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Monographic issue

Flood risk of Terai Region of Nepal and
response initiatives for Monsoon flood

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Letter from the editors

The Emergency and Disaster Reports is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the above-mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This monographic issue is about Nepal and the flood risk of Terai Region of and response initiatives for Monsoon flood.

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Flood risk of Terai Region of Nepal and response initiatives for Monsoon flood

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INTRODUCTION

Nepal is known as a landlocked country located in SouthEast Asian region which extends its area to 147,181 square km. In the World map it occupies the area of 0.03% whereas 0.3% in Asia. The National Population Census 2011 revealed that Nepal has the total population of 26.5 million people with an average growth rate of 1.35. Geographically, Nepal has its border with Tibet in North, China from East and India from West and South. From the very beginning of its history, Nepal has 75 districts froits eastern to far-western development region. On 20th September 2015, Nepal declares as a *Federal Democratic Republic* having changing its administrative structure from five development regions to seven states.(1)

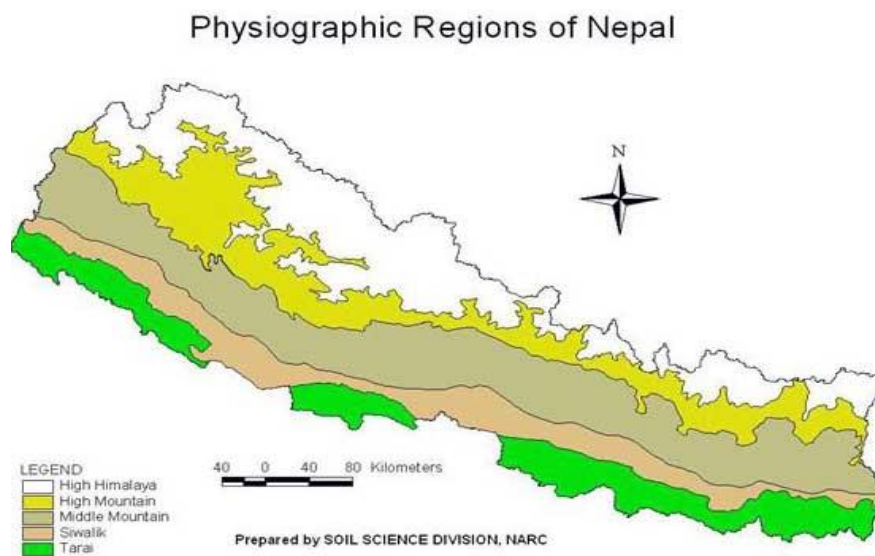
Nepal extends within the altitude ranges from a minimum of 70 meters to a maximum of 8,848 meters. This unique topography of the country serves diverse climatic situation especially tropical, mesothermal, microthermal, taiga and tundra. As far as physiographic structure is concerned the country is divided into five regions: the Terai, the Churiya, the Middle hills, the High hills and the Himalayas.(2) Identically, the ecological region runs from east to west and is divided into three main ecological regions as; the Terai (plain land), the Hills and the Mountains.

According to Human Development Report 2016 the percentage of people living under poverty is 25.2% which can be undertaken as most in risk population during disaster along with the people residing in highly prone areas of the country declared by Disaster Risk Reduction section of Ministry of Home Affairs.

Terai Region of Nepal

Terai is the lowland region of Nepal which extends over 33998.8 square kilometer of total land area of the country and lies within the altitude between 67 and 300 meter. Out of 75 districts of Nepal, 20 districts are situated in terai region. Although this is true that the terai region of Nepal serves as the green basket with more flat and fertile land, it occupies only 23% of the total land area of the country correspondingly with Hilly region covering the largest portion with 43%, and Himalayan region covering 34%.(3)

Figure 1 Physiographic Regions of Nepal ©NARC



Most of the development work, better services of health, education, better opportunities for quality of life leads to the movement of people from hilly and mountains to this plain land of the country. This plain region is characterized by variety of scrubs, clay, tall grasslands, clay rich swamps, and with more than 50 wetlands. Additionally, the texture of soil in the Terai region is alluvial and fine to medium. There is variances in the climatic condition between western and eastern edge of Terai region.

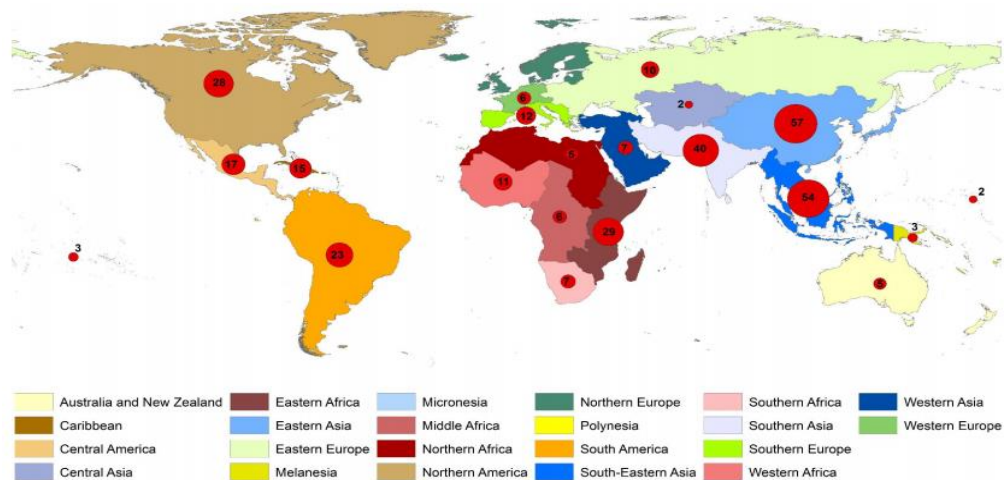
The Bay of Bengal influence the climatic condition of the Terai region of Nepal which make more continental climate with the significant difference between summer and winter. Furthermore, the rainfall diminishes from east to west where monsoon arrives later and ends soon, and winter is more wet in west.

Global Scenario of Hazard

The figure below proves that South Asian Region is the highly disaster prone region among all the continent which is supported by the annual number of natural disaster across the sub-continent region which marked South East Asia (57) in the first place with high number of natural disasters followed by the Eastern Asia (54) and Southern Asia (40).(4) Unprecedented loss of lives, flora and faunas occurred in South Asia Region due to natural disaster.(5)

The situation is made worse by the existing burden of poverty, malnutrition, poor health services, and conflict. Large portion of world population (i.e. 24.75%) reside in this region which have no choice besides living in a vulnerable situation. Due to the existence of other fundamental needs, DRR in this region gets less attention.

