ice	✓	✓	✓	✓	✓	✓	✓	✓	✓				SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓				CO
Queen Saovabha Memorial Institute	✓	✓	✓	✓	✓	✓	✓	✓	✓				SPM Pb
The meteorological Dep--artment Sukumvit	✓	✓	✓	✓	✓	✓	✓	✓	✓				SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓				CO

Table 2(3)-2-3 (continue)

Station	1987			1988									Pollutants Monitored
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Bangna Meteorological office	✓	✓	✓	✓	✓	✓	✓	✓	✓				SPM Pb
	✓	✓	✓	✓	✓	✓	✓	✓	✓				CO

2(3)-2-4

Table Monitoring Program of Air Pollution in Samut-Prakarn Province (1988)

Location	1988	Monitoring Parameters
1. Bangna Meteorological Office	1 Jan - 31 Dec	SO_X , NO_X , Total dust Dust < 10 um , Dust > 10 um , Meteorological data
2. Mettaleurgy Div. ,Depart--ment of Mineral Resources , Prapadaeng	Same	Same
3. National Housing Authority , Bang-Plee	Same	Same
4. Samut-Prakarn City Hall	Same	Same
5. EGAT , Prapadaeng	Same	Same

10.1

2(3)-3

Table Pollutants, methods of measurement and instrument used by ONEB

Pollutants	Methods of measurement	Instruments used by ONEB
Carbon monoxide (CO)	Non-dispersive Infrared detection	Beckman Co Analyzer Model 866
Nitrogen dioxide (NO_2)	Chemiluminescence	Beckman NO_x Analyzer Model 952 A
Sulfur dioxide (SO_2)	Pararosaniline/Fluorescence	Beckman Fluorescent SO_2 Analyzer Model 953 and Horiba AP-300
Suspended Particulate Matter (SPM)	Gravimetric-High Volume	GMW High Volume Air Sampler Model GMWL-2000 H
Ozone (O_3)	Chemiluminescence	Ozone Analyzer Beckman Model 950 A / Monitor Labs
Lead (Pb)	Wet Ashing-Atomic Absorption	Perkins-Elmer Atomic Absorption
Hydrocarbon (HC)	Flame Ionization	Beckman HC Analyzer Shimadzu Gas Chromatograph

19.

Table 2(3)-4

Number and Level of ONEB Staffs in Monitoring Programs

Project Name	No. of Staffs	Level	Education Background
1. Water quality development for Chao Phraya River	12	C 6 - 1	M.Sc
		C 3 - 6	B.Sc
		C 2 - 4	Dip. (Survey)
2. Water quality development for Bang Pakong River	4	C 4 - 1	M.Sc
		C 3 -3	B.Sc
3. Water quality development for Mae Klong River	3	C 4 - 1	B.Sc
		C 3 - 2	B.Sc
4. Water quality development for Tha Chin River	7	C 5 - 1	M.Sc
		C 4 - 1	B.Sc
		C 3 - 5	B.Sc
5. Songkhla Lake	3	C 5 - 1	Ph.D (Engr)
		C 3 - 2	B.Sc
6. Environmental quality develop-ment in Regional City	3	C 5 - 1	M.S (Engr)
		C 4 - 1	M.Sc
		C 3 - 1	B.Sc
7. Eastern Seaboard regional envi-ronmental management planning	2	C 6 - 1	Ph.D
		C 3 - 1	B.Sc
8. Water quality monitoring of coastal area along Phuket Island	1	C 4 - 1	M.Sc
9. Air pollution monitoring program in Bangkok area	8	C 4 - 2	M.Sc
		C 3 - 6	B.Sc

Table 4(3)-5 Method of Water Analysis

No	Parameter	Method
1.	Conductance , Specific	Electical Conductivity Method
2.	Residue , Non-Filterable	Gravimetric Method , Dried at 103-105°C
3.	Residue , Total	Gravimetric Method ,Dried at 103-105°C
4.	Turbidity	Nephelometric Method
5.	Acidity	Titrimetric Method
6.	Alkalinity	Titrimetric Method
7.	Arsinic	AAS Method
8.	Cadmium	AAS Method
9.	Chloride	Titrimetric ,Mercuric Nitrate Method
10.	Chromium	AAS Method
11.	Copper	AAS Method
12.	Cyanide	Colorimetric,Pyridine-Pyrazolone or 4-Pyridine Carboxylic Acid-Pyrazolone Method
13.	Fluoride, Total	Colorimetric, SPADNS with Distillation Method
14.	Hardness , Total	Titrimetric, EDTA Method
15.	Iron	AAS Method
16.	Lead	AAS Method
17.	Manganese	AAS Method
18.	Mercury	Cold Vapor Technique
19.	Nitrogen, Ammonia	Colorimetric, Nesslerization Method
20.	NItrogen, Nitrate-Nitrite	Colorimetric, Cadmuim Reduction Method
21.	Nitrogen, Nitrite	Colorimetric Method
22.	pH	Electrometric Method
23.	Oxygen, Dissolved	Azide Modification Method
24.	Phosphorus, Total	Colorimetric, Ascorbic Acid Single Reagent Method
25.	Selenium	AAS Method
26.	Silver	AAS Method
27.	Sulfate	Turbidimetric Method
28.	Sulfide	Colorimetric, Methylene Blue Method
29.	Zinc	AAS Method
30.	Anionic Surfactant	Methylene Blue Method

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Table 2(3)-5 (continue)

No	Parameter	Method
31.	Carbon, Organic, Total (TOC)	Combustion-Infrared Method
32.	Formaldehyde	Corimetric, Acetylacetone Method
33	Nitrogen, Total Kjeldahl	Kjeldahl Method
34.	Oxygen Consumed	Permanganate Method
35.	Oxygen Demand, Biochemical(BOD)	Five-Days BOD Method
36.	Oxygen Demand, Chemical(COD)	Dichromate Reflux Method
37.	Oil and Grease	Fluorescence Spectrophotometric Method
38.	Organochlorinated Pesticides	Gas Chromatographic Method
39.	Organophosphorus Pesticides	Gas Chromatographic Method
40.	Phenols	Colorimetric, 4-Aminoantipyrine Method
41.	Polychlorinated Biphenyls(PCB's)	Gas Chromatographic Method
42.	Trihalomethanes	Head Space Method
43.	Tannin and Lignin	Colorimetric Method
44.	Microbiological Examination in Water	Multiple Tube (MPN) Tests for Standard Total Coliform and Faecal Coliform

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(4) Environmental Impact Assessment ; problems and procedures

It is agreeable that economic development has led to a great improvement on the nation's economic stability and people's well being. However, development activities, to a certain extent, also created some adverse effects on natural environment. Thailand has embarked on the economic development in the past three decades which the project are normally reviewed in terms of economic and technical integrity while environmental consideration are generally ignored. Not until year 1970 that the recognition of environmental problems have become widespread, due to the public concerns on the rapid deterioration of natural resources. Eventually, official recognition to the need for inclusion of environmental planning into the development planning resulted in the establishment of a national environmental committee in 1971; the Technological and Environmental Planning Division within the National Economic and Social Development Board (NESDB) in 1974; and promulgation of the National Environmental Quality Act (NEQA) in 1975. The NEQA established the National Environment Board (NEB) and Office of the National Environment Board (ONEB), an executive secretariat and operation arm of ONEB.

(i) EIA System in Thailand

Legal Requirement

The National Environmental Quality Act of 1975 required that NEB perform several functions including advisory, policy-making and coordination of all environmental activities in the country. However, this Act did not grant NEB the authority necessary to require project proponents to prepare environmental impact assessments. To remedy this legal obstacle the Act was amended in 1978, so that NEB now has this authority. According to Section 17, paragraph (1) of the National Environmental Quality Act of 1978 "The Prime Minister shall, with the advice of the National Environment Board, have the power to issue notification of categories and magnitude of project or activities of Government agencies, state enterprises or private organizations, which are required to submit a report concerning the study and measures for the prevention of and remedy for the adverse effect on environmental quality during the preparation stage of such applicant to the Office of the National Environment Board for consideration and approval

before further proceedings." Under this revised Act, ONEB has authority and responsibility to review environmental impact assessment reports, which have to submitted to ONEB for approval before development projects can be implemented.

Ministerial Notification

The first notification of categories and magnitude of projects or activities in both public and private sectors which will require EIA was made by the Minister of Science, Technology and Energy in July 14, 1981. The notification was officially effective after its publishment in the Government Gazette in September 27, 1981. Development projects included in the Notification are : dams, irrigation, airports, hotel and resort facilities, mining, ports and harbors, thermal power plants, industrial estates and specific industrial projects. (see Annex I) .

Ministerial Decree

At the initial stage of the EIA system, registration of EIA experts or consultants was not required. Thus, EIA could be performed by any party, either it is a consulting firm or a free-lanch party hired by project proponents: Being aware that the effectiveness of EIA system depends mainly on the identification and assessment of the impacts, as well as the proper measures to cope with significant negative effects. In order to come up with substantial information and effective measures in the EIA, qualified experts or consultants are needed. Therefore, the Minister of Science, Technology and Energy has issued Ministerial Decree No 2 (B.E. 2527) in November 2, 1984 designating persons or parties eligible for applying for a license to prepare on EIA report (see Annex II). The Decree was officially effective after its publishment in the Government Gazette in December 12, 1984. To comply with the Decree, EIA report submitted to ONEB for consideration and approval has to be prepared only by party registered with NEB. Up to now 27 parties have been registered as qualified to conduct EIA report. They are educational institutions and private consulting firms.

(ii) Institutional mechanism on EIA implementation

Legal procedure and Institutional Involvement

Section 18 of the National Environmental Quality Act of 1978 states that in the case where there is a Notification regarding types of projects required EIA, the official invested by low with the power and duty to consider and grant a permit or renewal of a permit to any person in order to enable him to carry out any project or activity shall submit a report concerning the study and measures for the prevention of and remedy for the adverse effect on the environmental quality during the preparation stage of such applicant to the Office of the National Environment Board for consideration and approval before futher proceedings. Therefore, the parties involved in the EIA implementation can be categorize as :

- the permitting agency, who has to submit on EIA report, for the project which listed in the Notification, to ONEB for consideration and approval before a permit can be granted. Normally the report is provided by the project proponent. In the case of public project, the EIA report is directly submitted by the government agency on state enterprise concerned to ONEB because the final decision of such project will be made by the cabinet. The recommendations of the project will be submitted to the cabinet through the National Economic and Social Development Board.

- the project proponent, who may be a government agency state enterprise or private sector whose project or activity has to comply with the Notification. The project proponent is responsible for the EIA report preparation.

- the consultant who required by law to be registered with NEB as a qualified party to performed EIA.

- the reviewing agency, the Division of Environmental Impact Evaluation (DEIE) of ONEB is responsible for the reviewing process. A reviewing team, consists of DEIE staffs or official from other division of ONEB will be formed. And if it is necessary, outside-experts may also be invited to review specific topics. Numbers and qualification of reviewers for each project will depend upon it type, size and other characteristics as well.

10.,

Time for reviewing

In addition to the institutions involved in the EIA implementation, it is also required by law that the reviewing process has to be completed within a certain period of time. ONEB has to consider the EIA report within 90 days from the data of receiving such report, for the first review. If ONEB does not finish its consideration within the said period, it is deemed that ONEB has grants its approval.

In the case that, ONEB does not give its approval in the first review and requests for more detail information/data/preventive or mitigative measures, the permitting agency shall delay the grant of permit or renewal of permit to the applicant. For the second review, ONEB has to consider the requested document within 30 days from, the date of receiving such submission. The EIA approval process for both public and private project are shown in Annex III and Annex IV.

However, it should be noted that ONEB's enforcement powers indirectly control the proposed project by restriction of the permit granting authority of the agencies concerned. The EIA report, if is rejected by ONEB, the permitting authorities will also refuse to grant its permission for application of such project and vice versa. In the case that the EIA report is approved with conditions.

The conditions will simultaneously be included into the permitting licenses :

Manpower Strengthening

The manpower allocated for the EIA work is an important factor to determine the success of the system. ONEB included a Division of Environmental Impact Evaluation to be responsible for the administration of the EIA process in the country. Around forty, out of two-hundred of NEB's technical staffs is allocated to DEIE for managing EIA work. The main responsibilities of DEIE included reviewing EIA report, provision of EIA preparation guidelines, reviewing/preparing terms of reference for some specific project as requested as well as developing new techniques and methodologies for EIA.

The improvement of the EIA system and efficiency at the project and policy levels will not be accomplished without the co-operation of the agencies involved. Allocation and strengthening of the manpower to cope with environmental issues, in agencies concerned is necessary, especially, those concerned with planning and of natural resources management and pollution control. Although there is a number of existing or planned environmental units in government or state agencies, there still remain several agencies that have not established such units. Some units have been initiated, but have encountered budget and manpower shortage problems. Hence, the NEB found it desirable to specify policies for the establishment or strengthening of environmental units by considering the agencies that should have or promote environment units. The principle was approved by the cabinet in July 9, 1984. There are 6 agencies with high priority for the establishment of environmental units namely Royal Irrigation Department, Highways Department, National Energy Office, Harbor Department ,Mineral Resource Department and Thailand Industrial Estate. And there are 17 additional agencies with lower priority such as Fisheries Department, petroleum Authority of Thailand, Tourism Authority of Thailand, Social Welfare Department, National Housing Authority and so on (see Annex V).

