Developing National Disaster Risk Reduction Policy and Strategic Action Plan in Nepal: 2016- 2030

Lessons Learned from Recent Major Disasters in Nepal

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1 Introduction

Nepal is exposed to various geophysical, hydrological, climatic and biological hazards which each year kill hundreds of people and wreak vast economic damages. Nepal stands at the top 20th on the list of the most multi-hazard prone countries in the world[1]. It is ranked at the 11th in earthquake risk, 4th in climate change vulnerability[2] and 30th in flood risk[3]. Main hazards in Nepal are earthquake, epidemics, floods (including flash floods, Glacial Lake Outburst Floods), landslide, drought, storm, hailstorm, thunderbolt, avalanches, heat-wave, cold-wave and forest fires. Floods, landslides, epidemics, thunderbolt and forest fires are recurring disasters. The Gorkha earthquake 2015 and following aftershocks resulted in loss of 8891 lives and destruction of over a half million houses with economic loss of about USD 7 billion[4]. Each year, about 300 people in average die due to floods and landslides alone with annual economic damages exceeding USD 10 million. In the past 100 years, earthquakes have caused the most deaths of all disasters. However, floods have cost the most in damages. 33,482 people lost their lives due to various disasters from 1983 to 2015[5]. Disasters are costing about 6% of annual development expenditure of Nepal.

The causes of disasters in Nepal are the combination of various phenomena such as steep topography, fragile geology, extreme weather, land degradation, soil erosion, poverty, urbanization and unplanned development activities. The Himalayan mountain range is formed by orogeny, resulting from the collision of the Indian subcontinental plateau with the European continental plateau. The orogenic movement is still active as evidenced by numerous earthquakes in the region. The mountains and hilly landforms are young and unconsolidated and are fragile due to crustal deformation in the course of the orogenic movement. During the summer monsoon season, a belt of low atmospheric pressure known as “monsoon trough” is normally established over the northern plains of India. Sometimes, it moves northward to the foothills of the Himalayas and stays there for a couple of days before retreating back. Because of the lowest pressure, it creates the most unstable weather condition in and around this area, the severity of which depends mainly upon the moisture content in the air. During this period, a heavy downpour of the rain occurs triggering severe floods and landslides. Deforestation and unmanaged agricultural practices contribute to land degradation and soil erosion resulting in heavy sediment load in the rivers which aggravates the flooding problem. Urbanization also aggravates the flood problem by decreasing runoff retarding functions and accelerating flood flows due to pavements, rooftops and drainage systems. Urbanization has also resulted in increase in vulnerability. Climate change further exacerbates the disasters by enhancing the magnitude and frequency of extreme weather events.

[1] Nepal Disaster Report 2015, The Government of Nepal, Ministry of Home Affairs and Disaster Preparedness Network-Nepal

[2] https://maplecroft.com/about/news/ccvi.html

[3] UNDP/BCPR, 2004, Reducing Disaster Risk: A Challenge for Development, A Global Report, United Nations Development Programme, Bureau for Crisis Prevention and Recovery, New York, USA

[4] Nepal Earthquake 2015, Post Disaster Needs Assessment, Government of Nepal, National Planning Commission

[5] Disaster Review 2015, Government of Nepal, Department of Water Induced Disaster Management

This background working paper provides the review of the recent major disasters such as floods in Koshi and Far Western Region in 2008, floods in Surkhet, Bardiya and Kailali in 2014, Jure landslide in 2014 and Gorkha earthquake in 2015. The causes of those disasters, and good practices, shortcomings and recommendations of managing the disasters are presented.

2 Major Disaster Events between 2005 - 2015

2.1 Koshi Flood 2008

On 18 August 2008, the embankment 12.6 km upstream of barrage of the Koshi River breached. When the Koshi River changed its course towards the east breaching 1.70 km of its left embankment, it deposited silt on the flood affected area and adjoining villages covering 5475 ha of agricultural land. About 80% of flow passed through the breached section.