Figure 2 Occurrence of Natural Disasters per Sub-Continent in 2016 © CRED



Annual Disaster Statistical Review 2016 – The numbers and trends | 67

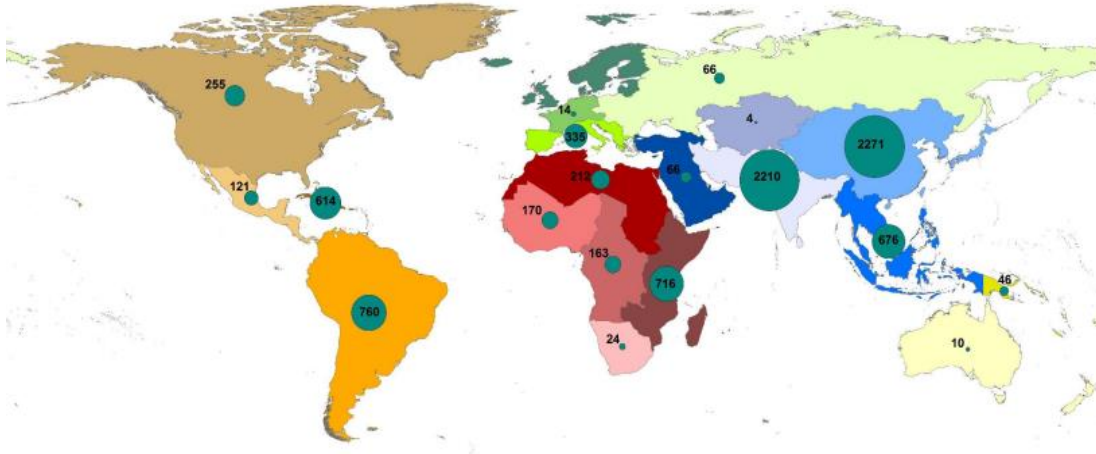
Nevertheless, the study of sub-continent analysis by CRED in 2016 shows that the South East Asia which serves as the hotbed for most of the disaster has the highest number of human deaths and loss of properties.

The figure 3 shows the critical analysis of the total number of human deaths by any type of disaster across sub-continent in 2016. The figure illustrates that in 2016, 2271 people lost their lives in South East Asia (highest) and 2210 in Southern Asia (second highest), the cause behind this may be due to the existing double burden of poverty and its high prone geological location.

Disaster Profile of Nepal

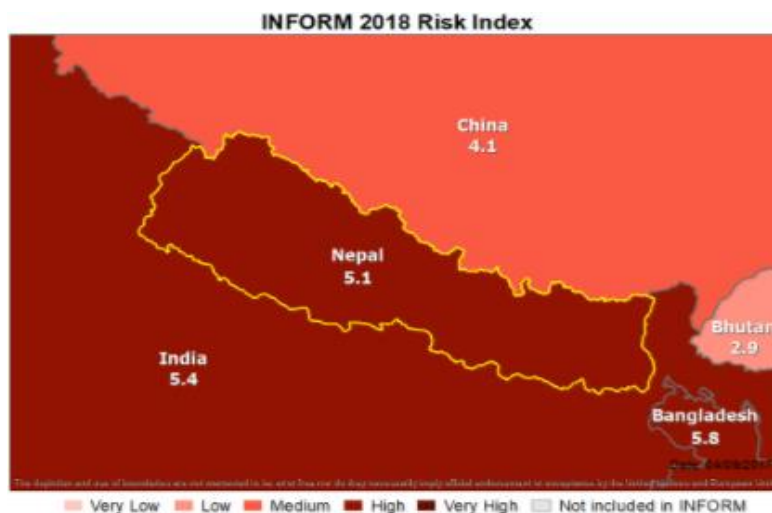
Nepal serves as a Hot Bed for most of the Natural Disaster. Nepal's distinct geographical structure and unstable steep slopes with heavy monsoon rainfall makes more vulnerable to hazard. Nepal struggle with the vulnerability of multiple hazards which is

Figure 4 Total Deaths by Disaster per Sub-Continent in 2016 © CRED



penetrative in every geographic and societal framework of the country is an inevitable fact. Geologically, Nepal is divided into three regions: *Terai, Mountain, and Hill* which carries distinct geological and climatic characteristics. These characteristics together lead to vulnerability to different types of disaster such as landslides, floods, earthquakes, heat wave, wild fire, drought, thunderbolt, hailstorm, glacial melting. (3) On the other hand, the open boarder leads to the increase risk of several pandemic and disease outbreak annually. Consecutively, the continuous exposure to these disaster not only causes the loss of lives and properties but also reasons for the largest economic loss.

Figure 3 Inform Risk Index 2018



As far the vulnerability inform index is concerned Nepal is ranked at 4th, 11th, and 30th position in terms of vulnerability to climate change, earthquake, and flood respectively. Eventually, Nepal ranks 23rd in terms of hazard related deaths while as far as deaths related to flood is concerned it is in 7th position globally. Out of 75 districts in Nepal 49 districts are highly prone to floods and landslides showed by 2008 UN Report. Ultimately these vulnerable circumstances put Nepal in a list of priority for emergency response and preparedness activities especially in terms of earthquake and flood.

The disaster risk index by OCHA done on the basis of analysis of risk of historical events, illustrates that Nepal is at high risk to the disaster especially for earthquake (9.9) and flood at the second with 6.5. Infact, after earthquake, floods and landslides are another leading disaster in Nepal which causes millions of loss annually.

Figure 5 Disaster Risk Index ©OCHA

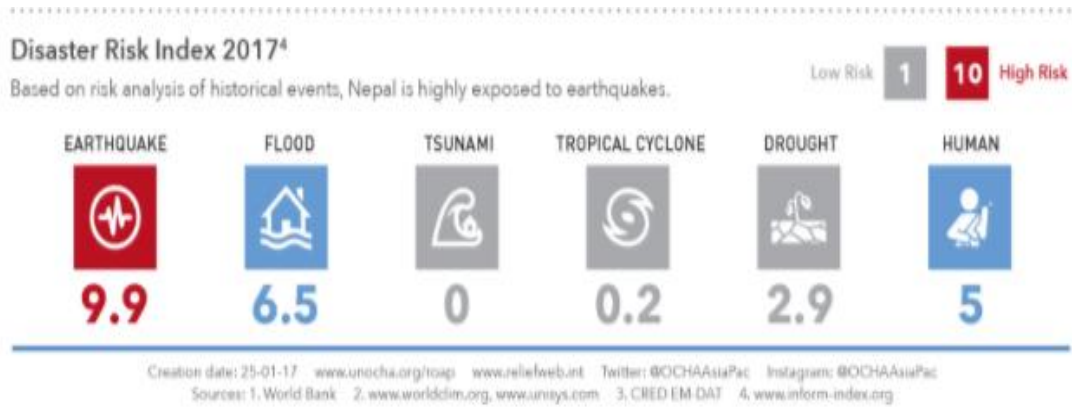


Table 2 shows the type of disaster and prone area. Some calamities like volcanic eruptions, tsunami does not occur in Nepal otherwise almost all kinds of disaster occurs. Although there is decrease in the reported event of disaster from the year 2013 (58 disasters) to 2014 (42 disasters) people are forced to live under the threat of multitude of natural disasters.(3)

