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Community Resilience To Flood Disaster In Ratukhola Watershed Mahottari District, Nepal

Laxman Subedi

(*Lecture Trichandra Multiple Campus,Ghantaghar Kathmandu*)

ABSTRACT

The idea of resilience is getting increasing attention among researchers, policymakers and experts. Abundant frameworks have been introduced and papers conscripted, and projects formulated to build community resilience. As a result, this is being undertaken in the various community of Nepal as well. This study addressed the issue of flood vulnerability and resilience at the level of communities residing along with Ratu watershed, Mahottari Nepal. This study sets out to analyze the community resilience to flood disasters in the Ratu watershed of Nepal based on the Disaster Resilience of Place (DROP). This study introduces resilience as an active process varying with antecedent conditions, disaster severity, and exogenous variable effects. Although resilience is supposed to be adaptive, immediately before the disaster, recovery level results in the static modeling of the antecedent conditions. The local community has been facing floods since the time of their ancestors, so they have exceeded their absorptive capacity. Similarly, the recurring impact of floods decreases the economic capability to bounce back from the following flood event and thus becomes ever more challenging to recover. In the same manner, the community learnings from the hazard event and the opportunity to improve mitigation and preparedness are very limited, the community is not able to increase their inherent resilience and capacity before the next event.

The study truly highlights the need of the hour which is an inclusive approach and long-term disaster risk management strategy within Bhangaha Municipality Ward No. 1, to cater to the vulnerability of these marginalised groups along with the seasonality floods experiences. Further stating the inadequacy of temporary flood protection measures and a lack of comprehensive disaster risk reduction policies at the municipal level. The research emphasizes the need for building community engagement and public awareness in resilience enhancement, further calling for increased participation in disaster preparedness. The outcomes of such studies point to increased preparedness

action through an increase in financial resources and improved governance that enhances flood response and recovery. Thus, these insights provide policy-level guidelines for the future development of better flood management strategies and stronger community resilience.

Key Words: Community, Disaster, Ratukhola , Watershed, Mahottari

1. INTRODUCTION

1.1 Background of the Study

Bhangaha Municipality which is located in the Terai region of Nepal is listed among one of the most flood-prone areas of the country. Similarly, Ward No. 1 of this municipality faces recurrent and severe problems related to flooding due to its location near the RatuKhola watershed. The RatuKhola, originating from the Siwalik foothills is highly dynamic with a river system showing high sedimentation rates, along with a very rapid flow of water during the monsoon season. During the monsoon, the heavy rainfalls in the Terai region increase the volume of the rivers and since the land is flat the water finds no outlet and thus keeps flooding and causing waterlogging for the people. In such times, floods hamper local people's ways of life by directly threatening agriculture, infrastructure, and livelihoods. The frequency and intensity of such flooding events have increased over recent decades which isprobably due to the impacts of climate change. As a result, the communities in Bhangaha Municipality always have to be under pressure to adapt and mitigate the risks of such frequent disasters.

Geographical location, unplanned settlement development, and rising urbanization have resulted in disasters suffering the loss of lives and properties(MOHA, 2019). For instance. the settlement of Wards No. 1 is located along the embankment of the RatuKhola and is most vulnerable to seasonal floods which cause serious damage to agriculture which is the main source of income for the majority of the population. Farming being a major part of the economy the floods pose serious problems by destroying crops, delaying recovery efforts, and prolonging financial suffering for the community. Although the local measures for preventing floods from sandbag embankments provide short-term consolation, they do not handle the flooding issue in the long term and show a lack of resources from the community with inefficient governance.

The Bhangaha municipality is rich in socioeconomic and cultural diversity. The municipality includes Madhesi, Janajati, Dalit, and Muslim ethnicities. The livelihoods of these communities are based on agriculture which is very highly vulnerable to floods. Besides the natural environmental issues, socio-economic ones such as poverty, poorly developed education and infrastructures also make up a more significant threat. Floods are accompanied by immediate harm and some long-term impacts, including loss of income, food insecurity, and health risks from water-borne illness. However, the local communities have developed some coping and adaptation mechanisms to flood risk. These are indigenous knowledge systems, community cooperation, and spiritual existence, thus providing the panoply for disaster resilience. But the effectiveness of such native coping mechanisms is variable, confirming that local wisdom ought to be supplemented by more formal disaster risk reduction interventions, especially as the environmental and socio-economic challenges become more complex.

