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RURAL STRATEGIES FOR FLOOD RESILIENCE: ANALYSIS OF COMMUNITY ACTIONS IN NARAYANI RIVER BASIN, NEPAL

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ABSTRACT: *In the context of Nepal, the most devastating disaster is flood in terms of the number of human causalities, livestock, livelihoods losses and damages. There are structural, soft structural, and nonstructural methods to reduce flood risks. In addition to these methods, there are also community actions being used for several years in the rural communities to mitigate, respond, and recover from the impacts of floods. The main objective of the research is to present an analysis of such community actions in the Disaster Risk Reduction (DRR) cycle, livelihood capitals, and Early Warning System (EWS) and then to summarize the conclusion. Accordingly, research was carried out in two communities, Kudiya and Paklihawa of Narayani river basin at Susta Rural Municipality, Nawalparashi-west, Nepal. The paper illustrates overall rural strategies adopted by community people to cope, withstand, and recover from the impacts of flood. The paper also includes an effective and efficient holistic approach to explain community-level empirical evidence. The paper illustrates the overall findings about community actions contributing to flooding resilience and these empirical evidences are found relevant, realistic, practical, and durable solutions in reducing the flood risks in the rural context of Nepal.*

KEYWORDS: flood, resilience, community, actions, livelihoods, capitals

INTRODUCTION

Flood is the most frequently occurring devastating disaster. On an average, river flooding affects the lives of 21 million people, causes the reduction of US$ 521 billion GDP (T. Luo, Robert S. Young, P. Reig, 2015) , and inflicts internal displacement of several thousand people annually (Willner, S.N., Otto, C. & Levermann, A, 2018). Flood-led disasters are increasing in frequencies and magnitudes together with more extreme events in recent decades as an impact of the rising global temperature all over the world, which needs an integrated approach that addresses social protection, DRR, and climate change adaptation. When compared to the other natural hazards, floods affect more people globally; they can literally 'wash away' overnight what communities have gained over years in terms of growth and development.

In Nepal, floods are expected to affect 156,600 people every year (WRI, 2011). The annual flooding put the communities and households with more poverty and marginalization (Myron B

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Fiering, 1982). The losses from the annual flooding in Nepal are considered a serious problem to the governments. Every year, it becomes a hotcake of discussion to the government, security persons, and victims. Agricultural land in the Terai region have been degraded in Nepal through floods. Narayani River is one of the big rivers in Nepal and causes floods almost every year and damages the lives and livelihoods of the rural communities. The Narayani river basin flows from the northern Himalayas down Susta Nawalparshi Nepal to the Ganges River in the Bihar of India. People living on the banks of this river basin are among the people who have very low socio-economic characteristics. Their impoverished condition of living is attributed due to floods especially during the monsoon season that starts in June and ends in September. Other disaster like drought conditions also prevails after the end of monsoon rains.

THEORETICAL UNDERPINNING

The paper focuses on the community actions that helps them in saving lives and livelihoods during floods and drive towards resilience. The rural strategies to the flood risk management are mostly neglected and ignored in the name of science and modernization. The paper follows the following simple theoretical underpinnings.

Defining resilience

In this paper, resilience is defined as capacity which safeguards the shocks and stressors which don't have long-lasting consequences on adverse development (Frankenberger, Timothy R., Constas, Mark A., Neson, Suzanne, Starr, Laurie, 2014). Household resilience is termed as the household ability to mitigate, withstand, recover as well as adopt from natural stresses and shocks. Resilience is means and not the end that is an ability to recover or manage the impacts of the disasters. Resilience is a holistic approach that includes the capacities – skills, a set of attributes and conditions which are identified to empower households for achieving resilience during the shocks and stresses. The paper discusses flood resilience in the rural context of Nepal.

Community flood resilience

"Community is resilient to flood when it can sustain the critical function as well as function the critical systems under flood stress caused by; adaptation to change in the economic, social as well as physical environment; and also, be self-reliant if external resources are cut off or limited." (Frankenberger, T., Mueller M., Spangler T., and Alexander S., 2013). Resilience is the extent to which communities can successfully combine collective actions and social capital in response to flood shocks and stresses.