(iii) EIA Guidelines

At the initial state of formal EIA implementation, most of the government and private project proponent are unfamiliar and uncertain as how to comply with the EIA requirements. The NEB, therefore, has to provide advice and assistance to the project proponent in the preparation of their EIA report. In addition, the ONEB has published and distributed the Manual of NEB Guidelines for preparation of Environmental Impact Evaluation. The manual is a series of guidelines, each dealing with a particular aspect of the subject of environmental analysis. These guidelines are as follows :

1) general Guidelines for Preparation of Environmental Impact Assessment Report, which are applicable to all EIA reports to be prepared for review by ONEB

2) Supplemental Guidelines for Specific Project Categories, which supplement the General Guidelines by furnishing additional information applicable to the particular type of project of concern.

3) Guidelines for Preparation of Initial Environmental Examination. These are applicable to all proposed projects. The objective of the IEE is to determine whether a full-scale EIA will be needed.

4) Guidelines for Preparation of Terms of Reference for preparation of EIA report.

All of the guidelines issued by ONEB are tentative and will be revised as needed when experience is gained in Thailand in the practice of environmental impact assessment. The objective of ONEB in developing these guidelines is that they will suit the current condition of development in the country and that they can be implemented by project proponent within budget and times limitations. It is believed that the EIA reports to be prepared accordance with this guidelines will serve to minimum essential environmental protection needs in Thailand.

Revising of EIA procedures and guidelines are under the consideration of ONEB after a few year experiences from implementation of the process. But, currently, due to staff limitation and workload, manpower can not be fully allocated for the overall revising tasks. So far, only specific guidelines is adapted on the case by case basis to meet the urgent needed such as guidelines for preparation of EIA report of hotel or resort facilities in Pattaya area. However, technical assistance has been request from Asian Development Bank and other developed countries which have EIA experiences. Since one mean of achieving appropriate techniques and methodologies, effective procedures ,and capable expertise is through technology transfer.

Suggested format of EIA report

The major contents of the EIA report can be outlined as follow :

1. Introduction : presentation of purpose of the report, extent of the EIA study, special techniques and methods used.

2. Description of project : included

- type of project

- need for project

- location (maps showing general location, specific location, project site layout)

- Size or magnitude of operation

3. Description of Environment : Sufficient information is needed to give a brief but clear picture of the existing resources namely

- Physical resources : Water/Air/Land

- Ecological resources : Aquatic/Terrestrial

- Human use value : Land use/Infrastructure etc.

- Quality of life values : Socio-economic/Recreation etc.

4. Anticipated Environmental Impacts and Plans for Protection : included

- expected impacts of the project and each resources should be evaluated on item by item basis.

- mitigation and offsetting measures should be proposed where there has been any significant adverse effects from the project.

- identification of the extent to which the proposed project would irreversible curtail the potential uses of the environment.

- temporary effects during project construction should also be discussed including proposed remedial measures.

5. Consideration of Alternatives : In the event that the proposed project will result serious loss of environmental resources. The report should include consideration of alternative projects or approaches which could achieve the same or equivalent results.

6. Monitoring : The report should describe the monitoring program to be established and continued by project proposal following granting of approval for the project to proceed.

7. Summary and Conclusions :

(iv) Experiences on EIA Implementation

The ONEB has received cooperation from government organizations and state and private enterprises in preparation of EIA reports for consideration and approval before project implementation. Since the legal procedure in September 27, 1981 up to December 30, 1987, a total of 1,628 projects were reviewed by the ONEB. Mining projects account for about 77.52 percent of the total projects. Most of there are small-scale project. Detail shown in the table below :

Table(4)-1 EIA Reports received by the ONEB, classified by project type and status of report review (September 27, 1981; December 30, 1987)

Project type	Number of review	Approved	Not approve	Required to submit more information
Mining	1262	1056	11	195
Industrial	73	60	2	11
Communication	198	188	-	10
Hotel	91	70	-	21
Dams/reservoirs	4	4	-	-
Total	1628	1378	13	237

(v) Manpower training on EIA

The ONEB is the agency directly responsible for the EIA administration. The key to the success of the system not rely on ONEB, but coordination among the agencied concerned. It is essential to produce competent manpower and expertise in all agencies involved. Since EIA system is a new activity most of the government and private sector are unfamiliar with the system, even the ONEB staffs. An in-house workshop on environmental impact evaluation was designed for NEB staff at the initial stage of work. ONEB also launched a five-year project on Enhancing Environmental Impact Assessment Capability Program, which started from 1981-1985. The program was designed to organize training course and workshop twice a year. One was held for participants from government agencies and state enterprises which are the permitting agencies and project proponents. the causes were particularly emphasized on environmental management, concept of EIA , techniques and methodologies, and benefit of EIA for environmental planning. The other was specially organized for the private project owners the legal matter, procedures to comply with EIA requirement, criteria for selection of consultants, benefit of EIA to project implementation were highlighted.

After the enforcement of the Ministerial Decree No 2 (B.E. 2527), which required the consulting firms to be registered with NEB as qualified to conduct EIA report, meetings has been conducted particularly for the registered firms in order to exchange experiences and problems. The ONEB designated that such a meeting should be held at least once a year. In addition, ONEB also jointly organized or participating the international meetings/workshops/seminars on EIA matter. It might say that the ONEB was the only agency in Thailand that had taken efforts to promote and enhance the knowledge of EIA.

(vi) Major constraint and EIA implementation

Even though the Notification of Minister of Science Technology and Energy was issued since 1981, ONEB considers that the preparation of EIA reports is a new activity for Thailand. There is still Limited awareness of environmental impact problems. Implementation of the ministerial Notification has given rise to problems and obstacles which ONEB is aware of and is trying to solve. These problems are as follows :

Legal problems

The National Environmental Quality Act requires the EIA report to be submitted whenever a permit or renewal of a permit is applied. The problems arise from the project, which the renewal period is very frequent, i.e. once every year; or which required approval from more than one agency. To comply with the law, EIA report is submitted very often or submitted from every permitting authority concerned. Attempt to evade compliance with the notification also a problem. For instance, a licensed hotel project with over 80 rooms may operate with 79 rooms in use, in order to evade preparing EIA report.

Procedural problems

Most of the EIA report is undertaken after the selection of project site. So, if the EIA found that the project site was not environmentally sound, the site alternation or the preventive measures would then appear to cause excessive additional expenses.

Technical and personnel problems

The lack of available informal on/data base and appropriate assessment techniques/methodologies is common problem. The report reviewers, the impact assessors are inexperienced in certain subject areas. The submission of the inadequate EIA report will cause project delay because it will normally be returned to the proponent for more information/data.

The ONEB has been making efforts to solve the problems, the working efficiency of its staff, dissemination of information to appropriate organizations in order to promote better understanding and awareness among the proponents, permitting agencies and ONEB. ONEB is also making efforts to amend and revise its working regulations to enhance working efficiency and effectiveness.

Table 2(A)9 Notification on Types and Sizes of Projects or Activities requiring EIA Reports and Measures for the Prevention and Initigation of Adverse Effects on Environmental Quality.

Items	Types of Projects or Activities	Sizes
1.	Dam or Reservoir	storage volume greater than 100,000,000 cubic meters or storage surface area greater than 15 square kilometers.
2.	Irrigation	irrigated area greater than 80,000 rai (12,800 hectares).
3.	Commercial Airport	all sizes.
4.	Hotel or Resort Facilities in environmentally sensitive area i.e. adjacent to river coastal areas, lakes or beaches or in the vicinity of national parks	greater than 80 rooms.
5.	Mass Transit System and Expressway as defined by Announcement of the Revolutionary Party No. 290, 24 November B.E. 2515	all sizes.
6.	Mining as defined by the Mineral Act No. 1 B.E. 2510 No. 2 B.E. 2516 and No. 3 B.E. 2522	all sizes.
7.	Industrial Estate as defined by the Industrial Estate Authority of Thailand Act, B.E. 2522	all sizes.

Table 2(4)-2 (continue)

8.	Commercial Port and Harbor	with capacity of vessels of greater than 500 ton-gross.
9.	Thermal Power Plant	capacity greater than 10 MW.
10.	Industries (1) Petrochemical Industry	greater than 100 tons/day of raw materials required in production processes of oil refinery and/or natural gas separat on.
	(2) Oil Refinery	all sizes.
	(3) Natural Gas Separation of Processing	all sizes.
	(4) Chor-Alkaline Industry requiring NaCl as raw material for production of Na_2CO_3, NaOH, HCl, Cl_2, NaOCl and Bleaching Power	production capacity of each or combined product greater than 100 tons/day.
	(5) Irons and/or Steel Industry	requiring iron ore and/or scrap iron as raw materials for production greater than 100 tons/day or using furnaces with combined capacity greater 5 tons/batch.
	(6) Cement Industry	all sizes
	(7) Smelting Industry other than Iron and Steel	production capacity greater than 50 tons/day.
	(8) Pulp Industry	production capacity greater than 50 tons/day

SESSION 3 : MANAGEMENT SYSTEM OF ERTC

3. Management System of ERTC

(1) Cooperative between ONEB and the Ministry of Science, Technology and Energy

Organization : See Table 3(1)-1
Personnel : See Table 3(1)-2
Budget : See Table 1(3)-2, 1(3)-3, 1(3)-4

(2) Relationship between ONEB and ERTC, referring to the future plan of facilities and equipments of ONEB

The facilities and equipments of the office of NEB in Bangkok will be transferred to ERTC.

(3) Organizational structure of ERTC

a) Chart : See Table 3(3)-1
b) Terms of reference of each Section : See table 3(3)-2
c) Number of staff in each Section : See table 3(3)-2
d) Qualification of each Section : See table 3(3)-2, -3
e) Expected candidates for ERTC staff

The expected candidates will come from the staff of ONEB and transferred staff from other universities and research institutes plus the new qualified staffs.

(4) Incentives for trained staffs.

ERTC will try to provide the good facility for the staff such as the housing, the schooling for their children, the transportation. The ERTC will utilize the new civil service system so that the staffs can utilize their own research papers for their own promotion automatically. It is also expected that the exchange, of researchers between Thailand and Japan can also provide incentives to the researchers.

