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From Policies to Practice: Governance Gaps in Climate and Disaster Reduction in Nepal's Riverine Communities

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Abstract

Background: Riverine communities in Nepal face escalating climate-induced disasters, yet governance gaps between national policies and local implementation remain poorly understood. This study examines how climate change and disaster risk reduction policies are translated into practice in the Kamala River Basin.

Objectives: We investigate (1) how riverine communities perceive and operationalize climate and DRR policies, and (2) the key disconnects between policy assumptions and local realities and what governance reforms are needed to bridge this gap.

Methods: Employing a mixed-methods approach in two municipalities (Siraha and Dudhauli) of the Kamala River Basin (2024-2025), we collected household surveys (n=408), key informant interviews (n=21), focus group discussions (n=2), and conducted policy document analysis to explore social, economic, institutional, environmental, and infrastructural dynamics.

Findings: Policy awareness among communities is critically low: >70% of respondents are unaware of formal disaster response procedures, and <90% lacking knowledge of local disaster management plans. Municipal disaster budgets constitute only 0.01% of total expenditure, overwhelmingly directed to post-disaster relief rather than preparedness. Institutional coordination between the Ministry of Forests and Environment and Ministry of Home Affairs remains fragmented, with limited formal joint planning mechanisms. While national policies emphasize climate-resilient development and decentralization, implementation reveals weak localization, project-based donor-dependent financing, and exclusion of marginalized groups from planning processes.

Conclusion: Policy coherence at national level does not translate to community resilience without accompanying reforms in institutional coordination, financial decentralization, and participatory governance. Addressing governance gaps requires: (1) mandatory joint planning across vertical and horizontal institutions of governments, (2) predictable climate finance mechanisms ensuring 80% local reach as mandated, and (3) legally binding requirements for marginalized group participation in disaster planning.

Keywords: Climate governance; disaster risk reduction; policy implementation; community resilience; federalism; Nepal; Kamala River Basin

Introduction

Disaster risk increasingly originates from interactions among climate change, development pathways, and governance systems and not from hazards alone. Climate change has induced these hazards including hydrometeorological threats like floods and erosion, which become more frequent and severe nowadays (Nepal et al., 2021, UNFCC 2007)). Anthropogenic activities in the form of settlement expansion, land-use change, and infrastructure development frequently increase exposure to climate induced hazards and exacerbate socio-ecological vulnerabilities (Lamichhane et al., 2025; Pandey, 2025; Daksiya et al., 2020). To reduce losses and damages, and strengthen community resilience, global frameworks including the Sendai

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Framework for Disaster Risk Reduction 2015-2030 and the Paris Agreement 2015 emphasize the integration of climate adaptation and disaster risk reduction (DRR) (UNDRR, 2015; UNFCCC, 2015). These frameworks promote three core strategies for managing climate induced hazards: 1) localization of policy action, 2) institutional coordination and 3) risk-informed decision making.

In accordance with these international commitments, many countries have developed policies and strategies to institutionalize DRR and climate efforts to build climate-resilient communities. Nepal has also enacted a number of laws and policies among Least Developed Countries (LDCs). The National Adaptation Plan of Action (2010), the Local Adaptation Plan of Action framework (2011), the Climate Change Policy (2019), and the Disaster Risk Reduction and Management (DRRM) Act (2017) are major legislative milestones (Nepal, 2019; Nepal et al., 2018). These policies emphasize preparedness, resilience, and decentralized governance, thereby signaling a shift from reactive disaster response toward proactive risk reduction (MoFE, 2021; GoN, 2017). The country's transition to a federal governance system has further decentralized responsibilities to provincial and local government, creating new opportunities for localized planning and implementation. In principle, this restructuring allows local governments to integrate climate and disaster considerations into development planning, budgeting and service delivery. However, empirical studies show that communities continue to rely primarily on their own formal mechanism, traditional knowledge and community level social capital rather than the policies designed to protect them (Sharma, 2021; Nash et al., 2019; Pandey & Basnet, 2023). Despite establishing robust policy architectures consistent with international frameworks, existing implementation gaps continue to leave vulnerable populations to be exposed to recurring hazards.

To address this gap the study examines the disconnect between Nepal's policy architecture and the fragility of community governance dimensions across riverine communities of Kamala River Basin to answer the following two research questions. 1. How do riverine communities perceive, interpret and operationalize climate change and DRR policies? 2. What are the key disconnects between policy assumptions and their realities and what governance reforms are needed to bridge this gap? This study links the policy process with community level evidence and contributes to a deeper understanding of how governance gaps shape vulnerability and resilience. It argues that resilience cannot be achieved through policy design alone but requires effective localization, institutional coordination, and sustained engagement between community and governance systems.

