

Feasibility of earthquake early warning system in West Sumatra

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The province of West Sumatra, Indonesia, is exposed to a threat of a large earthquake and tsunami disaster caused by the forthcoming mega-thrust earthquake. The September 30, 2009 earthquake of M7.6 occurred off Padang, the capital city of the province with the population of 900,000, have caused more than 1,000 deaths and missing people by collapses of the building and landslides. Many buildings and houses, if not collapsed, were damaged and weakened. It is no doubt that much larger casualty will occur by the next mega-thrust earthquake.

We investigated the feasibility of implementing an Earthquake Early Warning System in West Sumatra, which could largely reduce the loss of lives. Buildings and houses in Indonesia are more fragile against earthquake shakings than those in Japan. As they can collapse by a smaller shaking at longer distances from the earthquake sources, where longer lead-time for evacuation is available, many people could survive if early warning is available. West Sumatra is in the similar situation to SW Japan where a mega-thrust earthquake is also expected in the near future. It has, however, a great advantage on installing earthquake early warning system because of existence of the off-shore Mentawai Islands right above the source area. If we detect the earthquake by seismometers on the islands and transmit warnings to Padang 150km away, 20-30 seconds of lead-time to the S-wave arrival is available, by which people can quickly evacuate from the buildings to survive.

In order to realize the warning system, we need to design the upstream, midstream, and downstream systems to be suitable for local conditions in Indonesia, such as 1) a robust observation system against big shakings by the mega-thrust earthquake, 2) effective simultaneous dissemination method for the local people, 3) warning contents to tell the necessities of quick evacuation, 4) a guideline for evacuation to avoid panic and to manage false alarm, and 5) sufficient drill of evacuation by the people.

We carried out 1) an experiment of a long-range and low-power digital wireless telemetry over the sea, 2) designing dissemination system using FM radio and mosque speakers, 3) discussions on messages contents depending on location of the earthquake and its growth, and 4) discussions on evacuation action corresponding to the location and situation. We have a good prospect for development of the up- and mid-stream hardware systems. The most challenging part is the downstream, i.e., 5) people's effective evacuation and drills. We think the difficulty of the downstream became smaller after the September 30, 2009 M7.6 earthquake in Padang, because, although it was a big tragedy, people who survived could make a valuable practice of quick evacuation and realized how it was vital.

Through a questionnaire for the afflicted people by the Padang earthquake and discussion with the West Sumatra Provincial Government, we realized a great expectation to the implementation of the system. Earthquake early warning system is technically feasible and we can expect a large contribution for reducing loss of lives in West Sumatra.