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Coastal Vulnerability Studies based on Modeling and Mapping of Tsunami and Storm Surges along Indian Coast

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Under the Ministry of Earth Sciences (MoES), Government of India, national programme on Establishment of National Early Warning System for Tsunami and Storm Surges, an elaborate study has been carried out for data processing through field survey and spatial analysis for modeling and mapping for tsunami and storm surges under the coordination of Integrated Coastal and Marine Area (ICMAM) Project Directorate. This study was aimed to analyze and forecast possible risks of an ocean originating inundation, such as tsunamis and storm surges, upon low-lying and densely populated coastal areas of India. Under this study tsunami and storm surges model has been constructed using numerical equations. It was observed that numerical model found to be an excellent tool for understanding past events and stimulation for future forecasts. Since the source parameters that triggered 26th December 2004 Indian Ocean tsunami are well known these parameters are used as first to set in order to capture the past events. The prediction using the model developed under this study is directly related to the quality of data used to create ocean bathymetry and topography of the coastal land. The salient outcomes of this programme are: (1) creation of extensive database on coastal landforms elevation and (2) nearshore bathymetry. These two parameters are of immense use for the preparation of tsunami and storm surges model, which could be used for demarcating vulnerable sites.

The model results have been obtained using high resolution bathymetry and land elevation data through validation using extensive field observations. Other important data used for this study are seismic parameters, in conjunction with deep sea and shallow water bathymetry and land topography. Using the above data, grid has been generated for the entire Indian coastal region. Simulation for inundation model has been carried out by the two parameters, namely computation of initial deformation due to earthquake and propagation from source to inundation. Different scenarios of extreme inundation have been created using this model to study the extreme inundation and run-up by varying the source parameters that actually trigger the tsunami. This study outcome is found to be more suitable to assess and demarcate the vulnerable coastal areas along Indian coast.