Table 3(1)-1

Organization of the Ministry of science, Technology and Energy

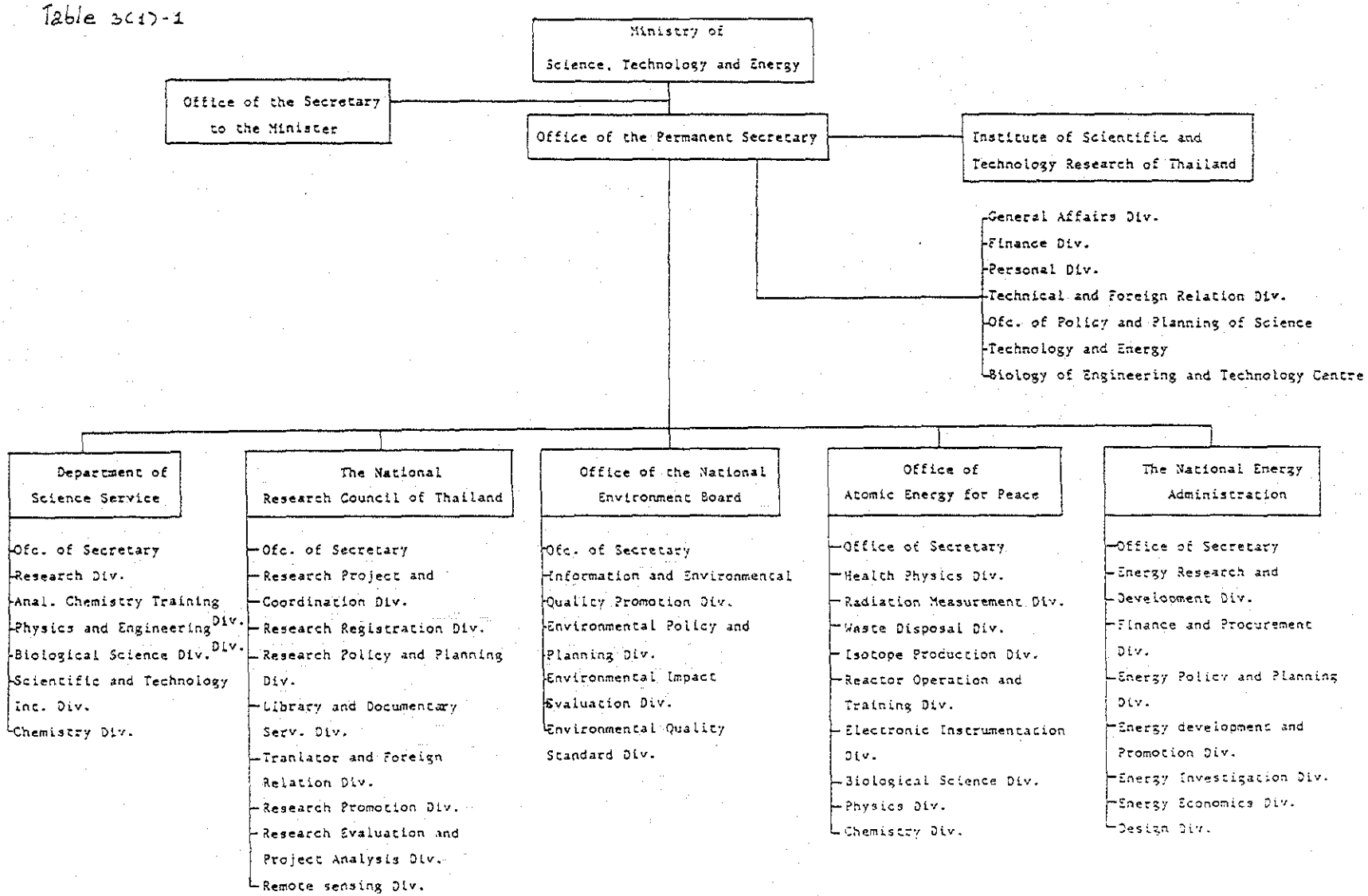

Table 3(1)-2

Manpower of the Ministry of Science,Technology and Energy

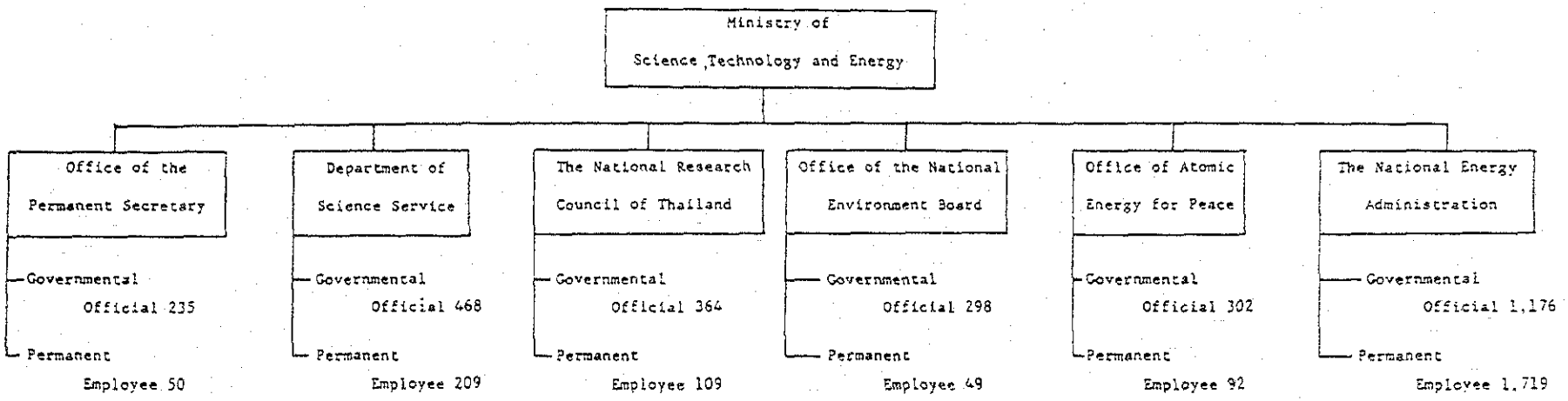

Table 3(3)-1

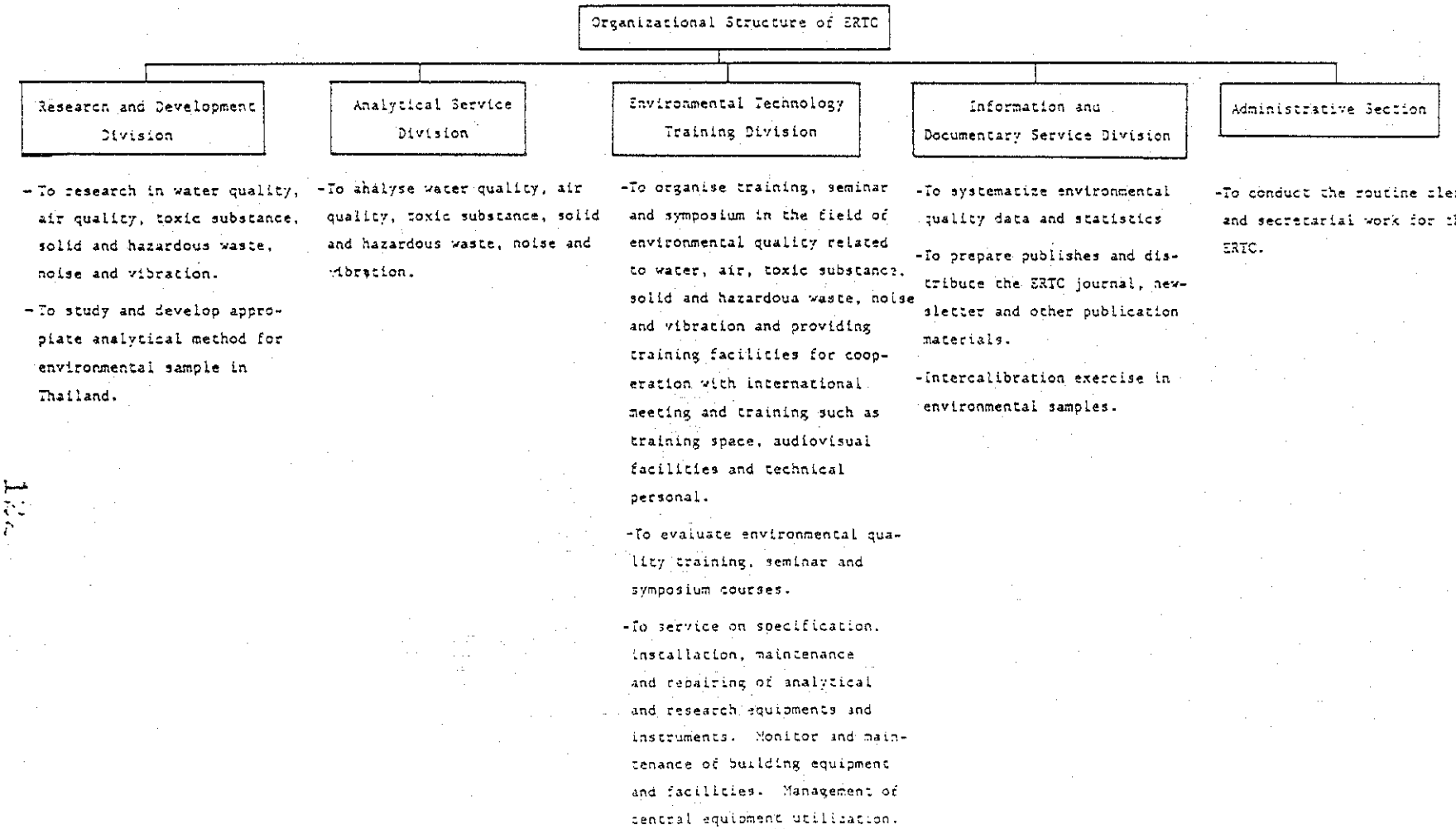
Organizational Structure of ERTC
Research and Development Division
- To research in water quality, air quality, toxic substance, solid and hazardous waste, noise and vibration.
- To study and develop appropiate analytical method for environmental sample in Thailand.
Analytical Service Division
-To analyse water quality, air quality, toxic substance, solid and hazardous waste, noise and vibration.
Environmental Technology Training Division
-To organise training, seminar and symposium in the field of environmental quality related to water, air, toxic substance, solid and hazardoua waste, noise and vibration and providing training facilities for cooperation with international meeting and training such as training space, audiovisual facilities and technical personal.
-To evaluate environmental quality training, seminar and symposium courses.
-To service on specification, installation, maintenance and repairing of analytical and research equipments and instruments. Monitor and maintenance of building equipment and facilities. Management of central equipment utilization.
Information and Documentary Service Division
-To systematize environmental quality data and statistics
-To prepare publishes and distribuce the ERTC journal, newsletter and other publication materials.
-Intercalibration exercise in environmental samples.
Administrative Section
-To conduct the routine clerical and secretarial work for the ERTC.

Table 3(3)-2 Structure of Manpower of environmental Research-Training Center

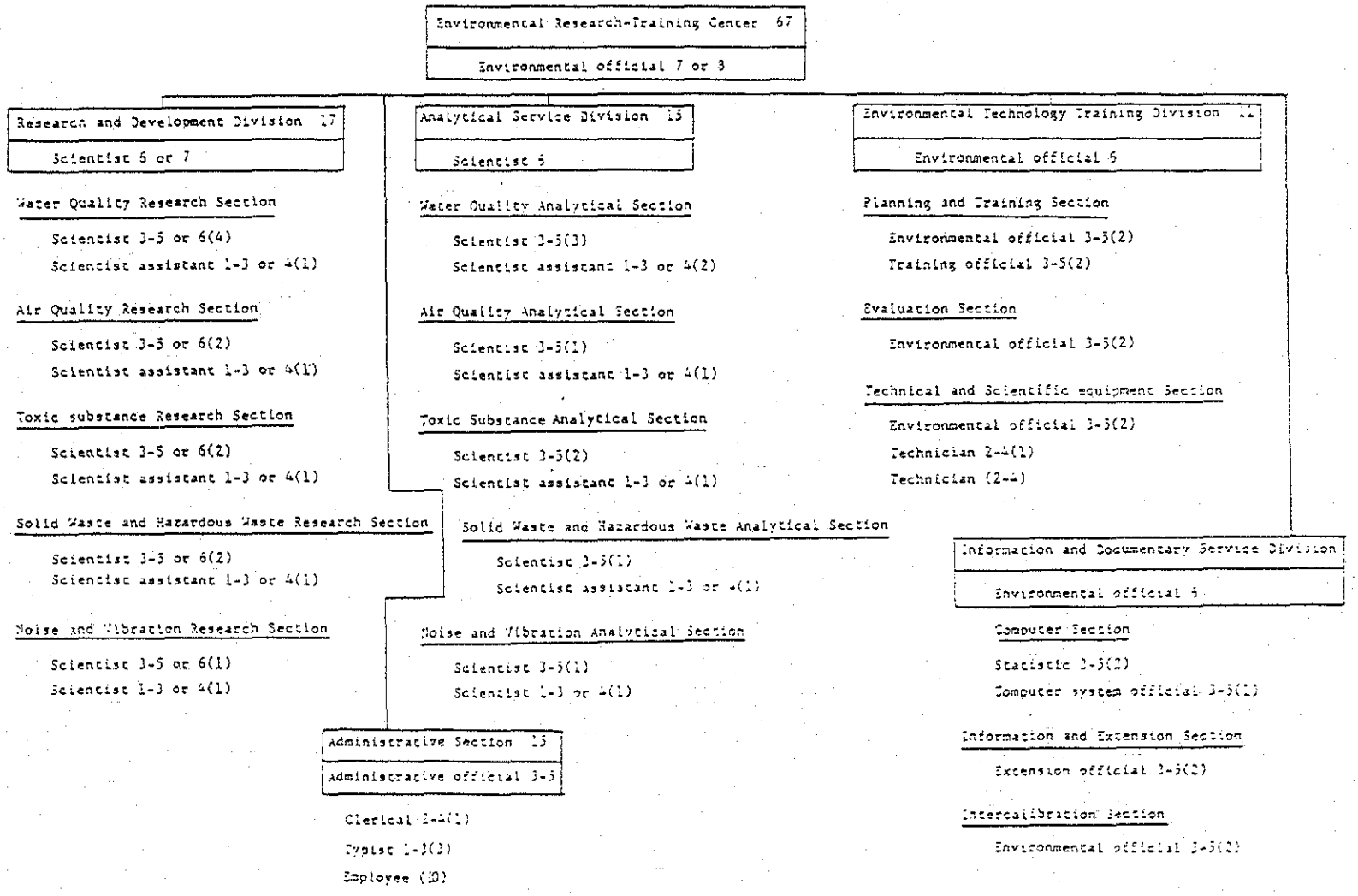

Table 3(3)-3 Qualification of Job Position of ERTC

	Job Position	Qualification
1.	Environmental official	Bachelor of Science or Engineering
2.	Scientist	Bachelor of Science or Engineering
3.	Training official	Bachelor of Science or Bachelor of Art
4.	Statistic	Bachelor of Science
5.	Computer system official	Bachelor of Science or Engineering
6.	Extension official	Bachelor of Science or Bachelor of Art
7.	Administrative official	Bachelor of Art
8.	Technician	Diploma in Engineering
9.	Clerical official	Commerce
10.	Typist	Mattayom Suksa 5
11.	Scientist Assistant	Mattayom Suksa 5
13.	Employee	Pratom Suksa 4

(5) Operation and Maintenance Plan

ONEB will be the executing agency of operation and maintenance of the facilities and equipment for the Project, after they are completed and turned over to Thailand. While the institute will be operated as an independent national research organization with its research activities, organization and personnel placement aligned with the objectives stated in Chapter 1, it is to be positioned as an organization belonging to ONEB, Ministry of Science, Technology and Energy in terms of operation and maintenance and budgeting.

a) Buildings

Maintenance of buildings mainly consist of daily routine maintenance such as cleaning, reconditioning, of wear and tear due to utilization and deterioration arising from breakage and aging, and guarding against crime. For routine maintenance, scrupulous and frequent cleaning, prompting the careful usage and early discovery of breakage and defects of the buildings and will ultimately result in the prolonged life of facilities, utility service equipment and research equipment.

Regular service of 8 to 10 persons will be necessary for the cleaning of the facilities.

As to repairs, provided that the expected life span of the buildings of the Project is 30 years, the repair works involving the structural components will not be necessary, it will be mainly executed regarding interior and exterior finishing. Remodeling and modification will be required afterwards.

