



# A Review of Policies and Institutions for Landslide Risk Management in Nepal

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## Abstract

Nepal has been experiencing different kinds of natural hazards in recent decades due to its unique topographic and climatic diversities. Earthquakes, landslides, floods, lightning, fire, cold and heat wave are major hazards. Among them, the landslide is one of the major natural hazards, and the occurrence of landslides is due to active tectonics and the Asian monsoon. The Spatio-temporal distribution of landslides in Nepal suggests that fatal landslides had an average of 113 death per year from 1971-2021. Moreover, Sindhupalchowk, Gorkha and Syangja had the highest number of fatal landslides. A proper landslide risk management policy should be implemented to reduce lives and properties. Landslide risk reduction is always challenging because it needs strong political determination, appropriate plans and policies, and good governance. This study reviewed the government's different plans, policies, acts and available literature to understand the status of landslide risk management in Nepal. Key informant interviews were conducted among stakeholders to understand how landslide risks are managed. The Disaster Risk Reduction and Management Act (DRRM), 2017, has considered the evidence-based decision-making processes instrumental in the paradigm shift from response-centric to anticipative and prevention-based approaches. Similarly, the Local Government Operation Act, 2017 has authorised and mandated the local government to undertake various functions for Disaster Risk Reduction. It is found that most of the plans and policies have not addressed landslides as an independent entity. Most existing documents have included disaster risk reduction but failed to identify the key issues of landslide risk reduction in Nepal. Therefore, this paper reviewed the current plans and policies and suggested recommendations for landslide risk management in Nepal.

**Keywords:** Landslide, Disaster Risk Management, Standard Operating Procedure, Contingency Plans

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## 1. Introduction

The occurrences of natural hazards in Nepal's Himalayas are common due to the coupling effect of the seismo-tectonic movement and the Asian monsoon. Landslide is one of Nepal's most prevalent hazards, damaging human lives and infrastructures. The country is characterised by rugged topography, high relief, diverse climatic conditions and complex geological structures. Nepal's complex geographical terrain followed by triggering factors such as extreme rainfall and earthquakes play a vital role in making the Himalayas vulnerable to landslides and other natural hazards. Besides, the growing urbanisation, haphazard excavation, and construction of roads and infrastructures without considering the natural hazards continuously aggravate landslide generation (McAdoo et al., 2018; Sidle & Ziegler, 2012).

The occurrence of landslides in Nepal's Himalayas has been increasing in recent years. Nepal's Himalayan region has witnessed a few large-scale landslide/debris flow in the past (B R Adhikari & Tian, 2021). For example, the Durban landslide of Myagdi killed more than 109 people and dammed the Myagdi River in 1988 (Upreti & Dhital, 1996). The debris flow in Phedigaun in the Palung Khola in central Nepal killed 62 people and destroyed 52 houses in 1993 (Upreti & Dhital, 1996). Similarly, the Krishna Bhir landslide was one of the most problematic landslides in the Nepal Himalaya that blocked the Prithivi Highway for 11 days and impacted the national economy (Maskey, 1999). Another large-scale Jure landslide buried a village with 156 death and blocked the Sunkoshi River, forming a 55 m high dam in 2014 (Van der Geest, 2018). Such landslides could be reduced by constructing mountain ponds to minimise soil erosion and stabilising landslides and gullies (Upadhyay, 2009).

The spatio-temporal distribution of landslides in Nepal suggested that fatal landslides reported by the DesInventar and Ministry of Home Affairs (MoHA) had an average of 111 death per year from 1971-2019 (Adhikari et al. 2022) (Figure 1).

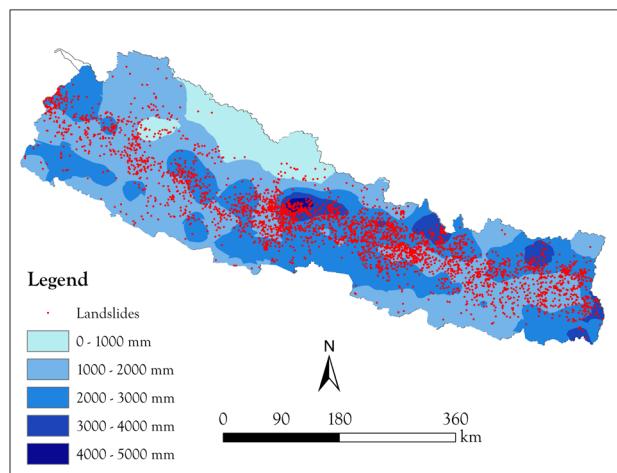


Figure 1: Spatial distribution of landslide in Nepal (Desinventar, 2016; MoHA, 2022) with total rainfall distribution in Nepal over 20 years period (1980-2014 (DHM, 2017)

A total number of 3201 landslide events were recorded from the Desinventar/newspaper from 1971 to 2013. Similarly, 2133 events were recorded from the Disaster Risk Recovery (DRR) Portal (MOHA) from 2014 to 2021, making a total of 5757 death, thus averaging around 113 deaths per year (Figure 2). Sindhupalchowk, Gorkha and Syangja districts had a high number of fatal landslides. The number of landslides was high ( $\geq 100$  events) in 1993, 1996, 2000, 2003, 2007 and 2013. The economic loss is enormous due to landslide.