Table 1 Type of Disaster in Nepal © ISDR

Types of Hazard	Prevalence
<i>Natural Hazards</i>	
Earthquake	All of Nepal is a high-hazard earthquake zone
Flood	Tarai (sheet flood), Middle Hills
Landslide and landslide dam breaks	Hills, Mountains
Debris Flow	Hills and Mountain, severe in areas of elevations greater than 1700 m that are covered by glacial deposits of previous ice-age
Glacier Lakes Outburst Floods (GLOF)	Origin at the tongue of glaciers in Higher Himalayas, Higher Mountains, flow reach down to middle Hill regions
Avalanche	Higher Himalayas
Fire (forest)	Hills and Tarai (forest belt at foot of southern-most Hills)
Drought	All over the country
Windstorms	All over the country
Hailstorm	Hills
Lightening	All over the country
<i>Human-Induced Hazards</i>	
Epidemics	Tarai and Hills, also in lower parts of Mountain region
Fire (settlements)	Mostly in Tarai, also in mid-Hill region
Accidents	Urban areas, along road network
Industrial/Technological Hazards	Urban / industrial areas
Soil erosion	Hills
Social Disruptions	Follows disaster-affected areas and politically disturbed areas

Source: Nepal Country Report: ISDR Global Assessment Report on Poverty and Disaster Risk 2009.

Trend and Analysis of Disaster in Nepal

The report of UNISDR shows that between 2005 and 2015 overall more than 700,000 people lost their lives, more than 1.4 million were injured, approximately 23 million were made homeless, more than 1.5 billion people were affected, and the economic loss was more than \$1.3 trillion by various types of disaster. Similarly, between the years 2008 to 2012, the number of displaced people by any type of disaster was 144 million. Evidence indicates that now the risk of disasters are mostly exacerbated by the rapid climate change which impedes the countries progress towards sustainable development. (3) Furthermore, if we see the history of flood and landslide of 1993, 2008 and 2014 have remain as the most devastating in the history which have caused enormous loss to human lives and physical properties. Climate change, environmental degradation, globalized economic development, poverty, inequality, poorly planned urban development, weak governance are the risk drivers which intensify the effect of natural disaster in the country.

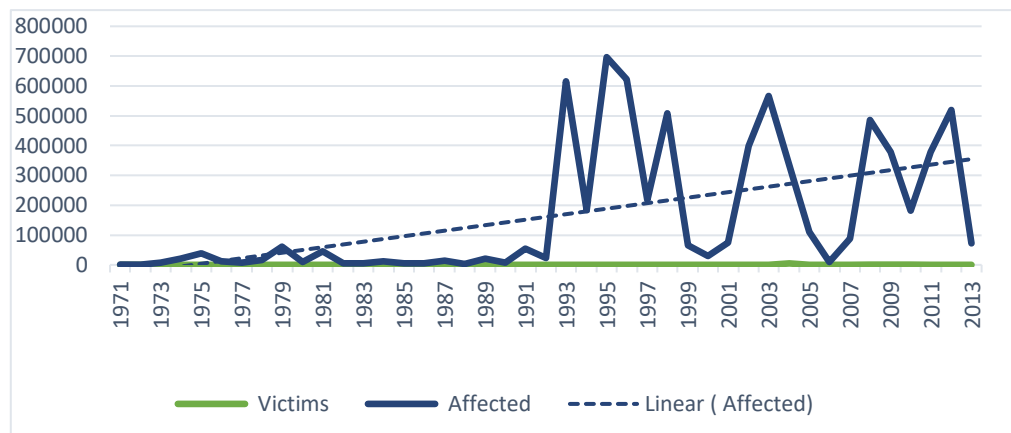
According to the vulnerability of geographic regions toward different types of disaster high risk of floods remains in Terai, landslides in the hills and mountains, and earthquake in the mid hills and terai region.(6)

Figure 6 Disaster Vulnerability of various parts of Nepal @DIPECHO



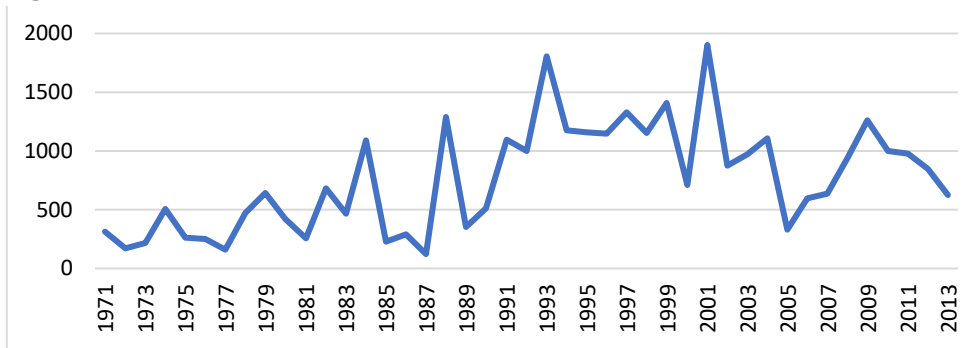
Figure 7 shows the sporadic trend of the number of people affected by any type of disaster across the years 1996. In 1996, the number of people affected by any type of disaster is high among all the year between 1971 to 2013. However, the number of victim remains almost stagnant from initial period of the graph i.e. 1971.

Figure 7 Number of People affected and victims due to various disaster



Similarly it is equally important to know the mortality rate so as to know the burden of the disaster which is shown in figure 8 where the graph shows the deaths due to natural disaster between 1971 and 2013. According to the graph, it was found that the highest number of deaths was recorded in 2001 and lowest in 1972. Although there is gradual decrease in the deaths due to disaster after 2001, still we cannot claim to be in the satisfactory level since the number of deaths are more than the initial periods.(7)

Figure 8 Deaths due to Natural Disaster



Hazard Risk and Disaster in Terai Region of Nepal

This small portion of the country serves as a hot bed for almost all types of disaster with annual occurrence of several types of disaster like disease outbreak, fire, heat wave, flood, cold wave. Flood is the major disaster in Terai Region of Nepal.

Flood

In Nepal the major cause of flooding is the heavy rainfall (annual phenomenon) during monsoon season which normally starts from the second week of June. The average rainfall in the country is 1500 to 2500 mm with 80% of the rainfall occurs between June to September. The topography of Nepal varies the distribution of precipitation from 150mm to over 5000 mm per annum with about 80% of the annual precipitation during this period.(8)

Normally monsoon starts from the eastern part of Nepal and goes to western part. Monsoon rainfall is not only the reason of flooding in Nepal, but the another risk is the Glacial Lake Outburst Floods (GLOFS) due to global warming. There are mostly three types of flooding namely; coastal (surge flood), riparian (fluvial flood), pluvial (surface/flash flooding).(9) In Nepal, riverine flooding is the common type of flooding caused by excessive rainfall over long period of time where river exceed its capacity and overflow of water happens often by breaking dams and dikes and occurs mostly in Terai region. Flash flooding is another type of flooding in Nepal mostly at the Mountains.