The necessary inspection and repair of buildings are as follows :

(exterior)

Repair and repainting of exterior finish and inspection of cracks caused by neutralized concrete

..... (once / 5 years)

Repair, repainting and inspection of roof slab
..... (inspection : once/year)
(other:once/5 years)
Inspection and partial repair of roof waterproofing
..... (inspection : once / year)
(Others : as occasion calls)
Periodical cleaning of downspouts, drains, etc.
..... (once / month)
Inspection repair of sealing of exterior doors and windows
..... (once / year)
Repainting of exterior doors and windows
..... (once / 5 years)
Periodical inspection and cleaning of drainage gutters, manholes, etc. ..... (once / 5 years)
Repainting of surrounding fences
..... (once / year)
Periodical checkup of landscaping and gardening
..... (as occasion calls)

b) Utility Service Systems

With respect to the various utility service systems such as electrical, air-conditioning and ventilation plumbing, special facilities and elevator, etc., in addition to daily operation control and periodical inspection to utility service equipment, maintenance such as repair in case of failure is necessary. It is important to form a maintenance system preventing failure and accidents and securing the smooth operation of facilities by operating the equipment properly and executing daily inspection, lubrication, adjustment, painting and repair.

The general equipment themselves are to be replaced at the end of their life span indicated below :

Durable Years of Equipment

(Electrical Equipment)	
Generator	15 to 20 years
Panel Board	20 to 30 years
Fluorescent Lamps	5,000 to 10,000 hours

Incandescent Lamps	1,000 to 1,500 hours
Telephone Exchange	40 years
Public Address System Equipment	10 to 20 years
Elevator	20 years
Dumbwaiter	15 years
(Plumbing Equipment)	
Pumps	10 to 15 years
Tanks	15 to 20 years
Pipes and Valves	10 to 15 years
Plumbing Fixtures	25 years
Fire Extinguisher	20 years
Gas Equipment	6 years
Sewage Treatment Equipment	7 years
(Air-conditioning and Ventilation Equipment)	
Pipes	10 to 15 years
Fans	10 to 15 years
Airconditioners	10 to 15 years
Package-type Airconditioners	5 to 10 years
Chilling Units	5 to 10 years

c) Maintenance Plan for Research and Training Equipments and facilities.

1) Research Equipment

As the precision of research equipment supporting the research activities should always be kept at high levels, daily maintenance and inspection over them are essential. It will be necessary for the Scientific and Equipment Section to maintain a staff of expert technicians skillful in the mechanism of research equipment, for the daily maintenance and inspection examination on purchase of new apparatus, and research development. A combined system is necessary where daily maintenance, inspection and repair are generally executed by the technicians of the Scientific Equipment Section, leaving specific kinds of equipment to maintenence services under contract with other organizations such as the manufacturers of the equipment. Periodical execution of daily maintenance and inspection is advisable with respect to the following items. The

necessary cost for parts, if executed by the internal staff, and transportation fee, and fee for dispatched engineers as well as costs for parts, in case of outside order, will be taken into account in the budget.

	Internal Execution	Outside Order
Experimental apparatus for general use	(4 time/year)	(once/year)
Analytical apparatus	(inspection only, 4 times/year)	(twice/year)
Optical apparatus	(twice/year)	(once/year)
Precision research	(inspection only, regularly)	(twice/year)

d) Estimated Costs of Operation and Maintenance

Estimation was made on the annual costs required for operation and maintenance of the facilities and equipment, to be covered by the The Thai Government after the completion of ERTC. The items are divided into Personnel Costs, Running Costs for Facilities, Cleaning/Guarding Costs, Maintenance Costs for Research Equipment, etc. and calculations are based on the prices as of July 1988.

(1) Personnel Costs

Estimation will be made on Personnel Costs, which will take up a major part of the operation and maintenance costs of ERTC, according to the personnel plan and operation and maintenance plan for ERTC at the time of its foundation. The estimated average salary per employee is 5,000 baht per person month

No.of Employees at the time of foundation = 98 persons x B 5,000/person/month x 12 months

= B 5,880,000 /year

(2) Running Cost for Facilities

Quantities to be consumed for water supply electricity, are estimated from the persumed daily usage, for calculating the annual running cost for the facilities.

a) Water

100 m^3/day x 365 x 5/7 x B 5/m^3 = B 130,392

b) Electricity

Lighting/Receptacles	100 KW x 8 hr/day x 365 x 5/7 day x B 1.6/KW = B 333,750/year
Research Equipment	240 KW x 8 hr/day x 365 x 5/7 day x B 1.6/KW = B 801,000/year
Airconditioners	100 KW x 8 hr/day x 365 day x 5/7 day x B 1.6/KW = B 333,750/year
Sewage Treatment	20 KW x 8 hr/day x 365 x B 1.6/KW = B 280,400/year
Water Supply	30 KW x 3 hr/day x 365 x 5/7 day x B 1.6/KW = B 37,600/year
Sub-total	1,786,500 B

12.

(3) Cleaning and Security Costs

This can be regarded as personnel expenses for workers required for cleaning and security guards.

1) Cleaning Workers 10 persons

B 2,000/month x 10 persons x 12 month = B 240,000/year

2) Security Guards 6 persons (around-the-clock system,
4 persons on duty all the time)

B 2,500/month x 6 persons x 12 month = B 180,000/year

Sub-total (1) and (2) = B 420,000/year

(4) Maintenance Cost for Facilities

1) Buildings

Maintenance, inspection and repair cost for buildings can be regarded as Repairing Expenses, which vary substantially depending on the age of buildings. For example, while repairing expenses for buildings are presumed to be about B 3/m^2 annually until about 5 years after completion. The following is the estimation at the rate of B 60/m^2 for annual average expenses of are assumed life span of 30 years. B 60/m^2 /year x 10,000 m^2 = B 600,000/year.

2) Utility Service Systems

As to the costs for inspection and maintenance of the utility service systems, there will be very few exchange of parts up to 5 years after the completion of facilities, but the next 5 years will necessitate a large number of exchange of parts and the systems themselves. The average annual expenditure required for maintenance of systems, in a 10-year span,

is approximately 5% of the total construction costs for utility service systems

B 72,000,000 x 5% year	= B 3,500,000/year
Sub total(1)and(2)	= B 3,500,000/year + B 600,000/year
	= B 4,100,000/year

(5) Maintenance Costs for Research Equipment, etc.

1) Maintenance, inspection and repair costs for research equipment.

Items	Costs per year for required parts	Costs per year for outside orders (transportation fee, fee for dispatched engineers)	Total
a. Experimental apparatus for general use	B 247,500	B 95,000	B 342,500
b. Analytical apparatus	B 27,500	B 190,000	B 217,500
c. Optical apparatus	B 33,000	B 95,000	B 128,000
d. Precision research apparatus	B 247,500	B 190,000	B 437,000
Sub-total	B 555,500/year	B 570,000/year	B 1,125,000/year

(6) Total Estimated Costs for Operation and Maintenance

1)	Personnel Costs	= B 5,880,000
2)	Running Costs for Facilities	= B 1,786,503
3)	Cleaning/Guarding Costs	= B 420,000
4)	Maintenance-Costs for Facilities	= B 4,102,000
5)	Maintenance Costs for Research Equipment ,etc	= B 1,125,000
6)	Chemicals	= B 2,330,023
7)	Operation and Maintenance Costs for 7 Air-Monitoring Stations	= B 2,030,000
	Grand Total	= B 17,311,500/Year

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SESSION 4 : EXPECTED TRAINING PROGRAMS OF THE ERTC PROJECT

4. Expected Training Programs of the ERTC Project

(1) Justification of Environmental Training

a) Demand from ONEB and other related agencies

Most of the staff of ONEB and other related agencies are graduates of Thai Universities, Therefor, their background of training and researching are restricted to Thai system. To upgrade the curriculum and to improve new technique, it is necessary that the teaching and researching staffs be further trained. Presently, there are more than 25 governmental environmental laboratories in Thailand, and there are about 100 laboratories in the non-governmental agencies including academic institutions and industrial establishments. ONEB has found out that these laboratories are manned by very few competent and qualified personnel. Majority of the personnel, indeed unqualified, who are in need of proper training and continue education.

b) Field of Research

The research should be divided into five fields such as Water Pollution, Air Pollution, Noise and Vibration, Solid Waste and Toxic Substances.

c) Target Groups and Levels of training.

Based on the training requirements, it is recommended that both the technical and administrative training courses should be formulated as the permanent training course in ERTC. The target trainees are expected to be invited from different agencies concerned, with environmental issues in Thailand. Table 4(1)-1 shows the minimum estimated number of trainees from the public sectors. As to the trainee for the technical training courses, 2,889 officials in each agency and institute are expected to be trainees for the time being which consist of 996 for water pollution, 555 for air pollution, 352 for noise pollution, 238 for solid wastes and 748 for toxic substances. Meanwhile, in the administrative training courses, 3,016 will be the nominated trainees which comprise 2,004 of junior officials and 1,012 of senior officials. Apart from the trainee from the public sector,

large number of trainee are expected to join both technical and administrative training courses in ERTC.

d) Priority of each Training Field.

The training program for all fields should be done in parallel.

Table 4-(1)-1 : Estimated Number of Trainees

ORGANIZATION	TECHNICAL COURSE					ADMINI. COURSE		TOTAL
	W	A	N	S	T	SENIOR	JUNIOR	
1. Office of the Prime Minister								
-Office of the Civil Service Commission	-	-	-	-	-	5	-	5
-Office of the National Economic and Social Development Board	-	-	-	-	-	11	8	19
-Office of the National Education Commission	-	-	-	-	-	6	10	16
-Office of the Board of Investment	-	-	-	-	-	14	31	45
-The National Statistics Office	-	-	-	-	-	14	15	29
-The Public Relations Office	-	-	-	-	-	2	12	14
-Department of Technical and economic Cooperation	-	-	-	-	-	3	7	10
2. Ministry of Agriculture and Cooperatives								
-Agriculture Department	-	-	-	-	248	56	69	373
-Agriculture Extension Department	-	-	-	-	139	-	-	139
-Fisheries Department	180	-	-	-	7	1	35	223
-Land Development Department	9	-	-	-	15	-	9	33
-Livestock Development Department	25	10	9	25	35	10	20	134
-Royal Forest Department	193	-	-	-	-	91	100	384
-Royal Irrigation Department	70	-	-	-	-	-	50	120
-Office of Agriculture Land Reform	-	-	-	-	-	5	5	10

Table 4(1)-1 : Estimated Number of Trainees(continued)

ORGANIZATION	TECHNICAL COURSE					ADMINI. COURSE		TOTAL
	W	A	N	S	T	SENIOR	JUNIOR	
3. Ministry of Commerce								
-Business Economics Department	-	-	-	-	-	14	31	45
-Commercial Registration Department	-	-	-	-	-	3	2	5
-Commercial Relations Department	-	-	-	-	-	4	13	17
4. Ministry of Communications								
-Harbour Department	-	7	7	-	-	3	3	20
-Highways Department	-	-	-	-	-	5	64	69
-Land Transport Department	-	50	50	-	-	5	15	120
-Meteorological Department	-	45	-	-	-	-	-	45
5. Ministry of Defense								
-The Supreme Command Headquarters	-	-	-	-	-	30	40	70
6. Ministry of Education								
-Educational Techniques Department	-	-	-	-	-	35	40	75
-Physical Education Department	-	-	-	-	-	3	24	27
-Institute of Technology and Vocational Education	-	-	-	-	-	15	20	35

Table 40)-1 : Estimated Number of Trainees(continued)

ORGANIZATION	TECHNICAL COURSE					ADMINI. COURSE		TOTAL
	W	A	N	S	T	SENIOR	JUNIOR	
7. Ministry of Finance								
-The Fiscal Policy Department	-	-	-	-	-	5	3	8
-Customs Department	-	-	-	-	-	10	15	25
-Treasury Department	-	-	-	-	-	5	5	10
8. Ministry of Industry								
-The Industrial Standards Institute	-	-	-	-	-	5	5	10
-Industrial Promotion Department	-	-	-	-	-	16	21	37
-Industrial Works Department	70	25	10	15	32	10	40	202
-Mineral Resources Department	21	-	-	-	53	-	105	179
9. Ministry of Interior								
-Community Development Department	-	-	-	-	-	56	165	221
-Lands Department	-	-	-	-	-	4	-	4
-Labor Department	-	-	-	-	-	2	16	18
-Local Administration Department	-	-	-	-	-	21	69	90
-Police Department	-	292	219	-	-	73	73	657
-Public Welfare Department	-	-	-	-	-	22	28	50
-Public Works Department	21	-	-	13	-	9	-	43
-Town and Country Planning Department	-	-	-	-	-	20	56	76

Table 4(1)-1 : Estimated Number of Trainees(continued)

ORGANIZATION	TECHNICAL COURSE					ADMINI. COURSE		TOTAL
	W	A	N	S	T	SENIOR	JUNIOR	
-The Office of Accelerated Rural Development	-	-	-	-	-	8	10	18
-Office of Policy and Planning	-	-	-	-	-	4	30	34
-Office of Land Communication Board	-	-	-	-	-	2	11	13
10. Ministry of Public Health								
-Communicable Disease Control Department	-	-	-	-	-	7	39	46
-Health Department	11	5	3	13	34	99	225	390
-Medical Science Department	1	-	-	-	57	5	-	63
-Medical Service Department	-	-	-	-	-	13	29	42
-Food and Drug Administration	-	-	-	-	15	10	10	35
11. Ministry of Science, Technology and Energy								
-Science Service Department	6	6	3	3	6	26	81	131
-National Research Council	-	-	-	-	-	20	31	51
-Office of the National Environment Board	45	10	3	11	8	20	152	249
-Office of the Atomic Energy for Peace	-	-	-	-	-	15	32	47
-National Energy Administration	12	-	-	-	-	22	38	72