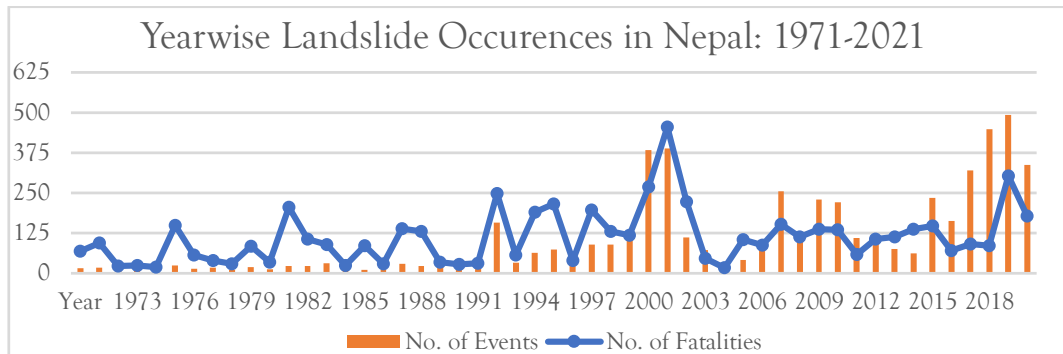


Figure 2: Year-wise landslide occurrence in Nepal from 1971 to 2021

The highest death toll in a single year was 455 in 2002, and the second highest death toll was about 303 in 2020. There has been an increment in fatal landslides and death tolls since 1993 (Figure 2). Similarly, the period between November to May has a significantly lesser number of landslide events and thus the least death tolls. However, the number of landslide occurrences increases from June to July, with the highest number of landslide events and death tolls. There was a slight drop in landslide occurrences and death tolls in August and September. The landslide data from the last 51 years shows that almost 91.7% of the landslide events occurred between June and September, contributing to nearly 90.9% of the death tolls. Thus, it is evident that the monsoon rainfall predominantly triggers landslide occurrence in Nepal.

The alarming trend of landslides should be studied in detail and integrated into the plans and policies. The Constitution of Nepal has addressed Disaster Risk Management as a whole, but it should be particular in terms of landslide risk assessment. Moreover, most existing acts, plans and policies are not explicitly spelt out on landslides. For example, the local Government Operation Act, 2017 has authorised and mandated the local government to undertake various functions concerning disaster risk reduction. However, it is not easy for landslide risk management in the changing federal context of Nepal, where different stakeholders are working together from the national to the local level. These stakeholders face

challenges regarding landslide investigation, project formulation and implementation due to unclear role division and duplication. Therefore, this paper discusses the major gaps and challenges for landslide risk reduction in Nepal and provides recommendations for better policy formulation and implementation.

## 2. Landslide Risk Management in Nepal

Landslide risk management is always challenging due to frequent landslides during the monsoon season. National Disaster Risk Reduction Management Authority (NDRRMA) has been established as per Section 10 of the Disaster Risk Reduction and Management Act, 2074. It is mandated to operate and manage disaster management activities effectively. The National Emergency Operations Center (NEOC) is working under NDRRMA within the Ministry of Home Affairs to address increasingly complex scenarios associated with landslide risks (Figure 3). The NEOC is multi-agency, comprising representatives from Ministries/Departments, other emergency services, non-governmental organisations (NGOs) and Private Sectors.

There are several departments under different ministries looking after landslide risk management. These institutions work against landslide risk in their limited capacities and organisational interests. For instance, based on its existing mandates, the Department of Hydrology and Meteorology (DHM) under the Ministry of Energy, Water Resources and Irrigation has focused explicitly on assessing and forecasting water-induced hazards, such as floods, droughts, and extreme weather events. Further, it has been issuing warnings relevant to the floods and landslides. Similarly, the same ministry's Water Resources Research and Development Centre (WRRDC) also has been supporting the training, research, design, geological, and geotechnical study for landslides and water-induced disasters. Under the same ministry, there is also a dedicated program entitled Vulnerable Landslide Management Project. Under the Ministry of Industry, Commerce and Supplies, the Department of Mines and Geology (DMG) has been preparing landslide inventories, distribution and susceptibility maps. Furthermore, DMG has been conducting emergency Geological Studies in the landslide-affected areas as per the request made through the Ministry of Home Affairs, Municipalities or other organisations and submitting the reports to the respective organisations. In addition, it has been carrying out the geological study of landslide-affected areas, ascertaining the cause of the landslide, recommending suitable mitigation measures, identification, and geological survey of resettlement areas.