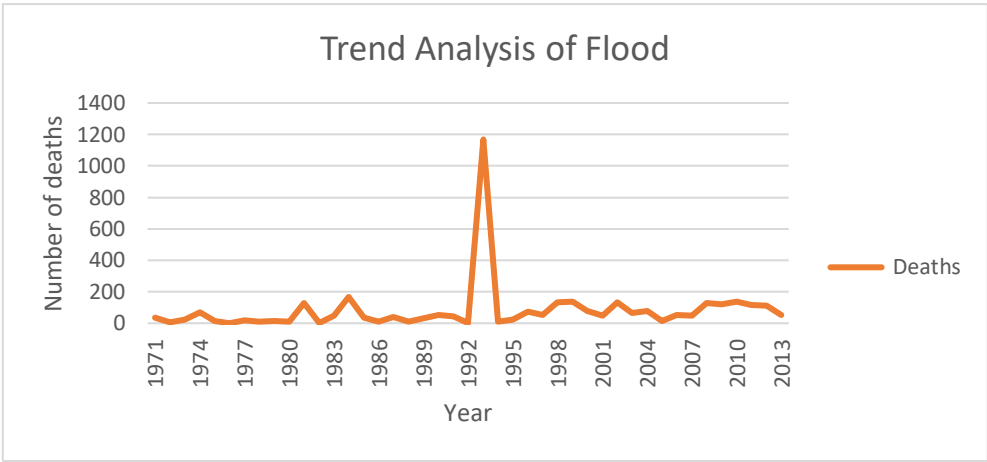
Nepal has the high risk of flood hazard due to its topographical variation, deformed rocks in the mountains, intense erosion, bank scouring and extreme precipitation in Siwaliks. More than 6000 streams and rivers flow across Nepal from the north towards the south with high velocity. These river and streams flow with high river gradient.(3) Most of the big rivers of Nepal are originated from the Higher Himalayas and Karnali, Gandaki and Koshi are the three main river system of Nepal.

As the major river system of Nepal has the Himalaya origin the high intensity of flood is expected with melting of glacial lake.(2) Although it affects all parts of the country, the high number of deaths and injuries due to flood is being reported in Terai region. Annually, flood affects hundreds of thousands of people across the country. Beside the natural cause of flooding there are some risk behaviour of human that leads to flooding i.e. deforestation, encroachment of flood plains, haphazard urbanization, environmental degradation, movement of people to the plan region are supposed to increase the vulnerability to natural disaster. River bank undercutting, landslides, debris flows, breaking of dams are the post impact of flood.(3)

Trend Analysis of Flood

There is a long history of flood in Nepal especially in the Terai region. In 13 and 14 of August 2017, there was a heavy flood in the Midwestern region of Nepal mainly in Banke, Bardiya, Surkhet and Dang where 211 people lost their life and 35,989 families have suffered with enormous loss of their physical properties.(3) It was not stopped and in the same year in 24th of August, Nepal experienced another worst rain which affected 35 out of 75 districts.(3) Experts stated that one-third of the poorest areas of east-west highway was flooded in this flood.(10)

Figure 9 Trend Analysis of Flood



Similarly, Nepal has suffered enormously in the year 2013 and 2014 with a continuous occurrence of floods and landslides in various parts of the country. The 2013 floods and landslides has affected various parts of Far-Western Region, particularly, in Darchula

district of Mid-Western region. During this year 165 people were missing, 517 were injured and 2697 families were affected. Additionally, the economic loss in 2013 was 2057 million rupees.

Moving towards the year 2014, Mid-Western region of the country particularly Banke, Bardiya, Dang and Surkhet was affected with the most frightening and devastating flood which causes huge number of loss of lives and physical properties. It was reported that during this year 357 loss their lives, 473 were injured, 39812 families were affected, 5282 animals were killed. On contrary the economic loss in this year was 16753.7 million rupees which was more than the year 2013.

Landslides and floods are positioned as most destructive type of disaster in Nepal. The devastating flood and landslides in the year 1984, 1993, 1999, 2002, 2008, 2014, and

2017 cannot be forgettable in the disaster history of Nepal which caused enormous loss of lives and properties. The graph in the figure 9 shows that every year the flooding cause the loss of human lives and in the year 1993 there were enormous loss of lives due to flooding. After 1993, the loss of human lives due to flooding is decreased but still carries high risk of being affected by flood.

Injuries, damage of infrastructures like bridges, canals, house, displacement and extinction of flora and fauna, displacement of human and animals, destroy of agricultural production, increases financial burden are some of the ultimate impacts of flooding. This combinely leads to slow developmental process of the human society and country.

Case Study: Flood August 2017

Situation Overview

From the second week of August 2017, Nepal struck with the continuous heavy rainfall resulting to flood. Heavy rainfall starts with the entry of moisture from the Bay of Bengal that releases significant rains on the southern parts of the Chure range and the mid-hills. It was the worst rainfall after 15 years of history in which 35 out of 75 districts were affected resulting to the enormous loss of lives and property. 18 districts were badly affected by this flood. Biratnagar airport in the east was completely inundated and the airport was closed for few days.

Figure 10 Flood in Terai, August 2017 © Annapurna Post



Initial Rapid Assessment in 28 districts reported that about 1.7 million people were affected, almost 65000 houses were destroyed, 460000 people have been displaced and an estimated of 19000 persons are residing in informal displacement sites like school, and some of the 40 communities remain inaccessible by this flooding. Mostly women, children, and older people were affected. The impact destroyed 80 schools across 28 districts and the critical damage to further 710 schools, 10 health facilities were destroyed and 64 were partially damaged which has made the accessibility to health services more critical. Regarding the crop, 64000 hectares of standing crops were destroyed in 10 worst affected districts which raise the food insecurity problem and livelihood is less effected. (11) The warning remains for East Rapti, West Rapti, Babai

and Ruikhola (Madi) basins due to heavy rainfall with the remaining subside forecasted by Department of Hydrology and Meteorology. Humanitarian response 1.7 million people of 35 districts were targeted and US\$ 41.4 million was requested for the humanitarian aid.

