Project Manager :	1	General management
Construction Engineer :	1	Construction management and schedule control
Construction Engineer : (also responsible for drawings)	1	Work management and guidance on working drawing preparation
Mechanical and Electrical : Engineer	2	Guidance on mechanical and electrical work
Clerk :	1	Control on imported equipment and materials, labour management and administration

2) Engineers specialized in the following equipment and instruments should be dispatched to give local technicians instructions on their installation and operation.

Gas chromatograph mass analyzer (GC-MS)	1
Fluorescent X-ray spectroscopic analyzer	1
Fourier transformation IR spectrophotometer	1
Instruments related to spectrophotometers	1
Fluorescence spectrophotometer	1
Instruments related to atomic absorption spectrophotometer	1
Instruments related to chromatography	2
Elemental analyzer (CHN)	1
Scanning electron microscope	1
Heavy metal waste water treatment facilities	1
Instruments related to balances	1
Total organic carbon analyzer	1
Instruments related to analysis of air pollutants	3
Instruments related to AV systems	1
Instruments related to noise and vibration	1
Instruments related to information systems	1
Other instruments	4

4-4-4 Equipment and Materials Procurement Plan

The following items should be taken into consideration when procuring construction materials and equipment to be used for the EMC.

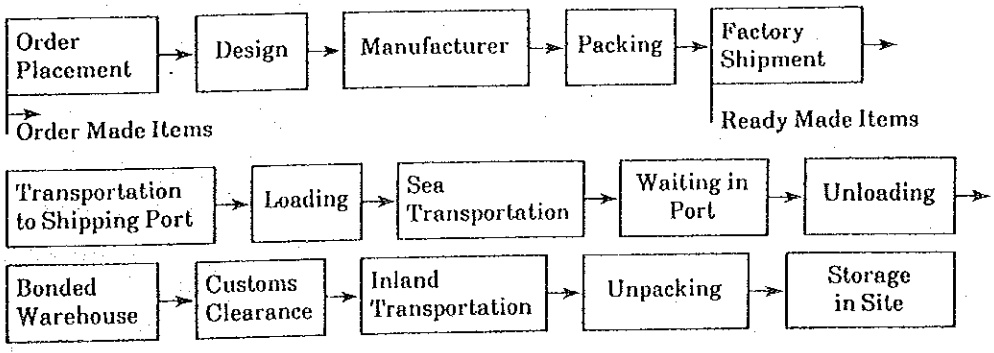
(1) Procurement policy

Main construction materials can be locally procured. Hence, the procurement policy is to procure materials in a reasonable manner by considering supply capabilities and quality vis-a-vis local manufacturers and suppliers.

The number of materials to be procured from Japan should be kept to a minimum, restricted to those which cannot be locally supplied such as special materials and equipment and those which cannot be locally procured because of unfavorable performance or local supply capabilities.

(2) Procurement in Japan

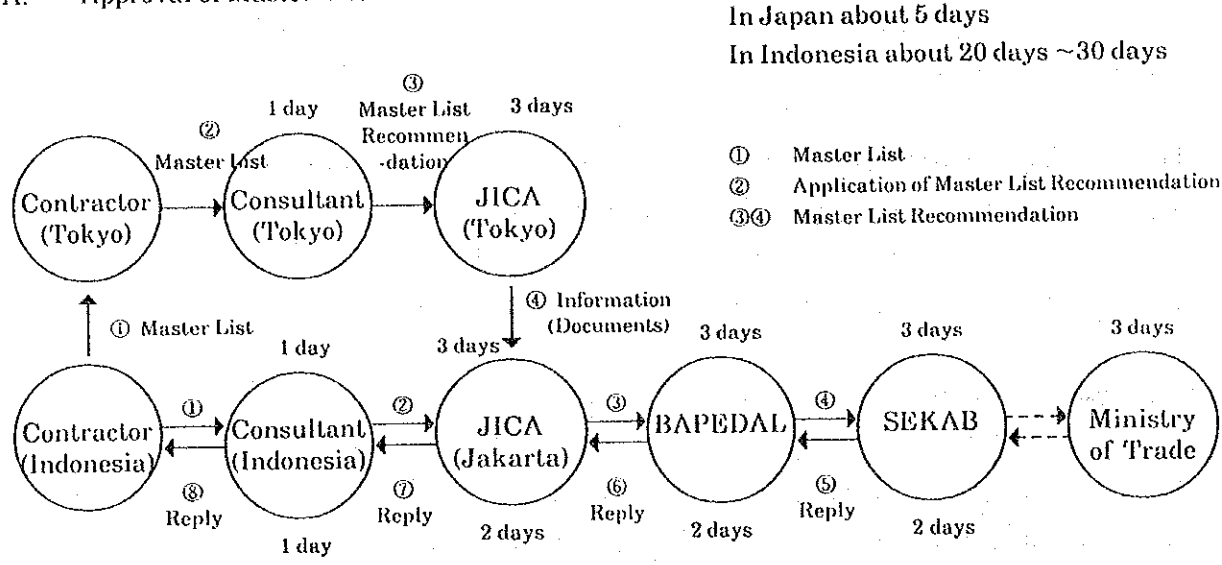
Those equipment and materials which are to be procured in Japan are to be manufactured and prepared in accordance with order specifications.The special fittings (large-sized movable partitions), telephone exchange board, power distribution board, and other materials and equipment are to be manufactured upon order. Unlike those currently available in the market, these items will be prepared only after an order is placed in a process including the steps from ordering to designing, approval, manufacturing, packing, and shipping, and will take longer time in manufacture than mass-produced ones. Hence, it is necessary to place orders for them in accordance with the progress of the construction work. Moreover, since imports of many items have been prohibited in Indonesia, and rules may vary over an interval of a few years, the current list of prohibited items should be referred to prior to placing orders. (See APPENDIX for the current list of prohibited items.)



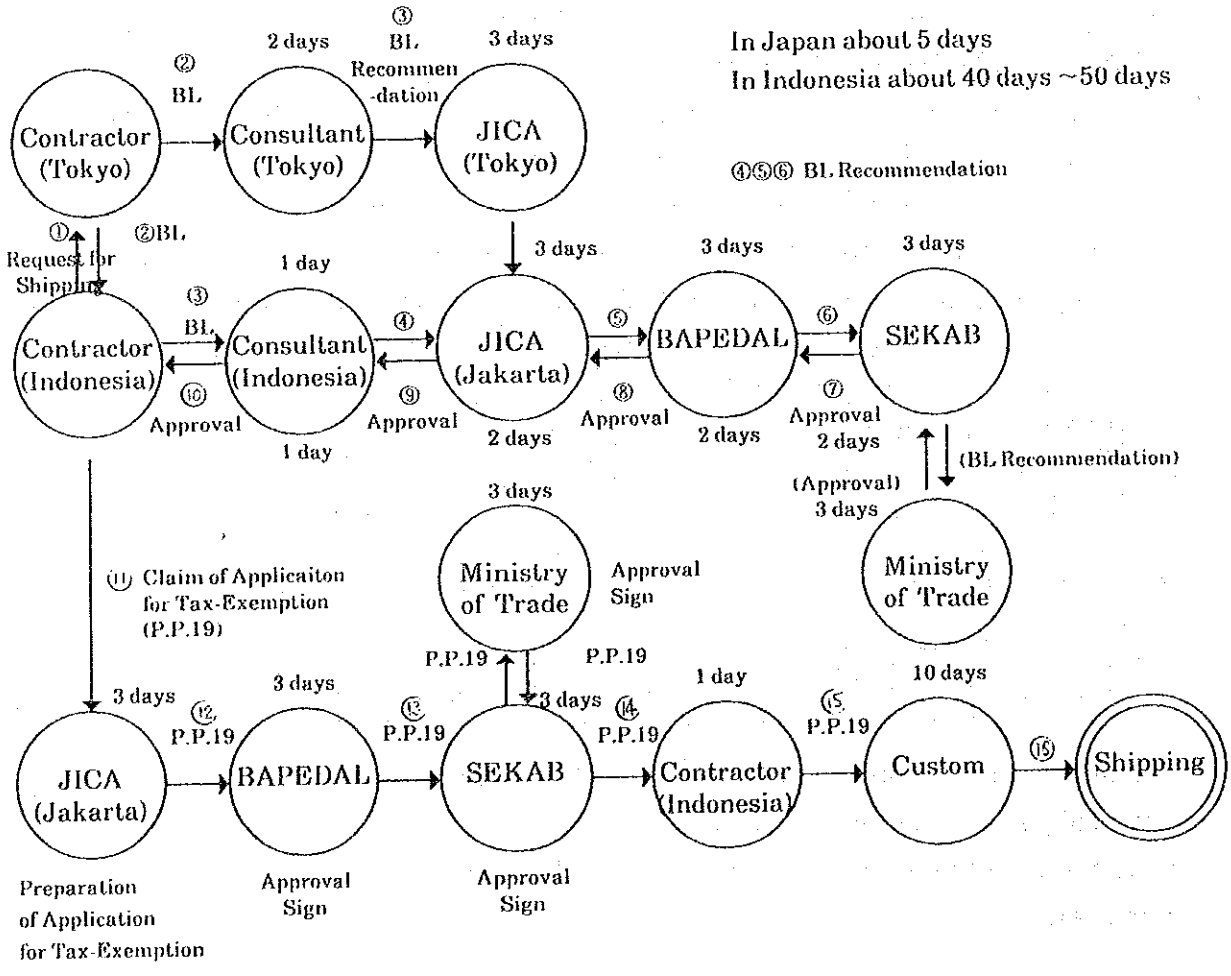
Unloading and customs clearance at local ports may take a long time in some cases. So, early arrangements should be made through close liaison with the Indonesian implementing agency so that these procedures may be smoothly expedited.

Fig. 4-4-2. Necessary Terms and Procedure for Custom Clearance of Importing Materials

A. Approval of Master List



B. Flow Chart of Shipping Document and Procedure of Tax-Exemption



(3) Local procurement

Almost all the construction materials can be locally procured and this means that the facilities can be maintained without any particular difficulties. Even if equipment and materials may be damaged, they can be quickly repaired. However, sufficient consideration should be given to uniform quality and supply volumes of materials so that they do not hinder the functions of the buildings and the construction process.

(4) Costs

By comparing materials that can be procured both locally and in Japan, those with lower costs will be employed. Procurement from Japan requires additional packing, transporting, and insurance expenses beyond their market prices, but there are no import duties.

(5) Procurement schedule

Based on the above-mentioned factors, materials and equipment to be used in construction of the EMC will be procured in the following manner.

1) Construction of building frames work
Almost all types of materials that to be used for construction of building frames, namely sand, gravel, cement, concrete, reinforcing bars, steel frames, concrete blocks, and bricks, are locally available in Indonesia. However, concrete blocks of local make are not applicable as bearing walls because they have insufficient strength.

2) Interior and Exterior finishing work and external work
Almost all the materials to be used for the construction work are locally available in Indonesia; they include timber, aluminum fittings, copper fittings, plastering materials, tiles, roof tiles, metallic roofing materials, paints, and glass (some of these materials are imported). Hence, only large-sized movable partitions, colored steel sheets, waterproofed materials, and other special materials as well as some types of metallic fittings and hardware (due to maintainability) are to be procured in Japan. Paints to be applied to external walls should also be procured in Japan in consideration of weatherability.

3) Air-conditioning and plumbing work

Since imports of pumps and boilers are prohibited in Indonesia, they are to be locally procured for the air-conditioning and plumbing work. Apparatuses (such as valves and dampers) to be used in this work are to be procured in Japan, but the plan intends to procure sanitary ware in Indonesia. Air conditioners, fans, and other instruments are to be procured in Japan, but they may be procured in Indonesia after close checking of their costs.

4) Electrical work

Importation is prohibited of such electric work materials as illumination lamps, power transformers, electric wires and cables, PVC pipes, and stand by motor generators. Hence, they are to be locally procured. Illumination fixtures, power distribution boards, terminal boards, etc., for which ready-made items are suitable, are to be procured locally as far as possible, as a result of comparison of costs. Transformers, switchboards, power control panels, telephone exchanges, specially designed illumination fixtures, and low-voltage electric apparatuses are to be procured in Japan.

5) Equipment work

Almost all the equipment and instruments (such as analyzers) to be introduced into the EMC are not available in Indonesia. They are to be procured in Japan, except for automobiles, personal computers, and copying machines etc. Most analyzing instruments are not mass-produced, but are manufactured upon special order. This means that sufficient time should be allocated to designing and manufacturing periods in the equipment and instrument procurement plan. Automobiles, personal computers, and copying machines are manufactured in Indonesia in a knock-down system and locally procured items are superior to those procured in Japan as to costs and maintenance. Hence, they are to be locally procured.Equipment and instruments to be procured in Japan includes many types of precision ones. Due care should be taken in marine and inland transportation. Moreover, engineers specialized in operating them should be dispatched at the time of local installation. Some advanced instruments will require the parties concerned to consider exercising and training of Indonesian

staff members to accustom them to operation of the instruments so that they may make efficient use of them after installation.

