

Local People Response to Flood in Roshi Rural Municipality, Kavrepalanchowk: Adaptive Strategies for Resilience

Khila Nath Sapkota

Assistant Professor, Tribhuvan University, Ratna RajyaLaxmi Campus, Department of Rural Development, Pradarshani Marg, Kathmandu, Nepal.
khila_sapkota@yahoo.com / ORCID: <https://orcid.org/0009-0004-3104-170X>

Saroj Pokharel

Lecturer, Tribhuvan University, Active Academy College, Department of Sociology, Basundhara, Kathmandu, Nepal
pokharelsaroj44@gmail.com / ORCID: <https://orcid.org/0009-0004-9336-423X>

Abstract

This study focuses on occupational changes and adaptation strategies to investigate the effects of flooding on local communities in Roshi Rural Municipality, Kavrepalanchowk. Using a mixed-methods approach, the study combines socio-ecological systems, resilience theory, and social constructionism to understand how locals view and react to flood risks. Interviews, focus groups and observations were used to gather information about the socioeconomic traits of the neighborhood. Research indicates that farmers are especially susceptible to the disruptions caused by flooding, frequently experiencing both short-term and long-term changes to their means of subsistence, with few alternatives, such as switching to modern labor. On the other hand, business owners showed more resilience by carrying on with their operations in spite of disruptions. The importance of skill development as a non-migration tactic that improves job opportunities and long-term economic prospects is a crucial finding. Although loan repayment obligations can put a strain on household income, loans also helped with recovery efforts. Another crucial adaptation tactic that has an impact on living costs and children's educational outcomes is migration. All things considered, this study emphasizes the variety of adaptive tactics used by flood-affected communities and the necessity of integrated support networks that give priority to financial resources, skill development, and sustainable livelihood strategies. Organizations and policymakers are urged to develop focused interventions that improve community resilience to flooding in the future.

Keywords: Adaptive strategies, Climate change, Flood, Local people, Resilience, Roshi rural municipality

Introduction

A changing climate raises the probability that extraordinary climate and climatic events will persist by altering their escalation, frequency, duration, and timing (IPCC, 2012; Stott, 2016). Extreme events can pose catastrophic risks when human and environmental factors interact (IPCC, 2014). People in low-income countries are more severely and unequally affected by climate change-related extreme weather events than those in high-income countries, and the effects of global warming are becoming more severe (De Silva & Kawasaki, 2018; Diffenbaugh & Burke, 2019). According to Montague, Tobin, and Hagelman (2017), a disaster is defined as a dangerous event that has real, significant financial effects on society, while a danger refers to possible harm to people and

the community as a result of people and their activities being exposed to everyday situations. Budhathoki (2020) attributes the uneven effects on these countries to a number of factors, including hostile geology, an excessive dependence on the climate-sensitive agricultural sector, and limited human, organizational, and financial resources to anticipate and respond to the coordinated and indirect effects of climate change. The majority of people are very vulnerable in developing nations, particularly in tropical and unstable climate zones (Duffy et al., 2019).

Climate change is increasing the frequency of river floods in addition to drought (IPCC, 2021). Nepal is thought to be a hotspot for natural disasters worldwide. In terms of the effects of climate change and flood risk, Nepal is ranked fourth and thirty-first, respectively, out of the twenty poorest countries (Tiwari, 2016). Furthermore, Nepal has seen numerous floods, many of which have resulted in a high death toll and significant financial losses. Water-induced disasters are primarily caused by Nepal's rocky terrain, negligent land use, melting snow caps, glacier lake eruptions, and intense monsoon rains (DWIDP, 2013). Due to changes in river course, bank erosion, and erosion in river meanders brought on by the suspended load carried by the rivers, flooding and widespread inundation are significant problems in the Terai. They cut and widen their banks every year (Manandhar et al., 2011). With extreme and frequent floods, landslides, severe drought, and other natural disasters, Terai has seen the worst climate change in recent decades (UNU-EHS and CRED, 2019).

The study intends to explore the adaptability strategies that the community works to build resilience against such natural disasters. This title indicates an emphasis on community-based responses, handling mechanisms, and the actions taken to mitigate the impacts of floods and strengthen the ability of local people to recover and sustain itself in the face of future challenges.