Literature Review

Climate Disaster Risk and Governance

Nepal ranked the fourth most vulnerable country globally to the effect of climate change despite contributing 0.02% of global greenhouse gas emission (Nepal, 2020). Situated in the Himalayan region, major rivers flow southward to the terai region where people are inhabiting in the lowland basin of rivers, such as Koshi, Karnali, Narayani, Kamala and Mahakali, are

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facing challenges including climate risks. Floods, riverbank erosion, and associated landslides are the common disaster risks that cause recurrent loss of lives, livestock, crops and property (Pandey, 2025; Pandey & Niraula, 2024; Maharjan, 2023; Neupane & Dhakal, 2017). Climate change is amplifying these risks. In some high-altitude districts, mean annual temperature increases at the rate of 0.04^0C per year between 1972-2012, while the recorded frequency of hazards including floods, landslides arose almost sevenfold over the same period (Uprety, 2017). Riverine communities face compounded challenges due to changing precipitation patterns, weak infrastructures, limited awareness and preparedness, which lead communities to highly depend on climate-sensitive livelihoods (Pandey, 2025; Adhikari et al., 2024; WB & ADB, 2021). Agricultural dependency, dispersed settlement patterns, unemployment, and limited economic opportunities, infrastructure development further deepen sensitivity to climate shocks (UNDRR, 2019). This disconnect is particularly consequential and amplifies vulnerabilities in floodplains and erosion-prone areas.

Climate change is both an environmental and developmental challenge, which requires coordinated action across global, national and local levels. Global agreements frameworks namely the Paris Agreement (2015), Sendai Framework for Disaster Risk Reduction (2015-2030) and Sustainable Development Goals (SGDs) act as the foundation for national and sub national climate and disaster governance. These agreements emphasize limiting the global temperature to below 2°C, reducing disaster risks and promoting adaptive capacity to increase resilience (UNDRR, 2015; UNFCCC, 2015; United Nations, 2015).

The federal system offers potential advantages for climate governance, yet they continue to face considerable challenges related to coordination and implementation. Chakraborty et al. (2024) and Acharya & Zafarullah (2020) argue that federalism's decentralized structures can enhance climate policy effectiveness by bringing decision making closer to local context and needs. Though the broader South Asian evidence remains limited and have followed their own national climate plans due to political distrust and wealth disparities (Sohail, 2025). The formal response to climate and disaster risk in Nepal progressed over the past two decades, where a relatively comprehensive framework has been developed since ratifying the UNFCCC in 1994. However, progress exceeded only after the formation of the constitution.

The 2015 constitution adopted federalism in the country with three levels of government although, country has started addressing climate change issues since 2010 with the formulation NAPA 2010 and LAPA framework 2011. The key policies and legislation have been updated in the federal context. The key policy namely DRRM Act 2017 replaced Natural Calamity Relief Act 1982, Local Government Operation Act 2017 replaced Local Self Governance Act 1999 and Climate Change Policy 2011 replaced by Climate Change Policy 2019. Other frameworks including Land Use Policy (2015) and National Adaptation Plan (2021-2050) were also prepared to strengthen disaster response. The Local Government Operation Act 2017 and the DRRM Act 2017 fundamentally shifted disaster response authority to local levels. The DRRM Act 2017 provides authorities to develop their own disaster policies to manage local disaster related operations. In response, many local governments have their own legal structures and administrative mechanisms. However, they lack specific strategies and technical

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guidelines to integrate DRRM into their broader development planning and execution (Khatri, 2022; Russel et al., 2022; Bhandari et al, 2020).

Table 1: Policy instruments and their ambitions

S. No.	Policy Instruments	Major Focused Areas
1.	Natural Calamity Relief Act, 1982	Reactive and response mechanisms rather than preventive measures (Nepal et al., 2018)
1.	NAPA (2010)	Adaptation measures across various sectors such as agriculture, water, forest, health and climate induced disasters (Darjee et al., 2021; Nepal, 2019)
2.	LAPA (2012)	Pioneer document which supports bottom-up planning process through participatory local planning (Ghimire & Chettri, 2022; Darjee et al., 2021)
3.	Disaster Risk Reduction Management Act (2017)	Concentrates on legislative basis for disaster governance through federal, provincial, and local mechanisms to strengthen adaptive capacity. Focus on preparedness and response mechanism (GoN, 2017)
5.	Disaster Risk Reduction Policy (2018)	Prioritize prevention, mitigation and preparedness rather than post disaster relief and mainstreaming DRR into sectoral planning such as agriculture, infrastructure and urban development (GoN, 2018)
6.	Climate Change Policy (2019)	Commit ensuring at least 80% of climate finance reaches the local communities to build climate resilient societies by streaming adaptation across government (Darjee et al., 2021; Nepal, 2020)
7.	National Adaptation Plan (2021-2050)	Provide a roadmap to 2050 which systematically integrates adaptation into development & shifts from project-based to programmatic resilience-building (GoN, 2021)