This study is being carried out with the perspective of understanding the resilience of the communities in Bhangaha Municipality Ward No. 1by exploring the relationships between the social, ecological, and cultural environment that shapes disaster preparedness, response, and recovery. In fact, theresearch recognizes that infrastructural or technical measures do not determine resilience solelybut it is the social fabric built from local beliefs, insight, and tradition that is of great consequence to community resilience. For example, indigenous practices in the sharing of resources, spiritual rituals for divine protection, and traditional water management techniques all contribute to critical disaster preparedness. Such types of local approaches usually complement official disaster risk management methods in the creation of a hybrid model of resilience that is both practically and culturally rooted.

The thesis adopts a mixed-method study to obtain an in-depth knowledge of flood resilience in the study area. The qualitative method which includes focus group discussion, in-depth interviews, and key informant interviews is used to record the lived experiences, perspectives, and coping strategies of the community. This method also provides insights into the role of traditional beliefs and practices that communities are using for disaster preparedness. On the other hand, the quantitative method which includes data from government papers, flood risk assessments, and secondary sources ultimately supports the qualitative results and provides a more comprehensive

contextual knowledge of the problem. This mix approaches also analyzes the interactions between the social, economic, and governance factors. By analyzing these factors the particular study aims to offer practical recommendations for improving the flood risk management in Bhangaha Municipality.

Resilience has been a part of disaster management for quite a long time, and investment in mitigation, risk reduction, and management in effective policies and systems is a need. Naturally, Nepal is prone to the calamities all the more it has been suffused by disasters growing worse by the year and has never been able to fit resilient community development into its government agenda. The Nepali government, however, enacted the Disaster Risk Reduction and Management (DRRM) Act-the replacement for the now-defunct Natural Calamity (Relief) Act of 1982, which had been in existence for over four decades-in 2017, as an effort to bring the disaster management initiative up to date. Nevertheless, Nepal is still stressed to form a functional coordinating agency projected in the new act (Sanam and Christopher, 2020).This study assessed community resilience and factors associated with differential community vulnerability to floods. It focused on different dimensions of our community resilience based on the Disaster Resilience of Place (DROP) focused on flood disasters.

The main purpose of this study is to gain more knowledge on disaster resilience in flood-prone communities with a focus on Bhangaha Municipality. This study highlights the importance of integrating traditional knowledge with contemporary disaster risk reduction techniques in order to come up with sustainable and culturally appropriate solutions. This study assessed community resilience and factors associated with differential community vulnerability to floods. It focused on different dimensions of community resilience based on the Disaster Resilience of Place (DROP) focused on flood disasters. The results of this study aim to close the gap between scientific disaster management techniques and local knowledge systems by encouraging a more flexible and community-centered approach to disaster preparedness, response, and recovery. In addition to Bhangaha Municipality, this study applies to other flood-prone areas of Nepal and abroad by showing how local populations may more appropriately adapt to the challenges that climate change and frequent natural disasters present.

1.2. Statement of the Problem

The Bhangaha Municipality is located in the flood-prone Terai region of Nepal which have been experiencing many devastating floods especially in Ward No. 1 which lies close to the RatuKhola watershed. The main source of income for the local population of that area is agriculture, which the floods adversely affect every year whereby climate change also plays an important role which worsens the conditions of the individual and communities. The government and community are constantly making efforts to reduce the risks of floods through sandbag embankments and other temporary solutions which show the long-term challenges and limitations of interventions. Often the existing flood management techniques are disorganized that is exposing the community to face the repeated cycles of destruction. Failure to make the community resilient does not only translate to loss of lives and properties over and over again but also significantly undermines long-term development goals. In line with these challenges, this study intends to investigate the underlying factors that shape community resilience and adaptive capacity in the case of Bhangaha Municipality. By applying the Disaster Resilience of Place (DROP) framework, the research integrate social, ecological, and cultural dimensions, in gathering community insights plus lived experiences, and ultimately the study identifies the key challenges and provide the evidence-based, context-specific recommendations for strengthening disaster preparedness, recovery, and long-term resilience at the local level.

