

Geological Survey of India

Vision - 2030

Landslide Hazard Management

Preamble

The mountainous region of Himalayas and Western & Eastern Ghats of India are vulnerable to different types of landslides that are triggered either by rainfall, earthquake or caused by anthropogenic activities. Landslides are annual recurring phenomena and cause substantial loss of human lives, livelihoods and seriously impacts the physical, socio-economic and cultural landscape of the country. In India, 4.2 lakh km² of hilly region in 16 states and two Union Territories, are vulnerable to landslide hazards.

National Disaster Management Authority (NDMA), is the statutory and apex body under the Chairmanship of the Hon'ble Prime Minister, mandated to lay down the policies, plans and guidelines for disaster management to ensure timely and effective response to disasters.

Geological Survey of India (GSI) is the nodal agency specifically for landslide studies in India providing quality geo-scientific information in order to minimize loss of life and damage to property from landslide hazards. The other stakeholders contributing to the cause are namely, NRSC, SOI, NIDM, BRO, DTRL, WIHG, CBRI, Research Institutes, Universities and other organizations. The strategic plan outlined below has seven major components, covering the whole spectrum from research to the formulation and implementation of policy and mitigation measures.

Implementation of such a strategy necessarily warrants a long term coordinated, integrated effort. All stakeholders require to share responsibility for addressing these priorities to effectively manage and reduce risk from Landslides. Strengthening collective capability through forging partnerships can help reduce societal vulnerability, increase community resilience, and engage and inform decision makers at all levels.

Objective

The objective is to provide comprehensive geoscience advice and information based on baseline mapping and predictive research. Routinely observe, monitor and characterize landslide incidences and maintain inventory, use collective expertise on understanding the dynamics of landslide as a phenomenon through collecting, analysing, interpreting, predicting and disseminating data, knowledge and solutions for the national good. Generate awareness at all levels, develop guidelines, policy and augment capacity to combat the hazard and enhance the rapid response capability.

Provide and encourage the use of multi-scale geo-scientific information, risk maps, methodology, landslide monitoring, commissioning of early warning systems and guidance for emergency management, and collaborative development and implementation of public policy and plans to effectively mitigate risk and reduce losses from landslides hazards nationwide.

Strategy

The Strategy envisions bringing together all relevant stakeholders, employ emerging technologies, routinely augment database and inventory, promote landslide research, conduct site-specific vulnerability assessment, use new technological advances to holistically deal with causative factors like, related natural hazards such as rainfall, floods, earthquakes and indiscriminate anthropogenic activities; foster community engagement, generate awareness to the micro level and develop decision support systems and early warning systems to eliminate losses from landslides.

Expanding landslide research, mapping, assessment, real-time monitoring, forecasting, information management and dissemination, mitigation tools, and emergency preparedness and response are the strategic objectives which need to be achieved through building new partnerships among government at all levels, academia, and the private sector and to minimize and mitigate landslide hazard risk.

Action Plan

The action plan is envisioned to pursue over the long term, with a goal to substantially reduce the risk of loss of life, injuries, economic costs, and destruction of natural and cultural resources that result from landslides in India by 2030. This includes a comprehensive approach incorporating a wide range of scientific, planning, and policy tools spanning research, mapping, monitoring, and mitigation activities to address various aspects of the hazard related issues.

Geological Survey of India has a role in each of the objectives by being the Nodal Agency and prime provider of landslide hazard related information. The outlined action plan is presented as under:

#	Strategic Objectives	Description	Action
1	Research	Develop long term national-level research agenda Develop a predictive understanding of landslide processes and triggering mechanism, landslide flow modelling, thresholds, etc. Develop ANN powered landslide prediction systems capable of interactively displaying spatio-temporal changes in landslide hazards	Led by GSI, along with NRSC, DTRL, research institutions, etc.
2	Hazard mapping and assessments	Delineate and routinely update susceptible areas and maintain inventory of different types of landslide hazards at a scale useful for planning and decision making by the authorities Macro-scale (1:50K Landslide Susceptibility Mapping – NLSM)	Led by GSI, with active support from SOI (1:10K base maps) and NRSC (satellite imageries)

		• Meso-Scale (1:10K Landslide Susceptibility Mapping – NLSM10) • Systematic Village Level Landslide Vulnerability Assessment (VLVA) • Site specific landslide investigations • Landslide incidence inventory	
3	Real-time monitoring and forecasting	Monitor active landslides and landslide-prone areas through establishing Landslide Early Warning Systems (LEWS) and develop predictive risk analysis models incorporating inputs from landscape, weather dynamics and community factors using state-of-the-art spatial, remote sensing, AI and telecommunications technologies.	Led By GSI, along with IMD, BRO and other organizations
4	Information collection, interpretation and dissemination	Employing emerging state-of-the-art technologies and methodologies for the dissemination of landslide information, investigation results, baseline and site-specific maps, data layers and real time warnings and alerts of potential landslide activity to assist research, planning, policy, and mitigation activities.	Led by GSI, NDMA and other organisations
5	Public awareness and Capacity building	Conduct community landslide awareness programs to encourage landslide hazard preparedness and mitigation activities, customized to local needs Develop and implement capacity building programmes for the user community, scientists, engineers, and decision makers specifically at the landslide prone State and district level, thus building resilient communities.	Led by NDMA / SDMA / DDMA and supported by GSI, NIDM, NGOs, etc.
6	Legislation and policies	Develop / revisit legislation and policies that support effective landslide hazard mitigation at local levels. Encourage and incentivize landslide hazard mitigation efforts by concerned agencies	Led by NDMA and Central & State Govts. supported by NGOs, GSI and other organizations
7	Emergency response, and preparedness	Develop readiness in all aspects (expertise, equipment, real-time data availability, communication) for coordinated rapid response in case of a disaster.	Led by NDMA / SDMA / DDMA supported by GSI, SOI, NRSC and other organizations