Table 4(1)-1 : Estimated Number of Trainees(continued)

ORGANIZATION	TECHNICAL COURSE					ADMINI. COURSE		TOTAL
	W	A	N	S	T	SENIOR	JUNIOR	
12. Ministry of University Affairs								
-Chiang Mai University	12	10	5	10	10	5	-	52
-Chulalongkorn University	20	15	5	12	15	10	-	77
-Khon Kaen University	10	10	5	10	8	5	-	48
-Mahidol University	15	5	5	10	25	4	-	64
-Prince of Songkla University	12	5	5	8	12	6	-	48
-National Institute of Development Administration	-	-	-	-	-	10	-	10
13. State Enterprises								
-Bang Pa-in Paper Mill	5	-	-	-	-	-	-	5
-Electricity Generating Authority of Thailand	10	8	-	-	-	5	-	23
-Liquor Distillery Organization	20	8	-	-	-	2	-	30
-Metropolitan Electricity Authority	-	-	-	-	-	10	-	10
-Metropolitan Water Works Authority	10	-	-	-	5	15	-	30
-North East Jute Mill Co.,Ltd	10	-	-	-	-	-	-	10
-Provincial Electricity Authority	8	4	-	-	-	-	-	12
-Provincial Water Works Authority	25	-	-	-	-	-	-	25
-Rubber Estate Organization	10	-	-	-	-	-	-	10
-Sugar Factories Inc	30	-	-	-	-	-		30
-Thai Airways Co.,Ltd	5	-	-	-	-	-	-	5

Table 40-1 : Estimated Number of Trainees(continued)

ORGANIZATION	TECHNICAL COURSE					ADMINI. COURSE		TOTAL
	W	A	N	S	T	SENIOR	JUNIOR	
-Thai Airways International Limited	5	-	-	3	-	-	-	8
-Thailand Institute of Scientific and Technological Research	8	5	5	6	8	3	-	35
-Thailand Tobacco Monopoly	5	-	-	-	-	-	-	5
-The Airport Authority of Thailand	5	3	1	1	-	1	-	11
-The Bangkok Mass Transit Authority	-	2	1	-	-	-	-	3
-The Battery Organization	3	-	-	-	-	-	-	3
-The Cholburi Sugar Corporation Ltd	2	1	-	-	-	-	-	3
-The Express Transportation Organization of Thailand	-	2	1	-	-	-	-	3
-The Expressway and Rapid Transit Authority of Thailand	-	2	-	-	-	-	-	2
-The Fish Making Organization	2	-	-	-	-	-	-	2
-The Forest Industry Organization	-	-	-	-	-	1	-	1
-The Glass Organization	2	-	-	-	-	-	-	2
-The Industrial Estate Authority of Thailand	5	3	1	1	1	1	-	12
-The National Housing Authority	5	-	-	-	-	1	-	6
-The National Petroleum Authority	3	2	-	1	1	1	-	8
-The Offshore Mining Organization	5	-	-	-	-	-	-	5
-The Port Authority of Thailand	3	1	1	1	1	1	-	8
-The State Railway of Thailand	-	2	-	-	-	1	-	3

Table 4(1)-1 : Estimated Number of Trainees(continued)

ORGANIZATION	TECHNICAL COURSE					ADMINI. COURSE		TOTAL
	W	A	N	S	T	SENIOR	JUNIOR	
-The Tanning Organization	10	2	-	-	-	-	-	12
-The Textile Organization	20	2	-	-	-	1	-	23
-The Tourism Authority of Thailand	2	2	2	2	2	2	-	12
-The Zoological Park Organization	5	1	1	1	1	1	-	10
14. Local Government								
-Bangkok Metropolitan Administration	20	5	5	20	5	10	20	85
-Provincial Government	20	5	5	72	5	72	72	251
Total	996	555	352	238	748	1,012	2,004	5,905

(Note) 1. Source : Civil Service Department 1987
2. W : Water Pollution
3. A : Air Pollution
4. N : Noise Pollution
5. S : Solid Waste
5. T : Toxic Substance

Table 4(1)-2 List of private environmental laboratory in Thailand

	Labolatory	Chemist
1)	Bangkok Assay Office Co.,LTD 1230-1232 New Road , Bangkok 10500 Tel.2362113	6
2)	CALEB BRETT (Thailand) LTD. 1041 Silom Road, Bangkok Tel. 2342113	2
3)	CCTC (Thailand) 233 Sathorn Tai Road, Yannawa, Bangkok 10120 Tel.2118721,2119329	4
4)	Central Lab Service 51/330 Drive-in Square Soi3,Lardproa 130,Klongchan, Bangkapi , Bangkok 10240 Tel 3781269,3782555	2
5)	Goshu Kohsan Co.,LTD. 1090/49 Soi Charuratana, New Petchburi Road, Bangkok 10400 Tel.2531472,2532339,2535581	4
6)	I.T. LAB Co.,LTD. 248 Praneeahan Building, Phaholyothin road, Bangkok Tel. 2712499,2710080	5
7)	International Quality Assurance Laboratory (IQA) 2096/5-8 P.P. Building, Ramchamhaeng ,Huamark, Bangkok 10240 Tel.314925-6,314927-9	10
8)	Overseas Merchandise Inspection Co.,LTD.(OMIC) 12-14 Yen Akas Soi 3, Chongnonsri, Yannawa ,Bangkok, P.O. Box 880 Tel.2864877	20
9)	P.S. WATER L.P. 29/7 Soi Wat Phaingern , Chan Road, Yannawa,Bangkok Tel.2123595	2
10)	R.Schaller Limited 44 Soi Phaholyothin 11 (Senaruam) , Phaholyothin Road, Bangkok Tel.2714818-20	2
11)	Sitthiporn Associate 113/4 Soi Nomchit , Nares Road, Bangrak ,Bangkok 10500 Tel.2360032,2368627	3
12)	Thai Chemical & Engineering C.L. 234 3rd Floor, Sab Road, Siohaya, Bangkok 10500 Tel.2359286-9	3

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Table4(1)List of private environmental laboratory in Thailand
(continue)

Laboratory	Chemist
13) Thai Wah Co., LTD. 21 Sathorn Tai , 21-22 Flour Thai Wah Tower, Sathorn Road , Bangkok Tel. 2409240	2
14) Thailand International Inspection Co., LTD. (INTECCO) 99 Soi Phrapinit , Suanploo Road , Bangkok Tel. 2860373, 2863017	3
15) Universal Surveying Co., LTD.(USCO) 763 Trok Kai , Anuwongse Road , Bangkok 10501 P.O. Box 1629 , Tel. 2228407-8	6
16) Wolfgang 10/2 Silom Road , Bangkok 10500 , Tel. 2352255	1
17) Labtest Inspection Services (Thailand) LTD. 888/168-9 16th Floor, Mahatun Bldg. , Ploenchit Road , Bangkok 10500 , Tel. 2536738	5
18) South East Aia Inspection Co., LTD. (SEACO) 611/2 Soi Pradoo 1 , Charoen Krung Road , Bangkok Tel. 2891404, 2890528	3
19) South East Asian Laboratories LTD. (SEAL) 135 Ard Narong Road , Klongtoey , Bangkok Tel. 2495948, 2490591-8	4
20) United Asia Supplier Co., LTD. (UNASCOL) 103 Patpong Road , Bangkrak , Bangkok 10500 Tel. 2355904-6	2

(2) Expected Training Courses : Titles Objectives, Qualification of trainees, Major-curricula, and duration of expected Training courses

A) Technical Training Courses

1) Technical training courses may play the most important role in ERTC and be expected to realize the human resources development in terms of the technique and technology necessary for the environmental pollution control or environmental protection.

2) According to the seriousness of environmental problems Thailand now faces, the eleven training courses in five environmental areas should be set up for the time being, three courses for water pollution, three courses for air pollution, one course for noise pollution, two courses for solid wastes and two courses for toxic substances.

a) Water Pollution Training Courses

3) It can roughly be said that there are two kinds of technicians, scientists or engineers who are engaged in water pollution control. One is that who chiefly belongs to public sectors such as government agencies and municipalities and is responsible for the monitoring and inspection of water pollution. The other is the man of private sectors who operates and maintains the waste water treatment facility. Being these persons as main target trainees, three technical training courses for water pollution are set up; "Introduction to Water Quality Analysis", "Advanced Water Quality Analysis" and "Waste Water Treatment Technology".

4) Table 4(2)-1 shows the outline of "Introduction to Water Quality Analysis" course. Considered the higher demand of water quality monitoring technician in proportion to the widespread water pollution, this training course aims at providing the on-site technician with the basic and practical technique for water quality analysis such as sampling, analysis and evaluation. The trainee who finishes this course is expects to be able to carry out the

exact analysis of conventional water quality parameters such as BOD, COD and SS in environmental water and domestic and industrial effluent.

4(1)-2

5) Table 4(1)-2 shows the outline of "Advanced Water Quality Analysis" course. This course might provide the trainee who has mastered the basic techniques for water quality analysis with the advanced techniques for water and waste water analysis. The demand for the analysis of the organic matters and heavy metals, most of which are included in environmental water quality standard and effluent standards, is increasing in proportion as the urbanization and industrialization accelerate water pollution. However, the number of analysts who can carry out these analysis is at present fairly limited because it is trace analysis and requires the rather sophisticated techniques. Then, this course is expected to focus on the trace water pollutants analysis by the analytical instruments such as the atomic absorption spectrophotometer and gas chromatograph.

4(1)-3

6) Table 4(1)-3 shows the outline of "Waste Water Treatment Technology" course. While large-scale factories and housing conglomerate have established the waste water treatment facilities to meet the effluent standards for these few years, the shortage of skillful scientists or engineers to operate and maintain the facilities often induces the decrease of efficiency and sometimes makes the facilities out of order. Then, it is emphasized in this course that trainees should be taught the basic techniques and technologies for waste water treatment especially for the operation and maintenance of them through the practices in both model plants and existing facilities.

b) Air Pollution Training Courses

7) Two types of technicians, scientists or engineers seem to be engaged in air pollution control activities. One is that who belongs chiefly to public sectors such as government agencies and municipalities and is responsible for the monitoring and inspection of air pollution. The other is employees of private sectors who operate and maintain the exhausted gas treatment facilities. Being these persons as main target trainees, three technical training courses for air pollution are set up; "Ambient Air Quality Analysis", "Exhausted Gas Analysis" and "Exhausted Gas Treatment Technology".

4(2)-4

8) Table shows the outline of "Ambient Air Quality Analysis" course. It is in these few years that the ambient air quality monitoring by the automatic monitor substantially started in Thailand so that the man in charge of does not always have enough techniques for the calibration, operation and maintenance of the instruments, the level of which directly affects the data accuracy. In addition, though simplified manual monitoring techniques are increasingly necessary to make up for the automatic monitoring networks, few is available now in this field. Therefore, this course aims at providing the engineers, scientists or technicians engaged in ambient air quality monitoring with the automatic and manual monitoring methods.

4(2)-5

9) Table shows the outline of "Exhausted Gas Analysis" course. Both industrial exhausted gas analysis and the automobile exhausted gas analysis are at the moment required in this field. As for the industrial exhausted gas analysis, only a few men can perform it in Thailand, which make it difficult to grasp the state of the air pollutants emission from industries. This is chiefly because the industrial exhausted gas monitoring requires the rather sophisticated techniques such as the stack sampling. As for the automobile exhausted gas analysis in which the automatic monitor is usually used, the training of inspectors in relevant agencies is increasingly necessary in order to check the automobile emission gas standards. Therefore, this course focused on the training of the sampling and analytical methods for both industrial and automobile exhausted gas.

4(2)-6

10) Table shows the outline of "Exhausted Gas Treatment Technology" course. There are few engineers working for the exhausted gas treatment facilities because only a black smoke standard is at present enforced and most of factories have no exhausted gas treatment facility except some of large-scale factories which at most facilitate bag filter, cyclone or electrostatic precipitator to reduce the black smoke emission. However, it is planned that a series of emission gas standards will be set up and enforced in near future. In accordance, it will soon be necessary to train engineers to be able to operate and maintain the exhausted gas treatment facility. Therefore, this course aims at providing the trainee with the knowledge, techniques and technologies necessary for the operation and maintenance of the treatment facility through the practices in model plants.

c) Noise Pollution Training Course

11) Both the monitoring and prevention technologies are of importance to promote the noise pollution control. While the noise pollution monitoring has high demand for training, the noise pollution prevention technologies are not so urgently demanded in terms of training. This is partly because noise pollution control is just at a beginning stage and the state of pollution is still not well grasped, and partly because noise pollution prevention methods involve various fields ranging from source reduction technologies to city planning and so the really necessary area for training cannot be identified at the moment. Therefore, only a "Noise Monitoring" course is run for the time being and "Noise Prevention Technology" course should be considered in future if it will become feasible for training.

12) Table 4(2)-7 shows the outline of "Noise Monitoring" course. This course deals with the noise monitoring techniques especially focused on the monitoring planning and the operation, calibration and maintenance of automatic noise meters.

d) Solid Wastes Training Courses

13) It can roughly be said that there are at present three kinds of persons who are engaged in the solid wastes treatment and disposal. One is that who conducts the analysis of domestic and industrial solid wastes in national government, municipalities and private sectors. Another is that who is responsible for the planning and management of domestic wastes disposal works in national government and municipalities. The other is the on-site worker engaged in the collection, transportation, treatment and disposal of domestic solid wastes. Among them, to train on-site workers is of course important to increase the labor productivity of solid wastes disposal works. However, it seems not to be fit for the training program in ERTC so that such kind of training course is not prepared. For the time being, two technical training courses for solid wastes are set up; "Solid Waste Analysis" and "Domestic Solid Waste Management Technique". As for the

solid waste treatment technology, almost all of domestic solid wastes are disposed of by open dumping method without any treatment except the composting of small volume of wastes in Bangkok, and then "Solid Waste Treatment Technology" training course should be considered to be set up when the treatment technologies such as composting and incineration will become a little more popular. Also the training course of "Industrial Solid Waste Treatment" will be considered in future.

