

Devastating Monsoon: Water Induced Disaster Management Practices in Nepal

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Abstract

Nepal is prone to a variety of recurring natural disasters such as floods, landslides, snow avalanches, thunderstorms, drought, earth quake and epidemics. In particular, floods, landslides, hailstorms and drought are almost regular phenomena. This paper has focused mainly on water induced disaster (Monsoon) prepared through review of documents, consultation with related line agencies and field level interaction with affected communities. The paper also seeks to explore and document the major disasters and their impacts in Nepal. It discusses policy and program, institutional arrangement and activities related to the disaster management as well as identification of gaps in the policy and program. Nepal has attempted to manage the prevalence of these hazards and their associated disasters through both informal civic involvement and formal government instruments. A legal and policy environment to deal with disasters has existed in one or the other form in Nepal since 1982, and these have been reviewed. Study showed that disaster management activities only found initial response rather post disaster program. However, findings of the previous and present programs and activities on disaster management have not addressed effectively to the vulnerable people and to reduce the impact from disasters at the local level. It is suggested that disaster management policy and program should be integrated and mainstreamed in development agenda.

Key words: flood, landslide, early warning system, Government policies.

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Introduction

Recent decade has witnessed numbers of catastrophic natural hazards (OECD 2003) in the South Asia region. For example, the 2004 Indian Ocean intercontinental tsunami, the 2010 floods in Pakistan, the 2013 Himalayan tsunami in India and recently, the 12 April 2015 earthquake (7.6 Richter scale) in Nepal and 26 October 2015 earthquake (7.5 rector scale) in Afghanistan near Pakistan border. Similarly, the current monsoon resulted wreak havoc flood and more than 800 people have been killed and 24 million affected following widespread floods across south Asia particularly, in India, Nepal and Bangladesh (The Guardian 2017). Severe flooding has devastated lowland communities and destroyed agriculture production, loss of livestock in the region, with Government Organizations and NGOs warning of food shortages and the risk of disease. It is reported that natural hazards have caused more damage to life and property than many major wars (EM-DAT 2013). Ministry of Home Affairs (MoHA) (2013) reported that Nepal faces different types of natural disasters, such as floods, landslides, fire, snow avalanches, glacial lake outburst floods (GLOF), hailstorms, drought, famine and epidemics and earthquake. Out of 75 districts in the country, 49 are prone to floods and/or landslides, 23 to wildfires, and one to windstorms. According to MoHA (2009), a total of 64 out of 75 districts in Nepal are prone to disasters of some type. People in most of Terai region are affected by floods every year. These recurring floods not only destroy their property and livelihood support system, but also, cost many peoples' lives. Furthermore, the country is located on an active seismic belt, therefore, it is also highly vulnerable to seismic activities. According to the Global Climate Risk Index (GCRI), Nepal is one of the highly vulnerable countries to hydrological hazards, many of these have been there for years but newer threats, which have come up in the recent decades, are more sever and frequent. Aryal (2014) reiterated that there are a wide variety and significant number of natural hazards every year and studies have revealed a high level of vulnerability.

The fragile mountain and flood-prone terrain, low levels of awareness, high illiteracy, poverty, political conflict, rapid and unplanned urbanization, uncertainty of the climate change impact and poor institutional and legal frameworks for disaster risk management all make Nepalese people, their property and the country's infrastructure vulnerable to natural hazards. It is further exacerbated by the combination of extreme topography, climate, geological instability, political

conflict and ill-advised human intervention (ICIMOD 2007). Furthermore, there will be increasing risks due to poor institutions and weak policy and legal environment commensurate with the present-day situation (NSDRM 2008). In the context of disaster reduction, Nepal has prepared and implemented different policy and program in disaster management. Thus, the paper has explored Nepal's disaster management policies, programs and activities particularly water induced disaster through review of documents, consultation with the related line agencies and field level interactions.