Social capital is observed as one of the key capacities at the household level that has a direct bearing on flood resilience. A community is group of the households who live together and share and celebrate the similar culture, language, and economic livelihoods. The households discuss,

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interact, and work together to respond to any kind disasters including floods with bonding, linking, and networking manner that help to mitigate, response and recover.

Community actions for flood resilience

The community people are living on the banks of the rivers from generations. They can wisely predict when the floods would come, and which area gets mostly inundated and where to evacuate. The communities employ their own rural strategies and actions to cope, withstands, and recover from the flood. They are regularly engaged in risk reduction and also analyze the scenario of cause-and-effect. Mostly they apply some of the structural measures of earthen and gabion embankment, making shelter houses, spurs, and river training for flood risk reduction. Recently the community people have also established upstream-downstream communication, nature-based solutions like plantation, local watershed management, maintaining water reservoir (ponds, water ways) etc, which are not adequately recognized by policy maker or researcher, but these community actions contribute to sustainable flood risk management.

METHODOLOGY

The study data and findings presented in this paper are a part of the ongoing Ph.D. research being carried out at Agriculture and Forestry University (AFU), Rampur, Chitwan, Nepal. Paklihawa and Kudiya communities of Susta rural municipality in Nawalparasi district under Lumbini Province were chosen to gather and examine empirical evidence as rural strategies for flood resilience management. Kudiya and Paklihawa are the most flood-prone communities in Nawalaparshi-west district and these communities are most vulnerable to monsoonal flooding almost every year. The communities regularly facing and responding to flood events were taken to be suitable for the research as it would provide community-based actions in flood resilience. A mixed research method was applied to collect both qualitative and quantitative data for the research purpose. Primary data were collected by administering household surveys within 402 households of respective communities, which was supplemented by information gathered using 4 Key Informant Interviews (KII) as well as 4 Focus Group Discussions (FGD) in the two communities. The secondary data collection included review of literature, articles, published materials, and books. The investigative study of this chapter entailed an in-depth review of the published documents and DRR policies of the government of Nepal and is accompanied by subsequent primary field data collection.

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RESULTS AND FINDINGS

The results and findings are discussed in the following categories:

Respondent's demographic characteristics

Out of 402 respondents, 227 (56%) were female and 175 (44%) were male. Higher respondent's age groups (n=286, 71%) fall under 26-50 years categories (Table 1)

Table 1: Sociodemographic characteristics of respondents from Kudia and Paklihawa

Age Group (years)	Female	Male	Total
15-25	16 (7.05 %)	13 (7.43 %)	29 (7.21 %)
26 -50	168 (74.01 %)	118 (67.43 %)	286 (71.14 %)
Over 50	43 (18.94 %)	44 (25.14 %)	87 (21.64 %)
Total	227 (100 %)	175 (100 %)	402 (100 %)

Source: Field Survey, 2019

There were different age groups of respondents from age of 15 to over 50 years. A total of 227 women and 175 males (total 402) participated in the survey, where 76 % women and 67% male participants were in the 26-50 age group.

Table 2: Ethnic composition of the respondent in Kudia and Paklihawa

Ethnic group	Kudiya(n)	Paklihawa(n)	Grand Total(n)
Chaudhary	69	19	88
Kanu/Kalawar/sah	30	15	45
Majhi	7	19	26
Mushar/Dalit	7	54	61
Muslim	22	34	56
Other	15	6	21
Pahadi	40	14	54
Yadav	12	39	51
Grand Total	**202**	**200**	**402**

Source: Field Survey, 2019

Table 2 includes the ethnic composition of those who participated in the survey from of Kudiya and Paklihawa sites. Chaudhari, Pahadi, Kannu/Kalawar were the major ethnic groups in the Kudiya, while Mushar/Dalit, Muslim, and Yadav were major ethnic groups in Paklihawa.

Rural strategies for flood risk management

Rural communities have several problems, but they also know solutions. They know local context and can provide an accurate understanding of the community concerns and aid in designing support

measures which build capacity of local and building rural strategies of adaptation for flood risk management. Especially, rural strategies help those who are affected by flood disasters in order to detect effective responses, avoid diseases, save assets and rebuild livelihoods. This paper highlights some major community actions observed in the study sites in reducing flood risk management, which are categorized and discussed as follows.