(6) Study of quality of main construction materials and countries from which to procure them

Work	Equipment and Materials	Procurement Country	Quality			Remark
			good	normal	poor	
	Washed block	Indonesia		○		
	Cement tile	Indonesia		○		
	Stone (Granite)	Indonesia		○		Materials from Italy, irregular colouring
	PVC tile	Indonesia		○		Japanese made high efficiency
	PVC sheet	Indonesia		○		Japanese made high efficiency
	Carpet tile	Indonesia		○		Japanese made
	Colourcrete	Indonesia		○		Japanese made uneven application with trowel
	Tile	Indonesia		○		Irregular colouring and only standard shaped tiles available
Base	PVC base board	Japan		○		
	PVC groove material	Japan		○		
Wall	Mortar	Indonesia		○		After rough and middle layer, cement wash finish. Uneven application with trowel
	Plywood	Indonesia		○		
	Exposed brick	Indonesia		○		
	Vinyl cloth	Indonesia		○		Cloth imported from Europe or Japan
	Perforated board	Indonesia		○		Board perforated by hand
	Paint	Indonesia		○		
Ceiling	Rockwool accoustic board	Indonesia		○		Imported material
	Asbestos cement board	Indonesia		○		
	Gypsum board	Indonesia		○		made in Europe
	Aluminum louver	Indonesia		○		Ready made, few types
	Paint	Indonesia		○		
	Wooden moulding	Indonesia		○		Difficult to ensure accuracy because installing on walls first

Work	Equipment and Materials	Procurement Country	Quality			Remark
			good	normal	poor	
Structural Work	Reinforcing bars	Indonesia		○		Tensile strength varies widely
	Concrete	Indonesia		○		Quality varies widely
	Forms	Indonesia		○		
	Space truss products	Indonesia		○		
	assembling	Indonesia	○			Experience in assembling efficient assembly and high accuracy
	Pre-stress concrete (PS)	Indonesia	○			Well experienced and good control of production. Japanese made PS wire.
Roof Work	Structural steels	Indonesia		○		Few product types
	Folded plate products	Japan	○			
	assembling	Indonesia		○		
	Water proof (FRP)	Indonesia	○			Well experienced efficient assembly, good quality
Exterior Finishing	Spray tile	Japan	○			
Fixtures	Aluminum	Indonesia	○			Use of products of Japanese companies manufactured locally and many types
	Stainless	Indonesia		○		Use Japanese made plates, manufactured with quite high accuracy inside reinforcement methods are still poor
	Steel	Indonesia		○		
	Sliding wall	Indonesia		○		Use Japanese made parts, but finishing accuracy falls slightly
	Wood	Indonesia		○		Well accustomed to drawing, manufacturing and installation
	Metal fittings	Japan		○		
Floor	Terazzo block	Indonesia		○		Due to method of on-site polishing of roughly ground products, become badly soiled during installation

Work	Equipment and Materials	Procurement Country	Quality			Remark
			good	normal	poor	
Furniture Work	Wooden furniture	Indonesia		○		
	Steel furniture	Indonesia		○		
	Folding desk	Japan		○		
	Roll back chair	Japan	○			
Others	Steel board	Japan	○			Insufficient local cutting technique
	White board	Indonesia		○		Can be curved on site
Air-Conditioning Work	Separate type air-conditioner	Indonesia		○		(Subject to import controls)
		Indonesia		○		
	Exhaust fan	Japan		○		Japanese made
	Outlet diffuser	Indonesia		○		
Plumbing Work	PVC pipe	Indonesia		○		
	Valve	Indonesia		○		Japanese made
	Sanitary Fixture	Indonesia		○		Metal fittings made in Japan
	Kitchen euqipment	Inodnesia		○		Refrigerator, kitchen equipment made in Japan
	Septic Tank	Japan		○		
Electrical Work	Transformer	Indonesia		○		(Subject to import controls)
	Power distribution board	Japan		○		
	Power board	Indonesia		○		Equipment made in Japan
	Lighting panel board	Indonesia		○		as above
	Lighting fixture	Indonesia		○		
		Japan	○			Special lighting fixtures only
	Public address system	Indonesia		○		Japanese made
	Telephone equipment	Indonesia		○		Japanese made
	Fire Alarm Equipment	Indonesia		○		Japanese made
	Electric Wires & Cables	Indonesia		○		
	Wiring conduit pipe	Indonesia		○		Japanese made

(7) Principal construction machinery procurement plan

Local subcontractors and machine lease companies possess the common machines which will be needed for the implementation of the Project. All the construction machines can be locally pro-cured in this project. However, when compared with the machines available in Japan, they are usually handled with less care and are poorly maintained, thereby often resulting in troubles.

Names of construction machines.

Pile driver
Truck crane
Tower crane
Bulldozer
Roller
Power generator
Backhoe
Crawler crane
Air compressor
Grader
Submerged water pump

(8) Means and numbers of days required to transport principal materials and equipment to the construction site (PUSPIPTEK)

Materials and equipment to be procured in Japan for the implementation of this project will be transported mainly by sea, but if urgent transportation is needed, they may be airfreighted. Procedures of and the number of days required for marine transportation are listed as follows.

Marine transportation will take about one month, while air transportation takes about one week. For items of smaller dimensions, DHL and other air parcel forms may be utilized.When the equipment and materials are imported into Indonesia, the imported item list must be approved by SEKAB. Judging from past experience, SEKAB may sometimes instruct that some items be locally procured. Hence, preliminary arrangements should be made to obtain its approval.

4-4-5 Construction Schedule

When the construction of the EMC is implemented under Japanese grant-aid, the following procedures are to be taken: i) signing of an Exchange of Notes (E/N) between the two countries, ii) choice of a Japanese design and supervision consulting company by the Government of Indonesia, iii) conclusion of a design supervision agreement between the Indonesian government and the consulting company, iv) three preparatory stages including preparation of design documents for implementation, tendering and conclusion of a construction contract with the successful tenderer, and v) construction of the facilities concerned. After the E/N is signed, BAPEDAL will act as the implementing agency of the Indonesian government.

(1) Detailed design work

Contract documents for construction are prepared based on the basic design and are composed of detailed design drawings, specifications, calculation sheets, etc. Close discussions are held with related agencies of the Indonesian government at the initial, middle, and final stages of preparing the detailed design, respectively. After the final results are approved by the agencies concerned, tendering procedures will be undertaken. Details are arranged in consideration of the contents and schedules of the project-type technical cooperation concerned.

(2) Tendering

After the detailed design work is completed, prequalifications (P/Q : preliminary review for qualification of applied tenderer) is announced and is carried out in Japan. In accordance with the review, BAPEDAL will invite tenderers for the Project, and the tendering is done in Japan under the supervision of the interested parties. The tenderer which underbids the others will become the successful one, if the contents of its tender are judged to be appropriate, and then it will conclude a construction contract with BAPEDAL of the Indonesian government.

(3) Construction work

After the construction contract is signed, the construction work will be commenced after the Japanese government verified it. Judging from the scale and contents of the facilities of the EMC, the construction periods are expected, at the least, to be about 10 months for Phase I (construction of the research library and administrative blocks) and about 10 months for Phase II (construction of the training block, auditorium, canteen, covered way, outdoor facilities, dormitory and equipment work), on the conditions that i) construction materials and equipment are smoothly procured, ii) smooth progress is seen in the Indonesian administrative procedures and reviews and preliminary work within the scope of responsibility of the Indonesian side, and iii) the one-year budgetary system of the Japanese government is applied correctly.

(4) Indonesian ministries and agencies concerned and procedures taken by them

The Indonesian ministries and agencies concerned and the procedures to be taken by them from conclusion of the consulting agreement to completion of the construction work are listed as follows.

1) National Development Planning Board (BAPPENAS)
After the E/N is signed, BAPEDAL will submit to BAPPENAS an application for approval of BAPEDAL's appointment of a consultant to take charge of design and supervision of the EMC project (usually, the consultant which has taken charge of the basic design study). It will usually take a few weeks to receive the approval.

2) Prime Minister's Secretariat (SEKAB)
BAPEDAL will submit an application to SEKAB so that SEKAB's tender document examination section will check each item of facilities and equipment to see whether or not locally produced materials and equipment can be employed as much as possible and examine the terms and conditions of the agreement. It will usually take a few weeks for the examination to be completed.

3) National Center for Research, Science, and Technology (PUSPIPTEK)

BAPEDAL will submit an application to an administrative agency of PUSPIPTEK for confirmation of the construction of the EMC. When it is confirmed, the construction work can be started. It will take one to six months to obtain a letter of confirmation.

4) Coordinating Minister for Economy, Finance, Industry, and Development Survey (EKUIN)
Any contract whose total value is 30 billion Rupiahs (¥210 million) or more should be approved by EKUIN. In the case of this project, BAPEDAL will apply to EKUIN for examination and approval of the contents of the contracts for the facilities and equipment after the contracts are concluded.

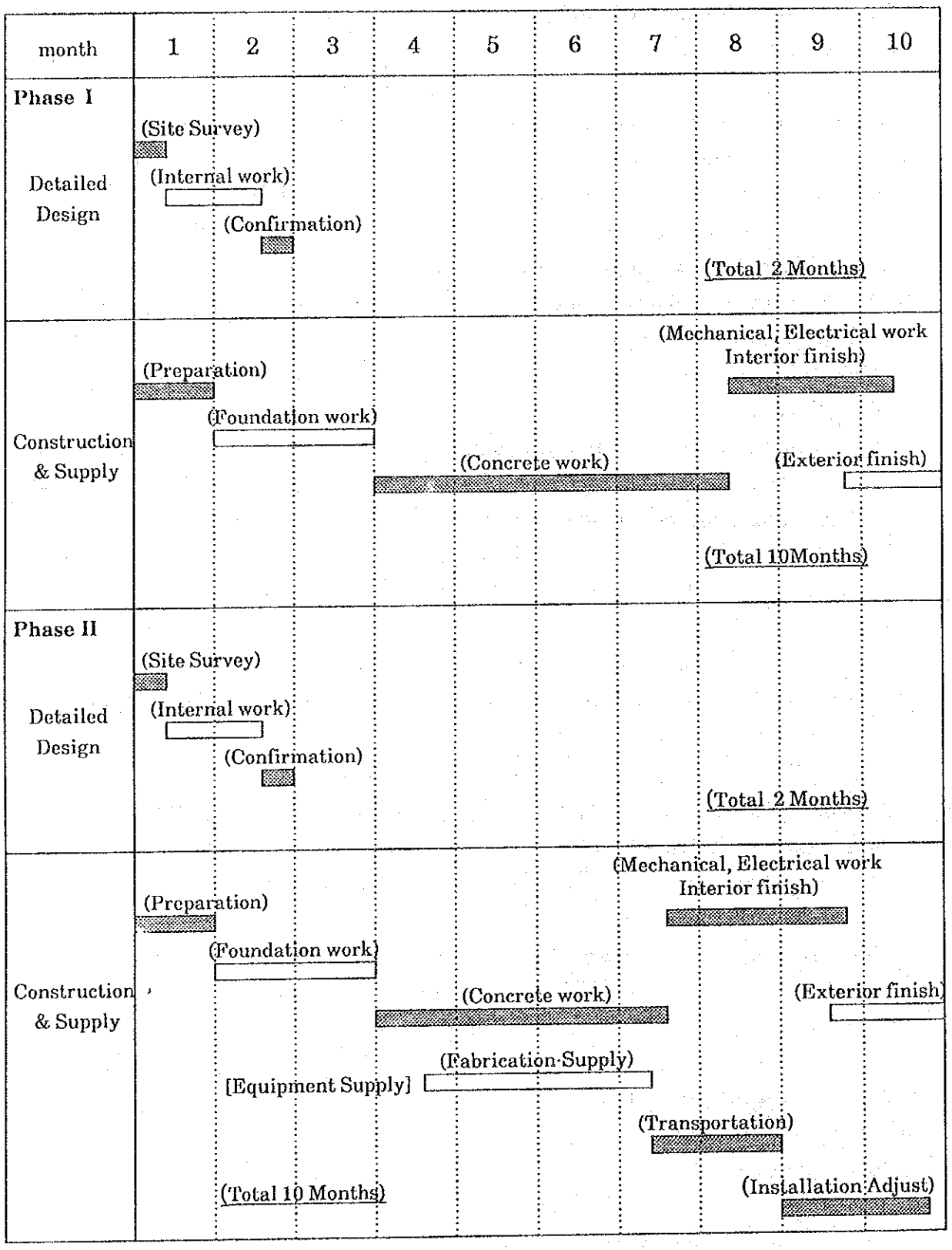
5) SEKAB
After the construction work is started, a list of materials procured and imported from Japan will be submitted to SEKAB. After it is approved, the materials can be transported from their ports of entry to the project site.

6) PUSPIPTEK
After the construction work is completed, BAPEDAL will apply for PUSPIPTEK's examination of the construction work. When approved, the facilities can be put to use.

It is expected that BAPEDAL, the implementing agency of this project, will maintain smooth coordination with the abovementioned agencies so that all of the construction work may be completed within the scheduled period.

The outlined process expediting chart is shown on the following page (Table 4-4-1).

