

THE MINISTRY OF MINES AND ENERGY
THE REPUBLIC OF INDONESIA

No. 1

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT OF EQUIPMENT ASSISTANCE
FOR ENLIGHTENMENT OF THE GEOLOGICAL
INFORMATION FOR SCHOOL CHILDREN
STUDENTS AND PEOPLE
IN
THE REPUBLIC OF INDONESIA**

DECEMBER 1997

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**JAPAN INTERNATIONAL COOPERATION AGENCY
UNICO INTERNATIONAL CORPORATION**

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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project of Equipment Assistance for Enlightenment of the Geological Information for School Children, Students and People and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team from September 2 to September 26, 1997.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Indonesia in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the teams.

December, 1997



Kimio Fujita

President

Japan International Cooperation Agency

December, 1997

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project of Equipment Assistance for Enlightenment of the Geological Information for School Children, Students and People in the Republic of Indonesia.

This study was conducted by UNICO International Corporation, under a contract to JICA, during the period from August 25, 1997 to December 26, 1997. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Indonesia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

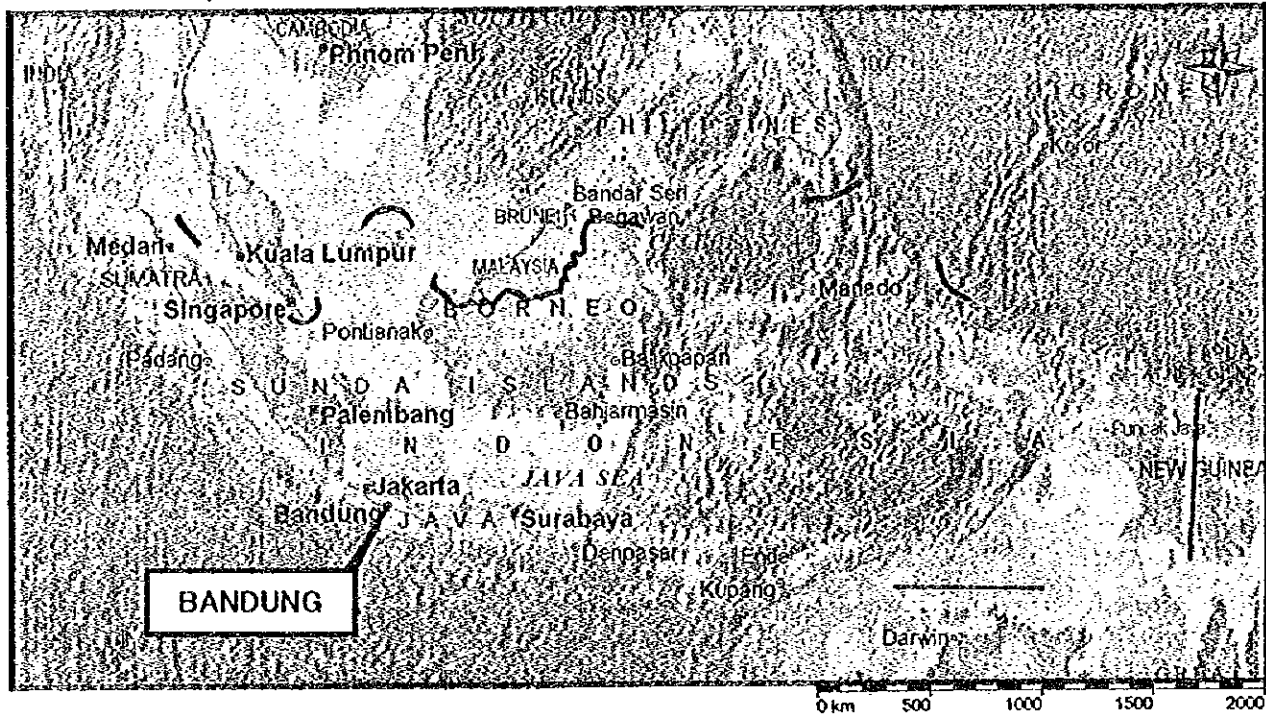
Very truly yours,



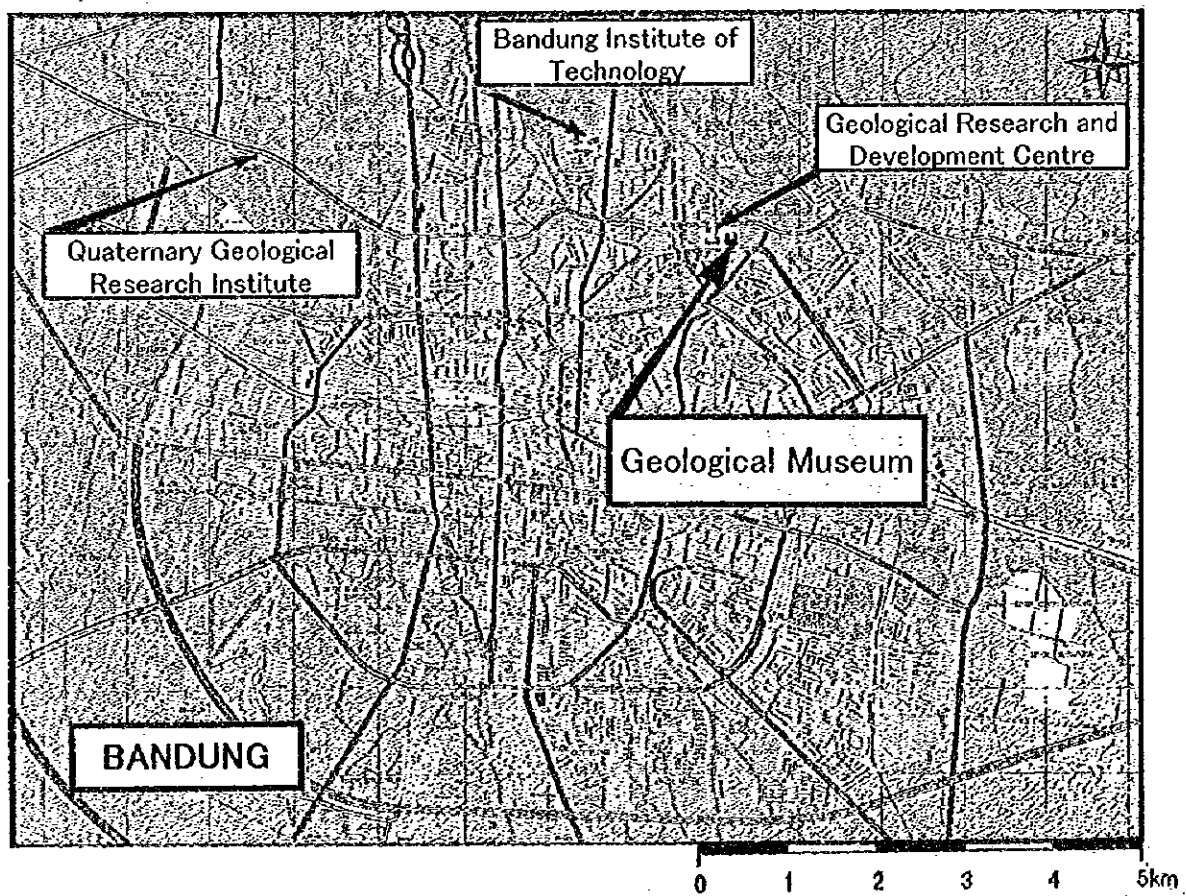
Takashi Kuroda
Project manager,
Basic design study team on
the Project of Equipment Assistance
for Enlightenment of the Geological
Information for School Children,
Students and People
UNICO International Corporation