Disaster overview in Nepal

Nepal is one of the vulnerable countries in the world due to its fragile landscape, climate sensitive ecosystem and socioeconomic circumstances. The 'Himalayan dilemma' (Ives, Messerli 1989) associated with the impacts of land-use changes has, hence, become more complex owing to the additional potential effects of global climatic change (Sharma et al. 2000). The effects of environmental changes in high mountainous areas, such as the Himalayan region, have been drawing significant attention of the scientists in recent years. Additionally, Nepal is on the frontline of climate change with a wide array of climate and habitats varying from the freezing Himalayas of the north to the hot lowland plains of the south (ICIMOD 2009).

According to UNDP/BCPR (2007), Nepal ranks 11th in the world from the earthquake vulnerability standpoint. Likewise, the country is in 30th place from flood aspect. In another similar report from World Bank (2005), Nepal is classified as one of the frequently natural disaster reoccurrence country. Official statistics of recent years reported that about 1000 people die in Nepal every year due to the natural hazard events; about 300 deaths occur only due to floods and landslides. The country suffers a direct loss of an average of nearly NRs 1208 million per year (MoHA 2010). The accompanied indirect losses, in terms of lost time and opportunities, and the lack of services and the repercussions there of, may be several times more than the above figure. This is a huge impact to neglect, especially if one considers that the losses due to natural hazards are increasingly alarming.

Landslides, riverbank erosion, flood and drought are the common disaster reported in the country (Table 1). Geographically, disaster, such as landslides are dominant in the Mountain and Siwalik. During the monsoon season flood disrupts the lives of

tens of thousands of people and ruins large tracts of agricultural lands. Landslides and floods are recurrent threats to hill communities and low land terai communities respectively. The recent devastating flood in the month of August, 2017 in Terai region and landslides in mountain region of Nepal resulted in a loss of more than 157 human lives and about 50% population affected in Terai region (MoHA 2017). Similarly, earthquake on 25 April 2015 caused the loss of more than 8000 human lives (Table 1) and damaged very large extent amounting to a significant proportion of the national GDP (NPC 2015). Among all the natural hazards, epidemics usually take the largest human toll in the country every year. Climate change is further exacerbating these threats leading to increase in frequency and intensity of disasters such as floods, drought and landslide, etc.

Table 1: Loss of Lives from Disaster in the Last Six Years (2011 to 2017)

S.N.	Types of Disaster	2011	2012	2013	2014	2015	2016	2017
1	Avalanches/snow storm	4	29	6	51	17	1	0
2	Earthquake	6	1	-	-	8891	-	-
3	Epidemic	9	33	4	14	-	5	1
4	Flood	126	9	131	129	-	101	157
5	Landslide	113	68	79	116	128	147	38

Source: MoHA 2014, 2015, 2017

Materials and Methods

Study area

The study was conducted in selected VDCs of the flood prone areas of Terai regions of Nepal ie Kajarhawa VDC of Kapilbasthu district, Thapapur VDC of Kailali district and Rajapur VDC of Bardia district.

Research methods

The research employed both quantitative and qualitative methods of data collection but more focused on qualitative information. The paper has been reviewing the government policy, program and activities as well as secondary data from the Ministry of Home Affairs (MoHA). Furthermore, researchers have had thorough and in-depth interactions and discussions with the concerned beneficiaries and vulnerable groups at various levels ranging from VDC to community level DRR management committees, DDC personals, district administration officers, local implementers, field level staffs, school teachers and other stakeholders as required.

Results and Discussion

Major disaster/hazard incidence in Nepal

Water induced disasters

In general, floods and landslides during the monsoon are a natural phenomenon in Nepal. The country's more than 6,000 rivers and rivulets, with a total of 45,000 km in length, support irrigated agriculture and other livelihoods, but also wreak havoc in valleys and in the terai when they overflow (Dixit 2010). It is reported that an average of about 211 lives have been lost annually in the past 10 years. The review of the documents and field data collected through local consultations indicated that the scale of vulnerability from water induced disasters has increased in recent years. The increasingly long drought periods have affected rainfed farmers and rural women. The scale of landslide and drought has increased due to climatic variability and anthropogenic activities, such as rural road construction in the mountain and forest degradation in the Siwaliks and mountain region.

