Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

Occurrence of Disaster Events and their Impact in Nepal: Role of Government and Civil Society Organizations to Reduce the Disaster Risks

Pitambar Aryal
PhD Scholar, Dr. K. N. Modi University, Rajasthan, India
pitambar.aryal@gmail.com

Received: February 16, 2023; Revised & Accepted: March 17, 2023

Abstract

Nepal is highly vulnerable to multiple geological, hydro and meteorological hazards in which floods, landslides, fires, avalanches, glacial lakes outburst floods, droughts and earthquakes are predominant. Nepal has also been experiencing outbreak of epidemics and pandemic having high morbidity and mortality. Every day, on an average, 2 people die due to recurrent disasters. Situated in seismic zone, Nepal is prone to earthquake, and it had experienced several episodes of earthquake having losses of human lives and physical infrastructure. Climate change attributing significantly in extreme weather conditions resulting heavy rainfall, drought, fire, and glacial lake outburst floods. The disasters events have severe impact in socio-economic and health of community people creating problem in access, disrupting supply chain, damage, and destruction of service delivery outlets. The main objective of this paper is to analyze the disaster situation in country, their impact and assess the role of government of Nepal and civil society organizations in reducing the disaster risks. This paper has been prepared by reviewing the secondary data mainly government, UN and I/NGOs reports and research articles. Marginalized groups of the society are hardest hit by the disasters. Investing resources in preparedness and risk reduction pays off in saving lives and properties, investing 1 NPR in DRR is equivalent to 18 NPR during post disaster situation. A whole of society approach where preparedness, risk reduction, response, recovery, and reconstruction go simultaneously in building resilience nations to disasters. Development work should mandatorily apply environmental impact assessment and do no harm principles. The government of Nepal has developed DRM Act, policy, and strategic plan. Accountability framework, risk governance and risk education play a critical role to achieve outcomes stipulated in the strategic plan.

Key words: Disaster Risk Reduction, Resilience, Vulnerability, Climate Change

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

Introduction

Diverse climatic, ecological, and geographical topography, Nepal is a landlock country having highest pick in the world and lowest land from the sea level. It is a reach country in terms of its cultural heritage, ethnicity, and religious composition. Nepal is prone to multiple disasters, around 90 percent population live at risk of death due to two or more types of disasters. Nepal has been ranked at 11th position in terms of earthquake risk and 30th in terms of flood and landslide risks. Situated in active seismic zone, Nepal is equally vulnerable to earthquake and had experienced a high intensity and magnitude earthquake in 2015, resulted a huge devastation in terms of lives, livelihoods, and infrastructures. It has been reported that more than 8,979 people lost their lives, 22,300 were injured and 498,852 houses and 2,656 government buildings were destroyed. Besides, 19,000 classrooms fully and 11,000 classrooms were partially damaged (The Government of Nepal, Ministry of Home Affairs, 2018). Students were unable to continue their study in their respective schools mainly due to building collapse and psychological trauma; transitional shelters were built or identified to continue the study. Hospitals/health centers were destroyed creating difficulties in delivering health services.

The research paper has primarily been prepared based on the literature review. The reports and disaster data source created by Ministry of Home, National Disaster Risk Reduction and Management Authority are reviewed and analyzed. The research studies carried out on cost benefit analysis mainly investment in DRR and its benefit on reducing risks and building resilience are reviewed and taken into consideration while preparing the research paper. This paper will play a critical role in getting better understanding about the context and provide an impetus for designing as well as implementing the disaster risk management programs in Nepal by government and civil society organizations.

It is important to get better understanding about the coping capacity of community people to future shocks or disasters and role of local authority in this regard. The local authority has a greater role to play having better understanding on suitable DRM framework for managing the multiple hazards, which would galvanize as well as institutionalize the initiatives taken at local level. It is hoped that the study would be instrumental to assess the situation and provide impetus to government and civil social organizations as well as scientific community in reducing the disaster risks and building community resilience at large.