It caused displacement of more than 107,200 people with a death toll of eight in Nepal. Approximately 493 lives were lost and 3,500 were reported missing after the disaster on the Indian side[6]. The death toll would have been very high if the flood had occurred at night. Progression of embankment breaching took place at the rate of about 500 m in every 5 hours breaching 1.7 km of left embankment. Low intensity rains for several days during monsoon season and scouring of the embankment caused the embankment to collapse. About 15 km of the East-West highway was obstructed and 3 km was damaged. The floods had drastic impacts on habitats of wildlife, aquatic flora and fauna of the Koshi Tappu Wildlife Reserve. About two thirds of houses were severely damaged as most of them were huts made of mud, bamboo and thatch. It caused extensive damage to the optical fibre cable network laid along the highway. In addition, telephone exchange, power plant, the main distribution frame transmission system were submerged in the floods and caused disturbances to the communication network in the eastern region of Nepal[7].

Causes:

- Natural
    - Breach of embankment due to erosion, change in river morphology, bed level rise, excess sediment load and concentration of flow towards eastern embankment
- Man-made
    - Poor maintenance of the embankments

Good practices:

[6] GFDRR, 2010. Bihar Kosi Flood (2008) Needs Assessment Report Prepared by Government of Bihar, World Bank Global Facility for Disaster Reduction & Recovery.

[7] Baral, M., 2009. Water Induced Disasters, Flood Hazard Mapping & Koshi Flood Disaster of Nepal, Report prepared for East & Southeast Asia Regional Seminar on Flood Hazard Mapping, Manila, Philippines, available online: http://www.icharm.pwri.go.jp/training/2009seminar/progressreport2009_nepal.pdf (accessed on 03/11/2016)

- Cluster approach[8] for emergency response proved effective and efficient

Shortcomings[9]:

- Lack of regular monitoring and maintenance of embankment
- Over confidence on the strength of structures (false sense of security)
- Lack of good coordination between Nepal and India (transboundary cooperation)
- Not proper capacity built and prepositioning for emergency response activity
- Lack of preparedness
- Lack of non-structural measures like raising of awareness, development of early warning system and flood hazard/risk mapping
- Poor coordination among government agencies in Nepal at national and district level
- Unsystematic/unmanageable political interventions during emergency response

Recommendations:

The Koshi flood due to embankment breach has taught us to take care of infrastructures. This also revealed the role of different agencies in different phases of disasters and reminded to shift the approach from traditional relief to preparedness.

- Risk Reduction
    - Promote flood adaptive infrastructures (e.g. adequate drainage, houses on stilts, raised plinth level etc.)
    - Promote community participation in flood management and mitigation
    - Perform regular maintenance of the embankments
    - Develop flood risk maps and implement land use regulation on flood risk areas

- Preparedness
    - Develop EWS
    - Public awareness and education
    - Improve coordination among government agencies
    - Strengthen preparedness for emergency response
    - Diversify livelihoods for building resilience to disasters
- Relief/rescue
    - Strengthen cluster approach at national, district and local level
    - Enhance coordination among government agencies, humanitarian organizations and private sector
- Recovery/reconstruction

[8] A cluster is a group of agencies that gather to work together towards common objectives within a particular sector of emergency response. The cluster approach, instituted in 2006 as part of the UN Humanitarian Reform process, is an important step on the road to more effective humanitarian coordination. National Disaster Response Framework 2013 of Government of Nepal has made the provision of 11 clusters with Government Agencies as leads and Humanitarian Agencies as co-leads.

[9] Dixit, A., 2009. Kosi Embankment Breach in Nepal: Need for a Paradigm Shift in Responding to Floods, Economic & Political Weekly, February 7, 2009.

- Manage floods by following policy of 'river management' rather than policy of 'river control'
- Take measures for reducing erosion and sedimentation

2.2 Mid-and-Far Western Flood 2008

In 19 - 21 September 2008, the Mid-and-Far Western Tarai region of Nepal witnessed the worst flooding in 25 years due to heavy late monsoon rains (229 mm of rainfall within 24 hrs, and over 400 mm of rainfall within 48 hrs). Several flash floods and landslides affected 23,660 households, killing 15 people in Kailali District. The damages caused by these devastating floods to infrastructure, private property and livelihoods were severe. The worst affected villages were Dasinhapur, Narayanpur, Tikapur, Khailad, Lalbojhi, Bhajani and Thapapur[10].