There is a separate Landslide Management section under the Watershed and Landslide Division of the Department of Forest and Soil Conservation. It undertakes surveys, risk assessment and documentation of large landslides, preparation of plan

policies, development of intervention measures, and rapid damage assessments. It also prepares landslide atlas and strategic documents to support province and local government, strategic documents, etc.

Similarly, the Department of Roads (DoR) has been collecting data on road blockage under Highways Condition Reporting System. The residents are the key primary source of landslide information in Nepal. The locals report directly to their community and local police or other authorities. However, there has not been an integrated approach to gathering spatial information about such landslides to prepare an inventory. Nepal Disaster Risk Reduction Portal (<https://drrportal.gov.np>) has been collecting information related to different hazards (with the date of the incident, damage, missing people and estimated loss), including landslides, in the form of tables in the portal.

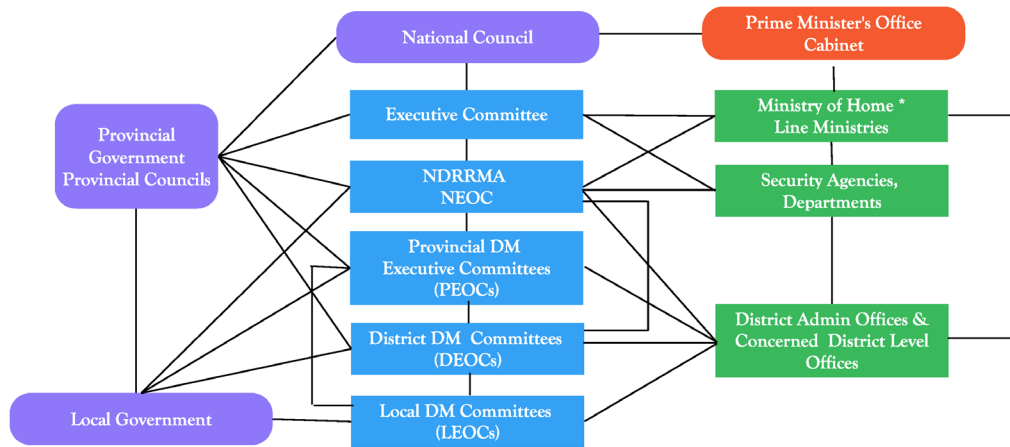


Figure 3: Organisational chart of disaster risk management in Nepal

### 3. Plans and Policies

Historically, landslide risk management activities were conducted on an ad-hoc basis, and most activities were predominantly reactive rather than proactive. The Disaster Risk and Management Act, 2074 (2017) (DRMA) (Figure 3) repealed and replaced the Natural Calamity (Relief) Act 2039 (1982) (NCRA) anticipated transitioning from the response-centric paradigm to an anticipative, prevention-based approach. The DRRM Act, 2017 is an umbrella Act incorporating the overall spectrum of the disaster management cycle. The act has mandated the National Disaster Risk Reduction and Management Authority to study and research the different landslides and soil erosion incidents. Moreover, the executive committee has the mandate to

relocate or cause to relocate the people and communities in safe zones living in steep-slope landslides threatening landslides. Further, it has assigned coordinating, facilitating and monitoring roles to the provinces and supporting local governments in disaster management (Figure 4).