Flood mitigation plan of Kudiya and Paklihawa

Flood mitigation are the measures adopted to decrease the human and material damage severity caused by the floods and it should safeguard that the action of human or natural phenomena do not result in emergency or disaster. Community people have their own local mitigation plan to reduce the risks of floods. Table 3 shows that the focus of the community mitigation actions is different in Kudiya and Paklihawa. Out of 402 respondents, 113 (28%) raise the plinth of their houses as the mitigation plan. A total of 22 respondents, 17 (77%) respondents from Kudiya prefer engaging in diversion channels, while only 5 (23%) respondents from the Paklihawa engage in diversion as the means of the mitigation plan. Similarly, a total of 35 respondents, 25 (71%) from Paklihawa responded that they plant trees while only 10 (29%) respondents from Kudiya, plant trees as a mitigation plan from the flood. Basically, the approaches adopted by these communities are different. Also, from the Chi-square test p-value is significantly less (p=0.006284236) than 0.05. It shows that the mitigation plan Paklihawa is significantly different than in Kudiya.

Table 3: Community mitigation actions adopted in Kudia and Paklihawa

Option	**Kudiya**	**Paklihawa**	**Total**	**Chi-square (p-value)**
Diversion channel	17	5	22	
Flood barrier or sandbags	26	30	56	
Wooden poles	25	13	38	*p*=0.006284236
Planting trees	10	25	35	
Raised floor inside	37	45	82	
Raised plinth of the house	55	58	113	
Wall around house	30	21	51	
Others – specify	2	3	5	
Total	**202**	**200**	**402**	

Source: Field Survey, 2019; [s] significant (p=0.006284236) is < p=0.05

Table 4 also indicates the same that includes qualitative information. There are different community actions as per the DRRM cycle between Kudiya and Paklihawa. The community actions of Paklihawa seem more realistic and practical, which leads to more resilience than Kudiya. The reasons behind it, Paklihawa has active Community Disaster Management Committee (CDMC) and receiving DRRM training and orientation more frequently. The community actions in other phases of the DRRM cycle like preparedness, response, and recovery are almost the same

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but the level of the focus, approach, and ownership are different in Kudia and Paklihawa. From the FGD and KII, the community actions are good in preparedness and response but have limited actions in mitigations and recovery. This is because the interventions related to mitigations and recovery needs more resources and needs to be supported by external stakeholders and governments, which is lacking in both communities. Table 4 presents detailed community actions as per DRRM Cycle.

Table 4: Community actions in DRRM cycle for flood risk management in Kudiya and Paklihawa

DRRM Cycle	Kudiya	Paklihawa
Mitigations	Participate in dike construction. Build an improved shelter. Cut trees which are nearer to houses. Build a strong house.	Coordinate with local government to maintain construction of reservoirs or basins for controlling the flood. Participate in forestation. Engage in bioengineering and embankment building. Help in building community emergency shelter.
Preparedness	Organize meetings and orientations by local communities and NGOs. Storing foods and valuables on the first floor that have a multistory building. Identification of relief camps and flood shelters. Build temporary sheds.	Train local youths to support response at the time of disaster. Connected to community early warning system (EWS). Implementing evacuation plan in a school. Keeping Ready2GoBag with dried foods and valuable items. Participate in flood simulation exercises
Response	Taking flood victims in public houses – schools. Communicate emergency communication sent by local government. Using the first aid kits previously prepared.	Shifting livestock and valuable properties to uplands. Stacking of sandbags away from the outside wall of houses. Turning off the electrical appliances and evacuating premises. Evacuate in the upland during the disaster.

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		Community leaders monitor and update the evacuation to ensure safety of all Coordination with government and external agencies for support
Recovery	Cultivation of new crops on affected lands. Helping neighbors for (re)constructing their infrastructures. Move the settlement shifts, who are rich.	Participate in temporary housing reconstruction. Adopting Flood Resilient crops. Engage with cooperatives for accessing financial services.

