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Assessment of the Exposure of Sri Lanka to Tsunamis generated at the Makran Fault

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Although tsunamis have not been frequent in Sri Lanka in the past, in view of the tsunami in 2004 and the subsequent tsunami alerts issued, it is evident that tsunamis can be considered as a natural hazard to which the country is exposed. Tsunamis are mainly generated by undersea earthquakes in subduction zones and Sri Lanka is exposed to two such zones, the Sunda trench and the Makran Fault. The tsunami in 2004 and other tsunami alerts issued in the country are associated with the Sunda Tranch and many of the studies on tsunami hazards in Sri Lanka have focused the attention on such hazards originating in the Sunda trench and relatively less attention has paid for the study of tsunami hazards originating in the Makran Fault. In this study, attention was focused on the assessment of the exposure of Sri Lanka to tsunami hazards from the Makran Fault. The Makran Fault or the Makran Subduction Zone (MSZ) is located to the northeast of Sri Lanka. Although tsunamis generated in the MSZ have not affected Sri Lanka in the recent past, records of historical earthquake and tsunami events in the MSZ indicate that the exposure of Sri Lanka to such potential events in the future cannot be ruled out. The study was based on mathematical modeling techniques and the mathematical model MOST (Method of Splitting Tsunamis) together with its interface ComMIT, developed by the National Oceanic and Atmospheric Administration (NOAA) was used for the computer simulation of tsunamis. The maximum tsunami wave height at selected locations was used to assess the level of exposure. Although the model is capable of simulating deep water and shallow water propagation of tsunamis as well as overland inundation, in this study, the simulations were carried out to only to assess the tsunami wave characteristics in the nearshore region, mainly due to the absence of required bathymetric and topographic information to simulate inundation characteristics. A number of simulations, representing a range of potential tsunami events were carried out. The representative propagation maps obtained by modeling indicate that the propagation is mainly southwards with no significant spread towards the coastal waters of Sri Lanka. In this initial study, a number of tsunami simulations were carried out but the maximum earthquake magnitude considered was limited to 8.8 due to modeling restrictions. No large tsunami wave heights were evident in the scenarios considered with the maximum wave height of 40 cm at a depth of 4.5 m in the vicinity of Colombo. The tsunami arrival times were in excess of 4 hours, which indicate adequate times for early warning of hazards. Although no significant levels of exposure are evident in the results obtained by this initial study, it would be more appropriate to conduct extensive tsunami simulation studies covering a wider range of scenarios for a more effective level of assessment of exposure of Sri Lanka to tsunamis generated at the Makran Fault.

Key words: Tsunami, Exposure, Sri Lanka, Makran Fault

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