Table 4-4-1. Project Implementation Schedule



4-4-6 Estimated Project Cost

(1) Work Demarkation

It is reasonable to divide the scope of the EMC construction work between the two governments as follows:

Work to be done by the Japanese Government

1) Facilities
   - Research and Training Building: Aministrative Block, Library Block, Researh Block, Training Block, Auditorium, Canteen, Covered Way, Outdoor Facilities
   - Dormitory:

2) Equipment for research, training, and environmental quality monitoring in the following fields
   - Commonly analytical equipment
   - General laboratory equipment
   - Water quality monitoring equipment
   - Air quality monitoring equipment
   - Noise and vibration level monitoring equipment
   - Waste and toxic substance analytical equipment
   - Information system equipment
   - Other training equipment
   - Workshop equipment
   - Research and training fittings

Item to be done by the Indonesian government

1) To remove obstacles under the ground of the project site before starting the construction work, and conduct necessary earth filling and leveling the land.
2) To carry out gardening, fencing, and installation of incidental external works
3) To pave parking lots in the project site
4) To supply electric power, water, telephones, water drainage facilities, etc., to the construction site

Table 4-4-2. Inflation Rate of 17 Cities in Indonesia (April 1977 - March 1978 = 100)

LAJU INFLASI 17 KOTA DI INDONESIA
INFLATION RATE OF 17 CITIES IN INDONESIA
(APRIL/*APRIL* 1977-MARET/*MARCH* 1978=100)

KOTA *CITY*	Tahun Kalender/ *Calendar Year*							Tahun Anggaran / *Fiscal Year*						
	1984	1985	1986	1987	1988	1989	1990[1)]	1984/ 1985	1985/ 1986	1986/ 1987	1987/ 1988	1988/ 1989	1989/ 1990	1990/[2)] 1991
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1. Medan	9,78	2,79	11,29	7,32	11,24	6,64	7,56	2,65	7,02	9,80	7,12	12,50	5,74	6,16
2. Padang	5,82	3,27	7,84	7,78	3,77	3,56	6,74	0,92	3,94	7,51	6,66	7,12	2,75	4,39
3. Palembang	6,23	3,04	8,17	5,81	4,45	5,08	8,54	1,26	5,73	6,24	7,88	4,19	1,62	8,81
4. Jakarta	11,25	3,94	8,18	9,02	4,44	5,56	11,26	4,17	5,44	8,60	8,08	5,99	4,97	9,28
5. Bandung	7,32	5,50	10,19	8,63	4,50	5,07	9,67	3,48	6,81	8,76	9,47	5,33	5,45	7,70
6. Semarang	5,79	4,49	9,73	9,59	5,30	4,83	9,02	2,97	5,11	9,16	9,89	6,07	4,65	8,22
7. Yogyakarta	7,86	5,76	9,23	10,37	4,43	5,21	10,73	3,26	6,95	8,28	9,48	6,17	4,99	9,20
8. Surabaya	7,82	4,53	8,48	9,26	6,46	6,73	9,69	4,39	5,13	9,87	7,54	6,95	6,21	8,87
9. Denpasar	12,79	6,70	13,52	11,07	7,92	7,37	12,73	5,98	11,35	9,76	11,88	7,66	7,67	9,46
10. Mataram	5,88	7,80	9,54	10,28	8,21	8,82	9,53	1,76	8,34	9,92	10,16	6,95	10,40	9,10
11. Kupang	5,08	4,79	11,32	7,61	5,39	6,95	7,40	0,96	8,55	11,47	5,62	4,35	8,61	4,87
12. Pontianak	7,56	5,62	8,56	10,68	7,75	6,55	9,24	2,90	8,05	8,94	9,28	6,81	7,10	7,85
13. Banjarmasin	6,65	4,04	9,03	10,45	3,10	8,00	10,08	3,31	4,72	8,38	10,45	4,22	8,01	8,28
14. Manado	6,89	6,59	13,29	8,79	2,86	5,74	8,76	1,50	8,29	12,47	7,12	7,45	3,73	7,72
15. Ujung Pandang	8,05	5,59	6,05	8,72	3,08	5,40	7,37	5,33	4,67	6,47	7,24	4,60	6,17	4,75
16. Ambon	3,54	4,51	3,56	15,63	17,23	26,05	9,38	0,05	-2,67	8,03	17,25	21,34	25,37	6,84
17. Jayapura	6,68	-0,74	7,08	6,24	11,70	8,54	5,49	2,31	2,02	13,09	6,67	6,30	5,99	6,19
NASIONAL	8,76	4,31	8,83	8,90	5,47	5,97	9,53[*)]	3,64	5,66	8,83	8,29	6,55	5,48	8,02[*)]

Catatan :1) Kumulatif dari Januari - Desember 1990 dimana laju inflasi sejak bulan April 1990 dihitung dari IHK baru (1988/1989=100)
2) Kumulatif dari April - Desember 1990
*) IHK Gabungan 27 Ibukota Propinsi di Indonesia

Note : 1) Cumulative from January - December 1990, Since April 1990 the inflation rate is calculated based on the CPI (1988/1989=100)
2) Cumulative from April - Desember 1990
**) Combine Consumer Price Indexes of 27 Capital Provinces*

Table 4-4-3. Wholesale Price Indexes of Construction Materials by Type of Construction

ANGKA INDEKS HARGA PERDAGANGAN BESAR BAHAN BANGUNAN/KONSTRUKSI MENURUT JENIS KONSTRUKSI/BANGUNAN
WHOLESALE PRICE INDEXES OF CONSTRUCTION MATERIALS BY TYPE OF CONSTRUCTION
(1983 = 100)

SUB SEKTOR / *SUB SECTOR*	Rata-Rata / *Average*						1989		1990	
	1984	1985	1986	1987	1988	1989	September	Oktober	September	Oktober
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Bangunan Tempat Tinggal dan Bukan Tempat Tinggal *Residential and Non Residential Building* (21)	107	112	119	131	144	160	163	164	179r)	180
2. Pekerjaan Umum untuk Pertanian *Public Works in Agriculture* (17)	109	115	121	130	142	159	165	166	183r)	185
3. Pekerjaan Umum untuk Jalan, Jembatan, dan Pelabuhan *Public Works on Roads, Bridges and Ports* (16)	108	114	120	132	147	163	166	167	183	184
4. Bangunan dan Instalasi Listrik, Gas, Air Minum dan Komunikasi *Construction of Electricity, Gas, Water and Communication* (19)	107	111	117	134	148	161	163	164	176	177
5. Bangunan Lainnya / *Other Building* (21)	108	113	119	133	147	162	165	165	183	184
Umum / *General* (21)	108	113	119	132	145	160	164	165	180	181

Catatan : - Angka dalam tanda kurung ( ) pada kolom jenis bangunan menunjukkan banyaknya kelompok barang yang mewakili didalamnya.

Note : - Figures within brackets () under column type of construction indicate the number of groups represented in that type of construction.

5) To supply LP gas
6) To conduct a geological survey
7) To provide ordinary office furniture and daily expendables
8) To bear commissions and other expenses arising from banking agreements
9) To pay value-added taxes (VAT)
10) To pay expenses related to application for building construction permit
11) To take prompt measures related to landing, duty exemption, customs clearance, and inland transportation at and from Indonesian ports where construction materials and equipment to be procured under the grant-aid are to be imported
12) To exempt Japanese nationals engaging in the supply of materials, equipment, and services under the Project from customs duties, national taxes, and other financial levies charged in Indonesia
13) To provide the necessary measures for the above-mentioned Japanese nationals to enter, leave and stay in Indonesia for execution of their work under the verified contracts.
14) To appropriately and effectively maintain and administer the facilities to be constructed and equipment to be granted under the scope of the grant-aid.
15) To bear all necessary expenses for carrying out the Project outside the scope of the grant-aid.
16) To secure budgets and personnel necessary to appropriately and effectively maintain and administer the facilities and equipment to be granted under the grant-aid.

(2) Estimated Project costs for the Work and relating matter to be done by the Indonesian government

The Indonesian government is estimating the expenses which it may bear for constructing the EMC as follows:

			Time of Arrangement
1.	Soil Test Charge	Rp.30,000,000	Already arranged as a budget 1991/1992
2.	Planting	Rp.35,000,000	Early 1993
3.	Water supply charge, Electricity incoming charge, Telephone incoming charge	Rp.80,000,000	1992 (During Construction)
4.	Furniture and Fixtures	Rp.120,000,000	1993 (Completion of Construction)
5.	Banking arrangement (B/A) commission	Rp.60,000,000	
6.	Application for Building permission (to PUSPIPTEK)	Rp.255,000,000	
7.	Administration cost	Rp.10,000,000	
8.	Customs clearance charge	Rp.40,000,000	
9.	Vehicle (for transportation)	Rp.100,000,000	
	Total	Rp.730,000,000	

CHAPTER 5 PROJECT EVALUATION AND CONCLUSION

Chapter 5 PROJECT EVALUATION AND CONCLUSION

5-1 Project Evaluation

When the EMC is established under the Project, the environmental conservation policies of the Indonesian government will be improved and reinforced. Concrete effects which the Project is expected to realize are listed as follows.

(1) Development in understanding the actual state of environmental pollution in Indonesia

The principal activities of the EMC are summarized into the following four points:
To establish standard procedures for analyzing and measuring environmental pollutants and to give instructions on applications of these techniques
To confirm causal relationships between environmental pollution to make plans of new environmental policies and to evaluate and study the effectiveness of environmental conservation measures
To set up and help implement environmental measures based on proper understanding of the present situation by analyzing environmental information and data, and
To improve and reinforce environmental monitoring functions in Indonesia by giving training opportunities to persons concerned.
When the EMC commences activities, it will be possible to collect environmental data which are highly reliable and can be compared with each other based on unified standards and the foundation of environmental administration will be established. As a result, environmental pollution in Indonesia will be understood in a more appropriate manner, thereby enabling correct measures to conserve the environment to be adopted. In addition, such an improved state will minimize the adoption of inappropriate measures which would have been otherwise taken based on erroneous data and will enhance efficiencies in the environmental administration.

(2) Reinforcement of human resources engaging in environmental conservation

Those people who are to be trained in the EMC include i) officials of environmental administrative agencies of the central and local governments,

ii) university members concerned with environmental problems, iii) members of private corporations, iv) NGOs' leaders and teachers, and 5) school teachers. The training courses are roughly divided into two types; a technical training course and an environmental administrative training one. The technical training course aims at giving education and training to engineers who are engaged in environmental monitoring and analyses, processing of environmental data, and pollution control, while the environmental administrative training course aims at administrative officers and members of private companies who are engaged in planning, preparation, and implementation of environmental policies. These two courses will train the participants in broad fields which have been earnestly demanded in the country, including "monitoring technology," "pollution control technology," "environmental impact assessment," "environmental data processing," and "environmental education."

These training activities to be offered by the EMC will reinforce basic human resources in many fields applicable to conserving the environment in Indonesia. The potential number of people who require such training is currently estimated to reach 20,000 people throughout Indonesia, while the EMC is expected to train about 780 trainees a year when it starts operation. Although only about 40% of the potential trainees are to be trained here in the EMC, graduates of these training courses are expected to diffuse and transfer acquired technology among members of organizations to which they belong.

(3) Promotion of appropriate environmental conservation policies

As analyzing and measuring methods are unified throughout the country as a result of the establishment of the EMC, the actual state of environmental pollution will be correctly recognized. The more people are trained in technology to protect the environment, the more characteristics and causes of pollution will be clarified. It will be possible to make correct decisions on conservation of the environment, which will lead to propermaintenance and improvement of the people's health, by estimating the influences of pollution upon the environment and the people.

(4) Reinforcement of BAPEDAL's administrative coordinating abilities among environment-related ministries and agencies

Since BAPEDAL officials will enhance their environment quality monitoring abilities as a result of the training to be given by the EMC, the technical potential of BAPEDAL will be increased so much that it will strengthen its capabilities and authority to carry out administrative coordination with and give instructions to related ministries and agencies in the field of environmental pollution.

(5) Improvement of environmental standards and promotion of new standards

Environmental data are to be collected from agencies of provincial governments through a national monitoring network which is one of the objectives of establishing the EMC. They will be arranged, analyzed, and publicized periodically as sets of unified national environmental information. It will be possible, based on such unified information, to improve or newly establish environmental standards most suitable for the present situation of the country, and thereby further promote environmental administration.

(6) Provision of data on environmental technology

In Indonesia, each environmental related administrative agencies have their own laboratories to engage in monitoring and analyzing environmental factors. Environmental study centers of some universities (PSL) analyze and study these data in their own laboratories. However, almost all of them have insufficient facilities and equipment at present, the number of analyzers have been less than what is expected, and their technical knowledge is not sufficient. When the EMC is set up as planned, environment quality monitoring and analyzing work will soon be unified while measuring and analyzing methods will be standardized. The EMC will then be able to provide environmental related agencies of the government with such technical know-how as monitoring procedures and measuring and analyzing manuals, thereby contributing to the promotion of operations in these agencies.

(7) Further diffusion of knowledge on conservation of environment

To realize conservation of the environment, people's understanding of and cooperation with the environmental protection policies will be needed in addition to training of the administrative officials related to conservation administration and research of monitoring technology.
The EMC is expected to offer a training course titled "Environmental Enlightenment Course for Citizens" for fostering leaders of environmental education in schools and communities. Then, people in general will improve their consciousness of conservation of the environment and will support governmental policies in this area.