LOCATION MAP

The Republic of Indonesia

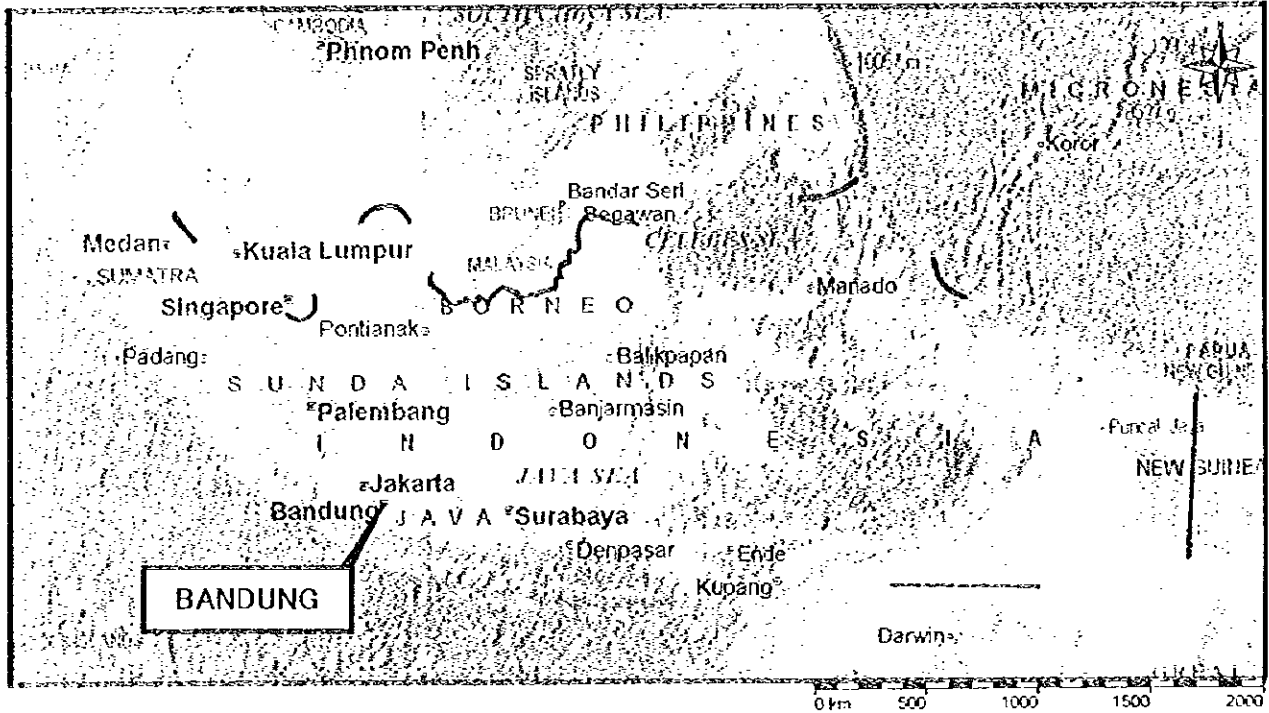


Location of the Site

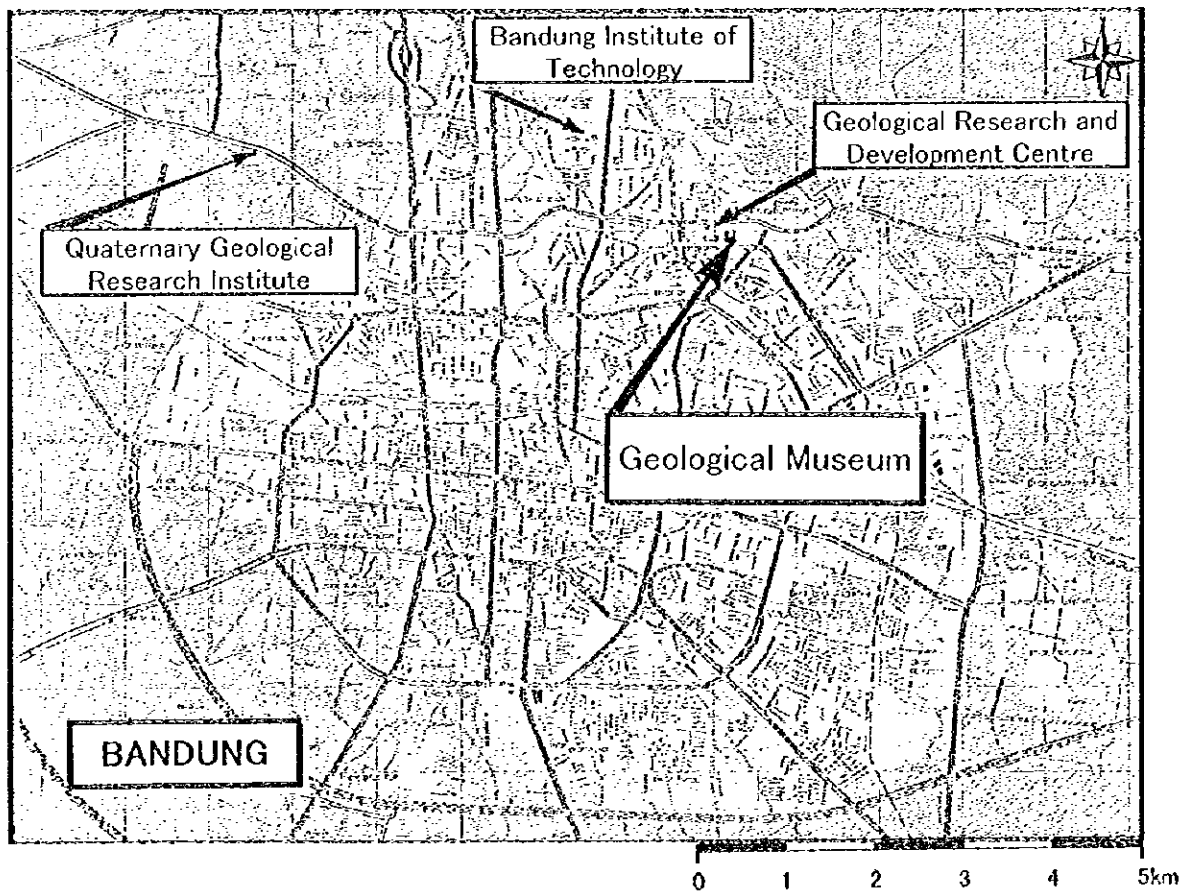


LOCATION MAP

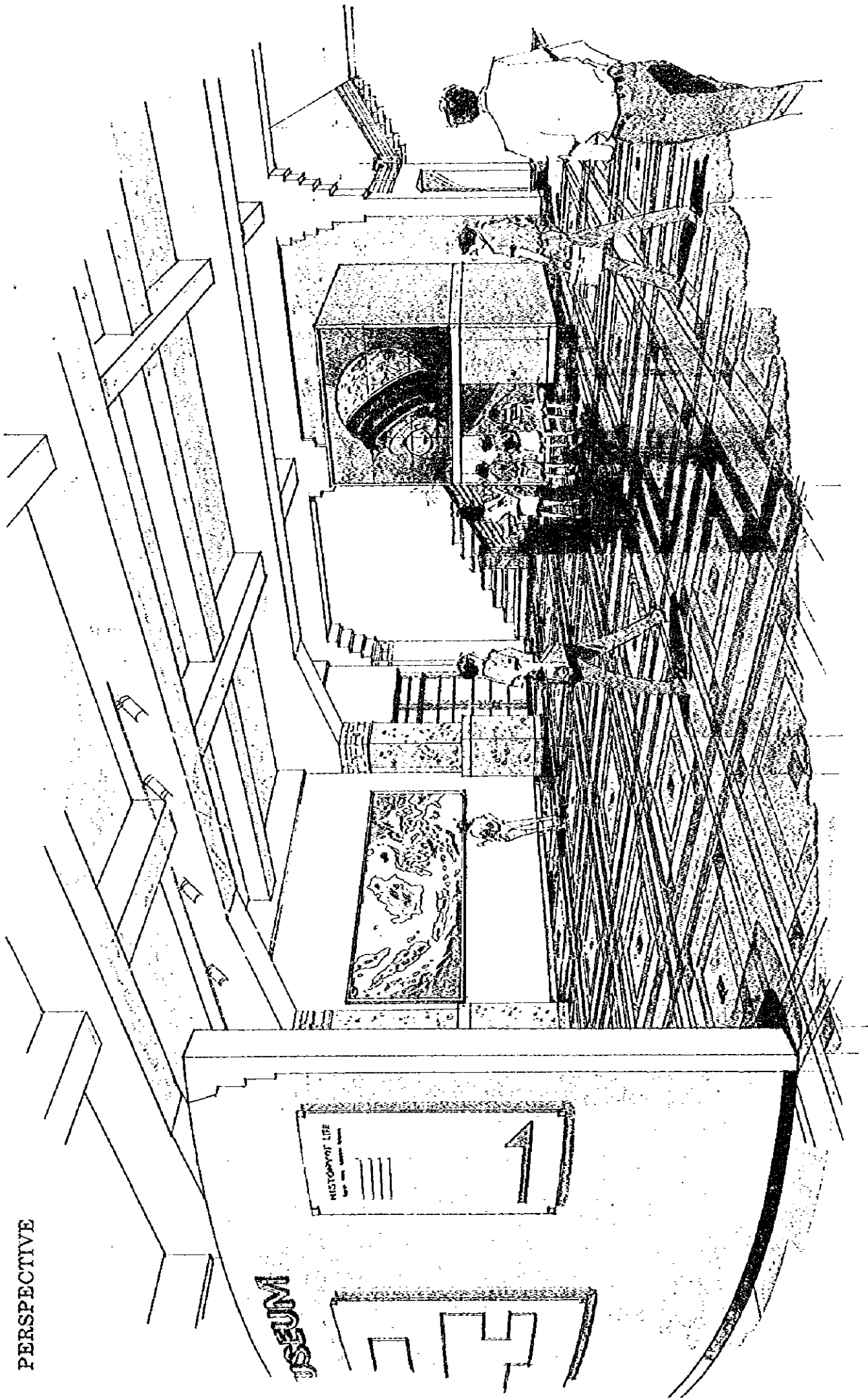
The Republic of Indonesia

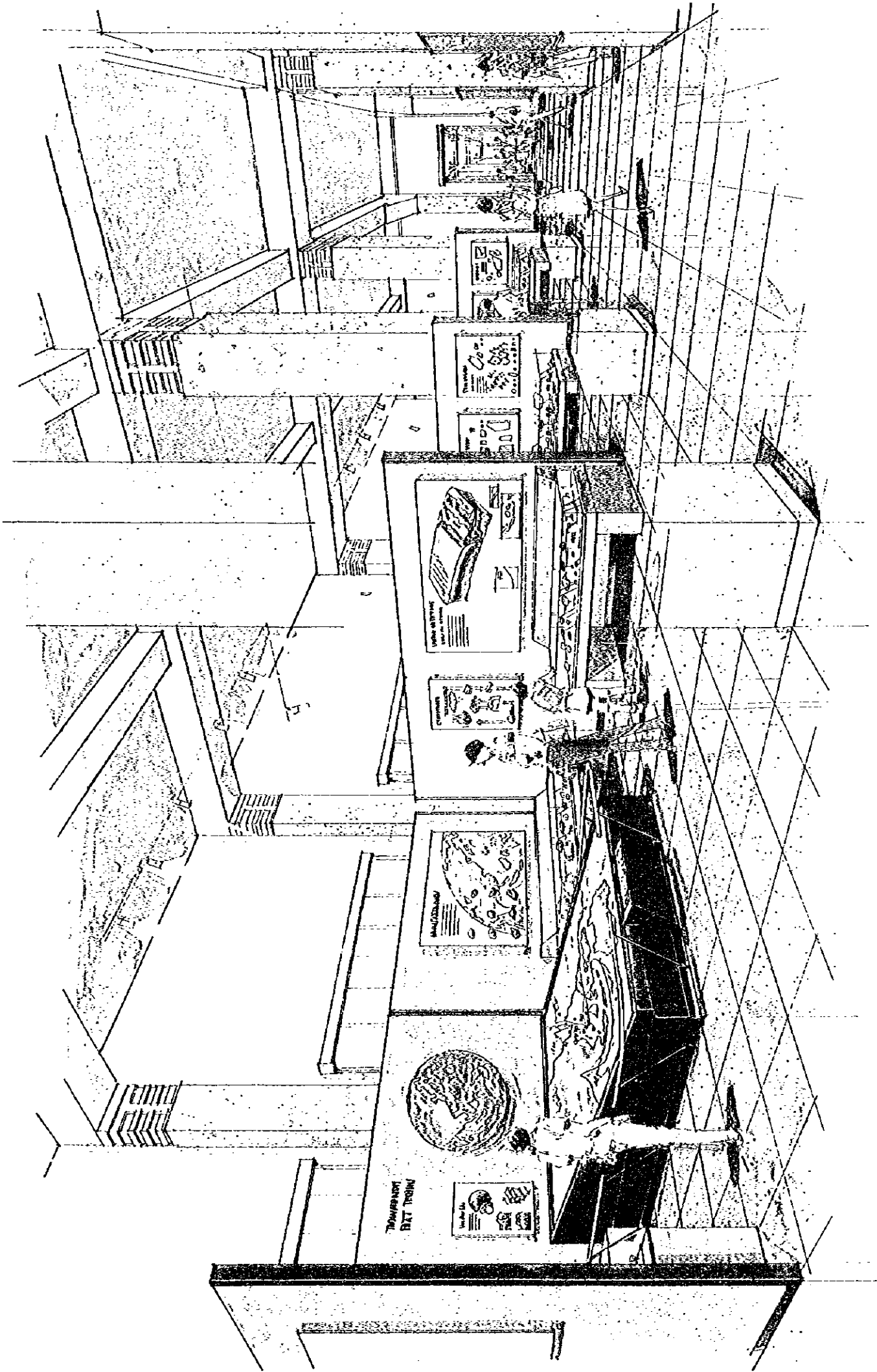


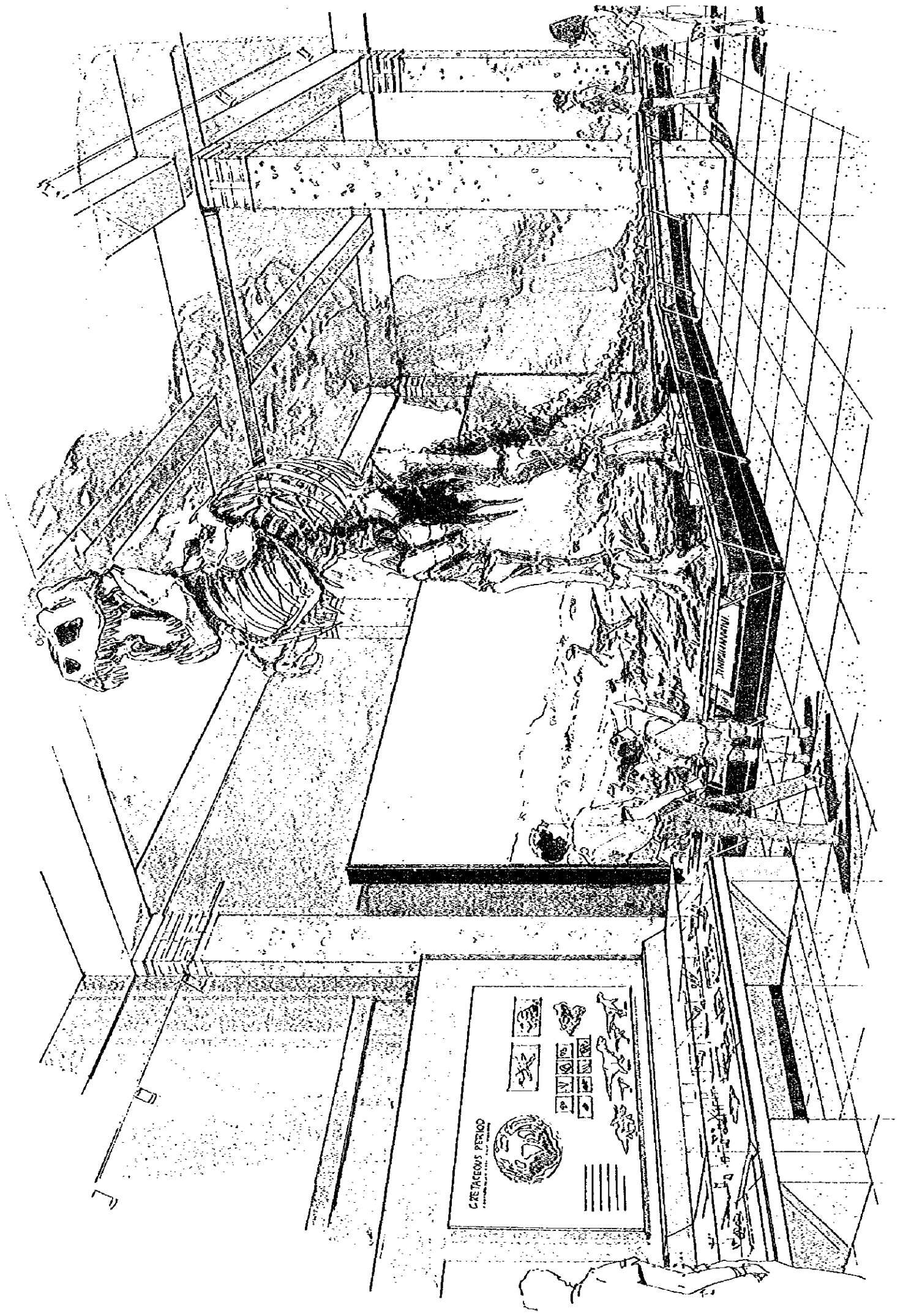
Location of the Site



PERSPECTIVE







CRETACEOUS PERIOD



TRUSSARDI

ABBREVIATIONS

ADB	: ASIAN DEVELOPMENT BANK
A/P	: AUTHORIZATION TO PAY
AV	: AUDIO-VISUAL
BAPPENAS	: BADAN PERANCANG PEMBANGUNAN NASIONAL
DGGMR	: DIRECTORATE GENERAL OF GEOLOGY AND MINERAL RESOURCES
E/N	: EXCHANGE OF NOTES
GDP	: GROSS DOMESTIC PRODUCT
GRDC	: GEOLOGICAL RESEARCH AND DEVELOPMENT CENTRE
IMF	: INTERNATIONAL MONETARY FUND
ITB	: INSTITUT TEKNOLOGI BANDUNG
JICA	: JAPAN INTERNATIONAL COOPERATION AGENCY
MOME	: THE MINISTRY OF MINES AND ENERGY
ODA	: OFFICIAL DEVELOPMENT ASSISTANCE
OS	: OPERATING SYSTEM
SGS	: SOCIETE GENERALE DE SURVEILLANCE
UPS	: UNINTERRUPTIBLE POWER SOURCE

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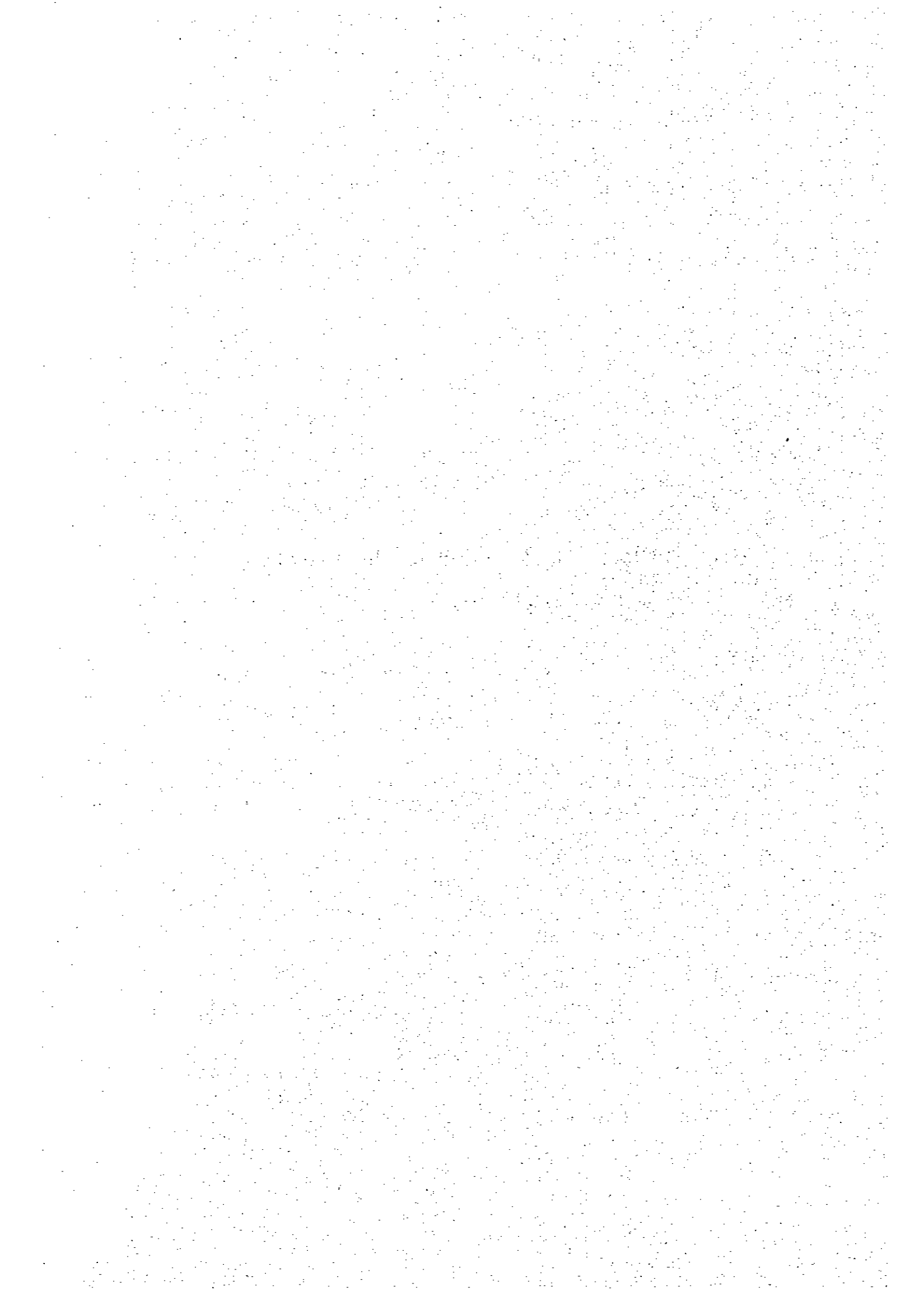
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CHAPTER 1 Background of the Project



Chapter 1 Background of the Request

1-1 Overview of Industry and Economy in Indonesia

Indonesia is traditionally an agricultural country based on the cultivation of rice, however, its economic structure has changed dramatically in the past 30-odd years. Thanks to a positive development-focused policy executed under the long stable administration of the President Soeharto that was established in 1968, the country achieved a remarkable economic growth through exports of its rich underground resources such as oil and natural gas in the 1970s, and since 1984 when the 4th Five-Year Development Plan started, industrial output has been growing markedly owing to economic restructuring aiming at emerging from the oil-dependent economy. During the three decades from 1966 to 1995, gross domestic product (GDP) grew at an average annual rate of 6.7% (source: Central Bureau of Statistics; figures given below are from the same source), expanding about 6.6 times during the period. By industry, agriculture, forestry and fisheries expanded about 2.9 times with an average annual growth rate of 3.7%, manufacturing about 21.7 times with an average annual growth rate of 11.2%, and mining about 5.0 times, with an average annual growth rate of 5.7% during the period. Looking at the industrial composition, agriculture, forestry and fisheries which accounted for 58.7% of GDP in 1965 decreased in share to 17.2% in 1995. During the same period, manufacturing increased its contribution to GDP from 7.6% to 24.2%, emerging as the largest industry sector. Mining increased its share from 2.5% in 1965 to a respectable 25.7% in 1980 as oil prices rose during the period. In terms of absolute amount, mining sector had been growing steadily (Table 1.1.1). As export items, mining products bring foreign currencies into the country (total amount of exports for 1996: \$14,776.1 million, which is broken down into \$11,721.9 million for oil and natural gas and \$3,054.2 million for coal, copper ore, nickel ore, granite, bauxite, etc.). The mining industry also supports the growth of the manufacturing industry by supplying it with necessary raw materials on a stable basis. Thus, the mining industry occupies an

important position in the Indonesian economy.

