INDONESIA

- SEISMIC RISK MANAGEMENT IN INDONESIA

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I SCIENCE OF EARTHQUAKES

1 Earthquakes of the World

Earthquake is a natural disaster that does not occur all over the world. Some geologists believe in the Plate Tectonic Theory which explains that the world consists of several plates where every plate moves continuously (Appendix 1). Table 1 lists the world's major earthquakes in the 20th century.

TABLE 1: WORLD'S MAJOR EARTHQUAKES IN THE 20TH CENTURY

Date	Region	Deaths	Earthquake Magnitude	Remarks
1906.1.31	Ecuador, Colombia	1,000	8.2	Tsunami
1906.8.16	Valparaiso, Chile	20,000	8.2	Tsunami, damage in Hawaii
1908.12.28	Messina, Italy	110,000	7.0	
1920.12.16	Kansu, China	200,000	8.6	Great rock slide
1922.11.11	Atacama, Chile	1,000	8.3	Tsunami
1923.9.1	South Kanto, Japan	140,000	7.9	Great Tokyo fire
1933.3.3	Off Sanriku, Japan	3,000	8.1	Tsunami
1934.1.15	India, Nepal	10,000	8.3	
1944.12.7	Off Kii-hanto, Japan	1,200	7.9	Great damage in Nagoya City
1945.11.28	Off Pakistan	4,000	8.0	Tsunami
1946.12.21	Off Kii-hanto, Japan	1,300	8.1	Tsunami
1950.8.15	Assam India, China	4,000	8.6	
1960.5.22	South Chile	10,000	8.5	Great tsunami
1976.7.28	Hopei, China	242,000	7.8	
1985.9.19	Central Mexico	10,000	8.1	
1992.12.12	Flores, Indonesia	2,000	6.8	Tsunami, liquefaction

Source. Dictionary of Earthquakes (Asakura Shoten Publishing Co.) and Indonesia Meteorological Agency

2 Earthquakes of Indonesia

Indonesia is located in one of the most disaster-prone regions. Two major earthquake belts, the Mediterranean and the Circum Pacific belts, pass through the Indonesian Archipelago. More than 400 earthquakes with magnitudes of $M \geq 4$ have been observed annually. Most of these are originally tectonic earthquakes which, by the nature of this process, are still in progress (Appendices 2 - 5).

Tidal waves (tsunami) and landslides are secondary disasters caused by tectonic earthquakes. This was demonstrated when a tectonic earthquake of magnitude 6.8 on the Richter scale hit Flores and the smaller neighboring islands, located in the Flores sea, on December 12, 1992 (Appendix 6).

This earthquake triggered strong tidal waves and landslides which caused a death toll of more than 2,000, destruction of more than 25,000 houses and public buildings, with estimated losses of US$150 million.

3 Population

Based on the 1980 National Census when the population was 147,490,298, the population is expected to increase dramatically to 216.11 million and 231.41 million in 2000 and 2005, respectively.

Table 2 gives the distribution of population on the areas/islands. Concentration of people in urban areas will be about 60%.

TABLE 2: POPULATION DISTRIBUTION AMONG INDONESIA'S MAJOR ISLANDS, 1990

Island	Percentage of Total Area	Population	Percentage of Total Population	Population Density per sq. km
a. Java & Madura	6.89	107,573,749	59.99	814
b. Sumatera	24.67	36,455,344	20.33	77
c. Sulawesi	9.85	12,521,385		66
d. Kalimantan	28.10	9,109,804	5.08	17
e. Nusa Tenggara	4.61	10,163,854	5.67	115
f. Irian Jaya	21.99	1,641,430	0.92	4
g. Maluku	3.88	1,856,075	1.03	25
Indonesia	100.00	179,321,641	100.00	93

Source: Statistical Yearbook of Indonesia

II SEISMIC RISK MANAGEMENT

1 What shall we manage ?

Seismic risk management should cover and plan activities in:

1. Disaster mitigation

   a. Prevention
   b. Preparedness

2. Response in the form of relief

The framework can be illustrated as follows:

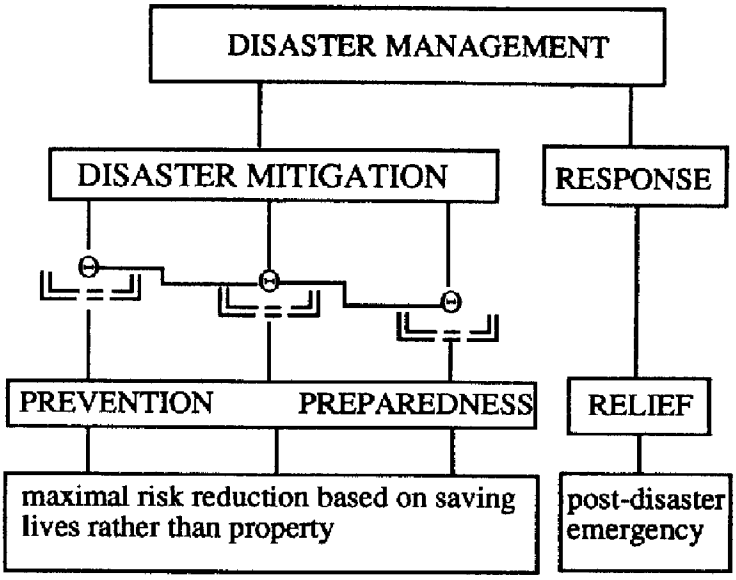


Figure 1: Disaster management

As it has been understood that disaster occurrence is dynamic and uncertain, a reference point where activity begins is assumed at a certain point in the following cycle:

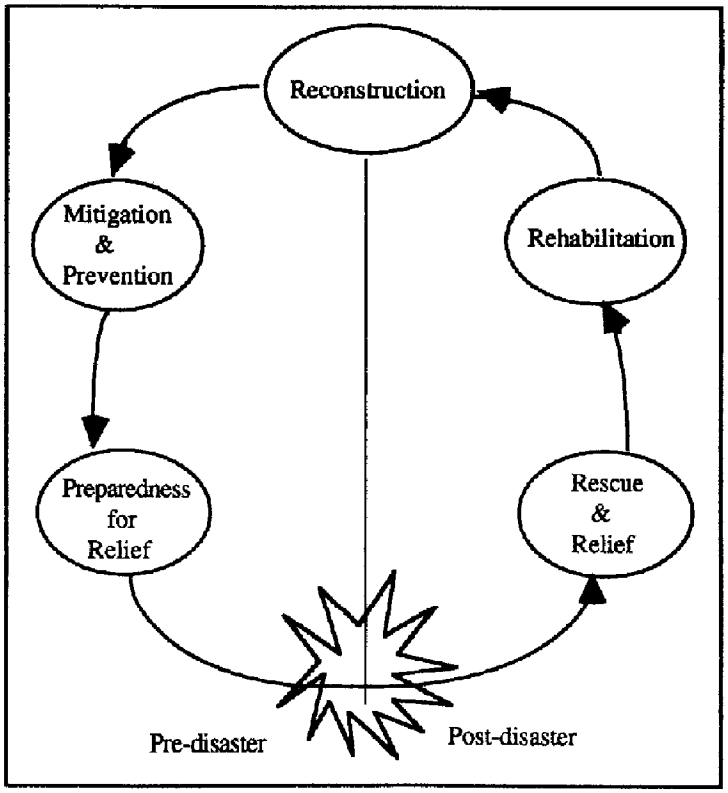


Figure 2: Disaster cycle

2 Risk reduction measure

To minimize the seismic hazard, specific safety measures must be applied. These measures are classified into structural (e.g., building structures) and nonstructural (e.g., disaster warning system).