These national policies and frameworks aim to shift disaster governance from reactive response toward proactive risk reduction and preparedness aligned with the Sendai Framework (Gyawali et al., 2022). It promotes the integration of climate and disaster considerations into development planning through a multi-tier governance structure. However, empirical studies show that translating global policy principles into effective local action remains challenging due to weak institutional coordination and limited implementation capacity (Khatri et al., 2022; Bhandari et al., 2020; Gentle et al., 2018; Pandey et al., 2019). This proposed climate and disaster governance need to be examined not only at the policy design level but also through its operationalization at the subnational and community levels.

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Policy Coherence and Institutional Coordination

Policy coherence, the alignment and integration of policy objectives, instruments, and institutional arrangements across sectors and governance levels is essential to address climate change and disaster risks (IPCC, 2022; UNDRR, 2019). Review of climate change adaptation (CCA) and DRR integration and related issues such as land restoration and sustainable development shows that international agreements encourage coherent, multi-level governance but translation is partial. Empirical studies of Africa, America, Europe and Asia reveal that DRR and climate policies including spatial and land use planning operate in parallel with weak institutional coordination and limited capacities, policy overlap and fragmented implementation (Kato & Shaw, 2024; Waheed, 2020; England et al., 2018), and highlight weak unclear mandates, centralized technocratic planning, constrained local capacity as a key barriers in policy implementation (Zimmermann et al., 2023). This suggests that climate and disaster governance must be examined not only in terms of policy design level but also through its operationalization within sub-national and community level practices.

Furthermore, social and political inequalities complicate climate and risks. These risks are being produced through not only by physical hazards but through land and settlement decisions in South Asian region (Sultana, 2014; Adger 2006). Studies show that marginalized and landless groups are often concentrated on the most hazardous land, such as riverbanks and steep slopes, where repeated inundation and livelihood disruption push them into vulnerability (Maharjan, 2023). Similar patterns are found in Nepal's rapidly urbanizing cities, where informal settlements are along flood prone areas making authorities to struggle to regulate legal action for the resident's safety (Ghimire, 2023). Against this backdrop, literature on land use planning and Risk Sensitive Land Use Planning (RSLUP) argues that without explicit pro-poor and risk sensitive spatial policies, existing disaster risk reduction methods including early warning systems, embankments and structural mitigation will only address immediate challenges (Sudmeier-Rieux et al., 2015). However, experiences from the Nepal and other contexts show that planning remains top down which even worsen existing inequalities (Maharjan, 2023).

This evidence suggests that improving policy coherence between climate adaptation, DRR, and land-use sectors must go hand in hand with transforming land governance: integrating RSLUP into municipal planning, strengthening participation, and addressing power imbalances that channel the poorest onto the riskiest land. Without such pro-poor, risk-sensitive land-use reforms, climate and disaster governance will continue to reproduce vulnerability rather than reduce it.

Conceptualizing Community Resilience

Resilience emerges from the interaction between vulnerability, local practices, and policy implementation besides policy strategies. It refers to the capacity of individuals to absorb, adapt, and transform in response to climate and disaster shocks (Southwick et al., 2014). Through the years community resilience focused on the "bounce back" to "bounce forward" approach encompassing social, economic, institutional, and environmental capacities (Zhai & Lee, 2024; Apostolopoulos et al., 2019; Folke et al., 2010). Van de Pas et al., 2017, highlight

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for bouncing back than bouncing forward since it helps to manage the existing situation. However, authors argue that bounce forward is equally important to improve the current situation of the community.

In South Asia, where climate change is already a development reality, policies are tailored to specific risks, supported by knowledge investment, pro-poor approaches, and regional cooperation (Sharma, 2011; ADB, 2007). Although existing policies emphasize institutional arrangements and strategic priorities, they often pay limited attention on how these translate into tangible social, economic, and institutional capacities at the community level (Gyawali et al., 2021). These challenges are evident of weak integration and fragmented interventions across regions, and communities facing climate variability, that include drought, declining productivity, and extreme events including erosion and lake glacier outburst floods (Gentle et al., 2018). Policy coherence is therefore central to shaping resilience outcomes. Resilience is not produced by community capacities alone but is strongly influenced by the degree of integration between climate change adaptation, disaster risk reduction, and development policies.