14) Table ۴(۲)-۸ shows the outline of "Solid Waste Analysis" course. Domestic solid wastes have been disposed of by dumping them to the field without paying little attention to the contents of wastes, which results in the mixture of toxic wastes, the degradation of environment near the disposal sit and the water pollution by the leachate. Although it becomes increasingly necessary to know the contents of domestic wastes, the shortage of skillful analysts makes it almost impossible. In case of industrial solid wastes, the situation is worse. It is often improperly disposed of because no one knows how dangerous it is. Therefore, this course is expected to provide solid waste analysts in national government, municipalities or private sectors with the adequate analytical techniques for domestic and industrial solid wastes as well as their leachate.

15) Table ۴(۲)-۹ shows the outline of "Domestic Solid Waste Management Technique" course. The efficient and appropriate implementation of domestic solid wastes disposal work depends to considerable degree upon the management planning. However, the planner of solid wastes disposal work in each municipality is often suffering from the lack of both knowledge and experiences for the better management of solid wastes disposal work. Therefore, in this course, those who are responsible for the planning, management or supervision of domestic solid wastes disposal work will be educated and trained to be skillful planning and management officials mainly through case study practices.

e) Toxic Substances Training Courses

16) Those who are engaged in toxic substances problems are mostly the analysts in national government, municipalities, universities and private sectors. As the pesticides analysis is demanded most in their field, two analytical training courses should be set up; "Pesticides Analysis" and

"Toxic Substances Analysis (other than pesticides)". The training course of "Toxic Substances Management" is preferable to be considered in future.

17) Table ٩(٢)-١٠ shows the outline of "Pesticides Analysis" course. This course offers the trainee the analytical techniques of pesticides residue in water, soil, agricultural products and foods including the techniques of sampling, preservation and pretreatment.

18) Table ٩(٢)-١١ shows the outline of "Toxic Substances Analysis (other than pesticides)" course. This course aims at providing the trainees with the necessary techniques to investigate the toxic substances pollution caused by food additives, drugs, detergents, etc.

Table 4(4)-1 : Technical Training Course (Water Pollution I)

NAME OF COURSE		Water Pollution I : Introduction to Water Quality Analycia
DURATION		8 weeks
FREQUENCY		4 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		40 persons/year
TARGET TRAINEE		On-site techniciens working as water quality analyst in national and local governments, universities, private companies etc. or technicians who will be in charge of water quality analysis and have background knowledge
TRAINING CURRICULUM	LECTURE	1)State of water pollution 2)Legal and institutional framework for water pollution control 3)Standards for water pollution control 4)Chemistry for water quality analysis 5)Standard analytical method for water and waste water 6)Biology for water pollution 7)Surveillance method for water pollution 8)Introduction to waste water treatment technology 9)Introduction to industrial chemistry 10)Introduction to statistics 11)Interpretation of water quality data 12)Effect of water pollution

TRAINING CURRICULUM	PRACTICE	1)Environmental water sampling by water sampler 2)Measurement of river flow by velocity meter 3)Industrial waste water sampling 4)Pretreatment and preservation of sample 5)Analytical practice of standard sample for conventional parameters (pH, DO, SS, BOD, COD, N and P) 6)Analytical practice of environmental water 7)Analytical practice of domestic waste water 8)Analytical practice of industrial waste water 9)Biological test (coliform, E coli) 10)Field case study of water quality analysis (sampling-pretreatment-analysis-data interpretation-evaluation)
GOAL OF TRAINING		1)To get necessary knowledge of water quality chemistry for water quality analysis 2)To get the technique for pretreatment and preservation of water sample such as environmental water and domestic and industrial waste water 3)To get necessary measuring technique of flow speed, flow volume and water temperature 4)To get basic analytical technique for conventional water quality parameters such as pH, DO, SS, BOD, COD, N and P 5)To get basic technique for biological test such as coliform and E coli 6)To get necessary technique to handle and evaluate water quality data

Table 4(1)-2 :Technical Training Course (Water Pollution II)

NAME OF COURSE		Water Pollution II : Advanced Water Quality Analysis
DURATION		8 weeks
FREQUENCY		2 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		20 persons/year
TARGET TRAINEE		Technician who finished "Water Pollution I" course, or scientist or engineer who has bachelor's degree in environmental science or its related field and is engaged in water quality analysis in national and local governments, universities, companies, etc.
TRAINING CURRICULUM	LECTURE	1)State of water pollution 2)Legal and institutional framework for water pollution control 3)Standards for water pollution control 4)Analytical chemistry and geochemistry 5)Advanced chemistry for water quality analysis 6)Instrumental analysis 7)Standard analytical method for water and waste water 8)Advanced biology for water pollution 9)Advanced surveillance method for water pollution 10)Waste water treatment technology 11)Industrial chemistry 12)Statistics 13)Interpretation of water quality data 14)Effect of water pollution

TRAINING CURRICULUM	PRACTICE	1)Environmental water sampling in river, lake and coastal area (layer sampling, plankton catch) 2)Bottom sediments sampling by grab and core sampler 3)Pretreatment and preservation of bottom sediments 4)Analysis by spectrophotometer (CN, phenol, etc.) 5)Analysis of metals by atomic absorption (Cd, Pb, Zn, Cu, Hg, Cr, etc.) 6)Analysis of organic substances by gas chromatography (pesticides, aldehyde, etc.) 7)Operational practice of HPLC, fluoro-SPM and TOC 8)Analytical practice of bottom sediments 9)Analytical practice of environmental water and domestic and industrial waste water on standards items 10)Classification of microorganism in water 11)Field case study of water pollution (planning-sampling-analysis-evaluation-source identification)
GOAL OF TRAINING		1)To get necessary knowledge for instrumental analysis of water 2)To get advanced analytical technique necessary for standards items by spectrophotometer, gas chromatography, atomic absorption, HPLC, etc. 3)To get the technique for sampling, pretreatment, preservation and analysis of bottom sediments 4)To get the technique for classification of microorganism in water 5)To get necessary know-how for water pollution surveillance

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Table 4-(1)-3 Technical Training Course (Water Pollution III)

NAME OF COURSE		Water Pollution III : Waste Water Treatment Technology
DURATION		4 weeks
FREQUENCY		3 times/year
CAPACITY		15 persons/time
TOTAL TRAINEE		45 persons/year
TARGET TRAINEE		Engineer or technician engaged in the design, operation or maintenance of waste water treatment facility in national and local governments, universities, companies, etc. or those who will be engaged in such a work and have bachelor's degree in environmental engineering or its related field
TRAINING CURRICULUM	LECTURE	1)State of water pollution 2)Legal and institutional framework for water pollution control 3)Standards for water pollution control 4)Waste water treatment planning 5)Fundamental waste water treatment technology (chemical treatment, biological treatment, etc.) 6)Applied waste water treatment technology (for industrial and domestic waste water and night soil) 7)Introduction to microbiology 8)Introduction to chemical engineering 9)Maintenance of waste water treatment facility 10)Effect of water pollution

TRAINING CURRICULUM	PRACTICE	1)Planning practice of industrial waste water treatment 2)Planning practice of domestic waste water treatment 3)Operational practice of chemical treatment by model plant (cosgulation, pH adjustment, activated carbon absorption, etc.) 4)Operational practice of biological treatment by model plant (oxidation pond, oxidation lagoon, activated sludge, rotating disc, anaerobic digestion, etc.) 5)Treatment practice of toxic industrial waste water (including Cd, Pb, Cr, Hg, As, CN, pesticides, etc.) 6)Analytical practice of indicator parameter for the operation of waste water treatment facility 7)Field case study of existing waste water treatment facility (survey of condition-proposal for improvement)
GOAL OF TRAINING		1)To get necessary knowledge for waste water treatment 2)To get necessary technique for the operation and maintenance of waste water treatment facility 3)To get analytical technique of indicator parameter for the operation of waste water treatment facility 4)To get necessary know-how for the design or improvement of waste water treatment facility 5)To get necessary know-how to deal with emergency case (overload, trouble of facility, etc.)

Table 4(2)-4 : Technical Training Course (AIR Pollution I)

NAME OF COURSE		Air Pollution I : Ambient Air Quality Analysis
DURATION		8 weeks
FREQUENCY		4 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		40 persons/year
TARGET TRAINEE		Engineer, scientist or technician engaged in the analysis or monitoring of ambient air quality in national and local governments, universities, companies, etc. or those who will be engaged in such a work and have bachelor's degree in environmental science or its related field
TRAINING CURRICULUM	LECTURE	1)State of air pollution 2)Legal and institutional framework of air pollution control 3)Standards for air pollution control 4)Chemistry for air quality analysis 5)Automatic air quality monitor 6)Standard monitoring and analytical method for ambient air quality 7)Simplified monitoring method of ambient air 8)Air pollution meteorology and dispersion theory 9)Surveillance method of air pollution 10)Effect of air pollution on man and vegetation 11)Introduction to waste gas treatment technology 12)Introduction to industrial chemistry 13)Statistics 14)Interpretation of monitored data

TRAINING CURRICULUM	PRACTICE	1)Air sampling (gas-liquid) by pump and flow meter 2)Air sampling (gas-gas) by vacuum bottle or bag 3)Dust sampling by Hi-Vol, Lo-Vol and dust jar 4)Monitoring practice of meteorological parameters 5)Analytical practice of liquid-absorbed sample (SO_2, NO_2, NH_3, etc.) 6)Analytical practice of gas phase sample (CO, HC, etc.) 7)Analytical practice of dust sample (heavey metals, sulfate, nitrate, etc.) 8)Monitoring of SO_2 and NO_2 by simplified method 9)Air pollution monitoring by automatic air quality monitor 10)Calibration and maintenance of automatic air quality monitor 11)Field case study of air pollution (planning-monitoring-evaluation-source identification)
GOAL OF TRAINING		1)To get necessary knowledge of air chemistry for air quality monitoring and analysis 2)To get manual sampling technique of ambient air 3)To get monitoring technique of meteorological parameters 4)To get the technique of manual analysis of air pollutants 5)To get the technique of simplified air quality monitoring 6)To get the technique of operation, calibration and maintenance of automatic air quality monitor 7)To get necessary know-how for air pollution surveillance

Table 4(3)-5 : Technical Training Course (Air Pollution II)

NAME OF COURSE		Air Pollution II : Exhausted Gas Analysis
DURATION		8 weeks
FREQUENCY		4 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		40 persons/year
TARGET TRAINEE		Engineer, scientist or technician engaged in the analysis or monitoring of industrial or automobile exhausted gas in national and local governments, universities, companies, etc. or those who will be engaged in such a work and have bachelor's degree in environmental science or its related field
TRAINING CURRICULUM	LECTURE	1)State of air pollution 2)Legal and institutional framework of air pollution control 3)Standards for air pollution control 4)Standard monitoring and analytical method for exhausted gas 5)Automatic exhausted gas monitor 6)Air pollution meteorology and dispersion theory 7)Fuel and combustion engineering 8)Automobile engineering (internal combustion engine) 9)Analytical method of fuel content (S, N, Pb, etc.) 10)Effect of air pollution on man and vegetation 11)Introduction to exhausted gas treatment technology 12)Introduction to industrial chemistry 13)Statistics 14)Interpretation of monitored data 15) Introduction of chemical engineering

TRAINING CURRICULUM	PRACTICE	1)Industrial exhausted gas sampling by stack sampler 2)Flow rate measurement of exhausted gas by gas meter or flow meter 3)Analytical practice of industrial exhausted gas (SOx, NOx, CO, etc.) 4)Sampling and analytical practice of exhausted dust (Quantity, black smoke, heavy metals, etc.) 5)Monitoring of industrial exhausted gas by automatic exhausted gas monitor 6)Analytical practice of fuel contents (S, N, Pb, etc.) 7)Monitoring of automobile exhausted gas by automatic exhausted gas monitor (CO, NOx, HC, black smoke, etc.) 8)Measurement of per capita emission load from automobile according to running mode 9)Calibration and maintenance of automatic exhausted gas monitor 10)Field case study of air pollution source (planning-monitoring-evaluation)
GOAL OF TRAINING		1)To get necessary knowledge for the monitoring and analysis of industrial exhausted gas 2)To get necessary knowledge for the monitoring and analysis of automobile exhausted gas 3)To get the technique of manual sampling and analysis of industrial exhausted gas 4)To get the technique of fuel contents analysis 5)To get monitoring technique of automobile exhausted gas by automatic exhausted gas monitor 6)To get the technique of operation, calibration and maintenance of automatic exhausted gas monitor 7)To get necessary know-how for air pollution source surveillance

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Table 4(t)-6 : Technical Training Course (Air Pollution III)

NAME OF COURSE		Air Pollution III : Exhausted Gas Treatment Technology
DURATION		4 weeks
FREQUENCY		3 times/year
CAPACITY		15 persons/time
TOTAL TRAINEE		45 persons/year
TARGET TRAINEE		Engineer or technician engaged in the design, operation or maintenance of exhausted gas treatment facility in national and local governments, companies, etc. or those who will be engaged in such a work and have bachelor's degree in environmental engineering or its related field
TRAINING CURRICULUM	LECTURE	1)State of air pollution 2)Legal and institutional framework of air pollution control 3)Standards for air pollution control 4)Exhausted gas treatment planning 5)Fuel and combustion engineering 6)Combustion control 7)Dust collection technology 8)Exhausted gas treatment technology 9)Air pollution meteorology and dispersion theory 10)Introduction to chemical engineering 11)Automobile engineering (internal combustion engine) 12)Maintenance of exhausted gas treatment facility 13)Effect of air pollution on man and vegetation

TRAINING CURRICULUM	PRACTICE	1)Planning practice of industrial air pollution control (choice of fuel, stack, exhausted gas treatment, air pollution level of nearby area, etc.) 2)Operational practice of exhausted gas treatment facility by model plant - choice of fuel - combustion control and improvement - dust treatment (gravity, centrifugal, filter, EP) - exhausted gas treatment 3)Treatment practice of toxic exhausted gas (including Cl2, F2, etc.) 4)Analytical practice of indicator parameter for the operation of exhausted gas treatment facility 5)Field case study of existing exhausted gas treatment facility (survey of condition-proposal for improvement)
GOAL OF TRAINING		1)To get necessary knowledge for exhausted gas treatment 2)To get necessary technique for the operation and maintenance of exhausted gas treatment facility 3)To get analytical technique of indicator parameter for the operation of exhausted gas treatment facility 4)To get necessary know-how for the design or improvement of exhausted gas treatment facility 5)to get necessary know-how to deal with emergency case (bad weather condition, overload, trouble of facility, etc.)