1.3. Research Questions

The study aims to interpret disaster resilience and assess how disaster risk reduction interventions perform in Bhangaha Municipality, Ward No. 1, using quantitative indicators and qualitative perceptions. It raises the following research inquiries

- How do social and ecological factors influence community resilience in Bhangaha Municipality Ward No. 1 with regular floods at the area?
- What are the major barriers to strengthening community resilience and adaptive capacities in flood-prone areas?

1.4. Objectives of the Study

The study was conducted with the following objectives:

Specific Objectives

- To determine the effect of social-ecological considerations, including poverty, educational accessibility, and facilities, on communities in Bhangaha Municipality Ward No. 1 toward disaster resilience, particularly in flood disaster scenarios.
- To evaluate existing adaptive capacities within communities to mitigate, respond to, and recover from disasters.

1.5 Research methodology

A descriptive research design has been followed to study the community's resilience against flooding within Bhangaha Municipality, Ward No. 1, in Nepal. This being one of the most appropriate avenues to understand the community deeply concerning adaptive responses toward flooding, the study took into consideration the nature and impacts of flooding and the coping strategies involved. The aims of the study included identifying the particular problems the community faces due to flooding, in terms of frequency, scale, and severity, along with resultant damage. Impact on flooding in terms of households, infrastructure, local economy, agriculture, and public health was also examined in this study.

Based on the impact of flooding as an important criterion, socioeconomic characteristics of the most affected populations were included in the study. The study collected data from area residents along dimensions of age, income, education, and occupation to form a profile for communities characterized as flood-prone, which has been gauged on the capacity for vulnerabilities of different groups to flood disasters as well as the ability to respond and recover from flooding. Finally, the study casts its net on major stakeholders in flood management and humanitarian assistance, these include local residents, community leaders, emergency responders, and NGOs. Thus, this has brought realization to the ability of joint efforts and partnerships towards bettering the flood resilience of the community.

Geographic analysis was also done to distinguish how flood disasters differ across regions in Ward No. 1. The research mapped flood-prone zones, infrastructure damaged in the floods, and community resources which gave a spatial context for resilience strategies and challenges. This particular study uses a combination of quantitative and qualitative methods to foster a balanced approach to assessing DRR strategies and community resilience. In the quantitative component, surveys and statistical analysis were used to measure some of the indicators, such as flood frequency, extent of damage, and state of preparedness of the community. Qualitative results were derived from descriptive statistics to evolve trends and specific correlations, thus evaluating existing DRR strategies and identifying possible areas for improvement.

Focus group discussions and interviews with local residents, local leaders, and experts produced qualitative data. This information further clarified the community perspectives on flood risk, traditional coping strategies, and social and cultural attributes of resilience. Qualitative data assisted in providing contextual clarification for quantitative outcomes toward a detailed interpretation of the community's attitudes, behaviors, and flood responses. By melding the numerical and contextual data, the study drew measurable conclusions but also aided in contextualizing them, making for a full understanding of disaster resilience. This process will assist DRR intervention strategies for coming flood events to be much more effective and context-specific.

2. DATA ANALYSIS AND FINDINGS

2.1 Act and Policy

The government of Nepal's prioritized area addresses the following: 1. Reduce existing disaster risk by investing in increasing resilience 2. Avoid forthcoming risks by promoting private and public investment in disaster risk reduction(MoHA, 2018).

National policy for Disaster Risk Reduction (MoHA, 2018) aims to enhance disaster resilience by increasing public-private partnerships. The Constitution of Nepal has assigned DRM as a priority for all levels of government in Nepal for post-disaster recovery, rehabilitation and reconstruction to ensure the 'Build Back Better Approach'. Schedule 9 assigns shared DRM priority to all levels of government, Schedule 8

describes the sole responsibilities of the local governments, Schedule 7 assigns the responsibilities of DRM as a shared priority of the federal and provincial governments(MoFAGA, 2020).