Similarly, frequency of flood and scale of damage has also increased in the Terai and inner Terai regions of Nepal. The long-term data recorded from MoHA reported that thousands of people are affected by flood every year (Table 2) in Nepal during the monsoon season. The MoHA report also claimed that the floods and landslides have intensified human casualties since 2000. According to MoHA (2011), about 5000 families in the mountain and Terai area are badly affected by drought each year. Additionally, during recent monsoon (2017) season many areas of the country reported human casualties, loss of properties and household (MoHA 2017) (Table 3).

Field visit showed that, the poor and the women were affected more by water related disasters than other sections of the society. For example, loss or decrease of nearby sources of drinking water adds extra burden on rural women. Additionally, it was observed that poor and vulnerable communities were more exposed to such disasters. Previous study also reported that vulnerability is dependent on the economic wellbeing, awareness of the people living in a society, preparedness and recovery conditions of the community. The poorest are disproportionately vulnerable and they have less capacity to adapt (Devkota et al. 2013). For example, the poor and vulnerable people who reside nearby flood prone areas were more badly affected from the flood and the poor and vulnerable people who reside by

marginal dry lands were more affected from failed crops.

Table 2: Devastating monsoon and their impact in Nepal (1971- 2017)

S.N.	Type of disaster	No. of events	No. of death	Affected family
1	Landslide	3330	4628	556340
2	Flood	3953	4239	472212

(Source: MoHA 2017)

Table 3: Devastating monsoon in Nepal and loss in the month of August 2017

S.N.	Area	Unit	Total
1	Human death	No.	157
2	Missing	No.	29
3	Injured	No.	45
4	HH fully damaged	No.	43406
5	HH partially damaged	No.	158194
6	Family displacement	No.	20888
7	Total estimated properties loss	NRs.	Initial estimate and 8.11 billion NRs worth of loss to agriculture only

(Source: MoHA 2017)

The recent monsoon incessant rainfall in the month of August has triggered a massive scale of flooding and landslides in 21 districts in Terai belt (Fig. 1), where more than 80% of its agricultural land and approximately 35,000 houses have been inundated and 11.5 million people have been affected (MoHA 2017).

The findings also indicated that a significant increase in heavy rainfall events in future will result in an increased flood risk to society, physical infrastructure, and water quality (Singh et al. 2011). Increase in the frequency and severity of landslides, floods and droughts are projected to have an adverse effect on sustainable development. Shrestha et al. (2003) suggest that the number of flood days and consecutive days of flood events have been increasing in Nepal. Increases in glacial melting and likely increases in runoff will also heighten the risk of glacial lake outburst floods. Table 2 and 3 display the type and frequency of disaster and their impacts on people in Nepal.

