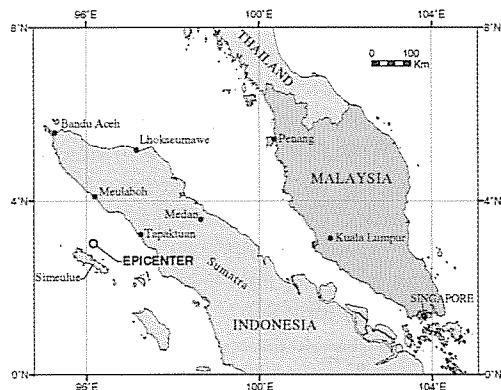


Learning from Earthquakes

Effects of 11-2-02 Northern Sumatra Earthquake in Indonesia and Malaysia

The following information is based on a report sent to EERI by Associate Professors Azlan Adnan (EERI member) and Hendriyawan of Structural Earthquake Engineering Research (SEER), Faculty of Civil Engineering, Universiti Teknologi Malaysia, and Dr. Ir. Masyhur Irsyam of the Civil Engineering Department, Institut Teknologi Bandung. Donald Wells of Geomatrix Consultants also contributed to this report.

A major earthquake of moment magnitude 7.4 occurred west of Sumatra at ~8:30 A.M. local time on November 2, 2002. The epicentral location (96.085°E and 2.824°N) and the moment tensor solution (northeast-dipping thrust) from the U.S. Geological Survey National Earthquake Information Center (NEIC) indicate that the northern Sumatra earthquake occurred on the northeast-dipping interface between the subducting Australian plate and the overriding Sunda block of the Eurasian Plate. The Bureau of Meteorology and Geophysics of Indonesia reports Modified Mercalli Intensity (MMI) ground shaking levels at the following locations: Tapaktuan (V-VI), Meulaboh (IV-V), Singkil (IV-V), Banda Aceh (III-IV), Medan (II-III), and Lhokseumawe (II-III). The earthquake reportedly destroyed more than 350 buildings and caused damage to about 1,000 additional buildings, primarily houses and a government building on Simeuleu Island to the west. Many cracks occurred in roads and highways. At least two people were killed and 54 were injured on Simeuleu during the earthquake, according to newspaper sources. The NEIC reports 30 deaths and 65 injured on Simeuleu. A moment magnitude 6.1 aftershock hit the area at about 5.00 p.m., which caused the 40-bed Simeuleu Hospital to evacuate patients. There were no reports of tsunamis.



Location of epicenter of November 2, 2002 northern Sumatra earthquake

The research group SEER at the Universiti Teknologi Malaysia analyzed peak ground and spectral accelerations using empirical attenuation relationships by Youngs (1997) and Atkinson and Boore (1997). This analysis indicates that the expected peak ground motions at Penang and Kuala Lumpur are about 0.003 to 0.005 g. Also analyzed were local site effects for Bandar Bau Sentul in Kuala Lumpur using a 1-D shear wave propagation theory with natural (1940 El Centro N-S and 1989 Loma Prieta) and synthetic (Random Vibration Theory) time histories. This analysis indicates that the site amplification for PGA is about 2.8, and that the amplification factors and spectral accelerations from the synthetic time histories are higher than those from the natural time histories.

The Malaysian Meteorological Service reported that the event caused tremors lasting several seconds in various parts of Penang, approximately 520 km from the epicenter. It caused panic among residents of high-rise buildings in Penang, with thousands running out of their buildings. Several cracks in buildings were reported in Penang but no injuries or other damage.

Learning from Earthquakes

EERI Sends Team to Mexico

EERI has sent a three-member reconnaissance team to Colima, Mexico, where they will join forces with Mexican colleagues in a joint reconnaissance effort to investigate the effects of the M 7.8 earthquake on January 21. Sergio Alcocer, EERI Board member and researcher at CENAPRED in Mexico City, and Francisco Sánchez-Sesma, President of the Sociedad Mexicana de Ingeniería Sísmica (SMIS), have traveled to the epicentral area with colleagues. Joining them from the United States with funding support from the National Science Foundation are Richard Klingner, civil engineering professor at the University of Texas, Austin; Paul Flores, Director, ABS Consulting Group in Irvine, California; and Anna Lang, a structural designer with Tipping Mar & Associates, Berkeley, California. EERI and SMIS recently signed a Scientific and Technical Collaboration Agreement, and this reconnaissance investigation will be the first activity undertaken jointly. The group will also coordinate with the NSF-sponsored geotechnical research team, under the leadership of Joseph Wartman from Drexel University and Adrian Rodriguez-Marek of Washington State University.

The group will report on the geological, structural, social, and economic impacts of the earthquake. Their initial findings will be posted on EERI's web site and published as an insert in EERI's *Newsletter*. Preliminary reports indicate that the damage is primarily to poorly constructed confined masonry buildings and older adobe structures. A hospital has been evacuated in the area, a power plant shut down, and some damage to the port of Manzanillo has been reported. For more information, contact EERI staff member Marjorie Greene at mgreene@eeri.org.