Table 1.1.1 Breakdown of GDP by industry (nominal prices)

Unit: billion rupiah

	1989	1990	1991	1992	1993	1994	1995
Agriculture, forestry And fisheries	39,163.9	42,148.7	44,720.8	50,733.1	58,963.4	66,071.5	77,639.3
Mining	21,822.5	26,119.0	31,402.6	29,907.2	31,497.3	33,507.1	38,045.1
Manufacturing	30,323.3	38,910.2	47,665.5	56,541.6	73,556.4	89,240.7	109,395.0
Electric, gas and water Supply	1,008.3	1,258.1	1,750.2	2,147.7	3,290.2	4,577.1	5,624.5
Construction	8,884.2	10,748.5	12,902.1	15,305.2	22,512.9	28,016.9	34,451.0
Wholesaling and Retailing	28,855.5	32,999.7	36,953.8	42,731.5	55,297.6	63,858.7	75,874.0
Transportation and Communications	9,305.5	10,999.6	13,908.0	17,099.3	23,248.9	27,352.7	30,778.3
Financing and health	6,666.7	8,287.1	10,157.6	12,499.7	18,352.7	17,817.5	21,232.8
Real estate	4,151.1	4,890.8	5,924.7	6,595.9	9,695.1	11,239.0	11,899.2
Administrative service	11,174.2	12,801.4	14,621.6	17,309.4	22,458.1	17,338.0	20,239.6
Other services	5,829.5	6,431.1	7,443.2	9,013.9	10,903.4	23,200.5	27,201.2
GDP	167,184.7	195,597.2	227,450.2	259,884.5	329,775.9	382,219.7	452,380.9

(Source: National and Regional Income – Statistical Tables)

1-2 History of Geological Survey and Excavation and Present Condition of Preservation of Excavated Articles in Indonesia

Geological survey and excavation in Indonesia were started by the Netherlands that is the former suzerain to Indonesia. Many valuable excavated articles include fossils of Java men discovered in the middle of Java Island for the first time in 1891 (Pithecanthropus Erectus; they lived from 500,000 to 35,000 years ago; though they have no direct connection with the present humankind, their remains provide an important clue for tracing the evolution of human beings; fossils (P-VIII) excavated in the middle of Java island in 1936 are preserved in the Geological Research and Development Centre (GRDC) in Bandung and their replicas are displayed in the Geological Museum, National Central Museum in Jakarta, etc.) and fossils of Homo Erectus Soloensis discovered in

1931. Indonesia's geological survey technology has made a remarkable progress through the implementation of Japanese technical cooperation (CTA-41) in 1977 to 1979, the use of the research equipment Japan supplied as part of CTA-41, and the introduction of such research techniques as the ancient terrestrial magnetism measurement method and Fission-Track method employing the above research equipment. In 1979, the Institute of Indonesian Geological Survey was dissolved into GRDC, which took over the technology and research equipment of the Institute. Since then, it has carried on geological surveys.

Geological surveys conducted by GRDC contribute much to the progress of natural science, and survey of mineral resources makes an enormous contribution to the development of the industry and economy of Indonesia which stand on the basis of mining industry, then, survey and study of natural history and geological environment as the basis of survey of mineral resources and education and enlightenment to the nationals are necessary for continuous economical growth of the country.

Many of the excavated articles were carried to the Netherlands, etc. or lost at transportation during the World War II, even so, a good number of valuable articles remained. At present, those excavated articles which remained are mostly kept in GRDC and Geological Museum in the form of specimens and exhibits. However, it cannot be said that they are kept in good condition, with some exceptions. Besides, considerable proportions of the excavated articles are held by the researchers or their departments that excavated them. In view of this, it is of urgent necessity to provide better storage facilities.

1-3 Outline of the Request

The Geological Museum, founded in 1929, is now one of the organizations of the Geological Research and Development Centre (GRDC) of the Directorate General of

Geology and Mineral Resources of the Ministry of Mines and Energy. It is the only museum in Indonesia that collects and exhibits geological specimens, and it boasts the longest history among the geological museums in Southeast Asia. This museum has more than 100,000 visitors a year, 80% to 90% of whom are schoolchildren and junior and senior high school students from all over the country (schoolchildren 12%, junior high school students 53%, and senior high school students 24% in 1996). With the exhibition of geological specimens of minerals, rocks, fossils, etc. and panels depicting disasters caused by volcanic activity, earthquakes, tsunami, landslides, etc., the museum has become a place of education and enlightenment where visitors can learn the natural history and geological environment of various parts of the country. However, since foundation of the museum, its facilities and equipment have seldom been refurbished, calling for modern exhibition equipment and storage facilities. In view of this situation, GRDC formulated a master plan for improving the condition of storage of specimens and enhancing the educational function of the Geological Museum, and has decided to reinforce the building, staff, and equipment of the museum. At present, in line with the master plan, the existing building is being renovated stepwise on the budget of Indonesian side. At the same time, the staff of the museum are improving in technical level thanks to the guidance of experts dispatched to the museum based on the Japanese technical cooperation. With respect to the equipment, however, the Center has difficulty obtaining new equipment due to shortage of funds. Under this condition, the Government of Indonesia has requested the Government of Japan to provide a grant aid for the procurement of equipment necessary for the Geological Museum.

The major contents of the request are as follows.

(1) Equipment for exhibition

Design, fabrication, and installation of equipment for exhibition (showcases, panels, dioramas, etc.), installation of specimens, replicas, etc., design and installation of equipment for producing stage effect (lighting equipment and large image projector),

and design and installation of equipment for preserving the exhibition environment (ventilating equipment and UV cutting film), in the permanent exhibition rooms, special exhibition rooms, entrance lobby, and outdoor exhibition space; procurement of tools for maintenance and control of the exhibition equipment and tools for preparing new specimens, replicas, etc.

(2) Equipment for processing, storing, and controlling specimens

Design and installation of equipment for storing specimens (mezzanine floor, fire-proof ceiling panel, fire- and burglar-proof doors, fixed racks for medium-weight articles, movable racks for medium-weight articles, boxes for housing specimens, special storage, carts for carrying specimens, lift for handling medium-weight articles), design and installation of equipment for preserving specimen storage atmosphere (sterilizing equipment and equipment for ventilation, temperature/humidity control, and air purification), and procurement of equipment for processing, appraising, and analyzing specimens (equipment for cleaning fossils, etc., equipment for cutting rocks into thin pieces, optical microscope, stereomicroscope, polarizing microscope, precision chemical balance, etc.)

(3) Equipment for promotional and educational purposes

Design and installation of audio-visual equipment (various projectors, screens, acoustic equipment, photographing and editing equipment), procurement and installation of auditorium equipment (desks, chairs, whiteboard), and procurement and installation of activity promotion equipment (light printing press)

(4) Equipment for processing data

Design and installation of equipment for processing data base of specimens, etc. (computers, various types of software, various types of input/output devices) and procurement and installation of activity promotion equipment (copy machines,

facsimile machines)

(5) Supporting equipment

Design and installation of safety equipment (emergency announcement equipment, monitor equipment for preventing fires and burglars, emergency power generating equipment) and procurement of vehicles (trucks for transporting specimens and documents, four-wheel drive cars for transporting survey instruments, cameras, etc.)

CHAPTER 2 Contents of the Project



Chapter 2 Contents of the Project

2-1 Objectives of the Project

The Geological Museum in Bandung, founded in 1929, is the only geological museum in Indonesia. At present, it belongs to Geological Research and Development Centre (GRDC) of the Directorate General of Geology and Mineral Resources of the Ministry of Mines and Energy. It has more than 100,000 visitors a year, and 80% to 90% among them are schoolchildren and junior and senior high school students from all over the country. Exhibiting geological specimens of minerals, rocks, fossils, etc. and panels which depict disasters caused by volcanic activities, earthquakes, tsunami, landslides, etc., the museum is a place of education and enlightenment in natural history and geological environment of various parts of the country. However, since foundation, the facilities and equipment of the museum have been seldom refurbished, calling for renewal of most of the exhibition equipment and storage facilities. In view of this situation, GRDC, aiming to enrich the education in natural science in Indonesia through reinforcement of the buildings, staff, and equipment of the Geological Museum, formulated a master plan for renovating the Geological Museum with the cooperation of experts dispatched from Japan. At present, in line with the master plan, the existing building of the Geological Museum is being refurbished on a step-by-step basis on Indonesian budget and the staff members are improving their technical levels under the guidance of the Japanese experts. With respect to the equipment, however, it is difficult for GRDC to procure new equipment due to shortage of funds.

The objective of the Project is to enhance the functions of specimen storage and education at the Geological Museum by providing the five types of equipment, i.e. equipment for exhibition, storage, education, collection and preparation, and research, which will be a part of the renovation plan of the Indonesian side.

2-2 Basic Concept of the Project

The types of equipment that were initially requested in writing from Indonesia were those for exhibition, specimen preparation and storage, education, data processing, and supporting operations, and only the major items of the equipment were specified in the request. At the beginning of discussions, the Indonesian side presented to the Study Team a new itemized list of equipment for exhibition, specimen collection and storage, education, research, and general administration. The major differences from the original request are that the equipment for data processing was included in the equipment for specimen collection and storage, that the equipment for supporting operations was distributed among other types of equipment, and that the equipment for general administration (personal computers, photocopying machines, facsimile equipment, document filing racks, etc.) was added. During the discussions, it was agreed that the equipment for general administration should be left out of the scope of the grant aid and that the items which do not agree with policy and premises of the Study Team for equipment selection (see Table 2.2.1), such as the personal computer for exhibition, stamping robot, and video camera for exhibition, should be excluded. As a result, the final request from Indonesian side came to 79 items of four types of equipment, i.e. equipment for exhibition, collection and storage system, education, and research. A list of those 79 items was confirmed as the final request between the Indonesian side and the Study Team, followed by the signing of the minutes of discussions between them.

During the discussion held after the signing of the minutes, the individual items of equipment were classified by priority according to the criteria shown in Table 2.2.1. In Japan, the Study Team reviewed the priorities by re-examining the necessity and validity of each individual item. The priority of each item discussed by the two parties in Indonesia and the results of the re-examination in Japan of the priority, necessity, validity, and quantity of each item are shown in Table 2.2.2.

Based on the results of the re-examination, the items with priority A shall all be included in the planned equipment since they are absolutely necessary and very useful, but the items with priority B or C shall be excluded from the planned equipment. With respect to the scanning electron microscope, the priority of which was left undecided by the two parties, it shall also be excluded from the planned equipment. Instead, a scanning electron microscope in Quaternary Geological Research Institute several kilometers away from the Geological Museum shall be used. Though this microscope is now out of order, it is scheduled to be repaired and put into operation again. The quantity of each item of the planned equipment is also shown in Table 2.2.2.

Table 2.2.1 Policy and premises for selection of equipment and order of priority

1. Policy for selection of equipment

The existing equipment and methods of museum management, specimen control, research, education, data processing, and operation, maintenance, and control of the equipment shall be investigated and priority of each of the items of equipment requested from Indonesia shall be decided.

2. Premises for selection of equipment

- 2.1 Higher priority shall be given to the renewal of the existing equipment.
- 2.2 With respect to any equipment which is needed to implement a plan in the future, the validity of the plan shall be determined and equipment which is considered to be used infrequently or difficult to operate or maintain shall be excluded.
- 2.3 Equipment selected shall be such that the operating costs are reasonable and that it can be maintained locally.
- 2.4 Equipment which is extremely sophisticated and expensive shall not be adopted.
- 2.5 As a rule, consumables, books, and audiovisuals shall be left out of consideration. Computer programs shall be limited to operating systems and other basic software.
- 2.6 As a rule, furniture for office rooms other than auditoriums (audiovisual rooms) shall be left out of consideration.
- 2.7 With respect to vehicles, the method and frequency of use, etc. shall be studied and only those vehicles which are judged necessary shall be adopted.
- 2.8 With respect to emergency announcement system, fire/burglar monitors, and emergency generators, only those which are judged absolutely necessary shall be adopted. Any fire/burglar monitor system for the entire museum shall be left out of consideration.

3. Order of priority

Based on the above premises, the items of equipment requested from Indonesia were classified into three priority levels A, B, and C.

- A: Items which are indispensable to attain the objectives of the Project and which meet all or almost all of the above premises or items which are much needed and which meet all of the above premises
- B: Items which are much needed but which do not meet some of the above premises or items which meet all of the above premises but which are judged not as necessary as items with priority A
- C: Items which are judged not as necessary as items with priority B

Table 2.2.2 Priority, Necessity, Validity and Quantities of Requested Equipment

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment		Necessity	Validity	Review of Quantity	Priority (in Japan)		
		A	B	C	Qty	Condition				A	B	C
I. Exhibition												
A. General Geology of Indonesia												
Audio Visual System with a Screen	1 set	1					Necessary for explaining to many people at a time the general geology of Indonesia as the basic knowledge needed to appreciate the exhibits	○	One set of AV system with a large screen (about 150 inches) which many people (about 200 persons) can watch is suitable.	1		1 set
B. Origin of the Earth												
Display Panel, Showcase, Graphic Panel, Display Stage, Sign Panel and Lighting Fixture	1 lot	1			※1	※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1		1 set
C. Endogenetic and Exogenetic Process												
1. General Tectonic												
Display Panel, Display Stage, Showcase, Model, Graphic Panel, Sign Panel and Lighting Fixture	1 lot	1			※1	※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1		1 set
2. Indonesia Archipelago												
Display Panel, Showcase, Graphic Panel, Model, Sign Panel and Lighting Fixture	1 lot	1			※1	※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1		1 set
3. Sumatra Island												
Display Panel, Showcase, Graphic Panel, Model, Sign Panel and Lighting Fixture	1 lot	1			※1	※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1		1 set
4. Kalimantan Island												
Display Panel, Showcase, Graphic Panel, Model, Sign Panel and Lighting Fixture	1 lot	1			※1	※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1		1 set
5. Java Island												
Display Panel, Showcase, Graphic Panel, Model, Sign Panel and Lighting Fixture	1 lot	1			※1	※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1		1 set

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty	Necessity	Validity	Review of Quantity	Priority (in Japan)			
		A	B	C					A	B	C	
6. Volcano in Indonesia Display Panel, Showcase, Model, Display Stage, Model, Graphic Panel, Sign Panel and Lighting Fixture	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
7. Sulawesi Island and Island Arc												
Display Panel, Showcase, Graphic Panel, Model, Display Stage, Sign Panel and Lighting Fixture	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
8. Irian Island												
Display Panel, Showcase, Graphic Panel, Model, Sign Panel and Lighting Fixture	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
D. Evolution of Life												
History of Life												
1. Geologic Time Scale												
Display Panel and Lighting Fixture	1 lot	1			1 Good, though some are difficult to understand	In this zone, exhibits are arranged in order of geological time scale. Explanation of the scale is necessary as a basic knowledge.	○	One set is necessary.	1			1 set
2. Pre-Cambrian Era												
Display Panel, Showcase, Graphic panel and Lighting Fixture	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
3. Paleozoic Era												
Display Panel, Showcase, Graphic panel and Lighting Fixture	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty	Existing Equipment Condition	Necessity	Validity	Review of Quantity	Priority (in Japan)			Planned Quantity
		A	B	C						A	B	C	
4. Mesozoic Era Display Panel, Showcase, Display Stage, Graphic Panel, Reconstructed Model of Dinosaurs, Sign Panel and Lighting Fixture	1 lot	1			*1	*1	Equipment indispensable for exhibition, etc. of specimens. Dinosaur models are useful for demonstrating the enormous sizes of dinosaurs which were dominating the land in the Cretaceous period.	○	As per exhibition plan. As a dinosaur model, only one frame (skeleton) replica shall be provided.		1		1 set
5. Cenozoic (Tertiary) Display Panel, Showcase, Graphic Panel, Sign Panel and Lighting Fixture	1 lot	1			*1	*1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.		1		1 set
6. Cenozoic (Quaternary) Display Panel, Showcase, Display Stage, Graphic Panel, Sign Panel and Lighting Fixture	1 lot	1			*1	*1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.		1		1 set
Evolution of Life													
1. Paleozoic Display Panel, Showcase, Graphic Panel and Lighting Fixture	1 lot	1			*1	*1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.		1		1 set
2. Mesozoic Display Panel, Showcase, Graphic Panel and Lighting Fixture	1 lot	1			*1	*1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.		1		1 set
3. Cenozoic Display Panel, Showcase, Graphic Panel, Lighting Fixture and Sign Panel	1 lot	1			*1	*1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.		1		1 set
E. Applied Geology Geology for human life													
1. Non-Metallic Mineral Display Panel, Showcase, Graphic Panel, Lighting Fixture and Sign Panel	1 lot	1			*1	*1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.		1		1 set