Research Problem

Around the world, flood disasters are a real problem, especially in developing countries where they have an impact on the socioeconomic standing of those impacted (Echendu, 2020). For example, a study conducted in Maputo revealed that urban areas in the Global South are facing challenges as a result of rapid urbanization, inadequate infrastructure, and flooding and storms that overwhelm cities (Zehra et al., 2019). Compared to other weather-related disasters, floods are by nature more dangerous and affect large populations when they occur (Ntanganedzeni & Nobert, 2020). It's important to note that those who live in low-income areas situated along city floodplains are typically impacted (Zehra et al., 2019). Furthermore, compared to other regions, these peoples' socioeconomic status is most affected. Climate change is expected to increase the frequency and severity of extreme precipitation events. This implies that there will be more occurrences that result in a lot of rain or snow falling quickly. Flooding and other types of water damage may result from these occurrences (IPCC, 2014).

Since 1950, there has been a 30% increase in the intensity of heavy precipitation events (NASEM, 2018). In the 1980s, there were an average of 2.7 billion-dollar weather and climate disasters annually; by the 2010s, that number had risen to 6.6 (NOAA NCEI, 2022). At 43% of all natural disaster events, floods are the most common natural disaster (UNU-EHS and CRED, 2019). The World Meteorological Organization claims that floods cause more fatalities and financial losses than any other kind of natural disaster. According to estimates from the World Health Organization, floods kill thousands of people each year and affect about 250 million people worldwide (WHO, 2012). Over 70% of those affected by floods worldwide and over 80% of flood-related deaths occur in the Asia-Pacific region (UNU-EHS and CRED, 2019).

Literature Review

In recent decades, one of the most pressing issues has been climate change. According to researchers, climate change is predicted to accelerate global hydrological cycles. Globally, river discharge will rise due to higher precipitation and lower evapotranspiration, which suggests that floods will occur more frequently in many parts of the world. The 20th century saw an increase in the likelihood of catastrophic floods (Hirabayashi et al., 2008). The two main causes of floods in South Asia, the monsoon and tropical cyclones, seem to be impacted by climate change. Variations in rainfall and temperature will have an impact on floods. As temperatures rise, snow and glacier ice will melt more quickly, increasing the Himalayan headwaters' seasonal peak flows. Flooding may then occur more frequently as a result, especially along rivers whose channel capacity has been diminished by sedimentation. However, over time, less snow will mean less water flowing into rivers (Aggarwal et al., 2004).

The most common and expensive natural disasters in the world are floods. Floods are one of the most common natural disasters worldwide, and they can be extremely dangerous for both people and the environment (Nicholls et al., 2008). 1,060 (roughly 40%) of the 2,654 hazard events Sivakumar (2005) documented globally between 1993 and 2002 were flood hazards. Floods occur more frequently than other natural hazards like strong winds, droughts, landslides, and forest fires. Due to their high frequency, intensity, and magnitude, flooding frequently causes significant damage and is becoming more widespread in terms of both the number of impacted individuals and the monetary losses. According to Jha et al. (2012), floods in 2010 impacted 178 million people, resulting in total economic losses exceeding \$4 billion USD. Numerous factors, such as climate change (increased precipitation, extreme runoff, and sea level rise), land subsidence, land use change, population growth, and the increase in assets situated in flood-prone areas, could lead to an increase in flood risk for lowland communities in many parts of the world in the future (IPCC, 2012; Jongman et al., 2012; Hirabayashi et al., 2013).

A significant trend in the ways that various households react to a flood in relation to variables like education, flood characteristics, income, occupation, and riverbank erosion can be seen in the adoption of coping strategies. There is a greater ability to deal with a disaster without depending on cheap food items or selling productive or unproductive assets when household income rises because there is more access to food and drinking water. The ability to gather flood forecasting data that lowers disaster vulnerability and improves a household's capacity to handle a disaster also increases with educational attainment. Households in the service sector are better able to purchase food and gather flood forecast data because their income is more stable than that of farmers or laborers.

According to a study that examined the impact of floods on households, the most affected households saw significant drops in their income and spending. The probability of using migration as a coping mechanism to lessen these losses significantly increased. The study also highlighted the importance of remittances from long-term foreign migrants, which provided significant financial assistance to lower-income households and were responsible for half of the decline in food expenditures and about 40% of the decline in income from self-employment in farming activities (Giannelli et al., 2022). Research on coping mechanisms suggests that in the event of a regional emergency, remittances from migrant family members are a more effective coping mechanism. Seasonal labor migration is frequently still a good way to get cash for food when local non-farm sources of income have become less viable. To draw in the remittances sent by urban workers to support their families, individual households encouraged their family members to leave (Armah et al., 2010).

