

## **Multi- Hazard Assessment**

MULTI-HAZARD assessment is a relatively new concept in civil–structural engineering that deals with loss estimation of different portfolios of structure and infrastructure systems located over an extended geographical area and subjected to multiple natural or accidental/man-made hazards. A multi-hazard approach considers more than one hazard at a given location that takes into effect the possible interrelations between these hazards, including their simultaneous or cumulative occurrence and their potential interactions. Being one of the 10 most disaster-prone countries of the world, India experiences both natural as well as accidental (technical)/man-made hazards, which are initiated most likely due to geoclimatic conditions, topographic features, environmental degradation, population growth, urbanization and industrialization, and nonscientific/non-engineered development practices. Over 25 states and Union Territories (UTs) out of the 36 have been experiencing more than a single natural hazard such as earthquakes, winds/cyclones, floods, droughts, landslides and avalanches, and forest fires for several decades<sup>1</sup> (<https://nidm.gov.in>). According to the National Disaster Management Plan (2019), almost 58.6% of the total area of the country is prone to earthquakes of moderate to very high intensity. More than 75% of the total coastline is prone to gusty wind/ cyclones and tsunamis, whereas ~12% of the land is prone to floods and river erosion (<https://ndma.gov.in>). In addition to the natural disasters, technological/man-made disasters that are caused by chemical, mechanical, civil, electrical or other process failures due to accident, negligence or incompetence have resulted in intense consequences, wherein 130 such incidents have been recorded from 2002 to 2010 in more than 15 states and UTs in India. Moreover, the threats induced by natural hazards have been ranked fourth among the possible 12 threats looming in the country, according to India Risk Survey , whereas terrorism and insurgency is ranked second and fire hazard is ranked fifth. These numbers are quite alarming in the Indian context, where the economy is growing by leaps and bounds compared to other larger/populous countries in the world. In this regard, preparedness and response mitigation strategies for the ever-existing multiple hazards must be devised for site-specific and scenario-based risks, wherein viable holistic technological solutions are required to be developed and implemented in order to build resilient structure and infrastructure systems against such multiple hazard scenarios.