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty. Condition	Necessity	Validity	Review of Quantity	Priority (in Japan)			Planned Quantity
		A	B	C					A	B	C	
2. Metallic Mineral. Display Panel, Showcase, Graphic Panel, Lighting Fixture and Sign Panel	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
3. Energy Display Panel, Showcase, Graphic Panel, Display Stage, Lighting Fixture and Sign Panel	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
4. Gemstone Display Panel, Showcase, Graphic Panel, Lighting Fixture and Sign Panel	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
5. Hydrology Display Panel, Showcase, Graphic Panel, Display Stage, Model, Lighting Fixture and Sign Panel	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
6. Civil and Structure Engineering Display Panel, Showcase, Graphic Panel, Lighting Fixture and Sign Panel	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
Geological Hazard Display Panel, Showcase, Graphic Panel, Display Stage, Lighting Fixture and Sign Panel	1 lot	1			※1 ※1	Equipment indispensable for exhibition, explanation, etc. of specimens	○	As per exhibition plan.	1			1 set
F. Other Equipment for Exhibition												
1. Polarized Microscopes with Camera and Monitor	1 set	1			1 Obsolescent	Indispensable for exhibition of very small specimens	○	One new set is necessary as replacement	1			1 set
2. Public Announcement System	1 set	1				Very useful for guiding pupils because there are often pupils from different schools in exhibition rooms	○	One set is necessary.	1			1 set

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment		Necessity	Validity	Review of Quantity	Priority (in Japan)			
		A	B	C	Qty	Condition				A	B	C	
3. Hydraulic Ladder	1 unit	1			.	.	Very useful for maintenance of exhibits, lighting fixtures, etc.	○	One unit is necessary (it is expected to be frequently used during routine maintenance work, etc.)	1			1 unit
4. Video Monitor Sets	2 sets	2			.	.	Very useful in explaining specimens, etc. to visitors in confined space	○	2 sets for explanation of volcano and oil rig respectively	2			2 sets
II. Equipment for Collection and Storage System													
1. Supporting & Handling Collection													
1) Truck Car with Hydraulic Lift	1 unit	1			.	.	Indispensable for carrying large rocks, specimens, etc. outdoors	Expected to be used infrequently	.		1		Deleted
2) Lift	1 unit	1			.	.	Useful in carrying rock, specimens, etc. indoors (between basement and ground floor)	○	One set is necessary.	1			1 set
3) Forklift	1 unit	1			.	.	Useful in carrying heavy rocks, specimens, etc. indoors	○	One unit is sufficient because heavy objects are carried around infrequently.	1			1 unit
4) Push Carts	5 units	5			2	Obsolete	Indispensable for carrying light rocks, specimens, etc. indoors. A pushcart with fork is also required in changing exhibits, etc.	○	Since the museum has a large space, four units (includes two replacement units) are necessary, one each for 1F storage rooms, 1F ground storage rooms, 1F exhibition rooms, and 2F exhibition rooms. One pushcart with fork is sufficient.	5			5 units
2. Rock and Fossil Specimen Preparation Equipment	1 set	1			.	.	Indispensable for preparing specimens	○	One set is necessary.	1			1 unit

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty	Necessity	Validity	Review of Quantity	Priority (in Japan)			Planned Quantity
		A	B	C					A	B	C	
3. Polarization, Ore Illuminated and Binocular Microscopes with Cameras and Necessary Accessories	2 units	1	1	1	1	Indispensable for selecting and identifying specimens	○	Since rocks and fossils are worked on for identification, etc. in separate rooms, about two units of each type are necessary. Therefore, one new set (1 ore illuminated and 2 binocular microscopes with 1 cameras) is necessary.	1	1	1	1 set
4. Digital Cameras	2 sets	2				Very useful in recording specimens, etc. Indispensable for processing data including visual images	○	Two units are necessary since rocks and fossils are worked on for identification, etc. in separate rooms.	2			2 units
5. Camera with Stand	1 set	1		1	1	Indispensable for recording specimens, etc.	○	Two units are necessary since rocks and fossils are worked on for identification, etc. in separate rooms. One unit is already available, hence one 35 mm camera shall be added. In addition, one brownie camera is needed.	1			1 set (2 units)
6. Dry Cabinets	8 units	4	4	2	2	Useful for storing cameras, microscopes, etc.	○	About four units are necessary in view of the contents and quantities of microscope attachments, cameras, and other planned equipment.	4	4	4	4 units
7. Soft X-ray Machine	1 unit	1				Indispensable for confirming fossils in rocks	○	One unit is necessary.	1			1 unit

Name of Equipment	Quantity Required	Priority (in Site)		Existing Equipment Qty	Condition	Necessity	Validity	Review of Quantity	Priority (in Japan)		Planned Quantity
		A	B						A	B	
8. Computer Systems for Data Processing	4 sets	4		1	Good, though insufficient to process the great number of existing specimens.	Indispensable for recording specimens, excavation site conditions, etc.	○	To organize the huge volume of data about the existing specimens, 4 clients and 10 GB server (or more) shall be provided. Printer etc. shall be 1 set.	1		1 set
9. Storage Equipment	550,000 specimens	○		※2	※2	Indispensable for storing rock and fossil specimens	○	To be planned based on the number of existing specimens and the space of storage. As per 1-3 basic design.	○		1 set
10. Thin Section Cupboards	1,000,000 thin sections	○		※2	※2	Indispensable for storing specimens set on slide glasses	○	In view of the number of existing specimens, etc., about 500,000 sections are necessary.	○		1 set
11. Fire Proof Filing Cabinets	12 units	12		-	-	Indispensable for storing prototype specimens (500 pcs existing) safely.	○	The number of units shall be limited to the necessary minimum 2 units	2	10	2 units
12. Plastic Containers	5,000 units	5,000		700	Good, though the number is far from sufficient.	Indispensable for storing rock and fossil specimens	○	To be planned based on the number of existing specimens and the space of storage. As per 1-3 basic design.	○		18,234 units
13. Fire Proof Panels	8 units	8		-	-	Useful for preventing storage rooms from fires	There are 6 storage rooms that have to be prevented from fire.	Same as above	○		for 6 storage rooms
14. Air/Dust Filters	30,000 m ³	○		-	-	Indispensable for keeping storage room environment in good condition	There are 6 storage rooms that have to be provided with equipment.	Same as above	○		for 6 storage rooms

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty	Necessity	Validity	Review of Quantity	Priority (in Japan)			
		A	B	C					A	B	C	
15. Humidity Control Machines	30,000 m ³	○				Indispensable for keeping storage room environment in good condition	There are 3 storage rooms that have to be provided with equipment.	Same as above	○			for 3 storage rooms
16. Ultraviolet Coating Films	100 m ²	○				Useful for keeping environment of specimen preparation places in good condition	○	To be planned based on the space of specimen preparation rooms.	○			100 m ²
17. Security Door Systems	14 doors	14				Useful for protecting storage rooms from fires and burglars	There are 6 storage rooms that have to be prevented from fire.	To be planned based on the number of existing specimens and the space of storage. As per the basic design described in 1-3.	○			for 6 storage rooms
18. Mezzanine	3 storages	3				Very useful for securing adequate storage space	○	Same as above	2	1		for 2 storage rooms
III. Equipment for Education												
1. Computer Systems for Preparation of Exhibition	2 sets	2		(2)	Computers borrowed from another department of GRDC are obsolescent.	Very useful for preparing exhibits, explanatory documents on exhibits, museum brochures, etc. and for giving classes to visitors	○	Based on the number of computers currently in use, two desk-top computers, one scanner, one plotter, and one printer shall be provided. In addition, one notebook-type computer shall be provided for giving classes to visitors.	1			1 set

Name of Equipment	Quantity Required	Priority (in Site)		Existing Equipment Qty.	Condition	Necessity	Validity	Review of Quantity	Priority (in Japan)		Planned Quantity
		A	B						A	B	
2. Audio Visual System	1 set	1			There was an obsolescent OHP, which was out of order and un-repairable.	Very useful in giving lectures in Auditorium. Necessity of portable equipment is low.	○	A set of 200 inch projector etc. are necessary based on the capacity of Auditorium (200 persons). Editing equipment, slide projector etc. are necessary too. Portable equipment is deleted.	1		1 set
3. Light Printing Machine	1 set	1				Indispensable for printing museum guides, lecture materials, etc.	○	One set is necessary.	1		1 set
4. Equipment for Reference Services:											
1) Bookshelves	10 sets		10			Indispensable to library	Excluded from the scope of grant aid			10	Deleted
2) Filing Cabinets	10 sets		10			Very useful to library	Excluded from the scope of grant aid			10	Deleted
3) Index Card Cabinets	3 sets		3			Useful to library	Excluded from the scope of grant aid			3	Deleted
5. Chairs with Desks for Auditorium-1	200 sets	200				Indispensable in giving lectures in the Auditorium	○	From the average number of 200 a group of pupils and the space of Auditorium, 200 sets shall be provided.			200 sets
6. Dry Cabinets	4 sets	1	3			Very useful for storing video tapes, etc.	○	One unit is necessary for storing video tapes.	1	3	1 unit
7. Air-conditioners for Auditorium-1	2 sets	2				Indispensable because the Auditorium is used closed during projection	○	6 sets are necessary based on the space and capacity of Auditorium	6		6 sets

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty.	Necessity	Validity	Review of Quantity	Priority (in Japan)			Planned Quantity
		A	B	C					A	B	C	
IV. Equipment for Research												
1. Polarization Microscope with Camera and Standard Accessories	1 set	1			1 Good	Indispensable for examination of specimens, etc.	○	Two units, one for rocks/minerals and one for fossil, are necessary. Since one unit is already available, only one unit shall be provided.	1			1 unit
2. Ore Illuminated Microscope with Camera and Standard Accessories	1 set	1			-	Indispensable for examination of specimens, etc.	○	One unit is necessary for petrological research.	1			1 unit
3. Binocular Microscope with Camera and Standard Accessories	1 set	1			-	Indispensable for examination of specimens, etc.	○	One unit is necessary for paleontologic research.	1			1 unit
4. Illuminated Binocular Microscope with Camera and Standard Accessories	2 sets	1	1		1 Good	Indispensable for examination of specimens, etc. Though about two units are required, one unit is already available and hence only one additional unit shall be provided.	○	Two units, one for rocks/minerals and one for fossils, are necessary. Since one unit is already available, only one additional unit shall be provided.	1	1		1 unit
5. Dry Cabinets	6 units	4	2		-	Very useful for storing cameras, microscopes, etc.	○	One unit is necessary for storing microscope attachments, etc.	1	5		1 unit
6. SEM Set with Air-conditioner	1 set		※3		-	Useful for preparing exhibition documents	Costs of operation and maintenance are considerably high.				1	Deleted
7. Computer Systems for Research	2 sets	2			-	Indispensable for examination and analysis of specimens, etc.	○	One unit each for petrological research and paleontologic research	2			2 sets
8. Vernier Calipers	2 sets	2			-	Indispensable for measurement of unearthed objects	○	One set each for petrological research and paleontologic research.	2			2 sets

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty/Condition	Necessity	Validity	Review of Quantity	Priority (in Japan)			Planned Quantity
		A	B	C					A	B	C	
9. Large Measurement Anthropology Set	1 set	1			.	Necessary for measurement of human bones, etc.	supplied from another source in future	.	1			Deleted
10. Tyler Standard Sieves with Shaker	2 sets	2			.	Very useful for investigation of ancient geological environment	○	One dry process and one wet process	2			2 units
11. Photo Processing Equipment	1 set	1			.	Indispensable for economically developing and printing films recording geological surveys, excavation scenes, etc.	○	One set is necessary.	1			1 set
12. Field Cars (4WD)	2 units	1			.	Indispensable for carrying personnel and equipment for geological survey, excavation, visiting class, etc.	1 unit instead of 2 units considering operating costs	At least one unit is necessary for common use by the petrological study team, paleontological study team, etc.	1		1	1 unit
13. Global Positioning Systems (GPS)	2 sets	2			.	Indispensable for positioning during geological survey and excavation	○	At least one unit is necessary for common use by the petrological study team and paleontological study team.	1		1	1 unit
14. Altimeters	2 sets	2			.	Indispensable for positioning during geological survey and excavation	○	Same as above	1		1	1 unit
15. Electronic Distance Measurement Equipment	2 sets	2			.	Indispensable for positioning during geological survey and excavation.	○	Same as above	1		1	1 unit
16. Video Cameras	2 sets	2			.	Indispensable for recording conditions of geologic survey and excavation	○	Same as above	1		1	1 unit

Name of Equipment	Quantity Required	Priority (in Site)			Existing Equipment Qty	Necessity	Validity	Review of Quantity	Priority (in Japan)			Planned Quantity
		A	B	C					A	B	C	
17. Cameras	2 sets	2				Indispensable for recording conditions of geologic survey and excavation	○	One 35mm camera and one macro-picture camera	2			2 units
18. Digital Cameras	2 sets	1	1			Useful for recording conditions of geologic survey and excavation. Indispensable when visual data is to be processed by a computer	○	Two units are necessary, one for the petrological study team and one for the paleontological study team. However, since the digital camera for collection and control of specimens can be used as necessary, only one unit shall be provided.	1		1	1 unit
19. Mirror Stereoscopes	2 sets	1	1			Indispensable for obtaining stereoscopic views of aerial photographs	○	It is desirable that the petrological study team and paleontological study team each have one unit. However, since they are not used very frequently, only one unit shall be provided.	1		1	1 unit

※1: There exist 158 showcases (94 sets in exhibition rooms, 15 sets in hall, 6 sets in lecture room, 39 set in storage rooms, 4 sets in corridors), 121 graphic panels (105 pieces in exhibition rooms, 16 pieces in hall), 10 models (in exhibition rooms), and several display stages. The showcases are suitable for academic and research purposes, but not for educational purposes.

※2: There exist 42 large wooden storage racks, 8 small wooden storage racks, and 202 steel storage racks. These racks and the 39 showcases in storage rooms, shown above, are used for storage. They are obsolescent.

※3: With respect to the SEM set, the Indonesian side maintains that it should be given high priority and that they should be able to secure sufficient budget for its operation and maintenance. The Japanese side, however, is opposed to giving higher priority to the SEM set.

• Figures in the priority columns indicate quantities of items for appropriate priority levels A, B, and C.

• Circles (○) in the same columns indicate items whose quantity could not be decided at that time.

• Circles (○) in the validity column indicate items which were judged valid.

2-3 Basic Design

2-3-1 Design Concept

In order to improve the condition of storage and control of geological specimens and the place of geological education for schoolchildren and junior and senior high school students in Indonesia, the Project is designed to provide the Geological Museum with equipment for exhibition, storage, education, etc., thereby helping the country to successfully carry out its museum renovation plan and offering better equipment for storage and control of geological specimens for the museum and a better place of education in geology for the general public, mostly for schoolchildren and students. In preparing a list of equipment planned to be supplied, the four types of equipment (for exhibition, collection and storage system, education, and research) on the list of equipment requested from Indonesian side were re-classified into five types – for exhibition, storage system, education, collection and preparation, and research – according to the place where they are used. Namely, the equipment for collection and storage system was divided into equipment for storage system and equipment for collection and preparation, and the equipment for geological surveys, originally included in the equipment for research, was put in the category of equipment for collection and preparation.

