National Interventions for Landslides Risk Reduction and Resilience

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Abstract

The safety of slopes and management of landslides have always been a major concern especially in the hilly regions across the globe. The landslide disaster engulfs precious lives besides devastating impacts on environment, infrastructures and structures. Moreover, the physiological blow by these catastrophic phenomenons is enormous and healing can take a long period. To regain the status quo of the affected area after the incidence of landslides have not always been a straightforward chore. In addition to the inherent characteristics of the slope, climate change and anthropogenic activities have augmented the frequency, intensity, risks and adverse impacts of the landslides. Therefore, safeguarding the fragile slopes required a holistic multi-hazard approach. India has always shown its commitment towards creating a disaster resilient nation. To achieve its goals, a number of interventions have been taken by the Government of India. Disaster Management Act 2005 was the first milestone that shifted the course of relief centric disaster management approach in the country to the holistic approach of preparedness, mitigation and prevention.

Taking the cognizance of the challenges posed by the landslides, major interventions and initiatives were carried out. The Disaster Management Act of 2005 provided the platform for these interventions and initiatives. The paper will illustrate national interventions taken for landslides risk reduction and resilience.

Keywords: Landslides, National Interventions, Resilience

Introduction

The stability of slopes has always been under the menace from the landslides, one of the major hydro-geological hazards which affects a large part of India from the mighty Himalayan range in the north to the coastal areas of the south. North and North-east states residing in the lap of the Himalayan ranges are highly landslides vulnerable

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regions in the country. As per an estimated around 30 per cent of the World's landslides took place in the territory of Himalayan ranges (NDMP, 2019). Apart from the Himalayan range, the other landslides prone areas in the country are situated in Western Ghats, Nilgiris and the Eastern Ghats.

Landslides not only pose threat to lives and environment but also adversely influence the livelihood, normal activities and psychology of affected community beside huge economic losses by the devastation of infrastructures and structures. It is always a big challenge for the community to return to the status quo after the episode of any catastrophic landslides.

Being situated on tectonically active plates along with unripe geology, brittle ecology, meandering rivers and climatic discrepancy the nation has faced unprecedented challenges from the landslides. Besides the own characteristics of the slopes, earthquakes and unprecedented rainfall also trigger the landslides, therefore, high landslides vulnerable areas in the country concurred areas with high seismic activities and high rainfall. Other disasters such as floods, flash floods, cloudburst, Glacial Lake Outburst Floods (GLOF) and Landslides Dammed Lake Outburst Floods (LLOF) are also capable of producing landslides. Further, the changing climatic variables have augmented the number of incidences of landslides in susceptible slope. Apart from the natural factors, the cruelty of humankind on the natural slopes to satisfy their insatiable ravenous for development without considering the measures for landslides risk reduction and resilience have created havoc for themselves as well as for the ecosystem.

The cognizance of the challenges posed by landslides for lives, economy and development laid down a number of interventions in the country. Prior, the site-specific quick-fix approach of debris removal and dumping was carried out at the solution for the landslides but with the enactment of Disaster Management Act 2005 and subsequent interventions more holistic approaches for prevention, mitigation and preparedness was adopted.

Global Interventions

To promote the landslide research and capacity enhancement for the benefits of humanity and the environment, an international non-governmental and n1on-profit scientific organization, International Consortium on Landslides (ICL) was created at the Kyoto Symposium in January 2002 (Sassa et al 2017). The objectives of crafting the organisation at international level were to protect the natural ecosystem, enhance the capacity of community, synchronization of international proficiency in landslides risk reduction and resilience and fostering global multidisciplinary programme on landslides.

Tokyo Action Plan of 2006 ushered to the establishment of International Programme on Landslides (IPL) that incorporates triannual World Landslide Forum (WLF) and the World Centres of Excellence on Landslide Risk Reduction (WCoE).