These can be illustrated as follows:

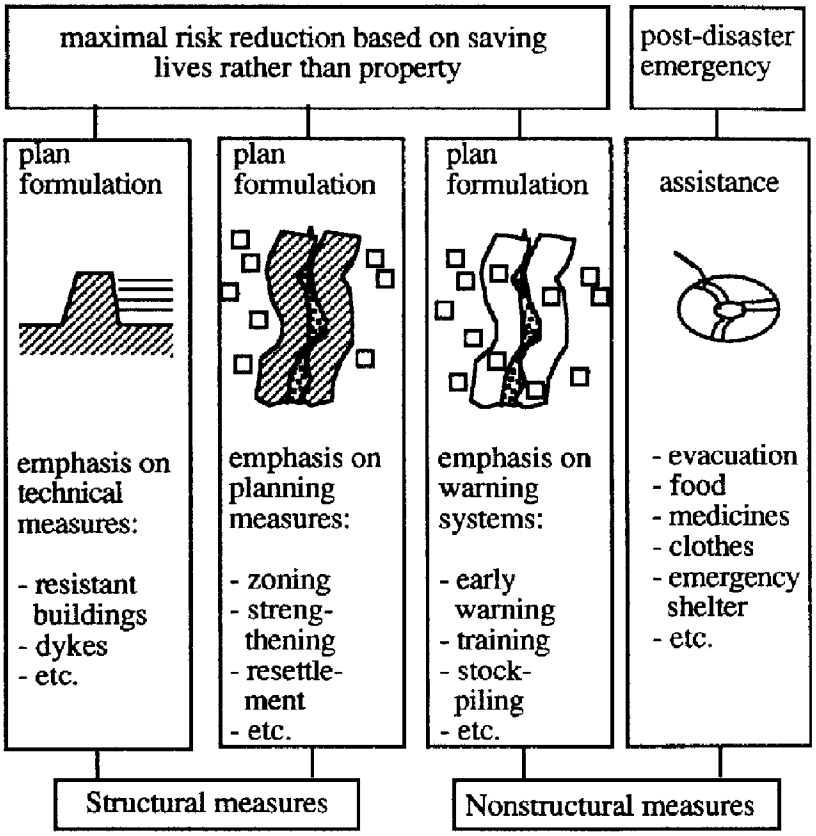


Figure 3: Risk reduction measure

3 Pattern of Administration for Seismic Risk Reduction

Enforcing with political will and resources there are four basic models of national organization which offer different opportunities and constraints as follows:

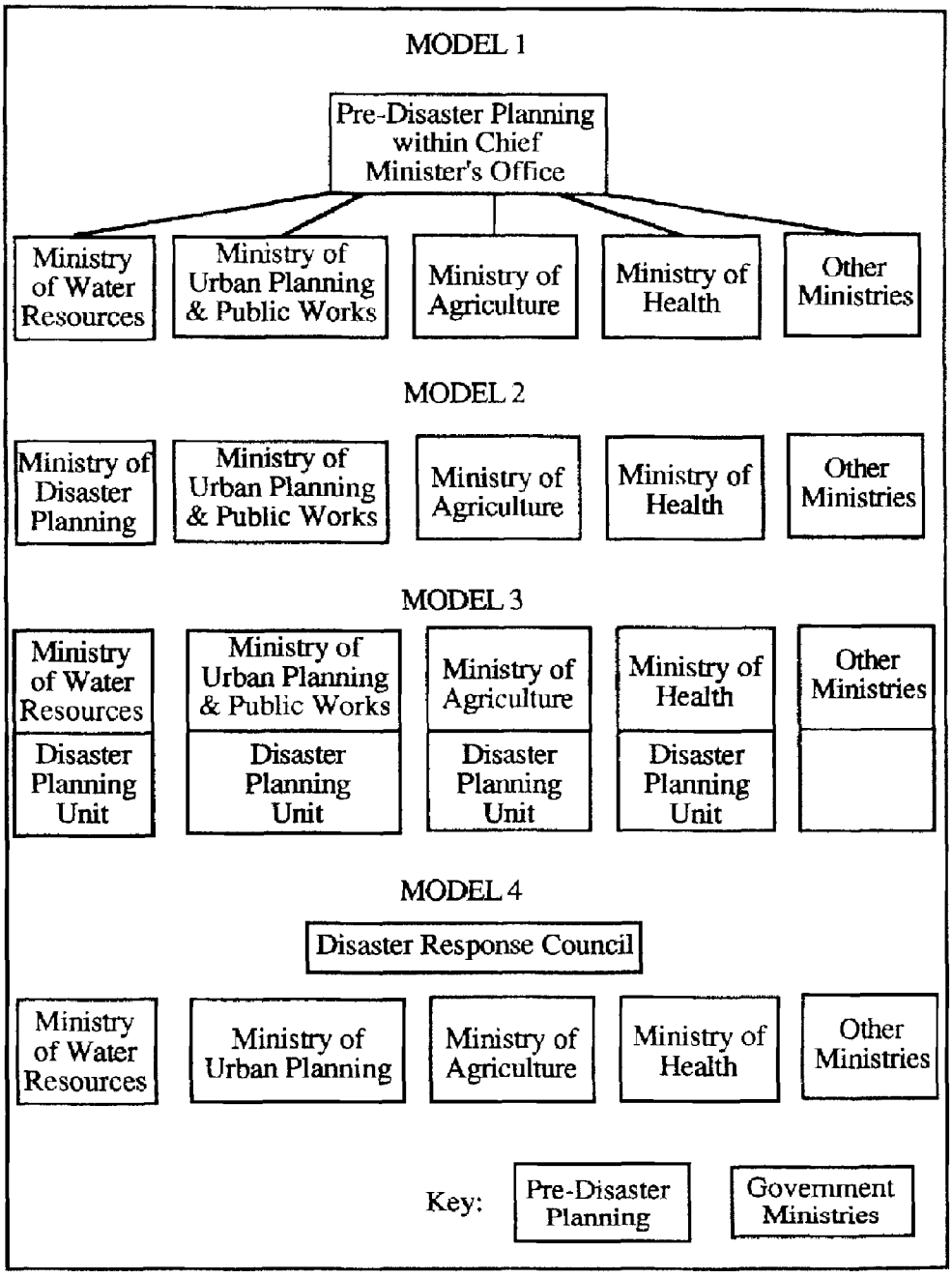
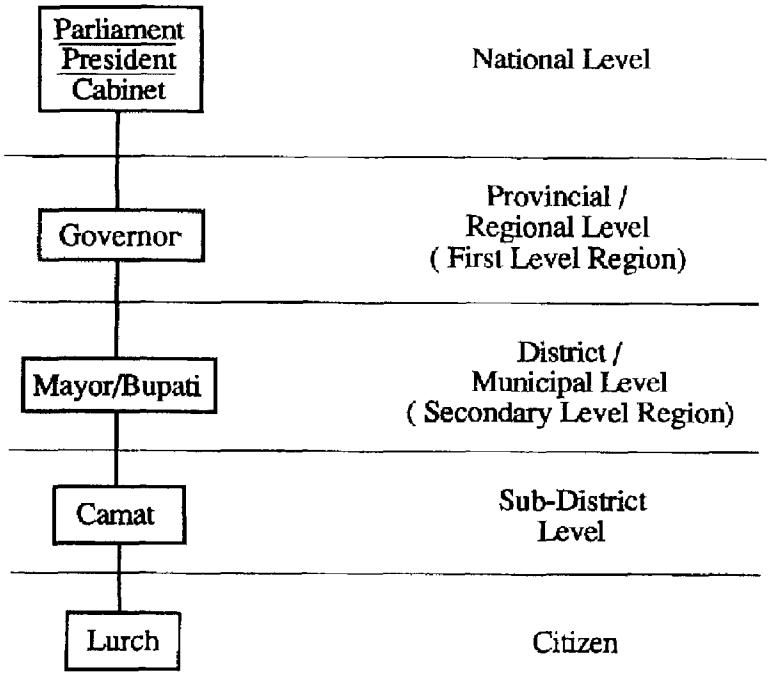