In view of the fact that 80% to 90% of the visitors, which are more than 100,000 persons a year, are schoolchildren and junior and senior high school students from all over the country, the equipment for exhibition shall be so designed as to enhance the functions of the museum as a place of education and enlightenment in natural science for schoolchildren and students. In addition, consideration shall be given to the fact that the exhibition rooms are a part of the storage space for specimens.

The exhibition space shall be divided into four zones for exhibition of the outline of general geology of Indonesia, geology of Indonesia, evolution of life, and applied

geology, respectively. For the general geology of Indonesia, the entrance hall shall be used. Large-screen video equipment shall be installed there to provide the visitors with basic knowledge required for appreciating the exhibits and introduce to them the geological features of various parts of the country. This exhibition in the entrance hall also serves as the introduction to the exhibition of geology of Indonesia. For the exhibition of geology of Indonesia, the three rooms that are now used for the purpose shall be allocated. Here, the origin of the earth, geological features of various parts of Indonesia, disasters caused by natural forces, etc. shall be exhibited. For the exhibition of evolution of life, the room that is now used for the purpose shall be mainly used. In addition, the adjoining office room, toilet room, lecture room, elevator, and passageway shall be renovated for that purpose by the Indonesian side. Here, fossils, etc. shall be exhibited arranged in order of geological chronology. In particular, representative species shall be exhibited in such a way that the process of their evolution through geological ages can be seen. For the exhibition of applied geology, the seven rooms exhibition hall and the passageway on the second floor shall be used to exhibit minerals and metals for industrial use, matters relating to energy, geological survey, etc. Outdoor exhibition is left out of the scope of the Project.

Since the Geological Museum has a great number of specimens, the contents of exhibition shall be based on a scenario of exhibition decided by the Indonesian side. Namely, the Indonesian side shall exhibit mainly the existing specimens and decide the layout, etc. of the exhibits. The Japanese side shall, as a rule, prepare showcases, exhibition stages, fixtures, lighting instruments, panels for basic explanation of exhibits, etc. With respect to the five models for exhibition and one frame (skeletal) replica of a dinosaur, they are included in the scope of the Project, since they are an important part of the exhibition plan but can hardly be prepared by the Indonesian side. As far as possible, the dimensions of the showcases, graphic panels, etc. shall be standardized to cut the costs of design and fabrication and facilitate the contents of exhibition to be changed. In particular, the showcases shall be designed with due consideration given to their safety, function, and durability since they are used to store and exhibit specimens

at the museum.

The equipment for storage system shall be so designed as to permit the existing specimens (350,000 rocks and 130,000 fossils) to be stored efficiently in the existing storage rooms. In addition, consideration shall be given to enhancing the storage functions.

Plain-wood boxes are the most suitable to store specimens. However, in view of the need to reduce the weight of containers (the storage floor is not very strong) and the ease of handling, replacement, etc. on the Indonesian side, it was decided to employ plastic containers and steel racks. In the three storage rooms on the first floor, fixed racks are planned to be installed and a mezzanine is planned for two of those rooms. In order to reduce the weight of the mezzanine itself, fossil specimens which are relatively light in weight shall be stored on the mezzanine, and rock specimens shall be stored under the mezzanine. In the three storage rooms on the basement, rock specimens shall be stored since the floor strength is sufficient, in addition, movable racks shall be mainly used to increase storage efficiency. With respect to prototype fossils (about 600 pieces) which are especially important among the existing specimens, those which can be housed in boxes several centimeter cube shall be stored in fireproof cabinets. For this purpose, two fireproof cabinets are planned.

The three storage rooms on the first floor and the three ones on the basement shall be provided with fireproof walls and doors for protection of the articles stored therein. In addition, the three storage rooms on the first floor shall be provided with a fireproof ceiling since the roof of the museum is made of wood. The fireproof ceiling shall be capable of standing the heat of a fire for about two hours. Furthermore, all the six storage rooms shall be equipped with a dust remover since a considerable amount of dust is contained in the air in Bandung. Also, dehumidifiers shall also be installed in the three storage rooms on the first floor since humidity is so much fluctuated in Bandung.

With respect to the equipment for education, considering 200 persons of capacity of Auditorium-1 in accordance with approximate number of one group of school children and students on educational field trips to the Geological Museum, necessary equipment shall be designed for acting education plans using audio-visual aids. In addition, uses for supporting exhibition, i.e. preparation of graphics for exhibition, editing video tapes for audiovisual system in entrance hall, printing pamphlets of the Geological Museum, etc., shall be considered.

The equipment for collection and preparation and the equipment for research shall be included in the scope of the Project since those activities are indispensable for maintaining the functions of the museum and the improvement in technical level at the museum contributes to the improvement in levels of education. In this context, equipment which is absolutely needed for those activities shall be designed. With respect to highly specialized research equipment, however, it shall be borrowed from GRDC and excluded from the scope of the Project.

The levels and specifications of the planned equipment shall be designed in line with the following policy.

- 1) Select equipment which is most suitable for exhibition, storage, education, specimen collection and preparation, and research in light of the roles and functions of the Geological Museum.
- 2) Design equipment which can be operated, maintained, and controlled with reasonable levels of skill, time, and cost.
- 3) Local products and local procurement shall be considered positively, and adopt them as long as required quality is guaranteed in order to save costs. For showcases, design the equipment provided that those have necessary performance (preservation etc. of specimen) and regarding delivery period and uniform quality as important.
- 4) Design equipment which allows for ready procurement of parts and easy repair in Indonesia.

5) Design equipment which conforms to the applicable laws, regulations, and standards of Indonesia.

2-3-2 Basic Design

(1) General plan

With the exception of vehicles and portable devices, all the equipment supplied in the Project shall be installed in the building of the Geological Museum. Therefore, it is necessary that the repairs of the building and the relocation of existing equipment, specimens etc. based on the museum renovation plan of the Indonesian side be completed before the planned equipment is carried in.

(2) Equipment plan

The planned equipment is shown in Table 2.3.1. The electrical and electronic devices which require maintenance, repair, and spare parts supply by their manufacturers shall be those of manufacturers which have their branch, office, or agency providing maintenance and repair services in Indonesia. For those items which are manufactured by only one or two companies in Japan, products of third parties too shall be considered in order to assure fair price competition. Computers which require routine maintenance and inspection by their makers shall be procured locally. In Bandung, electrical power fails for 30 minutes - 2 hours a time, 2 - 4 times a year, and some UPS are included in the planned equipment which are necessary for the computers. The quantity, specifications/contents, and use of the major planned equipment are shown in Table 2.3.2.

(3) Exhibition plan

Based on the concept of the master plan, an exhibition plan shall be formulated and the present mode of exhibition shall be totally changed. Though the new form of exhibition shall focus on junior and senior high school students, the contents of

exhibition shall be decided giving due consideration to the fact that the Geological Museum having a great number of specimens is utilized by many geologists as well. In particular, emphasis shall be placed on giving proper instructive materials and explanations to junior and senior high school students and allowing geologists access to all the specimens. The exhibits shall be arranged effectively, with some suitable themes attached to them. The equipment for exhibition shall be easy to maintain. As far as possible, using electrical gadgets should be avoided.

(4) Storage plan

With the number of existing specimens (350,000 rocks, 130,000 fossils) as the basic factor, an efficient form of storage shall be planned. With respect to the storage room on the ground floor, in particular, installing mezzanines there is planned to increase the storage capacity. This requires a careful examination of the structure of the storage room and due consideration should be given to the safety of the plan. According to the result of structural calculation, floor strength and girder strength are 300kg/m^2 and 240kg/m^2 respectively, and the capable live load is 250kg/m^2 . It means that the present load is almost the limit and the mezzanines cause overloads. Therefore, the mezzanines and racks in the storage rooms shall be designed as light as possible in order to reduce the load applied to the floor, and for that purpose, racks on the mezzanines shall be only for fossils which are lighter than rocks, furthermore, Indonesian side shall make reinforcement columns at crossings of girders and beams under the storage rooms (Columns of the mezzanines shall be located just above the reinforcement columns). The Indonesian side shall manage the future increase in number of specimens (40,000 rocks and 20,000 fossils), and equipment for that purpose is not included in the scope of the Project.

Table 2.3.1 Planned Equipment

Equipment	Quantity	Remarks	Original Number
1. Equipment for Exhibition			
A. General Geology of Indonesia			
Audio-visual System	1 set		I - A
Display Panel	1 set		I - A
Graphic Panel	1 set	Map of Indonesia	I - A
Sign Panel	2 sets	Information of Museum	I - A
Lighting Fixture	7 sets		I - A
B. Origin of the Earth			
Display Panel	4 sets		I - B
Showcase	3 sets		I - B
Graphic Panel	7 sets		I - B
Display Stage	2 sets		I - B
Sign Panel	1 set		I - B
Lighting Fixture	10 sets		I - B
C. Geology of Indonesia			
Display Panel	49 sets		I - C
Showcase	34 sets		I - C
Graphic Panel	84 sets		I - C
Display Stage	10 sets	including stages for models	I - C
Model	4 sets	plate tectonics, globe, structure of volcano, volcanoes	I - C
Sign Panel	11 sets		I - C
Lighting Fixture	128 sets		I - C
D. Evolution of Life			
Display Panel	43 sets		I - D
Showcase	70 sets		I - D
Graphic Panel	52 sets	including 4 wall pictures	I - D
Display Stage	7 sets		I - D
Dinosaur Frame Replica	1 set		I - D
Model	1 set	slice of strata	I - D
Sign Panel	12 sets		I - D
Lighting Fixture	163 sets		I - D
E. Applied Geology			
Display Panel	10 sets		I - E
Showcase	25 sets		I - E
Graphic Panel	39 sets		I - E
Display Stage	3 sets		I - E
Sign Panel	11 sets		I - E
Lighting Fixture	72 sets		I - E
F. Other Equipment for Exhibition			
1. Polarization Microscope with Monitor	1 set		I - F - 1
2. Public Announcement System	1 set		I - F - 2
3. Hydraulic Ladder	1 unit		I - F - 3
4. Video Monitor Set	2 sets		I - F - 4
2. Equipment for Storage System			
1. Rack (for rock)	763 sets		II - 9
2. Rack (for fossil)	366 sets		II - 9
3. Moving Rack (single)	6 sets		II - 9
4. Moving Rack (double)	24 sets		II - 9
5. Thin Section Cupboard	1 set		II - 10
6. Fireproof Cabinet	2 units	width 110cm x depth 80cm x height 180cm (approx.)	II - 11
7. Plastic Container (for rock)	12,012 units		II - 12
8. Plastic Container (for fossil)	6,222 units		II - 12
9. Air/Dust Filter	6 rooms		II - 14

Equipment	Quantity	Remarks	Original Number
10. Humidity Control Machine	3 rooms		II - 15
11. Fireproof Panel	6 rooms		II - 13
12. Security Door System	6 rooms		II - 17
13. Mezzanine	2 rooms		II - 18
3. Equipment for Education			
1. Computer System for Preparation of Exhibition and Education	1 set		III - 1
2. Audio Visual System	1 set		III - 2
3. Light Printing Machine	1 set		III - 3
4. Chair with Desk	200 sets	folding chair with a side desk	III - 5
5. Dry Cabinet	1 set	with an electric dehumidifier	III - 6
6. Air-conditioner	6 sets	professional type	III - 7
4. Equipment for Collection and Preparation			
1. Lift	1 set	capacity 500kg, height 3m, stage approx. 1m x 1m	II - 1 - 2
2. Forklift	1 unit	capacity 500kg, battery operation, remote control	II - 1 - 3
3. Push Cart	4 units	capacity approx. 100kg	II - 1 - 4
4. Push Cart (with fork)	1 unit	capacity approx. 1.5ton, length approx. 1.5m	II - 1 - 4
5. Rock Cutter (large)	1 unit	approx. 0.75kW, with diamond blades	II - 2
6. Rock Cutter (small)	1 unit	approx. 0.2kW, with diamond blades	II - 2
7. Micro-cutter	1 unit	approx. 25W, with diamond blades	II - 2
8. Resin Impregnator	1 unit	heating, decompression or pressurization type	II - 2
9. Rock Polishing Machine (rough)	1 unit	approx. 0.4kW	II - 2
10. Rock Polishing Machine (finish)	1 unit	approx. 0.4kW	II - 2
11. Rock Polishing Machine (mirror surface)	1 unit	approx. 50W	II - 2
12. Finishing Plate	4 pcs	glass plate	II - 2
13. Vacuum Cleaner	1 unit	with 2 small boxes for working	II - 2
14. Air Blaster	1 set	compressor (approx. 0.75kW) and nozzles	II - 2
15. Ultrasonic Cleaning Machine	1 set	for approx. 5L	II - 2
16. Weighing Machine (large)	2 units	extra large (up to 150kg, graduation 0.02kg), large (up to 10kg, graduation 1g) each 1set	II - 2
17. Weighing Machine (medium)	2 units	up to approx. 6kg, graduation 0.1g	II - 2
18. Weighing Machine (small)	1 unit	up to approx. 200g, graduation 0.1mg	II - 2
19. Oven	1 unit	approx. 70L	II - 2
20. Ore Illuminated Microscope	1 set	with accessories	II - 3
21. Illuminated Binocular Microscope with Camera	1 set	with accessories	II - 3
22. Binocular Microscope	1 set	with accessories	II - 3
23. Ultraviolet Coating Films	100 m ²		II - 16
24. Digital Camera	3 sets	2 sets for specimen in museum, 1 set for geological survey	II - 4 and IV - 18
25. Camera with Stand (35mm)	2 sets	1 set for specimen in museum, 1 set for geological survey	II - 5 and IV - 17
26. Camera with Stand (brownie)	1 set	tripod with light box	II - 5
27. Camera with Stand (35mm macro)	1 set	for close-up photographs	IV - 17
28. Photo Processing Equipment	1 set	refrigerator, filter, exposure tank, expansion light	IV - 11
29. Dry Cabinet	4 units	with an electric dehumidifier	II - 6

Equipment	Quantity	Remarks	Original Number
30. Soft X-ray Machine	1 unit		II - 7
31. Computer System for Data Processing	1 set		II - 8
32. Tyler Standard Sieves with Shaker	2 sets	wet and dry process, 1 each	IV - 10
33. Field Car (4WD)	1 unit		IV - 12
34. Global Positioning System (GPS)	1 set	portable	IV - 13
35. Altimeter	1 set	portable	IV - 14
36. Electronic Distance Measurement Equipment	1 set	laser	IV - 15
37. Video Camera	1 set	1/2 inch tape format	IV - 16
38. Mirror Stereoscope	1 set	for 2 persons	IV - 19
5. Equipment for Research			
1. Polarization Microscope with Camera	1 set	with accessories	IV - 1
2. Ore Illuminated Microscope with Camera	1 set	with accessories	IV - 2
3. Binocular Microscope with Camera	1 set	with accessories	IV - 3
4. Illuminated Binocular Microscope with Camera	1 set	with accessories	IV - 4
5. Dry Cabinet	1 set	with an electric dehumidifier	IV - 5
6. Computer System for Research	2 sets		IV - 7
7. Vernier Calipers	2 sets	range approx. 0-150mm, graduation 0.05mm	IV - 8