During the Third World Conference on Disaster Risk Reduction (3rd WCDRR), 2015 in Sendai, Japan, ICL proposed the ISDR-ICL Sendai Partnerships 2015-2025 for global promotion of understanding and reducing landslide disaster risk. This confederation was adopted and signed by 17 United Nations, international and national stakeholders.

The Kyoto Landslide Commitment 2020 was endorsed subsequent of 2017 Ljubljana Declaration on Landslide Risk Reduction. The Commitment endeavoured to provide a framework for landslides risk reduction and resilience at all levels aiming to hasten and encourage the efforts for reducing the risk of landslides. It also fosters synchronising the key stakeholders concerned with the landslides and allied sectors (tools, information, platforms, technical expertise) for landslides risk reduction and resilience at the global scale (Kyoto, 2020 Commitment).

National Interventions

High Power Committee, 1999

Every coin has two faces likewise; disasters besides causing challenges to the humankind also provide equal opportunity to learn from them. Focusing on to clutch the learning of past disasters in India and outside the country, the High Power Committee constituted in 1999 endeavoured to provide a new conceptual framework to diminish the impacts of the disasters. The committee exhorted focusing on the preparedness for the prevention and reduction in addition to mitigation of the disasters (HPC, 2001). The natural as well as man-made disasters were classified under five categories. Landslides were placed under the "Geological Related Disaster" group. The committee highlighted that landslides are predictable and the adverse impacts posed by them can be minimised or even averted with proper and systematic studies. Priorities were given to landslide hazard identification, improved mapping, assessment to identify the existing/potential slope failures, land use patterns, control measures and development of reliable risk assessment beside sensitising the community about the threats of landslides and the possible solutions to minimise them it, they are unavoidable. They also emphasised to encourage the R&D on prediction and forecasting of landslides, especially for old landslides that have potential for reactivation, recurring landslides, and those occurring in the areas known to be hazardous.

Disaster Management Act, 2005

The Disaster Management Act, 2005 was the major intervention in the history of the country for effective disaster management. The DM Act virtually revolutionized the entire approach towards disaster management in India from a relief centric to holistic and integrated with an emphasis on prevention, mitigation and preparedness. The Act adopted many recommendations of the High Power Committee and formulated an institutional framework from the Central to the local levels through unified response mechanism and bestowing extensive powers on the Central Government and other disaster management agencies. It also ushered to develop a National Policy on Disaster Management and National Disaster Management Plan for creating disaster-resilient India.

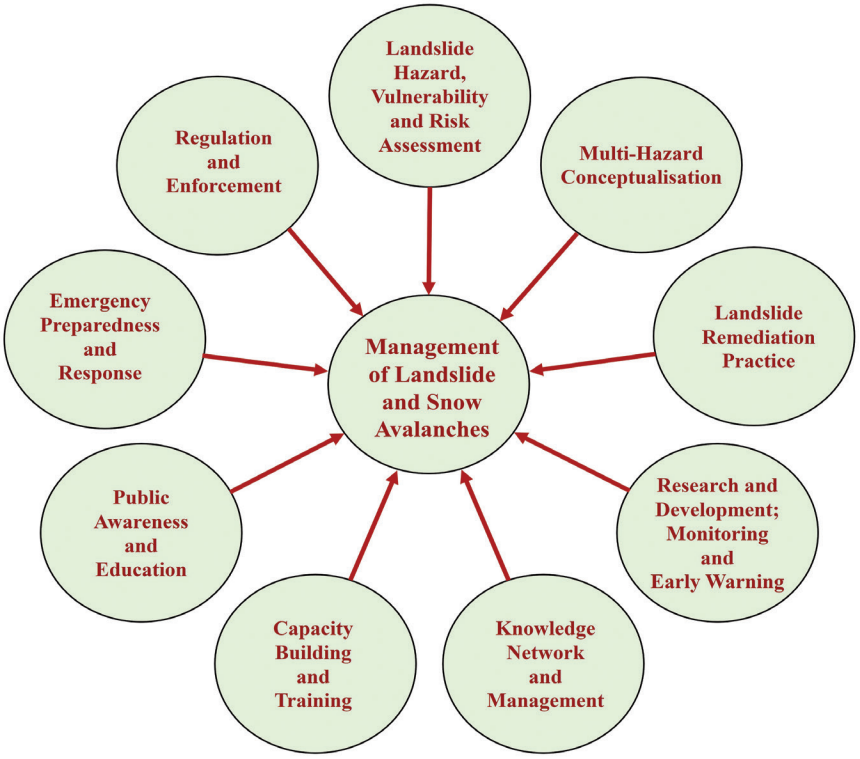
National Policy on Disaster Management, 2009