A large number of the affected populations were displaced in the immediate aftermath of the flash floods. Livelihoods were largely affected as the majority of the flood-affected populations were dependent on hard labour and working on the crops, which are affected. The flood waters largely damaged rice that was stored in houses, depriving the flood-affected families of both food security and the main income for the year. The canal systems were damaged, which increased insecurity in production. Animal husbandry was also badly affected. Local infrastructure was affected by the flash floods and landslides.

Causes:

- High intensity rainfall

Good practices:

- Cluster approach for response proved to be effective and efficient.
- Food for work program was helpful to recover from floods.
- The communities took initiatives to repair the community infrastructures.

Shortcomings:

- Lack of transparency in distribution of relief
- Delay in relief and rescue
- Inadequate amount of relief materials
- No special food for children
- Lack of adequate and proper medicine
- Lack of female health workers
- Lack of support for the loss of educational materials
- Structurally weak school buildings damaged easily due to floods
- Low quality non-food-item (NFI) and hygiene kit
- Inadequate water purifier and hygiene kit
- No orientation and training on the use of hygiene kit

[10] Workshop Report, Flood response lessons learned workshop, District Disaster Relief Committee – Kailali, 4 February, 2009

- No support on rehabilitation of damaged hand pumps
- No post-event assessment of agriculture
- No technical support to cultivate in sand-covered lands
- Lack of flood early warning system
- Lack of proper monitoring and evaluation system

Recommendations:

- Risk Reduction
    - Resilient water and sanitation system against floods, these could include raised hand pumps, raised toilets etc.
    - Design of structures particularly critical infrastructures – such as schools, hospitals, government offices, and shelter in low risk areas.
    - Lack of 'open' and 'actionable' risk assessment
    - Bioengineering in the flood prone area
    - Strengthen/retrofit weak school buildings and shelters
- Preparedness
    - Preparedness, for example, rescue centers, safe places, NFI Bank
    - Establishment of early warning system in flood prone area
    - Preparedness plan for upcoming monsoon
    - Create basket fund for emergency response
    - Scaling up of the Community Based Disaster Preparedness
    - Rural and Urban Municipal Disaster Risk Management Plan/ Finalization of Emergency Preparedness Plan
    - Pre-positioning of food and NFI at community level
    - Planning and Monitoring led by DDRC and implementation process in field level
    - DDRC need to form sub-committees in flood prone communities
    - Need of warehouse in the flood prone area
    - Market survey for relief items
    - Creation of the Assessment Roster and training
    - Rural municipal level Disaster Management Committee
    - Data Bank / Information Management
    - Strengthening of the overall and general coordination mechanism and Capacity building of DDRC
    - Nomination of the Disaster focal Person at the organization level
- Relief/rescue
    - Proper assessment before the relief distribution to avoid any conflict in the community
    - Ward level committee to be formed with the participation of affected people to ensure proper distribution of relief support and assessment
    - Distribution should follow Sphere standards[11]

[11] Sphere standards help aid workers determine the minimum level of quality in humanitarian aid, providing both a description of what's required, quantitative indicators to help determine if these are met, and guidance notes as to

    - Food should be distributed at ward level
    - Gender balance approach in emergencies, inclusion, participation and joint monitoring and evaluation
    - Identity card system should be introduced for the relief distribution
    - Planning and Monitoring of the relief work should be taken by DDRC
    - Identify focal person within a organizations to coordinate flood response
- Recovery/reconstruction
    - Develop rapid assessment system for rehabilitation and reconstruction
    - Establishment of monitoring mechanism for relief distribution, recovery and reconstruction
    - Rehabilitate damaged hand pumps

2.3 Kailali and Babai Flood 2014

On 15 August 2014, there was widespread flooding in the Tarai areas of Babai and Karnali rivers triggered by heavy rainfall in the foothills of the Babai and Karnali catchments. In 24 hours, nearly 500 mm of rain fell across the plains and foothills[12]. A total of 34,760 families (173,800 people) have been affected, of which 5,936 families (29,680 people) are displaced. 53 people confirmed dead. The floods and landslides have damaged roads, bridges, local markets, transport vehicles as well as livestock, crops and daily consumables. More than 1,240 houses destroyed and 435 houses damaged[13].

