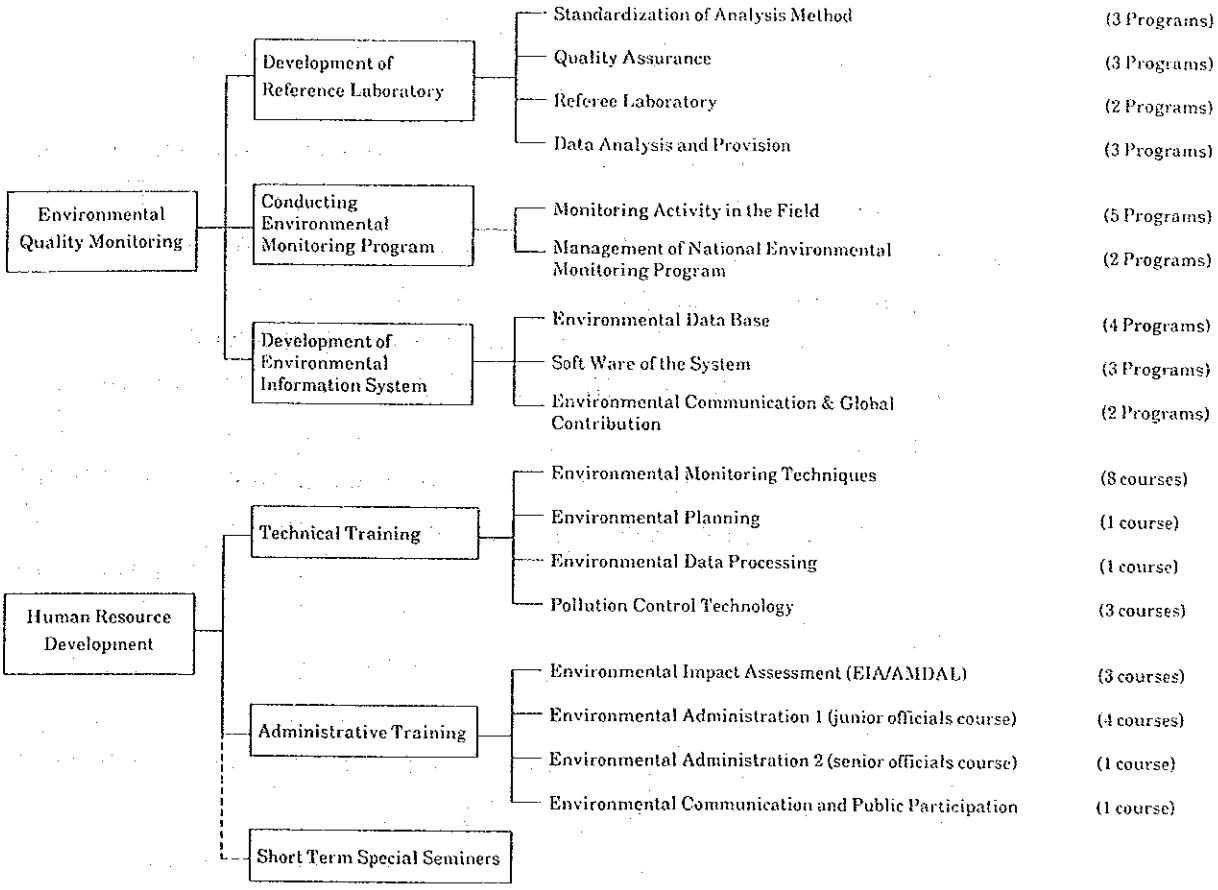
3-3-2 Activities Plan

Activities in the EMC are classified into environmental quality monitoring activities and human resources development activities. Specific activities are described below.



(1) Environmental quality monitoring activities

Environmental quality monitoring activities are aimed at understanding current conditions in four areas of environmental pollution (water pollution, air pollution, noise and vibration, and toxic substances), identifying pollution sources, and establishing the EMC as the center of the national environmental quality monitoring network for directly contributing to national environmental administration including the enforcement and revision of environmental standards and measures for environmental pollution control. For these purposes, practical research activities are

planned in the EMC, which will be given the roles of establishing standardized measuring methods, giving guidance in environmental monitoring, and building an environmental quality information system.

1) Establishing standardized measuring methods
(reference laboratory)

① Objectives are mentioned below.

- Selection and confirmation of analysis methods applicable to all samples and analysis items
- Accuracy management to promote technological improvement and program development for research and development
- Provision of reliable data pertaining to specific projects
- Reference facilities for different or contradictory data obtained at more than one institution
- Supporting pilot studies for examining new or improved methods for environmental analysis and waste treatment
- Research activities for identifying causes and effects of environmental pollution
- Guidance in specific testing conducted by other measuring institutions
- Provision of technical evidence regarding sampling, analysis procedures, and data interpretation

② Outline of major programs

Major programs are classified into four categories as mentioned below. For activity plans and targets of activities in these programs, see Table 3-3-1.

<Standardization of analysis methods>
Regarding sampling and measuring methods developed both in Indonesia and in foreign nations, accuracy is examined by using reference substances and analysis equipment such as an atomic absorption analyzer. Sampling and measuring methods will be standardized on a national basis, with technical levels of Indonesian people and analysis equipment possessed by them being taken into

consideration. If these methods are insufficient in accuracy or difficult to carry out, or if equipment possessed by the environment-related institutions are changed, the standard sampling and analyzing methods will be improved or more accurate methods will be developed to improve standardized analysis methods.

<Accuracy management>
Accuracy of data provided by national institutions is ascertained, and procedures and systems are studied for accuracy management of data obtained every day. Research will be done regarding methods for preparing standard materials which provide reference for determining and improving accuracy of data collected in institutions. Research will also be done regarding the development of standard analysis equipment and experiment facilities. Through distributing reference materials prepared in the EMC among the institutions concerned and charging measurement to them, accuracy is ensured for daily data, and guidance and supervision are carried out to improve accuracy. If data differ from institution to institution, they are compared with analysis results obtained from the same sample by using standard analysis equipment in the EMC. The EMC thereby determines the accuracy of analysis.

<Research and development>
When new methods for environmental pollution control or new chemical substances are developed, research is to be done to develop methods for measuring very small quantities of pollutants discharged into the environment. Methods will also be developed to measure substances which may pollute the environment in the future.

<Analysis and provision of data>
Analysis is to be made on levels of concentrations of pollutants at the monitoring points, pollution distribution, and characteristics of pollution by synthesizing geographical data including topographic and geological information. These data will be provided to the institutions concerned and presented in research papers, and thereby assist in formulating policies for environmental management.

2) Guidance in environmental quality monitoring

① Objectives are as follows

- Establishing a national monitoring network
- Ascertaining causes and effects of environmental pollution
- Ensuring accuracy concerning monitoring methodology

② Outline of major programs

Major programs are classified into two categories as mentioned below.
For activity plans and targets of activities in these programs, see Table 3-3-2.

<On-the-spot monitoring activities>
This is the first time that Indonesia has used Automatic Measuring Equipment for continuous air monitoring. Consequently, from now on they will begin the pioneering work of collecting data with the aim of establishing a nationwide monitoring system from fixed measurement points.

The following three points are essential to the establishment of a nationwide monitoring network :
- Confirmation of the analytical accuracy of Automatic Measuring Equipment,understanding of the various characteristics of analytical data
- Understanding of important matters regarding maintenance management.
- Aquisition by the staff of BAPEDAL & EMC of specialist knowledge regarding Automatic Measurement Equipment.

In Indonesia, monitoring spots are extremely limited, but at certain representative spots, ongoing accumulation of continuously monitored air pollution data will begin.
From now on, in order to monitor changes in the long term condition of air pollution, the pioneering work in the supply of valuable information can be done.

On the other hand, mobile monitoring of the environment will be established, so that when local pollution problems arise, special research projects in specific regions to monitor the condition of the environment can be conducted.
In this way, we anticipate that that this system will be useful in understanding and solving local pollution problems, and in forming new planning policies.

3) Establishment of environmental information systems

① Targets of activities are as follows

- Collecting information from the relevant departments and bureaus of the provincial governments and international agencies
- Management of environmental monitoring data from every corner of the country

② Outline of major programs

Major programs are classified into the following three categories. For activity plans and targets of these programs, see Table 3-3-3

<Environmental data bases>
Monitoring data on air and water quality are provided by the EMC and other environment-related institutions. Other data include registers in which kinds of pollutants, quantities of pollutants discharged, and operating conditions of major facilities emitting pollutants are entered. Other information to be obtained includes geographical information such as weather, topography, and geology of the measuring points, and socioeconomic information such as population and industrial activities. Comprehensive environmental data bases are to be established in this manner and they provide the basis for understanding the conditions of environmental pollution in Indonesia and identifying the causes of pollution.

<System software>
Data will be analyzed on computers by using these data bases. Software for statistical analysis will be developed for knowing pollution levels and regional or seasonal characteristics of pollution. Simulation models will be developed for pollution forecasts and analysis of pollution distribution. Image processing programs will be developed to display analysis results clearly and visually.

<Communications pertaining to environment and their global contribution>
Data will be computer-analyzed by using the data bases and these programs. Plain environmental information is to be available to citizens, and a consequent increase in their consciousness of environmental protection will result in their broad-based participation in environmental pollution control.The EMC is to play an important role in the environmental monitoring network by managing and working it and promoting the centralization of environmental data bases.

③ Environmental information system plan

The EMC environmental information system is as follows.

<Roles of the environmental information system>
Environmental administration in Indonesia is independently carried out by ministries, and monitoring systems have yet to be established. It is an important task to establish environmental monitoring techniques and a monitoring network, and to improve accuracy of monitoring data and measuring techniques through activities in the EMC. In parallel with this task, it is necessary to make environmental data bases into which environmental data obtained from ministries and agencies and socioeconomic information such as geographical information, vital and industrial statistics, and development plans are incorporated. It is important to analyze and evaluate various pieces of information in these data bases and reflect the results in environmental administration.

The following things are necessary for these purposes.

a) Unification and expansion of environmental data bases
b) Development of analysis software for knowing conditions of environmental pollution and its characteristics
c) Establishment of a system to provide environmental information to ministries and agencies

<Information to be dealt with>
Effective operation of the EMC information system requires data and information mentioned below.

Information collected to EMC Environmental Information System

Classification	Content of Information	Source
Environmental Monitoring Data	Water Quality, Air Quality, Noise and Vibration Level, Toxic Substance Pollution, Soil Pollution etc.	EMC, Other Government Authorities
Emission Source Data	Factory or Plant Name, Industrial Sector, Products, Classification of Emission Facilities and Pollution Load Generation of Emitted Pollutants.Operation Gondition of Each Facility etc.	EMC, Other Government Authorities
Geographcal and Geological Data	Geographcal Features (Altitude, Topographical Classification etc),Geology , Meteorological Data(Rainfall, Wind etc.), Hydrologic Data(River Water Volume, Ocean Current etc.)	Mainly from Other Government Authorities
Socio-Economic Information	Population, Land Usage, Industries, Water Usage, Movement of waste etc.	Other Government Authorities
Information supporting to EMC Activities	Literature & Libraries (Inside, Domestic, Overseas), Certificates of Analysis, Information of Training Activities of EMC.	EMC, Publishers

<Organization of the system>
Since it is not efficient to deal with information in a central processing unit, subsystems are established as follows to meet individual proposes.

a) Environmental information management system
   - Information source management and search subsystem
   - Environmental pollution analysis and assessment subsystem

b) Data base management system
   - Water quality and hazardous substances subsystem
   - Air monitoring subsystemAir, noise and vibration subsystem
   - Relevant information management subsystem
   - Geographical information management subsystem

<Outline of the system>

a) Environmental information management system

A central processing unit is to be introduced to manage and search data and information and establish data bases. Information may be received from relevant ministries and agencies by means of

- Books and reports,
- Magnetic tapes, and
- Floppy disks (3.5", 5").

To deal with these media, magnetic tape units and disk driving units are to be installed. Through a simplified LAN, personal computers are to be connected with the central processing unit, which is used to develop statistical analysis methods, and analyze and evaluate data.

b) Data base management system

In each of the subsystems of the data base management system, personal computers are introduced to prepare data bases. Each subsystem is to be constructed so as to find classified totals and

equipped with a printer. The geographical information management system is equipped with a digitizer, an image processor, and an X-Y plotter, to input and output maps of the whole country.

Outline of the system on research and training are showen on Fig. 3-3-2 and Fig. 3-3-3.

<Software>

Regarding software, only operating systems (OS) and basic application programs are to be introduced. Programs for pollution forecasts and statistical analysis are to be developed in activities in the EMC or during project-type technical cooperation, since necessary kinds of programs greatly depend on contents of these activities. Software which are planned to be introduced includes the following.