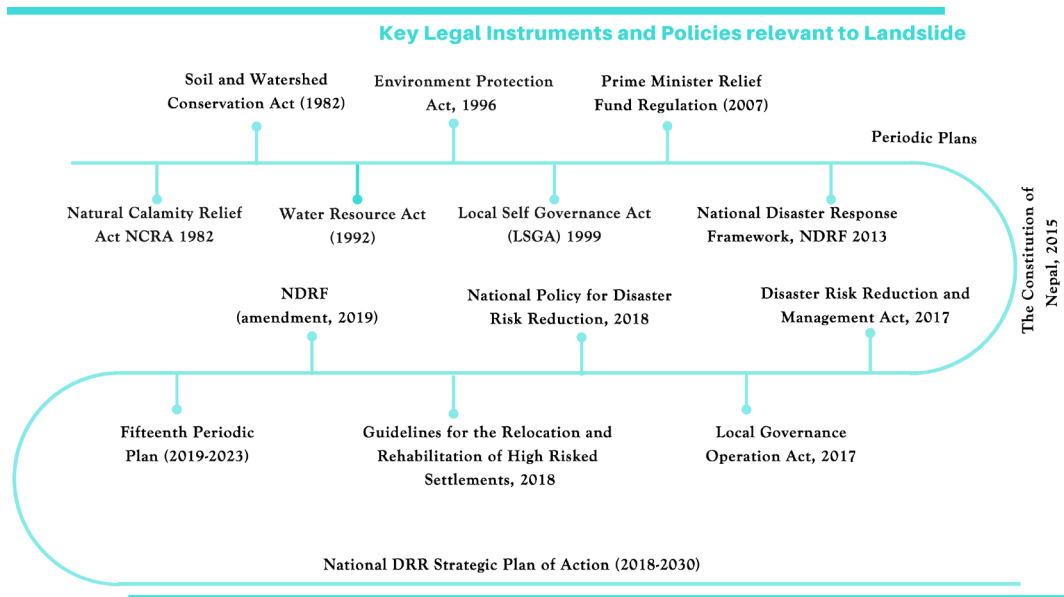


Figure 4: Timeline of major milestones of plans and policies in Nepal

The Constitution of Nepal has listed natural and human-induced disaster preparedness, rescue, relief and rehabilitation(s) in the concurrent powers of Federal and Provincial governments in its Schedule 7. Further, it delineates the role of disaster management to the local government as an implementation authority in Schedule 8 of the Constitution. Similarly, the concurrent powers of three tiers of government have been explored in Schedule 9. The Local Government Operation Act, 2017 has authorised and mandated the local government to undertake various functions concerning DRR. The Nepal Reconstruction Authority (NRA) enforced the Vulnerable (Geo-hazard Prone) Settlement Relocation and Rehabilitation Procedure, 2073 (2017) and Land Buying Procedure for Earthquake Affected Beneficiaries Guideline, 2074 (2017) for the displaced and landless people. Three categories were made as per the procedures and guidelines 2017; the first category didn't require relocation, the second category focused on protecting the area, and the third category focused on relocation somewhere else. National Reconstruction Authority (NRA) has published and distributed a resource book on 'Prevailing Acts, Procedures, Guidelines and annexes for Reconstruction in Nepal', a compilation of reconstruction-

related laws in Nepal. This resource book has become one of the essential reference materials for all stakeholders from the community to the district and national levels.

## **4. Methodology**

This research was carried out by reviewing relevant journal articles, government plans and policies, published newspaper articles and key informant interviews. All the journal articles published in national and international journals available in different databases such as Nepjol, Scopus, Pubmed and others related to disaster risk reduction and management along with landslide policy mentioning “Nepal and/or Himalayas” were reviewed. All the available national plans and policies were reviewed by visiting different government websites and available hard copies. Selected stakeholders representing government, academia, development partners, I/NGOs and private sectors were consulted for qualitative interviews. The interview questionnaires were categorised under six themes: the importance of landslide risk reduction measures in the context of Nepal; expert view on DRR/M practices; existing practices and initiatives in Nepal; key issues and challenges encountered; suggestions and recommendations and way forward.

## **5. Policy gaps and challenges**

The review process has revealed that most plans and policies have not addressed landslides as independent entities. Most existing documents have included disaster risk reduction but failed to identify the critical issues of landslide risk reduction in Nepal. Moreover, there has been no systematic review of Nepal’s institutional dimensions of landslide risk management. Due to inadequate plans and policies, the loss of lives and properties due to landslides has increased in recent years. The relevant stakeholder such as governments, academia, and development partners have not addressed the issues of hazard, exposure elements and vulnerability to understand landslide risk management. Therefore, this research has reviewed all the plans and policies on landslide risk reduction and recommends policy intervention. The following subsections were drawn from acts, grey literature, key informant interview or expert knowledge.

### **5.1 Coordination mechanism**

#### **5.1.1 Between the three spheres of government**

The coordination between three spheres of government during the planning process (7 steps) is well established; however, there lacks clarity in terms of the actor responsible for the response on a varying scale of landslide disasters. There are very high expectations from the local government as it is very close to the day-to-day activities



of the public. However, the local government must rely on the federal government's support due to the resource constraints and lack of adequate technical capacities. Most newly formed municipalities in 2014, 2015 and 2017 have little capacity to address landslide risk. Besides, the political differences have also affected the coordination of intra-and inter-governmental bodies. So, the power dynamics between these governments sometimes look like a standalone approach and sometimes duplication. However, on a positive note, after the establishment of NDRRMA, there has been support and facilitation to the local government in assessing the situation and carrying out the field assessment (MoHA, 2017). Some local governments have proven their response capacity during COVID-19. For example, the Melamchi municipality has shown its capacity during Melamchi debris flow with the help of NDRRMA in carrying out the household survey and field assessment. Moreover, NDRRMA has been focusing on impact-based multi-hazard early warning systems (EWS), but it needs to be improved with high-resolution meteorological data from satellite and ground measurement stations. The local government can use this information for food security and to save lives.

### **5.1.2 The conflicting role between local government and district-level organisations**

Landslide mitigation/risk reduction is primarily concerned with the local government and is supported by provincial and federal governments. The disaster response is further guided through the District Administration Office (DAO), which requires engaging security forces and relief management. There is a coordination gap between local government and the District Disaster Management Committee (DDMC) as there is no clear distinction between the scale of disaster and magnitude of engagement. Discretionary and discriminatory practices exist in relief package announcements and distribution by the political leaders (local government) and bureaucrats (DAO). Furthermore, there is a visible conflict in the coordination and collaboration due to the existing hierarchical imbalances between the Chief District Officer (CDO) and the Chairman of rural municipalities /mayor of municipalities. The mayor often finds it difficult to align with the CDO in case of delayed response in sending troops during a landslide emergency. It is difficult for the local governments to coordinate with some district-level organisations, including the Department of Road (DoR) and the Department of Forest and Soil Conservation (DoFSC), due to the limited resources and limited scope of landslide management work.