The above-mentioned effects are expected to be attained when the EMC is established. To assure continuous operation of the EMC, the Indonesian side needs to acquire the technology and experience of developed countries. Hence it has already requested the Japanese government to offer project-type technical cooperation in addition to the grant-aid. The above-mentioned effects will be realized and further increased i) when the Japanese government provides Indonesia with project-type technical cooperation backed by its technology and experience which lead the world in the field of environmental conservation and ii) as this cooperation assists in appropriate and efficient utilization of the facilities and equipment to be granted under the grant-aid.

5-2. Appropriateness of the Project

Results of discussions with BAPEDAL concerning the contents of the request by the Indonesian government, together with those of the field survey and analyses made in Japan, are summarized in the plan described in Chapter 3. When reviewing the appropriateness of the Project to establish the Environmental Management Center (EMC) in terms of finances, maintenance and management, and operation systems by referring to the contents of that plan, it has been confirmed that the Project will be implemented without any particular problems as shown below.

(1) Financial aspects

Sustainable development in Indonesia forms a basis of its governmental policies, and the objectives of the establishment of the EMC have been included in the Fifth 5-year National Development Plan in a wider sense. Under these circumstances, BAPPENAS has expressed an affirmative position to giving priority to the implementation of budget plans for establishing the EMC which will allow BAPEDAL to manage the environment as a pollution control agency under the direct control of the President.

According to a trial calculation of the EMC's operational budgets, the EMC will need 590 million Rupiahs for its ordinary budget and 730 million Rupiahs for its development budget, totaling 1,300 million Rupiahs. According to BAPPENAS, this total budget is reasonable for newly establishing the only center for conserving the environment in Indonesia, when compared with those required for establishing other types of agencies. The World Bank is now studying possibilities of applying its EMTAL Project for cooperating with the development budget of BAPEDAL. Since there seems to be a great possibility of this being realized, it is expected that the EMC will be able to secure its operational budget without any particular difficulties.

(2) Maintenance and management

The Management Division of BAPEDAL will supervise the daily maintenance and inspection of equipment and instruments to be used for monitoring, research and training, while EMC staff and subcontractors will take charge of them in their routine work. Much consideration has been given to minimizing maintenance and management expenses in the EMC's facility and equipment plan. The Project involves a considerable amount of spare parts, standard solutions, and reagents which are rarely available in Indonesia, and the EMC has been designed to allow easy maintenance and management after the facilities are completed. Many of the equipment and instruments have been selected from the viewpoint that they should be repaired and maintained in Indonesia as far as possible.

It is planned to allow several candidates for EMC analyzing researchers to be trained in P4L or other agencies prior to the opening of the EMC. Since the equipment and instruments to be granted under the Project meet the technical level of P4L, the researchers are expected to be accustomed to their operation within a short period, thereby there being no particular problems in maintenance and management.

(3) Operation system

The personnel plan is to start the operation of the EMC with a total of 63 staff members; 7 from BAPEDAL, who have been trained especially for this purpose, 9 from other ministries and agencies, 47 to be newly employed (15 university graduates, 18 junior college graduates, and 14 high school graduates). They are to be employed by the time the facilities are completed. This means that instructions on handling and operating the facilities and equipment can be given directly to their users, there-by there being no particular problems found in the operational system.

5-3 Conclusion

As the population is rapidly increasing and development is making considerable progress in Indonesia, environmental pollution in both urban and rural districts is having exercised a serious effect upon the people's health.
Under these circumstances, the Government of Indonesia has adopted a political objective to "control environmental pollution while continuing sustainable development" in its Fifth 5-year National Development Plan which started in 1989. The government expects private corporations to play a more important role in controlling environmental pollution.

As one of its policies to conserve the environment, the Ministry of Population and Environment was established in 1978, but it has been engaged only in maintaining coordination among a variety of ministries and agencies related to development and environmental conservation and in arranging of cabinet orders related to environmental administration. In June 1990, the Government started the Environmental Impact Control Agency (BAPEDAL) for the purpose of reinforcing measures to solve environmental problems, to upgrade human resources and to improve technology to conserve the environment. Then, the

government made a plan to establish the environmental Management Center (EMC)" which will concentrate on practical research which contributes to the control of environmental pollution caused by industrialization; training of persons concerned with conservation of the environment; and environmental quality monitoring. When established, the EMC is expected i) to promote research activities aiming at application to administrative policies, ii) to help realize correct policies through education and training of people engaged in the field of environmental conservation, and iii) to upgrade the level of researchers who will contribute to solution of the serious environmental problems existing in Indonesia and maintenance and improvement of the people's health. The Project is expected to play an extremely important role in not only contributing to the improvement of environmental problems but also in realizing Indonesia's economic development at a sustainable pace and bringing about a healthful economy and society in the country.

Since the Project contributes substantially to healthy socioeconomic development in the country, it is quite appropriate to implement it with grant-aid. In our opinion, there are no particular problems in the management and maintenance of the Project, since the system which Indonesia will prepare for the operation of the EMC will be reasonable in terms of personnel and budgets. However, the Project will be more smoothly and efficiently implemented if the following points are improved:

5-4 Recommendations

(1) Establishment of the EMC

If official procedures are taken to organize the EMC promptly after the E/N is concluded between the two Governments, it will bepossible to take measures in Indonesia to proceed with the EMC project. Since it is expected to take a very short period (about one and a half years) starting from the conclusion of the E/N to the completion of the construction and opening of the EMC, preparation of the personnel and budget plans should be done in advance of the progress of the Project.

(2) Model facilities for conservation of the environment

The EMC is the only official facility in Indonesia acting as an environmental management agency. It has been designed to be a model laboratory for conserving the environment equipped with pollution control facilities and equipment (capable of handling waste water, waste gases, and heavy metals). It is expected that this function should be widely applied to the activities of governmental and private organizations as well as to training at the EMC, so that it may contribute to the improvement of environmental conservation activities.

(3) Development of human resources

The EMC is planned to commence operations with an initial staff of 63 people and to increase the some number of researcher or analyzing technical staff in five years. Since the basic design of the facilities has been formulated to accommodatethis total number, it is important to adopt a plan to employ people without fail in the years subsequent to that in which it is to be opened. Only when this employment plan is completed, this project will function as effectively as designed.

(4) Monitoring system

An important step to promote the EMC's activities is to set up a monitoring system and to realize the exchange of accurate information between the EMC and reference laboratories at the provincial environmental management agency (BAPEDALDA) in those 11 provinces where PROKASIH has been carried out among the total of 27 provinces.

It is also necessary to exchange information by establishing a coordinated monitoring system with the 15 ministries and agencies which govern such existing facilities as BKLH, TKP2, and PSL, and other new environmental development plans.

(5) Training lecturers arrangement plan

The Training Division will take charge of the training activities of the EMC, but it will be engaged in management only. Lecturers will give instructions

on monitoring technology while EMC analyzers will train participants as to some aspects of data analyses training. Administrative training will be given partly by BAPEDAL staff and partly by outside lecturers. However, lecturer arrangement plans have not been clarified as yet for training courses which have been planned. To enable the EMC to start training as soon as it is opened, the arrangement plans should be formulated as quickly as possible. Moreover, it is necessary to make plans for preparing teaching materials related to the training and to foster leaders in accordance with the future expansion of training activities.

(6) Proposal on maintenance and management

To effectively manage this project, it is expected that the Indonesian side will arrange for full-time engineers to engage in the maintenance, management, and repair of the EMC's facilities and equipment from the initial time of their installation and that a system will be set up to allow the engineers to understand the characteristics and functions of these facilities and equipment before the EMC buildings are completed.

It is also necessary to review the possibilities of holding long-term training in Japan as to the operation and maintenance of the precision equipment and instruments to be granted which take a long time to learn and become accustomed to.

Since the maintenance and management expenses of the facilities and equipment may substantially affect environmental quality monitoring activities and training, it is preferable that a sufficient budget be secured every year for the effective utilization of the Center.

(7) Taking necessary measures and work to be done by the Indonesian side

It is necessary for the smooth promotion of this project that BAPEDAL smoothly handle such procedures as tendering, contracting, bank agreements, and customs clearance and quickly negotiate with BAPPENAS, SEKAB, EKUIN, etc.

Land filling and leveling work by the Indonesian side in the project site is hardly required. However, gardening, installation of general furniture, and

the procurement of office fittings, miscellaneous goods etc. should be completed before the EMC is opened. Hence, sufficient budget allocation measures should be taken.

(8) Operational budget

Since the project activities in the EMC are closely related to the national finances, correct budget allocation is extremely important.

Since investment in this project is needed for implementation of environmental conservation throughout the country, close cooperation is expected with related ministries and agencies and with the World Bank and other assistance agencies.

APPENDIX

1. Member of the Study Team
2. Interviewed Persons
3. Minutes of Discussions
4. Process of Discussions
5. Condition of the Project Site
6. Other Documents

1. Member of the Study Team

1-1 The Basic Design Study Team (June 23 ~July 20, 1991)

1-2. The Draft Final Report Explanation Team
(November 5~November 15 , 1991)

1. Member of the Study Team

1-1. The Basic Design Study Team (June 23 ~ July 20, 1991)

Team Leader	Mr. Kazuhisa Matsuoka Director First Basic Design Study Division Grant Aid Study and Design Department Japan International Cooperation Agency
Environmental Planning	Mr. Koichi Kubokura Environmental Cooperation / Phisies & Chemistry Section Fukuoka City Public Health Laboratory
Environmental Cooperation	Mr. Tsutomu Matsuda Environmental Cooperation Coordinator Office of Overseas Environmental Cooperation Global Environment Department Environment Agency
Architectural Planning	Mr. Osamu Matsumura Kume Architects-Engineers
Architectural Design Planning	Mr. Fumikazu Ohba Kume Architects-Engineers
Electrical Design Planning	Mr. Katsuei Osao Kume Architects-Engineers
Mechanical Design Planning	Mr. Yoshizo Ohmae Kume Architects-Engineers
Environmental Equipment Planning	Mr. Hiroshi Kobayashi Nippon Environmental Pollution Control Center Inc.
Maintenance, Operation and Management Planning	Mr. Kihachi Inagaki Nippon Environmental Pollution Control Center Inc.

1-2. The Draft Final Report Explanation Team of the Basic Design Study (November 5 ~ November 15, 1991)

Team Leader	Mr. Ryutaro Yatsu Deputy Director, Planning Division Global Environment Department Environment Agency
Environmental Cooperation	Mr. Tsutomu Matsuda Environmental Cooperation Coordinator Office of Overseas Environmental Cooperation Global Environment Department Environment Agency
Grant Aid Cooperation	Mr. Teruaki Kamada Assistant Director Grant Aid Division Economic Cooperation Bureau Ministry of Foreign Affairs
Coordinator	Mr. Ikufumi Tomiomto Deputy Director First Basic Design Study Division Grant Aid Study and Design Department Japan International Cooperation Agency
Architectural Planning	Mr. Osamu Matsumura Kume Architects-Engineers
Mechanical Design Planning	Mr. Yoshizo Ohmae Kume Architects-Engineers
Environmental Equipment Planning	Mr. Hiroshi Kobayashi Nippon Environmental Pollution Control Center Inc.

2. Interviewed Persons

2. Interviewed Persons

Concerned Persons on the Indonesia Side

☐ Ministry of State for Population and Environment (KLH)

Hon. Emil Salim	Minister of State for Population and Environment (Head of BAPEDAL)

☐ Environmental Impact Management Agency (BAPEDAL)

Mr. P. L. Coutrier	Deputy II
Dr. Noegroho Hadi Hs. Ir.	Director
Mr. Sri Oeripto Ir.	Architect
Mr. Dana Kartakusumah Ir.	Acting chief sub Director of Programme
Ms. Liana Bratasida	Candidate Chief of Course and Training
Mr. Bambang Prabowo, SH.	Lawyer
Mr. Theo Widjanarko	Directorate Information System
Mr. Pitamtoyo	Chief of Referal Laboratory
Mr. Syaiful Bahri	Sub-Director for Information System
Dra. Arum Prajanti	Referal Laboratory
Mr. Bambang Prabowo, SH.	Lawyer

☐ National Development Planning Board (BAPPENAS)

Dr. Herman Heruman	Head of Bureau for Environmental Resource and Development

☐ Secretary Cabinet (SEKAB)

Mr. Wahid Salim	Head of Intergovernmental Technical Cooperation Division, Bureau for Technical Cooperation

☐ National Center for Research, Science and Technology (PUSPIPTEK)

Mr. Boy Soehartono Ir.	Director for Project Development
Mr. I. G. G.Ngurah	Deputy Director for Project Development

Mr. Mohammed Joenoes	Head of Site Management
Mr. Syahmir Nasunon	Staff of Director for Planning
Mr. Dany Kadir Ir.	Electrical Engineer
Mr. Chandra Prawira Ir.	Mechanical Engineer

☐ Center for Urban and Environmental Research and Development (P4L)

Mr. E. Budirahardjo Ir.	Director
Dra. Ruth Ariani	
Mr. Rafdjon	

☐ State Run Survey Company, Jakarta (Jakarta SUCOFINDO Lab.)