For the humanitarian response, Government of Nepal activated the cluster with the deployment of 27,000 security personnel and 700 civil servants for the humanitarian

Table 2 Highly affected district in August flooding 2017

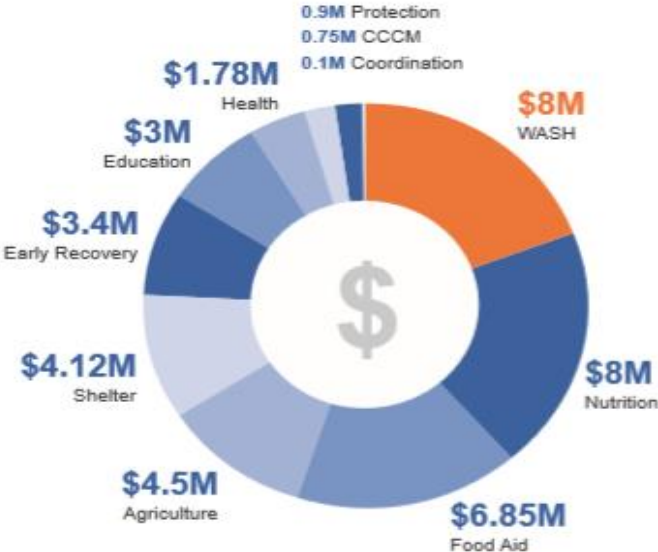
District	Affecte Population		
	Male	Female	Total
Banke	25,705.00	26,732.00	52,437.00
Bara	6,306.00	7,257.00	13,563.00
Bardiya	66,015.00	68,789.00	134,804.00
Chitwan	10,820.00	11,490.00	22,310.00
Dang	2,089.00	2,131.00	4,220.00
Dhanusha	34,140.00	34,830.00	68,970.00
Jhapa	12,228.00	12,752.00	24,980.00
Kailali	7,640.00	7,795.00	15,435.00
Mahottari	100,567.00	99,433.00	200,000.00
Makwanpur	5,485.00	5,595.00	11,080.00
Morang	11,523.00	12,054.00	23,577.00
Nawalparasi	3,193.00	3,257.00	6,450.00
Parsa	19,835.00	20,235.00	40,070.00
Rautahat	131,910.57	134,575.43	266,486.00
Saptari	353,279.00	295,666.00	648,945.00
Sarlahi	10,195.00	11,445.00	21,640.00
Siraha	28,858.00	29,442.00	58,300.00
Sunsari	37,205.00	38,002.00	75,207.00
Total	866,993.57	821,480.43	1688,474.00

Source: MOHA, Initial Rapid Assessment, 20 August 2017

assistance and rescue. The relief provided in the affected district was more than US\$11.3 million to address the significant humanitarian need. The helicopters, rafts, rope were send by the Ministry of Home Affairs to evacuate the people to the safer locations.(11) The vulnerability of multi hazard in Nepal lead the rescue and relief work more back, until the recovery from one disaster is fully completed another disaster hit the country.

Figure 11 shows the cluster wise response planning of August 2017 flooding. WASH and Nutrition cluster is the first priority area to response covering the highest need of budget allocation \$8M followed by the food aid \$6.85M. As all the clusters are interlinked with each other, budget is allocated based on the need and loss. The figure shows the budget planning to response the effect of flood.(11)

Figure 11 Cluster wise response planning



Post Disaster Analysis of Loss (human life and economic loss)

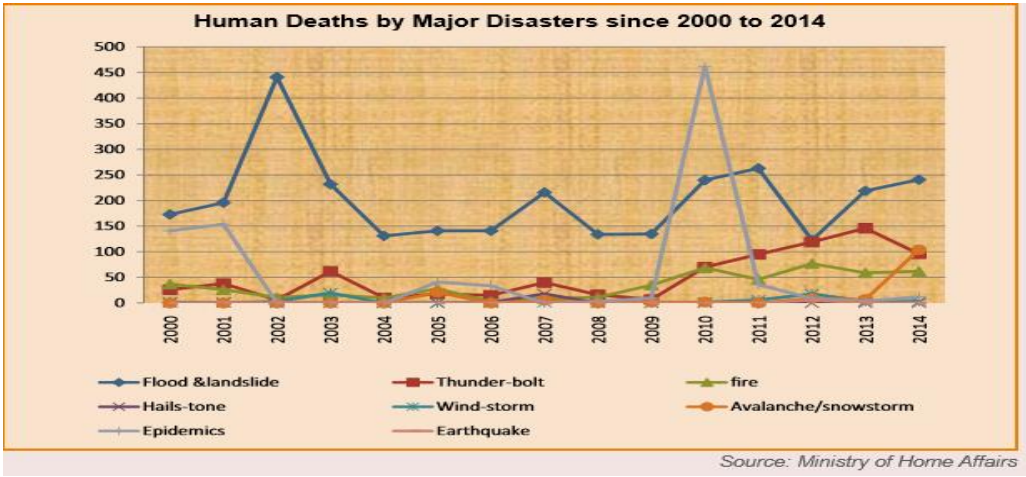
It is viable and demanding to conduct the post disaster analysis of loss to explore the most needed humanitarian assistance and urgent task to be carried out. The post disaster analysis further assist in developing the comprehensive recovery plan. The impact of disaster is categorized as direct, indirect, and secondary impact. Each year the small, medium and large disastrous flood and landslides in Nepal causes deaths of about 300 people and economic loss of 1 billion NPR on an average. The government database shows that on an average more than 80 people loss their live annually due to flood and an economoc loss equals to 1.5 million USD (8) However, the indirect socio-economic impacts and negative impact on development and economy of the country is also inevitable. This has eventually caused significant loss of GDP due to natural disaster.

Human Lives

Human lives is directly affected by the disaster and its impact varies year-by-year based on the nature of disaster.

Figure 12 is the official statistics of Ministry of Home Affairs for the year between 2000 to 2014 shows that flood and landslides are the major contributors for the total human loss and every year significant number of human deaths is due to flood and landslide. It was only in 2010 that the epidemic causes the heavy loss of life with flood and landslide in the second position. It is seen that the impact of flood and landslide was dropped in 2012 since then it keeps on increasing. As per the data of MoHA 2013, other major causes of human deaths are thunderbolt, fire, and avalanche. Similarly, the human death during the period of 30 years (1983-2013) accounts 23,705.

Figure 12 Human Deaths by disaster 2000-2014



Economic Loss

Average of 14033 houses were annually destroyed with the total number of 435049 houses being destroyed by disaster between the year 1983 and 2013. Table 3 shows the comparative economic loss over the years and it was found that the economic loss from 1983 to 2013 is NRs. 39095.87 million (12) The year 1988 has the highest economic loss with NRs, 6099 million and the 1985 and 1986 reports the lowest economic loss with NRs 23 million by the disasters. Estimated economic loss follows similar trend after 1995 upto 2013. In 2013 only, economic loss was NRs.3425.59 million, which was 8.76 percent of the total estimated loss over the year 1983 to 2013. (13)

The table 4 reflects the post disaster impact of damage of infrastructure incurred by different types of disaster. According to desinventar database, it is observed that 211616 houses were totally damaged, 1034605.492 hector crops were destroyed and the loss of livestock was 768465 between 1971 to 2013. Additionally the database

shows that between flood causes the high infrastructural damage (242295) among all disaster. Flood accounts for the 97.9% of the total economic loss according to the OFDA/CRED - International Disaster Database 2015.