- Operating systems
- Data base management system
- Geographical information systems
- Totaling programs for air monitoring

<Amount of data>

The amount of data after opening the EMC is estimated as follows ;

Data Volume of Environmental Information System After Five Years from Installation of EMC

Environmental Sectors	No. of Area	No. of Monitoring Point (points/Year)	Monitoring Frequency (Per Year)	Items	Data Volume Predicted (Data/Year)
1. Prokasih	36	20	12	40	345,600
2. Underground Water	36	10	6	40	86,400
3. Sea Water	14	10	3	40	16,800
4. Lake & Marshes Water	14	20	3	40	33,600
5. Air Quality					
Manual Monitoring	36	5	12	9	19,440
Automatic Monitoring	-	3	8,760	9	236,520
Others	-	16	12	9	1,728
6. Emission Source					
Waste Water	36	100	4	30	432,000
Exhaust Gas	36	20	4	20	57,600
Grand Total					1,229,688

Data Volume Predicted per Year : About 1,500,000

<Necessary memory volume>

Necessary memory volume is estimated as follows ;

- Monitoring data		1,500,000
Necessary bit volume Sub-total : 1,500,000×20bit		30,000,000
		(30MB)
- Emission source inventory		
Water Pollution Facilities	3,600 Facilities 50 items	180,000
Air Pollution Facilities	720 Facilities 40 items	28,800
Other Facilities		100,000
- Socio-economic data		200,000
- Geographical & geological data		500,000
- Others		1,000,000
	Total About	2,000,000
Necessary bit volume Sub-total : 2,000,000×30bit		60,000,000
		(60MB)

Yearly Total of Necessary bit for preservation of date

About 100 MB

Estimation of Necessary Bit Volume ;

It is necessary to accumulate the 5 years data for the Magnetic Disk Device, and the necessary memory volume of Magnetic Disk Device for 5 years is estimated as follows.

Data Base (100 MB/year×5 years)	500MB
Softwares	500MB
Others (OS System area, Operation Record etc.)	200MB
	1,200MB

(1.2 GB = 1.2×10^9B)

Fig. 3-3-2. Information System in EMC

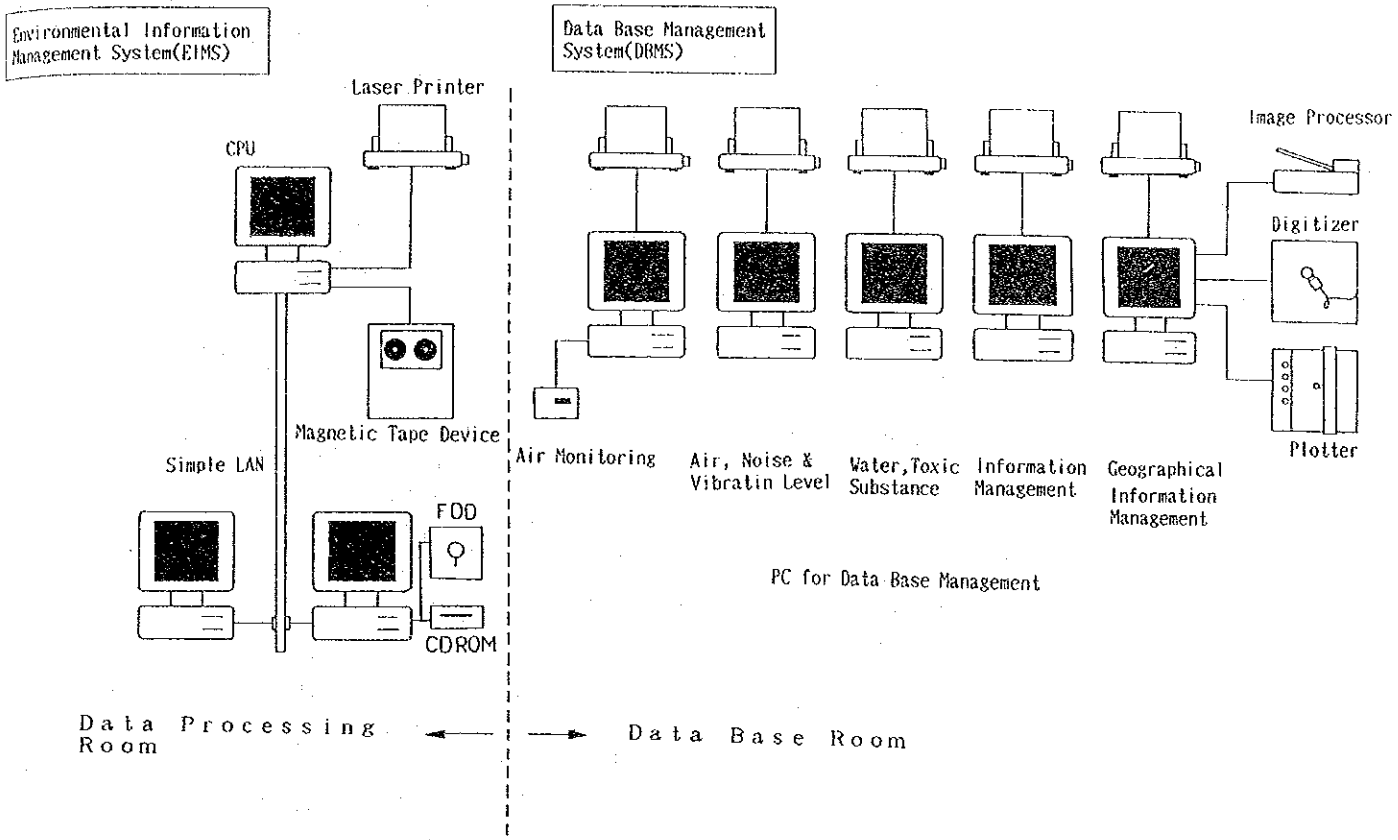


Fig. 3-3-3. Computer Training System in EMC

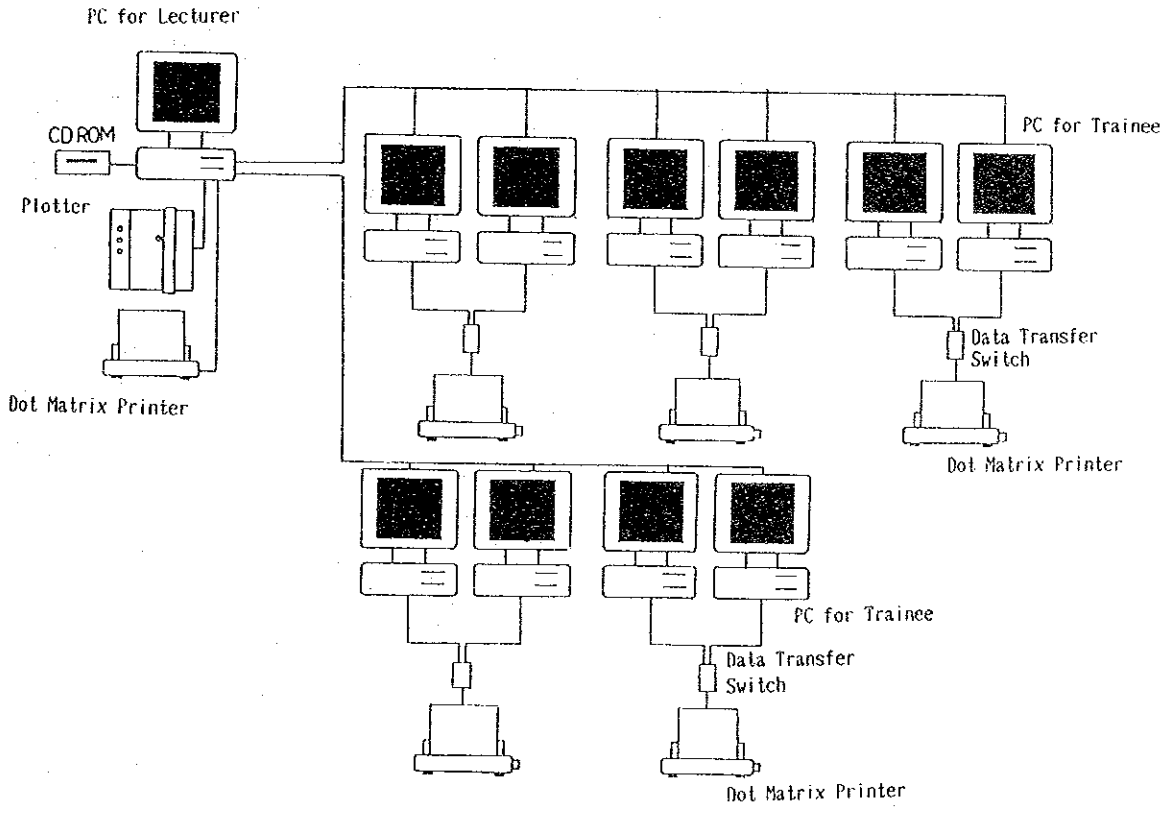


Table 3-3-1. Major Program and Parameters of Activities in Reference Laboratory Section

Item	Major Program	Parameters	Principal Equipment	Time Schedule: First Year	Second Year	Third Year	Fourth Year	Fifth Year
1. Standardization of Analysis Method	- Standardization of methods commonly in use (Water Quality, Air Quality, Hazardous and Toxic Substance, Noise and Vibration) - Development of new or improved method of analysis as required - Development of sampling procedures and equipment	Air Quality Ambient Air : SO2, CO, NOx, H_2S, NH_3, O_3, HC, TPM, Pb Emission Sauce : SO_2, CO, NO_X, H_2S, Heavy Metals, Methylmercaptan, H_2SO_4,NH_3,Halogen (Cl, F), Smoke Water Quality pH, SS, Dissolved Residue, Hardness, SS, CN, S, F, Cl, SO_4, NH3-N, NO_3-N, NO_2-N, $KMnO_4$ Valve, Methyleve Blue Active Substance, Phenol, Oil & Fats, Chloroform Carbon Extract, PCB, Coliform Group, Microorganism, DO, BOD, COD, Pesticides, Residual Chlorine, PO_4, Heavy Metals Toxic Substances CN, Toxic Heavy Metals, Pesticides, PCB	- Gas Chromatograph - Atomic Absorption - Spectrophotometer - Sectrophotometer - Automatic So_2 Analyzer - Stack Sampler - Computer					
2. Quality Assurance	- Development of a QA programs - Interlab studies to support a QA Program - Development of Standard Reference Materials (SRM)		- X-ray Fluorescence Analyzer - High Accuracy Type pH Meter - Standard Gas Generator - Standard Gas - Computer					
3. Referee Laboratory	- Acting as a referee laboratory - Providing expert testimony regarding sampling or analysis procedures		- Gas Chromatograph - Scanning Electron Analyzer - Automatic So_2 Analyzer - Blender - Milling Machine					
4. Data Analysis and Provision	- Analysis of environmental data including geographical information - Provision of resource for data management including statistical evaluation of results - Publishing study reports		- Computer - Information System Equipment					

Table 3-3-2. Major Program and Parameters of Activities for Environmental Monitoring Program

Item	Major Program	Parameters	Principal Equipment	Time Schedule				
				First Year	Second Year	Third Year	Fourth Year	Fifth Year
1. Monitoring Activity in the Field	- Monitoring at the fixed points - Monitoring of cause and effect relationship in necessary cases - Preliminary survey to establish new environmental programs - Monitoring to evaluate the effectiveness of environmental practices - Monitoring to study the mechanism of environment	Same Parameters as Reference Laboratory	- Common Analytical Instruments - Gas Chromatograph - Water Sampler - Stack Sampler - Portable Water Quality Analyzer - Portable Air Analyzer - Computer					
2. Management of National Environmental monitoring Program	- Development of the framework of national environmental monitoring network - Coordination of government institutions to carry out the nation wide environmental monitoring program	Ditto	- Computer - Information System Equipment					

Table 3-3-3. Major Program and Object of Activities in Environmental Information Section

Item	Major Program	Object	Principal Equipment	Time Schedule				
				First Year	Second Year	Third Year	Fourth Year	Fifth Year
1. Environmental Data Base	- Ambient quality (quality of rivers, lakes, air in major cities, etc.) - Effluent/Emission inventory - Geographical and geological data - Socio-economic data	- Support for carrying out of AMDAL, PIL and so on - Support for Environmental Management plans such as PROKASIH - Support for Environmental Education - Presentation of Data and Materials for stimulating Environmental Pollution Research to Researchers	- Computer - Information System Equipment					
2. Soft Ware of the System	- Statistical analysis - Computer simulation modeling - Computer mapping and graphics							
3. Environmental Communication & Global Contribution	- Providing environmental information to raise public awareness and participation - Acting as a national focal point of regional and international environmental information network							

(2) Human resources development activities

Human resources development activities consist of Technical training and Administrative training aimed at environmental conservation. Comprehensive training is planned to be provided for researchers, engineers, and administrative staffs of relevant administrative agencies and personnel of private corporations, those who actually deal with environmental problems.
The following courses are offered.

1) Technical training

Thirteen courses are planned in four categories of technical training, namely, Environmental monitoring techniques, Environmental planning, Environmental data processing, and for Pollution control technology. It is planned that 340 participants will receive training annually.