Table 2.3.2 Quantity, specifications/contents, and use of main planned equipment

Equipment name	Quantity	Specifications/contents	Use
1. Equipment for Exhibition			
Audio-visual System	1 set	Multi-cube (50-inch monitor 3 x 3), LD player, acoustic equipment, etc. Site work: Assembly of mounting, installation of multi-cube, wiring, etc.	For explanation of general geology of Indonesia to visitors in entrance hall
Display Panel	107 units	Framework: Steel Inside panel: Wood Width: 1.0 to 5.3m, Height: 2.5 to 4m Site work: Assembly and arrangement	For installing graphic panels, background paintings, etc.
Showcase	132 units	Width: 75 to 400cm, Depth: 50 to 120cm, Height: 75 to 270 cm Site work: Assembly and arrangement	For displaying specimens
Graphic Panel	183 units	Width: 0.5 to 9m, Height: 0.3 to 2.5m, Thickness: 25 mm Site work: Installation	For displaying charts, etc.
Display Stage	22 units	Width: 0.75 to 7.5m, Depth: 0.75 to 2m, Height: 15 to 45 cm Site work: Assembly	For displaying models, etc.
Dinosaur Frame Replica	1 units	Whole body, length: approx. 14m Site work: Assembly and adjustment	For making visitors realize how big dinosaurs of the Cretaceous period were. And they can learn dinosaur bones.
Model	5 units	Continental drift model, globe (semispherical) model, volcano cross-section model, and volcano topographic model, slice of strata	For explaining to visitors Indonesia's geologic structure, topography, volcanoes, etc. by 3D models
Lighting Fixture	380 units	Halogen lamps, frames, etc. Site work: Installation and wiring	For lighting specimens
Polarization Microscope with Monitor	1 units	Magnification: Approx. 40 to 1,000 Attachments: Polarizer, various stages, halogen lamp, and monitor (about 20 inches)	For showing very small specimens
Public Announcement System	1 set	Speakers, amplifier Site work: Installation of speakers, wiring	For guiding school children and students
Hydraulic Lift	1 units	About 4 m in height; with battery charger	For maintenance of exhibits, lighting fixtures, etc.
Video Monitor Set	2 sets	17- to 19-inch monitor x 4 21-inch monitor x 1 Site work: Installation of devices	For explaining specimens, models etc. to visitors
2. Equipment for Storage System			
Rack (for rocks)	768 units	11-tier steel rack measuring approx. 50 cm (W) x 63 cm (D) x 220 cm (H) Site work: Assembly and arrangement	For storing rock specimens

Equipment name	Quantity	Specifications/contents	Use
Rack (for fossils)	366 units	17-tier steel rack, measuring approx. 50 cm (W) x 63 cm (D) x 240 cm (H) Site work: Assembly and arrangement	For storing fossil specimens
Moving Rack (single)	6 sets	Steel rack, measuring approx. 3.2 m (W) x 1.26 m (D) x 2.4 m (H) Site work: Assembly and arrangement	For storing rock specimens
Moving Rack (double)	24 sets	Steel rack, measuring approx. 3.2 m (W) x 0.63 m (D) x 2.4 m (H) Site work: Assembly and arrangement	For storing rock specimens
Thin Section Cupboard	1 set	170 slide cabinets, racks, etc., each measuring approx. 410 mm(W) x 275 mm(D) x 235 mm(H) Site work: Assembly and arrangement	For storing specimens on slide glass
Plastic Container	18,234 units	Plastic Approx. 43 cm (W) x 60 cm (D) x 4 to 12 cm (H)	For storing rock and fossil specimens
Air/Dust Filter	For 6 rooms	Air filters for removing sand and dust Site work: Installation	For conserving storage environment
Humidity Control Machine	For 3 rooms	160kg/day, ducts, humidity sensors Site work: Installation of dehumidifiers and ducts	For conserving storage environment
Fireproof Panel	For 6 rooms	Flameproof boards, lighting fixtures Site work: Installation	For preventing storage system from fires
Security Door System	For 6 rooms	Flameproof doors and security devices Site work: Installation	For preventing storage system from fires and burglars
Mezzanine	For 2 rooms	Punched steel deck Site work: Assembly and installation	For storing fossil specimens
3. Equipment for Education			
Computer System for Preparation of Exhibition and Education	1 set	2 desk-top computers, 1 notebook-type computer, 1 A3 scanner, 1 A0 plotter, 1 printer, etc.	For preparing exhibits, explanatory materials for exhibits, museum brochures, materials for visiting classes, etc.
Audio Visual System	1 set	300-inch screen, 200-inch projector, video deck, LD player, amplifier, microphones, speakers, slide projector, editing system (3 video decks, 1 switcher, 4 monitors, 1 mixer, microphones etc.) Site work: Installation and wiring	For lecture in Auditorium-1, and editing video tapes
Light Printing Machine	1 unit	Digital color printer Paper size: A6 - A3 Printing speed: 60 to 120 sheets/min.	For printing museum guides, lecture materials, etc.

Equipment name	Quantity	Specifications/contents	Use
4. Equipment for Collection and Preparation			
Lift	1 set	Capacity 500kg Site work: Installation	For transportation of rocks, fossils etc. in Geological Museum (between the basement and 1st floor)
Rock and Fossil Specimen Preparation Equipment	1 set	Rock cutters (1 large, 1 small, and 1 microcutter), resin impregnator, rock polishing machines (one each of rough, finish, and mirror surface polisher, and 4 finishing plates), vacuum cleaner, air blaster (compressor and nozzles), ultrasonic cleaner, weighing machines (2 large size, 2 medium size, 1 small size), oven Site work: Installation of vacuum cleaner and air blaster	For preparing rock and fossil specimens
Ore Illuminated Microscope	1 unit	Magnification: Approx. 40x to 1,000x Microscope with polarizer, various stages, halogen lamp, and universal illuminator	For selecting and identifying specimens
Illuminated Binocular Microscope with Camera	1 unit	Magnification: Approx. 450x max. Microscope with stand for diascopic illuminator (halogen lamp) and camera	For selecting and identifying specimens
Illuminated Binocular Microscope	1 unit	Magnification: Approx. 450x max. Microscope with stand for diascopic illuminator (halogen lamp)	For selecting and identifying specimens
Ultraviolet Coating Film	100 m ²	UV cutting glass (film sandwiched between 4 mm thick glass plates) Site work: Installation	For conserving environment of place of specimen preparation
Soft X-ray Machine	1 unit	Output approx. 125 kVp; with 12-inch monitor	For confirming fossils in rocks
Computer System for Data Processing	1 set	4 clients, server (approx. 10 GB memory), 1 printer, LAN cable, hubs, etc. Site work: Installation of LAN	For recording specimens, etc.
Field Car (4WD)	1 unit	4WD, 6-7 persons capacity	For transportation of personnel and equipment for geologic survey, excavation, field education etc.
Video Camera	1 unit	1/2-inch tape format and PAL, with tripped	For recording conditions of geologic survey, excavation, etc.
5. Equipment for Research			
Polarization Microscope with Camera	1 unit	Magnification: Approx. 40x to 1,000x Microscope with polarizer, various stages, halogen lamp, and camera	For examining specimens, etc.

Equipment name	Quantity	Specifications/contents	Use
Ore Illuminated Microscope with Camera	1 unit	Magnification: Approx. 40x to 1,000x Microscope with polarizer, various stages, halogen lamp, camera, and universal illuminator	For examining specimens, etc.
Binocular Microscope with Camera	1 unit	Magnification: Approx. 1,500x max. Microscope with various stages, halogen lamp, and camera	For examining specimens, etc.
Illuminated Binocular Microscope with Camera	1 unit	Magnification: Approx. 450x max. Microscope with stand for diascope illuminator (halogen lamp) and camera	For examining specimens, etc.
Computer System for Research	2 sets	Desk-top type computer, color printer (1 unit for 2 sets)	For analyzing data, controlling specimens for research, etc.

(3) Major equipment layout plan

The plan for layout of the major equipment is shown in Figures 2.3.1 through 2.3.10., and other detailed drawing are attached to the report as Appendix-8.

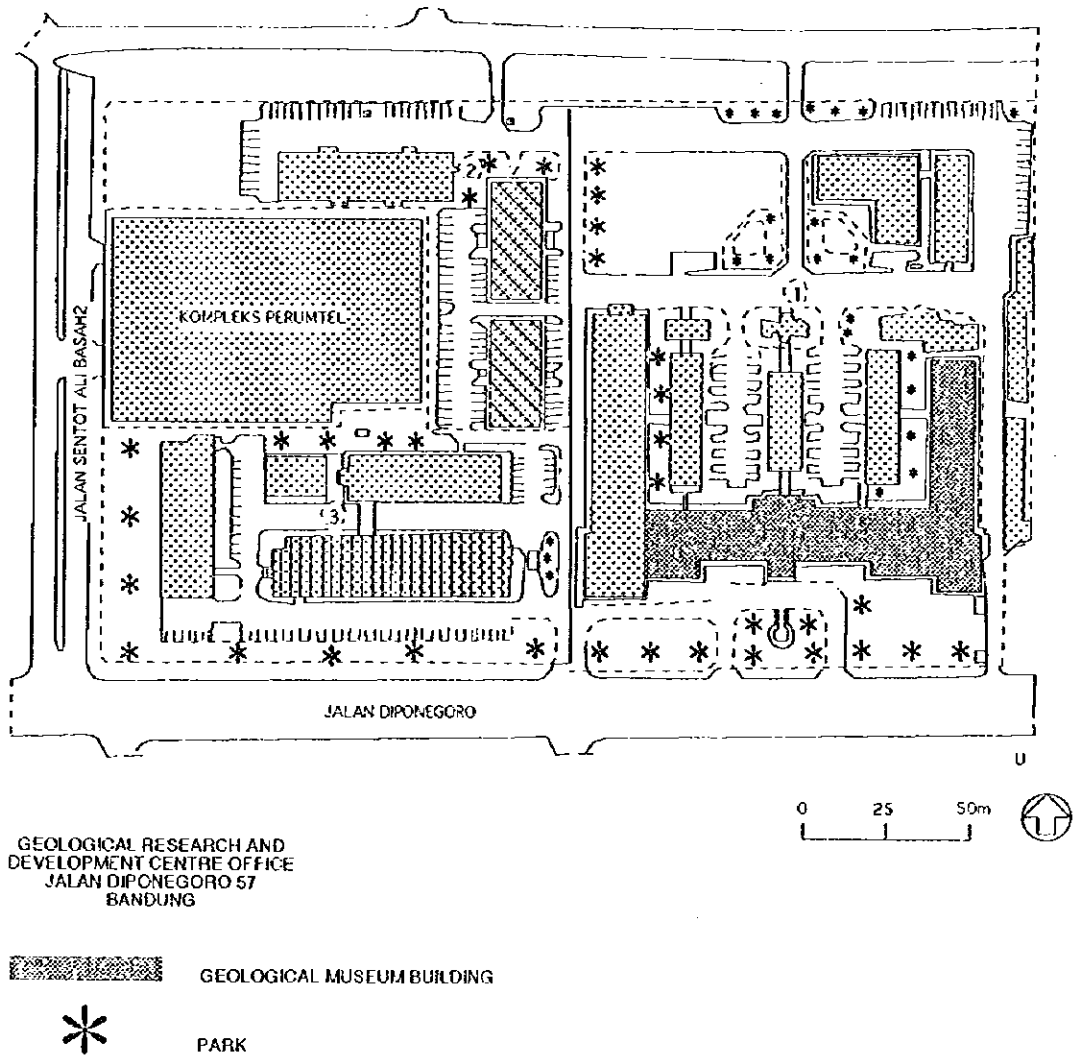
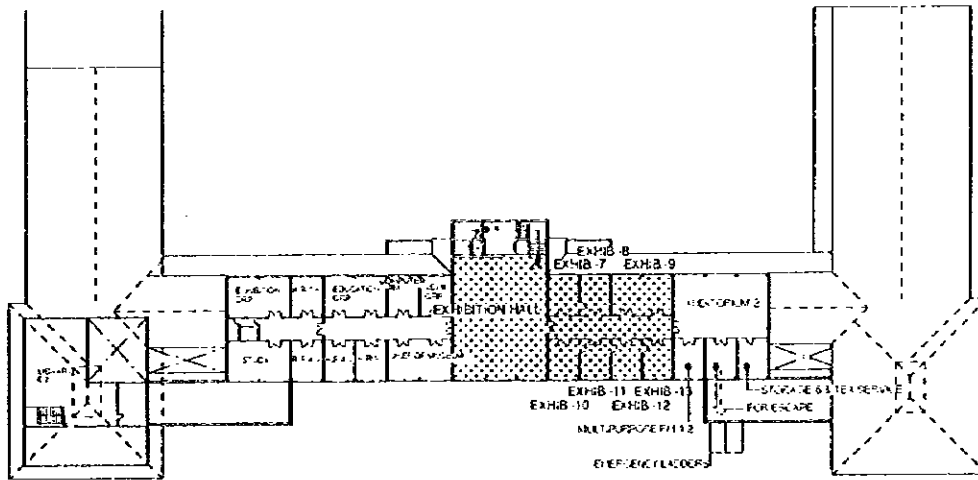
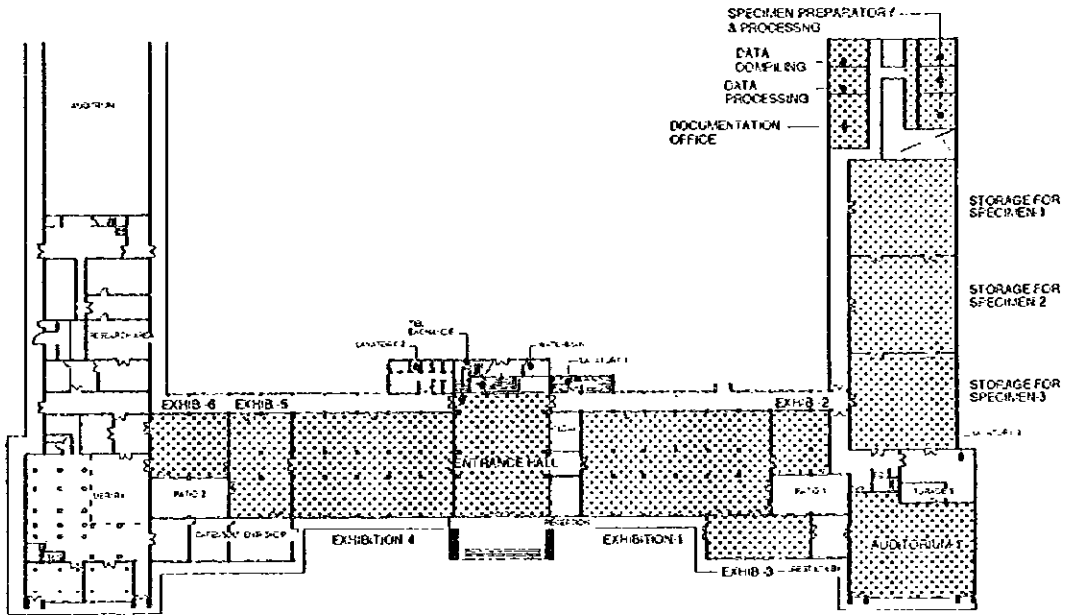