The National DRR Strategic Action Plan includes several activities that are aimed at developing Disaster Risk Management (DRM) capacity at the local government level. The Local Government Operations Act of 2017 also prominently addresses the orientation of DRM activities at the local government level by delineating the major functions of local governments for disaster risk management. Apart from this, the Government of Nepal has also formulated policies such as Local Disaster Risk Reduction and Management Act, Standard Operating Guidelines for Emergency Operation Centres, Guidelines for Local Disaster Management Fund Operations, the Local Environment and Natural Resources Protection Act, and guidelines on the preparation of Local Disaster and Climate Resilience Plans (LDCRP). While such steps are in the right direction, the point is to institutionally implement such tools in practice (IOM &MoFAGA, 2019).

2.2 Understanding National and Local DRRM Governance

The Bhangaha Municipality seems to be missing out the knowing the DRRM governance at the national level. It has been a while Government of Nepal circulated numerous samples and directions; Bhangaha Municipality has not prepared basic DRRM tools. The local DRRM act has not been endorsed so far. However, ward no 1 recently formulated their Ward level Disaster and Climate Resilience Plan in the support of non-governmental organizations but still, it is not endorsed to the date. The plan seems to stand in isolation due to the lack of a DRRM mainstreaming strategy with the municipality and wards.

The Municipality has created Disaster Management Fund without preparing its mobilization guidelines. Although municipal, ward level staff and representatives have been taken participation in various capacity building training on DRRM, it couldn't be replicated in their plan policy and strategies to mainstream DRRM to the development process.

2.3 Disaster Risk Reduction and Management (DRRM) institutional mechanism at the local level

The municipality has formed Disaster Management Committee (DMC) at the municipal (LDMC) level and ward level (WDMC) only in 2 wards. The municipality has a building code but it has not been followed properly. The early Warning System (EWS) is in operation in Ratukhola which is partially effective. However, a survey showed that the majority of community people have no idea about its mechanism and information about the early warning system. However, LDMC and WDMC at the ward level and municipal level are inclusive, with representation ensured from gender and sexual minorities, religious minorities, different age groups, persons with disabilities and other vulnerabilities and discriminated groups of municipality and wards.

2.4 Flood Characteristics and Impacts

Floods in Nepal that have intense damage are driven by five main causes: excess rainfall, glacial lake outburst, dam failure, infrastructure issues, and floods caused by excessive rain or river flow obstructions due to infrastructure. The most affected area is the Terai region, accounting for about 77% of the total damage caused by water-related disasters like landslides, floods, and avalanches, and the most common among these are floods (Khanal, 2007).

The climate at the macro-level is prevailed by the monsoon and topology plays an vital role in creating meso- and micro-level variances (Chalise 2001). Hence, there are pronounced time-based and spatial variations in rainfall. “The average weight of annual precipitation for the country is about 1,630 mm. More than 80% of the total annual precipitation occurs during the summer months (June-September)” (Khanal, 2007).

In the rainy season when Ratu gets flooded, it ruins most of the part of ward no 1 of Bhangaha Municipality specially Kabilasha, Singyahi, Dostia and Barka tole. As the result, it damages crops and also causes a great loss of humanitarian and physical assets annually.

As the ward lies alongside Ratukhola, it has a river training embankment which often gets destroyed and flood inters into the village and agriculture field. Due to the low budget and apathy of governance, they made river training embankments of sand sacs each year before the rain starts and eventually it destroys immediately after the very first rain.

2.5 Conclusion

The research has identified various factors that are contributing to the flood risks and resilience challenges which has been faced by Bhangaha Municipality Ward No.1. The ward one is highly impacted by RatuKhola watershed during flood. As Ward One is situated in the embankment of RatuKhola the drainage patterns of that particular area make it very vulnerable to seasonal flooding. The overflow of the RatuKholariver during rainy seasons leads to severe flooding which disrupts the livelihoods damaging the infrastructures.