Objectives of the Study

The general objective of the study is to cope the local people response and adaptability strategies to the flood. The following specific objectives were formulated to guide the study:

- a. To examine how flooding affects housing and farming and adaptive strategies employed by local people.
- b. To look into the adaptation measures that locals have taken in response to the effects of flooding on their places of employment.

Description of Study Region

Roshi Rural Municipality, located in the Kavrepalanchowk District of Nepal, is particularly vulnerable to flooding due to its geographical location, characterized by river systems and steep terrain. The area experiences seasonal monsoon rains, which can lead to rapid water runoff, causing floods that disrupt local livelihoods, damage infrastructure, and threaten the safety of residents. Flooding in Roshi affects various aspects of community life. The primary livelihood in this area is agriculture, with many households relying on farming for their income. However, floods can lead to soil erosion, crop destruction, and loss of livestock, significantly impacting food security and economic stability. The damage to infrastructure, such as roads and bridges, hampers access to markets and essential services, further exacerbating the challenges faced by local residents.

The adaptive strategies employed by the residents of Roshi Rural Municipality illustrate their resilience in the face of environmental challenges. By diversifying livelihoods, improving agricultural practices, enhancing community preparedness, and investing in infrastructure, the community is taking significant steps to mitigate the impacts of flooding. However, ongoing support from government agencies and NGOs is crucial to strengthen these initiatives and ensure sustainable development in the region.

Methodology

To investigate the impacts of flooding on local occupations and the adaptation strategies employed by residents in Roshi Rural Municipality, Kavrepalanchowk, this study utilized a descriptive research design combined with a qualitative approach. The municipality was selected due to its susceptibility to seasonal flooding, which significantly affects local livelihoods. Specific wards were chosen based on their distinct socioeconomic characteristics, ensuring a diverse representation of the community's experiences and responses to flooding.

Results and Discussion

The effects of floods on occupations highlight serious difficulties for those impacted, especially farmers who experience both short-term and long-term work disruptions. Because of the destruction caused by flooding, many farmers reported having to change careers. Day labor was frequently the main alternative, underscoring the limited options available in the wake of such natural disasters. On the other hand, business owners were more resilient, as most of them continued to operate even in the face of short-term disruptions. Migration and skill acquisition were two adaptation strategies used by those impacted; many people sought new skills to improve their employability in less vulnerable industries. A vital non-migration tactic that offers better employment prospects and income potential is learning new skills. However, depending too much

on loans to rebuild and recover frequently led to financial strain, reducing total income and spending on things that were not necessities. Migration strategies yielded mixed results in terms of socioeconomic outcomes, whether they involved retaining prior occupations or switching to new roles after gaining skills. People who migrated with new skills typically had better living conditions and financial circumstances, but people who migrated without improving their skills had more financial difficulties. Furthermore, these adaptation strategies had a significant impact on the educational opportunities for children in flood-affected households; development of skills was associated with improved educational outcomes, while reliance on loans seemed to have a negative effect on educational resources. The need for efficient support systems to promote skill development and long-term recovery strategies in flood-prone areas is highlighted by these findings overall.

The discussion highlights the wide range of adaptation strategies used by impacted individuals and the significant impact that flooding has on different occupations. Farmers are particularly vulnerable because many of them experience major disruptions that could result in long-term career changes in addition to affecting their immediate means of subsistence. This emphasizes how people who depend on agriculture, a field that is naturally vulnerable to natural disasters, have few alternatives. Day workers and business owners, on the other hand, exhibit differing levels of resilience; many day workers only encounter brief setbacks, suggesting that their working conditions may be flexible. The varying reactions to flooding highlight the necessity of customized approaches that take into account the particular difficulties encountered by different occupational groups. The study also shows that migration is an important adaptation strategy that enables people to look for safer economic opportunities, whether or not they acquire new skills. It is especially important to acquire new skills because they improve employability and make it easier for people to deal with the aftermath of floods. However, relying on loans becomes a double-edged sword because, although they offer short-term financial support for recovery, they may also result in longer-term financial strain that impacts household spending and overall economic stability.

The need for all-encompassing financial support systems that encourage sustainable recovery is highlighted by this dynamic. Additionally, these adaptation techniques have an impact on children's educational outcomes in flood-affected households, as improved educational opportunities are positively correlated with skill acquisition. This demonstrates how educational attainment and economic resilience are linked, indicating that interventions meant to enhance livelihoods can also help the following generation.

In order to ensure that strategies for flood-affected communities not only address immediate recovery needs but also foster long-term resilience and educational advancement, policymakers and organizations must take these complex relationships into account when designing interventions. In the end, this conversation highlights how difficult it is to adapt to the effects of flooding and advocates for a comprehensive strategy that helps vulnerable populations' economic and educational development.