Source: Field Survey from FGD and KII, 2019

Flood livelihoods recovery

Livelihoods options are economic capitals like income, assets, and resources. In the flood resilience measurement, a common thumb rule is that having more livelihood options with diversification help to cope, withstand, and early recovery from the flood risk. The table 5 shows that out of 402 respondents, 92 (23%) respondents rely on labor work for their livelihoods option after hit by the flood, while 80 (20%) respondents have no plan due to the poor economic condition. Considering the p=0.025878, which is less than 0.05 indicates that the community actions for livelihood recovery in Kudiya and Pakliha are different. The level and focus of the community actions are significantly different in Kudiya and Paklihawa with p=0.025878.

Table 5: Livelihood recovery plan of Kudiya and Paklihawa

Option	**Kudiya**	**Paklihawa**	**Total**	**Chi-square (p-value)**
No plan	30	50	80	
Incomes from agriculture	28	21	49	p= 0.025878
Labor work	40	52	92	
Using saving	28	30	58	
Borrowing loans	31	21	52	
Selling assets	21	12	33	
Jobs	14	10	24	
Business	8	3	11	
Others – specify	2	1	3	
Total	**202**	**200**	**402**	

Source: Field Survey 2019; ^{s} significant at p=0.05

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Similarly, table 6 also supports findings expressed above that community actions in economic capitals are not strong enough. Community actions are good in social and human capitals but there are limited actions in the economic, physical, and natural capitals. This is because the community lacks the resources and has limited resources from external and government stakeholders. Please refer table 6 for detailed community action as per the five livelihood capitals.

Table 6: Community actions in livelihoods capitals for flood risk management in Kudiya and Paklihawa

Livelihoods Capitals	Kudiya	Paklihawa
Human	Organize community meetings and orientation – occasionally. Participate in the meeting by CDMC members but not active now. Engage with ward representative who informs about flood program. Build linkage with local leaders has access to the municipality.	Organize meetings and have CDMC and task forces – active members. Participate in NGO training and orientation. Participate in community flood simulation exercise. Coordination with local government.
Social	CDMC was formed in the past but not active now. Participate in women groups for social issues Engage in sugarcane groups. A long history of living in the village for several decades. Domination of large population of Tharu.	Organize meeting and has active CDMC and task forces. Run women cooperatives for access to finance. Organize youth clubs meeting for several issues. Engaged with the banana farming group. A long history of living in the village. Domination of large population of Muslim.
Economic	Engage most population in agriculture and livestock are the main occupation. Go for labor works in agriculture. Establish small shops – cycle repair.	Household incomes depend on labor works. Most people engage in Agriculture farming. Household income depends on remittance from abroad. Get self-employed – small shops.

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	Depends on household income by remittance from abroad Get engage for employment – private sector.	Engage in banana farming for few farmers.
Physical	Participate to build dike and embankment in the river. Use EWS – sirens. Maintain and repair roads and culverts functioning well.	Use community emergency shelter Use EWS – sirens, flood gauge Use boat during flooding, Maintain seed bank, tool kits – rope, tubes, etc. Upgrading evacuation routes Repair and maintenance of embankments
Natural	Maintain and repair ponds and natural water reservoirs. Plant sugarcane that helps reducing flood because sugarcane withstands floods situation Plant household fruits	Carry out plantation at school's open space. Maintain and repair ponds and water reservoirs. Manage wetland – public. Plant household fruits and vegetables. Controlled grazing in flood plains and riverbanks.

Source: Field Survey from FGD and KII, 2019

Flood monitoring and warning services

EWS plays a vital role in flood risk management. Flood monitoring and warning services are one of the elements of EWS. Table 7 shows that out of 402 respondents, 116 (29%) and 105 (26%) respondents are receiving flood early warning alerts from sirens through early warning task forces and community relatives respectively in Kudiya and Paklihawa. Out of 55 respondents, 35 respondents of Kudiya receive EWS through local government stakeholders while only 20 respondents receive through government stakeholders in Paklihawa. Community actions seem different in Kudiya and Paklihawa but considering the p-value (p=0.135615664) is greater than the *p*-value at 0.05. So, community actions adopted by Kudiya and Paklihawa are not significantly different. However, it shows that Kudiya has more linkage with the local government than Paklihawa. Also, as out of 51 respondents, 30 respondents receive the EWS through flood gauge reader in Paklihawa. The early warning receiving respondent in Paklihawa is higher because flood gauge is installed in the river near to their community.