Drs. Hoesni Baadilla	General Manager Marketing
Drs. A. Rasjid	General Manager Laboratory
Mr. Lelyatiningsih	Manager of Environmental
Mr. Rika Devi Kartika	Technical Staff Consultant

☐ Ministry of Finance

Mr. Jusuf Anwar	Secretariate Directrate of External Funds Directrate General

☐ Ministry of State for Administrative Reform

Dra. Ny. Dwiarti Marojono	Junior Assistant 4 for Minister

☐ World Bank

Mr. H. Benjamin Fisher	Senior Environmental Institutions Specialist
Dr. Colin Mac Andrews	Project Manager / Institutional Advisor (EMTAG)
Mr. Levis Louis	Project Coordinator
Mr. Kazuhiko Takemoto	Environmental Specialist Environment Division (ASTEN) Asia Technical Development
Mr. Ismid Hadad	President Director, Resource Development Consultants (REDECON)

☐ Canadian International Development Agency (CIDA)

Mr. David Keithlin	Counseller (Development)

☐ University of Indonesia (UI)

Dr. Endang Asiati	Head of Chemistry Dept.
Dr. Na Peng Bo	Head of Physic Dept.
Drs. Sunarya Wargasas	Head of Biology Dept.
Dr. M. Soerjani	Director Center for Research of Human Resources and the Environment
Dr. PH. Haryoto Kusnoputranto	Center for Research of Human Resources and the Environment

☐ Environmental Technical Health Institute, Surabaya (BTKL)

Drs. Maryadi Broto Suwandi	Director
Mr. Joko Waluyo Bse	Staff Seksi Kimia, Fisika Udara
Dra. Siswati Kesuma	Kasie Kimia Fisika Gas / Udara
Dra. Sri Rochana	Staff Seksi Biology
Mr. Soesiyani Adi Widiaja	Ka Sub Bag Kimia

☐ Industrial Research Development Institute Ministry of Industry, Surabaya (BPPI)

Mr. Init Koernach	Development Section

☐ State Run Survey Company, Surabaya (Surabaya SUCOFINDO Lab.)

Dr. A. Aziz Hubeis	Consultant, Supervisor
Mr. Retnoningsih	Chief of Section Laboratory

☐ Water Supply and Environmental Sanitation Training Center

Mr. Susanto Mertodiningrat Ir.	Director
Mr. Susanto Sijoatmodjo, Dipl.S.S. Ir.	Chief of Implementation W.S.
Mr. Widhi Handoko, Dipl.S.E. Ir.	Chief of Implementation E.S.

☐ Veterinary Drug Assay Laboratory

Dr. Syamsul Bahri Siregar M.S.C.	Director

Concerned Persons on the Japanese Side

☐ Embassy of Japan

Hon. Michihiko Kunihiro	Ambassador Extraordinary and Plenipotentiary
Mr. Toshio Sano	First Secretary
Mr. Hiroshi Moriguchi	Second Secretary

☐ Environmental Impact Management Agency (BAPEDAL)

Mr. Takashi Hayase	JICA Expert (Environmental Pollution Control)

☐ Water Supply and Environmental Sanitation Training Center

Mr. Toshiaki Simazaki	JICA Expert (Team Leader)
Mr. Shoichi Kunizutsumi	JICA Expert (Water Quality)
Mr. Hisayuki Futami	JICA Expert (Environmental Sanitation)

☐ The Japan Chamber of Commerce & Industry

Mr. Toshiharu Saito	Resident Representative

☐ JICA Indonesia Office

Mr. Akira Takahashi	Resident Representative
Mr. Takashi Kaneko	Deputy Resident Representative
Mr. Kazuhiro Yonedea	Assistant Resident Representative
Mr. Noboru Taneda	Assistant Resident Representative
Mr. Hiroshi Kurakata	Assistant Resident Representative

☐ Center for Urban and Environmental Research and Development (P4L)

Mr. Koichi Kubokura	JICA Expert (Water Quality Monitoring)

3. Minutes of Discussions

3-1. The Basic Design Study (July 1, 1991 signed)

3-2. The Draft Final Report of the Basic Design Study (November 13, 1991, signed)

3-1. The Basic Design Study (July 1, 1991 signed)

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
THE PROJECT FOR ESTABLISHMENT OF
ENVIRONMENTAL MANAGEMENT CENTER
IN
THE REPUBLIC OF INDONESIA

Based on the results of the Preliminary Study, the Japan International Cooperation Agency (JICA) decided to conduct a Basic Design Study on the Project for Establishment of Environmental Management Center (hereinafter referred to as "the Project").

JICA sent to the Republic of Indonesia a study team, which is headed by Mr. Kazuhisa Matsuoka, Director of First Basic Design Study Division, Grant Aid Study and Design Department, JICA and is scheduled to stay in the country from June 24 to July 19, 1991.

The team held discussions with the officials concerned of the Government of Indonesia and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

Jakarta, July 1, 1991

Mr. Kazuhisa MATSUOKA
Leader
Basic Design Study Team
JICA

Mr. P.L. COUTRIER
Deputy for Development
BAPEDAL

ATTACHMENT

1. Objective

The objective of the Project is to construct necessary facilities and provide necessary equipment for establishment of Environmental Management Center (EMC) in order to strengthen scientific and technological bases for environmental policy development and implementation.

2. Project site

The project site is located at PUSPIPTEK, Serpong, West Jawa. (The project site map at PUSPIPTEK is attached as ANNEX I.)

3. Executing Agency

Environmental Impact Management Agency (BAPEDAL) is responsible for the implementation of the Project.

4. Activities of EMC

Main activities of EMC are as follows:

(1) Environmental Quality Monitoring
(2) Human Resources Development

Summary of EMC activities and outline of programs are shown in ANNEX II (ANNEX - II-1 and ANNEX-II-2) and ANNEX III respectively.

5. Organization and staff of EMC

Organization chart and staff numbers of EMC are shown in ANNEX IV.

6. Necessary items for the realization of the Project

After discussions between both sides, the following items were confirmed necessary for the realization of the Project. The final items and details necessary for the Project, however, will be decided after further studies through both side discussions.

(1) Construction of the main facilities of EMC.

a. Research facilities
environmental laboratory/information system room

b. Training facilities
lecture rooms/audio visual room/practice room/ auditorium

c. Management facilities
administration office/library/meeting room/ canteen

d. Dormitory facilities
bedroom/cafeteria

(2) Total floor area of EMC will be approximately 8,500 square meters.

(3) Provision of Equipment

a. Research equipment
b. Laboratory equipment
c. Environmental information system equipment
d. Training equipment
e. Office equipment
f. Vehicle and others

The list of major equipment is shown in ANNEX V.

7. Japan's Grant Aid system

(1) The Indonesian side has understood the system of Japanese Grant Aid explained by the team.

(2) The Indonesian side will take necessary measures, confirmed in ANNEX VI for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

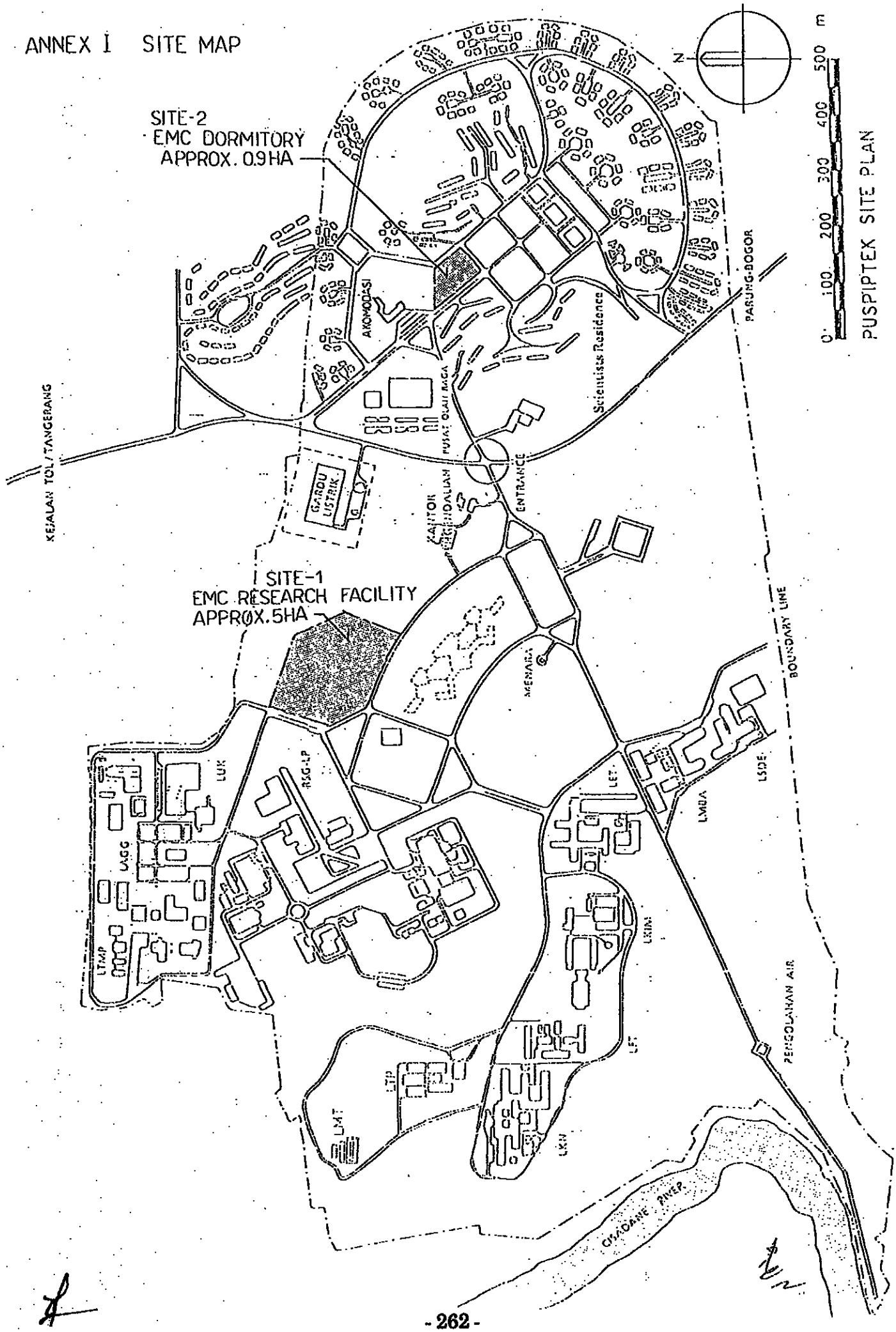
8. Schedule of the Basic Design Study

(1) The team will proceed to further studies in Indonesia until July 19, 1991.

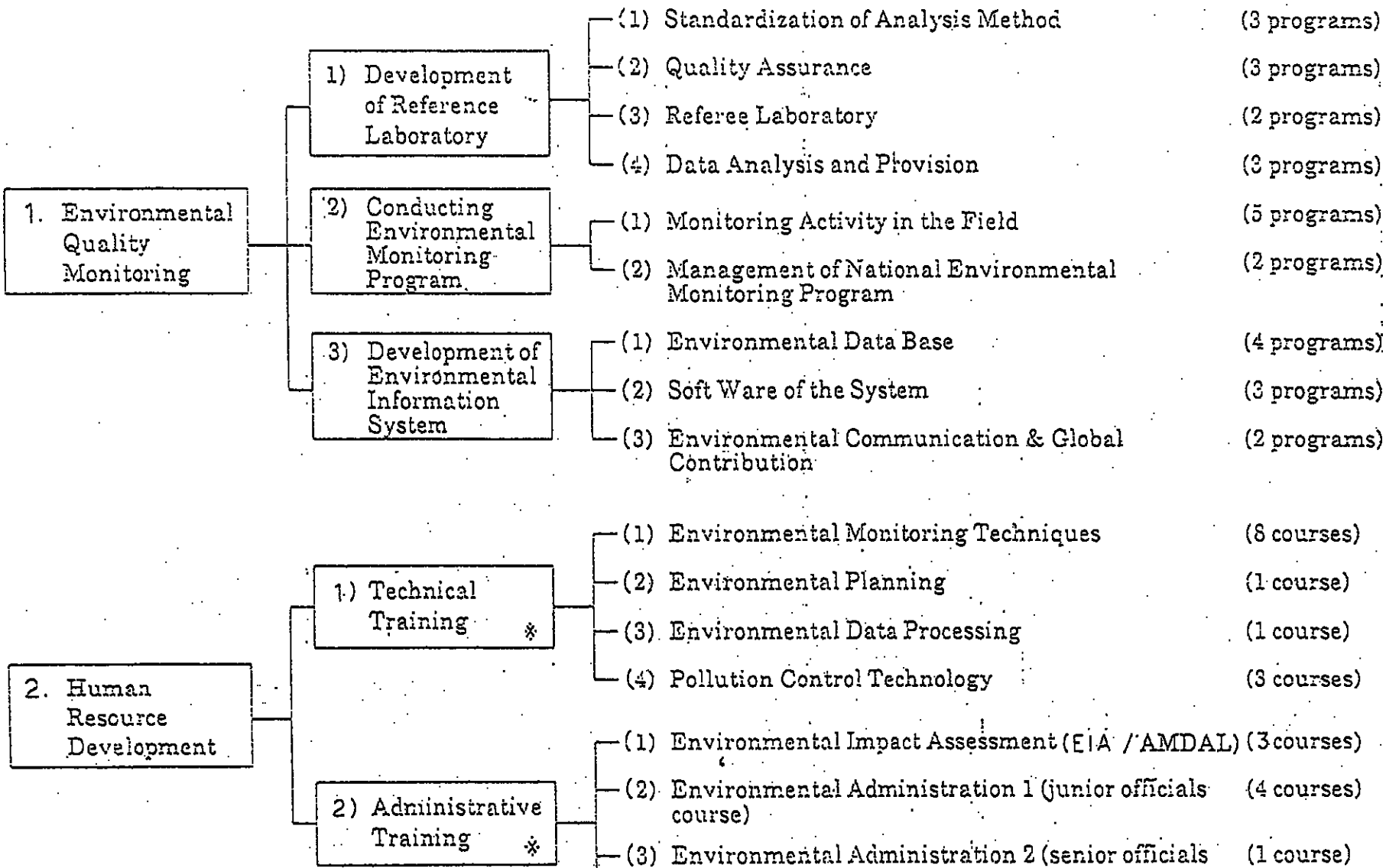
(2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around the beginning of November, 1991.