Findings

The results of this study offer a thorough understanding of how flooding affects different types of occupations and the adaptation techniques used by impacted communities. The study emphasizes extreme vulnerability of farmers, as flooding frequently causes severe disruptions to their livelihoods. A large number of farmers are forced to change their career paths, often switching to modern labor or other jobs that might not be compatible with their prior experience or skill set. This change highlights the restricted choices for people whose main source of income is threatened by natural disasters. On the other hand, day workers exhibit a comparatively high degree of resilience,

undergoing minimal changes in their employment, indicating that their work may be less vulnerable to disruptions caused by floods.

The ability of business owners to adjust is also impressive; most of them carry on with their operations even in the face of brief disruptions. The study also identifies a variety of adaptation strategies which are divided into migration and non-migration tactics. One crucial reaction is migration, which enables people to look for opportunities in less flood-prone areas, whether or not they have acquired new skills. The importance of skill development in boosting resilience is demonstrated by the fact that people who learn new skills during migration typically have better job prospects and higher income potential.

On the other hand, using loans is also a common tactic that helps people recover and rebuild after a flood. This strategy, however, has drawbacks since families might put debt repayment ahead of necessities, which would compromise their overall financial security. Beyond just short-term financial issues, adaptation strategies have an impact on children's educational outcomes in flood-affected households. Families that migrate and acquire new skills frequently give their kids better educational opportunities, whereas those who rely too many on loans suffer from financial limitations that hinder their ability to complete their education.

The results show a strong correlation between the type of adaptation strategy used and its socioeconomic effects, suggesting that some strategies may make it easier to access education and higher income levels than others. Policymakers and organizations working to assist communities in developing resilience against future flood events need to be informed by this nuanced understanding of how flooding affects occupations and the ensuing adaptation strategies.

Conclusion

The effects of flooding on nearby communities have been thoroughly examined in this study, with particular attention paid to adaptation tactics, changes in occupation, and the related socioeconomic consequences. The results show that farmers are especially susceptible to flood-related disruptions, frequently experiencing both short-term and long-term adjustments to their means of subsistence. The few choices these farmers have, like switching to modern labor, underscore the major obstacles they face in preserving their financial security. Business owners, in particular, showed a higher level of resilience than other occupations, with many of them carrying on with their operations even after brief disruptions.

The wide range of adaptive strategies people use in response to flooding is a significant finding from the study. An important non-migration tactic that has been shown to improve job prospects and increase resilience to future shocks is skill development. Through this proactive approach, people were able to enhance their long-term economic prospects in addition to recovering from the effects of flooding. Furthermore, loans played a vital role in supporting recovery efforts by supplying crucial capital for programs aimed at rehabilitation. But depending on loans also has drawbacks, especially when it comes to repayment commitments, which can reduce household income and financial flexibility.

Another essential adaptation strategy was found to be migration, which includes both moving to new places after acquiring new skills and continuing older occupations in different places. These tactics have consequences that go beyond the short-term economic recovery; they also affect the cost of living and the educational attainment of children in flood-affected households. Learning new skills and moving afterward were linked to higher living expenses, but they also provided more chances to earn money, according to the study. On the other hand, loan-dependent families were

under financial strain and had to prioritize necessities, which made it difficult for them to make educational investments.

In order to adequately address the effects of flooding on communities that are at risk, integrated support systems that emphasize skill development, improve access to financial resources, and encourage sustainable livelihood strategies must be established. In order to ensure a robust and flexible response to future flooding incidents, policymakers and organizations should concentrate on developing focused interventions that support economic recovery and educational opportunities.