There are varieties of factors that come into consideration while talking about risk due to flood. Social vulnerabilities are one factor that plays a crucial role in intensifying the risk in the community. The ward no.1 population of Bhangaha municipality includes diverse population such asMadhesi, Janjati, Dalits, and Muslims which also includes vulnerable groups including children, elderly people with disabilities, and single women. These vulnerable groups often face limited access to services which is essential for them. Essentially, they are also limited to likenecessary resources for disaster preparedness making them more vulnerable to flood impacts. This study's findingsThis study's findings highlight the importance of integrating social-ecological perspectives when planning disaster risk reduction (DRR) strategies, and underscore the need for inclusive, community-driven approaches that directly address the specific needs of marginalized populations.

Most of the people earn their living from agriculture. That is why the area becomes susceptible and prone to the influence of floods since it depends only on agriculture. This study found that the flood causes significant damages to the agricultural productionof surveyed households reporting reduced yields or crop failures during monsoon seasons which ultimately leads to the hardship of economic for the

farmers which also causes delays in the recovery process. Additionally, the study shows that the municipality often depends on temporary flood protection measures like the sandbag embankments which highlights the financial limitation and governance inefficiency. These kinds of short-term solutions are not reliable and are insufficient for addressing the flood risks faced by the community.

While Nepal has established its national risk reduction and management (DRRM) policies the implementation of these policies at the municipal level is inadequate. This research shows that the Bhangaha Municipality lacks specific DRRM policies, procedures, and sufficient financial resources. The lack of these is limiting the ability of the Municipality to prepare for and respond to flood events. Furthermore, the formed disaster management committees are found either inactive or lack capcaity which hampers the ability of the municipality to address the flood risks.

According to the study, the role of community engagement in disaster preparedness was found to be the key factor that helps in community resilience. However, the study also suggested that community participation in disaster risk reduction activities is minimal. There is a lack of coordinated early warning systems, and fewer respondents were aware of emergency shelters or community response plans. Additionally, public awareness programs on flood preparedness are insufficient, which correlates with low levels of individual household preparedness as reflected in the data. This ultimately loses and weakens the community's overall capacity to respond to and recover from floods. The findings of the study highlight the challenges faced by the BhangahaMunicipality Ward 1 in managing floods and building long-term resilience in the community.

Despite the challenges, the study has also established that there are adaptive capacitive features of the community like informal early warning mechanisms, strategized seasonal movement, and dependence on social networks for recovery assistance. These informal adaptive mechanisms can still serve as the bedrock on which solid community disaster risk management systems can be built.

Thus, the research answers the research questions and meets the study objectives by establishing that not only social-ecological factors and community

perceptions, but also the adaptive capacities and institutional gaps are instrumental in understanding and improving disaster resilience in flood-prone areas, like Bhangaha Municipality, Ward No. 1.

2.6 Social Work Intervention

The methods used by social workers to help families, groups, and communities to deal with any social issues, help them enhance their well-being, and improve their ability to cope with different challenges. It is the intentional act performed by social workers to assist anyonewith obstacles in improving their overall well-being. The interventions are usually based on social work concepts, theories, and values. The challenges posed by the recurring floods in Bhangaha Municipality Ward No.1 are essential to address. To address the issues and challenges of recurring floods effective social work interventions play a crucial role. Social work interventions often are done in micro-level, mezzo-level, and macro-level strategies to build resilience and enhance disaster preparedness.

2.7 Recommendations

A recommendation is an opinion and suggestion which is made by the researcher which is based on the study's results, analysis and conclusions. The research recommendations is to provide actionable counsel to a variety of stakeholders including policymakers, practitioners, industry professionals, and individuals involved in the topic being studied.

To effectively solve the effects of flooding and enhance the community resilience recommendations are necessary at different levels. Recommendations at micro, mezzo and macro levels are essential for sustainable recovery and disaster preparedness in Bhangaha Municipality.

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