(3) In case that the contents of the report is accepted in principle by the Indonesia side, JICA will complete the final report and send it to the Government of Indonesia by January, 1992.

ANNEX I SITE MAP



SUMMARY of EMC Activities



※ Time schedule for Training is shown in ANNEX-II-2

Time Schedule for Training Course

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
[TECHNICAL TRAINING COURSE]/capacity													
Environmental Monitoring Technique													
-water quality monitoring(junior)/20													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													20/180
Environmental Planning /10													20/20
Environmental Data Processing /10													20/20
Pollution Control Technology													
-waste water treatment /15													30
-exhaust gas treatment /15													30
-hazardous waste treatment /15													30/120
[ADMINISTRATIVE TRAINING COURSE]													
Environmental Impact Assessment(EIA)													
-Basic EIA /10													40
-Conducting EIA /10													20
-Evaluation of EIA /10													60/120
Environmental Administration 1													
-water pollution control /20													80
-air pollution control /20													80
-hazardous waste management /20													40
-small scale industry management /20													40/240
Environmental Administration 2 /20													40/40
Environmental Communication and Public Participation /20													40/40
Maximum Number of Trainee		33	65	85	105	80	105	85	80	35	75	65	925/780

ANNEX-III OUTLINE OF PROGRAMS

1. Environmental Quality Monitoring

1) Development of Reference Laboratory

Item	Program	Parameters
(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 Source : 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, CN, S, F, Cl, SO_4, NH3-N, NO_3-N, NO_2-N, $KMnO_4$ Value, Methylene 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
(2) Quality Assurance	- Development of a QA programs - Interlab studies to support a QA Program - Development of Standard Reference Materials (SRM)	
(3) Reference Laboratory	- Acting as a referee laboratory - Providing expert testimony regarding sampling or analysis procedures	
(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.	

2) Conducting Environmental Monitoring Program

Item	Program	Parameters
(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
(2) Management of National Environmental monitoring Program	- Development of the framework of national environmental monitoring network - Coordination of government institutions to carry out the national environmental monitoring program	Ditto

3) Development of Environmental Information System

Item	Program	Object
(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
(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 Resource Development

1) Technical Training

(1) Environmental Monitoring Techniques

Name of Course	Target Trainee	Goal of Training	Curriculum		No. of Trainee	Terms (Week)	Frequency
			Lecture	Practice			
a. Water quality monitoring (junior course) b. Water quality monitoring (senior course) c. Air quality monitoring (ambient quality monitoring) d. Air quality monitoring (exhaust gas monitoring) e. Toxic substance monitoring (pesticide) f. Toxic Substance monitoring (other than pesticide g. Soil quality monitoring h. Noise and vibration monitoring	Researchers, technicians or engineers who are in charge of environmental monitoring practice in central and local governments, universities, private sectors and those who will be in charge of monitoring practices	- to get necessary knowledge of environmental quality monitoring and analysis - to get sampling technique both ambient sample and sample at emission source - to get monitoring techniques of meteorological and hydrologic parameters - to get the technique of manual and automatic analysis	- chemistry of environmental analysis - sampling procedure - analytical procedure - data handling and interpretation of monitoring data - present status of environment - legal and institutional frameworks - impact of environmental pollution to human health and ecosystem	- sampling practice - analysis practice - data handling and evaluation - field case study	10 10 10 10 10 10 10 10	6 8 8 8 8 8 4 4	4/Y 2/Y 2/Y 2/Y 2/Y 2/Y 2/Y 2/Y

(2) Environmental Planning

Name of Course	Target Trainee	Goal of Training	Curriculum		No. of Trainee	Terms (Week)	Frequency
			Lecture	Practice			
Environmental planning	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 - strategic planning process - 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	10	4	2/Y

(3) Environmental Data Processing

Name of course	Target Trainee	Goal of Training	Curriculum		No. of Trainee	Terms (Week)	Frequency
			Lecture	Practice			
Environmental data processing	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 - geographical information system	10	4	2/Y

(4) Pollution Control Technology

Name of Course	Target Trainee	Goal of Training	Curriculum		No. of Trainee	Terms (Week)	Frequency
			Lecture	Practice			
a. Waste water treatment	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 environment - impact of environmental pollution to human health and ecosystem - environmental pollutants and production process as their sources - theory of treatment technology - operation and maintenance - emergency response	- planning and basic design of the facility - operational practice by model plants	15	4	4/Y
b. Exhaust gas treatment					15	4	2/Y
c. Hazardous waste treatment					15	4	2/Y

2) Administrative Training

(1) Environmental Impact Assessment (EIA/AMDAL)

NAME OF COURSE	TARGET TRAINEE	GOAL OF TRAINING	CURRICULUM		No. of Trainee	Terms (Week)	Frequency
			LECTURE	PRACTICE			
a. Basic Environmental Impact Assesment (AMDAL Dasar)	Public including Project Proponents)	To get knowledge and understanding on basic impacts of development and the management of these impacts.	- National policy on Environmental - Science of Environment (Ecology, etc.) - Basic EIA - Methodologies in EIA Impact Identification, Projection, and Evaluation - Impacts of various kind of activities to the environment - Impacts and mitigation measures - Approach in monitoring of impacts	- Field trip (1 day) - Report on impact identification, etc.	10	2	4/Y
b. Conducting Environmental Impact Assesment	Consultants, people who intend to become expert in conducting EIA	To get ability and expertise in conducting EIA either as Team Leader or member of EIA Team	- Scoping - Screening - Methods of impact projection - Methods of techniques of analysis of physico-chemical, natural environment, and social-economical components	- Simulation TOR - Simulation EIA - Conducting EIA - Seminar/ Evaluation EIA	10	6	2/Y
d. Evaluation of EIA documents	Government officials, technical team members for EIA, NGOs	To get ability to evaluate EIA documents	* Refreshing - Scoping & screening - Impact projection - Impacts evaluation - Procedures on conducting EIA	* Case study and presentation	10	1	6/Y

(2) Environmental Administration 1 : (junior official's course)

Name of Course	Target Trainee	Goal of Training	Curriculum		No. of Trainee	Term (Week)	Frequency
			Lecture	Practice			
a. Water pollution control b. Air pollution control c. Hazardous waste management d. Small scale industry management	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	20 20 20 20	4 4 4 4	4/Y 4/Y 2/Y 2/Y

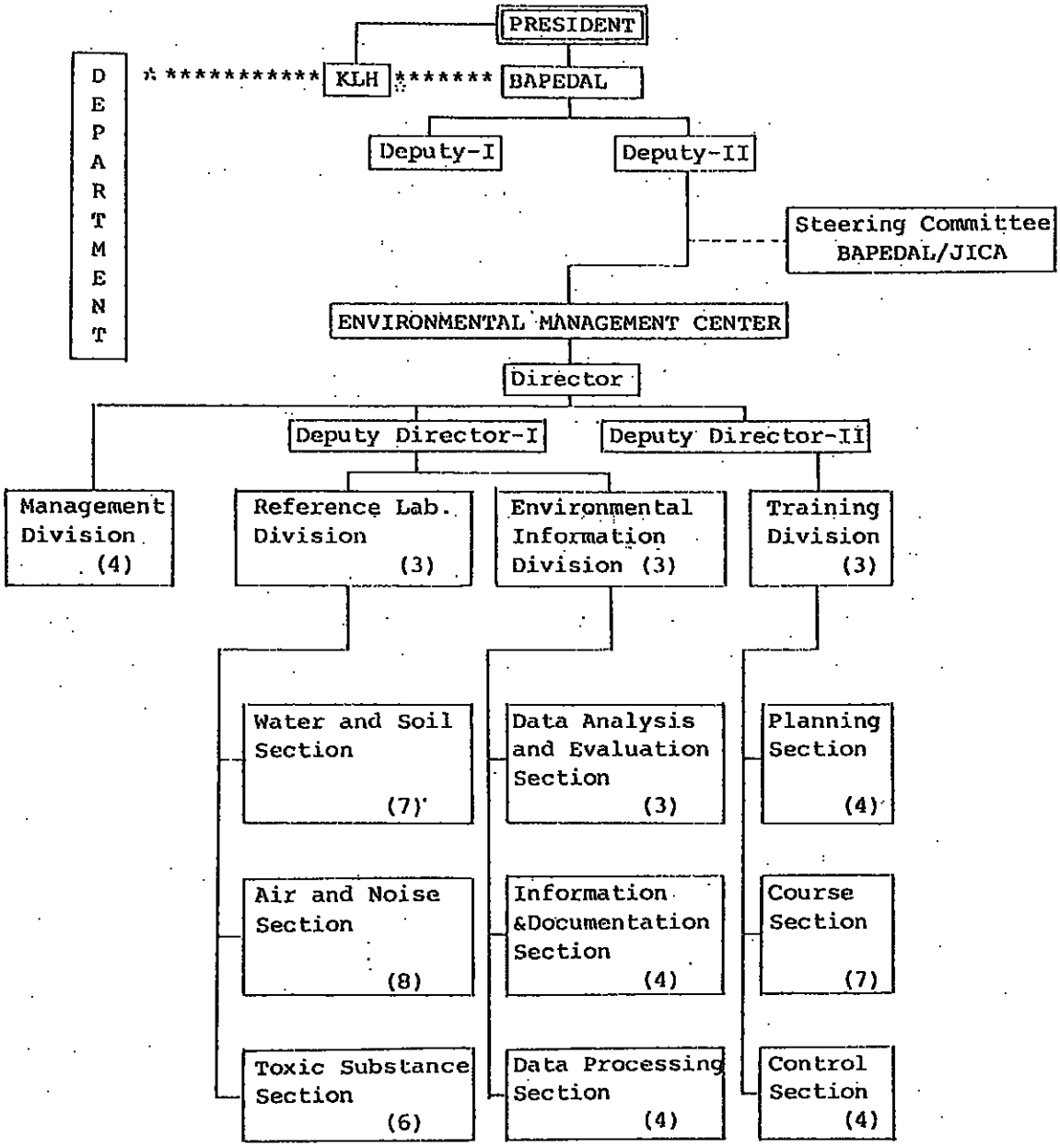
(3) Environmental Administration 2 :(senior official's course)

Name of course	Target Trainee	Goal of Training	Curriculum		No. of Trainee	Term (Week)	Frequency
			Lecture	Practice			
Environmental administration 2	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 sustain-able 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	20	2	2/Y

(4) Environmental Communication and Public Participation

Name of Course	Target Trainee	Goal of Training	Curriculum		No. of Trainee	Term (Week)	Frequency
			Lecture	Practice			
Environmental communication and public participation	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	20	2	2/Y

ANNEX-IV ORGANIZATION CHART AND STAFF NUMBERS OF EMC



( ):Staff Number
Total 63 Staffs

ANNEX -V LIST OF MAJOR EQUIPMENT

A. List of Major Equipment with High and Medium Priority

1. Common Analytical Instruments
   (1) Gas Chromatograph
   (2) High Performance Liquid Chromatograph (UV/FL)
   (3) Ion Chromatograph
   (4) Polarograph
   (5) Spectrophotometer (UV/VIS, IR, FTIR, AAS)

2. Other Instruments
   (1) GC-MS (Quadruple)
   (2) Scanning Electron Microscope
   (3) X-ray Fluorescence Analyzer

3. Water Quality Monitoring Instruments
   (1) Portable Water Quality Analyzer
   (2) Microscope
   (3) DO, pH Meter etc.

4. Air Quality Monitoring Instruments
   (1) Portable Gas Analyzer
   (2) Continuous Air Quality Monitoring System
   (3) Others

5. Noise and Vibration Level Meters

6. Waste Analysis Apparatus
   (1) Milling Machine etc.

7. General Laboratory Equipment
   (1) Balance
   (2) Centrifuge
   (3) Oven
   (4) Water Bath
   (5) Destilling Apparatus

8. Workshop Equipment
   (1) Precision Engine Lathe

9. Laboratory Facilities
   (1) Laboratory Table

10. Library furniture
   (1) Book shelf

11. Information System
   (1) Central Processor and Terminal
   (2) Printer (Line, Dot Matrix)
   (3) Personal Computer

12. A/V System
   (1) Slide Projector
   (2) OHP Projector

13. Office and Other Facilities
    (1) Typewriter
    (2) Facsimile

14. Others
    (1) 4WD Land Cruiser etc.

B. List of Major Equipment with Low Priority

1. Common Analytical Instruments
    (1) Thin Layer Chromatograph
    (2) TLC Scanner

2. Water Quality Monitoring Instruments
    (1) COD Meter
    (2) Process Polarograph
    (3) Ultra Violet IR Meter

ANNEX – VI

Items confirmed of necessary measures to be taken by the Government of Indonesia in case Japan's Grant Aid is executed.

