

Risk assessment of multi-hazards along Indian coasts*

An International Workshop on Risk Assessment of Multi-Hazards along Indian Coasts was organized at the Indian Institute of Remote Sensing (IIRS), Dehradun. S. K. Govil (Dean Incharge, IIRS, Dehradun) inaugurated and initiated the workshop. Rabindra Nayak (IIRS) revealed the aims and objectives of the workshop in his keynote address. Manzul Hazarika (Asian Institute of Technology, AIT), Bangkok gave an introduction to the SCRATCH (Strengthening Capacity on Multi-Hazard Risk Assessment in Tsunami Affected Countries) Project, the objectives of the US-Indian Ocean Tsunami Warning System programme, etc.

Totally eleven lectures were delivered and two practical sessions were conducted. The lectures presented were: (1) An overview of natural hazards in India by P. K. Champati Ray (IIRS). He discussed geological hazard modelling, direct and indirect methods for landslide zonation by fuzzy gamma integration and precipitation analysis. Seismic hazard assessments and role of liquefaction for initiation of earthquake and sliding were explained with a case study of Bhuj earthquake. (2) Definition and types of risk analysis using remote sensing and GIS techniques were explained by D. Mitra (IIRS). He discussed in detail, the nature of hurricane/cyclone, tsunami, salt-water intrusion, coastal erosion/accretion, etc. Multi-temporal satellite data and GIS using GRID techniques have a major role in finding areas of erosion and deposition along the coastal

tracts. He opined that coastal zone management policy can be successful only with regular participation of the coastal communities. (3) Introduction to multi-hazard risk assessment was the theme of the lecture by V. Hari Prasad (IIRS). He gave an account of types of disasters and their occurrences in the country and the basic components and steps involved in a GIS-based vulnerability risk assessment. According to him, the ongoing trends for increasing vulnerability are population growth, climate variability, migration of population to cities, environmental degradation, density of population on marginal lands, unplanned settlements due to land scarcity and natural and man-made hazards. (4) A. S. Rajawat (Space Applications Centre (SAC), Ahmedabad), in his lecture on remote sensing applications in coastal zone hazards, focused on the role of space technology in classification and components of disaster management plan in India. Satellite data are useful for preparedness (detection, monitoring and forecasting), during disaster event, hazard zonation, damage assessment and relief (rehabilitation, reconstruction and mitigation). He explained the extent of damage to the vegetation during pre- and post-cyclone periods, with a case study of Mahanadi delta using normalized difference vegetation index techniques with OCM data. (5) A lecture on tropical cyclone studies was delivered by C. M. Kishtawal (SAC). He discussed in detail the factors affecting changes in intensity and advanced empirical techniques for track prediction using genetic algorithm. He highlighted that sea surface temperature, shear, storm, environmental symmetry and impact of dry air stream are the main factors in controlling the intensity of a cyclone. (6) Extreme sea-level analysis, important for studies on modelling of tsunamis and storm surges in the east coast of India, was explained by Unnikrishnan (National Institute of Oceanography, Goa). Statistical analysis of tide gauge data using Gumbel distribution method and numeri-

cal modelling of storm surges in the Bay of Bengal were explained in his lecture. (7) D. Banerjee (Wadia Institute of Himalayan Geology, Dehradun) presented various aspects and applications of GPS in tsunami, earthquake, landfall and tectonic-related studies. (8) A talk on suitable site selection for cyclone shelters in the coastal area was delivered by A. K. Mishra (IIRS). Genesis and conditions required for tropical cyclone formation, the methodology adopted and identification of suitable sites for cyclone shelters in the coastal area were explained. That sea surface temperature of at least 26.5°C through an ocean depth of 60 m with significant Coriolis effect is required for formation of tropical cyclones, was revealed by him. (9) Tsunami and earthquake source parameters in the Indian Ocean was the theme of the lecture by Nayak. He emphasized on various models and their limitations pertaining to tsunami generation, propagation, simulation and construction of possible rupture surfaces. (10) Rittick Borah (AIT) spoke on tsunami evacuation planning. The different types of tsunami evacuation planning, warning and risk management, implementation issues, requirement of evacuation shelter-building, elements considered for evacuation and problems were discussed by him. (11) S. K. Srivastav (ISRO) gave an overview of natural disasters like earthquakes, tropical cyclones, floods and their insured versus total economic loss in major natural catastrophes in India.

In the practical classes, demonstrations were made by Rittick Borah about tsunami prediction, inundation modelling using Tsunami N2 model and pedestrian evacuation modelling using MATLAB, Surfer and ArcGIS software.

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