Figure 2.3.1 Buildings of GRDC

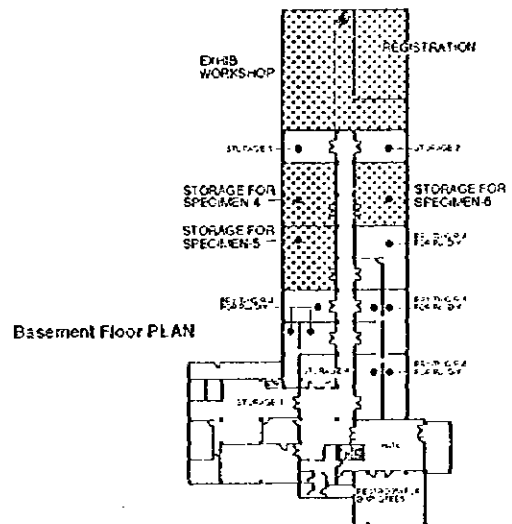


2nd Floor PLAN



1st Floor PLAN

 Equipment set up zone



Basement Floor PLAN

Figure 2.3.2 Floor Plan of Geological Museum

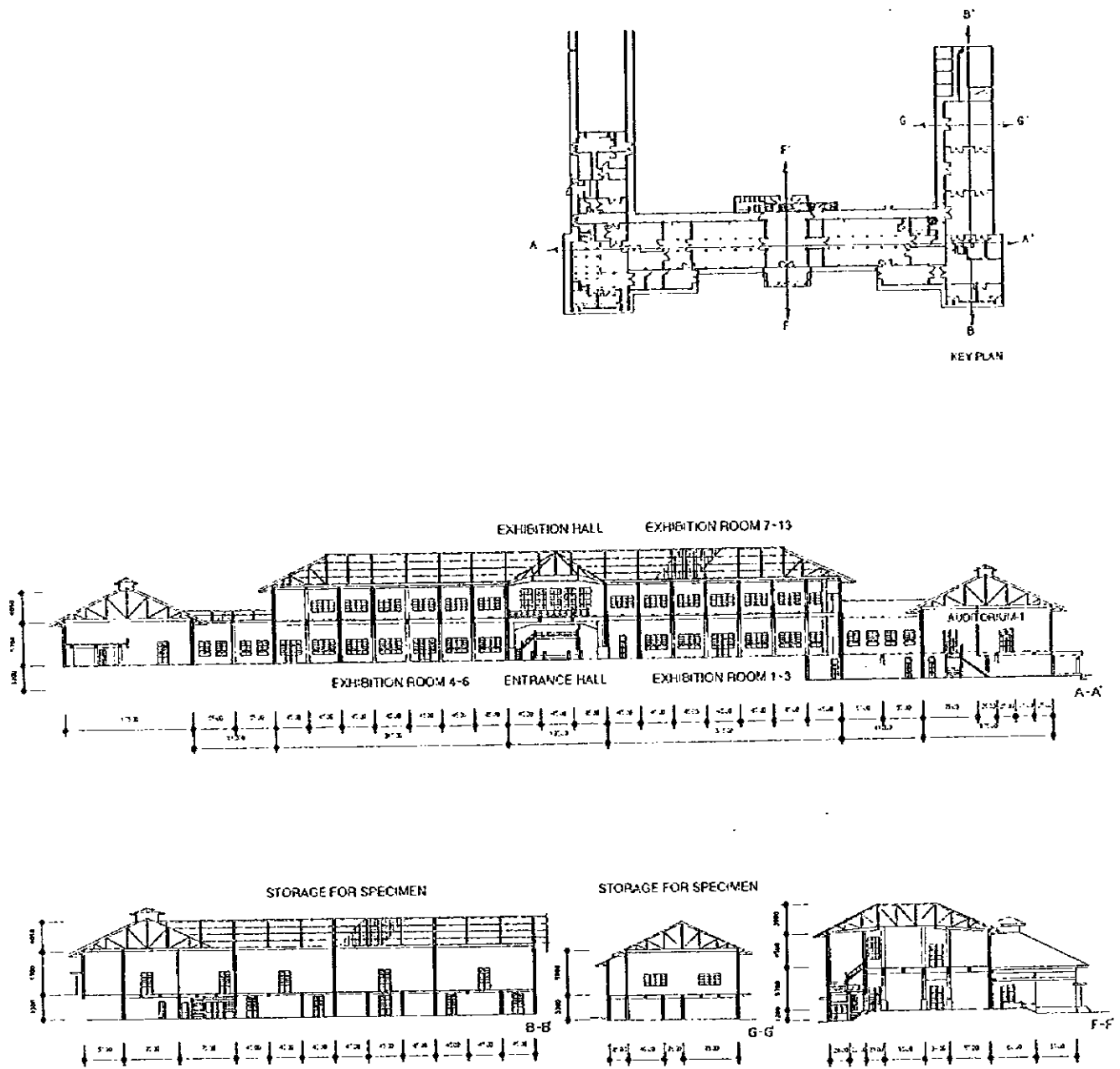


Figure 2.3.3 Longitudinal Section of Geological Museum

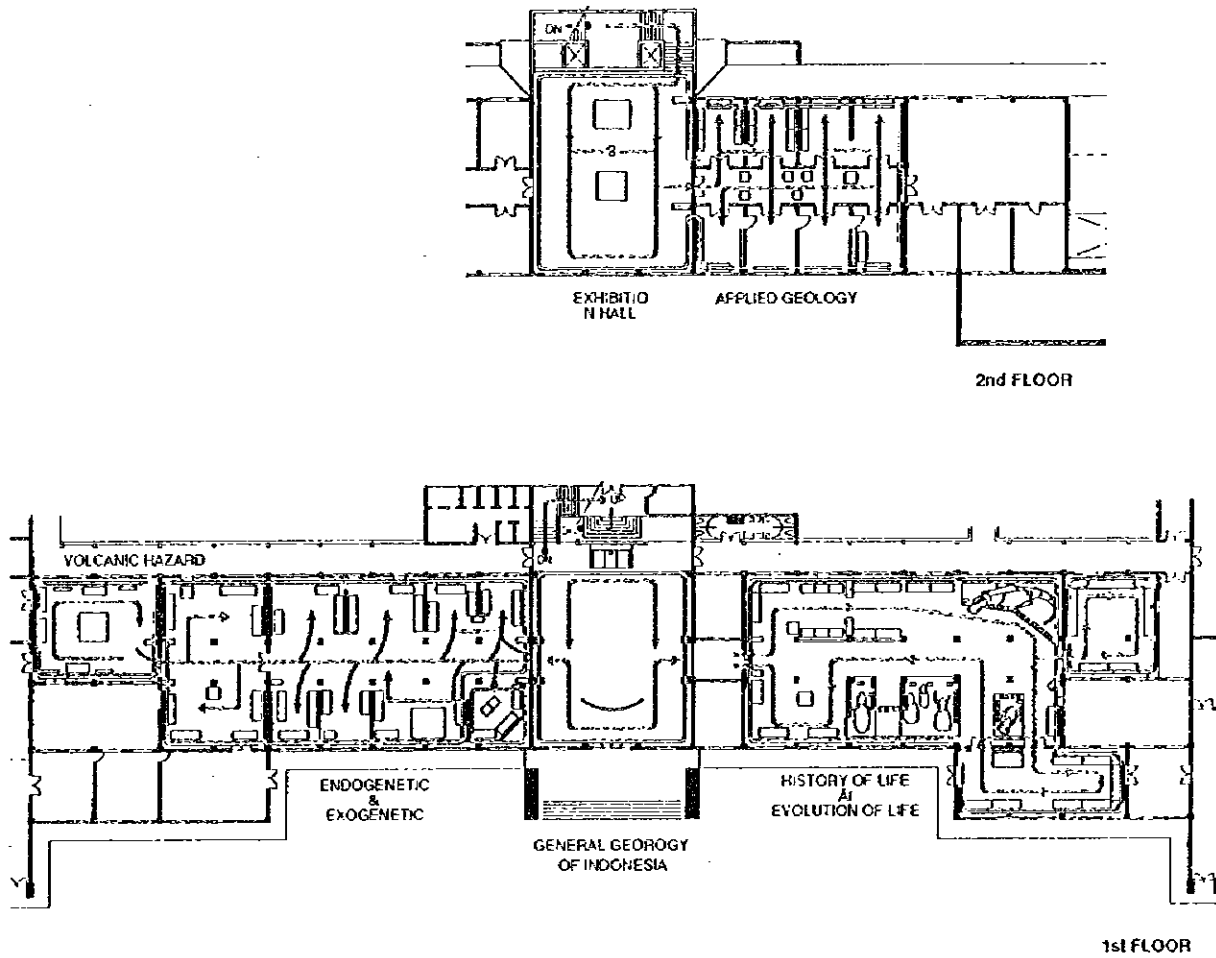


Figure 2.3.4 Exhibition Zoning and Circulation Diagram

EQUIPMENT LIST

Graphic Panel	P-4	1
	P-5	1
Sign Panel	SP-3	2
Map Panel	MP-3	1
Display Panel	WP-12	1
Audio Visual Booth		1

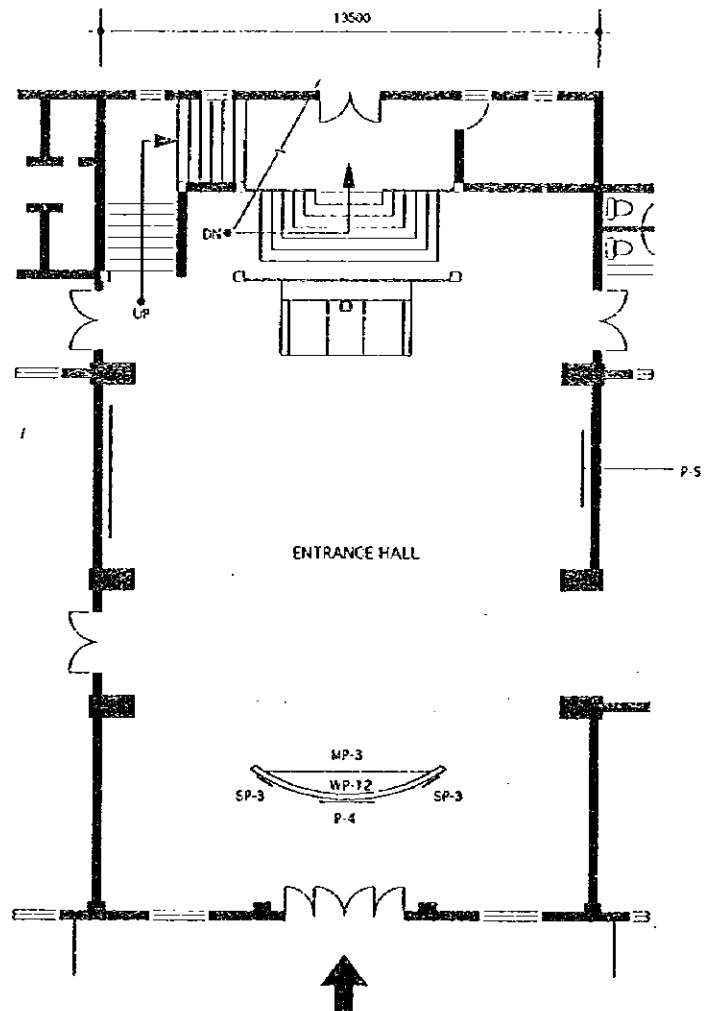


Figure 2.3.5 First Floor Entrance Hall (First Floor)

EQUIPMENT LIST

Show Case	SC-1	18
	SC-2	1
	SC-3	8
	SC-4	3
	SC-5	1
	SC-6	1
	SCM-1	1
Show Case for Map	M-1	1
	M-2	1
	M-3	1
	M-4	1
	M-5	1
Display Stage	ST-1	2
	ST-2	1
	ST-3	1
	ST-4	4
	STM-1	1
	STM-3	1
Graphic Panel	P-1	18
	P-2	27
	P-3	10
	P-4	16
	P-5	12
	MP-1	1
	MP-2	6
	MP-4	1
Sign Panel	SP-1	3
	SP-2	8
	SP-3	1
	PH-1	3
Display Panel	WP-1	9
	WP-2	9
	WP-3	7
	WP-4	4
	WP-5	16
	WP-6	1
	WP-7	1
	WP-8	5
Model	Plate tectonic model	1
	Structure of volcano model	1
	Volcano model	1

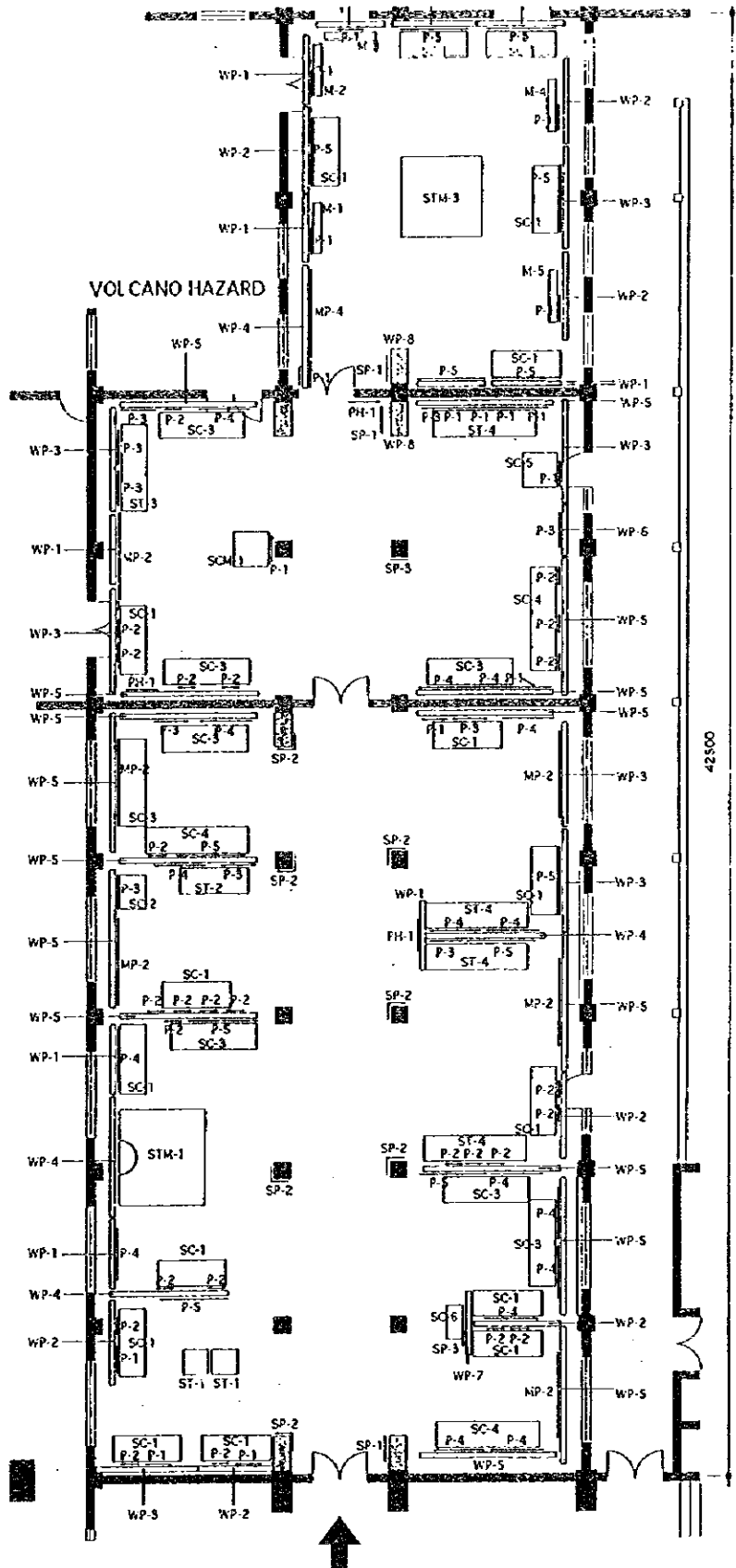


Figure 2.3.6 Exhibition – Geology of Indonesia (First Floor)

EQUIPMENT LIST

Show Case	SC-1	6
	SC-3	10
	SC-4	1
	SC-7	1
	SC-8	1
	SC-10	6
	SCW-1	3
	SCW-2	2
	SCW-3	1
	GC-1	34
	GC-2	5
Display Stage	ST-5	1
	ST-6	1
	ST-7	1
	ST-9	1
	ST-10	1
	ST-11	1
	ST-12	1
Illustration Panel	Wall Illustration-1	3
	Wall Illustration-2	1
Frame Replica	Tyrannosaurus	1
	Stuatum replica	1
Graphic Panel	P-1	6
	P-2	1
	P-3	13
	P-4	12
	P-5	3
	P-6	3
	P-7	8
Sign Panel	SP-1	6
	SP-2	3
	SP-3	3
Photo Panel	PH-1	4
Display Panel	WP-1	2
	WP-2	13
	WP-3	2
	WP-5	9
	WP-7	8
	WP-8	3
	WP-9	2
	WP-10	0
	WP-11	0
	WP-13	2
	WP-14	2