References

- Aggarwal, D., Chatterjee, A., Garg, S., & Chawla, M. (2004). *Impact of climate change on water resources and livelihoods in the Himalayas*. WWF Nepal Program.
- Armah, F. A., Yawson, D. O., Yengoh, G. T., Odoi, J. O., & Afrifa, E. K. (2010). Impact of floods on livelihoods and vulnerability of natural resource dependent communities in Northern Ghana. *Water*, 2(2), 120-139.
- De Silva, M. M. G. T., & Kawasaki, A. (2018). Socioeconomic vulnerability to disaster risk: A case study of flood and drought impact in a rural Sri Lankan community. *Ecological Economics*, 152, 131-140.
- Diffenbaugh, N. S., & Burke, M. (2019). Global warming has increased global economic inequality. *Proceedings of the National Academy of Sciences*, 116(20), 9808-9813.
- Duffy, P. B., Field, C. B., Diffenbaugh, N. S., Doney, S. C., Dutton, Z., Goodman, S., ... & Myers, S. (2019). Strengthened scientific support for the Endangerment Finding for atmospheric greenhouse gases. *Science*, 363(6427), eaat5982.
- Echendu, A. J. (2020). The impact of flooding on Nigeria's sustainable development goals (SDGs). *Ecosystem Health and Sustainability*, 6(1), 1791735.
- Giannelli, G. C., Ricchiuti, G., & Tasso, M. (2022). Remittances and household resilience to economic shocks: Evidence from developing countries. *World Development*, 152, 105784.
- Hirabayashi Y, Kanai S, Emori S, Oki T, Kimoto M, (2008). Global projections of changing risks of floods and droughts a changing climate. *Hydrol. Sci. J.* 2008, 53, 754–772.)
- IPCC. (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation*. Cambridge University Press.
- IPCC. (2014). *Climate change 2014: Impacts, adaptation, and vulnerability*. Cambridge University Press.
- IPCC. (2021). Climate change 2021: The physical science basis. *Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*.
- Jha AK, Bloch R, Lamond J, (2012). Cities and flooding: A guide to integrated urban flood risk management for 21st century. *The World Bank and GFDRR, Washington*
- Jongman B, Ward PJ, AertsJCJH, (2012). Global exposure to river and coastal flooding: Long term trends and changes. *Glob Environ Change*. doi:10.1016/j.gloenvcha.2012.07.004
- Manandhar, S., Vogt, D. S., Perret, S. R., & Kazama, F. (2011). Adapting cropping systems to climate change in Nepal: A cross-regional study of farmers' perception and practices. *Regional Environmental Change*, 11(2), 335–348. <https://doi.org/10.1007/s10113-010-0137-1>
- Montz, B. E., Tobin, G. A., & Hagelman, R. R. (2017). *Natural hazards: Explanation and integration*. Guilford Publications.
- National Academies of Sciences, Engineering, and Medicine. (2018). Attribution of extreme weather events in the United States. Washington, DC: *The National Academies Press*. doi:<https://doi.org/10.17226/24652>.

- Nicholls, R. J., Hanson, S., Herweijer, C., Patmore, N., Hallegatte, S., Corfee-Morlot, J., Cha[^]teau, J., & Muir-Wood, R. (2008). Ranking port cities with high exposure and vulnerability to climate extremes: Exposure estimates. *OECD Environment Working Papers No. 1*, ENV/WKP. Paris-France.
- NOAA National Centers for Environmental Information. (2022, February 14). Billion-dollar weather and climate disasters. <https://www.ncdc.noaa.gov/billions/>.
- Ntanganedzeni, B., & Nobert, J. (2021). Flood risk assessment in Luvuvhu river, Limpopo province, South Africa. *Physics and Chemistry of the Earth, Parts A/B/C*, 124, 102959.
- Poudel, S. (2022). *Assessment of the Flood-Induced Loss and damage to agricultural crops in Rajapur, Bardiya*. Pokhara University.
- Sivakumar, M.V.K. (2005). Impacts of natural disasters in agriculture, rangeland and forestry: An overview. Geneva: World Meteorological Organization.
- Stott, P. A. (2016). The attribution of weather and climate-related events to human influence. *Wiley Interdisciplinary Reviews: Climate Change*, 7(1), 29-45.
- Tiwari, K. R. (2016). Disaster management policies and practices in Nepal. In *Natural Disasters Risk Assessment, Management Strategies, and Challenges* (pp. 31–46). [Online]. Available:https://www.adrc.asia/countryreport/NPL/2011/FY2011B_NPL_CR.pdf
- United Nations Office for Disaster Risk Reduction. *Floods and Livelihoods*. <https://www.unisdr.org/we/inform/publications/8984> 67. UNU-EHS and CRED. (2019). *Global Flood Risk Assessment Report*. *United Nations University Institute for Environment and Human Security (UNU-EHS) and Centre for Research on the Epidemiology of Disasters (CRED)*.
- World Health Organization. (2012). *Floods and health: A review of the evidence*. Geneva, Switzerland: World Health Organization.
- Zehra, D., Mbatha, S., Campos, L. C., Queface, A., Beleza, A., Cavoli, C. & Parikh, P. (2019). Rapid flood risk assessment of informal urban settlements in Maputo, Mozambique: The case of Maxaquene A. *International Journal of Disaster Risk Reduction*, 40, 101270.