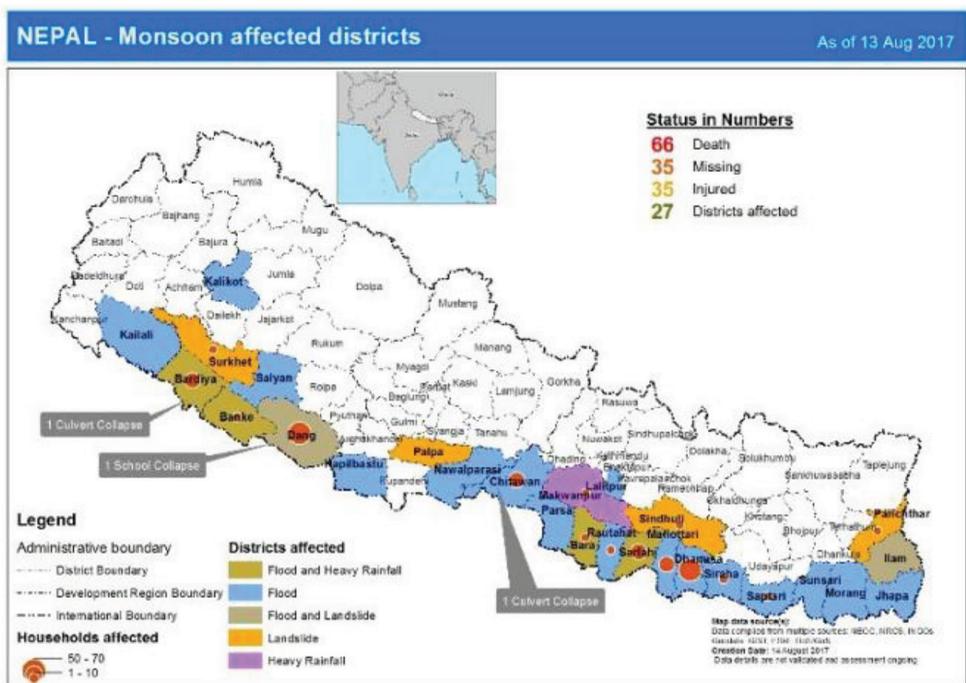


Fig. 1: Flood affected districts 2017 (MoHA 2017)

Earthquake

Nepal is vulnerable to earthquakes because of its location in a tectonically active zone. Earthquakes of major consequence were reported in 1255 AD, 1810 AD, 1866 AD, 1934 AD, 1980 AD, and 1988 AD in Nepal (NPC 2015). The earthquake in 1934, which also hit Kathmandu Valley, was in the order of 8.4 on the Richter scale. It did great damage to Kathmandu Valley with the loss of more than 8,500 lives and partial collapse or complete destruction of 38,000 buildings (ICIMOD 2007). There have since been earthquakes causing severe human and physical loss in 1980, 1988 and 2011 in the area.

Gorkha Earthquake 2015: Over the last 80 years, another high Richter scale earthquake (7.6) on 25 April, 2015 and its aftershocks have been the terrible calamity in Nepal as they affected more than one third area of the country (NPC 2015). It is estimated that nearly 9,000 people lost their lives and more than 22,000 people were injured. As per the latest estimates, more than half a million houses are damaged. It is estimated that the lives of eight million people, almost one-third of

the population of Nepal, have been impacted by the earthquake (NPC 2015). The scale of destruction is immense.

Epidemic

In Nepal, outbreak of several epidemics takes the largest toll of life every year (Table 1). Water borne diseases like typhoid, diarrhea and vector- borne diseases like *kalaazar*, malaria, and Japanese encephalitis are the major health problems in terms of morbidity and mortality. It is the result of poverty, poor sanitation, food insecurity, low level of awareness, and poor health facilities. In 1999 A. D. 1,207 people died of epidemics and 6,119 families were affected in various parts of the country (MoHA 2010). About 300 people died in June and July of 2009 in Midwestern part of the country due to the epidemic of diarrhea (MoHA 2010).

Avalanches

Topographically, the high mountainous region composed of rugged and steep slopes is susceptible to avalanches. A number of cases of avalanches with destructive nature have been reported in Nepal. Unexpected Seti River flood of 5th May, 2012 in Kaski district is an example of this type of hazard. The snowstorm disaster occurred in central Nepal during the month of October 2014, and resulted in deaths of at least 43 people of various nationalities. Similarly, in 2015 earth quake with avalanches in the Mt. Everest region resulted in loss of at least 17 people in the mountain and more than 60 have been reported injured (The Gradian 2015).

Table 4: Disaster Management Policies Initiatives in Nepal

S.N.	Year	Policy highlight	Key feature
1	1982	Natural Disaster Relief Act	The first and main legal instrument. It is specifically directed towards disaster management in Nepal.
2	1996	National Action Plan for Risk Management	Focused on plan for devising the necessary measures for all kinds of natural disasters.
3	10 th National Plan (2002-2007)	Incorporated in 10 th National plan	First time introduced the disaster management plan and program in National Plan
4	2005	Signatory of the Hyogo Framework for Action (2005-2015)	Countries that develop policy, legislative and institutional frameworks for disaster risk reduction; Building the Resilience of Nations and Communities to Disasters.