Table 4(2)-7 : Technical Training Course (Noise Pollution)

NAME OF COURSE		Noise Pollution : Noise Monitoring
DURATION		4 weeks
FREQUENCY		2 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		20 persons/year
TARGET TRAINEE		Engineer, scientist or technician engaged in noise monitoring in national and local governments, universities, companies, etc. or those who will be engaged in such a work and have background knowledge
TRAINING CURRICULUM	LECTURE	1)State of noise pollution 2)Legal and institutional framework for noise pollution control 3)Standards for noise pollution control 4)Physics on noise 5)Noise source 6)Standard monitoring method for noise 7)Surveillance method for noise pollution 8)Effect of noise 9)Introduction to noise prevention technology 10)Statistics 11)Interpretation of monitored data

TRAINING CURRICULUM	PRACTICE	1)Planning practice of noise monitoring 2)Operational practice of noise measuring instrument (sound level meter, precision sound level meter) 3)Monitoring practice of industrial noise 4)Monitoring practice of traffic noise 5)Monitoring practice of household noise 6)Monitoring practice of automobile source noise 7)Monitoring practice of motorboat source noise 8)Measurement of power level of noise source 9)Calibration and maintenance of sound level meter 10)Field case study of noise pollution (planning-monitoring-data analysis-evaluation)
COAL OF TRAINING		1)To get necessary knowledge for noise level monitoring 2)To get the technique of ambient noise level monitoring 3)To get the technique of source noise level monitoring 4)To get the technique of calibration and maintenance of sound level meter 5)To get the technique to calculate and evaluate noise level index 6)To get necessary know-how for noise pollution surveillance

Table 4(2)-8 : Technical Training Course (Solid Waste I)

NAME OF COURSE		Solid Waste I : Solid Waste Analysis
DURATION		4 weeks
FREQUENCY		2 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		20 persons/year
TARGET TRAINEE		Engineer, scientist or technician engaged in solid waste analysis in national and local governments, universities, companies, etc. or those who will be engaged in such a work and have the background knowledge of solid waste analysis
TRAINING CURRICULUM	LECTURE	1)State of solid waste problems 2)State of domestic solid waste treatment and disposal works 3)Legal and institutional framework for solid waste management 4)Standards for solid waste 5)Chemistry for solid waste analysis 6)Standard analytical method for domestic solid waste 7)Standard analytical method for industrial solid waste 8)Introduction to the treatment and disposal technology of domestic solid waste 9)Introduction to the treatment and disposal technology of industrial solid waste 10)Effect of solid waste on man and environment 11)Interpretation of solid waste quality data

TRAINING CURRICULUM	PRACTICE	1)Uniform sampling of domestic solid waste 2)Classification of the contents of domestic solid waste 3)Analytical practice of domestic solid waste - general items (calorie, moisture, volatile matter, C, H, N, etc.) - special items (heavy metals, etc.) 4)Analytical practice of industrial solid waste 5)Analytical practice of the leachate from final disposal site 6)Field case study of solid waste disposal site (planning-sampling-analysis-evaluation)
GOAL OF TRAINING		1)To get necessary knowledge for solid waste analysis 2)To get the technique for uniform sampling of domestic solid waste 3)To get the technique for the analysis of general and special items in domestic solid waste 4)To get the technique for the analysis of contents in industrial solid waste 5)To get the technique for the analysis of leachate from solid waste final disposal site 6)To get necessary know-how for the environmental pollution arising from solid waste

Table 4(2-9) : Technical Training Course (Solid Waste II)

NAME OF COURSE		Solid Waste II : Domestic Solid Waste Management Technique
DURATION		6 weeks
FREQUENCY		3 times/year
CAPACITY		15 persons/time
TOTAL TRAINEE		45 persons/year
TARGET TRAINEE		Engineer or scientist engaged in the planning, operation or management of domestic solid waste treatment and disposal work in national and local governments or those who will be engaged in such a work and have enough background knowledge
TRAINING CURRICULUM	LECTURE	1)State of solid waste problems 2)Legal and institutional framework for solid waste management 3)Standards for solid waste 4)Estimation of per capita generation of domestic solid waste 5)Domestic solid waste collection planning 6)Domestic solid waste transportation planning 7)Domestic solid waste treatment planning 8)Domestic solid waste disposal planning 9)Management of final disposal site for domestic solid waste 10)Environmental sanitation in and around final disposal site for domestic solid waste 11)Environmental protection around final disposal site of domestic solid waste

TRAINING CURRICULUM	PRACTICE	1)Case study I : revision and improvement of existing solid waste management plan - to pick up a small or medium scale city - to conduct a field study on the state of solid waste generation, collection, transportation, treatment, disposal, sanitation, environmental protection, etc. - to clarify the problem of existing plan and propose a revised and improved one 2)Case study II : formation of an appropriate and comprehensive solid waste management plan - to pick up a small or medium scale city without soil waste management plan - to study natural and social condition and gather necessary data for the planning - to form an appropriate and comprehensive solid waste management plan
GOAL OF TRAINING		1)To get necessary knowledge and technique for solid waste management 2)To get necessary know-how to revise and improve an existing solid waste management plan 3)To get necessary know-how to form an appropriate and comprehensive solid waste management plan

Table 4(2)-10: Technical Training Course (Toxic Substance I)

NAME OF COURSE		Toxic Substance I : Pesticides Analysis
DURATION		8 weeks
FREQUENCY		3 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		30 persons/year
TARGET TRAINEE		Scientist, engineer or technician engaged in the analysis of pesticides in national and local governments, universities, companies, etc. or those who will be engaged in such a work and have bachelor's degree in environmental science or its related field
TRAINING CURRICULUM	LECTURE	1)State of the pollution by pesticides 2)Legal and institutional framework for pesticides pollution control 3)Standards for pesticides pollution control 4)Pesticides chemistry 5)Analytical chemistry 6)Instrumental analysis 7)Ecology 8)Toxicology 9)Food sanitation 10)Standard analytical method for pesticides 11)Statistics 12)Interpretation of analyzed data

TRAINING CURRICULUM	PRACTICE	1)Sampling of fresh food, processed food, etc. 2)Pretreatment and preservation of samples 3)Analytical practice of standard and field samples - food additives - drugs - detergents - others 4)Field case study of toxic substance pollution - toxic substance residue survey in foods - estimation of the route and amount of human exposure to toxic substance - evaluation of toxic substance pollution
GOAL OF TRAINING		1)To get necessary knowledge of toxic substance and its analysis 2)To get the technique of sampling, pretreatment and preservation of samples for toxic substance residue analysis 3)To get analytical technique for toxic substances used in Thailand 4)To get necessary know-how for toxic substance pollution surveillance

Table 4(2)-11: Technical Training Course (Toxic Substance II)

NAME OF COURSE		Toxic Substance II : Toxic Substance Analysis (other than Pesticides)
DURATION		8 weeks
FREQUENCY		3 times/year
CAPACITY		10 persons/time
TOTAL TRAINEE		30 persons/year
TARGET TRAINEE		Scientist, engineer or technician engaged in toxic substance analysis in national and local governments, universities, companies, etc. or those who will be in engaged in such a work and have bachelor's degree in environmental science or its related field
TRAINING CURRICULUM	LECTURE	1)State of the pollution by toxic substance 2)Legal and institutional framework for toxic substance pollution control 3)Standards for toxic substance pollution control 4)Food chemistry 5)Analytical chemistry 6)Instrumental analysis 7)Ecology 8)Toxicology 9)Food sanitation 10)Standard analytical method for toxic substance 11)Statistics 12)Interpretation of analyzed data

TRAINING CURRICULUM	PRACTICE	1)Sampling of water, soil, agricultural products, food, etc. for analysis 2)Pretreatment and preservation of samples 3)Analytical practice of standard and field samples - organochlorine pesticides (DDT, dieldrin, aldrin, endrin, chlordane, heptachlor; BHC, etc.) - organophosphrous pesticides (parathion, methyl-parathion, etc.) - others 4)Field case study of pesticides pollution - pesticides residue survey in environment (agricultural product, soil, environmental water, bottom sediments, groundwater, fish, animal, etc.) - analysis of the relationship between the amount of pesticides used and the environmental residue - evaluation of pesticides pollution
GOAL OF TRAINING		1)To get necessary knowledge of pesticides and their analysis 2)To get the technique of sampling, pretreatment and preservation of samples for pesticides residue analysis 3)To get analytical technique for pesticides used in Thailand 4)To get necessary know-how for pesticides pollution surveillance

B) Administrative Training Course

1) The administrative training is another important training activity of ERTC, in which administrative techniques and Know-how is expected to be transferred.

2) Two courses should be set up as administrative training courses. One is "Junior Official's Course" which is prepared for the junior official directly in charge of environmental problems in each field. The other is "Senior Official's Course" which is formed for the senior officials responsible for the decision-making in environmental problems and their related issues.

3) Table 4(2)-12 shows the outline of "Junior Official's Course". The power to form and implement the environmental policies and measures is at present scattered to various government agencies, each of which manages only a bid of them. That often results in the lack of coordination among relevant agencies and the officials in charge are apt to have a narrow view of things. In addition, as the environmental administration itself has a fairly short history in Thailand and the accumulation of experiences is not good enough, the effective and proper measures are not always taken to cope with the increasing environmental problems. Upon these situations, this course is prepared to offer junior officials in national government, municipalities or private sectors the opportunity to learn the necessary administrative tools through lectures and case study practices, which cover the state of environmental problems, legal and institutional framework for environmental protection, environmental standards, the implementation way of environmental policies and measures public relations, etc.

4) Table 4(2)-13 shows the outline of "Senior Official's Course". As is often the case with developing countries, the economic development is a primary concern in order to upgrade the standard of living in Thailand. Realizing the goal, it is inevitable to develop and utilize its own natural resources as well as to promote industrial development based on them. So Thailand has tried to accelerate the industrialization together with natural resources development. However, as natural resources also mean environmental resources, as inappropriate development of them not only

Table 4(2)-12: Administrative Training Course (Environmental Administration I

NAME OF COURSE		Environmental Administration I : Junior Official's Course
DURATION		4 weeks
FREQUENCY		3 times/year
CAPACITY		20 persons/time
TOTAL TRAINEE		60 persons/year
TARGET TRAINEE		Junior official engaged in the planning or implementation of environmental policy in national and local governments, companies, etc. or those who will be engaged in such a work and have bachelor's degree
TRAINING CURRICULUM	LECTURE	1)State and countermeasures of water pollution 2)State and countermeasures of air pollution 3)State and countermeasures of noise pollution 4)State and countermeasures of solid waste problems 5)State and countermeasures of toxic substance pollution 6)Legal and institutional system for environmental pollution control (environmental law, environmental policy, control standards, etc.) 7)Implementation of environmental policy and measures 8)Public relations for environmental protection 9)Environmental education 10)Environmental management planning 11)Industrial pollution control management 12)Emergency management in environmental pollution

TRAINING CURRICULUM	PRACTICE	1)Case study of environmental problems - To find out appropriate solution through group dynamics on the problems which trainees experienced in the process of implementation of the environmental policy and measure - field : water pollution, air pollution, noise pollution, solid waste and toxic substance 2)Practice of public relations - To find out effective way of public relations through making leaflet by which trainees try to let the public know the importance of environmental protection
GOAL OF TRAINING		1)To well understand the state of environmental problems 2)To well understand the legal and institutional system for environmental pollution control 3)To well understand the cause of environmental pollution 4)To get know-how to solve the problems in the process of implementation of environmental policy and measures 5)To get know-how for effective public relations of environmental protection

Table 4(2)-13 : Administrative Training Course (Environmental Administration II)