## **5.2 Budget allocation on disaster risk reduction**

There are provisions for the allocation of a certain percentage of the annual budget of the urban/rural municipalities for disaster risk reduction, which is often categorised



under “Environment and DRR Divisions”. The budget structure has focused mainly on response rather than preparedness and mitigation. The allocated budget has been used primarily as a relief fund for gabion wires, awareness and reliefs. Similarly, the budget allocation for landslide management is relatively low because there is a lack of adequate technical capacity to understand the importance of landslide management activities.

Moreover, the project formulation process does not follow evidence-based decision-making based on sufficient data, information, human resources and technical assistance. There is a lack of clarity in the budget due to inadequate knowledge of hard-core and soft-core solutions regarding the landslide risk. As per the recorded landslide events, landslides in Nepal mainly occur between June and September during the monsoon, while the fiscal year ends in mid-July. Therefore, landslide preparedness and risk management is always a deficit budget.

### **5.3 Regulations associated with landslide management**

Although the envisioned and enacted DRR plans, policies and guidelines cover different aspects of disaster risk reduction and management; they are limited in the disaster-specific context. Several provisions are provisioned for general disasters; however, the specific regulations on landslide management are in the early stage. The recently promulgated DRRM Act 2017 does not detail the specific landslide mitigation and debris flow management. The National Policy on Disaster Risk Reduction, 2018, has envisioned the short-term, medium-term and long-term strategies through the multi-sectorial participation of responsible supported by the concerned Ministries, provincial and local governments. However, it lacks the lead with a clear framework and roadmap for effective implementation in the field. The preparedness and mitigation work provisions are unavailable in the budget, and some incorporated in the infrastructure/development budget are below par.

### **5.4 Land-use management for reducing landslide/debris flow risk in the ecologically sensitive area**

People’s attachment to the existing places, lack of alternatives and livelihood opportunities, high-risk acceptance and lack of proper understanding pose challenges in relocating the people from the risk areas. Most landslides in Nepal’s mountainous regions are due to non-engineered road construction (McAdoo et al., 2018). Further, the debris generated during road construction adds up the vulnerabilities and intervenes the land use. The evidence-based decision-making practices are imaginary due to the regulatory bodies’ lack of resources and technical capacities. The mandates of the key stakeholders, such as the Department of Mines and Geology (DMG), and

DoFSC, etc., are neglected while considering the landscape, reshaping the slopes and land use. The components of participatory risk analysis and integrated risk-sensitive land use planning are given less priority. Nepal's National Land Use Project has started integrating landslide hazards during the Land Use Zoning map preparation. However, implementing these components is primitive and less opted at the local level.

The protection forces and interventions have contributed toward slope stability. However, in some places, it has resulted in slope failures due to the added surcharge. Further, the increase in forest floor had accumulated additional soil creating a perfect condition for debris generation during heavy rains or when runoff were diverted to the forest area. The effective implementation of the Environmental Act, National Adaptation of Program of Action (NAPA), Local Adaptation Plans of Action (LAPA), and Community-based Climate Change Adaptation Plan of Action (CAPA) will bring positive changes in land-use management (GoN, 2011; NAPA, 2010).

### **5.5 Financial instrument for landslide risk reduction**

The NDRRMA provisioned determination and implementation of instruments; procedures of disaster risk transfer, insurance and social security, which includes disaster management fund, agriculture and livestock insurance, soft loan, farmer's welfare fund, disaster response fund, and promotion of agriculture insurance.

However, there are significantly fewer or no financial instruments as such reduced tax and impact fees in landslide-affected regions. The National Disaster Risk Reduction Policy, 2018 has envisioned promoting and wide accessibility of agriculture, livestock, and business insurance for risk sharing and risk transfer of vulnerable communities (MoHA, 2017). Some initiatives such as crop and cattle insurance have begun in a few flood and landslide-prone areas, which links farmers with the Nepal Government's insurance subsidy program. The country diagnostics assessment prepared by Asian Development Bank reviewing the current disaster risk financing (DRF) landscape and enabling environment in Nepal reported that there are some provisions of risk transfer instruments: insurance, reinsurance, and capital markets (ADB, 2020). However, these financial instruments are not easily accessible to vulnerable people due to their limited or poor framework.

### **5.6 Public Private Partnership**

Despite the provisions for engagement of the private sector on DRR and environment protection, none of the agencies is seriously engaging. The NDRRMA, Guidance

note on Disaster Preparedness and Response Plan (2011) (MoHA, 2011), and Local Disaster Risk Management Plan Guidelines 2011 (MoFALD, 2011) promote the engagement of the private sector in disaster preparedness and response in the district and local levels. Based on them, some ongoing examples of private sector engagement include private radios/F.M.s in broadcasting jingles and awareness-raising messages. The construction sector provides heavy equipment and fund to clear debris and mitigation measures. However, there is a lack of trust between private and public sectors, a conducive environment for private sector business, a lack of motivation among stakeholders, and poor mutual accountability.