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Table 7: EWS monitoring and warning services mechanism of Kudiya and Paklihawa

Option	Kudiya	Paklihawa	Total	Chi-square (p-value)
Siren - EWS task forces	53	63	116	
Community Relatives	50	55	105	*p*= 0.135615664
Through government people	35	20	55	
Community gauge readers	21	30	51	
Mobile SMS	40	30	70	
Others – specify	3	2	5	
Total	**202**	**200**	**402**	

Source: Field Survey,2019; ^{ns} non-significant at p=0.05

Similarly, table 8 also shows that flood monitoring, and warning services are mostly received through sirens and people to people communication in the village. There are few people who receive flood alert SMS from the government. People in the Paklihawa look comparatively more prepared than people in Kudiya. Both communities have some relevant community action in risk knowledge and dissemination but there are limited community actions in response capacity based on given flood alert. Refer to the table below for detailed community actions as per the element of EWS in Kudiya and Paklihawa.

Table 8: Community actions in EWS for flood risk management in Kudiya and Paklihawa

Element of EWS	Kudiya	Paklihawa
Risk Knowledge	Few community people know about the DRR Plan of the community. DRR Plan exists but most of the people don't know about this plan. Ward representative informs about the flood program. Risk maps are not available.	Participate in the NGO facilitated DRR Plan and have active members. Participate and engage in NGO provided trainings and orientations. Participate in flood simulation exercise Coordination with local government Use risk and social maps, hoarding boards
Monitoring and Warning Services	Receive SMS from Department of Hydrology and Meteorology (DHM) at the risk time.	Active CDMC and task force member monitor the flood alert Read and measure the flood gauge Receive SMS from DHM

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	Local government informs through phones. No motoring mechanism at community level.	CDMC members read and monitor the river water levels.
Dissemination and Communication	Dissemination and communication by neighbor and ward representatives. CDMC members communicate the alert. Use siren in case of evacuation.	Active flood early warning task force. Active CDMC members. Exists communication plan – upstream downstream. Use display board and siren Adequate lead time.
Response Capacity	Not trained response human resources in the community. Depend on the local government for response. No resource is allocated by the community nor the local government.	CDMC members are active but not trained enough. Use grain and seed banks, and DRR funds are allocated by the community. No other resources are allocated by the local government. Evacuation plan in place and discussed with communities.

Source: Field Survey from FGD and KII, 2019

Role of local government

Local government i.e. municipality is also part of community actions. Almost every year flood causes significant damages and losses to lives and livelihoods in the communities. Flooding not only dismantles the structure of livelihoods but also brings different problems which make the condition of living extremely challenging. For example – it disrupts the health and education systems and damages the houses. Local government has a crucial role in flood response than province and federal government because they know the local context well and have greater linkages and connectedness with community people. As per the Disaster Risk Reduction and Management (DRRM) Act 2017, local government (rural/municipalities) has greater role to implement DRRM plans locally. Below are few examples observed during the key informant interview with the Susta Municipality representative:

- Hazards, risks and vulnerability assessments and plans.
- Creating flood risk awareness, simulation exercise, and learning events
- Carrying out disaster-resilient construction works for preventing floods such as dam, spur, embankments etc. forestation, and bioengineering.
- Organizing training for the local peoples and helps in an early warning system operation.
- Providing temporary shelter to the people who are displaced by floods.

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- Providing safe drinking water and food to the people who are affected during and after the flood.
- Provide rescue operations during the flood and provide health services to the wounded people in the primary health care center.
- Provide livelihood opportunities to the people who have suffered from the disaster
- Provision for DRR fund and local resource allocation for DRR.
- Localization of DRRM Act, formation of Local Disaster Management Committee, Local Emergency Operation Center etc. for effective early warning, preparedness, response and recovery.