Figure 4: Models of government administration for risk reduction

III SEISMIC RISK MANAGEMENT IN INDONESIA

1 Administration of Seismic Risk Management in Indonesia

The framework of the administration of Indonesia is as follows:



2 Progress of seismic management in Indonesia

2.1 Since the 1960's, the Indonesian Government has been very concerned about disasters (not specifically seismic disaster) as these have tended to become more and more destructive, affecting even larger concentration of population. Its response has been primarily providing financial assistance for relief and recovery activities. However, it has realized that the actual and potential consequences of natural hazards are becoming so serious and increasingly global in scale. Emphasis has then shifted to disaster mitigation, prevention and preparedness.

Disaster management, however, is not mono-sectoral, whether in disaster prevention, preparedness or relief phases. The socioeconomic and spiritual welfare of people, the protection of personal and public property, and development programs require cross-sectoral efforts and planning or response. Furthermore, the character of disasters, especially after their occurrences, places a high premium on coordination and the rapid exchange of information horizontally between departments and vertically within each department.

2.2 In this effort to mitigate the disaster, the Government of Indonesia has issued the following policy and operational directives:

- Presidential Decision No. 256 of 1966, i.e., Establishment of Consultancy Board for Natural Disaster Relief

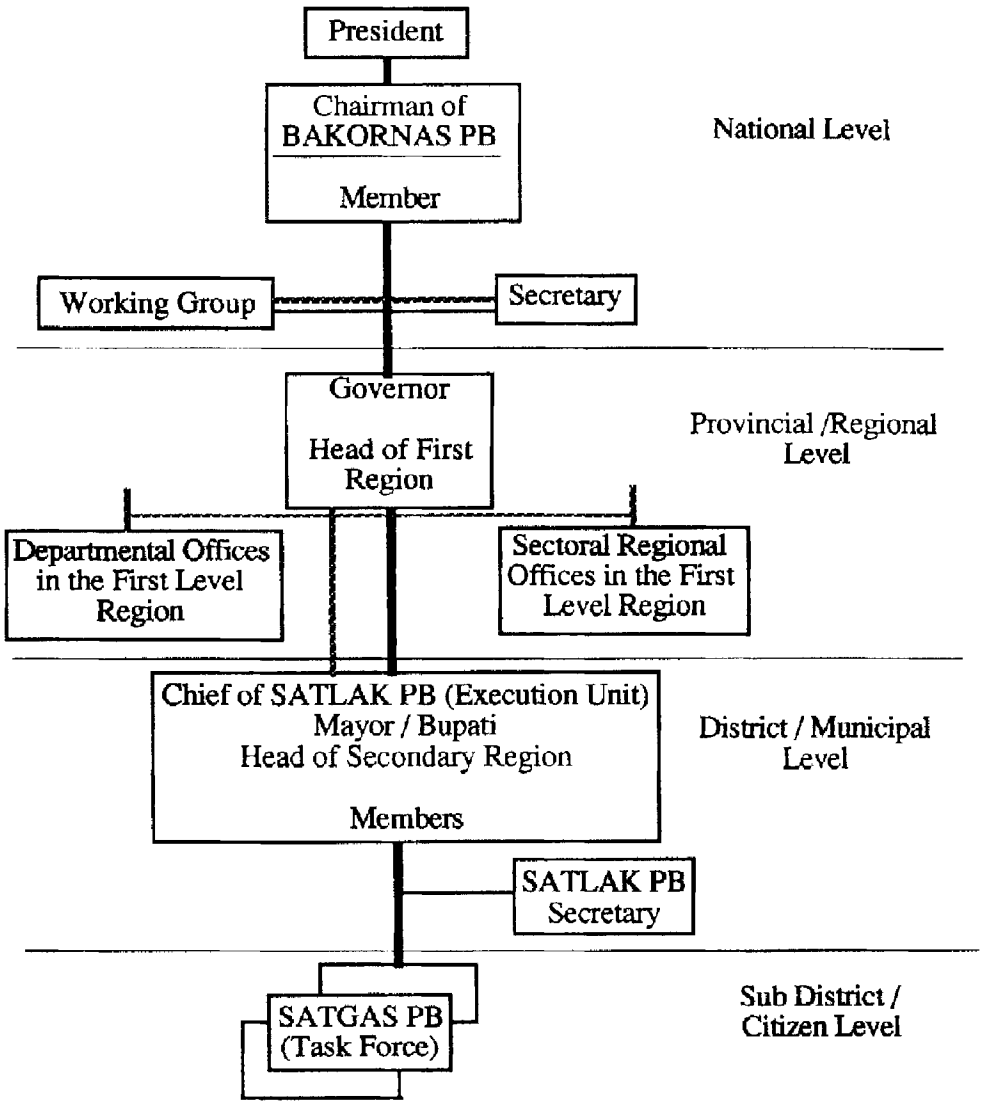
- Presidential Decision No.14/4/Kep/I/67 of 1966, i.e., Establishment of Coordination Team for Natural Disaster Relief
- Establishment of National Coordination Board for Natural Disaster Relief (BAKORNAS/SATKORLAK PBA) of 1979
- Presidential Decision No. 11/1972, i.e., Establishment of Indonesian Board of Search and Rescue
- Presidential Decision No. 11 of 1972 on "Board of Search and Rescue in Indonesia"
- Decision of the Minister Coordinator of People's Welfare/General Chairman of BAKORNAS PBA No. 003/Kep/KBAK/PBA/IX/1980 on Establishment of Coordinator of Warning Communication for Natural Disaster Relief (LAKK0R KOMBRA)"
- Decision of the Minister of Social Affairs No. 18/Huk/Kep/III/1984 on "Social Task Force for Disaster Relief" (SATGASOS PBA)
- General guidelines for coping with disasters to be applied by civil defence units as a follow-up to the Decision of the Minister of Home Affairs on "Organizational structure and working procedures of local civil defence to cope with natural disaster"
- General guidelines for natural disaster relief (Department of Social Affairs)
- Organization and management of disaster relief, municipal/regency of Pekalongan (issued by the municipal of Pekalongan)
- Act No. 4 of 1972 on Basic stipulation of environmental management
- Decision of the Minister of Communications No. KM 164/OT.002/PHB-80 on "The establishment of Board of Search and Rescue"
- Decision of the Minister of Forestry No. 098/Kpts II/1984 on "Organizational structure of DAS management technology"
- Statutes and regulations of Indonesia Red Cross defining its aim, i.e., to assist victims of disasters

