MALAYSIA

- SEISMIC HAZARD MANAGEMENT IN MALAYSIA

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1 SEISMICITY OF MALAYSIA

Southeast Asia is considered as one of the most seismically active regions in the world, with over 200 million people subject to various degrees of earthquake hazards. Although Malaysia is one of the countries in the region, it is fortunate to be relatively less seismic.

Peninsular Malaysia and the State of Sarawak lie on the western and eastern fringes of the stable Sunda Shelf. Except for the northeastern portion of Sarawak, these stable areas have not experienced any earthquake of local origin in the recent past. Only induced local earthquakes of low magnitudes (less than 4.5 on the Richter scale) were known to occur over the Kenyir Dam area in the State of Terengganu in 1986, due to the impounding of the dam. However, they are not free from the threat of earthquake damage. The west coast states of Peninsular Malaysia are occasionally affected by tremors originated from large to great earthquakes located mainly to the west of Sumatra or northwest in the Andaman Islands. On the other hand, the State of Sabah, including the northeastern portion of Sarawak, is more seismic and subject to the effect of local earthquakes (e.g., an earthquake of magnitude 5.8 on the Richter or magnitude scale occurred in Lahad Data/Kunak area in 1976). In addition, the east coastal areas of the State of Sabah are also affected by tremors from distant earthquakes located in the Straits of Macassar and the Celebes Sea.

Damage-wise, there has been no known record of casualty or serious earthquake damage to properties in Peninsular Malaysia. The most severe cases reported objects falling from shelves. In Sabah, stronger felt intensities have been recorded in the past and resulted in minor cracks in masonry walls and narrow fissures on the ground. More severe earthquakes even triggered the eruptions of mud volcanoes.

With the national economic development proceeding rapidly, more high-rise buildings, large power plants, bridges, dams and other critical installations have been built and will be built. Buildings are competing with one another to be taller and larger. Coupled with higher concentration of population, the threat of earthquake is bound to increase progressively with time.

2 SEISMOLOGY IN MALAYSIA

Proportional to the level of seismicity of the country, the level of development of seismology in this country is relatively low compared to other Southeast Asian neighbors. In fact, no seismology of any kind was undertaken in the country before the early 70's. The continuous monitoring of earthquake activities only began in 1974 when the UNESCO/UNDP sponsored project, "Regional Seismological Program for Southeast Asia",

was implemented. Under the guidance and technical and financial support of UNESCO experts, the country established its own network of seismological stations. A dozen or so professional, semi-professional and technical staff were also trained in basic seismology and station operations and maintenance.

When the above project ended in September 1979, the participating countries established the Southeast Asian Association of Seismology and Earthquake Engineering (SEASEE) to continue the good work of the project and to promote continued cooperation among member countries.

From 1982 till mid 1986, SEASEE successfully coordinated a USAID-sponsored project called the "Earthquake Hazard Mitigation Program in Southeast Asia" with the ultimate aims of:

i) providing the required basic information for governments to frame building and land-use codes and for engineers and others to appropriately design structures, and
ii) developing an institutional framework within each country for continued earthquake hazard assessment and public information.

Under this project, Malaysia had:

i) developed a seismological database which includes a catalogue of instrumental epicenters and a catalogue of intensity surveys of historical earthquake events, and
ii) prepared seismotectonic maps for the country.

From July 1992, SEASEE has been officially dissolved and its role has been taken over by the ASEAN Subcommittee on Meteorology and Geophysics. Malaysia, like any other member countries, has looked to the Subcommittee for upgrading its capabilities and for carrying out projects aimed at dealing with earthquake hazards.

3 RELEVANT INSTITUTIONS

Seismic hazard management requires multidisciplinary approaches involving several agencies and institutions. The roles of the relevant agencies and institutions are described below.

The Malaysian Meteorological Service is the national agency responsible for the continuous monitoring of earthquake activities in and around the country and for maintaining a comprehensive database to provide advice to policymakers, architects and engineers for earthquake hazard management purposes.

The Geological Survey is responsible for geological surveys and related studies. In seismic hazard mitigation, its role is to provide support related to geological structures and advisory geological services for foundation of civil structures in the country, to carry out geological and geophysical mapping, etc. It has a pool of geoscientists and the necessary equipment to undertake earthquake hazard mapping or zoning.