How social capital matters in flood resilience

Community actions are part of the social capitals in the rural context that play vital roles in reducing flood risk management. Social capital refers to the complexity and strength of the relationships between the peoples within and beyond their communities. In the community disaster resilience context, social capital illustrates community connectedness or social cooperation which provides informal safety during disasters and also helps the people for accessing the resources. Bridging, bonding, and linking among the people reduces barriers to collective action and helps those who are most affected and need help or supports. However, at the time getting relief and funding supports; poor and marginalized groups, women, and dalits have challenges in accessing the resources and supports as compared to the people with a political link or higher social status. In the rural context, support among the communities is must needed during the flood since the support from the local government does not arrive on time. There are a few examples observed in Kudiya and Paklihawa during FGD and KII:

- Helping people in finding goods or materials lost during the floods.
- Sharing of the shelters and food amongst the people who are affected by flood
- Helping each other in re-building/renovating the houses and much more construction-related work
- Supporting immediate relief of food, clothing, shelter and medication during emergency to the needy.
- Further, plans are made within community people for the prevention of flood and preparing the plans regarding the steps which should be taken during the flood
- Counseling to the people who are highly affected due to flood and further motivating and supporting them in each sector
- Providing loan to the people who are affected due to flood without any interest rate
- Working together in agricultural lands for enhancing the production of crops

Remaining community gaps and needs

Nepal has been suffering by repeated flooding's which has led to huge damage and also the loss of lives which hence testifies that the measures which are taken during and after the flood are not

efficient. The loss of lives also shows that there are lots of gaps that should be filled in for minimizing the impacts of floods. Some remaining gaps and challenges observed at the time of FGD and KII at Kudiya and Paklihawa are:

- Community engagement in hazards, risks, vulnerability assessments and DRR plans and policies preparation.
- Access and dissemination of flood early warning to the most vulnerable and disadvantaged groups in the community.
- Limited knowledge and skills about the flood risk management activities such as EWS, structural and natural solutions like bioengineering, plantation, watershed planning, etc.
- There is no strategy focused to flood risk management in Nepal. The DRRM Act mostly emphasizes on emergency management and does not emphasize risk management and preparedness.
- Limited education and training about flood risk management among the community people, and local government for the prevention of flood, response during and after the flood
- Lack of vibrant DRR community institutions (CDMCs, task forces etc.) who are primary responders during the disasters.
- Lack of diverse livelihood opportunities and resilient livelihoods schemes for the ral people living in these areas.
- The public and private sectors' willingness to support these rural communities was found limited.

IMPLICATION TO RESEARCH AND PRACTICE

The paper addresses the gaps in the academic and development research related to rural strategies to cope, withstand and recover from the impact of floods. The results and findings show that community actions to reduce the flood risks are very crucial, relevant and useful. The paper highlights importance of rural strategies for flood risks management in the development practices concurred to mitigations, preparedness, response and recovery. The stronger and capacitated community with relevant community actions have higher capacities of resilient community appropriately. With the comparative analysis, Paklihawa community is more active and carried out relevant community actions during and after the flood that helps them to build more resilient community than Kudiya. The implication of the above research supports to a broader idea to respect community actions that are useful, innovative and sustainable and that also provides high level pathway and direction to the possible academia and development stakeholders. Social capitals and role of local governments are also part of community actions and they can play a crucial role at the time of flooding. There are several remaining gaps for the flood resilience, but rural strategies are relevant and useful for minimizing the flood risks. Similarly, community actions are not the peninsula but sustaining milestones and can be built upon over the time and that helps to reducing the flood risks.