Literature Review

In last 45 years (1971 to 2015), more than 40264 people have lost their lives due to disasters in which earthquakes, floods, landslides, and epidemics account a high number of deaths among other disaster events; this number is on an average 2 losing life every day. The physical devastation outlined in introductory paragraph is a tip of the iceberg as there has been severe psychosocial impact of earthquake and other hazards, which might take years to recover. The

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

disaster events have reversed the development gain, around 2 percent GDP has been lost due to disasters every year in Nepal (The Government of Nepal, Ministry of Home Affiars, DRR National Strategic Plan of Action , 2018). A summary of key hazard and their deaths and affected population covering the period from 1971 to 2015 is outlined below:

S.N.	Hazard type	No of records/ events	Number of deaths	Number of injuries	Affected families	No of houses damaged/ destroyed
1.	Epidemics	3448	1654	43076	512970	-
2.	Earthquake	175	9771	29142	890995	882855
3.	Landslide	3012	4832	1727	556774	32819
4.	Flood	3720	4344	527	3702942	215427
5.	Fire	7187	1541	1379	256445	83527
6.	Thunderstorm	1505	1502	2444	6880	952
7.	Cold Wave	390	515	83	2393	-
8.	Avalanche	2	16	2	-	-
9.	Windstorm	16		-	-	-
10.	Hail stones	17	-	-	2608	6
11.	Heavy rainfall	3	-	-	5	4
12.	Others	2892	1092	-	-	15323
	Total	22372	40264	78383	5, 932,012	1,330,913

(The Government of Nepal, Ministry of Home Affairs, 2016)

The data stipulated above gives an overview on number of key hazard events struck in Nepal, their impact in terms of loss of lives and affected population where epidemics, earthquake, landslides, and floods account high number of deaths and affected population. Nepal had experienced an outbreak of acute watery diarrhea in Mid and Far Western region of country from March to August 2008, about 282 people lost their lives. Due to diarrhea outbreak, 128 people lost their lives and 12,500 people were affected alone in Jajarkot district whereas 46 people lost their lives in Rukum district. The main underlying causes of an outbreak was an early monsoon in Mid and Far Western region resulted massive flood, which destructed and contaminated the water sources. The sanitation, hygiene and access to safe drinking water is a key challenge in remote parts of country during normal time, the situation further aggravates by flood and landslide disasters. On the other hand, like other countries in the globe, the COVID 19 Pandemic severely affected the lives of people across the country. The deadly virus took lives of 1209 until 9th of December 2022 and the problem is not over yet. The case fatality rate was 1.2 percent whereas the recovery rate was 98.8 percent in Nepal (The Government of Nepal, Ministry of Health and Population, 2022). Due to rapid transmission of COVID 19 across the globe, WHO and respective government imposed a curfew with the notion of preventing further transmission of virus. However, the situation posed a challenge for

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

sustaining the economy of country; some of the countries' economy is at verge of collapse and many of them are still facing severe financial crunches.

Following this, studies carried out in developed country also indicate that there has been severe impact of multiple disasters' exposure to public health, access to safe drinking water, operation of health facilities, sanitation and hygiene practices, garbage disposable, toilet facilities and care for chronic patients and emergency health services. It is equally important to note that physical and psychological trauma are commonly reported during disaster situations however little has been explored on impact of disaster exposure in public health (Leppold Claire and et.al, 2022).

Nepal has made a commitment to contribute to achieve the Sustainable Development Goals. Some of the SDGs outlined are no poverty, zero hunger, good health and well-being, clean water and sanitation, sustainable cities and communities and climate action; in several instances, the process of achieving the stated goals are impacted by the disaster events. Similarly, Nepal has also made a commitment to implement the road to resilience (UNISDR, Sendai Framework for Disaster Risk Reduction, 2015). The Sandai Framework for Action 2015-2030 was adopted at the third UN World Conference in Sandai, Japan on 18th March 2015. The UN World Conference set four priorities for building resilience communities and nations to disasters. The government of Nepal together with civil society organizations actively participated in this conference and collectively endorsed the framework. The framework underscores the importance of four priorities mainly understanding the disaster risks, strengthening disaster risk governance to manage disaster risk, investing disaster risk reduction for resilience, enhancing disaster preparedness for effective response and to build back better in recovery, rehabilitation, and reconstruction. Focus has also been given on role of stakeholders for building international cooperation, and global partnerships (UNISDR, Sendai Framework for Action 2015-2030, 2015). This is a roadmap for building resilience communities and nations to disasters. Being signatory to Sandai Framework, the government of Nepal has a greater responsibility to initiate risk reduction activities proactively so that vulnerability to disasters can be reduced, capacities of people could be enhanced to cope with the situation and are able to respond the disasters in an effective and efficient manner.