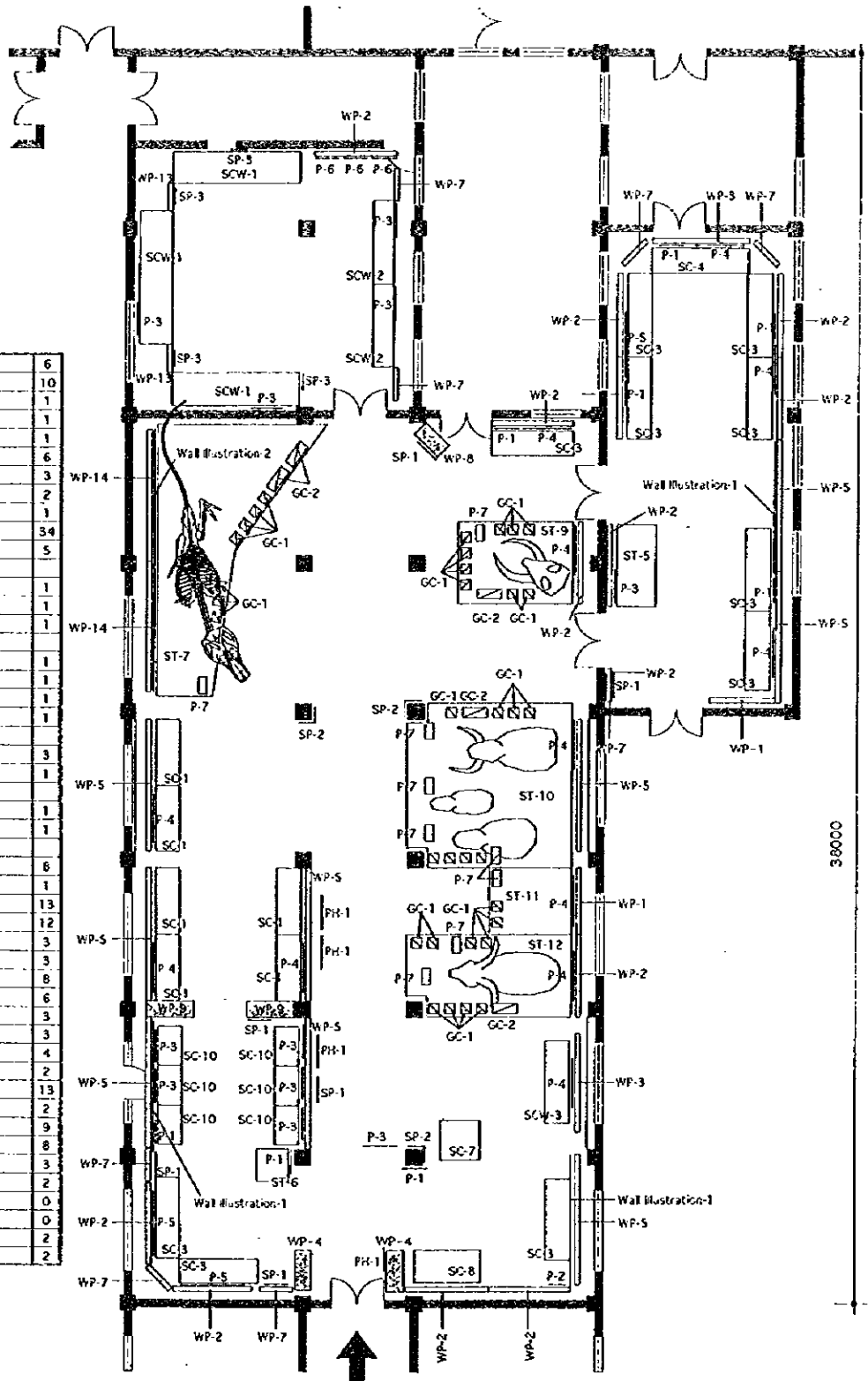


Figure 2.3.7 Exhibition – Evolution of Life (First Floor)

EQUIPMENT LIST

Show Case	SC-1	4
	SC-3	1
	SC-10	1
	SC-11	1
	SC-12	5
	SCM-1	1
	SCW-4	8
	SCW-5	4
Display Stage	ST-13	1
	STM-4	2
	STM-5	2
Graphic Panel	P-1	18
	P-2	10
	P-3	3
	P-4	2
	P-5	6
	SP-1	4
	SP-3	7
	PH-2	2
Display Panel	WP-2	4
	WP-3	1
	WP-5	1
	WP-9	4

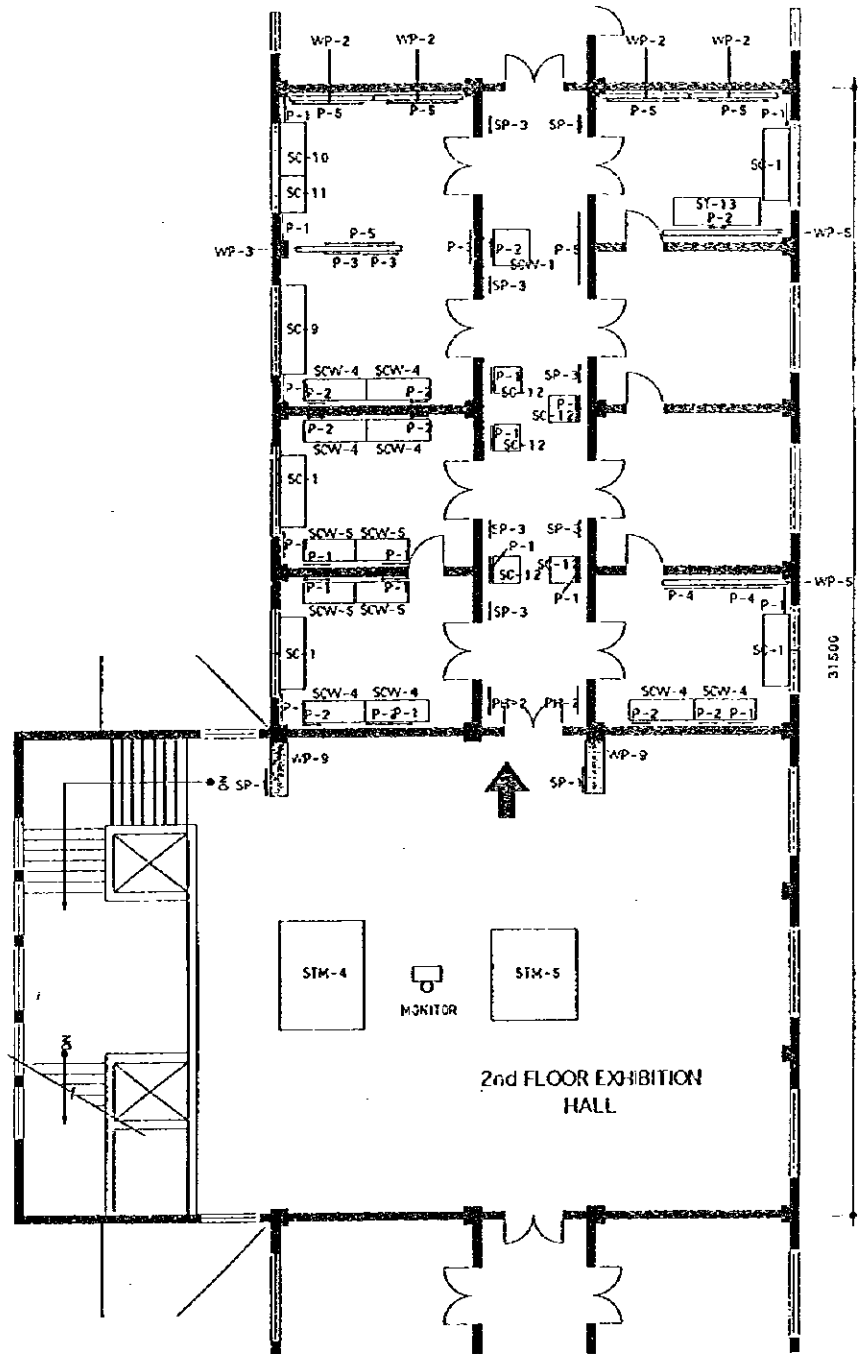


Figure 2.3.8 Exhibition – Applied Geology (Second Floor)

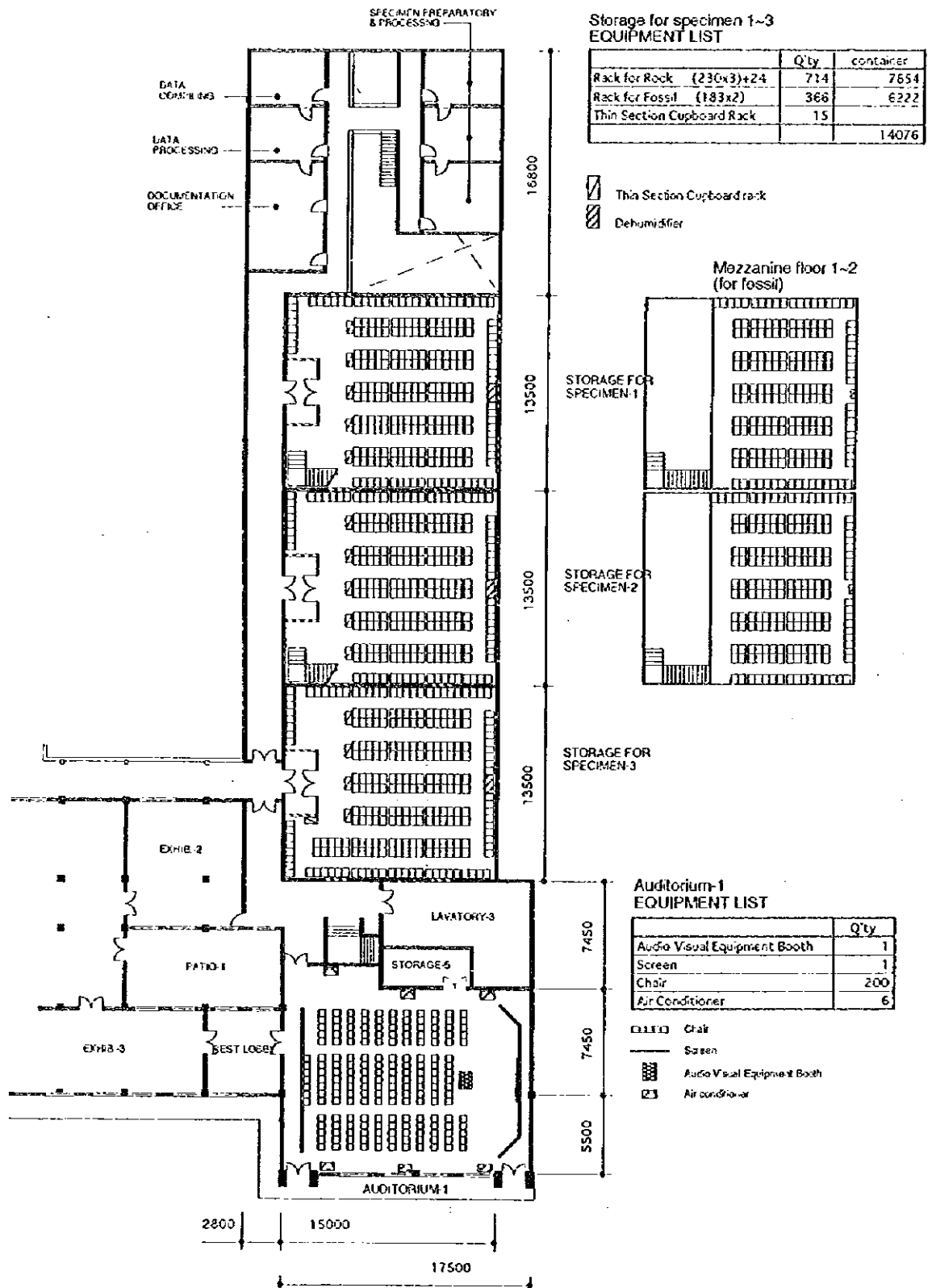


Figure 2.3.9 Storage for Specimen 1 - 3 and Auditorium-1 (First Floor)

EQUIPMENT LIST

	Rack Qty	Container
Rack for Rack (12x3)	54	594
Rack for Rack Single (2x3x6)	36	396
Rack for Rack Double Move Rack(6x3x12)	288	3168
	376	4158

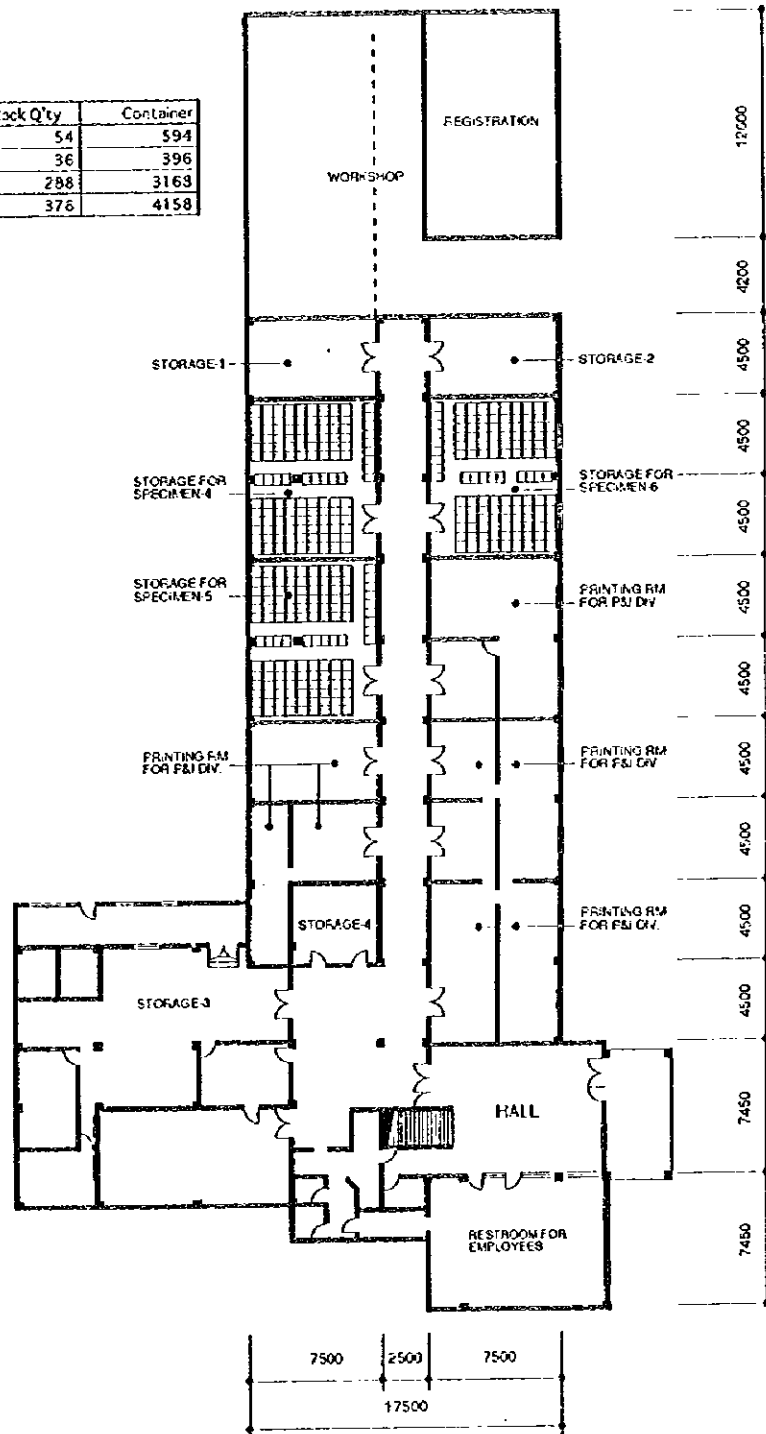


Figure 2.3.10 Storage for Specimen 4 - 6 (Basement Floor)