NAME OF COURSE		Environmental Administration II : Senior Official's Course
DURATION		2 weeks
FREQUENCY		3 times/year
CAPACITY		20 persons/time
TOTAL TRAINEE		60 persons/year
TARGET TRAINEE		Senior official responsible for decision-making in environmental administration or its closely related areas such as development planning and natural resources management
TRAINING CURRICULUM	LECTURE	1)State of environmental problems 2)Legal and institutional system for environmental pollution control (environmental law, environmental policy, control standards, etc.) 3)Agriculture and environment 4)Industrial development and environment 5)Mining and environment 6)Urbanization and environment 7)Environmental planning I - for the restoration of already polluted area 8)Environmental planning II - for the protection of non-polluted area 9)Appropriate natural resources management

TRAINING CURRICULUM	PRACTICE	1)Group dynamics I : environmental restoration planning - to pick up an already polluted area, investigate the cause, form a restoration plan and explore the feasibility of implementation 2)Group dynamics II : environmental management planning - to pick up the area which seems to be polluted in near future, elaborate on existing plans related with environmental pollution, form a comprehensive environmental management plan and explore the feasibility of implementation 3)Group dynamics III : integration of environmental policy into development - to re-evaluate the existing development plans and integrate environmental policy into the plans 4)Group dynamics IV : natural resources management - to explore the appropriate management of natural resources such as forest, soil and water
GOAL OF TRAINING		1)To understand the state of environmental problems 2)To understand the legal and institutional system for environmental pollution control 3)To understand the cause of environmental pollution 4)To get know-how to integrate environmental policy into development plans on the beginning stage so as to realize the sustainable development 5)To get know-how to form an environmental restoration plan 6)To get know-how of appropriate natural resources management

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results in the environmental deterioration but also makes it impossible to sustain the development. In addition, the industrial development accompanies the change of social structure, in which the urbanization is often observed. In the process of the urbanization, the city or community planning affects the environmental quality to a considerable degree. Thus, it is appropriate and effective to solve the environmental problem that the environmental protection measures should be considered at a planning stage of projects which seems to affect the environmental quality. Therefore, focusing on a senior officials responsible for the decision-making in the environmental administration and its closely related areas such as the development planning and natural resources management, this course offers the opportunity to learn the state of environmental problems, legal and institutional framework for environmental protection, development and environment, urbanization and environment, environmental planning method, natural resources management, etc. The trainees are expected to get the know-how to integrate environment policy into development policy at the planning stage through lectures and practices.

C) Other Training Course

1) Apart from both the technical and the administrative training courses which are fundamental and permanent activities of ERTC, other training courses should be temporarily set up to make most of the facilities and equipments of ERTC if the training demands are clearly identified. It is recommended that three courses should be at least prepared; "Environmental Impact Assessment", "Environmental Data Procession" and "Environmental Education".

2) Table 4(2)-14 shows the outline of "Environmental Impact Assessment" course. Environmental impact assessment system was created in 1975 by the the Improvement and Conservation of National Environmental Quality Act and was enforced in 1981. According to the rules, those who want to carry out the development project must submit an Initial Environmental Examination (IEE) or an Environmental Impact Statement (EIS) to ONEB for examination through relevant government agencies. Until now, more than thousand IEE or EIS have been submitted to ONEB for consideration. To ensure the sound implementation of environmental impact assessment

system, the assessment technique must be upgraded both in the formation side and in the examination side. Therefore, being those who prepare or examine IEE of EIS as target trainees, this course aims at providing them with the know-how to prepare or examine the IEE and EIS.

3) Table 4(2)-15 shows the outline of "Environmental Data Processing" course. While the environmental monitoring has been widely carried out in accordance with growing concern of environmental problems, the data have been accumulated for use. It can be said that the formation of appropriate environmental policies and measures depend to some degree upon the reliable and well processed data, However, the environmental data are not always made most use of due chiefly to the shortage of data processing techniques. Therefore, being the engineers, scientists or technicians in charge of environmental data processing as target trainees, this course aims at offering them the opportunity to learn the techniques and know-how to handle and process the environmental data including computer analysis techniques.

4) Table 4(2)-16 shows the outline of "Environmental Education" course. Environmental education is an important tool to get support and cooperation from the public in the environmental protection. Up to now, ONEB has executed various kinds of environmental education programs, most of which were focused on growing up the community leader of environmental education. Following these results, this course is expected to carry out the more intensive and systematized training to create the leader of environmental education in communities, schools and business societies.

D) Seminars and Workshops

1) Seminars, workshops and symposium should occasionally be held as one of the permanent activities of ERTC in order to promote the spread of the expertise on environmental protection and its related field widely. While training courses above mentioned, requiring rather long periods, are set up to provide small number of trainees with the expertise chiefly through practices such as laboratory exercises and case studies, these seminars and workshops should be short termed (usually less than one week) and provide larger number of participants with up to date knowledge, ideas and strategies through lectures and discussions.

2) These seminars and workshops should include not only national ones but also international ones in cooperation with relevant government agencies, foreign countries and international organizations.

Table 4(2)-14: Other Training Course (1)

NAME OF COURSE		Environmental Impact Assessment
DURATION		4 weeks
FREQUENCY		2 times/year
CAPACITY		15 persons/time
TOTAL TRAINEE		30 persons/year
TARGET TRAINEE		Engineer or scientist engaged in the formation or evaluation of environmental impact statement in national and local governments, universities, companies,etc. or those who will be engaged in such work and have bachelor's degree in environmental engineering or science or their related field
TRAINING CURRICULUM	LECTURE	1)State of the environmental problems 2)Legal and institutional system for environmental pollution control (environmental law, environmental policy, control standards, etc.) 3)Guidelines for preparation of initial environmental examination (IEE) 4)Guidelines for preparation of environmental impact statement (EIS) 5)Methodology for IEE and EIS 6)Evaluation of environmental resources - physical resources (air, water and land) - ecological resources (aquatic, terrestrial, etc.) - human use values (recreation, transportation, land use, etc.) 7)Organization of IEE and EIS

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TRAINING CURRICULUM	PRACTICE	1)Case study I : re-evaluation of existing IEE and EIS for; - agriculture and mining - communication and transportation - housing and public utility - industry - water resources 2)Case study II : preparation of IEE and EIS - to prepare IEE and EIS on given condition 3)Group dynamics - to study and evaluate IEE and EIS prepared in case study II
GOAL OF TRAINING		1)To understand the state of environmental problems 2)To understand the legal and institutional system for environmental pollution control 3)To understand the procedure of environmental impact assessment 4)To get know-how to prepare IEE and EIS 5)To get know-how to evaluate IEE and EIS

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Table 4(2)-15 : Other Training Course (II)

NAME OF COURSE		Environmental Data Processing
DURATION		2 weeks
FREQUENCY		2 times/year
CAPACITY		15 persons/time
TOTAL TRAINEE		30 persons/year
TARGET TRAINEE		Engineer, scientist or technician engaged in environmental data processing in national and local governments, universities, companies, etc. or those who will be engaged in such a work and have bachelor' degree in environmental engineering or science
TRAINING CURRICULUM	LECTURE	1)State of environmental problems 2)Legal and institutional framework for environmental pollution control 3)Objective of environmental data processing 4)Accuracy of environmental data 5)Theory of statistical analysis 6)Application of statistical analysis to environmental data processing 7)Introduction to personal computer 8)Introduction to computer language 9)Computer programming 10)Application of personal computer to environmental data processing

TRAINING CURRICULUM	PRACTICE	1)Practice I : data handling - to order raw data and make tables and figures 2)Practice II : introductory data analysis - to calculate representative statistical values 3)Computer I : operation - to learn how to operate a personal computer 4)Computer II : programming - to make an introductory program 5)Computer analysis I : data base 6)Computer analysis II : statistical analysis - correlation, regression and multi-regression analysis 7)Computer analysis III : computer graphic 8)Computer analysis IV : simulation - air or water pollution simulation modeling and calculation
GOAL OF TRAINING		1)To understand the state of environmental problems 2)To understand the objectives of environmental data processing 3)To understand the characteristics of environmental data 4)To learn the theory of statistics 5)To get the technique for the application of statistical way to environmental data processing 6)To get the technique to use personal a computer as a tool of environmental data processing

Table 4(2)-11 : Other Training Course (III)

NAME OF COURSE		Environmental Education
DURATION		1 weeks
FREQUENCY		3 times/year
CAPACITY		20 persons/time
TOTAL TRAINEE		60 persons/year
TARGET TRAINEE		Those who play a leading role of environmental education in communities, schools and business societies, for example, community leaders, teachers, monks, etc.
TRAINING CURRICULUM	LECTURE	1)State of the environmental pollution problems 2)Legal and institutional framework for environmental pollution control 3)Nature conservation 4)Human dependence on environment 5)Daily life and environment 6)Development and environment 7)Creation of better environment 8)Curriculum development for environmental education 9)Teaching method for environmental education 10)Field activity for environmental education

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TRAINING CURRICULUM	PRACTICE	1)Practice I : curriculum development - to make a leaflet as a teaching material for environmental education 2)Practice II : field study - to practice the way to hold a field activity for environmental education 3)Group dynamics - to try to find out better way of environmental education through the discussion on trainees experiences
GOAL OF TRAINING		1)To understand the state of environmental problems 2)To understand the legal and institutional framework for environmental pollution control 3)To understand the state of nature conservation 4)To understand the relationship between man and environment 5)To get the technique of curriculum development 6)To get know-how of teaching and field study for effective environmental education

Table 4(2)-17 Name List of Trainning Courses and number of training Anually Provided by ERTC

Name of Training Course	Month												No. of Trainee
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1. Water Pollution I	8 weeks												40
2. Water Pollution II			8 weeks										20
3. Water Pollution III		4 weeks											45
4. Air Pollution I	8 weeks												40
5. Air Pollution II	8 weeks												40
6. Air Pollution III		4 weeks											45
7. Noise Pollution					4 weeks								20
8. Solid Waste I	4 weeks												20
9. Solid Waste II		6 weeks											45
10. Toxic Substance I	8 weeks												30
11. Toxic Substance II			8 weeks										30
12. Environmental Admin. I		4 weeks											60

Table 4(2)-11 continue

Name of Training Course	Month												No. of Trainee
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
13. Environmental Admin.	2 weeks												60
14. Environmental Impact Assessment	4 weeks												30
15. Environmental Data Processing			2 weeks										30
16. Environmental Education	1 weeks												60
												Total number of trainees	615

g) Expected number of training courses and trainees annually

Sixteen courses will be provided and the expected trainees will be at least 555 trainees per year as shown in table

h) Qualification and number of trainers

The trainers will come from the training staffs of ERTC who are well-trained in each field from Japan and through JICA experts in Thailand. In one particular topics, trainers will be invited from different research institutes, universities and other government agencies within Thailand and Japan other government agencies within Thailand and Japan. The number of permanent trainers should be at least 20.

i) Necessary Facilities and Equipments

(1) Necessary Facilities for Training Program

To carry out the Environmental Training Programs, the following buildings and facilities are requested.

Table 4(2)-13 shows the outline of Training Building, This building, a main building in ERTC, is for the use of Training Division, Administrative Section and Information Section. It is estimated to be more than 4,500 square meters. The rooms for training use involve "Lecture Room" for the lectures of each training course, "Seminar Room" for the seminars, workshops or symposium, "Meeting Room" for the group dynamics, "Practice Room A" for the reports or figures making, "Practice Room B" for the technical training practices of water pollution, air pollution, noise pollution, solid wastes and toxic substances, "Personal Computer Room" for the data processing practices and "Audio Visual Room". Other rooms involve "Administrative Section Room", "Information Section Room", "Planning Section Room", "Management Section Room", "Instructor Room", "Director-General Room", "Deputy Director-General Room", "Training Division Director Room", "JICA Team Leader Room", "JICA Expert Room", "Guest Room", "Medical Treatment Room", as well as "Library" for whole ERTC.

Table 4(2)-14 shows the outline of Welfare Building, estimated to

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be more than 300 square meters, provides the welfare to the staff members of ERTC and trainees, comprising of Cafeteria and Common room.

Table 4(2)-20 shows the outline of Dormitory, estimated to be more than 1,200 square meters, consists of "Training Room" for the accommodation of trainees and "Guest Room" for the accommodation of invited lecturers, researchers and guests.

In relation to the buildings, the following facilities are recommended to be prepared for the activities of ERTC: for example air conditions, telephones, desks and chairs, books, tennis courts, basketball courts and swimming pool.

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Table 4(2)-19: Outline of Training Building

No	TYPE OF ROOM	NO. OF ROOM	SIZE OF ROOM (PERSON)	REMARKS
1	Lecture room	7	20-30	-for lecture of each training course.
2	Seminar room	1	200	-for seminar, workshop or symposium with necessary devices
3	Meeting room	3	20-30	-for case study discussion or group dynamics
4	Practice room A	3	20-30	-for report, table or figure making
5	Practice room B	6	20	-for technical practice. common equipment room(1), water pollution practice room(1), air pollution practice room(1), noise pollution practice room(1), solid waste practice room(1) and toxic substance practice room. with necessary devices for technical training
6	Personal computer room	1	15	-for data processing practice. with 15 personal computers
7	Audio visual room	1	50	-with necessary audio visual devices
8	Library	1	100	-library of this Center
9	Administrative room	4	5-10	-Administrative Section(1), Information Section(1), Planning Section(1), Management Section(1)
10	Instructor room	1	10	-for instructors of training
11	Director-Gen room	1	1	
12	Deputy Dir-Gen room	1	1	
13	Training Division Director room	1	1	
14	JICA Team Leader room	1	1	
15	JICA Expert room	6	1	
16	Guest room	1	10	
16	Medical treatment room	1	5	