S.N.	Year	Policy highlight	Key feature
5	11 th and onward three-year interim plan 2007-10, 2010-13, 2013-15	Major plan and program highlights Three-year interim national plan	Current plan approach paper focused on the issues of Disaster Risk as one of the components for development. The current plan realized that without mainstreaming DRM in national development, it will not be sustainable.
6	2009	National Strategy for Disaster Risk Management (NSDRM)	Developed on the basis of Hyogo Framework for Action (HFA) 2005 and its vision was Disaster Resilience Nepal.
7	2011	Guiding Notes on Disaster Preparedness and Response Planning	Disaster preparedness and response planning process at the district level and local level
8	2011	Climate Change Policy Nepal	Provides multiple avenues for addressing the adverse impacts of a changing climate and natural hazards
9	2013	National Disaster Response Framework (NDRF)	Provides a clear, concise, and comprehensive framework for the country to deliver a more effective and coordinated national response in the event of a large-scale disaster.
10	2015	SFDRR- framework	The Government adopted Sendai Framework for Disaster Risk Reduction (SFDRR), The concept of 'Build Back Better'; a move away from silos to working on integrated model of recovery.
11	2015	PDNA Report, NPC	Develop policy and plan for long-term reconstruction to restore not only lost assets but also to rebuild lives in the country.
11	2015	New Constitutions of Nepal: Article 51. Policy regarding conservation, management and use of natural resources	Clause No. 9. The State shall formulate and pursue a policy of designing a pre-warning system, disaster preparedness, rescue, relief works and rehabilitation in order to minimize the risks of natural disasters.

Source: MoHA (2013); MoE (2011); GoN (2015); NPC (2015)

Disaster management (DM) in Nepal: Existing policy, legal and institutional frameworks

The Natural Calamity Relief Act 2039 (1982), as amended in 1992, is the main legal instrument specifically directed towards disaster management in Nepal. Its focus is on response and reconstruction (MoHA 2013). There has been a growing realization on the need to redefine the existing policies in order to accommodate the considerable advances in the field of disaster risk management in the region (Table 4). The Government approved National Strategy for Disaster Risk Management, 2010 in Nepal (NSDRM) for implementation of national Disaster Risk Reduction (DRR) strategies. In 2009, the Nepal Risk Reduction Consortium was formed to support the Government of Nepal in developing a long term Disaster Risk Reduction Action Plan building on the NSDRM. It also has a legally mandated system of devolved decision-making and local governance system at District Development Committee (DDC), which is central to DRR implementation. Moreover, the present policy and programs has shifted its focus from a reactive to a proactive approach for disaster risk management (DRM) and has undertaken efforts in strengthening legal frameworks, policy and planning, organizational aspects, institutional capacities and partnerships for DRM. This include; moving from a disaster response oriented legal framework, NSDRM 2009, transformation from the National Calamity Relief Act 1982 toward DM Bill (currently in in-depth discussion for endorsement), coordinated work for the improvement of overall DRM capacity through Nepal Risk Reduction Consortium, established focal desk for DRM within line ministries, establishment of national multi-stakeholder platform for DRR, to name a few.

Further, the Government of Nepal committed implementation of new Sendai Framework for Disaster Risk Reduction 2015-2030 at the Third United Nations World Conference (March 2015) on Disaster Risk Reduction, to enhance efforts to strengthen disaster risk reduction to reduce losses of lives and assets from disasters, increase the capacity for understanding about the disaster risks, strengthen the global cooperation for DRR and establish multi-hazard risk information management (EWS) system for potential disasters worldwide.

Furthermore, there are many sector specific policies over the years, which could have a significant impact on activities related to disaster risk management (Table 4). The programs seek to support policy frameworks and institutional development at

national and local levels in addition to the integration of DM into core development policies and plans of Nepal. Such support will include activities such as the formulation of a national policy on DM, and revision of existing disaster legislation. However, they are yet to materialize. From the Tenth Development Plan to present three-year interim plan (2013-2015), the stress is to bring legislation and more comprehensive policies and programs in this area. The current plan realized that without mainstreaming DRM in national development, it will not be meaningful and sustainable (NPC 2013).