① Environmental Monitoring Techniques

a. Water Quality Monitoring Junior Course
Capacity 10 person / Duration 6 weeks / Frequency 4 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who are in charge of water quality monitoring practice in central and local governments, universities, private sectors or those who will be in charge of water quality monitoring practices	- to get necessary knowledge of water quality monitoring and analysis - to get sampling technique both ambient sample and effluent sample - to get the technique for pretreatment and preservation of water sample - to get the technique of manual or automatic analysis for basic water quality parameters, for example ; pH, BOD, COD, DO, SS, N, P, coliform - to get monitoring techniques of meteorological and hydrologic parameters - to get basic technique to handle and evaluate water quality monitoring data	- chemistry of water quality analysis - biology for water pollution - present status of environment - legal and institutional frameworks - sampling procedure - anaytical procedure - data handling and interpretation of monitoring data - impact of environmental pollution to human health and ecosystem	- sampling practice (environmental water and effluent) - pretreatment and preservation of sample - analysis practice - data handling and evaluation

b. Water Quality Monitoring Senior Course

Capacity 10 person / Duration 8 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who finished "Water Quality Monitoring Junior Course" or who are admitted to have an equal or higher qualification	- to get advanced knowledge of water quality monitoring and analysis - to get advanced analytical technique for various water quality parameters by spectrophotometer, gas chromatograph, atomic absorption, etc. - to get the technique for sampling, pretreatment, analysis of bottom sediments - to get the technique for classification of microorganisms - to get advanced technique to handle and evaluate water quality monitoring data	- advanced chemistry of water quality analysis - advance biology for water pollution - present status of environment - legal and institutional frameworks - surveilance method for water pollution - sampling and pretreatment method of sediments - instrumental analytical procedure - industrial chemistry - data analysis and interpretation of various monitoring data - impact of environmental pollution to human health and ecosystem	- sampling practice (bottom sediment and environmental water) - pretreatment and preservation of bottom sediments - analysis practice using spectrophotometer, gas chromatograph, atomic absorption, etc. - analysis practice of sediments sample - identification of microorganism in water - data analysis and evaluation

c. Air Quality Monitoring Ambient

Capacity 10 person / Duration 8 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who are in charge of ambient air quality monitoring practice in central and local governments, universities, private sectors or those who will be in charge of ambient air quality monitoring practices	- to get necessary knowledge of air quality monitoring and analysis - to get sampling technique of ambient air - to get the analytical technique of air pollutants - to get the technique of operation, calibration, and maintenance of automatic air quality monitor - to get monitoring techniques of meteorological parameters - to get basic technique to handle and evaluate air quality monitoring data	- chemistry of air quality analysis - present state of air pollution - legal and institutional frameworks - sampling procedure - analytical procedure - automatic air quality monitor - basic theory of air pollution mechanism - survailance method of air pollution - data handling and interpretation of monitoring data - impact of air pollution to human health, etc. - climate & meteorological	- sampling practice(gas-liquid, gas-gas, dust) - monitoring practice of meteorological parameters - analysis practice (gas-liquid, gas-gas, dust) - air pollution monitoring by automatic air quality monitor - data handling and evaluation

d. Air quality monitoring exhaust gas monitoring

Capacity 10 person / Duration 8 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who are in charge of exhaust gas monitoring practice in central and local governments, universities, private sectors or those who will be in charge of ambient air quality monitoring practices	- to get necessary knowledge of exhaust gas monitoring and analysis - to get sampling technique of industrial and automobile exhaust gas - to get the analytical technique of industrial and automobile exhaust gas - to get the technique of fuel contents analysis - to get the technique of operation, calibration and maintenance of automatic exhaust gas monitor - to be basic technique to handle and evaluate exhaust gas monitoring data	- industrial chemistry for exhaust gas analysis - present state of air pollution - legal and institutional frameworks - sampling and analytical procedure - automatic exhaust gas monitor - basic theory of air pollution mechanism - fuel and combustion engineering - analytical method of fuel contents (S, N, Pb, etc.) - data handling and interpretation of monitoring data - introduction of exhaust gas treatment technology - impact of air pollution to human health, etc. - climate & meteorological	- sampling practice of industrial emission gas (including flow rate measurement) - analysis practice of industrial emission gas - monitoring of industrial emission gas by automatic monitor - analysis practice of fuel contents - monitoring of automobile exhaust gas by automatic monitor - measurement of emission load from automobile according to running mode - calibration and maintenance of automatic monitor - data handling and evaluation

e. Hazardous & Toxic Substance Monitoring (Pesticide)

Capacity 10 person / Duration 8 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who are in charge of hazardous or toxic substance monitoring practice in central and local governments, universities, private sectors and those who will be in charge of hazardous or toxic substance monitoring practices	- to get necessary knowledge of pesticides monitoring - to get sampling technique of pesticides - to get the technique of pretreatment and preservation of samples for pesticide analysis - to get the analytical technique of samples for pesticides - to get basic technique to handle and evaluate pesticide monitoring data	- pesticide chemistry - state of the pollution by pesticides - legal and institutional frameworks - sampling procedure - analytical procedure - toxicology - data handling and interpretation of analysed data - emergency response	- sampling practice (water, soil, products, fish, etc.) - analysis practice (including pretreatment and preservation of the sample) - data handling and evaluation - field case study

f. Hazardous & Toxic Substance Monitoring (Other than pesticides)
Capacity 10 person / Duration 8 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who are in charge of hazardous or toxic substance monitoring practice in central and local governments,universities, private sectors and those who will be in charge of hazardous or toxic substance monitoring practices	- to get necessary knowledge of hazardous or toxic substance monitoring - to get sampling technique of hazardous or toxic substances - to get the technique of pretreatment and preservation of samples for hazardous or toxic substances analysis - to get the analytical technique of samples for hazardous or toxic substances - to get basic technique to handle and evaluate hazardous or toxic substance monitoring data	- toxic chemistry - state of the pollution by toxic substances - legal and institutional frameworks - sampling procedure - analytical procedure - toxicology - data handling and interpretation of analysed data - emergency response - meteorological & climate - geological aspects	- sampling practice (water, soil, fish, etc.) - analysis practice (including pretreatment and preservation of the sample) - data handling and evaluation - field case study

g Soil Quality
Capacity 10 person / Duration 4 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who are in charge of noise or vibration monitoring practice in central and local governments, universities, private sectors and those who will be in charge of noise or vibration monitoring practices	- to get necessary knowledge of soil monitoring and analysis - to get sampling technique of soil sample - to get the technique of pretreatment and preservation of samples for soil quality analysis - to get the analytical technique of soil samples - to get basic technique to handle and evaluate soil quality monitoring data	- soil chemistry - basic soil biology - state of the soil pollution - legal and institutional frameworks - sampling procedure - analytical procedure - basic theory of soil pollution mechanism - toxicology - data handling and interpretation of analysed data	- sampling practice - sampling practice (including pretreatment and preservation of the sample) - data handling and evaluation - field case study

h. Noise and Vibration Monitoring

Capacity 10 person / Duration 4 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Researchers, technicians or engineers who are in charge of noise or vibration monitoring practice in central and local governments, universities, private sectors and those who will be in charge of noise or vibration monitoring practices	- to get necessary knowledge of noise and vibration monitoring and analysis - to be the technique of ambient noise and vibration level monitoring - to get the technique of source noise and vibration level monitoring - to get the technique of operation, calibration, and maintenance of sound level meter and vibration level meter - to get the technique to handle and evaluate noise level and vibration level	- physics on noise and vibration - present status of noise and vibration pollution - legal and institutional frameworks - monitoring procedure for noise - monitoring procedure for vibration - noise source and vibration source - untroduction to noise prevention technology - data handling and interpretation of monitoring data - impact of environmental pollution to human health	- monitoring practice of noise and vibration - monitoring practice of source noise (industry, automobile) - monitoring practice of source vibration (industry, automobile) - data handling and evaluation - field case study

② Environmental Planning

Capacity 10 person / Duration 4 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Environmental officials who are in charge of policy and program development in central and local governments and those who will be in charge of environmental planning	- to get necessary knowledge of environmental planning - to get necessary knowledge of strategic planning process - to get necessary knowledge of implementation and evaluation of the plan	- methodology of environmental planning - theory of decision making - strategic planning - present status of environment - legal and institutional frameworks - impact of environmental pollution to human health and ecosystem	- case study of planning process - case study of evaluation process

③ Environmental Data Processing

Capacity 10 person / Duration 4 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Environmental officials who are in charge of environmental data processing in central and local governments and those who will be in charge of environmental data processing	- to understand the characteristics of environmental data - to get basic knowledge of statistics - to get the technique to use personal computer as a tool of data processing - to get the technique to use basic application softwares	- present status of environment - theory and application of statistical analysis - computer programming - introduction of application softwares	- data handling - programming - data base management - diffusion modeling - geographycal information system

④ Pollution Control Technology

a. Waste Water Treatment

Capacity 15 person / Duration 4 weeks / Frequency 4 times a year

Target Trainee	Goal of Training	Lecture	Practice
Environmental officials in central and local governments who are in charge of development and enforcement of environmental standards, and researchers or engineers in universities, private sectors who are in charge of design and operation of pollution control facilities and those who will be in charge of these jobs	to get necessary knowledge of : - environmental pollutants and their sources - theory of treatment technology - design and operation - emergency response	- legal and institutional frameworks - present status of water pollution - impact of water pollution to human health and ecosystem - pollutants and their production process as their sources - theory of treatment technology - operation and maintenance - emergency response	- planning and basic design of the facility (industrial waste water and domestic waste water) - operational practice by model plants (coaguration, pH adjustment, activated sludge, anaerobic digestion, etc.) - analytical practice of indicator parameters for the operation of the treatment facilities - field case study

b. Pollution Control Technology (exhaust gas treatment)
Capacity 15 person / Duration 4 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Environmental officials in central and local governments who are in charge of development and enforcement of environmental standards, and researchers or engineers in universities, private sectors who are in charge of design and operation of pollution control facilities and those who will be in charge of these jobs	to get necessary knowledge of: - environmental pollutants and their sources - theory of treatment technology - design and operation - emergency response	- present state of air pollution - legal and institutional frameworks - pollutants and their production process at sources - basic theory of air pollution mechanism - fuel and combustion engineering - exhaust gas treatment technology - automobile engineering - operation and maintenance of exhaust gas treatment technology - impact of air pollution to human health, etc.	- Operational practice by model plants (chose of fuel, combustion control, exhaust gas treatment, etc.) - operational practice of toxic gas treatment (clolide, fluoride, etc.) - analytical practice of indicator parameter for the operation of exhaust gas treatment facility - field case study

c. Hazardous Waste Treatment
Capacity 15 person / Duration 4 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Environmental officials in central and local governments who are in charge of development and enforcement of environmental standards, and researchers or engineers in universities, private sectors who are in charge of design and operation for pollution control facilities and those who will be in charge of these jobs	to get necessary knowledge of: - environmental pollutants an their sources - theory of treatment and disposal technology - evaluating the risk of waste disposal	- legal and institutional frameworks - present status of industrial and domestic waste discharge - hazardous pollutants and their souces - treatment and disposal of hazardous waste - sampling and analysing method of hazardous pollutant in waste - impact of environmental pollution to human health and ecosystem - risk management in waste disposal - geological aspects	- sampling and analysing practice of hazardous pollutants in waste - case study of risk evaluation of waste disposal, etc. - planning and basic design of the treatment and disposal facility

2) Administrative Training Course

① Environmental Impact Assessment (AMDAL)
Capacity 20 person / Duration 4 weeks / Frequency 4 times a year

Target Trainee	Goal of Training	Lecture	Practice
Environmental officials who are in charge of implementation of AMDAL in central and local governments, and researchers or engineers in universities, or private sectors who are involved in AMDAL study and those who will be in charge of these jobs	to get necessary knowledge of : - legal and institutional framework of AMDAL and other environmental management programs - methodologies of EIA - compiling AMDAL report - evaluation of AMDAL report	- legal and institutional frameworks of AMDAL and other legislation - present status of environment - impact of environmental pollution to human health and ecosystem - methodologies of EIA - compiling AMDALreport - evaluation of AMDAL report	- case study of compiling AMDAL report - case study of evaluation of AMDAL report

② Environmental Administration 1

a. Water Pollution Control Junior Official's Course
Capacity 20 person / Duration 4 weeks / Frequency 4 times a year

b. Air Pollution Control Junior Official 's Course
Capacity 20 person / Duration 4 weeks / Frequency 4 times a year

c. Hazardous Waste Management Junior Official's Course
Capacity 20 person / Duration 4 weeks / Frequency 2 times a year

d. Small Scale Industry Management Junior Official's Course
Capacity 20 person / Duration 4 weeks / Frequency 2 times a year

Target Trainee	Goal of Training	Lecture	Practice
Junior environmental officials who are in charge of planning and enforcement of pollution control programs in central and local governments and who will be in charge of these jobs	to get necessary knowledge of : - legal and institutional framework of pollution control programs - pollutants and their emission sources - enforcement of environmental legislations - approach to solve environmental problems	- legal and institutional frameworks of pollution control programs - present status of environment - impact of environmental pollution to human health and ecosystem - inspection of the industries - emergency response	- case study of approach toward suitable solution - case study of communication with industry and the public

③ Environmental Administration 2 : Senior Official's Course
Capacity 20 person / Duration 2 weeks / Frequency 4 times a year

Target Trainee	Goal of Training	Lecture	Practice
Senior environmental officials who are in charge of decision making in environmental affairs in central and local governments and those who will be senior officials	to get necessary knowledge of -environmental policy development and its background - decision making process - approach to solve environmental problems	- environmental policy and sustainable development - present status of environment including global environment - impact of environmental pollution to human health and ecosystem - decision making process	- case study of approach toward suitable solution - case study of communication with industry and the public

④ Environmental Communication and Public Participation
Capacity 20 person / Duration 2 weeks / Frequency 4 times a year

Target Trainee	Goal of Training	Lecture	Practice
Environmental officials who are in charge of community participation program or its relating field in central and local governments, leaders of NGOs and school teachers and those who will in charge of these jobs	to get necessary knowledge of -environmental communication - environmental education - public participation	- present status of environment - impact of environmental pollution to human health and ecosystem - community improvement and environment - simplified environmental monitoring techniques - simplified pollution control techniques - environmental communication - environmental education	- case study of community participation - field study of environmental education

Year time schedule of above described training courses are planed as follows.