The analysis of the flooding event has identified the following causes, good practices, shortcomings and recommendations:

Causes:

- Natural
    - Heavy rainfall
- Man-made
    - Fragile infrastructures (housing, power, transport, communications)
    - Embankment failures and breaches

Good practices:

- EWS are effective in saving lives and to some extent property (Babai River EWS failed due to washing away of equipment but Karnali River EWS worked well)
- Community Disaster Management Committees are instrumental in responding to community needs. Local response is more effective than central response.
- Diversified livelihoods increase resilience of the communities to cope with the flooding.

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how agencies should work with communities, in 4 key sectors: water and sanitation, health, food security, and shelter.

[12] Risk Nexus, Urgent case for recovery: what we can learn from the August 2014 Karnali River floods in Nepal, Zurich Insurance Group Ltd and ISET-International.

[13] http://www.ifrc.org/docs/Appeals/rpts14/IBNPfl170814

Shortcomings:

- Poor coordination across and within state agencies and government departments
- Slow response
- Political interference during the response
- The Government of Nepal has not adequately focused on basic needs of people such as housing and livelihood assets in its recovery efforts. Most people have to recover on their own. People have to build their housing infrastructures and livelihood assets on their own.
- Flood protection systems, such as embankments, are designed without considering the changing pattern of river bed level and sedimentation and increasing trend in rainfall intensities due to climate change.
- Lack of land use regulation is increasing disaster risks due to developments adjacent to risk-prone areas.
- Government funding for response and emergency preparedness is inadequate.
- Hydrological and meteorological monitoring network is inadequate.
- Lack of redundancy in EWS[14].

Recommendations:

- Risk Reduction
  - Establish proper guidelines for designing hydraulic structures to reduce flood risks (e.g. downstream structures shouldn't block flood flow, upstream structures should retain flood flow)
  - Harness and scale up local capacities to increase flood resilience
  - Design, implement and maintain flood protection systems in ways that don't ultimately exacerbate risk
  - Design flood protection systems considering the changing pattern of river bed level and sedimentation and increasing trend in rainfall intensities due to climate change
  - Establish participatory disaster risk management system
- Preparedness
  - Enhance hydrological and meteorological monitoring network
  - Enhance existing EWS and expand to other basins
  - Maintain redundancy in EWS
  - Establish monitoring and evaluation system, organize pre-monsoon and post-monsoon multi-stakeholder's workshops to review preparedness measures before monsoon and effectiveness of response after monsoon
  - Allocate adequate funding for emergency preparedness, especially at the local level
- Relief/rescue
  - Promote cluster approach for effective and efficient response

[14] Spare stock should be maintained for the equipment of early warning system such as batteries, solar panels, sensors, data logger, communication system etc.

- Strengthen coordination across and within state agencies and government departments
- Provide adequate Government budget for response and emergency preparedness

- Recovery/reconstruction
  - Update existing flood risk maps regularly considering the vulnerabilities of the population and the infrastructures
  - Regulate developments in flood plains
  - Enforce building construction regulation
  - Improve coordination – within communities, between humanitarian organizations, between government and humanitarian organizations etc.

2.4 Jure Landslide 2014

A massive landslide occurred on 2 August 2014 at Jure village in the border of Mankha and Ramche VDC of Sindhupalchok district. The landslide killed 156 people, injuring 27 and displacing 1011 people[15]. Only 33 dead bodies including those of 7 children have been recovered from the debris. Unfortunately 123 missing people buried in the debris have been presumed dead as their remains were not traced. The highly affected 4 VDCs are Ramche, Mankha, Dhuskun and Tekanpur. About 165 houses were damaged completely whereas about 37 households were partially damaged. The landslide damaged several schools, shops, fish-ponds and poultry firms. The landslide blocked Sunkoshi River creating a high dam across the river. The landslide-dammed lake created havoc amongst the local residents and people living in the downstream and upstream riverside areas. The landslide damaged and completely obstructed the Arniko Highway making it impossible to pass through the landslide disconnecting the only route that connects Nepal to the Chinese border. Five hydropower plants and several bridges were also damaged. The damage and losses due to blockage of road, disturbance on livelihood and economic activities, damages in transmission line and hydropower plant were significant.