The Survey Department is responsible for national mapping and could provide support in geodetic work and other tasks.

SIRIM (Standard and Industrial Research Institute of Malaysia) is responsible for formulation of national standards and codes. Its involvement is required in the preparation of earthquake codes.

The Housing Ministry is the policy decision maker on the need to incorporate seismic provisions in the national building bylaws.

The Public Works Department is involved in the design and construction of many public facilities and infrastructures that are susceptible to earthquake damage. It has a pool of engineers who can advise on the technique and the necessary earthquake resistant features required to be incorporated given a certain level of seismic hazard expected.

Local universities have a pool of seismologists, geologists, and engineers who have experience in their respective fields which are valuable to the seismic hazard management efforts.

4 TYPES OF STRATEGIES TO MITIGATE RISKS

4.1 Identified

Strategies identified to be implemented in this country are the introduction of earthquake codes, land use planning and regulations and the need for disaster planning.

It is felt that earthquake hazard management effort should focus primarily on large cities and on civil engineering projects which are most vulnerable to long-period waves of distant earthquakes (e.g., multistory high-size buildings, power plants, dam and bridges). Perhaps comprehensive mitigation programs should be drawn up for the cities of Kuala Lumpur and Penang which are developing rapidly.

There is a need to carry out research on subjects peculiar to local conditions. The areas of research should cover the response of the above mentioned types of construction to earthquake waves, and the effects of ground amplifications due to thick consolidated sediments underlying cities.

There is a need to construct the probabilistic seismic hazard maps as a first step towards the introduction of earthquake codes.

4.2 Strategy Implemented

So far, there has not been any concrete achievement of any sort except for the push from the two programs mentioned earlier. The need for seismic hazard management in this country has been stressed to or impressed upon officers in several relevant agencies. Some effort has also been carried out in the preparation of the seismotectonic maps for the country and the publication of the catalogue of past earthquake intensities which form valuable input for future seismic hazard management effort.

The Malaysian Meteorological Service is upgrading its monitoring activities. It is taking steps to link up its stations to a computer system at its head office in Petaling Jaya by dial-up telephone lines. Earthquake epicentral values can then be speedily determined and any rescue action, if warranted, can be immediately initiated.

5 DIFFICULTIES/PROBLEMS

The low seismicity of the country has led to complacency among the policy decision makers which makes hazard management effort difficult to be initiated and implemented. The absence of any incidence of human casualty and serious damage to properties in the past perhaps has made some of them wonder whether those who advocate the introduction of earthquake codes are actually barking at shadows! The occasional tremors or earthquakes felt in the past might have created public concern for a brief moment but these were soon forgotten before any concrete hazard management action could be put in place.

The second problem encountered is that earthquake hazard management, being a difficult task that requires multidisciplinary approaches and input from a number of agencies, requires team effort of a group of experts and pooling of resources of relevant agencies. Hence, it needs high level commitment and support for any action to be initiated and implemented. It also requires strong leadership from the agency that will head the program.

The third problem is the lack of expertise within the country in various related fields. (The low seismicity may have indirectly given rise to such a state of affair.) Paragraph 4.1 above has mentioned some areas where research needs to be done to improve our understanding. For the implementation of hazard management plans, expertise in the fields of earthquake hazard zoning, the buildings' response to earthquake waves and earthquake-resistant designs are needed.

It is pertinent to point out that in the mid 1980's, the Malaysia Meteorological Service had forwarded a proposal to the Ministry of Science and Technology and Environment on the task of formulating earthquake codes to be incorporated in the national building bylaws. However, it did not receive the required support and the matter was abandoned.

6 PRIORITIES IN STRATEGIES

Current priorities should be concentrated on building up the expertise and improving the understanding of the actual level of earthquake hazards the country is subject to. Detailed seismic hazard zoning of the country particularly where the bulk of the population and development is concentrated needs to be carried out. Its output is required both for land-use planning and the introduction of land-use regulations and earthquake codes.

7 SUGGESTIONS

Lack of expertise and the general feeling of complacency and no urgency suggest the need for external assistance. The need for the service of an expert in earthquake hazard management cannot be overemphasized. The expert's advice is required to identify the appropriate strategies, formulate a subject plan and to help implement the project.

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