Studies indicate that investing in risk reduction initiatives pays off in saving lives and properties during aftermath of disasters. The findings from the cost benefit analysis shows that the program generates over 18 NPR of benefit for every 1NPR spent in DRR interventions. The DRR initiatives help community people making them aware about the hazards, risks and initiate various risk reduction initiatives; establishment of revolving fund for DRR, formation of community DRR committees and units, development of disaster preparedness and response plan, training of community people on vulnerability, capacity and hazard risk mapping, and ranking, identification of appropriate mitigation measures, regular simulation and drills for testing preparedness and response plan, establishment of community resource center. It is

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

reported that Nepal's contribution to global warming through greenhouse gas emission is negligible however Nepal is facing severe impact of climate change due to global warming. Green energy technology needs to be promoted thus DRR initiatives help building community capacity for using green energy technology and promoting positive indigenous knowledge and practices and applying climate change lens in assessing the community needs, setting priorities, and designing the DRR interventions (British Red Cross/Nepal Red Cross, 2009).

Every year, drought, floods, and landslides have been affecting agricultural fields, damage of crops, destruction of fertile land, declining food production resulting shortage of food. The proportion of the population who are undernourished, as measured insufficient caloric intake is very high over 40 percent. These underlying conditions contribute towards the context where Cholera, Malaria and Japanese Encephalitis are prevalent. Populations affected by the flooding in Nepal are equally at risk from water borne and food borne diseases particularly, Cholera, Typhoid, Dysentery, Hepatitis A (Nepal Red Cross Society, 2009).

Since last 3 decades, efforts have been made by the government of Nepal as well as other agencies to reduce the risks of disasters and build resilience of communities however they are not adequate as limited impact has been seen in lives of vulnerable people. Therefore, it is imperative to apply a whole of society approach to build community resilience. While analyzing the DRM landscape, it is observed that the coping capacities of local communities have been over stretched due to lack of risk reduction, preparedness, response, and recovery interventions. A study carried out on deaths and injuries due to the earthquake in Armenia has clearly indicated that an impact of earthquake depends on structures, mainly multi stories houses and their resilience to earthquakes. The study also pointed out that deaths and injuries of family members of 9 stories and above were very high compared to two story buildings. Further, residents of houses made by panel structure were highly affected compared to other structures, and houses that are condensed and no open space had also negative impact on search and rescue operation to evacuate trapped people from those collapsed structures (Haroutunue K Armanian, 1997).

A study indicates that there is a direct link between poverty and disaster vulnerability. Between 1990 to 1998, more than 90 percent deaths related to disasters were from developing countries. Average losses from disasters as a proportion of GDP were 20 percent higher in developing countries than in industrial economies. Poverty is an underlying cause of under education; uneducated people lack knowledge about the disaster risks and risk reduction measures, deforestation, rapid urbanization, construction of weak infrastructure, haphazard settlements are common phenomenon of poor society which are underlying causes of disasters. It is also noted that out of 1.2 billion population in developing world that live in less than $ 1 dollar a day: 43.5 percent live in South Asia and 23.2 percent live in East Asia and the Pacific. Disaster increases vulnerability to poor society and poor people are hardest hit by the disasters as disasters are causing displacement, losing livelihood assets, jobs and destruction of cultural

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

heritage, tourism, destruction of fertile lands, disturbance in supply chain and dismantling the social fabric. It is noted that the response and recovery operation are not effective and efficient in poor societies as they lack with advance technology as well as resources. In Asia, 70 percent of worlds floods occur, the annual cost of floods over the past decade was estimated at $15 billion, with infrastructure losses accounting for 60 percent. The disaster-stricken countries compelled to divert government resources from long term development to response and recovery operation (Kreimer, 2001).

It is noted that coastal areas are prone to costal floods as they have high exposure to floods and susceptibility to flood inundation. Due to climate variability the coastal areas are either gradually sub merging or forming delta. These findings are also resemble the flood vulnerability of Nepal, river beds are highly fertile and people migrate to river basin mainly due to having irrigation, drinking water and sanitation facility, fertile land however due to lack of proper dike or increasing river beds; inhabitants residing in river basin are susceptible to floods and exposure to floods is also very high (S.F. Balica, 2012).