Time Schedule for training Course

Technical Training Course/Capacity	4	5	6	7	8	9	10	11	12	1	2	3	Total
Environmental Monitoring Techniques													
· Water Quality Monitoring (junior) /10													40
· Water Quality Monitoring (senior) /10													20
· Air Quality Monitoring (ambient) /10													20
· Air Quality Monitoring (emission) /10													20
· Toxic Substance (pesticide) /10													20
· Toxic Substance (others) /10													20
· Soil Quality Monitoring /10													20
· Noise and Vibration /10													20
Environmental Planning /10													20
Environmental Data Processing /10													20
Pollution Control Technology													
· Waste Water Treatment /15													60
· Exhaust Gas Treatment /15													30
· Hazardous Waste Treatment /15													30
Administrative Training Course													
Environmental Impact Assessment (EIA)													
· Basic EIA /10													40
· Conducting EIA /10													40
· Evaluation of EIA /10													60
Environmental Administration 1													
· Water Pollution Control /20													80
· Air Pollution Control /20													80
· Hazardous Waste Management /20													40
· Small Scale Industry Management/20													40
Environmental Administration 2 /20													40
Environmental Communication and Public Participation /20													40
Maximum Number of Trainee		85	95	85	105	60	105	85	80	85	75	65	925/780

3) Short term special seminars

Ordinary training in the EMC is given in accordance with the training programs described in 3-3-2 Activities Plan, regarding environmental technologies and environmental administration. After EMC activities are started, special training is planned in the form of seminars given in the auditorium, as mentioned below.

No.	Seminar Program	No. of Participants (P)	Duration (Day)	No. of Seminar/Year
1	Environmental Impact Assessment	75	3	4
2	Environmental Management for Local Governmental Officials	200	3	4
3	Water Quality Monitoring	150	4	4
4	Soled Waste Management	250	4	3
5	Pesticide Management including Safety Use, Handling and Storage	250	3	3
6	Noise and Vibration Management	50	2	2
7	Air Quality Management	150	4	4
8	Environmental Information System	200	2	2
9	Environmental Legislation for Government Officials	200	2	2
10	Environmental Legislation for Private Sector	400	4	2
11	Environmental Consideration for Sustainable Development	250	2	2
12	Environmental Consideration for Regional Development	250	3	2
13	Environmental Education	300	3	1
14	Ceremony of the World Environment Day and Its Exhibition	800	2	2
15	Environmental Exhibition for Schools and Publics	800	2	1
16	Coastal Resource Management	400	2	2
17	Forest Resource Management	200	2	2

In addition to above described programs, other seminars are periodically planned for the students of junior high school and senior high school as a environmental education. Above described seminars will be held more than 42 times in a year, and more than 90% of these seminars participants are less than 400, to hold these seminars properly, capacity of seminar room will be planned for maximum 400 persons is suitable.

(3) Activities in the departments and divisions

The EMC comprises nine sections in four divisions :
Reference Lab. Division (Water Quality and Soil Section, Air and Noise Section, and Toxic Substances Section), Environmental Information Division (Data Analysis and Evaluation Section, Information and Documentation Section, and Data Processing Section), Training Division (Planning Section, Course Section, and Control Section). The first two divisions are concerned with environmental quality monitoring activities, and the third divisions is concerned with human resources development.
The following are activities of these devisions and section.

1) Activities of the Reference Laboratory Division

- Management of experimental equipment
- Development of sampling and analysis methods
- Sample analysis
- Management of the researchers and personnel
- Cooperation with other research institutions
- Preparation of reports

The following are activities in the three sections of the Reference Laboratory Division.

1-1) Water Quality and Soil Section
- · Maintenance of instruments for water and soil analysis
- · Management of the use of equipment
- · Development of researchers and personnel
- · Management of sampling and testing activities
- · Preparation of reports

1-2) Air and Noise Section

- Maintenance of instruments for air and noise analysis
- Management of the use of equipment
- Development of researchers and personnel
- Management of sampling and testing activities
- Preparation of reports

1-3) Hazardous Substances Section

- Maintenance of equipment for analyzing toxic substances (odor, toxicity, and toxic substances)
- Management of the use of equipment
- Development of researchers and personnel
- Management of sampling and testing activities
- Preparation of reports

2) Activities of the Environmental Information Division

- Collection and evaluation of environment-related data
- Development of information systems and services
- Planning of computer systems and problem analysis
- Management of the library
- Development of software programs
- Management of the personnel
- Preparation of reports and documents

The following are activities of the three sections of the Environmental Information Division.

2-1) Data Analysis and Evaluation Section

- Analysis of environmental data
- Evaluation of environmental data
- Preparation and preservation of new data
- Examination of application and improvement of new methods
- Development of staff members

2-2) Information and Documentation Section

- Preparation of teaching materials, reference materials, and information materials

- Provision of environment-related information
- Management of information management systems and data including books and magazines, and preparation of lists
- The making of lists and extracts of reference literature, and the making of indexes of them
- Preparation of reports
- Development of staff

2-3) Data Processing Section
- Maintenance of the data processing units
- Problem analysis, development of new programs, development of systems
- Development of systems for evaluating new systems applied in new programs
- Management of the systems
- Development and investigation of software
- Improvement of systems
- Preparation of reports
- Development of staff

3) Activities of the Training Division
- Management of training and seminars
- Preparation for and development of training courses
- Management of training facilities
- Management of audiovisual aids and training materials
- Selection of training participants
- Management of instructors
- Preparation of reports
- Planning of necessary training courses

The following are activities of the three sections of the Training Division.

3-1) Planning Section
- Investigation of the necessity of training
- Preparation of training facilities and training courses
- Planning of training and seminars
- Budgetary planning of training and seminars
- Preparation for necessary training courses

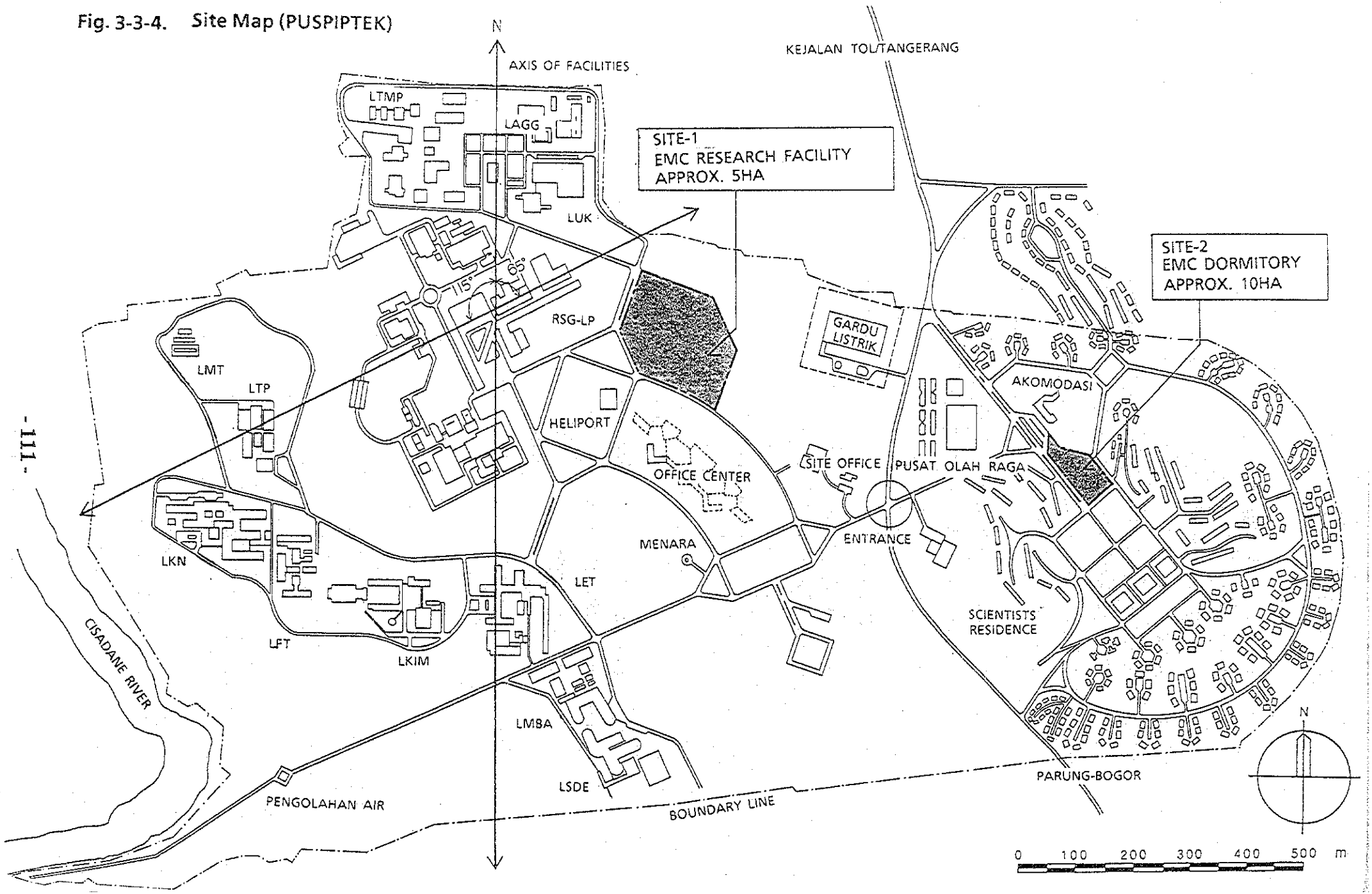
- Preparation of reports
- Development of staff

3-2) Course Section
- Holding and operation of training and seminars
- Management of training and seminar activities
- Ensuring of instructors
- Making of training schedules
- Evaluation of the training participants
- Selection of training participants
- Preparation of training reports
- Development of staff

3-3) Control Section
- Control of training and seminar activities
- Evaluation of training and seminars
- Budget control
- Evaluation of those who have completed training
- Preparation of reports
- Development of staff

4) Activities of the Management Divisions
- Management of the facilities
- Management of budgets

Fig. 3-3-4. Site Map (PUSPIPTEK)



3-3-3 Location and Conditions of the Project Site

(1) Location of the site

The proposed site is located in the complex of the National Center for Research, Science and Technology (PUSPIPTEK) in Serpong, Java.

The main route from Jakarta to the proposed site: drive to Tangerang along the Jakarta-Merak Toll Road, proceed about 18 kilometers southward along the Tangerang-Bogor highway, and pass through central part of Serpong to the site.

About one hour's drive from the central part of Jakarta will take one to PUSPIPTEK, which is about 45 kilometers away from the city. Though the Jakarta-Merak railroad passes through Serpong, it cannot provide a means of commuting because of the train schedule. Since it is distant from Jakarta, it is necessary to provide lodgings for training participants and houses for the officials.

(2) Outline of the National Center for Research, Science and Technology (PUSPIPTEK)

PUSPIPTEK was established in October 1974 by the Government of Indonesia, for the purpose of gathering together the national science and technology institutions which were scattered throughout the country. The center has the objectives as mentioned below, under the control of the ministry in charge of research and technology.

- Promoting efficient research under the cooperation of the research institutions
- Jointly using facilities necessary for research
- Developing human resources in the area of research, science and technology
- Understanding conditions of research, science and technology development in the world and incorporating it into the development of Indonesia
- Supporting researches in various areas done in private research institutions and industries as well as supporting their application

PUSPIPTEK PRESENT SITUATION

1991 July

No.	Facilities: Name of Facilties	Abbre-viation	Agency	Present Stage: In Planning	In Design	Under Con-struction	In Operation	Foreign Aid: Equipment Loan	Equipment Grant	Acceptance of Trainee Loan	Acceptance of Trainee Grant	Dispatch of Expert Loan	Dispatch of Expert Grant	Others
1	Strength of Materials Components and Structures Laboratory	LUK	BPPT				○	Germany			Germany		Germany	
2	Energy and Energy Resources Laboratory	LSDE	BPPT				○	Germany USA			Germany USAJapan		Germany USAJapan	
3	Aerodynamics, Gasdynamics, and Vibration Laboratory	LAGG	BPPT					Holland			Holland		Holland	Germany
4	Thermodynamics, Engine and Propulsion Systems Laboratory	LTMP	BPPT											France
5	Processing Technology Laboratory	LTP	BPPT					France			France		France	USA
6	Natural Disaster Mitigation Laboratory	LMBA	LIPI											
7	Calibration, Instrumentation and Metrology Laboratory	LKIM	LIPI				○	Germany	Japan		Germany		Germany	
8	Applied Physics Laboratory	LFN	LIPI				○							
9	Applied Chemistry Laboratory	LKN	LIPI				○							
10	Applied Electronics Laboratory	LET	LIPI											France
11	Applied Metallurgy Laboratory	LMN	LIPI						Japan				Japan	
12	Multipurpose Reactor and its Supporting Laboratory	RSG-LP	BATAN					Germany			Germany		Germany	USA France Italy Canada
	Conference & Information Center							Remarks : Accomodation facilites 150 rooms						
	Office Center							Remarks :						
	Scientists Residence						○ (Units)	Remarks : 700 Units (total) 50~120 m² (4 types)						

The site of PUSPIPTEK has an area of 350 hectares, extending east and west. The site is divided by the Tangerang-Bogor highway running through it from north to south. Its eastern part, having an area of 120 hectares, is the housing zone, where there are houses for researchers, a mosque, an elementary school, a secondary school, a clinic, a guest house, a park, and athletic facilities. Dormitory for training participants of the EMC may be constructed in this zone. In the research zone in the western part, having an area of 230 hectares, laboratories have already been constructed for the Strength of Materials, Components and Structures, Energy and Energy Resources, Calibration, Instrumentation and metrology, Applied Physics, Applied Chemistry, etc. The laterite refining laboratory, which has been constructed under Japan's grant aid, is in operation, too. Within the site, roads have been constructed, with service water pipes, drainage ways, electric power trunk lines, and telephone trunk lines along them. Consequently it is considered appropriate as the planned construction site for the EMC.