2.3 The National Coordinating Board for Disaster Management (BAKORNAS PB)

Presidential Decree No. 43 in 1990, followed by the Decision of the Minister Coordinator for People's Welfare as Chairman of the National Coordinating Board for Disaster Management No. 02/Kep/Menko/Kesra/I/1992; No. 13/Kep/Menko/Kesra/IV/1992 and No. 14/Kep/Menko/Kesra/IV/1992, clearly stipulates the organization, duty and working system of National Coordinating Board of Disaster Management.

2.4 BAKORNAS PB, chaired by the Minister Coordinator for People's Welfare, is a nonstructural institution responsible to the President.

The organizational structure of BAKORNAS PB is as follows:



2.5 BAKORNAS PB has the following functions and responsibilities:

- To coordinate the efforts in disaster management that include activities in prevention, mitigation, relief, rehabilitation, and reconstruction.
- To coordinate the formulation of policy, plan, and the realization of the disaster management program.
- To give direction and guidance in the realization of disaster management.
- To coordinate the inspection, controlling, monitoring, and evaluation of disaster management.

- To facilitate the cooperation among the governmental institutions and non-governmental institutions in disaster management both at home and abroad.

- To coordinate the revenue, distribution and utilization of aid for disaster management.

- To report the activities of disaster management to the President.

2.6 The members of BAKORNAS PB should direct and optimally mobilize the systems under their management in coping with disasters in accordance with the BAKORNAS PB policy as follows:

- The Minister of Social Affairs will direct and mobilize aid, assistance, and social services for disaster victims and set up social organizations, social task forces, and social welfare families.

- The Minister of Home Affairs will guide and direct the regional government, and develop and mobilize the community protection units.

- The Minister of Health will direct and mobilize health facilities and health services for the victims.

- The Minister of Public Works will direct and mobilize the technical capabilities and public works facilities.

- The Minister of Communications will direct and mobilize technical and transportation facilities, meteorology, geophysical offices, and the Search and Rescue (SAR).

- The Commander-in-Chief of the Armed Forces will direct, mobilize and control military units and equipment and supply either in the Central Level or in the region in accordance with the delegation of authority.

- Related ministers and officials of other institutions will assist disaster management especially in prevention and mitigation relevant to their own functions.

As a member of BAKORNAS PS, the Governor/Head of provincial Region should guide and direct/mobilize the regional government agencies and community in the region, coordinate regional departmental offices/ABRI, and control the activities of SATLAK PB in a disaster.

2.7 The Secretary of BAKORNAS PS has the following duties:

- To prepare and realize the follow-up activities of BAKORNAS PS.

- To prepare and control the administration of BAKORNAS PS.

- To coordinate the duties and the activities of the working groups.

- To publicize information about disasters.

- To collect and analyze data on disasters.

- To prepare and compile the BAKORNAS PS report.

2.8 The Working Groups in BAKORNAS PS, led by its Chairman, have the following duties:

- To prepare the plan of disaster management policy.
- To comply with orders and/or guidelines laid down by the Chairman of BAKORNAS PS.

The Working Groups are coordinated by the BAKORNAS PS Secretary and are responsible to the BAKORNAS PS Chairman.

2.9 SATLAK PB, Execution Unit, implements the disaster management activities in accordance with the policy determined by BAKORNAS PS and/or the First Level Regional Government before, during and after a disaster. These include activities in prevention, mitigation, relief, rehabilitation, and reconstruction.

The job descriptions and responsibilities of each member of SATLAK PB are stated in the decision made by the Supati/Walikotamadya in his capacity as Chief of SATLAK PB.

2.10 SATGAS PS, Task Force, led by a person appointed by the Chief of SATLAK PB, should implement activities based on the guidelines of SATLAK PB Chiefs in accordance with their functions.

The formation, job description, and functions of SATGAS PS are determined in the decision made by Bupati/Walikotamadya, Head of Secondary Level Region in his capacity as Chief of SATLAK PB.

2.11 Finance and Assistance

Financial resources for disaster management come from:

- APBN, Government Budget
- APBD, Provincial Government Budget
- Assistance without any attachment
- Communities
- Other sources.

2.12 The distribution and utilization of aid are outlined below:

- Aid for disaster management is delivered to the Chief of SATLAK PBs by departments and agencies in their lines.
- Aid from communities for disaster management is directly chanelled to the Chiefs of SATLAK PBs through the Department of Social Affairs or through the Governors/Heads of the First Level Regions.
- To be effective, direct aid from the communities to the victims of disaster is coordinated by the Chiefs of SATLAK PB.