In the context of the earthquake disaster on 25 April, 2015 and its aftershocks, the government has realized to develop policy and plan for long-term reconstruction to restore not only lost assets but also to rebuild lives in the country. The Post Disaster Needs Assessment (PDNA) report prepared by NPC (2015) highlighted the impact of the earthquake and suggested a large-scale recovery programme. It has recommended that the government will plan, organize and facilitate the recovery programme through involving all stakeholders such as GOs, NGOs, local institutions and INGOs. It will involve implementing a large number of activities in a relatively short period of time, and will require substantial preparation in institutional, financial and logistical terms.

The following are the sector-related policies to deal with disaster risk management:

National Building Act 2007, Building Code 1994, Guidelines 2015

Local Self Government Act 1999

Soil and Water Conservation Act 1982

Environment Protection Act 1996

National Agriculture Policy 2004

National Shelter Policy 1996

National Urban Policy 2006, Guidelines 2015

National Water Resource Strategy 2002

Water Induced Disaster Management Policy 2006

Health Related Policies

Climate Change Policy 2011

Land Use Policy 2013

Institutional arrangements and activities on disaster management (DM) from national, district to local level

MoHA is the national focal point for managing all natural disasters at the central level, and it does so through its 75 district administration offices. MoHA is responsible for formulation of the national policies and their implementation, preparedness and mitigation of disasters, immediate rescue and relief work, coordination and mobilization of all the stakeholders, data collection and dissemination, collection and distribution of funds and resources. The ministry is the nodal agency for the Central Natural Disaster Relief Committee (CNDRC), and is headed by the Minister for Home Affairs. The committee has tiers at regional and district levels; viz. the regional natural disaster relief committees (RNDRCs) and district natural disaster relief committees (DNDRCs). Disaster Risk Reduction (DRR) has been institutionalized in the national, district and village development committee (VDC) level plans, and budget is allocated, particularly, for flood prone area of the district. Similarly, the Department of Hydrology and Meteorology (DHM) under the Ministry of Science, Technology and Environment is responsible for all forecasting with regards to floods, hazard and vulnerability assessment, and a strategy for mapping and bringing all vulnerable areas under an Early Warning System (EWS) is in the pipeline.

Local government institutions

Nepal has now 77 districts development committees (DDCs), and currently 753 local body i.e. village development committees (VDCs), municipalities (MoFALD 2017). These are local-level government institutions empowered by the constitution of Nepal 2015 and Local Self Governance Act 1999 to coordinate development activities under the leadership and guidance of the Chief District Officer (CDO) who is the representative of the central government in the district. At the district level District Disaster Reduction Management Committee has been formed under the chairpersonship of the District Administration Officer by involving all stakeholders to implement all disaster management activities. Similarly, VDC and community level committees have also been formed in some districts, particularly, in flood prone areas. These local-level institutions play a significant role in mobilizing the community for disaster mitigation activities such as flood mitigation and River control at the local level. Scott and Tarazona (2011) also reported that local government can play an important role in bringing together the benefits of “top-

down national government-driven” and “bottom-up community-led” approaches. Under disaster management, the government is involved in four distinct components: mitigation, preparedness, response, and recovery. Efforts have already been made to raise disaster awareness among the people and provide training at the community level for effective disaster management for reducing or eliminating the likelihood or the consequences of a hazard, or both. Early warning system in flood prone area, weather forecasting system in the high mountain areas, community disaster management plan, community buildings, and livelihood support program in the vulnerable area are some activities at the local level. Action is also taken to coordinate with different stakeholders involved in disaster management and proper mobilization of non-governmental organizations in disaster preparedness, response and recovery works. The operating strategy includes mobilizing internal and external resources for equipping people, rehabilitation and reconstruction. Formation of teams and their mobilization in disaster areas to assist in recovery works and assess the damages, collect and analyze data, and disseminate information are other operational strategies. Past studies by different authors have highlighted the effective decentralization and good local governance to be effective for disaster management (Veron et al. 2006).