1. To secure adequate number of personnel and budget necessary for the implementation of the Project.

2. To secure the site for the Project.

3. To clear, level and reclaim the site prior to commencement of the construction.

4. To undertake incidental outdoor works such as gardening and exterior lighting around the site.

5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.

   1) Electricity distributing line to the site.
   2) Water distribution main to the site.
   3) Drainage facility main to the site.
   4) Telephone trunk line to the site.
   5) General furniture and materials for daily activities.

6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.

8. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Indonesia and stay therein for the performance of their work.

9. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.

10. To bear all the expenses, including V.A.T. (value added tax) and the application of building construction permit other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.

3-2. The Draft Final Report of the Basic Design Study (November 13, 1991, signed)

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
THE PROJECT FOR ESTABLISHMENT OF
ENVIRONMENTAL MANAGEMENT CENTER
IN
THE REPUBLIC OF INDONESIA
(CONSULTATION OF DRAFT REPORT)

In June 1991, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Establishment of Environmental Management Center (hereinafter referred to as "the Project") to the Republic of Indonesia, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Indonesian side on the components of the draft report, JICA sent to Indonesia a study team, which is headed by Mr. Ryutaro Yatsu, Deputy Director, Planning Division, Global Environment Department, Environment Agency, and is scheduled to stay in the country from November 5 to 15, 1991.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Jakarta, November 13, 1991

Mr. Ryutaro YATSU
Leader
Draft Report Explanation Team
JICA

Mr. P. L. COUTRIER
Deputy for Development
BAPEDAL

ATTACHMENT

1. Components of Draft Report

The Government of Indonesia has agreed and accepted in principle the components of the Draft Report proposed by the team.

2. Japan's Grant Aid System

(1) The Government of Indonesia has understood the system of Japanese Grant Aid explained by the team.

(2) The Government of Indonesia will take the necessary measures, which are manifested in the Annex of the "Minutes of Discussion" on the project signed on July 1, 1991, on condition that the Grant Aid assistance by the Government of Japan is extended to the project.

3. Further Schedule

The team will make the Final report in accordance with the confirmed items, and send it to the Government of Indonesia by the end of December 1991.

ANNEX

Items confirmed of necessary measures to be taken by the Government of Indonesia in case Japan's Grant Aid is executed.

1. To secure adequate number of personnel and budget necessary for the implementation of the Project.

2. To secure the site for the Project.

3. To clear, level and reclaim the site prior to commencement of the construction.

4. To undertake incidental outdoor works such as gardening and exterior lighting around the site.

5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.

   1) Electricity distributing line to the site.
   2) Water distribution main to the site.
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   4) Telephone trunk line to the site.
   5) General furniture and materials for daily activities.

6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.

8. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Indonesia and stay therein for the performance of their work.

9. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.

10. To bear all the expenses, including V.A.T. (value added tax) and the application of building construction permit other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and the installation of the equipment.

4. Process of Discussions

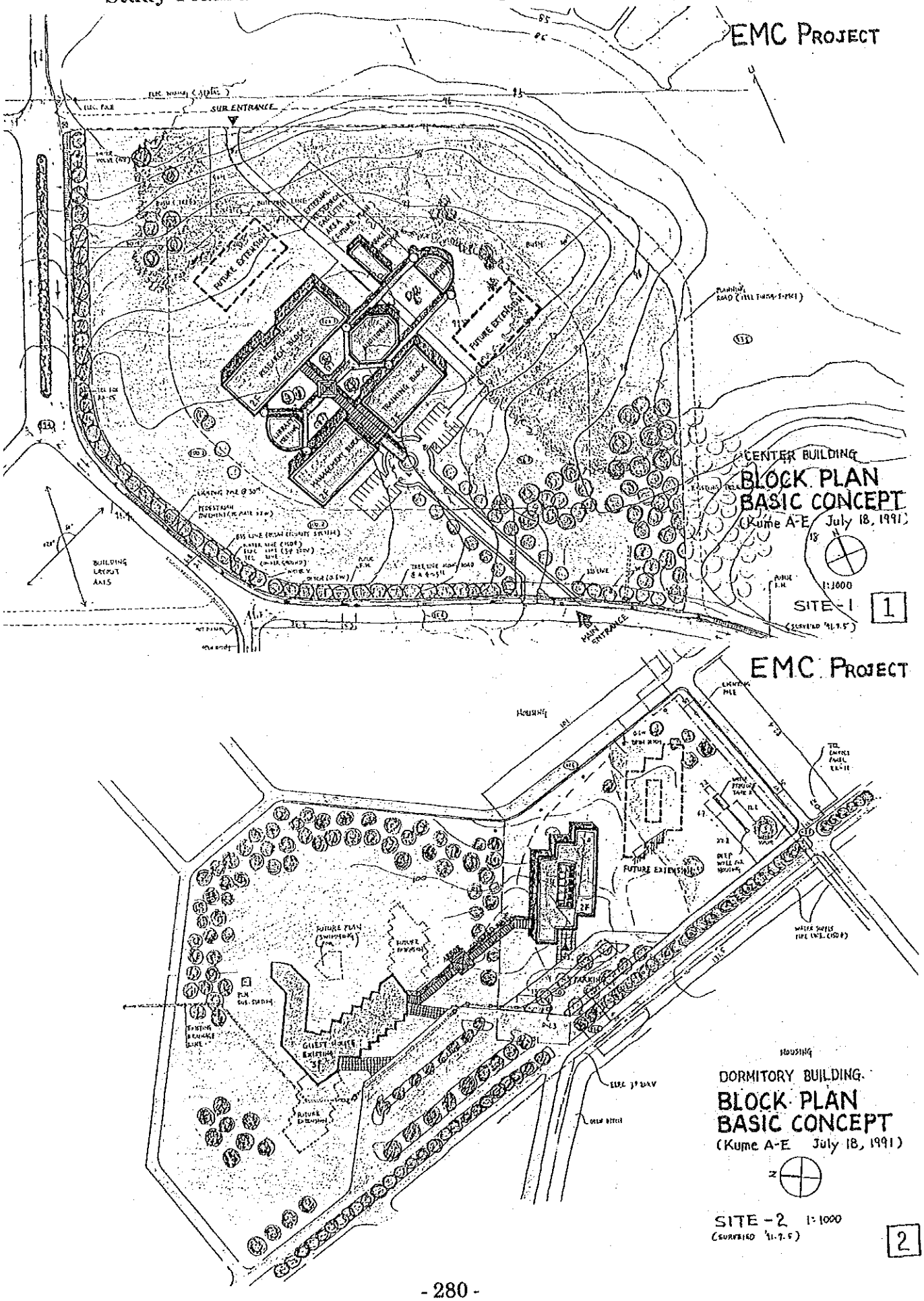
4-1. Requested Facilities and the Preliminary Calculation of the Facility Size by the Study Team

4-2. Concept Model

4-1. Requested Facilities and the Preliminary Caluculation of the Facility Size by the Study Team

Room	Requested Size		Calculation by the Study Team	Calculation Basis
<Administrative Block>				
Director's Room		150m²		Excessive compared to other example
Deputy Director's Room		100m²		
Division Chief Room	50m²×4rms.	200m²	500m²	
Technical Expert Room		500m²		
Administrative Office		300m²	400m²	Increased to include canteen
Library		300m²	250m²	30 seats, 15,000 book capacity
Auditorium				Includes Printing room
Meeting Room		800m²	-	Transferred to Training block
		500m²	100m²	2m²×25 seats×2 rooms
Sub Total		2,850m²	1,250m²	
<Research Block>				
Reference Laboratory Div.				
Water Quality Analysis		250m²		The scale of each room depends on equipment layout
Air Quality Analysis		200m²	1,750m²	There is not enough space for requested content, additional equipment space considered
Hazardous Substance Analysis		200m²		
Information System				
Environmental Data Base		150m²	100m²	Depends on equipment layout
Data Processing		150m²	100m²	
Meeting Room	100m²×2rms.	200m²	50m²	Decreased because other rooms can be used
Sub Total		1,150m²	2,000m²	
<Training Block>				
Lecture Room				Depends on training activities
Large Lecture Room	500m²×1	500m²	400m²	Auditorium with 400 person capacity
Medium Lecture Room	150m²×3	450m²	200m²	100m²×2
Small Lecture Room	100m²×5	500m²	250m²	50m²×5
Practice Room				Depends on equipment layout
Medium Practice Room	150m²×2	300m²	400m²	and training activities
Small Practice Room	100m²×2	200m²	300m²	Possible to conduct two classes of
Audeo-Visual Room	300m²×1	300m²	200m²	20 students simultaneously
				Excessive considering training
Lecturers Room	100m²×2	200m²	50m²	activities
Meeting Room	100m²×2	200m²	50m²	Decreased because other rooms can be used
Sub Total		2,650m²	1,850m²	
<Dormitory Block>				
Dormitory		1,200m²	950m²	For three trainees 36m²×16 rooms For two lecturers 24m²×4 rooms
Canteen, Others		700m²	450m²	Includes private study rooms and storage Includes canteen for 40 seats, pantry, meeting room and common space
Sub Total		1,900m²	1,400m²	
<Others>				
Workshop		500m²	100m²	Excessive for a maintenance space
Entrance Hall		200m²		
Toilets & Pantry		1,300m²	1,900m²	By the standard calculation basis
Storage, Mech. Rm.		350m²		of building , comon space is 35%
Circulation		1,100m²		of total floor area
Sub Total		3,450m²	2,000m²	
Total		12,000m²	8,500m²	

4-2. Concept Model (agreed Concept between Indonesia Side and the Study Team at the Time of Basic Design Study)



5. Conditions of the Project Site

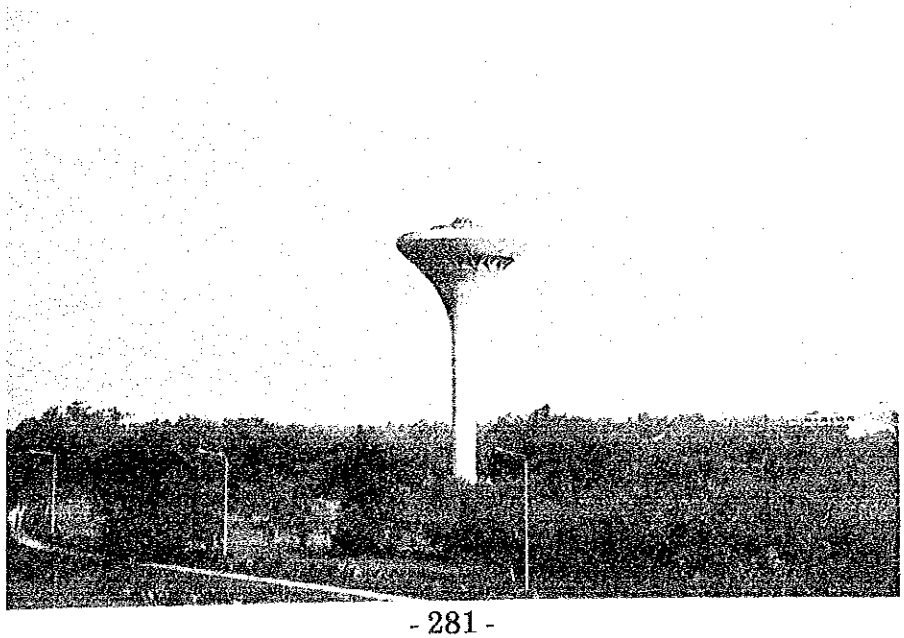
5-1. EMC Project Site

5-2. Site Survey Map

5-1. EMC Project Site

Site for Research and Training Bldg.

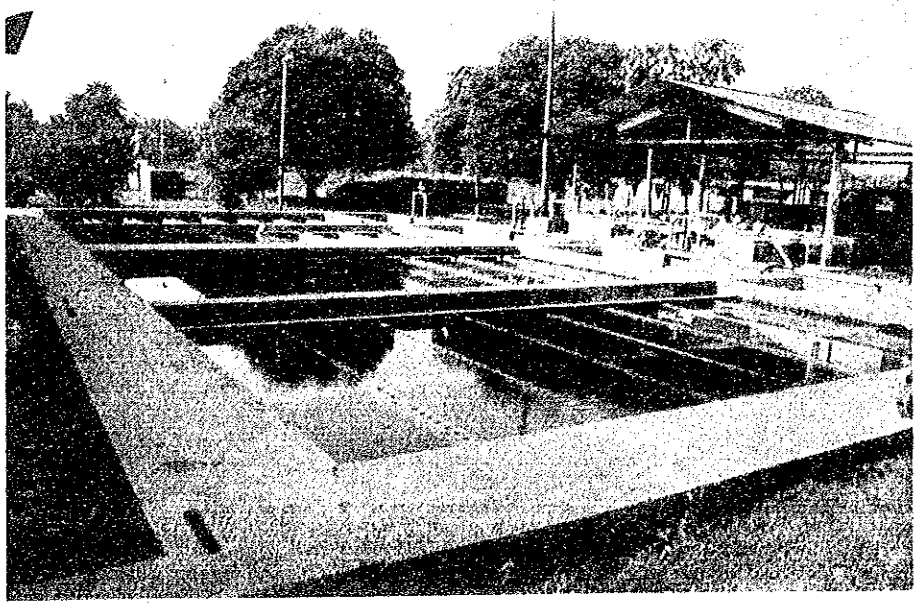
Site for Research and Training Bldg.