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DISCUSSIONS

Community-based local DRR institutions are the primary and first responders for any disasters. Flood is considered as one of the major and frequently occurring disasters in Nepal that causes the loss and damage to thousands of lives and livelihoods annually. In this context, the role of community people is crucial to cope, withstand and recover from the adverse impacts of floods. The role of the community and their actions in the rural areas are discussed, perceived, and observed differently at different levels. In this paper with research findings, authors have found that community has been playing very positive roles, and community actions in the different spheres like livelihood capitals, DRR cycle, and EWS are found practical, realistic, and durable to reduce the flood risk. However, actions and interventions are not perfect and enough to reduce the risks to a safe level, but these can't be ignored. These are the foundations and there is a need to project and conserve the traditions and skills. The rural community can provide practical methods to reduce the negative social impacts of flood by building on the actions that families already take and by designing interventions that can accommodate changing situations (Dixit A. et. al., 2007). In contrast, the risk reduction traditional approach does not analyze the scenario of cause-and-effect and mostly applies structural measures (Dhakal, 2013). This is not clear in the context but analysis in the above research found that communities have no resources to apply the structural measures, basically, they apply soft structures like bioengineering, plantations, sandbags pilling, etc. to reduce the flood risk in the rural communities.

The paper highlights that the community having more livelihood options i.e economic capitals and diversity can be a more flood resilient community to cope, withstand and recover from the flood. Being rich in all five capitals is ideal but natural, economic, and physical capitals are more influential to reduce the flood risk and its adverse impacts in the community. This is supported by another study that capacity of household to adapt the extreme flooding largely depends on access to natural and economic capitals (M.R. Motsltolaplte, Donald L. Kgathi, Cornelis Vanderpost, 2014). Similarly, community actions and interventions as per DRR cycle are most crucial because it covers all phases of the disaster and empowers the community dealing with the floods. An efficient early warning system is very important to reduce the flood risk, which needs to be inbuilt with community actions. Barriers to dissemination of information are also linked to low-capacity and knowledge about the information on warning, communication devices, transportation, and the use of advanced forecasting tools and models and that need to be addressed to strengthen the community-based EWS (Rishiraj Dutta, Senaka Basnayake, Atiq Kainan Ahmed, 2015). Rural strategies of flood resilience are crucial and important. The community actions are very helpful to reduce the flood risks that they need more technical support and resources and its need to be strengthened with a holistic approach that should include DRR cycle, livelihood capitals, and effective EWS. Engagement of local community in hazard, risk, vulnerability assessments and DRR plans and policies for strengthening resilience is crucial for empowering the community for sustainable ways of mitigating, responding and recovery from the floods.

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CONCLUSIONS

There are no specific hard-core approach and strategies to lessen the adverse social and economic impacts of flood. Rural techniques with community actions can be practically transferred and capacitated which families have been taking already, and by designing interventions that can accommodate changing situations and context of the community. Such interventions should address the flood shocks and stresses as well as their impacts. In the case of flood in the above communities, the community actions such as local people seek safety frequently by moving to higher grounds, people to people and upstream and downstream communication, early ripening variety crops or planting flood-resistant varieties, stockpiling some emergency food and supplies, establishing DRR fund at local level, that really help them to mitigate, response and recovery to the impact of the floods. Community actions also aid in improving the access to clean drinking water during floods by continuous institutional local innovations like raising hand pump platform and boiling the water with local medicinal neem plant, use of water purifiers etc. The local community plans that help the rural people in diversified livelihood development for reducing the flooding hazards and vulnerability are more active responses than exclusively concentrating on hardcore structural measures to reduce the flood risks. The traditional and rural innovative strategy is carried out as an appropriate strategy for building the houses on high points or on stilts for respite during flooding. Along the flood plains, activities like community forestry can aid to promote biological shield and as buffer zones. The community actions of Paklihawa are found to be more relevant and effective; and people are also more active in flood risks management than of Kudia. With these active participation and relevant community actions, Paklihawa seems more flood resilient than Kudia.

Overall, the approaches which aim to enhance resilience and lessen people's vulnerability to flood hazard is by increasing the capacity and by establishing the community actions of existing mitigation, preparedness, response, and recovery plan which are found highly effective in Paklihawa. The benefits of these measures can be implemented by people in their localities without major institutional restructuring. There is need to focus on the implementation as well as formulation of appropriate laws and compliance with local government i.e., municipalities codes. The role of local government stakeholders and social capitals through engaging community is important in the flood resilience. The above community actions in DRR cycle, livelihood capitals, and EWS are found relevant, durable, practical, and sustainable, they just need additional technical supports and financial resources to enhance capacities to preparedness, respond and recover to the impact of floods.

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