Field study found that local level institutions (community-based organizations-CBOs) were more active where flooding is the regular problem in their area. Early Warning (EW) and DRR have been recognized by the state, a disaster management strategy is legalized and an EW strategy is in the pipeline, as an immediate and long term national priority. Some terai districts of the flood prone areas have already prepared VDC level disaster management plan and implemented regularly. Additionally, at present, district administrations in disaster affected areas have also come on board on developing systems and committees have been put in place in the districts where the programs are running. However, it was noticed that local institutions lack capacity to rescue the disaster affected communities immediately and no any effective management activities had not noticed in the flood victim communities. Similarly, field visit showed that many settlements were located nearby flood prone area in the Terai region and some River training activities were built to control the flood.

Field study and DRR program and activities at the local area through Community-based organizations (CBOs)

Establishment of emergency relief matching funds at VDC level

To fulfill the needs of disaster affected people during the time of emergency, some VDCs of Kapilbastu districts have created an emergency fund at the community level so that they could provide emergency relief to loss and damage caused by the disasters. For example, in Kailali and Kapilbastu districts, funds have been used in relief support and distributing grains during flooding time. Two thousand HHs are participating and benefitting from this program. It is reported that Singhokhor and Dhankauli VDCs had established such emergency funds comprising of NRs. 200,000 and 16,000 respectively (Tiwari 2013).

Establishment of grain bank

Interestingly, people were found developing innovative ideas to struggle with different disasters. Collection and storage of food grains from each HH at community level is being practiced in one area. Each HH voluntarily contributed food grains during the rice crop harvesting time. The grains collected were sold in the market and the money was deposited in a bank to create relief fund. The purpose of this fund is to provide relief to those HHs who are affected from any kind of disasters or during famine at least for a week. The support is provided either directly distributing the grains or in cash or other supports by selling food grains in the market. This practice seemed more helpful to the most vulnerable groups like children, pregnant and lactating women, ageing and disabled to be safe from the adverse situation of disaster. Two communities (Singhokhor and Dhankauli) had already established the grain banks and two other communities (Akabarpur and Kajarhawa) were collecting the grains for the same purpose at local level. In the long run these local initiatives of the grain bank could be very positive initiation for the sustainability of the disaster management programs.

Strengthening institutions/networks in targeted VDCs

One of the major progress made by the DRR activities is the strengthening of the local institutions and network at the district and regional level. In all sites, local partners are playing leading role to implement the DRR program and establish a network from local to national level. These activities had developed good rapport with all stakeholders at district level government offices and sensitized them to

institutionalize the DRR program. It is a positive indicator for sustainability of the program.

However, the research team noticed that with poor resources and weak institutional capacity prevalent at the district and local level, it is difficult to address the DRR program effectively unless these things are improved. It is also observed that the government mechanisms in the post disaster management activities in the recently earthquake affected areas were of limited capacity and mechanisms to response for recovery and rebuild for the victim people were also poor.

Early warning system

Early warning system (EWS) was found to be an effective intervention for reducing disaster risks, particularly in targeted communities in some flood prone areas of the Chitwan, Banke and Bardia districts. The EWS project has strengthened the capacity of vulnerable flood prone communities and district authorities and stakeholders to respond to and mitigate the effects of flood. The activities included advocacy and public awareness, infrastructure support, development of information flow mechanisms system (Fig. 2) and establishment of mitigation measures, such as installation of EWS equipment and capacity building of vulnerable communities to strengthen their resilience to respond to risk. The direct beneficiaries are people living alongside the river bank and downstream, such as Narayani Rivers of Chitwan district, west Rapti River in Banke district and Karnali River in Bardia district. Altogether 31 VDCs of Chitwan, 5 VDCs of Banke and 8 VDCs of Karnali River are benefitting from this project. The Department of Hydrology and Meteorology (DHM) has provided technical support to establish community level flood gauge stations.