A National Policy on Disaster Management was formulated in the year 2009 with a vision to build a safe and disaster resilient India by developing a holistic, proactive, multi-disaster oriented and technology-driven strategy through a culture of prevention, mitigation, preparedness and response at all levels (NPDM, 2009). The policy exhorted mainstreaming disaster management plan in the development activities. Further, major emphasis was given on identification, assessment and monitoring of disaster risks; mitigation measures based on traditional knowledge, technology and environmental sustainability; forecasting and early warning systems; building disaster-resilient structures and efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society.

Guidelines on Management of Landslides and Snow Avalanches, 2009

Apprehending the enormous destructive potential of the landslides and the need of reducing the resultant losses of lives and economy, National Disaster Management Authority, Government of India in the year 2009 materialised "National Disaster Management Guidelines Management of Landslides and Snow Avalanches". The guidelines incorporated time-bound regulatory and non-regulatory framework to institutionalise the landslide hazard mitigation efforts apart from enhancing the capacity of society to take appropriate measures to avoid/reduce the risks and costs associated with the hazard (National Disaster Management Guidelines, 2009). To address the challenges against the landslides risk reduction and resilience, nine major areas were acknowledged for systematic, synchronised and effective management of landslides hazards (Fig. 10.1).

Fig. 10.1: Major Elements for Effective Management of the Landslides



Source: National Disaster Management Guidelines, 2009

National Disaster Management Plan (NDMP), 2016 & 2019

To carry forward the bequest of Disaster Management Act 2005, National Policy on Disaster Management (2009) and to shoulder the current global best practices and knowledge in all the horizons of disaster management, the National Disaster Management Plan was formulated in 2016. The plan provides a framework and direction to all the government departments/agencies for all phases {mitigation (prevention and risk reduction), preparedness, response and recovery (immediate restoration and build-back better)} of disaster management cycle (NDMP, 2019). It was the world's first national plan line up with the Sendai Framework-2015. NDMP was revised in the year 2019 integrating rationality of Sendai Framework for Disaster Risk Reduction (SFDRR)-2015, Paris Agreement on Climate Change, Sustainable Development Goals (2015-30) and Hon'ble Prime Minister Ten Point Agenda on DRR.

NDMP adopted the classification system the catalogues natural hazard into five major categories and is used globally for the Sendai targets monitoring. As per the classification, landslides are placed in the hydrological category while landslides as a secondary hazard after any earthquake are kept in a geophysical group. The national plan provides a planning framework and directions to government's cross-sectoral departments/agencies under six thematic areas for each hazard. The thematic areas classified are Understanding the Risk, Inter-Agency Coordination, Investing in DRR-Structural Measures, Investing in DRR-Non-Structural Measures, Capacity Development and Climate Change Risk Management. Further, these thematic areas are divided into different sub-thematic areas. The activities mentioned in the framework are grouped under overlapping time frames concluding by 2022 (short-term), 2027 (medium-term) and 2030 (long-term).