Unlike Terai districts, hilly districts extended up to Himalayas which are highly prone to multiple hazards and have experienced several episodes of floods, landslides, glacial lake outburst floods, earthquake, fire, thunder bolt, hailstorm, epidemics almost every year. Cascading effects of floods and landslides in Terai districts are also very high. Like in the past, a torrential rainfall (141mm), which triggered a massive landslide in Jure, Sindhupalchok on 2nd August 2014 resulting 156 people's death and destruction of vegetation, farming land, pastures as entire village was swept away to Bhote Koshi river creating a lake. The Jure landslide not only swept away the village but also created a vulnerability to downstream communities. The landslides severely impacted household assets and natural environment. The loss of environment, soil which are permanent basis for the people's livelihood, economy (Schindler, Case Study Report: Loss and Damage from a Catastorphic Landslide in Sindhupalchok Distirct, Nepal , 2016). The Jure landslide affected to entire country having economic loss as well as opportunity cost due to obstruction of Araniko highway for a long period. The study also indicates that the massive landslides impacted on their livelihood assets, environment, soil, forest and more importantly their family members whom they lost that is unrecoverable loss for them as well as the nation. The family members survived the incident are having mental stress, psychological trauma, and fear of next landslide. The study also pointed out that the lower income groups were relatively severely affected compared to the middle-income group.

On 16th June 2021, Panch Pokhari, Helambu and Melamchi were hit by a heavy flash flood from two tributary- Melamchi and Indrawati rivers which resulted in 5 dead and 20 missing having destruction to Melamchi Drinking Water Project cutting off road access to several villages. The massive landslides had huge impact to physical infrastructure mainly bridges, fertile land, drinking water scheme, agriculture farms, and houses. It is reported that in total

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

344 families were directly affected by flood and landslide in which 162 households from Helambu Rural Municipality ward no. 1,2,3, 4 and 6, and 182 households from Melamchi Municipality ward no. 10,11 and 12 (Nepal Red Cross Society, 2021). The government and civil society organizations played a critical role for evacuating people, establishing temporary shelter and distribution of food items for early phase of disaster. However, little has been done to enhance risk awareness of community people, initiating risk reduction measures, and develop preparedness and response capacity. Studies are primarily focused on physical devastation, but socio economic and health impact hasn't been properly assessed.

The government of Nepal has endorsed the DRM Act 2017, established the NDRRMA and set the DRM strategic priorities, which are milestones in managing the disasters risks and their devastating impact. Besides the institutional mechanisms set up at headquarters level; the provincial and local bodies are still lacking trained HR, resources as well as institutional mechanisms. The situation prevailing in the country always prevent implementation of policy decisions at operational level (The Government of Nepal, Ministry of Home Affairs, 2018).

Studies indicate that climate change attribution to disasters in Nepal is very high. There has been severe impact in extreme weather conditions e.g. heavy rainfall, increase temperature and melting ice at Himalayan range and glacial lake outburst flood. The mean temperature has increased in Nepal at a rate of 0.04 C per year during the years 1975 to 2005, this trend has been increasing (Kabita Poudel, 2019). The average annual temperature increased by 0.011 in the foothills, 0.021C in the middle mountains and 0.041 in the higher Himalayas; and 1.4-1.71C increase for the country predicted by 2030 (Karen Sudmeier-Rieux, 2012). Due to raise in average temperature at high Himalaya range contributed forming the glacial lake outburst floods. The cascading effects of floods and landslides is very high in midhill reason which continues up to Terai reason. Nepal experienced major floods in Melamchi, Indrawati, Tinahu, Koshi, Tadi/Rapti, Bagmati, Koshi river basins, which had devastating impact in respective riverbanks. The level of riverbeds is increasing due to debris flow in Terai/southern parts of country consequently the dykes/embankments are unable to prevent the high flow of river water together with debris, which ultimately enters into the human settlements affecting pastures, vegetation, crops, shelter, water supply system, sanitation and hygiene causing loss of livelihood, outbreak of water borne diseases, diarrhea, mosquito, snake bite (Dewan, 2015). Due to a high volume of water, the Koshi river changed its course on 18th of August 2008 breaking the embankment towards eastern part of country. 90 percent waterflow was in new course resulting huge devastation in terms of fertile land, houses, and livelihood assets. The Koshi flood affected 65000 people and 700 hector fertile land in Nepal whereas 2.6 million people affected in India and Nepal. Similarly, Koshi flood occurred in 2011 also destroyed the fertile land with debris/sediments making it uncultivable (K.R. Kafle, 2017).