PUSPIPTEK has an site office, where comprehensive maintenance and management of the infrastructure of the whole Complex are carried out and guidance is given regarding construction plans, in accordance with its regulations on construction and design. Permits to build facilities in the Complex are given through this office. Regulations relevant to the Project include the following.

- Master plan :
  Separation of the research zone and the housing zone,Reference axis for facility arrangement,Wall surface setback line, and Restriction on constructing entrances and exits in the premises

- Construction design :
  Restriction on stories (three stories or lower, as a rule)Exterior finishing materials partially (bricks or tiles)

(3) Conditions of the proposed site

The EMC has the functions of research and training as well as of lodging. In PUSPIPTEK, it is stipulated that the research zone and the housing zone should definitely be divided, and hence it is not permitted to construct buildings having the function of research and housing combined, in the

proposed site for the construction of research facilities. The Government of Indonesia therefore has proposed two construction sites: one is for research and training facilities and the other for dormitory.

1) Conditions of the site proposed as the research and training block

In the preliminary study, the Indonesian government proposed two sites as the planned site for the research and training block: a site to the northwest of the administration office at the PUSPIPTEK main entrance (second site proposed) and a site south of the precinct road (first site proposed), and the first site proposed was provisionally chosen. However, although in the basic design study, the Government of Indonesia requested that the site northwest of the administration office be chosen, the Study Team concluded that the second site was more appropriate, in view of the conditions of the infrastructure, surroundings, and the area of the site, as well as the fact that the site was located in the highest part of PUSPIPTEK. This decision was entered and confirmed in the Minutes of Discussions.

The site has an area of about five hectares (see the Site Plan in the APPENDIX), which is sufficient, in view of the scale of the EMC research and training block, and provides space for outdoor practice, and the future addition of buildings. The proposed site fronts the PUSPIPTEK office center now under construction. The site is bordered by a precipice about 10 meters high on the north and by a road on the west, fronting the multipurpose nuclear reactor. The central part of the site is almost level, which fact allows the Government of Indonesia to bear only nominal expenses for infrastructure preparation including the raising of the ground level. Acacias and other plants have grown from place to place to the southwest. An electric power trunk line, a telephone trunk line, and water service pipes have already been laid five meters inside the site along the front road.

2) Conditions of the site proposed for the lodging block

The site proposed for the lodging block is adjacent to the southwest side of the existing guest house (three-storied RC structure) in PUSPIPTEK's housing zone. The site fronts the precinct road extending southwest from

the Tangerang-Bogor highway, which runs through the PUSPIPTEK premises.

The site has an area of about one hectare (see the Site Plan in the APPENDIX), which is considered sufficient in view of the future extension of buildings. There are houses for staffs (one-storied and two-storied) scattered around the site, and, in the southwest part of the site, a well and a pressure tank for water supply have been constructed for these houses.

The difference in level of the site is about two meters. Like the existing guest house, the site is lower on the whole than the roads around it, and consequently it is necessary to formulate careful plans for rainwater and waste water drainage.

(4) Conditions of infrastructure of the proposed site

1) Water source

Water is taken through an intake pipe having a diameter of 300 millimeters from the Cisadane River, a river one kilometer southwest of the premises of the research and training block. There is a water purification plant constructed for water supply in PUSPIPTEK. This plant is equipped with a sedimentation tank, a condensation tank, and filters, and water treated here can be used for the general water supply, except for drinking water, and supplied for laboratory experiments, in view of the analysis results mentioned in the APPENDIX. The plant has a treatment capacity of 3,000 m^3 per day, and the receiving tank has a capacity of 2,000 m^3 per day. The plant, however, is not equipped with a back-up power generator.

PUSPIPTEK is supplied with water from a water tower (600 m3 capacity, 48 meters high) about 400 meters away along the road from the proposed site. Water is pumped up from the plant to the tower and fed by gravity. An asbestos pipe having a diameter of 150 millimeters has been laid, about three meters southwest of the road, in the site proposed for the EMC research and training block. There is no problem regarding the diameter and location of this pipe.

In the site proposed for dormitory, there has been laid an asbestos pipe having a diameter of 150 millimeters, about three meters away from the road southeast of the site. There is no special problem either, regarding the diameter and location of the pipe. Most of the PUSPIPTEK facilities are directly fed with water from the water tower. Only one or two buildings have own receiving tanks. Since a power failure would prevent water supply because the water purification plant is not equipped with a power generator, it is necessary to plan to construct a receiving tank for the EMC.

2) Drainage

Drainageways have been constructed along the roads. But only waste water from buildings and rainwater can be discharged into these drainageways. Sewage is treated in local-type septic tanks and permeated into the soil through osmotic tanks. Waste water from laboratories is treated in neutralization tanks, etc., and permeated into the soil through osmotic tanks. Along the proposed site, there is a ditch 60 centimeters wide and 70 centimeters deep. Since the entire site is higher in level than this ditch, there is no problem in drainage planning, but sufficient consideration is needed for treating waste water from the center in view of the activities conducted there. Though there is a ditch along the site for the dormitory, it is higher in level than the entire site except for the southeastern part, and consequently it is impossible to discharge water from the site into the ditch. It is necessary to consider constructing a new ditch connecting with the existing catch basin in the approach road to the guest house, which is adjacent to the site. It is also necessary to simultaneously consider pumping up waste water.

3) Electric power

Within the PUSPIPTEK area, at a location about 1.2 kilometers away from the EMC, a local power station of PLN, a state-owned enterprise, is in operation. Electric power is supplied throughout the area from this power station, which is outlined as follows.

① Initial receiving system : two systems through an overhead line from PETUKANGAN

② Initial receiving voltage : 150 KV 50 Hz
③ Transformer capacity : 60 MVA one unit; addition of another unit is planned (there is room to install it.)
④ Secondary supply voltage : 20 KV 50 Hz loop distribution
⑤ Electric power substation : outdoor open type

A shortage in electric power supply has been caused by the unexpectedly rapid development in industries. It will therefore be difficult for PLN to meet the ever-increasing demand for electric power over the next several years. In newly constructed buildings in Jakarta, electric power needs to be supplied from independent power generators installed there, because power supply from PLN has been entirely suspended. In PUSPIPTEK, power failures happen once or twice a week, or two or three hours a month, which is actually better than in other regions.

The necessity of a backup power supply to the equipment for continuous measurement or equipment subject to humidity or high temperatures and the necessity of power sources for smooth execution of research and training in the EMC have been confirmed through surveying other institutions.

Regarding the quality of electric power, variations of voltage are comparatively small (about +5%) because of the EMC site being near the PLN local power station and electric power loads being low. However, it is necessary to take measures for minimizing variations of voltage due to the frequent occurrence of thunderbolts in the rainy season. And it is also necessary to take measures for protecting individual equipment that may be damaged by them and thus impede research and training, as a result.

There is no problem in power supply, since a 20 KV underground loop distribution line has already been laid within the site for research and training facilities.

As for the dormitory, a low-voltage power supply (a capacity of 200 KVA or under) is planned. Construction work in PLN makes the power supply

possible, because the PLN electric power substation is located in the PUSPIPTEK guest house, whose overall length is about 150 meters.

4) Communications

① Telephone

A central telephone exchange system is in operation for PUSPIPTEK as a whole, under the permission of PERUMTEL. It is planned that telephone lines (extensions) will be provided from this PABX system. The telephone system is outlined below.

- Controlling telephone station :
  PERUMTEL Serpong Station (communication with other stations through micro-lines)
- Number of lines provided :
  400 Pr cables will be provided for PUSPIPTEK PABX.
- Capacity of PUSPIPTEK PABX (digital PABX):
  200 lines for the housing area1,000 lines for the facilities area (planned to be increased to 2,000 lines by 1992)
- Regarding provision for the EMC, branch lines from central PABX and one or two direct trucks have already been laid as a telephone branch board within the site for the research and training facilities. The ensuring of the planned number of lines (about 30 lines) has been confirmed through arrangements made by the Government of Indonesia.
  Regarding the dormitory, a telephone branch board has been installed in the adjacent site, and consequently provision for the lodgings is possible.

② On-line communications

An optical cable has been laid between the computer facilities in the Laboratory for Measuring Instruments Testing and Adjustment and Meteorology (the KIM building) of PUSPIPTEK. When on-line communication between the EMC and the outside becomes necessary in the future, it may be used, though detailed arrangements with KIM are necessary.

③ Security communications

There are important facilities (such as nuclear power research facilities) in PUSPIPTEK, and central security management is partially conducted. A spare pipe has already been laid within the EMC site, which fact makes future introduction of a security system possible.

In view of the above-mentioned descriptions, it is concluded that the Government of Indonesia needs to bear only a small amount of expenses for preparing infrastructure including electric power supply and communications.

3-3-4 Outline of Facilities and Equipment

Facilities and equipment have been chosen by taking into consideration the personnel plan and the activity plan as well as the request from the Government of Indonesia. Facilities and equipment necessary for the activities in the EMC are outline below.

(1) Facilities

1) Research and Training Buildings

- Management Facility :
  Consisted of the rooms for activities of top staffs and management division.
  Director's Room, Deputy-Director's Room, Technical Expert Room, Administrative Office, Meeting Room, Reception Room, etc.

- Research Facility :
  Consisted of the rooms for activities of reference laboratory division and environmental information division.
  Laboratories (Water Quality and Soil, Air Quality, Toxic Substance), Special Laboratories (Scanning Electron Microscope Room, MS Room, etc.), Data Processing Room, Data Base Room, Division Office, Meeting Room, Work Shop, Library etc.

- Training Facilities :
  Consisted of the rooms for activities of training division.
  Practice Room (Water Quality and Soil, Noise and Vibration, Solid Waste, Toxic Substances, Computer Room, etc.), Lecture Rooms, Audio Visual Room, Drafting Room, Auditorium, Canteen etc.)

2) Dormitory :

  Consisted of the rooms for lodging of trainees and lecturers.
  Bed Rooms, Dining Room, Counseling Room, Laundry Room, etc.

(2) Equipment

Categories and outlines of equipment necessary for activities in the EMC are mentioned below.

1) Common Analytical Equipment

(used for instrumental analysis of samples obtained in monitoring activities and for training)
Gas chromatograph mass spectrometer, fluorescent X-ray spectrometer, scanning electron microscope, various types of spectrophotometers, fluorescent spectrophotometer, various types of chromatographs, polarograph

2) Water Quality Monitoring Equipment

(used for examining the quality of river water, seawater, lake water, and marsh water collected under PROKASIH and at the EMC)
pH meter, dissolving oxygen meter, electric conductivity measuring instrument, TOC analyzer, ion meter, portable oil content analyzer, various types of microscopes, portable water quality measuring instrument, water samplers

3) Air Quality Monitoring Equipment

(used for environmental air monitoring and training and for providing data when AMDAL is conducted)
Portable air monitoring and automatic measuring instrument, automatic air monitoring and measuring instrument, meteorological observation instrument, vehicle exhaust measuring instrument, dust sampler, Orsat analyzing apparatus, exhaust gas sampler

4) Noise and Vibration Level Monitoring Equipment

(used for monitoring outdoor noises and vibration and for training)
Noise meter, vibration level meter, level recorder, tape recorder

5) Equipment for Waste and Toxic Substance Analysis

(for pretreatment of sample waste, such as crushing, determination of flashing points, and composition analysis. Experiments are to be done regarding toxic substances dissolving during monitoring and storage.)
Crusher, various types of balances, drier, flashing point measuring apparatus, corrosion tester

6) General Laboratory Equipment

(used to prepare samples for measurement and analysis by treating samples obtained in surveys and monitoring)
Balances, centrifuge, dryers, muffle furnace, incubator

7) Experiment facilities and materials

(used to prepare samples for instrumental analysis by treating samples obtained in surveys and monitoring)
Laboratory table, glass ware, chemicals

8) Information System Equipment

(used to computer-process data obtained from measurement and analysis, make data bases, and accumulate and analyze data)
Minicomputer, printers, personal computers, plotter, software

9) Other Equipment

(used for maintenance and repairs of the equipment, training and research in the EMC, the recording of the conditions of the monitoring points, and transportation of samples and instruments)
Machines for repairs and manufacturing, audiovisual aids, camera, 4WD car

Purposes and necessity of major large equipment are as follows.

1) Quadruple pole gas chromatograph mass spectrometer

There exist a great variety of chemical substances in the environment, in a wide range of concentrations. Some of them are very toxic even in very low concentrations. Gas chromatographs are generally used for analyzing organic chemical substances. Quadruple pole gas chromatograph mass spectrometers are used for analyzing trace amount of organic chemical substances that cannot be identified with gas chromatographs. The Government of Indonesia originally requested a double focusing gas chromatograph mass spectrometer, which was given a low priority in the plan proposed by the Study Team as a grant aid because this apparatus required complex techniques in operating it and a large amount of maintenance expenses.