Table 3 Comparative loss by disaster 1983-2013 source DWIDP 2013

Year	People		Livestock loss(Nos.)	Houses Destroyed (nos.)	Affected Family (Nos.)	Land Affected (Ha.)	Public Infrastructure	Estimated Loss (Million NRs.)
	Death	Injured						
1983	579	NA	248	12	NA	NA	NA	240
1984	941	NA	3547	10597	NA	1242	869	49
1985	1387	NA	3399	7166	NA	1355	436	23
1986	1512	NA	6566	3370	NA	1315	436	23
1987	881	162	1852	36220	97036	18858	421	2005
1988	1584	12538	2788	108801	70197	NA	4365	6099
1989	1716	3014	4240	7648	NA	NA	NA	4172
1990	913	196	867	6352	8462	1132	NA	139
1991	971	43	642	5510	6426	283	39	43
1992	318	17	1586	13997	11535	135	66	52
1993	1524	246	NA	21911	90911	NA	NA	5189
1994	765	155	1329	3234	11701	392	NA	184
1995	873	1937	2053	10275	134216	41867.26	NA	1933
1996	895	1527	2480	30014	58329	6063.4	NA	1579
1997	1160	1120	1191	4825	46054	6063.4	NA	452.37
1998	1190	117	1179	15082	36987	326.89	NA	1230
1999	1466	146	650	4304	17842	182.4	NA	509
2000	377	162	1017	6886	24900	888.9	NA	1141.5
2001	415	132	665	6103	15908	NA	NA	526.55
2002	458	287	2126	19856	40935	10077.5	NA	525.56
2003	310	160	1125	6819	11730	2360	NA	989.93
2004	192	220	888	4818	16997	0	NA	341.09
2005	242	153	955	3169	4315	0	NA	387.21
2006	132	88	10098	3765	19023	3396.84	NA	392.31
2007	274	144	21861	37984	117203	513.65	NA	1928.55
2008	171	55	7066	13864	21600	21315	NA	1633.28
2009	641	117	228	1050	3028	NA	4.88	420.25
2010	415	261	1526	23370	19026	200	2.85	1398.19
2011	509	271	254	9644	11417	120	0	616.90
2012	433	466	1449	5500	4010		0	1489.97
2013	461	421	990	2903	2710	232	0	3383.21
Total	23705	24155	84865	435049	902498	118319.24	6639.73	39095.87

Table 4 Economic loss by type of disaster 1971-2013@desinventar

Event	Houses		Losses \$Local	Education centers	Hospitals	Damages in crops Ha.	Lost Cattle	Damages in roads Mts
	Destroyed	Damaged						
ACCIDENT	7	516	93739000	1	0	0	27	0
AVALANCHE	82	33	20303100	0	0	1.01	658	0
BIOLOGICAL	0	0	15600000	0	0	100	606	0
BOAT CAPSIZE	0	0	320000	0	0	0	0	0
COLD WAVE	0	0	834650000	12	0	26906.5	732	0
DROUGHT	0	0	11700000	0	0	412773.7	0	0
EARTHQUAKE	34813	57030	580753700	2780	8	0	2215	0
EPIDEMIC	0	0	2631040	0	0	2000.94	7577	0
EXPLOSION	4	1	20215200	0	0	0	0	0
FAMINE	0	0	0	0	0	26136	0	0
FIRE	77646	2154	26371595017	83	8	2092.99	125220	25
FLOOD	96418	103318	6076094069	72	5	243131.8069	538324	42482
FOREST FIRE	1877	2	1292489301	0	0	12767.88	373	3000
FROST	0	0	457200000	0	0	5005	0	0
HAIL STORM	208	1636	2228402606	16	1	132866.86	943	0
HEAT WAVE	0	0	0	0	0	0	250	0
LANDSLIDE	18897	34126	1179349524	132	8	22575.935	10798	380341
LEAK	1	0	2000000	0	0	0	0	0
OTHER	68	0	1000000	0	0	500	15	0
PANIC	0	0	0	0	0	0	0	0
PLAGUE	0	0	7122000	0	0	45764.52	71429	0
POLLUTION	0	0	0	0	0	0	24	0
RAINS	791	2319	379373069	23	0	70629.6	5174	203200
SEDIMENTATION	0	0	0	0	0	0	0	0
SNOW STORM	102	59	2000000	0	0	1900	882	72000
STORM	1022	566	24634280	16	0	87	358	0
STRONG WIND	2056	8712	802834026	486	6	25946.5	1140	0
STRUCT.COLLAP SE	1308	626	43352285	16	1	3419.25	160	0
THUNDERSTORM	360	518	38645967	9	0	0	1560	0
TOTAL	235660	211616	40486004184	3646	37	1034605.492	768465	701048

National Policy and Strategy on Disaster Initiative

Government of Nepal has been participating in all world conferences on disaster management (Yokohama, 1994; Hyogo 2005; and Sendai 2015). Government of Nepal has committed to implement the new Sendai Framework for Disaster Risk Reduction 2015-2030 in Third United Nations World Conference (March 2015) on Disaster Risk Reduction with a aim to broaden the horizon of understanding of disaster risks, establish multi-hazard warning system through strong DRR global cooperation mechanism. These global platforms have capacitate Government of Nepal to draft the strategy and guideline to response the disaster like National Disaster Response Framework (NDRF), Local Disaster Risk Management Planning Guideline, 2011. There are different strategy based on the nature of the disaster like National Building Code (Earthquake), NAPA (Climate Change).(3)

Natural Disaster Relief Act 1982

Natural Disaster Relief (Calamity) Act 1982 is a well-structured road map promulgated by government of Nepal to respond disaster. It is the outcome of the realization of the need of disaster policy to respond the disaster in a systematic way and reduce the loss. Natural Disaster Relief Act was formulated in 1982. The act basically focuses on relief and response activities but the need to focus on the preparedness to reduce disaster risk reduction and mitigation since than emphasizes the act to amend many times (first in 1986, second in 1989 and third in 1992). Today also it is in the process of revision to make it more friendly to respond and mitigate the natural disaster.(12) The Ministry have already started to review the Act which is integrating the preparedness and mitigation component of disaster risk reduction cycle . To respond the disaster, the act has develop a systematic structure from central to local level with well defined task and responsibilities.

Local Governance Act 1999

The decentralization and devolution of authority is defined by the Local Self Governance Act 1999 which helped to make the local authorities more responsible to undertake disaster management activities.(12) Decentralization empowers the local government to build their capacity to respond to natural disaster with local resources, prepare realistic plans, and programs. LSGA helps to keep the momentum to the disaster risk reduction activities at the community level. Local authorities' municipalities, VDCs, and DDCs have come up with the initiative to respond to the vacuum in disaster response. However, the poor legal tools such as regulations, by-laws have hindered the implementation of LSGA.

National Strategy for Disaster Risk Management 2009

Nepal realizes the need of a proactive disaster management act and policy that covers the whole cycle of disaster management since early 90s. The government approved National Strategy for Disaster Risk Management (NSDRMN) in 2009 which is based on the Hyogo Framework. This strategy can be taken as a well-structure DRR mechanism of Nepal. *To achieve the goal of disaster resilient Nepal by providing guidance for improving the policy and legal environment and by prioritizing the strategic interventions is the target of the National Strategy for Disaster Risk Management.* This strategy emphasizes the need of re-organization and development of institutions working in the disaster through the improvement in existing policy and creating enabling environment for DRR initiatives. Mainstreaming DRR strategies into the national development agenda is another forth suggestion made by the NSDRMN. Nevertheless, Government of Nepal is committed towards protection and safety of human lives, properties as well as to mitigate by improving quality of life of people.