The above finding has also been backed up by a study: due to weak geo structure and high volume of rainfall, river damming and outburst flood, riverbank erosion and debris deposition

Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

massive landslides are occurring. This has direct impact to the downstream communities of the river basin (Sudan Bikash Maharjan, 2021).

Nepal experienced an outbreak of diarrhea in Mid-Western and Far Western region of country from March to August 2008, about 282 people lost their lives. Due to diarrhea outbreak, 128 people lost their lives and 12,500 people were affected alone in Jajarkot whereas 46 people lost their lives in Rukum. It is evident that there was an early monsoon in Mid and Far Western region resulted flood, which impacted in destruction and contamination of water sources. The sanitation, hygiene and access to safe drinking water is a key challenge in remote part of country during normal time, the situation further deteriorates during flood and landslide disasters. The COVID 19 Pandemic severely affected the lives of people across the globe and Nepal has been badly hit by the COVID 19 Pandemic. The deadly virus took lives of 1209 until 9th of December 2022 and the problem is not over yet. The case fatality rate was 1.2percent in Nepal and the recovery rate was 98.8 percent in Nepal (Ministry of Health and Population, 2022).

Due to rapid transmission of COVID 19 across the globe, WHO and respective government imposed the curfew with the notion of preventing further transmission of virus. However, the situation posed global economy at verge of collapse and many countries are facing severe financial recession. Following this, studies carried out in developed country also indicate that there has been severe impact of multiple disasters' exposure to public health, access to safe drinking water, operation of health facilities, sanitation and hygiene practices, garbage disposable, toilet facilities and care for chronic patients and emergency health services. It has equally important to note that physical and psychological trauma are commonly reported during disaster situations however little has been explored on impact of disaster exposure in public health (Claire Leppold, 2022).

A study carried out on disaster impact in public health infrastructure and non-communicable diseases in Queensland, Australia indicates that there has been tangible impact of cyclone, flood and strome in public health infrastructures mainly disruption of access, supply chain, destruction of health facilities and disturbance in timing of service provider including acute exacerbation of non-communicable diseases mainly cardiovascular, renal, respiratory, diabetic and undergoing cancer treatment patients (Rayan, 2018). Researchers have also been trying to analyze the human impact of disasters. The study focuses on how much loss has been made in monitory term while having loss of human lives. Although it is difficult to calculate the human lives in monitory term as life cannot be procured and generate through financial resources. In public health domain, human impact is being calculated through lost lives, lost life years and DALY (Disability Adjusted Life Year). The review of different studies indicated that the value of one life has been calculated using stastical life from 143,000 to 15 million USD (Aditi Karib, 2022). Besides unrecoverable loss, it is equally important to shed light on loss of investment made in human capital as well as opportunity cost.

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

A study defines vulnerability from two school of thoughts: human ecology and the structural view. As per the human ecology thought adjustment and adaptation are key components, adjustment is short term risk reduction or coping strategy whereas adaptation is longer term approach. According to human ecology hazards and natural disasters are generated by false human adaptation rather than natural forces only. This strongly promotes on adaption to natural hazards to reduce possible impact of natural hazards. Structural theory focuses on access to the resources plays a critical role mainly due to lack of resources adjustment and adaptation can not be undertaken. Further, this theory also emphasizes on socio, economic, cultural, and political context where people live in; this can be summarized as pressure and release (PAR) model. Deforestation, rapid urbanization, unsafe living conditions, unsafe buildings, settlement in dangerous location, lack of press freedom, which create pressure on nature as well as social arena. These are the root causes of vulnerabilities and disaster hits to most vulnerable populations (Hufschmidt, 2011). Inferences could be drawn from above theories that disaster and vulnerability form a vicious cycle where disaster has greater impact on vulnerable communities and vulnerability factors makes people more prone or susceptible to disasters.