The Chiefs of SATLAK PBs submit a report on revenue and utilization of aid to the Chairman of BAKORNAS PS as well as to the heads of related Departments and the Governors/Head of Provincial Regions as BAKORNAS PS members.

Periodically, the Chairman of BAKORNAS PS submits an accounting report of the aid to the President.

IV MEASURES AGAINST SEISMIC DISASTER IN INDONESIA

Plans for emergency countermeasures to cope with disasters are listed below:

- Establishment of the system for emergency activities
- Collection and dissemination of information
- Application of the Disaster Relief Law
- Mutual assistance, and plan for requesting dispatch of a disaster relief force
- Fire fighting and disposal of dangerous materials
- Security and traffic control
- Emergency evacuation plan
- Rescue and ambulance plan
- Medical and first-aid plan
- Plan to supply drinking water, foodstuffs, and other essential provisions
- Emergency transportation plan
- Plan for cleaning, prevention of epidemics, and disposal of human remains
- Provisional housing plan
- Plan for temporary schooling, financing, and employment
- Provisional measures to secure lifeline facilities
- Provisional measures for operating public facilities, etc.

Risk reduction measure

As stated earlier, disaster mitigation, prevention, preparedness and relief comprise structural and nonstructural measures.

Structural measures, particularly those on the technical aspect, aim to enable cities to better withstand a disaster. This is an urgent need and is accorded priority in the Department of Public Works. The Research Institute for Human Settlements (RIHS) has been doing and issuing standards related to seismic forces on buildings and structures.

By Act No. 4 in 1992, the Government has planned measures to optimize risk reduction considering the limitations. Preparedness, i.e., early warning, drill training, stockpiling, earthquake prediction, is still in an initial stage but may soon be drafted to save lives rather than property.

V CONCLUSION

1. Government of Indonesia has realized that the country, due to its location in a seismic area, has very serious earthquakes disasters which result in big losses of lives and property.

2. To reduce these losses, it is necessary to develop and implement risk management.

3. It is hoped and suggested that all countries in seismic areas exchange information and directly cooperate in a plan to minimize these losses.

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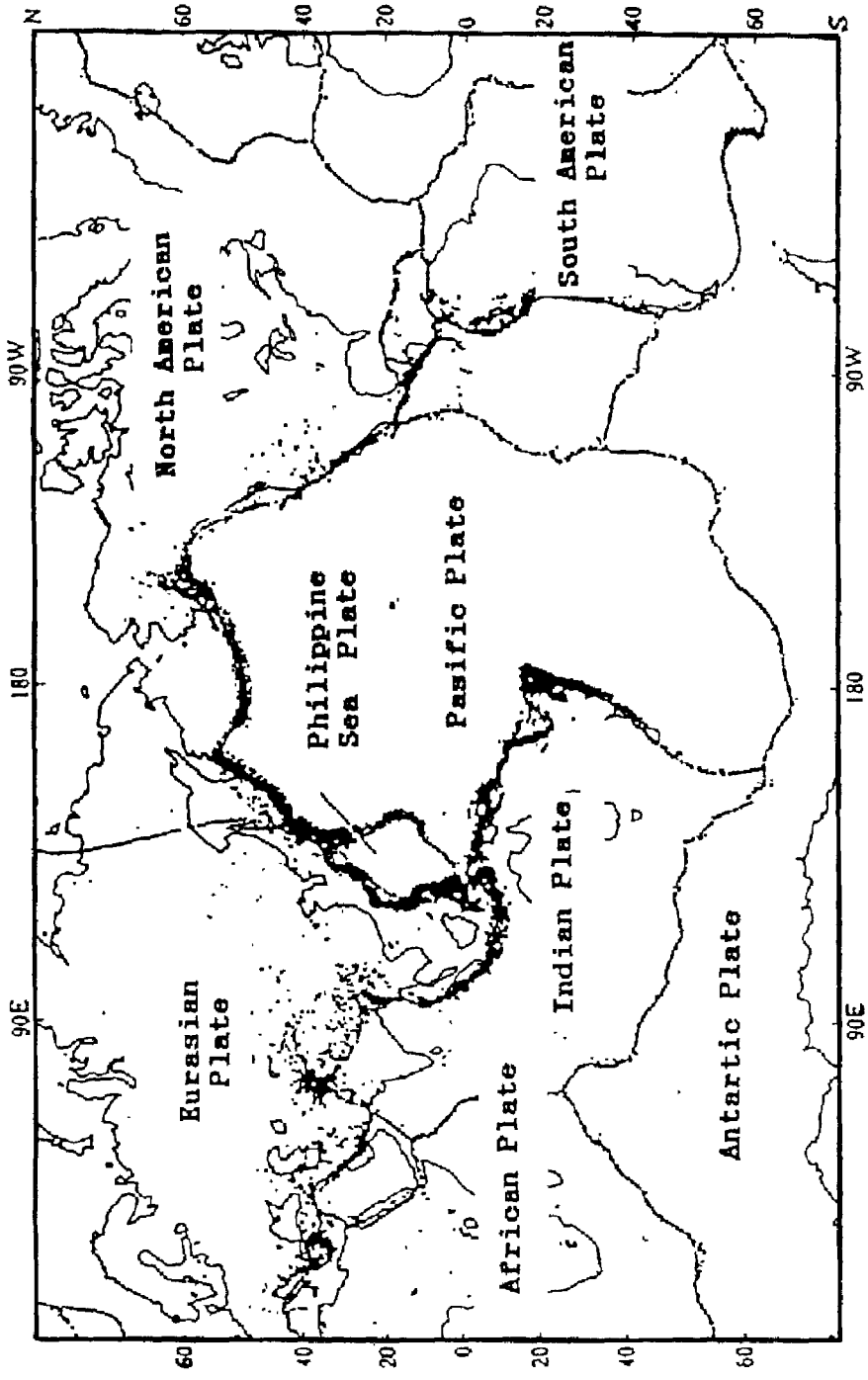
3. Earthquake Disaster Countermeasures in Japan, Natural Land Agency, Prime Minister's Office, Government of Japan, 1992.