The lead role exists within the Ministry of Home Affairs (MoHA) for managing the response efforts through activating the cluster system and Emergency Response Preparedness plan. Committees are activated for rapid response during disaster. Hence, the strategy is the road map for all sectors to prepare sector specific DRM programs and formulate the necessary policy. Twenty nine cross-sectorial areas has been identified based on the HFA priority actions to make the strategic actions. Shelter, food security, nutrition, water, sanitation and hygiene, health, education, protection, and logistics are the clusters for the humanitarian recovery action where all the humanitarian action is directed. (12) There is an integrated approach from different ministries to carry out NSDRM namely National Planning Commission, Water and Energy Commission, Ministry of Home Affairs, Ministry of Water Resources, Ministry of Forest and Soil Conservation, Ministry of Health, Ministry of Local Development, Ministry of Environment and Population, Ministry of Science and Technology.

Vision

The ultimate vision of the National Strategy for Disaster Risk Management is to create a Disaster-resilient Nepal.

Mission

The mission includes:

- Enhancing policy and legal environment for broad participation of all stakeholders and comply towards the principles of centralized Policy, decentralized implementation.

- Creating enabling environment for the planning and implementation of Disaster Risk Reduction action from central to the household levels,
- Assure that the disaster risk reduction strategies are integrated into sectoral development and poverty alleviation plans.
- Institutional development,

Priority

To achieve the vision of creating disaster resilient Nepal, the National Strategy for Disaster Risk Management has set five priorities based on the Hyogo framework:

Priority Action 1: to ensure the disaster risk reduction as a national and local priority with strong institutional development for effective implementation

Priority Action 2: identify the risk of disaster, ensure proper monitoring and enhance early warning

Priority Action 3: to develop curriculum on DRR training for different target groups and its implementation

Priority Action 4: to reduce the underlying risk factors for disaster

Priority Action 5: to enhance preparedness plan for effective response

Key National Achievements

From the last few decades Nepal has made a remarkable progress in Disaster Risk Management. Continuous exposure and the global ranking of disaster risk have sooner lead to the realization of the need of policy frameworks. Finally, today Nepal has a number of legal, institutional and policy framework ready to collectively response disaster. Mainstreaming DRR into the development plans is one of the good initiative recently practiced by the country but there is more to work to adequately incorporate into development plans and programs. New Constitution boost the importance of DRR through the provision of disaster management section in different level of government. The Natural Calamity Act 1992 also form committee for the effective disaster response from central to local level. CNDRC, RNDRCs, and DDRCs have been the outcome of the Natural Calamity Act. Nevertheless, various operational guidelines are also in a place to mitigate the disaster and as a part of disaster risk reduction response.

Prime Minister's Natural Disaster Relief Fund have motivated all the people for acting effectively in disaster risk reduction. The current disaster management policies try to minimize the burden of other natural disaster through static and reactive approach. To create a good pool of human resources, there is a compulsory for all the concerned government agencies to assigned one senior officer as a Disaster and Climate Change Focal Person. Similarly, at the local level communitybased disaster management activities are initiated to reduce the risk and burden of disaster in the disasterprone

areas. Also the government has focused on school improvement, curriculum development of disaster management, and school sector development plan which is appreciable. Likewise government of Nepal has implemented hospital preparedness program in both public and private sector. The establishment of National Emergency Operational Centre (NEOC) has been vital to smoothly operate the national disaster risk reduction initiatives at various level. Nevertheless, at regional and district level there are more than four dozen of Emergency Operation Centers for reducing the burden of disaster. After the earthquake 2015, 83 open space points has been identified within Kathmandu Valley for temporary shelter during disaster where the infrastructure development is under construction in few open spaces. Keeping in mind that the shortage of safe drinking water, emergency kits, shelter with warehouse capacity Government of Nepal has been engaging themselves in ensuring the availability of these basic needs and exploring the possible options to overcome the gap during disaster.

The Nepal Building Code was not followed properly in previous but today to follow the building code has been mandatory in all parts of Nepal mostly in municipalities. To overcome the weak information system GoN has initiated GIS based Disaster Information Management System (DIMS) and operational DRR portal helps in collection, analysis and dissemination of information. Moreover, the institutionalization of cluster approach to respond to disaster is another effort for effective implementation and better coordination among stakeholders in disaster management and response. Along with this, mason trainings, awareness program has been conducted at various level. Operationalization of the medium and light Search and Rescue (SAR) team, Get Airport Ready (GAR) are some of the other disaster response initiative by GoN.

Flood Risk Reduction Initiatives

Nepal's current disaster management policies deals with the risk reduction and preparedness plans of recurrent natural hazards but does not geared enough to deal with the flood risk management. The frequent occurrence of flood with heavy loss have pushed to develop a new approach of flood risk reduction. This was developed after wide discussion and consultation among governmental, non-governmental stakeholders and the communities. Flood management is complicated, time consuming, and needs multi-sectoral approach. Multi-Criteria Decision Support Systems (MCDSS) can be one of the way to deal this complexity nature of flood by combining technical information and quality judgements in a structured decision framework.(14) Community based early warning system and flood mitigation is the current requirement for flood risk management initiatives. In this context, the flood risk reduction initiative replace the traditional approach of treating upstream and

downstream separately with linking both upstream and downstream, watershed management, information centers, and alternate economic activities. This approach identified the integrated approach to deal with the flood risk reduction action. Siwalik conservation through watershed management, bio-engineering and alternative economic activities to the surrounding communities to stop deforestation and encroachment, river training and check dams, embankment construction, safe escape route, shelter houses, water level monitoring systems and formation of information centers have been some of the major flood risk management initiatives done in Nepal. Adding to this, the approach also pinpoint the easy and low cost early warning system to be applied in upstream, middle stream and downstream. This new flood risk reduction initiative is under the implementation phase in Terai region of Eastern region of Nepal.(15) Additionally, five major river basins as a part of basic Early Warning System can be taken as another progress toward DRR.

Community Based Early Warning System of Flood in Nepal

Universal aim for the idea of establishment of early warning system is to reduce the burden of disaster and decrease the loss from any types of disaster.(8) Community based early warning systems is an approach where the communities actively participate in designing the preparedness and response plan along with regular monitoring and management. This approach is people centric which encourages communities to identify the local resources and community capacity to cope with the changed hazardous events in an effective way. An INGO-Practical Action have first piloted the Community Based Early Warning System in Nepal in 2002 for the East Rapti River. After the successful of this very first CBEWS it was enhanced and expanding to cover eight river basins across Nepal namely Karnali, West Rapti, Babai, East Rapti, Narayani, Bagmati, Kankai and Koshi basins. (16)

It was since 2007 when community based flood early warning system is in operation. Similarly, Department of Hydrology and Meteorology in collaboration with Action Aid Nepal has promoted CBEWS in Sunsari district. Another CBEWS for excessive rainfall and landslide has been established in Mugling-Narayanghat Highway at Kabilas VDC of Chitwan district by Department of Water Induced Disaster Prevention. (8). Operationally, government body in the district maintain electric flood monitoring display with setting the automated siren (sound) when water cross the danger level. Gauge reader is assigned to monitor the water level carefully and circulate the reading to the concerned body at the local level.