### **5.7 Institutional setup and coordination for landslide emergency response**

The local governments are solely responsible for landslide risk management. However, the National Policy on DRR has envisioned several agencies, like DHM, DMG, DoFSC, etc., as responsible for establishing a real-time landslide monitoring system, assessing geo-referenced exposure and vulnerability of landslide-prone infrastructures. The supporting agencies for these activities will be the concerned Ministries and different spheres of the government. However, there still lacks a comprehensive plan in a coordinated manner. The National Council for Disaster Risk Reduction and Management (NCDRRM), NDRRMA, Province Disaster Management Committee, DDMC and Local Disaster Management Committee (LDMC) are working on landslide risk reduction. Still, all the efforts are ad-hoc, and there is no specific module for landslide emergency management. There is a provision for District Emergency Operations Center (DEOC); however, it seems inactive in most districts. Few rural/municipalities opt for the Municipal Emergency Operations Center (MEOC) provisions, but again, it is in the infant stage. There should be proper coordination among the MEOC, DEOC, Provincial Emergency Operations Center (PEOC) and the federal level NEOC.

The MoHA coordinates with DMG for technical expertise and with DoR for placing some excavators, heavy equipment and associated human resources in some strategic locations to clear the debris in case of landslides. Security forces such as Nepali Army, Nepal Armed Police Force, Nepal Police and some Search and Rescue (SAR) trained human resources are major institutions for response activities. However, there are problems at the coordination level due to the hierarchical mismatch among the three spheres of government and authorities for the landslide emergency response. There are unclear roles, newly elected local leaders, a lack of sound communication and coordination between different role takers, hierarchy issues with CDO and Mayor, and not enough funds and human resources in place.

## 5.8 Standard Operating Procedures (SoP) for landslide emergency response

The National Disaster Response Framework (NDRF) (NDRF, 2013) and NDRRMA have well spelt out in their guidelines about SoP, but there is no specific module for landslide emergency response in Nepal. A lack of coordination and priority/focus are mismatched among and between the responding agencies and local, provincial and federal authorities. There is a lack of technical human resources and experts in the field and a tedious bureaucratic process. Therefore, the people and households not directly at risk of landslides are not interested in participating and contributing; meanwhile, the vulnerable have other livelihood priorities and cannot contribute.

## 5.9 Landslide Contingency Plans at different levels

The NDRRMA prepares monsoon preparedness plans during the pre-monsoon phase at different levels by meeting and engaging different stakeholders. The NDRRMA leads the process at the national level, whereas DDMC and LDMC lead at the local level. The Ministry of Home Affairs (MoHA)/NDRRMA issues letters to district and local levels to review and update the plans. Some district and local levels review the plans after getting the letter from MoHA, while some active district and local units do it proactively on their own without waiting for letters. The NDRRMA and security forces are working efficiently in disaster rescue and relief works, but their effectiveness in reducing losses and rehabilitating the affected is yet to be seen. Moreover, there is a lack of information, database, and coordination linkages with other plans and priorities correlated with landslide contingency plans at different levels.

## 5.10 Evacuation and emergency shelters

There are no such provisions for predefined or well-planned evacuation and emergency shelters for landslide victims. The provision of landslide emergency shelters was incorporated after the landslide of 1993; however, it faded over time. Recently, the affected communities were immediately provided with emergency shelters by the local government and other development agencies after the landslide disaster in the Sindhupalchowk district in 2021. Nonetheless, the shelters were inappropriate based on SPHERE guidelines because of the poor basic lifelines such as water and gender-friendly toilets (Sphere, 2018). In most cases, government schools, open spaces and relatives' houses were often used for emergency shelters. The local governments are facing challenges in managing the resources, identifying safe sites or locations for shelter construction and maintenance, difficulties in supply and management of food and non-food items, proper Water Sanitation and Hygiene (WASH), and escape routes identification, etc. The allocated budget is spent on preparing and managing

shelters reducing the budget and priorities for landslide preparedness. There are some successful case studies and stories of Landslide Early Warning Systems (LEWS); however, its replication and scaling to the other parts of the country are very weak (Thapa and Adhikari, 2019).

### **5.11 Capacity for damage assessment and Search and Rescue (SAR) after the landslide**

The international community highly praised the search and rescue operation conducted by the community during the Gorkha earthquake in 2015. However, the damage assessment and search operations were hindered by the remoteness, poor transportation, information and communication infrastructures. Local governments, NGOs, Red Cross district chapters and sub-chapters have been conducting search and rescue training at the local level. Nevertheless, organising and managing the regular refresher training and provisioning of SAR kits has been challenging. The MoHA, with support from Red Cross and other humanitarian agencies, have developed the guidelines, forms and templates for post-disaster damage and need assessment, such as Initial Rapid Assessment (IRA) and Multi-cluster Initial Rapid Assessment (MIRA).