A study carried out on elements at risk as a framework for assessing the vulnerabilities of communities to landslides conduced in Germany underscores the GIS map/data on geo structure/susceptibility of land as well as building materials, slopes of the land, windows size, floors of buildings and some symptoms observed in the building and surrounding e.g. fences, surface condition, road/railways, lifelines can help in calculating the vulnerability of buildings, economic vulnerability, and human vulnerability in landslide prone areas. However, this research doesn't talk much about how to identify land susceptibility to landslides which could be applicable in Nepal case (M. Papathoma- Kohle, 2007).

Research objectives

The main purpose of this research article is to identify most recurrent disasters that struck in Nepal, their impacts and highlight the role of government of Nepal and civil society organizations to reduce the risk of disasters. The following are the specific objectives:

a. To assess key disaster events occurred in Nepal in terms of their frequency and intensity, socio economic and public health impact.
b. To assess the role of government of Nepal and civil society organizations to reduce the risk of disasters and make appropriate recommendations for future disaster risk management.

Research Methodology:

This research has primarily been designed based on review of secondary data mainly scientific journals, books, reports and conference papers that are published at national and international levels primarily focused on floods and landslides that occurred in Sindhupalchok district as

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

well as other parts of country and globe. The data source maintained by Ministry of Home Affairs, government of Nepal for over 45 years together with reports prepared by National Disaster Risk Reduction and Management Authority (NDRRMA) have thoroughly been reviewed to assess major disaster events that struck in the country and their impact in terms of human, socio economic and public health. Further, commitments made by government and civil society organizations at UNISDR are also reviewed to verify the endorsements and their level of implementation. Altogether more than 25 scientific articles/journals, books and reports have been reviewed and studied to prepare this research article.

Research Limitations/ Gaps

This research has been carried out based on secondary data mainly reviewing the scientific journals, reports and books thus primary data is not included while conducting the research. The research primarily focuses on socio economic and public health impact but generating separate data for said sectors would be difficult as other sectors are interconnected and these are overarching sectors among others. There are limited studies done on impact of disasters in Nepal thus inferences have been made from different countries across the globe.

Research Analysis and Findings

The findings of this study would provide recommendations for different entities which will help facilitate for managing the disaster risks in the future. Besides having all the recurrent disasters and high prone to landslides, little has been done in terms of research and reducing the impact of disaster in socio economic and public health arena.

The review provides a clear understanding that Nepal is vulnerable to multiple hazards. Hydro meteorological and geological hazards are predominant in the country. Earthquake, landslides, floods and epidemics account high number of deaths and disability. Least occurred are earthquake and thunderstorms in number however both the events resulted in high number of deaths compared to flood and fires. Floods, landslides, and fires account a high number of affected populations. Floods have least number of deaths, which could be due to technological advancement mainly proper use of monsoon forecasting and early warning system.

The earthquake is a major disaster event which has high number of deaths and injuries however frequency of earthquake is limited compared to meteorological and geological hazards. Landslides are mostly occurred in midhill region which has cascaded effects to Terai region whereas floods impacted directly to Terai region of country destroying fertile land, vegetation, infrastructure. Every year Nepal witnessed loss of lives, injuries, damage, and destruction of houses by both the flood and landslides in which landslides account a high number of deaths and injuries compared to flood. The research pointed out that preparedness and effective response were critical in saving lives and protecting the livelihoods. Communities which are organized, initiated risk reduction measures, developed preparedness and response plan and

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

conducting regular simulation and drills have greater impact on responding the situation effectively and efficiently. Investing resources in risk reduction has greater advantages in reducing the impact of disaster.

People residing around weak geo structures are more vulnerable to landslides whereas river basins, low land areas are vulnerable to floods and flood inundation. It is noted that information produced by technical institutions are not reaching to the local communities in understandable manner which impact in preparedness and response efforts. Thus, local authorities require a participatory planning, risk awareness, risk governance and maintain linkage between technical innovation and practice.