However, it was concluded in discussions with the Indonesian officials concerned that a gas chromatograph mass spectrometer was indispensable for research and environmental monitoring, and consequently it was decided that a quadruple pole gas chromatograph mass spectrometer be introduced, which is easy to handle and requires a smaller amount of maintenance expenses.

2) Fluorescent X-ray spectrometer

Fluorescent X-ray spectrometers are very useful because they make possible nondestructive analysis of a variety of hazardous heavy metals in water, air and soil. Much can be expected from a fluorescent X-ray spectrometer, with which a number of samples can be simultaneously analyzed in a short time, not only in the development of measuring methods in the EMC but also in environmental monitoring activities.

3) Scanning electron microscope

Scanning electron microscopes make it possible for us to observe smaller living samples, bacteria and very small particles, samples that cannot be observed with optical microscopes. Scanning electron microscopes can be widely utilized in environmental monitoring and research for identifying

pollution sources in water, air and waste and understanding pollution mechanisms. Since observation results are kept in photographs, they provide visual explanations for training participants and have considerable effect for promoting the campaign for environmental pollution control.

4) Air pollution monitoring system

There are no fixed monitoring stations for measuring air pollution in Indonesia, except a few research institutions in Jakarta. Conditions of air pollution are not accurately understood. In discussions with the Indonesian officials concerned, the Government of Indonesia proposed that three fixed monitoring stations be built in Jakarta (BAPEDAL), an industrial zone (Tangerang) and a rural region (EMC), and showed a plan to conduct mobile measurements to learn detailed conditions. Consequently it was concluded that equipment belonging to these fixed monitoring stations and a portable air monitoring automatic measuring apparatus be installed.

3-4 Operation, Management and Maintenance Plans

When the Center buildings are completed and turned over to the Government of the Republic of Indonesia, the operation of the EMC will be undertaken by BAPEDAL members who will be newly employed for that purpose. Advance full training and closer cooperation will be required in coordination with the Japanese technical cooperation for facilitating the operation of the new organization. As already stated, the EMC, which will be engaged in environmental research and training, will act as the core for helping BAPEDAL and other environment-related agencies secure smooth and efficient environmental conservation policies. From the organizational and budgetary viewpoints, however, it is positioned as one of the related organization of BAPEDAL. (For the organization and budget of BAPEDAL, refer to Section 3-2-2 and Fig. 2-1-3.)

The whole Center will be operated, managed, and maintained, in principle, by the management division of the EMC, but it is necessary to assign technicians and operators specialized in the fields of power, air-conditioning, sanitation, and special equipment for the operation, management and maintenance of the facilities belonging to the Center. It is also important to set up a system to entrust periodic maintenance and management, inspection and repair of precision instruments for laboratory and training uses to their manufacturers' agents. Moreover, EMC staff members in charge of maintenance should witness the installation and adjustment work of the equipment and instruments at the Center so that they may understand their installation and smoothly maintain them after the Center is handed over to the Indonesian side.

Project-type technical cooperation by the Government of Japan has been requested so that it may be implemented along with the granting of the buildings and equipment under the Project. In the case of realization of it, the Project is expected to make a great contribution to improvement of the Indonesian capability to maintain and manage the buildings, equipment, and research and training instruments.

3-4-1 Budget Plan

According to BAPEDAL's budget, the Indonesian side has established the following budget for operating, managing, and maintaining the EMC.

(1) Ordinary Budget

1) Personnel expenses (Not included in the EMC's budget, because personnel expenses are paid directly by the Ministry of Finance)

①	Salaries		Rp. 165,000,000
	Top staffs	Rp. 300,000×12 months×7	
	Section chiefs	Rp. 250,000×12 months×9	
	General employees	Rp. 200,000×12 months×47	
②	Human resources development expenses		75,000,000
③	Traffic expenses		35,000,000
④	Others		60,000,000
	Subtotal		Rp. 170,000,000
			(Salaries not included)

2) Facility operation expenses

①	Power rates	Rp. 8,000,000/m x 12 months	96,000,000
②	Water rates	2,000,000/m x 12 months	24,000,000
③	Telephone expenses		24,000,000
④	Miscellaneous expenses		10,000,000
	Subtotal		Rp.154,000,000

3) Facility and equipment maintenance expenses Rp.161,000,000

(2) Development budget

1) Activity expenses (research and training expenses)

①	Monitoring expenses	
	40 sites×12 months× Rp. 250,000/month/site	120,000,000
②	Research expenses	
	2,600 persons in total×Rp. 85,000	221,000,000
③	Training expenses 780/year×Rp 450,000/trainee	351,000,000
	Total	692,000,000

(3) Total of the operation and maintenance expenses

Ordinary budget		
1)	Personnel expenses (not including salaries)	Rp.170,000,000
2)	Facility operation expenses	154,000,000
3)	Facility and equipment maintenance expenses	161,000,000
	Subtotal	Rp.485,000,000
Development budget		
1)	Activity expenses	Rp.692,000,000
	Total	Rp. 1,177,000,000

When compared with the trial budget for operation, management, and maintenance in the basic design study (namely, Rp. 593,850,000 for the ordinary budget and Rp. 729,500,000 for the development budget, or Rp. 1,323,350,000 in total: see Section 3-4-3-(4) below), it can be seen that the facility operation expenses and the budget for maintaining the facilities and equipment in the future will be necessary to increase. The development budget is supposed to be able to cover necessary expenses. However, budgets for operation, management, and maintenance of the EMC in subsequent fiscal years should meet possible increases in personnel expenses and commodity prices at the rate of 15 to 20%.

3-4-2 Operation Plan

(1) Operation system and personnel plan

1) Operation system

The operation system of the EMC will compose a total of 63 persons as stated in Chapter 3, Section 3-3-1.

Category of Staff	Number of Staff	Activities in the Division
Director	1	Total management responsibility of EMC.
Deputy-Director	2	Assistance of director, management of operation of EMC.
Management Division		Management, accounting and personal affairs of
Economist	3	the EMC.
Others	1	Public relation and general affairs of EMC.
(Sub Total)	4	
Reference Lab. Division		
Water Quality and Soil		
Division		· Management of experimental equipment
Chief	1	· Development of sampling and analysis methods
Technical Staff	5	· Sample analysis
Assistant	2	· Management of the researchers and personnel
Air and Noise Division		· Cooperation with other research institutions
Chief	1	· Preparation of reports
Technical Staff	5	
Assistant	3	
Toxic Substance Division		
Chief	1	
Technical Staff	4	
Assistant	2	
(Sub Total)	24	

Category of Staff	Number of Staff	Activities in the Division
Environmental Information Division		
Data Analysis and Evaluation Section		· Collection and evaluation of environment-related data
Chief	1	
Technical Staff	2	· Development of information systems and services
Assistant	1	· Planning of computer systems and problem analysis
Information and Documentation Section		· Management of the library
Chief	1	· Development of software programs
Technical Staff	2	· Management of the personnel
Assistant	2	· Preparation of reports and documents
Data Processing Section		
Chief	1	
Technical Staff	2	
Assistant	2	
(Sub Total)	14	
Training Division		
Planning Section		
Chief	1	· Management of training and seminars
Technical Staff	3	· Preparation for and development of training courses
Assistant	1	
Course Division		· Management of training facilities
Chief	1	· Management of audiovisual aids and training materials
Technical Staff	5	
Assistant	2	· Selection of training participants
Control Section		· Management of instructors
Chief	1	· Preparation of reports
Technical Staff	3	· Planning of necessary training courses
Assistant	1	
(Sub Total)	18	
Total	63	

2) Personnel plan

The personnel plan has been set up as follows and has been proposed to the Ministry of State for Administrative Reform, an agency responsible for personnel affairs for public ser-vants. The Ministry will offer some counterproposals as to the number of top staff based mainly on maintaining a balance with other ministries and agencies. Recruitment of other staff members is entrusted to BAPEDAL. Training of researchers is planned to be held at P4L prior to the commencement of the operation of the Center.

① Recruitment plan (63 persons)

• From BAPEDAL	7
• From other ministries and agencies	9
• To be newly employed	
(College graduates)	15
(Upper high school graduates)	18
(Lower high school graduates)	14

Ten to fifteen EMC members will be trained at P4L in fiscal 1992/1993.

② Qualifications of the EMC staffs

Staffs with the following types of qualifications are to be employed. The recruitment plan is shown in Table 3-4-1.

- Management Division
  Director : Economist with 10 to 15 years' experience
  Other staff members : Upper high school graduates

- Reference Laboratory Division
  Division Chief :
  Scientist or engineer with 10 to 15 years' experience
  Section Chief : Scientist engineer with 8 to 10 years' experience

Table 3-4-1. Time Schedule of Staffing for EMC

Organization		Director					1	
		Deputy - Director					2	
Division	Section	Discipline	FY1991/92	FY1992/93	FY1993/94	FY1994/95	Sub-Total	Total
Management		Economist	1	1	1		3	
		*Others (Assistants, etc.)	1				1	4
Reference Labo.	- Water & Soil	Chemical Engineer	3	3			6	
		Chemist	3	4	1		8	
	- Air & Noise	Physicist / Instrument		2			2	
	- Toxic Substance	Sanitary Engi.		1			1	
		*Others (Assistants, etc.)		3	4		7	24
Environmental Information	- Data Analysis & Evaluation	Scientist	2	3			5	
		Librarian	1	1			2	
	- Informations & Documentation	Programmer	1	1	1		3	
	- Data Processing	*Others (Assistants, etc.)		2	2		4	
								14
Training	- Planning	Chemical Engineer	2	3			5	
	- Course	Chemist	1	2	1		4	
	- Control	Physicist	1	1			2	
		Civil, Engi.		1			1	
		*Others (Assistants, etc.)		2	4		6	18
		Total	16	30	14			63

* Others do not Include : Secretary, Maintenance staff, Janitor, Security staff, Driver, etc.

Technical staff members :

Chemical engineer, chemist, physicist, instrument and sanitary engineer

Other staff members :

Assistant with upper high school certificate or similar qualification

- Environmental Information Division

Division Chief :

Scientist or engineer with 10 to 15 years' experience

Chief of Data Analysis and Evaluation Section :

Scientist or engineer with 8 to 10 years' experience

Chief of Data-processing Section :

Scientist or engineer with 8 to 10 years' experience

Chief of Information Data Section :

Librarian with 8 to 10 years' experience

Technical staff members : Scientist or programmers

Other staff members :

Operator and assistant with upper high school certificate or similar qualification

- Training Division

Division Chief :

Scientist or engineer with 10 to 15 years' experience

Section Chief :

Scientist or engineer with 8 to 10 years' experience

Technical staff members:

Chemical engineer, chemist, physicist, and civil engineer

Other staff members :

Assistants with upper high school certificate or similar qualification

(2) Training execution system

1) Appointment of lecturers

The EMC is to carry out such training activities as stated in Section 3-3-2. Lectures on environmental administration will be given by BAPEDAL officials while those on environmental quality monitoring and technical training will be given by EMC staffs in charge of analysis and technology. However, most parts of the lectures will be entrusted to lecturers of other organizations which include:

- Ministry of State for Population and Environment (KLH)
- Environmental experiment centers of Ministry of Health, Ministry of Industries, and others
- Environment Research Center (PSL) of universities
- P4L
- Private consultants (about 50 companies)

Lecturer candidates should be selected before the completion of the EMC, or by the time when training under the technical cooperation is to be given to training staff.

① Full-time lecturers

Assuming that full-time lecturers coming from the EMC and BAPEDAL allocate a half day to the education of trainees and the remaining half to the preparation of lectures and training materials and general clerical work, average training hours per lecturer will be 20 weeks a year.

② Outside lecturers

Training hours per outside lecturer will be 2 to 4 weeks a year.

③ Assistant

At least one assistant is needed for each full-time lecturer to assure efficient execution of training and smooth practice among trainee groups in practical exercises.

The number of lecturers needed for each training course is expected to be as follows.

Full-time lecturers	15~20
Outside lecturers	5
Assistants	20

The numbers of training hours under the plan, expressed by weeks a year, are listed as follows:

Training Programme	Course	Total Training weeks	Number of Lecturer		Number of Assistant
			Full time	Outside	
Environmental Technical Training	Environmental Monitoring Techniques	120weeks	6	1	8
	Environmental Planning	8weeks	1	1	2
	Environmental Data Processing	8weeks	1	1	2
	Pollution Control Technology	32weeks	3	1	4
	Sub Total	168weeks	11	4	16
Environmental Administrative Training	Environmental Impact Assessment (EIA/AMDAL)	26weeks	1	1	1
	Environmental Administration 1 (junior officials course)	48weeks	2		1
	Environmental Administration 2 (senior officials course)	4weeks	1		1
	Environmental Communication and Public Participation	4weeks	1		1
	Sub Total	82weeks	5	1	4

2) Recruiting of trainees

The EMC is scheduled to train 780 persons a year as stated in Section 3-3-2. Persons to be trained and methods of recruiting them are stated as follows.

- Persons to be trained
  A total of about 20,000 employees of ministries and agencies and private companies engaged in environmental affairs (the ratio between those employees living in Jakarta and its vicinity and those in rural districts is 1 to 5.)
- Recruiting methods
  (Periodic) advice to ministries and agencies
  Public announcement

3-4-3 Management and Maintenance Plan

(1) Facility Maintenance Plan

1) Building

The main points in regard to building maintenance are daily cleaning, the repair of worn or damaged parts and security in order to ensure building safety and security.