4. Indonesian Earthquake Study, Beca Carter Holling & Ferner Ltd and the Indonesian Counterpart Team, 1978.

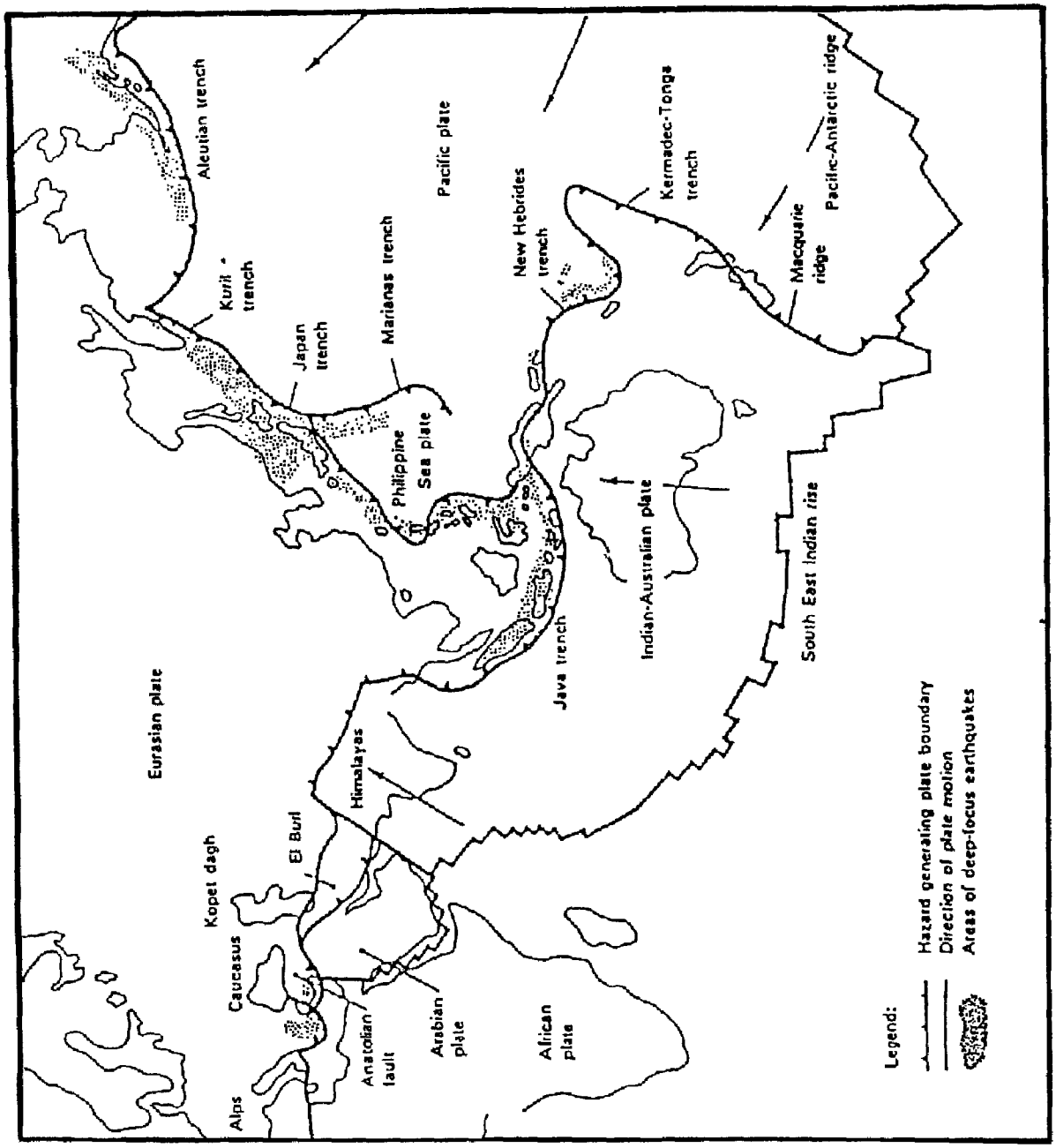
APPENDIX 1

WORLD GEOGRAPHICAL DISTRIBUTION OF HYPOCENTERS AND PLATES