Due to global warming climate change impact has been observed and climate change has been playing a central role in aggravating the extreme weather-related events thus focus equally be given in proper planning, forecasting, early warning system and adaptation innovations. The forecast-based actions have been showing effective results in case of flood and many lives have been saved through applying forecast and early warning however limited work has been done in landslides forecasting and early warning. Thus, further study needs to be done and early warning system needs to be established for landslide hazards. Technical information generated by climate science needs to be disseminated at local level in a timely and understandable manner. The institutional mechanisms established at federal level needs to trickle down at provincial and local level to coordinate with all concerned stakeholders, ensure quality as well as interventions are following the standard practices.

The research paper also highlights the fact that the infrastructure development work has been done without having proper technical assessment e.g. expansion of road access resulting massive landslides thus proper technical assessment is crucial to reduce risk of landslides. Use of climate lens while assessing the needs, designing, and implementing different projects mainly risk reduction and adaptation are paramount to overcome the climate change impact. A robust preparedness and response plan is vital and testing of the plan at various levels would help facilitate in building capacity of community people to respond the emergency for saving lives and protecting livelihoods.

Organizing a pre monsoon preparedness workshop help facilitate to identify the capacities, take stock of human, material, and financial resources, create scenarios-based planning and take appropriate actions to alert the responders and overcome the gaps identified by the workshop. Given the dynamics of disasters, it has been realized that a whole of society approach would play a central role in reducing the disasters' risks and building the capacity of communities. Limited focus has been given on public health impact of disaster however it has severe impact thus it should equally be emphasized as part of holistic DRM interventions. Efforts to be made in reducing the vulnerabilities in terms of socio cultural, physical, economic, and educational

Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

so that disaster risk could be minimized thus multi-disciplinary approach can leave a lasting impact in the society.

Earthquake resilient infrastructure is vital to reduce the risk of earthquake as well as devastation thus enforcement of building code, risk sensitive land use planning and training to construction workers and public on earthquake vulnerability are prerequisite to reduce the risks and build earthquake resilience.

Public health is hardest hit by disaster events or outbreak of epidemic and pandemic having high morbidity and mortality thus preparedness and risk reduction should be mandatory.

Initiating risk transfer through insurance mechanism, establishing DRR fund, DRR resource center, formation of DRR committee will help build capacity to organize the communities and undertake mitigation measures at local level and work jointly to reduce the disaster risks.

Strengthening emergency operation centers at all levels and organizing simulation and drills will be beneficial to make response effective and efficient. Coordination with service centers and preparedness and risk reduction measures to be applied at health facility level so that access to services are uninterrupted during emergencies.

Conclusions

The fragile geo structure, unplanned settlements, rapid urbanization, haphazard construction of road and other infrastructure without having proper technical as well as environmental impact assessments; ignorance, negative traditional and cultural beliefs, poverty, lack of risk governance and accountability framework could be considered as major underlying causes that either contribute to increase disasters risks or proliferate the disaster impact. Expansion of road access without having proper technical assessment and design, it has been creating a huge devastation every year mainly cascading effect of multi hazards (flood and landslides) resulting loss of human lives, livelihood, soil erosion and impacted in all spheres of development paradigm. The government of Nepal has already made commitment to Sandai Framework for Action 2015-2030 and SDGs thus it has a greater responsibility to come up with a clear action which could be implemented in a harmonized manner. The trend analysis from 1975 to 2005 shows that epidemics, earthquake, floods, and landslides account a high level of devastation in terms of deaths, injuries and affected population thus MoHA, NDRRMA, MoHP and other relevant government and non-government institutions should work closely to address the associated risks and build resilience. A whole of society approach is essential where equal emphasis is given on preparedness, risk reduction, response and recovery. The risk reduction will have vulnerability and capacity assessment, risk awareness, risk reduction measures both hardware and software. Investment in DRR pays off thus all components of DRR to be included in program planning and implementation having participation of community people.

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

References

Nepal Red Cross Society. (2009). *Cost Benefit Analysis of a Nepal Red Cross Society's Disaster Risk Reduction Programme.* British Red Cross.

2015-2030, T. S. (2015). *UNISDR.* UNISDR.

Aditi Karib, S. B. (2022). Valuing Human Impact of Natural Disasters: A Review of Methods . *Environ Res Public Health* , 18-19.

Claire Leppold, L. G. (2022). Public Health Implications of Multiple Exposures . *Lancet Public Health*.