Daily cleaning will have a favorable effect on the attitude of those using the building and is also important to maintain the necessary level of cleanliness for the research facilities. It also leads to the early discovery of damage and equipment breakdowns and subsequent early repair, thus prolonging the life of building mechanical equipment and research equipment.

Repair work mainly consists of the repair or renewal of exterior and interior finishing materials which protect the structure of building. Based on Japan's experience, it is believed that remodeling or partial rebuilding will be required every ten years due to changes in activities and/or staff increases. The regular inspections and repairs required to prolong the building life will be described in detail in the maintenance manual to be presented to the Indonesian side at the time of handing over the building and are outlined below.

Outline of Regular Building Inspections

(Exterior)

- Repair and repainting of exterior finishings	every five years
- Inspection, repair and repainting of roof	inspection: annually, others: every five years
- Inspection and repair of roof waterproofing	inspection: annually, others: as required
- Cleaning of gutters and drains	monthly
- Inspection and repair of sealing material around doors and window frames	annually
- Painting of exterior doors and window frames	every five years
- Inspection and cleaning of drainage ditches and manholes	monthly
- Gardening	as required

(Interior)

- Alteration of interior finishings	as required
- Repair and repainting of interior walls	as required
- Replacement of ceiling materials	as required
- Adjustment of doors and windows	annually
- Replacement of hardware	as required

With regard to security work, access to the EMC in general and particularly to the research and monitoring blocks where the precision and safety of the equipment is vital, must be checked and security measures must be taken to prevent the theft of any equipment.

2) Building Mechanical System and Equipment

Not only regular operation control and inspection but also the repair and exchange of parts will be required for the proper maintenance of building mechanical systema nd equipment. The life of building mechanical system and equipment can definately be extended by proper operation and regular inspections, adjustment, cleaning and repair. Their safety must be secured by measures to prevent breakdowns and accidents without causing damage to the building. Overhauls and the replacement of worn parts must be conducted pursuant to the maintenance manual at the time of regular inspections.

Maintenance staff members must have an exact understanding of the system design and capacity, etc.. so that they can prevent accidents. Full-time engineers should, therefore, be provided for each of the electricity, air-conditioning, plumbing, and special equipment fields. Moreover, these engineers should undergo on-site training from the system and equipment installation and test operation stages to obtain a thorough knowledge of the system and equipment for which they will be responsible. Maintenance manuals will be provided at the time of project completion. The service lives of the main building system and equipment are as follows :

Service Lives of Main Building System and Equipment

Electricity	
- Generator	15 - 20 years
- Panel Boards	20 - 30 years

- Fluorescent Lamps	5,000 - 10,000 hours
- Incandescent Lamps	1,000 - 1,500 hours
- Telephone Exchangers	40 years
- Public Address Equipment	10 - 20 years
- Elevator	20 years
Plumbing	
- Pump, Pipes and Valves	10 - 15 years
- Tanks	15 - 20 years
- Sanitary Fixtures	25 years
- Fire-Fighting Equipment	20 years
- Gas Apparatus	6 years
- Sewage Treatment Equipment	7 years
Air-Conditioning	
- Pipes	10 - 15years
- Fans	10 - 15 years

(2) Management and maintenance plan of equipment and materials

1) Equipment

Correct management and maintenance of equipment and instru-ments is one of the most important factors to ensure smooth operation of the Center. For instance, analytical instruments are composed of precision parts, and some are easily damaged or affected by ambient conditions such as temperature and humidity while others are subject to influences of vibration and shock. They require well planned management and maintenance.

Generally speaking, management and maintenance procedures include

① routine inspections to be conducted by persons who daily operate the equipment and instruments

② emergency inspections in case of the occurrence of troubles

③ regular inspections, usually once or twice a year, to be conducted by engineers with proper expertise and techniques.

Routine inspections are to be carried out in accordance with the inspection items and frequencies stipulated in relevant manuals by a person responsible for a specific instrument and designated from among the operators of that instrument.

Emergency and periodic inspections are usually carried out by engineers of the manufacturers' agents who are dispatched in response to a request to that effect. The need for these types of inspections is frequently found in high precision instruments such as gas chromatograph mass analyzers and electron micro-scopes, and such inspections require the dispatch of engineers with specific technical abilities. Hence, it is necessary to conclude a maintenance agreement with an agency in accordance with a management and maintenance plan to be made at the beginning of each fiscal year. (Principal agencies with which the said maintenance agreement can be concluded are listed in the Appendix Data.)

Outlines of management and maintenance of principal instru-ments are listed in the following table.

Outlines of management and maintenance of principal instruments

Equipment	Main Equipment	Internal Maintenance	Local Agents Maintenance
General Purpose Instruments	Oven, Blender	Cleaning once/month inspection twice/year	as required
Analytical Instruments	Atomic Absorption Spectrophotometer	Cleaning routine inspection four times/year	as required once/year
Optical Instruments	Optical Microscope	Cleaning routine inspection once/year	as required once/year
Precision Instruments	Gas Chromatograph	Cleaning routine inspection once/month	as required three times/year
Audio Visual Equipment	VTR, Camera, Video, TV Editing Set	Cleaning routine inspection once/month	as required twice/year
Printing Equipments	Photo Copy Machine	Cleaning routine inspection once/week	as required once/year

2) Expendables and chemicals

Inventory control of expendables and chemicals should be effected in close coordination between research and training facilities and management ones. The research and training facilities should confirm inventories of these items to check whether or not they are being appropriately used. The management facility should secure a smooth supply of these items to the research and training facilities and procure them from suppliers in a planned way.

Some of the expendables and chemicals may take a long time in procurement, because they cannot be procured in Indonesia and have to be ordered and imported from overseas countries.

Typical examples of such expendables and chemicals are listed below :

① Laboratory glassware
- Glassware with ground joints

② Laboratory metalware
- Platinum crucible, Platinum boat and nickel crucible

③ Rubber and plasticware
- Teflon products

④ Chemicals
- Column packings for gas chromatography
- Some analytical reagents

⑤ Standard substances and solutions
- Harmful metallic standard solutions for atomic absorption spectrometry (mercury, cadmium, arsenic, serene, etc.)
- pH standard solutions
- Standard gases
- Standard solutions for ion chromatography
- Standard substances such as organic mercury, PCB, and detergents

⑥ Filters
- Teflon filters
- Millipore filters

⑦ Gases
- High-purity nitrogen gas

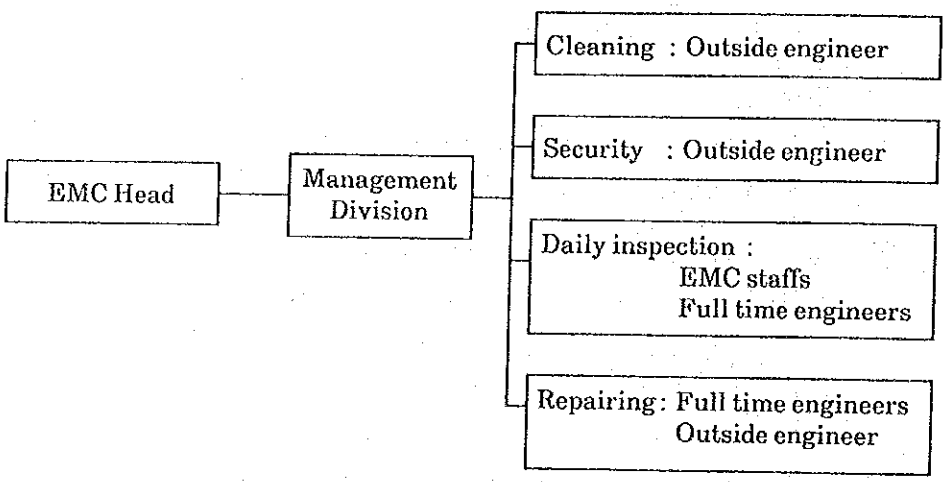
⑧ Expendables for analyzers
- Columns for high-performance chromatography
- Columns for ion chromatography
- Columns for gas chromatography
- Capillary columns
- Column joints for gas chromatography
- Light source for spectrophotometers
- Graphite tubes to be used in flameless atomic spectrophotometers
- Printing paper for electron microscopes

(3) Management and maintenance system for the facilities and the equipment

1) Management and maintenance system for the facilities

The director of the EMC is liable for managing and maintaining the facilities of the Center. However, the Management Division is responsible for management and maintenance of the facilities in routine work, and some of the management and maintenance procedures will be subcontracted to outside companies.

The management and maintenance system is listed as follows :



2) Management and maintenance system for the equipment

Researchers and Lecturers should be responsible for daily management and inspection of equipment and materials to be used in their research and lectures. Cleaning of Laboratories and workshops may be subcontracted to outside companies, but it should be done under the supervision of responsible researchers and lecturers.

Instructions by manufacturers' engineers as to operation, management, and maintenance of equipment, and materials must be given at the time of turning over the EMC buildings.

(4) Trial calculation of management and maintenance expenses

Trial calculation of management and maintenance expenses, which the Indonesian side should bear after the completion and turnover of the EMC buildings to it, has been effected in accordance with the results of the basic design study. Expenditure items are classified into personnel, facility operation, facility and equipment maintenance, expendables, and activity expenses.

1) Personnel expenses

Personnel expenses to be borne at the time of opening the Center (1993) are calculated based on the Indonesian personnel plan. Average annual income is based on data available from the Indonesian side and an average increase till the Center's opening is included in this trial calculation.

① Salaries (Not to be included in the trial calculation, because salaries are directly paid by the ministry of Finance)

Top staffs	Rp. 300,000×12 months×7=	Rp. 25,200,000
Section chiefs	Rp. 250,000×12 months×9=	Rp. 27,000,000
General employees	Rp. 200,000×12 months×47=	Rp. 112,800,000
② Human resources development expenses		Rp. 75,000,000
③ Traffic expenses, others		Rp. 95,000,000
Subtotal		Rp. 170,000,000
		(Salaries not included)

2) Facility operation expenses

Annual operation expenses are calculated by assuming routine loads of power, telephone, water supply, and LPG.

① Power charges

A. Research and training buildings

a. Calculation of power to be used
Operation hours

Monday~Thursday : 8:30~16:00 (lunch break 1 hour)

6.5 hours×4 days= 26 hours

Friday : 3.5 hours×1 days= 3.5 hours

Saturday : 4.5 hours×1 days= 4.5 hours

34 hours/week

Average : 34 hours / 6 days= 5.7 hours/day

Annual : 5.7 hours×20 days×12 months

=1,368 hours/year

≒1,400 hours

· Lighting and outlets :

173 KW×0.6×1,400 hours= 145,320 KWH/year

· Air-conditioners and general power :

424 KW×0.7×1,400 hours= 215,600 KWH/year

· Research and training equipment :

385 KW×0.4×1,400 hours= 215,600 KWH/year

· Others :

60 KW×0.2×1,400 hours= 16,800 KWH/year

793,240 KWH/year

≒800,000KWH/year

b. Estimation of electrical charge

Use charge :

800,000 KWH×(79.5+1.75)= Rp.65,000,000 ·· ①

Unit charge :

865 KVA× Rp.2,960×12 months= Rp.30,724,800 ·· ②

≒Rp.31,000,000

Total ①+②

65,000,000+31,000,000= Rp.96,000,000

×1.2=Rp.115,000,000 ··· A

B. Dormitory building

a. Caluculation of power to be used

Operation hours

~18:00 (daytime charge)

3 hours×(365 days - 200 days) = 495 hours/year

18:00~21:00 (night charge)

3 hours×365 days = 1,095 hours/year

LWBP (daytime charge)

· Lighting and outlets :

28 KW×0.6×0.8*×495 hours= 6,652.8 KWH/year

· Air-conditioners and general power :

120 KW×0.8×0.8×495 hours= 30,016 KWH/year

36,668.8 KWH/year

* Usage ratio of total facilities ≒37,000 KWH/year

WBP (night charge)

· Lighting and outlets :

28 KW×0.7×0.8×1,095 hours= 17,169.6 KWH/year

· Air-conditioners and general power :

120 KW×0.8×0.8×1,095 hours= 84,096 KWH/year

· Hot water supply

120 KW×0.8×0.8×2 hours×365 day=

42,048 KWH/year

143,313.6 KWH/year

≒144,000 KWH/year

b. Estimation of electrical charge

LWBP : 37,000 KWH×(79.5+1.75)= Rp. 3,006,250

WBP : 140,000 KWH×(159.5+1.75)= Rp. 23,220,000

Rp. 26,226,250

×1.2 =Rp. 31,471,500

… ③

Unit charge

240 KVA × Rp.2,960 × 12 months = Rp.8,524,800

× 1.2 = Rp. 10,224,760

... ④

Total ③ + ④ 31,471,500 + 10,229,760 = Rp.41,701,260

≒ Rp. 42,000,000

... B

Running cost of total facilities A + B =

115,000,000 + 42,000,000 = Rp.157,000,000

② Telephone charges

The telephone service in Serpong belongs to the network of Jakarta Telephone Office, and the local telephone rate is Rp. 100 per call. The trial calculation assumes 5,000 calls a month.

· Annual telephone charge

5,000 calls/months × Rp. 100/call × 12 months = Rp.6,000,000

· Estimate take into consideration of long distance call and international call depends on the general conditions of Indonesia

Rp. 6,000,000 × 3 = Rp.18,000,000/year

③ LPG charges

The volume of LPG to be consumed is calculated based on the number of staff members and trainees.