Causes:

- Natural
  - Seepage of water through cracks in the rock at the upper and middle portions of the landslide mass
  - Steep topography
  - Fragile geology
  - Seismic activities
  - Heavy precipitation
- Man-made
  - Uncontrolled human settlements
  - Construction of roads without proper stabilization of hill slopes

[15] Report on Jure landslide, Mankha VDC, Sindhupalchowk District, Ministry of Irrigation, Government of Nepal, September 21, 2014

Good practices:

- Nepal Army carried out controlled breach of landslide induced dam

Shortcomings:

- Inadequate relief and rescue
- Distribution of relief and rescue not effective and efficient
- Lack of coordination between different Government institutions
- Lack of equipment and trained human resource

Recommendations:

- Risk Reduction
  - Landslide hazard mapping
  - Formulate risk sensitive land use planning and enforce regulations
  - Establish community based disaster management system
  - Awareness raising on landslide risk
- Preparedness
  - Strengthen preparedness measures in high risk areas
  - Monitoring of critical landslides and establishment of EWS
  - Stockpile adequate relief and rescue materials for high and medium-risk prone areas
  - Provide trainings and conduct mock drills regularly
- Relief/rescue
  - Promote cluster approach for effective response
  - Enhance coordination between different Government institutions
- Recovery/reconstruction
  - Establish an autonomous, powerful and capable organization for landslide risk management in a holistic manner
  - Establish a disaster database management system
  - Resettlement of the people from high risk areas to safe areas
  - Promote research in collaboration with Universities on landslide risk reduction

2.5 Gorkha Earthquake 2015

On 25 April 2015, a massive 7.6 magnitude earthquake struck Nepal, with the epicenter near Barpak village of Gorkha district. It was the worst quake to strike the country in more than 80 years. After 17 days on 12 May 2015, another 6.8 magnitude strong aftershock caused further damage and sufferings. These earthquakes took the lives of 8,891 and injured seriously 22,303 people. The earthquake destroyed 604,930 houses completely and 288,856 houses partially. It is estimated that the total value of disaster effects (damages and losses) caused by the earthquakes is NPR 706 billion or its equivalent of US$ 7 billion[16]. This devastating earthquake

[16] Nepal Earthquake 2015, Post Disaster Needs Assessment, Government of Nepal, National Planning Commission

has affected vast parts of Nepal and left deep scars in the economy and infrastructure of the country.

Causes:

- Natural
    - Seismicity due to plate-tectonics
- Man-made
    - Unplanned settlements
    - Environmental degradation
    - Population growth
    - Urbanization
    - Low levels of development
    - Poverty
    - Social exclusion
    - Fragile infrastructures (housing, power, transport, communications)
    - Weak institutions

Good practices:

- Community based institutions played a constructive role in managing services like drinking water, electricity, forest and even developing infrastructure such as trail bridges

Shortcomings:

- Lack of sufficient search and rescue equipment and resources
- Slow and inadequate search and rescue
- Search and rescue not well organized
- Delay and serious lapse in damage and need assessment
- Lack of emergency warehouses, prepositioning of relief materials with proper inventory
- Lack of debris management equipment, tools and techniques
- Lack of open spaces for temporary settlement
- Inconsistency between the need of the affected people and delivery of services
- Weak database on earthquake risk

Recommendations:

- Risk Reduction
    - Develop risk-sensitive land use plans, regulations for enforcing such plans and building code, building by-laws etc.
    - Scaling up new construction and retrofitting of schools and hospitals
    - Develop a seismic risk reduction policy
    - Set up a network of seismic monitoring throughout the country and promote seismological research
    - Improve legal and institutional arrangements for seismic risk assessment