Similarly, with different stakeholders' support, training is organised in different districts and rural municipalities/municipalities to generate a pool of resources that can assess needs, thereby building capacity. Security forces have a SAR team for damage assessment; however, there is a lack of adequate modern technology and resources to detect the life inside the debris and rapid excavation equipment. Moreover, rescue work is always delayed in remote areas due to most SAR-trained people migrating to urban areas.

### **5.12 Debris removal and road function restoration**

The status of debris removal on the roadside is very poor on rural roads. Generally, local governments and DDMC mobilise the local contractors, construction companies and hydropower agencies to coordinate to clear the debris and restore function on mutually agreed costs.

Similarly, DoR has provisions for the debris removal machine in different parts of Nepal and road maintenance activities. The road maintenance activities include preventive measures (clearing of ditches and pavement, repair of cut and fill slopes, etc.); periodic measures (overlay, gravelling, etc.); and emergency measures (removal of debris or obstacles, repair of damage caused by traffic accidents). Despite it, the number of road obstruction and debris accumulation cases is increasing yearly. Local

people also contribute voluntarily to debris removal but follow the traditional practices with the help of security forces and nearby technical offices.

The following challenges exist in different parts of Nepal:

- a. Availability of functional equipment and stand-by human resources in near locations
- b. Rapid characterisation of the landslide mass by a technical expert and guiding quick removal method
- c. Accompany debris removal by immediate temporary stabilisation to avoid falling of the debris.
- d. Availability of alternative routes.

### **5.13 Landslide risk information dissemination and knowledge**

The knowledge on landslide risk is primarily centralised and very poor at the local level. There are fewer efforts on applications of science and technology in landslide risk information dissemination and knowledge building. A good number of technical research papers and reports are available, but there is a massive gap in the implementation at the ground level. At the national level, government agencies such as DMG, DoR, DoFSC and NDRRMA, universities, non-governmental organisations/networks such as the National Society for Earthquake Technology-Nepal (NSET), Disaster Preparedness Network-Nepal (DPNet), Community-based Disaster Risk Management (CBDRM) platform, Association of International Non-Government Organization task group for Disaster Management and Climate Crisis (AINTGMCC), National Platform for Disaster Risk Reduction (NPDRR) and I/NGOs are active in knowledge generation, gap identification and dissemination. Similarly, local government offices and I/NGOs are facilitating the participatory vulnerability and capacity assessment at the district level.

Moreover, radios, T.V.s, newspapers, and social media are also used in information dissemination. The information is used in awareness-raising campaigns and disseminated through formal/semi-formal meetings, door-to-door campaigns, brochures, flexes, flyers, street dramas and songs. Recently, the NDRRMA has started developing thematic videos and awareness materials and disseminating them through social media. Nonetheless, the question of the accessibility of the resources to the people vulnerable to landslides; the credibility and accountability of the thematic experts on landslide risk mitigation and management as everybody becomes landslide experts irrespective of their knowledge is always there.

### **5.14 Community-based emergency preparedness and response**

In previous years, there have been scattered, scanty Community-based Emergency Preparedness and Response activities, but most did not focus on landslides. Presently, although there is a provision in LDMC, implementation is very weak because most activities are spontaneous, coordination gap and consensus building with all communities, isolated, poorly organised and donor-driven. Similarly, most of the young generation have migrated from the villages, older people cannot do anything during the landslide emergency, and communities prioritise livelihood. In addition, women, the elderly and persons with disabilities (PWDs) and other at-risk groups are not well participated in the risk analysis and risk reduction planning process.

### **5.15 Human resource allocation and existing capacity**

At the central level, DMG, DoFSC and DOR have the technical capacity, but there are no or minimum technical human resources in the local governments. The provision of a technical person like a single civil engineer for the landslide management seems very primitive. It will be challenging for a single technical person to look after the overall aspects (including building construction, regular day-to-day engineering activities, landslide risk estimation, and so on). Multidisciplinary approaches involving geologists, environmentalists, soil conservation experts and DRR experts at the local level are essential. Thus, a similar kind of human resource allocation must be made to contribute to risk reduction.

Additionally, there is a lack of understanding of landslide planning and budget allocation; therefore, most of the budget is relief supply centric. Moreover, a considerable gap exists between academia/university professors and implementing agencies like local government. Similarly, the out-migration of skilled human resources on EWS, first aid and SAR is another major threat to the local government. Also, there is a lack of motivation and desire to learn about new technology/research findings in the bureaucracy.

### **5.16 Gender equality and social inclusion (GESI) during landslide management**

The integration of GESI in landslide risk management is impoverished and often ignored, but some practitioners have been raising this issue for a long time. There is a lack of meaningful women participation besides a few participation. Every rural municipality /municipality has a female elected chairperson or deputy chairperson/mayor/deputy mayor; however, the DRRM plan formulation lacks the proper participatory risk analysis process. Hence, the most vulnerable groups are generally excluded from this process. When the poor, ethnic minorities, persons with



disabilities marginalised and women are expected to engage in community-based landslide management interventions voluntarily, they must compromise their waged labour and household chores.