· Research and training blocks : 16 kg/day
· Dormitory : 7 kg/day

Rp. 818.2 Rp. × 23 kg × 200 year = Rp.3,763,720/year

≒ Rp.3,800,000/year

④ Water charges

Maximum daily water consumption is calculated based on the number of persons working or staying in the Center and average consumption per person in Indonesia.

· Research and training buildings :

Laboratory	63 persons×200 ℓ/day=	12.6 m³/day
Trainees	105 persons×120 ℓ/day=	9.0 m³/day
Lecturers	20 persons×120 ℓ/day=	2.4 m³/day
		24 m³/day … ①

· Supply water for cooling tower (water cooled refrigerator)

260RT×12.5ℓ/RT.minute×0.02×60 minutes×10 hours/day
= 39 m³/day … ②

①+② 24 m²+39 m²=63 m²/day

· Dormitory building

53 persons×500 ℓ/day=26,500 ℓ/day ≒28 m³/day

(63 m³+28 m³)×Rp. 500/m³×300 day/year
= Rp. 13,650,000/year

⑤ Scrubber maintenance expenses (expenses to be needed for draft chamber flue gas disposer)

Frequencies of operation of the draft chamber flue gas disposer are assumed to be 50% of the average in Japan.

· Electric power consumption :

21.7 KW/day×3 hours/day= Rp. 1,100,000

⑥ Expenses to exchange clean room filters

Frequencies of utilization of the clean room are assumed to be 50% of the average in Japan.

Change of 4 sets of HEPA filter / once a 2 years Rp. 2,800,000

2) Total Rp. 196,350,000

3) Facility and equipment maintenance expenses

① Maintenance expenses of facilities

Building maintenance expenses vary substantially as time elapses. By assuming that annual average maintenance expenses per floor area amount to Rp. 4,000/m2 when viewed over a span of 30 years, the facility maintenance expenses are calculated (including the facility cleaning and guarding expenses).

RP. 4,000/m^2·year×8,500m^2= Rp. 34,000,000/year

② Maintenance expensese of mechanical system

Mechanical system maintenance expenses will not amount to much during the first five years after the completion of the Center, but parts and instruments will have to be replaced with new ones thereafter. The expenses are calculated by assuming that annual average maintenance expenses are about 1.5% of the mechanical systemexpenses when viewed over a span of ten years.

Rp. 28,000,000/year

③ Maintenance expenses of research and training equipment

Equipment maintenance expenses will not amount to much during the first few years after the completion of the Center, but they will gradually increase as time passes. Based on ordinary examples seen in Japan, annual maintenance expenses are expected to be 1.5% of equipment prices for the initial five years and 4% for the next five years. Hence, they amount to ¥ 5 million.

· During the initial five years

¥ 500,000,000×*0.5×0.015= ¥ 3,750,000/year

≒Rp. 52,500,000

· During the next five years Rp. 196,000,000/year

* Ratio of equipment requires maintenance among all equipment

---

3) total Rp. 114,500,000

4) Expendables expenses

① Expendables and chemicals

Volumes of expendables and chemicals to be consumed in the Center will vary substantially depending on the degree of its activities. In this trial calculation, the ratio of utilization of the equipment and materials is assumed to be 50% of the ordinary ratio in Japan.

a. Glass wares

The consumption ratio of glass wares whose grant amount is ¥ 10 million in total is assumed to be 0.5% a month.

¥ 10,000,000×0.005×12 months= ¥ 600,000/year
≒Rp. 8,400,000

b. Expendables for analyzers

The consumption ratio is assumed to be 0.5% a year for a half of the total amount (¥ 700 million) of the equipment.

¥ 700,000,000×0.005×0.5= ¥ 1,750,000/year
≒Rp. 29,500,000

c. Chemicals and gases

This trial calculation is based on the amount of chemicals used by an analyzer in experimental activities in a similar laboratory (P4L), multiplied by the ratio (2.0) which will meet the needs of the expected activities of the EMC.

¥ 6,000/month·person×24 persons×2.0×12 months=
¥ 3,456,000/year
≒Rp. 48,384,000

d. Standard gases and solutions

- Standard gases (for gas analyzers)

Supposing that three air-monitoring stations are to be established and that the total cost of standard gases to be used

at each station is ¥100,000 per monitoring, this trial calculation is based on six exchanges of gases a year.

¥100,000/monitoring·station×6/year×3 stations=
¥1,800,000/year
≒Rp. 25,200,000

● Standard solutions

· Heavy metals

The calculation assumes that 20 types of heavy metals are to be purchased twice a year.

¥2,000/type×20 types×2 times/year= ¥80,000/year
≒Rp. 1,120,000

· pH

¥2,000/type×2 type×12 times/year= ¥48,000/year
≒Rp. 672,000

· Ion Chromatograph

¥2,000×6 times/year= ¥12,000/year
≒Rp. 168,000

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4) Total Rp. 113,444,000
≒Rp. 113,000,000

5) Total of the trial calculation

① Total maintenance expenses (ordinary budget)

a.	Personal expenses	Rp. 170,000,000
b.	Facility operation expenses	Rp. 196,350,000
c.	Facility and equipment maintenance expenses	Rp. 114,500,000
d.	Expendables expenses	Rp. 113,000,000

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1)~4) Total Rp. 593,850,000
··· A

Hence, the trial calculation assumes Rp. 593.85 million as annual maintenance expenses, or ¥42.4 million in Japanese currency.

② Research and training expenses (development budget)

Based on research and monitoring expenses recorded at a similar laboratory (P4L) and the expected number of researchers to work in the EMC (17 engineers in FY 1991/92), the expenses are calculated as follows:

· Monitoring expenses

40 stations × 12 months × Rp. 300,000/month·station

Rp. 144,000,000

· Research expenses

17 perons × 0.5 × Rp. 23,000,000/year·person Rp. 195,500,000

· Training expenses

780 perons × Rp. 500,000/person Rp. 390,000,000

Rp. 729,500,000

··· B

Hence, the trial calculation assumes Rp. 729.5 million as annual research and training expenses, or about ¥ 52.1 million.

Based on the amounts calculated above, the total expected operation and management expenses for the initial year are taken to be Rp. 1,323.35 million (A + B), or about ¥ 94.5 million. They are estimated to increase by 15 to 20% in subsequent years, judging from annual price hikes of personnel expenses and commodity prices.

3-5 Technical Cooperation

Since most of the activity schedules and other main points have been established for the project-type technical cooperation for this Project, it is expected that a Japanese working committee should be started as quickly as possible. The technical cooperation schedule in the preliminary study of May 1991, has proposed that the cooperation should be started about one and a half years before the completion of the Center. If this cooperation is started at an early stage, it will contribute to

① timely preparation of operation, activity, and training plans prior to the completion of the Center

② arrangement of training courses which should be started immediately after completion of the construction, in accordance with recommendations to be given to each department, and

③ training of Indonesian engineers as to the operation and management of the equipment and instruments at the stage of their installation.

As a result of preliminary study of the project type of technical cooperation in May 1991, scopes of the technical cooperation as requested by the Indonesian side are outlined as follows.

(1) Dispatch of long-term experts

1) Environmental science (team leader)
2) Coordinator
3) Air pollution
4) Water pollution
5) Toxic substances

(2) Dispatch of short-term experts

1) Environmental monitoring and analysis (Noise and Vibration)
2) Environmental information system
3) Environmental impact assessment
4) Ecology/biology
5) Environmental engineering (Wastewater treatment, etc.)
6) Health effect

(3) Acceptance of counterpart trainees in Japan (about 25 personnel for 5 years)

1) Environmental Monitoring and Analysis (Water, Air, Hazardous and Toxic Substance)
2) Environmental Engineering
3) Environmental Information System
4) Impacts of Pollution on Human Health and Ecosystems

(4) Provision of equipment and spare parts other than these provided under Grant Assistance Program.

CHAPTER 4 BASIC DESIGN

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4-1 Basic Policies

The Environmental Management Center (EMC) is positioned as a reference center for environmental conservation in Indonesia. Since it is located within the PUSPIPTEK Complex, the Center is expected, when completed, to occupy an important position among facilities in this Complex.Based on the environmental conditions of the construction site of the EMC, the basic design has been prepared in accordance with the contents of the Project and under the following policies in which stress has been put on functionality, durability, and the economic merits of the Center.

- Model plan of environmental laboratory of an appropriate grade
  The scale and the grade of the facilities and the equipment shall be planned in accordance with necessity and reasonableness. They must correspond to the planned activities also correspond to based on the contents of project-type technical cooperation and the actual technical level of Indonesia. However, since the Center is expected to act as the model type of an environment laboratory in Indonesia, it should be equipped with a reasonable scope of necessary facilities and instruments, even if initial costs may be increased.

- Applicable standards
  The plan should comply, in principle, with applicable laws and standards prevailing in Indonesia and instructions and guidlines to be given by PUSPIPTEK. In addition, it refers to Japanese laws and standards on construction and facilities, when the necessity occurs.

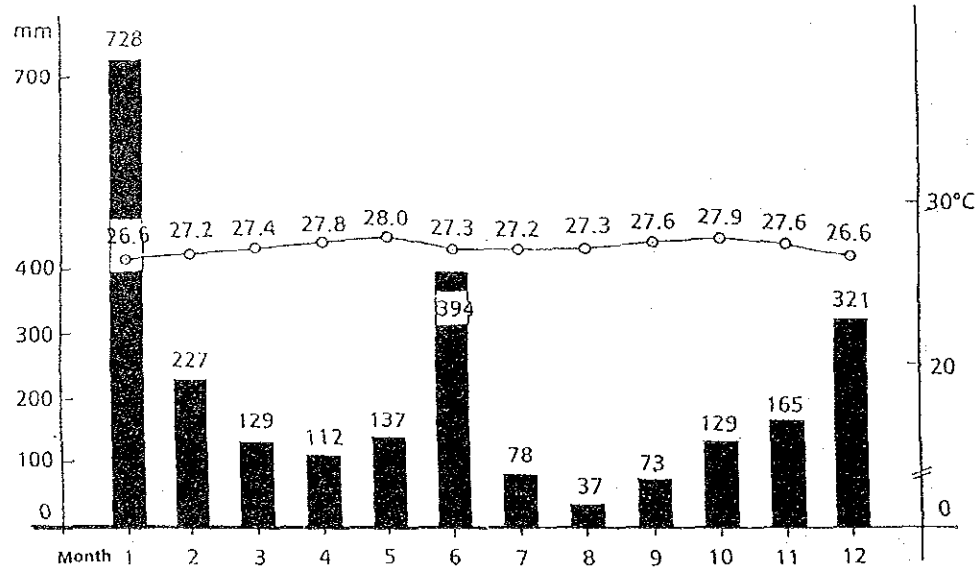
- Facility configuration which assures functionality and operational ease
  The EMC comprises two buildings, one for a research and training and the other for a dormitory. The research and training building is composed of three major sections; research, training, and administration. These three sections together with a auditorium and a canteen are specifically zoned for their respective purposes. The basic design aims at the efficient and functional movement of many people working for the different departments by clearly forming efficient traffic lines within the building and assuring division of the sections by an easy-to-use design. Since the dormitory building is to be constructed adjacent to the existing guest house, the design aims at architectural harmony between the

building and the guest house. Facilities in both the laboratory and dormitory buildings are arranged to allow future expansion in expectation of an increased scope of the Center's activities in the future.

- Design suited to the environmental conditions
  When tropical meteorological conditions are taken into account, the construction plan should adopt many eaves and louvers to protect the buildings from strong sunlight and heavy rain with strong winds. By employing natural lighting and natural ventilation systems as far as possible, loads on mechanical facilities are minimized while a comfortable living environment can be assured. The layout plan leads to a facility configuration with great openness by making full use of the spacious site area and makes it possible for researchers and trainees to feel comfortable and refreshed while they are working and studying. The external appearance will be harmonized with the adjacent facilities by complying with the guidance of PUSPIPTEK, and at the same time, the Center should express itself as a symbol of the national center.

- Easily maintainable facilities with less administration costs
  The design aims to construct facilities which afford minimized running costs by saving energy, simplifying the facility system, and giving priority to higher durability of facilities and equipment. Construction materials are selected by identifying robust, easy-to-maintain materials and construction methods suited to local construction techniques.

Fig. 4-1-1. Meteorological Data in Jakarta
(Monthly rainfull & Monthly average temperature)



Source : Meteorology and Geophysics Board

4-2 Design Conditions

4-2-1 Composition of Facilities

The facilities are composed of the elements as stated in Section 3-3-4. In our opinion, the most reasonable way to construct the necessary rooms in the research and training building is to arrange the whole facilities by dividing them into blocks of appropriate scales and disperse them in the area, utilizing the space and excellent surrounding environment. They are divided into the following blocks, by giving priority to the integration of related rooms and assuring the functions and convenience of the entire facility.

(1) Research and Training Building

- Administrative block : Office director room, meeting room, experts' room, etc.
- Library block : Library, document service room, etc.
- Research block : Laboratories (water quality, air quality, and toxic substances), special laboratories (gas chromatographs, gas chromatography mass analysis, x-ray spectroscopes, electron microscopes, atomic absorption analyzers, balances, IR spectroscopes), office, meeting room, etc.
- Training block : Lecture rooms, practice rooms (water quality, air quality, noise and vibration, soil, toxic substances, computers, audio-visual, drafting), etc.
- Auditorium : Auditorium, foyer, etc.
- Canteen : Canteen, kitchen, etc.
- Others : Covered way, solid waste, pretreatment room, ether distillation room, garage,etc.

(2) Dormitory : Bed room, dining room, keepers room, laundry, etc.