EWS has been successfully institutionalized and implemented as DRR activities at the district level through coordination among the stakeholders. It has implemented community-based flood EWS by developing linkages of upstream DHM gauging station with downstream communities (Fig. 2). Combination of simple information flow channel, hand operated siren and involvement of communities and local stakeholders to disseminate the upstream water level information and possible flood risk to the downstream vulnerable communities proved very effective.

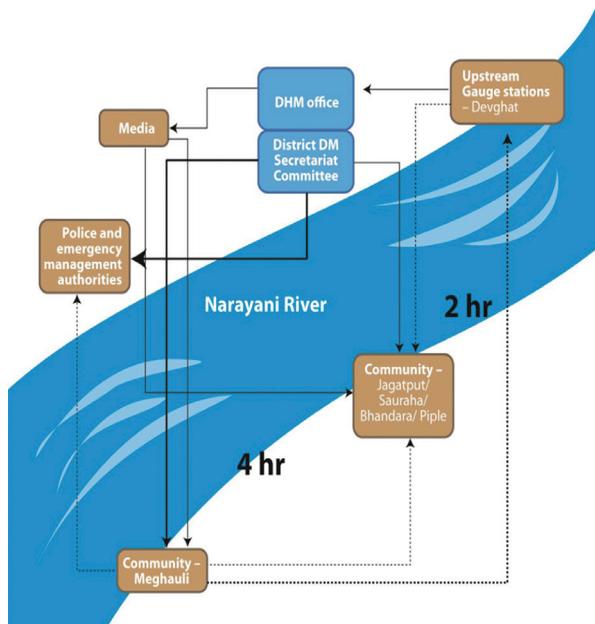


Fig. 2: Mechanisms of the early warning system in Narayani River, Chitwan District Nepal (Practical Action 2012)

Additionally, small scale mitigation activities and low cost, replicable infrastructures were promoted to assist community level Disaster Risk Reduction (DRR). For example, community house equipped with the rescue equipment and first aid items are constructed at the ward level to shelter during the flood time, Community-based Disaster Management (CBDM) plan in target communities, DDR Plan at VDC level and District Disaster Management Plan (DDMP) at district level have been prepared in some districts. It is reported that improvement in flood risk monitoring and early warning system at the community and institutional level have significantly reduced the human loss almost to nil in Chitawan, Banke and Bardia districts in recent years.

Conclusion

Nepal has faced many types of disaster as it lies in high risk seismic zone as well as due to its young fragile mountain chain. The recent devastating flood in the month of August, 2017 in Terai region and landslides in mountain region of Nepal resulted in loss of at least 157 human lives and about 50% population affected in Terai region. Similarly, the catastrophic earthquake of 7.6 Richter scale followed

by more than 300 aftershocks resulted in loss of lives of nearly 9,000 people and more than 22,000 people injured. In recent years, significant efforts have been made to identify the disaster risk reduction activities in Nepal in order to optimize the outcomes of implementation followed by positive impact. Analysis of the different policy and program documents as well as field level consultation showed paradigm shift in disaster management from “response and recovery” to “prevention and preparedness”. Policy, programme, activities and institutional arrangement from national to local level have been formulated and implemented for reduction of disaster. It is noticed that local institutions are active in disaster management activities in the flood prone area of the Terai district. It is also found that community-based disaster management and early warning system were effective to reduce the vulnerability from flood. As a result of the catastrophic earthquake of 2015, the Government has now realized to plan for long-term reconstruction to restore not only lost assets but also to rebuild livelihoods. MoHA oversees the overall disaster response activities and coordinates the preparedness and rehabilitation initiatives. Despite the different disaster management policy and programs in Nepal, the quality of governance, at all levels, is likely to be the biggest challenge for effective initiation, integration and implementation of disaster management activities at the local level particularly, for the poor and vulnerable communities. Consultation with policy level to field practitioner revealed that weak government institutional arrangement at local level, poor coordination, limited infrastructure, financial and human resources, as well as poor public awareness on disasters risk management are the major barriers for implementation of the policy and program at the local level. It is suggested that disaster management activities should be mainstreamed in the development and livelihood support program in the Nepalese context.

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