Similarly, there have been difficulties in engaging them in the committee at the local level while formulating and preparing the Local Disaster Risk Management Plan (LDRMP)/Local Disaster Climate Local Disaster and Climate Resilience Plan (LDCRP) guidelines. The guideline has also emphasised political representatives, civil servants, social workers, local teachers, etc., as the committee members. However, most of them are male or people from a higher caste. Hence, making the committee non-inclusive and dominated by persons from higher castes and males.

### **5.17 Incorporation of academic research findings for risk reduction**

The findings of M.Sc. and Ph.D. research of different national and international universities are intriguing and applicable. The development of landslide hazard methodology is well established in the academic arena. The preparation of landslide inventory is well established in different academic programs of various departments such as the Department of Geology, Department of Civil Engineering, Department of Environmental Sciences, and Department of Geography of the Tribhuvan University. Some other information is also available in other universities in Nepal. However, academic research findings are not properly used and utilised. Therefore, preparing the national database of these research works is of utmost necessity. The central government, i.e., the Ministry of Education, Science and Technology, should prepare a national database system. Similarly, the NDRRMA could also integrate these information into the BIPAD portal. Moreover, these information and findings should be incorporated into plans and policies.

## **6. Conclusion**

Landslide risk management is a concurrent responsibility of all three levels of government responsible for landslide risk reduction in Nepal. Among them, the local government has more responsibility for landslide management. However, the local governments do not have adequate human resources for landslide management. Most of the plans and policies are focused on landslide hazard management. Introducing hazards, exposure elements and vulnerability are necessary to integrate into policy. In the new federalism, there are unclear and overlapping interests of different levels of government, from the local to the federal. Therefore, there should be more clarity in terms of jurisdictions and responsibilities. Most importantly, the local government should be well-equipped with search and rescue equipment and technical human

resources for launching a community awareness campaign on landslide risk information evidence-based decision-making process with relevant institutions.

## **7. Policy Implication**

Nepal has entered into a federal structure and promulgated “The Constitution of Nepal, 2015”. Disaster management falls under the local government; however, there should be proper communication between three spheres of government. These concerned departments and stakeholders must be oriented to understand the existing landslide risk in the country. The following suggestions are recommended to improve Nepal’s existing policies for landslide risk reduction.

- The landslide inventory and hazard map should be prepared on a 1:25000 scale covering Nepal. The disaster portals, i.e., BIPAD and DRR portal, should be upgraded to incorporate the spatial landslide information (GPS location) of the landslide at the ward level.
- A detailed implementation plan should be formulated at the ward level, activating the ward disaster management committee. These plans should be backed by regular mock drills creating hypothetical scenarios.
- The district disaster management committee should bring concerned stakeholders such as local government, District Administration Office, and Department of Roads to discuss the overlapping and conflicting roles.
- The disaster policy should include Sloping agricultural land technology (SALT), cash crop plantation, stream management and small stream mitigation
- The environment protection fund should be established for the protection of the environment, prevention and pollution control.
- The Public Private Partnership (PPP) framework should be formed in an easy way with incentives to recognise financial support in implementing landslide risk reduction measures.
- A separate Standard Operation Procedure (SOP) should be formed at the local level involving Geographic Information System/Technical information with clear roles and responsibility for landslide emergency response.
- One national entity should directly coordinate with all three government spheres for landslide risk reduction.
- The emergency response plan should be formed based on risk assessment incorporating local culture and socio-economic setting.

- The national landslide policy should be prepared with clear roles and responsibilities of the concerned stakeholders for developing robust disaster governance that would bring management and broader policy into a single framework.
- Academic research findings such as from M.Sc and PhD thesis should be used for landslide risk reduction.
- The local government must be well-equipped and technically sound and draft the policy with community consultation.

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Mr Suraj Gautam is a geo-hazard researcher working in the Nepal Himalayas. He is a graduate of Masters in Disaster Risk Management with a background in Civil Engineering from the Institute of Engineering, Pulchowk Campus. Currently, he is working as an Executive Director at the Institute of Himalayan Risk Reduction. He is working extensively on the application of frontier technologies like UAVs and has been collaborating with multiple stakeholders for the science-based decision making in DRR/M. He has been leading a number of activities that include Hackathon, Exploration of Indigenous Knowledge and Technologies, highresolution aerial survey of an urban city, and so on. His key research interests lie in the area of Geo-Hazards, Urban DRR and Climate Change along with its modelling, mapping, and risk assessment. He is also enrolled in a Young Scientist Program of Integrated Research on Disaster Risk (IRDR). He was a fellow of Kathmandu Metropolitan City Mayor’s Research Fellowship 2020/21 Program.