Elevated Water Tank of PUSPIPTEK

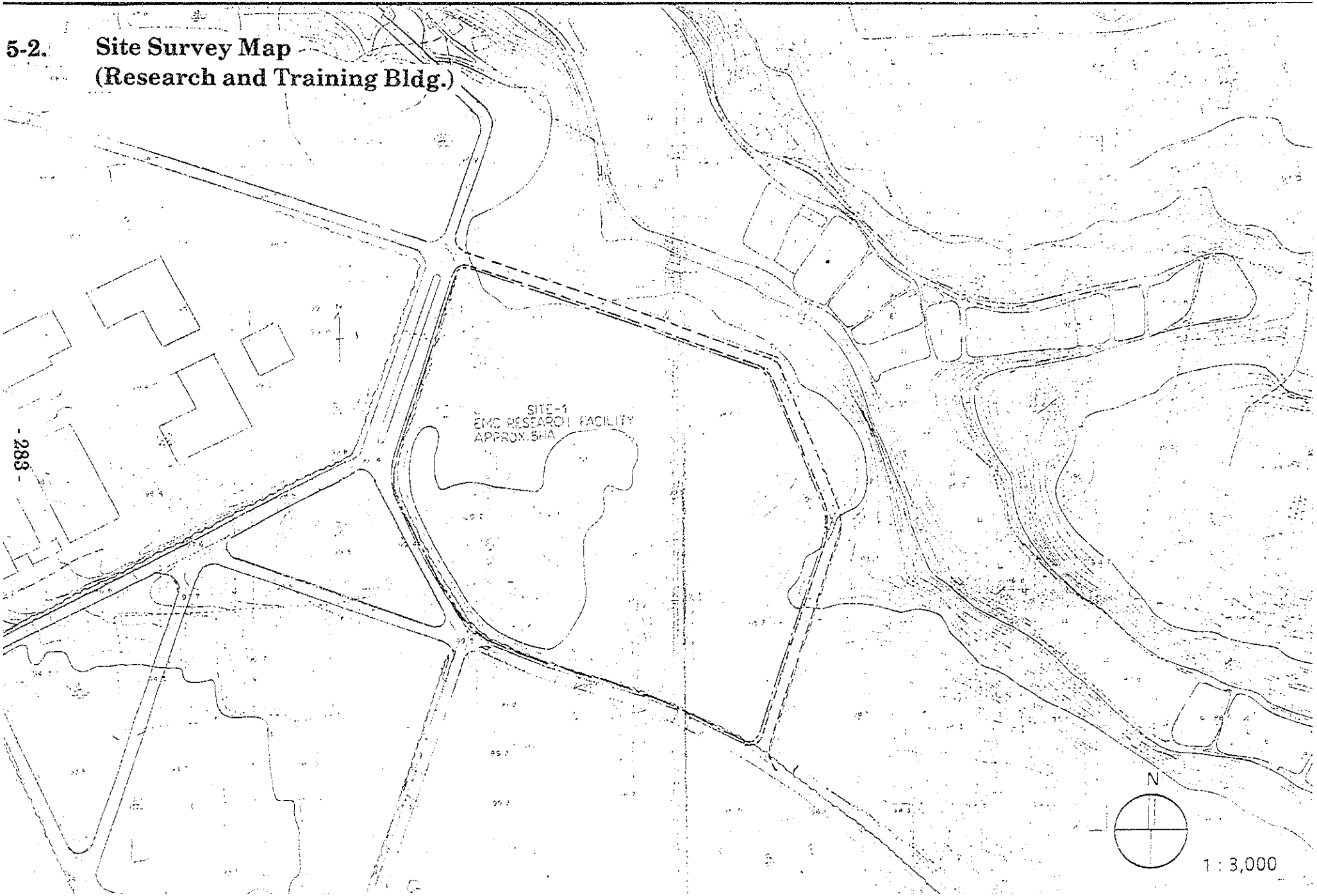
Site for Dormitory

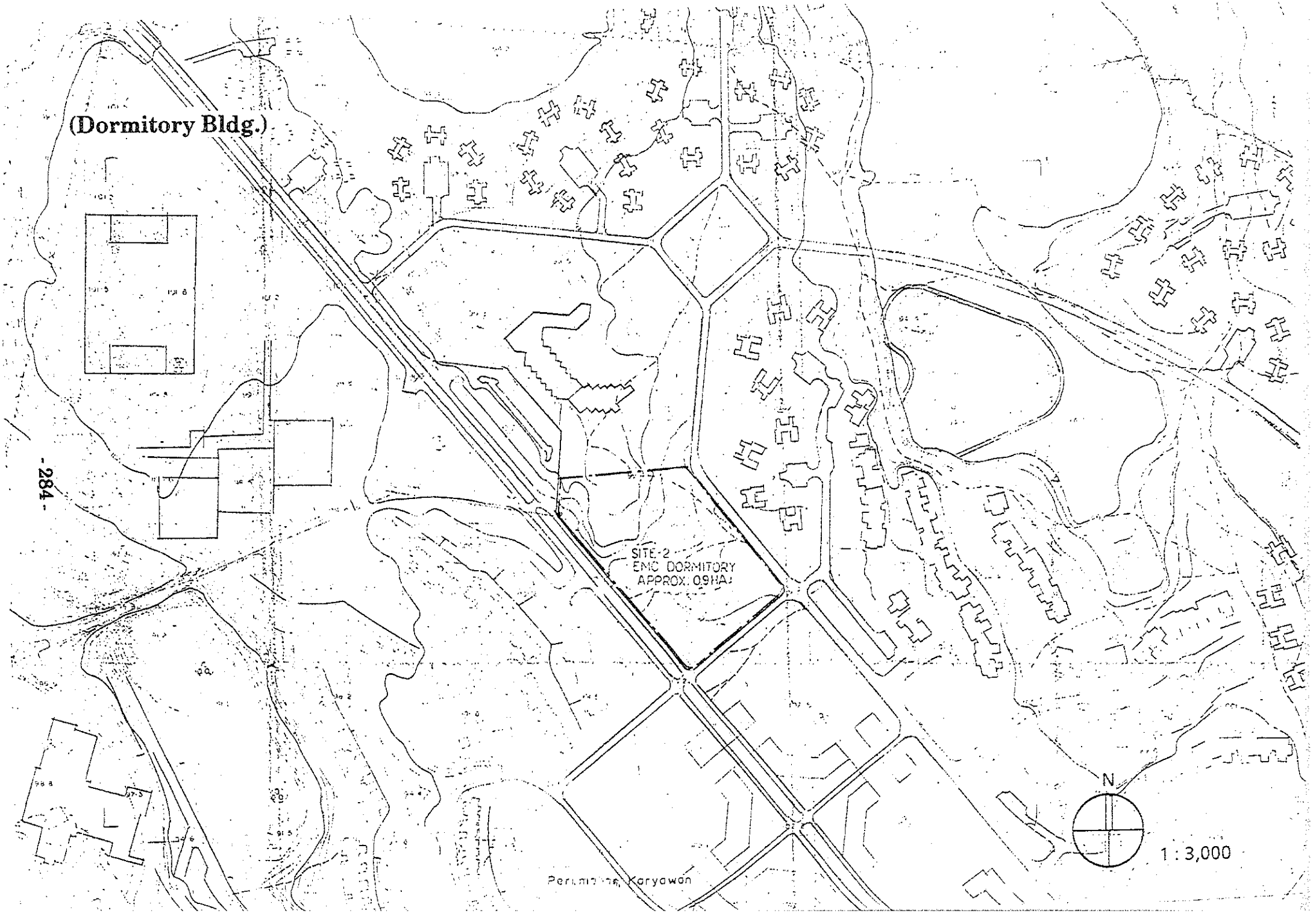
Site for Dormitory and Approach Road



PUSPIPTEK Water Treatment Plant

5-2. Site Survey Map (Research and Training Bldg.)




(Dormitory Bldg.)
SITE-2
ENC DORMITORY
APPROX. 0.9HA
Perumahan Karyawan
N
1 : 3,000

6. Other Documents

6-1. List of Goods Subject to Import Prohibition

6-2. Local Sole Agents for Laboratory Instruments

6-1. List of Goods Subject to Import Prohibition

○ Goods Subject to Import Prohibition
● Goods Subject to Import Control

1) Goods Concerned with Construction Work

○ Motor Vehicles (all kinds)
● Compressors, other than for refrigerators, below 1 kw
● Motors other than DC motors in CKD including Parts
● AC Generators including Parts
● Transformer
● Liquid Dielectric
● Rubber and Rubber goods
○ Iron or steel coils for re-rolling, of a thickness of 1.5 mm or more
○ Sheets and plates, of iron or steel, hot-rolled or cold rolled, not surface treated, of a thickness not less than 40 mm and width of not more than 500 mm
○ Wire rod, hot-rolled of an average diameter thickness exceeding 5 mm but not exceeding 10 mm, in coils, a raw material for industrial use
○ Corrugated sheets & plates, whether or not surface-treated, thickness of 3 mm or more
● Plates or coil coated with zink, aluminium etc.
● Sheets and plates of alloy steel.
● Seamless tubes and pipes for bicycle frames and the like, of an internal diameter of not less than 5/8" and not more than 1 1/2"
● Other seamless tubes and pipes, of an internal diameter of 4" of less
● Welched, of circular cross section, of iron or non-alloy steel
● Aluminium strips, aluminium sheet/coil, width exceeding 1,000 mm
● Pumps for liquids and liquid elevators, hand operated
● Lubricating oil including lubricating grease
○ Internal combustion piston engines
○ Tower cranes, tractors, hydraulic excavator and other construction machine
○ Boilers
○ Reciprocating piston engines

2) Other Goods

- ○ Printing industrial products (books, magazines and all kinds of printed matter of paper in indonesian or other regional languages or chinese, offset printed matter of proper for cigarette wrapping and medical labeling in indonesian as well as partly in foreign languages.
- ○ Motorcycles
- ○ "Ani Pic" mosquito repellant with sound vibrations
- ● Pocket lighters, gas fueled, non refillable
- ● Amonium nitrate fertilizer
- ● Nuts, Soya bean
- ● Some kind of foods
- ● Grass shears, Hoes, Axes and hatchets, Spacles, Shovels and other agricultural tools
- ● Some kind of fiber
- ● Textile fabrics
- ● Garments (Knitted or crocheted fabric, wool or fine animal hair, under garments etc. are the good subject to import prohibition)
- ● Bed linen, table linen and kitchen linen etc.
- ● Pure sodium chloride
- ● Saccharine, saccharine in salt
  (cyclamate and artificial sweetening substances other than sodium cyclamate)
- ○ Fruits
- ○ Foods preserved by freezing, containing added sugar or sweetening matter
- ○ Waters, including natural or artificial mineral water, and aerated waters
- ○ Wine and spirits
- ○ Meat and edible offal, of poultry not cut in pieces
- ○ Marine fish, fresh water fish
- ○ Milk in powder

6-2. Local sole agents for Laboratory instruments

Maintenance of high precision analytical instruments such as Gas chromatograph-Mass spectrometer can be made by the local sole agents of each instrument manufacturer. The users are necessary to apply to these agents by the conclusion of the yearly maintenance contract.
Main local sole agents are described as follows ;

1. Shimadzu Corporation
   P. T. Ditek Jaya
   Jl. Bungur Besar 85, Blok A2 Jakarta
   Tel : (021)414489, 415926
   Fax : (021)413801
   Main Commodities : Gas Chromatograph-Mass Spectrometer, X ray Fluorescence Analyzer, Scanning Electron Microscope, Atomic Absorption Spectrophotometer, Gas Chromatograph etc.

2. Hitachi, Ltd
   P. T. Hilab Sciencetama
   Jl. Tanah Abang No. 12D Jakarta
   Tel : (021)375734, 375857
   Fax : (021)376074
   Main Commodities : Gas Chromatograph-Mass Spectrometer, X ray Fluorescence Analyzer, Scanning Electron Microscope, Atomic Absorption Spectrophotometer, Gas Chromatograph etc.

3. DKK Corporation
   Berka Indonesia P. T.
   Jl. Cikimi Raya 78 Jakarta
   Tel : (021)324199
   Fax : (021)325535
   Main Commodities : Air Monitoring System. ph Meter and other Laboratory Equipment

4. Shibata Scientific Technology, Ltd.
   P. T. New Module
   Jl. Abdul Muis No. 36Q Jakarta
   Tel : (021)366815
   Fax : (021)347986
   Main Commodities : Air Monitoring System, ph Meter and other Laboratory Equipment, Glass wares

5. HACH Co. (USA)
   C. V. Sumber Karya
   JL. Batu Ceper No. 2 C Jakarta Pusat 10120
   Tel : (021)363081, 363173, 366712
   Fax : (021)3807965
   Main Commodities : Water Quality Analyzer etc.