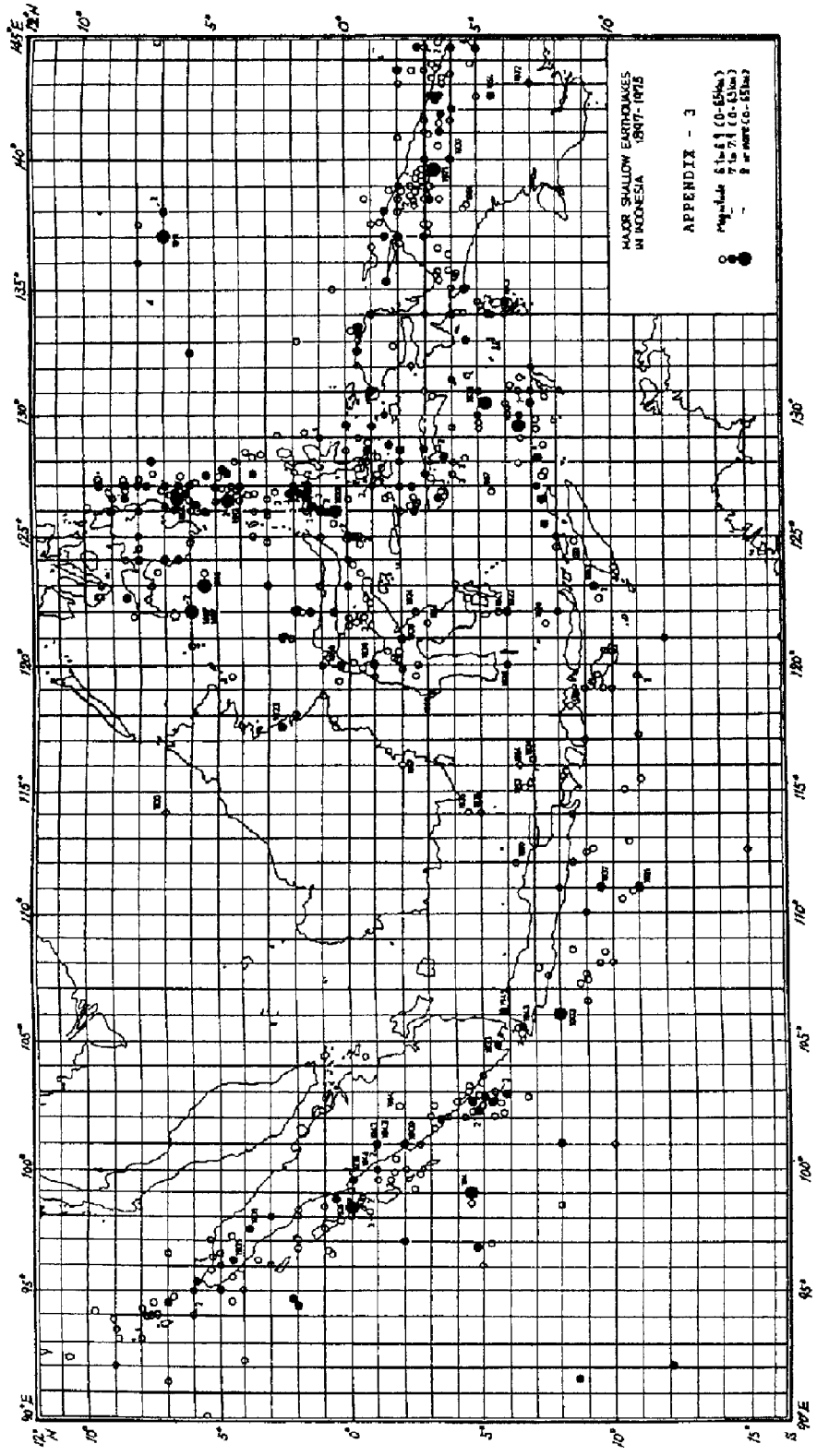
APPENDIX 2

THE PLATES OF THE LITHOSPHERE IN SOUTH-EAST ASIA



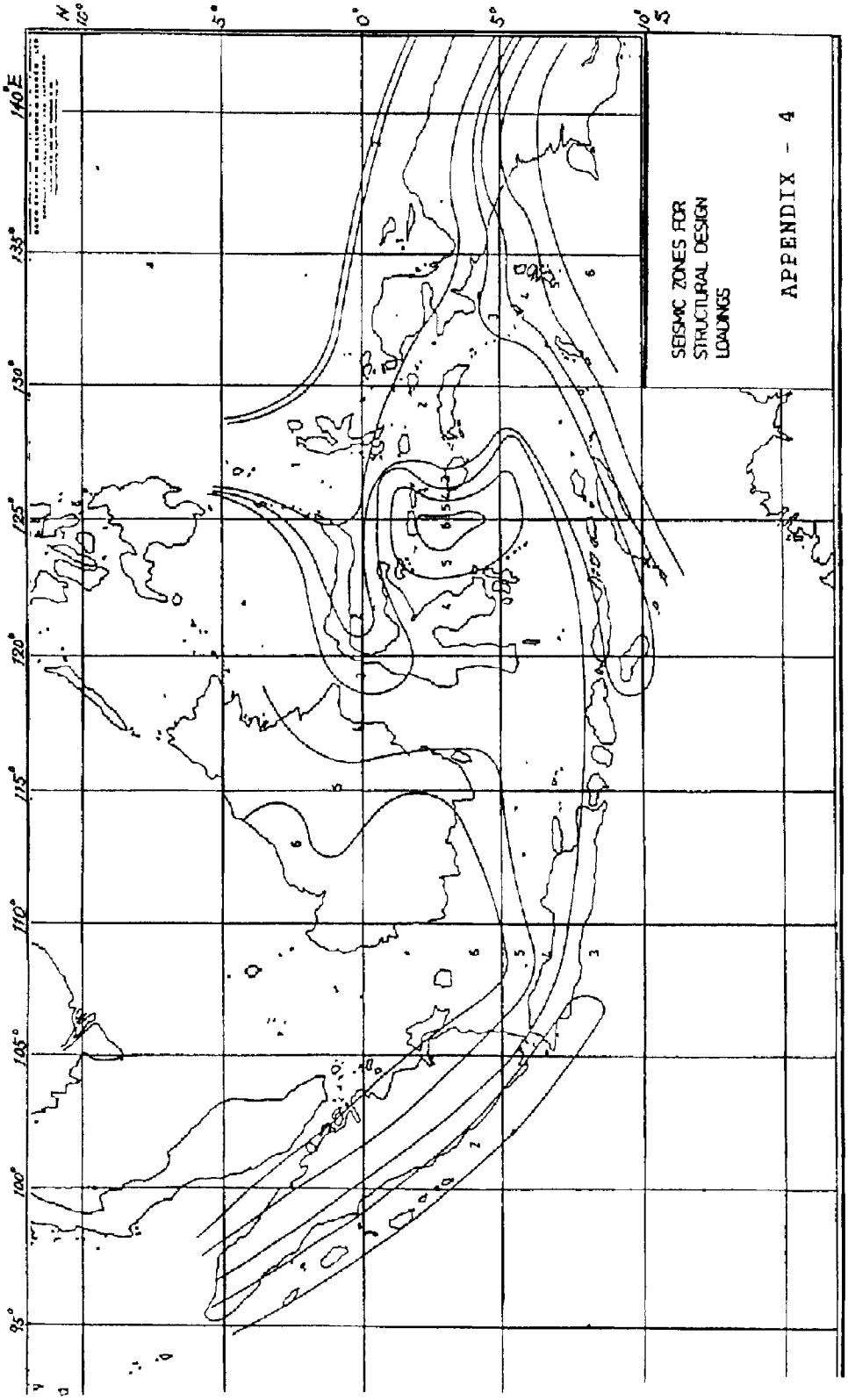
APPENDIX 3

MAJOR SHALLOW EARTHQUAKES IN INDONESIA (1897-1975)