    - Mainstream DRR into the developmental sector, particularly housing, private and critical public infrastructure, social sectors (health and education), and livelihood
    - Improve integration of climate change adaptation and DRR
- Preparedness
    - Build social capital and community resilience
    - Improve preparedness, response, relief and logistics systems
    - Enhance multi-hazard risk monitoring, vulnerability assessment, risk information dissemination and awareness
    - Develop early warning systems
    - Promote community based disaster risk management system
- Relief/rescue
    - Promote cluster approach
    - Strengthen information and communication capacities for relief, response and recovery
- Recovery/reconstruction
    - Build earthquake resistant infrastructures
    - Revise building codes, develop building by-laws for all rural and urban municipalities
    - Enforce building code and other regulations (e.g. land use) strictly

3 Key Recommendations for Disaster Risk Reduction Policy and Strategic Action Plans

The recommendations in line with 4 priority actions of Sendai Framework for DRR are as follows:

1. <u>Understanding</u> Disaster Risk

- Enhance multi-hazard risk monitoring (seismic monitoring, hydrological and meteorological monitoring, monitoring of diseases, forest fires etc.)
- Develop national standard for multi-hazard risk assessment
- Enhance multi-hazard risk assessment, develop multi-hazard risk maps, update them at regular intervals
- Enhance gender, age and disability disaggregated vulnerability and capacity assessment
- Enhance multi-hazard risk information dissemination and make them publicly available
- Enhance multi-hazard risk awareness, develop public awareness program on DRR (Audio-visuals, radio programs, TV programs etc.)
- Strengthen collaboration with media partners in information collection, sharing and dissemination
- Strengthen technical capacity of local authorities to conduct risk assessment and analysis
- Implement DRR education at all levels including school and University curricula

- Strengthen national capacity for disaster risk information and database management
- Develop resource management system based on GIS and open data (e.g. Open Street Map, Sahana EDEN etc.)
- Promote trans-boundary cooperation in disaster risk reduction
- Strengthen cooperation with regional/intergovernmental organizations (e.g. ICIMOD, ADPC, RIMES, SDMC, ECMWF etc.)
- Establish and implement protocols for transboundary information sharing
- Promote research in DRR in collaboration with Universities and research centers

2. Strengthening disaster risk <u>governance</u> to manage disaster risk

- Develop policy of 'river management' based on Integrated Water Resources Management (IWRM) principles rather than policy of 'river control'
- Establish community based disaster management system
- Harness and scale up local capacities
- Develop and implement inclusive approach in DRR considering gender, age, disability, economic disparity and cultural diversity
- Develop and formulate risk sensitive land use planning and enforce regulation
- Develop a seismic policy, strategy and action plan
- Update/enforce building construction regulation, revise building codes for urban, peri-urban and rural areas, develop building by-laws for all municipals
- Develop disaster and climate change risk screening process
- Update EIA regulation including disaster and climate change impacts
- Establish National DRR Training Center
- Promote trans-boundary cooperation and collaboration in community to national level
- Establish proper guidelines for designing hydraulic structures to reduce flood risks considering the changing pattern of river bed level and sedimentation and increasing trend in rainfall intensities due to climate change (protection systems shouldn't ultimately exacerbate risk e.g. downstream structures shouldn't block flood flow, upstream structures should be able to retain flood flow etc.)
- Develop retrofitting guideline at national level
- Develop Design Manual for embankment and river training works
- Establish strong implementation mechanism with an autonomous, powerful and capable organization for disaster risk management in a holistic manner
- Improve coordination – within communities, between humanitarian organizations, between government and humanitarian organizations for disaster risk reduction and management
- Upgrade and Strengthen flood forecasting section of DHM
- Establish landslide risk management center
- Upgrade and Strengthen National Seismological Center of DMG
- Clarify the policies and roles of line ministries
- Strengthen overall and general coordination mechanism and capacity building of EOCs
- Mainstream DRR into the developmental planning (particularly in housing, private and public infrastructure, social sectors (health and education), and livelihood)