Dewan, T. H. (2015). Societial Impact and Vulnerability to Floods in Bangladesh and Nepal . *Weather and Climate Extremes* , 36-42.

Geest, K. V. (2016). *Case Study Report: Loss and Damage from Catastrophic Landslides in Sindhupalchok District, Nepal* . United Nations University for Environment and Human Security.

Haroutunue K Armanian, A. M. (1997). Deaths and Injuries due to the Earthquake in Armenia: A Cohort Approach. *International Journal of Epidemiology, 26*(4).

Hufschmidt, G. (2011). A Comparative Analysis of Several Vulnerability Concepts . *Nat Hazards* .

K.R. Kafle, S. K. (2017). Consequences of Koshi Flood 2008 in Terms of Sedimentation Charastistics and Agricultural Practices. *Geoenvironmental Disasters*.

Kabita Poudel, B. D. (2019). Assessment of Climate Change and People's Perception on Climate Change and its Impact in Solu Khola Catchment of Mt. Everest Region of Eastern Nepal . *Applied Ecology and Environmental Sciences* , 208-214.

Karen Sudmeier-Rieux, J. C. (2012). *Floods, Landslides and Adapting to Climate Change in Nepal: What Role for Climate Change Models?* University of Lausanne .

Kreimer, A. (2001). Social and Economic Impact of Disasters . *International Geology Review* .

M. Papathoma- Kohle, B. N.-H. (2007). Elements at Risk as a Framework for Assessing the Vulnerabilities of Communities to Landslides . *Natural Hazards and Earth System Sciences* .

Ministry of Health and Population. (2022).

Nepal Red Cross Society. (2021). *Flood and Landslide Update.* Nepal Red Cross Society.

Population, M. o. (2022). *Update on COVID-19.* Kathmandu: Ministry of Health and Population.

Rayan, B. J. (2018). *Addressing the impact of disasters on public health infrastructure and non communicabloe diseases.* Jamescook University Australia .

S.F. Balica, N. W. (2012). A Flood Vulnerabilities Index for Coastal Cities and its Use in Assessing Climate Change Impact . *Nat Hazards* .

Schindler, K. V. (2016). *Case Study Report: Loss and Damage from a Catastorphic Landslide in Sindhupalchok Distirct, Nepal* . United Nations University Institute for Environment and Human Security.

Nepal Journal of Multidisciplinary Research (NJMR)
Vol. 6, No. 1, March 2023. Pages: 88-101
ISSN: 2645-8470 (Print), ISSN: 2705-4691 (Online)
DOI: https://doi.org/10.3126/njmr.v6i1.54355

Schindler, K. V. (2016). *Case Study Report: Loss and Damage from a Catastrophic Landslide in Sindhupalchok District, Nepal.* United Nations University for Environment and Human Security.

Society, N. R. (2021). *Flood and Landslide Update.* Nepal Red Cross Society.

Sudan Bikash Maharjan, J. F. (2021). *The Melamchi Flood Disaster, Cascading Hazards and the need for multihazard Risk Management.* ICIMOD.

The Government of Nepal, M. o. (2018). *Disaster Risk Reduction, National Strategic POlan of Action 2018-2030.* Kathmandu: United Nations Development Programme.

The Government of Nepal, Ministry of Health and Population. (2022). *COVID-19 Update.* Kathmandu: Ministry of Health and Population.

The Government of Nepal, Ministry of Home Affairs. (2016). *AMCDRR Report.* Kathmandu: Ministry of Home Affairs.

The Government of Nepal, Ministry of Home Affairs. (2018). *Disaster Risk Reduction National Strategic Plan of Action 2018-2030.* United Nations Development Programme.

The Government of Nepal, Ministry of Home Affairs. (2018). *Disaster Risk Reduction, National Strategic Plan of Action 2018-2030.* Kathmandu: United Nations Development Programme.

The Government of Nepal, Ministry of Home Affiars, DRR National Strategic Plan of Action . (2018). *Disaster Risk Reduction National Strategic Plan of Action 2018-2030.* Kathmandu: United Nations Development Programme. Retrieved December and January 2022 and 2023

UNISDR. (2015). *Sendai Framework for Action 2015-2030.* UNISDR.

UNISDR. (2015). *Sendai Framework for Disaster Risk Reduction.* UNISDR.