APPENDIX 4

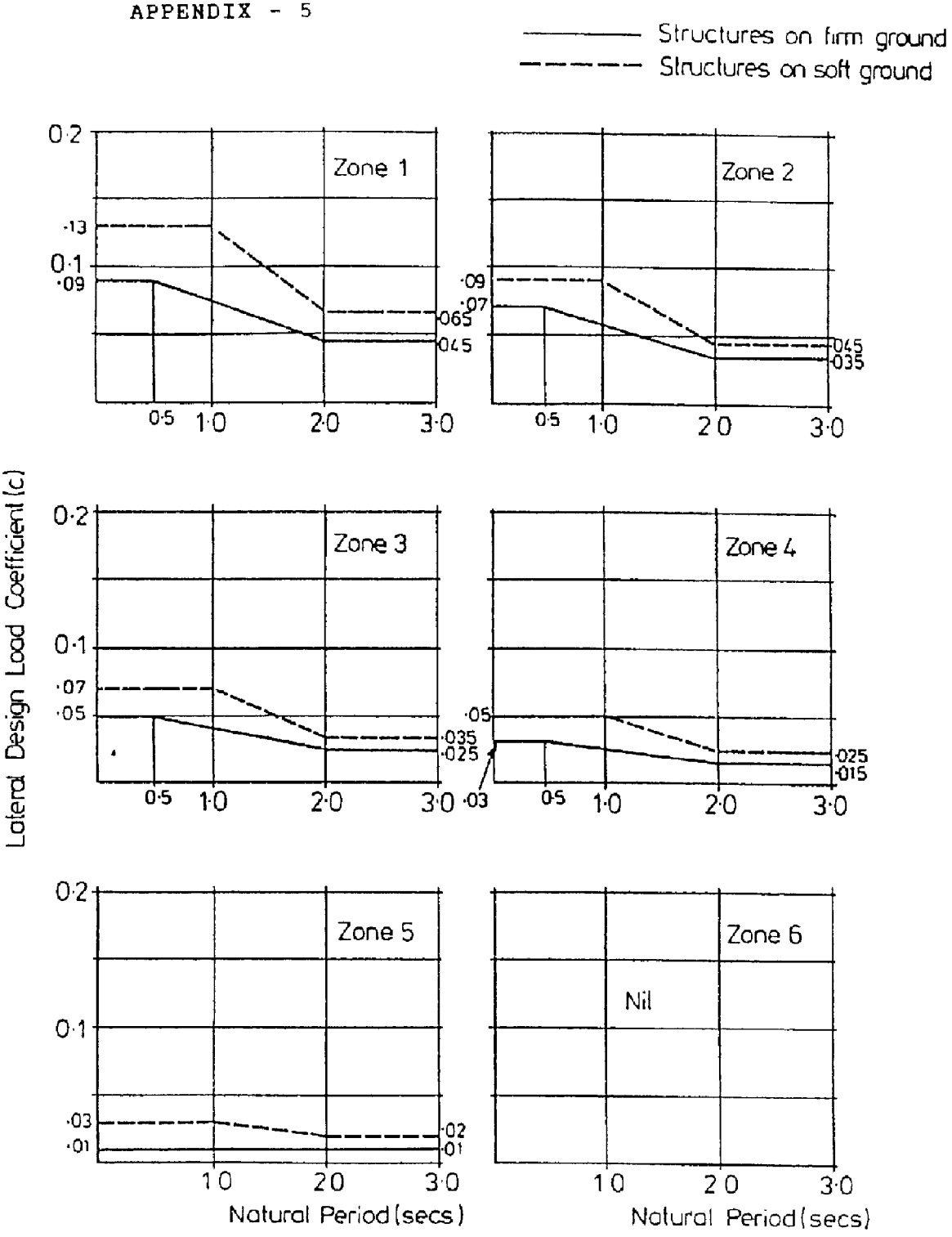
SEISMIC ZONES FOR STRUCTURAL DESIGN LOADINGS



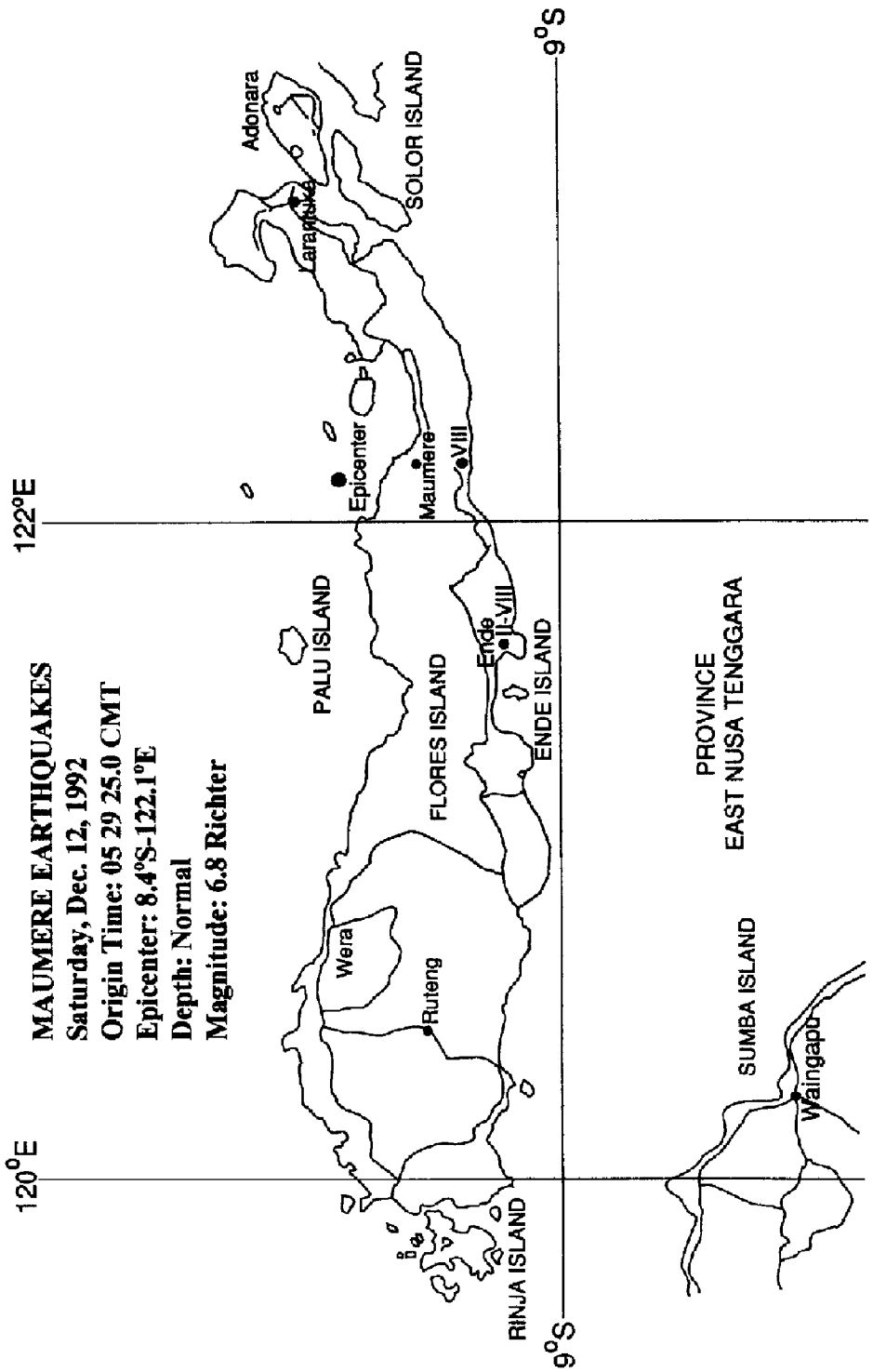
APPENDIX 5

BASIC SEISMIC COEFFICIENTS

APPENDIX - 5



APPENDIX 6


MAUMERE EARTHQUAKES
Saturday, Dec. 12, 1992
Origin Time: 05 29 25.0 CMT
Epicenter: 8.4°S-122.1°E
Depth: Normal
Magnitude: 6.8 Richter
120°E
122°E
9°S
9°S
Adonara
Larantuka
SOLOR ISLAND
Epicenter
Maumere
VIII
PALU ISLAND
FLORES ISLAND
Ende
II-VIII
ENDE ISLAND
Wera
Ruteng
RINJA ISLAND
PROVINCE
EAST NUSA TENGGARA
SUMBA ISLAND
Waingapu