- Integrate climate change adaptation and DRR
- Develop regulations for risk transfer mechanisms (e.g. microinsurance, contingency fund, low-interest credit scheme etc.)
- Develop regulation and SOP for forecast-based financing of emergency preparedness and response
- Update National Disaster Response Framework for forecast-based financing of emergency preparedness and response
- Formulate emergency preparedness plan at all levels
- Establish monitoring and evaluation system for DRM
- Strengthen national and local platforms for DRR (e.g. DPNet)
- Ensure representation of civil society organizations, national finance and planning institutions, key economic and development sector organizations, private sector, science and academic institutions, women's organisations, organisations of marginalised communities and disabled people in the national and local platforms
- Strengthen governance system of Prime Minister's disaster relief fund and district disaster relief fund

3. <u>Investing</u> in Disaster Risk Reduction for Resilience

- Integrate disaster and climate change risks into national development plan and sectoral strategies
- Integrate DRR into Civil Defence Policy, Strategy and Contingency Planning
- Promote measures for reducing erosion and sedimentation
- Perform regular maintenance of the embankments
- Promote bio-engineering in the flood prone area
- Strengthen/retrofit schools, hospitals and shelters
- Promote diverse livelihoods for building resilience to disasters
- Develop a policy/regulation for risk transfer/insurance (crop and property insurance, micro-finance, micro-insurance, short-term loan, conditional cash transfer, employment guarantee etc.)
- Develop financial risk sharing mechanism particularly insurance and reinsurance against disaster and climate change risk
- Build social capital and community resilience
- Build flood adaptive infrastructures (e.g. adequate drainage, houses on stilts, raised plinth level, raised hand pumps etc.)
- Build earthquake resistant infrastructures
- Mobilize risk-sensitive investment by public and private sector
- Allocate adequate budget for DRR in each sector at all levels (national, sub-national, local) and develop sustainable funding mechanism
- Create basket fund for emergency preparedness and response at community level

4. Enhancing disaster <u>preparedness</u> for effective response and to '<u>Build Back Better</u>' in recovery, rehabilitation and reconstruction

- Establish early warning system (EWS) for critical hazards, enhance existing flood EWS based on long range (seasonal and 10-15 day) weather forecast and expand to other basins
- Maintain spare stocks of equipment in EWS
- Develop Common Alerting Protocol for major hazards
- Improve communication and dissemination system at all levels
- Promote science and technology in enhancing communication and dissemination system for disaster preparedness and response (e.g. web-based system, mobile apps, CB-SMS, IVR etc.)
- Ensure access, representation and meaningful participation of women, children, elderly people, people with disability and marginalized communities in disaster risk reduction and management
- Empower women, children, elderly, disabled and marginalised communities for preparedness, response and reconstruction
- Strengthen preparedness for emergency response
    - Provision of rescue centers, safe places, NFI Bank , warehouses, etc.
    - Stockpile adequate relief and rescue materials
    - Market survey for relief items
    - Creation of the Assessment Roster and training
    - Nomination of the Disaster Focal Person at the organization level
    - Organize pre-monsoon and post-monsoon multi-stakeholder's workshops to review preparedness measures before monsoon and effectiveness of response after monsoon
    - Provide trainings and conduct mock drills regularly
    - Strengthen cluster approach at national, district and local level and Identify focal person within the organizations to coordinate response
    - Strengthen national search and rescue capacity
    - Strengthen coordination across and within state agencies and government departments
    - Develop proper assessment system before the relief distribution to avoid any conflict in the community
    - Ensure the participation of affected people for proper distribution of relief support and assessment
    - Develop indentity card system for the relief distribution
    - Strengthen information and communication capacities for relief, response and recovery
    - Establish an efficient transport and logistics management system and enhance access to remote areas (identify helipads, construct airports etc.)
- Develop rapid assessment system utilizing modern information technology for rehabilitation and reconstruction
- Resettlement of the people from high risk areas to low risk areas
- Enforce building codes for earthquake resistant infrastructures
- Identify the minimum parameters required for "build back better" and link with existing norms, guidelines and legal frameworks