In 2014, CBEWS fails and there was heavy flooding caused by Babai River. CBEWS in Babai basin washed away the gauge station as it has short lead time. There is some significant limitations of current Early warning system of flood in Nepal firstly, the

system is based on real-time water level readings due to which there is high probability of getting exact reading during extreme rainfall. Secondly, the short lead time where the level of water rises shortly and lastly limited hydro-met stations where mostly the flood-prone remote areas do not have upstream gauge.(16)

National and International Organizations

It is important that along with the government bodies the national and international organizations should collaborate for the effective response of disaster. Many I/NGOs are now working in Nepal in Disaster Risk Reduction sector some of the active organization in this sector are United Nation, World Bank, IFRC, OXFAM, NRCS, Save the Children, Practical Action, Inter Agency Sectorial Committee (IASC), Action Aid Nepal, CARE Nepal, Mercy Corps, Lutheran World Federation, and many more with their local partner organization.(3) These organization provide humanitarian assistance during disaster and also provide their technical support to build disaster resilient Nepal through funding, their technical and engineering expertise.

Gaps

Despite of the significant progress towards disaster risk reduction, Nepal has not been lift from the heavy loss of lives and property during disaster. This can be say that still the efforts and resources are more focus on risk reduction activities rather than preparedness. The unequal distribution of resources in preparedness and response has been a challenge. Another fact of shift of Nepal to new administrative structure of federal system have blur the disaster mitigation plan and placed a state of confusion. This administrative transition have raise the question of what kind of disaster mitigation technology to be adopted and how it is implemented in the new government system. Although DRR is incorporated in all sectorial development plans at different level (central and local) disparity can be seen simultaneously in policy, program, and practice. Nevertheless, government policies should imbed decisive DRR action from their part. Political stability and commitment is another big issue. Adequate and effective coordination among the organizations working for disaster management is in high need. Thus, harmonizing DRR in the existing policies is needed.

Limited resources, inadequate preparedness, poor coordination among organizations related to disaster management, inadequate and poor management of emergency warehouse, ineffective awareness program, and lack of sophisticated modern technology are some of the gaps against disaster response. Similarly delay in need assessment and service delivery increase the severity of effect of disaster. During the disaster delay in deployment of relief material and prepositioning with proper

inventory is another alarming problem in the disaster reduction response in Nepal. So far, Nepal DRR is concerned it is mostly focused on the disaster response and relief rather than to focus on complete approaches including planning, preparedness and recovery. Lastly, none of the academic institutions have prioritized the curriculum of disaster risk reduction and research.

Lesson Learnt

The lessons call from the various devastating disaster like 1988 earthquake and 2015 Gorkha earthquake, 1993 flood and landslide, 2008 Koshi flood and 2014 mid-western and eastern region flood have drawn the attention towards the nature and seriousness of multiple hazards in Nepal. This incident have emphasized the need of heavy investment and multi-sector commitment in disaster resilience. Keeping in view the Nepal highly prone to different types of disaster, the country needs a well-structured DRR mechanism and for this Nepal has to form and develop various structural and non-structural measures. The exposure to large number of hazards and disasters over the years there is realization of the need of adopting Build Back Better (BBB) strategy to ensure the infrastructures are retrofitted to better standards. The effective coordination among all levels from community to national level for disaster preparedness and response is crucial. The need of effective EWARS system and prompt response is highly needed with construction of lowcost community based EWARS mechanism. Since every year Nepal experience a number of floods and landslides the encroachment at the highly prone area should be prohibited and the capacity of people to cope with the disaster should be increased through various capacity building and educational training.

Discussion and Way Forward

Study shows that South Asia suffers from heavy flooding in the monsoon season with enormous social, economic and environment loss annually. It reveals that annually the damage caused by disaster is approximately 1 billion USD.(17) Similarly, flooding in 2010 in Pakistan has affected 18 million people majority of which are already living in poverty and enormous loss of farmland, livestock, infrastructures.(18) Analysis of Risk, Resources, coordination, infrastructures (medical service) is needed as a part of preparation. It is said that well planning is half done, so the planning at the first stage of Disaster Risk Reduction cycle helps to reduce the risk. There is a need of adequate and effective multi-sectorial approach for DRR. From the literature it is concluded that the first person to respond to disaster is always the community people so to increase the capacity of community people to cope with the hazardous event is always a primary need. This is supported by one study which emphasizes addressing the people in the

high risk areas by enhancing their resilience capacity.(19) Hospitals are at the response level only. Having many committees, policies, guidelines, programs to respond to the DRR is not sufficient but the proper execution is the main thing. The data shows that there is prominent need of well-developed preparedness plan, program and projects to reduce the fatality and loss of properties due to disaster in future. The current trend of disaster in Nepal suggest the demand of incorporation of disaster risk reduction and resilience strategy into both public and private sector development works. Mean time the identification of local resources, realizing own capacity to respond disaster and exploring other external (national and international) resources is highly desirable.

Under above circumstances, main crux is Nepal need a collaborative approach to response to multi hazard situation. The recurrent occurrence of flood and landslides has adverse effect in life of people, biodiversity, and economic development. Eventually, if a multi sectorial approach is not taken than it is difficult to cope with the change abnormal hazardous situation. Building local capacity for risk analysis, developing preparedness and mitigation plan and programs, coping mechanism, assessing the basic human needs like health facilities, safe drinking water, transportation during disaster, exploring the local organization working in the disaster can be one of the major thing to work to minimize the impact of disasters. The need of prioritizing the high risk area with the type of disaster can be another thrust of disaster response. The findings suggests that government should be always ready with response and mitigation strategies. After every disaster response action, there is always a need of evaluation which is poor in Nepal.

The evaluation evaluates the initiatives adopted and helps to document the leaning from the specific interventions, and programs. Evaluation also encourages to rethink, redesign the disaster preparedness plan. The proper documentation of the evaluation is a better way to reduce the risk of repeating the same mistake and generate innovations. Decentralization of the responsibility, engaging all stakeholders and community helps to respond effectively with multi-hazards at all levels. Overall, ensuring security to live in a harmonious environment and help the affected to rebuild their lives should be the priority of every government. The International Law says that every person in a disaster has right to live with dignity and has right to receive humanitarian assistance during the changed hazardous situation. Since Terai is a plain land, it is easier to save one's life and property through an effective education program so an investment in education today reduces the communities vulnerability and effect of flood in future.(20)

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