National Landslide Risk Management Strategy, 2019

To address all the odd challenges of the landslides at national as well as local level, National Disaster Management Authority, Government of India formulated a strategic document that also accomplishes the fifth target of Sendai Framework for Disaster Risk Reduction (2015-30) i.e., Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020 (NLRMS, 2019). National Landslide Risk Management Strategy laid recommendations on all the major components of landslide disaster risk reduction and management. The components which were focused are, landslide hazard mapping, monitoring and early warning system, awareness generation programmes, capacity building & training, mountain zone regulations & policies and mitigation of landslides & creation of special purpose vehicle for landslide management. The recommendations laid by the strategy document included:

- As most of landslide hazard zonation maps available are at a small scale (1:50000), they have limited efficacy in any development activities. Hence, the need of hour is to produce maps at macro and meso scale using advanced scientific state-of-the-art tools such as Unmanned Aerial Vehicle (UAV), Terrestrial Laser Scanner, and very high-resolution Earth Observation (EO) data.
- To foster the R&D for development of early warning system based on rainfall threshold, earthquake-induced landslide modelling and Wireless Sensor Network (WSN) based instrumentation.
- To promote the culture of awareness generation and preparedness by involving and educating the local communities especially the youth about the landslide management as well as other hazards of their respective areas.

- Identifying the target groups from national to the grass root level and enhancing their capacity for landslides risk reduction through training programmes having upgraded and simplified contents with new technological inputs.
- To review and revise existing codes/standards/uidelines for landslide management and to update and enforce building regulations and bye-laws by State Governments/ Local bodies.
- To identify most problematic landside sites and identifying suitable control measures for site-specific landslide stabilisation and mitigation of problematic landslides.
- To establish a national-level centre dedicated only for landslide research studies and management.

Initiatives Taken On National Interventions

A number of departments/institutes are working in the field of landslides risk reduction and resilience in the country. Geological Survey of India (GSI) under the Ministry of Mines is associated with studies of landslides since 1880. GSI was declared as the 'Nodal Agency' for undertaking research and development in the field of landslides management on January 29, 2004. The Gazette of India Notification dated September 25, 2012, constituted a Technical Advisory Committee (TAC) for Landslide Mitigation and Management to foster landslides related R&D in the field of mapping, monitoring and capacity enhancement. In 2014, GSI launched National Landslide Susceptibility Mapping (NLSM) programme to cover landslide prone areas of the country to create a dynamic National Landslide Susceptibility Geo-database, GIS-based seamless Landslide Susceptibility Maps and a nation-wide repository on GIS-based Landslide Inventory. The other achievements of GSI include collaboration with national and international organisations/institutes for the development of S&T for mapping, hazard risk assessment, instrumentations and early warning system.

Bureau of Indian Standards (BIS) published a number of codes and guidelines related to different facets of landslides such as landslide hazard zonation mapping, design and construction of various retaining walls, landslide control, selection of materials for residential buildings in hilly areas and national building code. Indian Road Congress (IRC) helped the stakeholders concerning landslides on highways and roads through their guidelines on landslides mitigation, prevention and correction. Building Materials and Technology Promotion Council (BMTPC) under Ministry of Housing and Urban Affair educed third addition of Vulnerability Atlas of India in 2019 that provides State-wise hazard maps and district wise damage risk tables for the whole country. Institutes/

organisations can be utilised given information and data in the Atlas for developing methodologies for mitigation and prevention.

In pursuance of the mandate of DM Act 2005 for capacity enhancement, National Institute of Disaster Management developed a training module on "Comprehensive Landslides Risk Management" beside face to face and online training programmes on landslides risk reduction and resilience.

Conclusion

The High Power Committee (1999) and Disaster Management Act 2005 were the milestones that set a robust comprehensive institutional framework of the disaster management in country. The national interventions taken for reducing the risks of landslides have boost the capacity of various stakeholders for effective management of landslides. Safeguarding of the slopes is not the responsibilities of a particular section. We need multi-hands to support to protect them. Though many initiatives have already been done against the national interventions yet we have to go a long way for building a resilient ecosystem. Some of the major points on which we have to work are establishment of a national level centre dedicated only for landslide research studies and management, large scale landslide mapping, considering landslide risks in development projects, pacesetter example of landslides management, developing robust early warning system and enhancing the capacity of local communities.

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