Among the various approaches developed to assess resilience, including the Climate Resilience Index (CRI), Livelihood Vulnerability Index (LVI), and Social-Ecological Systems (SES) framework, Baseline Resilience Indicator for Community (BRIC) is considered one of the most widely applied and methodologically mature models (Bakkensen et al., 2017; Stevenson et al., 2015). CRI and LVI emphasize the assessment of various components in narrow domains, while the BRIC framework provides a practical tool for measuring resilience at the local level through quantifiable indicators across multiple components (Cutter et al., 2010). Although the SES framework provides a holistic understanding of coupled human-environment systems, it often remains conceptually abstract and offers limited guidance for linking governance processes to measurable local outcomes. BRIC addresses these limitations by adopting a capital-based approach, viewing communities as integrated systems composed of distinct but interrelated social, economic, institutional, and infrastructural capacities (Javadpoor et al., 2021). This approach enables a more grounded assessment of inequalities, governance capacity, and practical resilience outcomes, particularly in contexts where climate risks interact with hazards, exposure, and institutional constraints (Zhai & Lee, 2024; Cutter et al., 2014). Empirical applications further demonstrate their relevance, showing variations in resilience across regions and highlighting the importance of resource access, social networks, and governance effectiveness in shaping resilience outcomes (Niraula et al., 2026; Camacho et al., 2023; Javadpoor et al., 2021). Building on these theoretical insights, the national framework links global climate and disasters governance framework with Nepal's national policy architecture and examines how these policies are translated into local practice through BRIC lens (Figure 1).

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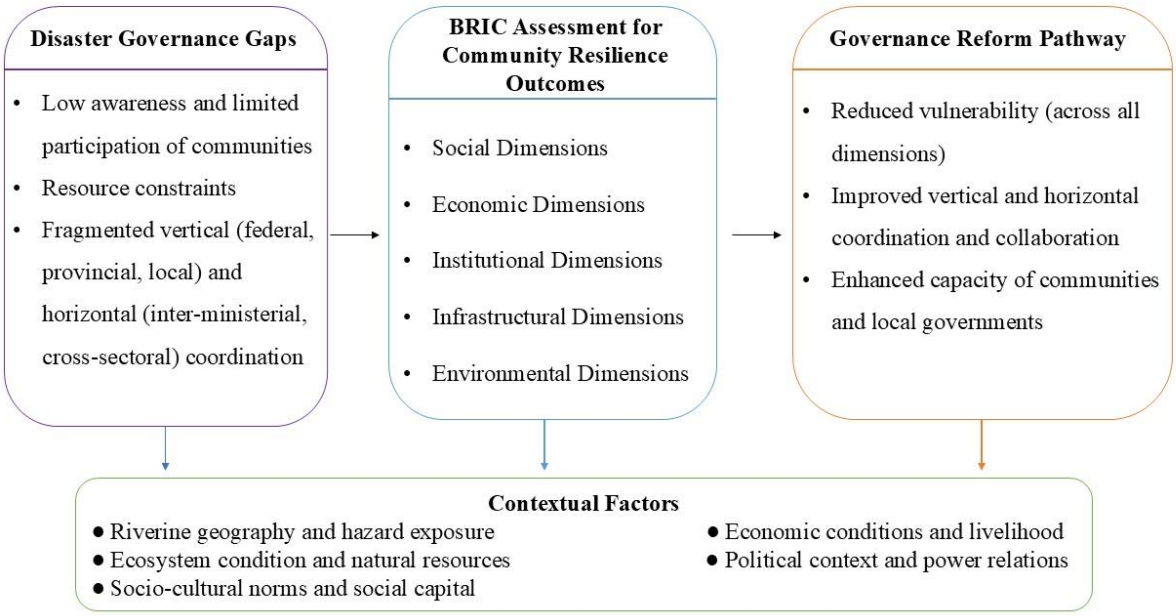

Figure 1: Analytical Framework of the study

Study Site and Methods

The study was conducted in Kamala River Basin, which is located in the eastern Terai region of Nepal. Administratively, it covers four districts: Udayapur and Sindhuli in the upper basin and Siraha and Dhanusha in the lower part of basin (WECS & CSIRO, 2020). The basin is highly vulnerable to climate hazards despite mitigation efforts have been implemented (CBS, 2017). These riverine areas are characterized by their distinct socio-ecological settings, unique characteristics and shared climate vulnerabilities, including mixed rural-urban livelihoods, high exposure to flooding and complex governance structures. Based on this criteria Ward No. 11 of Dudhauli and Ward No. 12 of Siraha municipality were selected (Figure 2) because they are located at the foot of Chure region and faced flooding every year either from Kamala River or its tributaries (Pandit et al., 2023).

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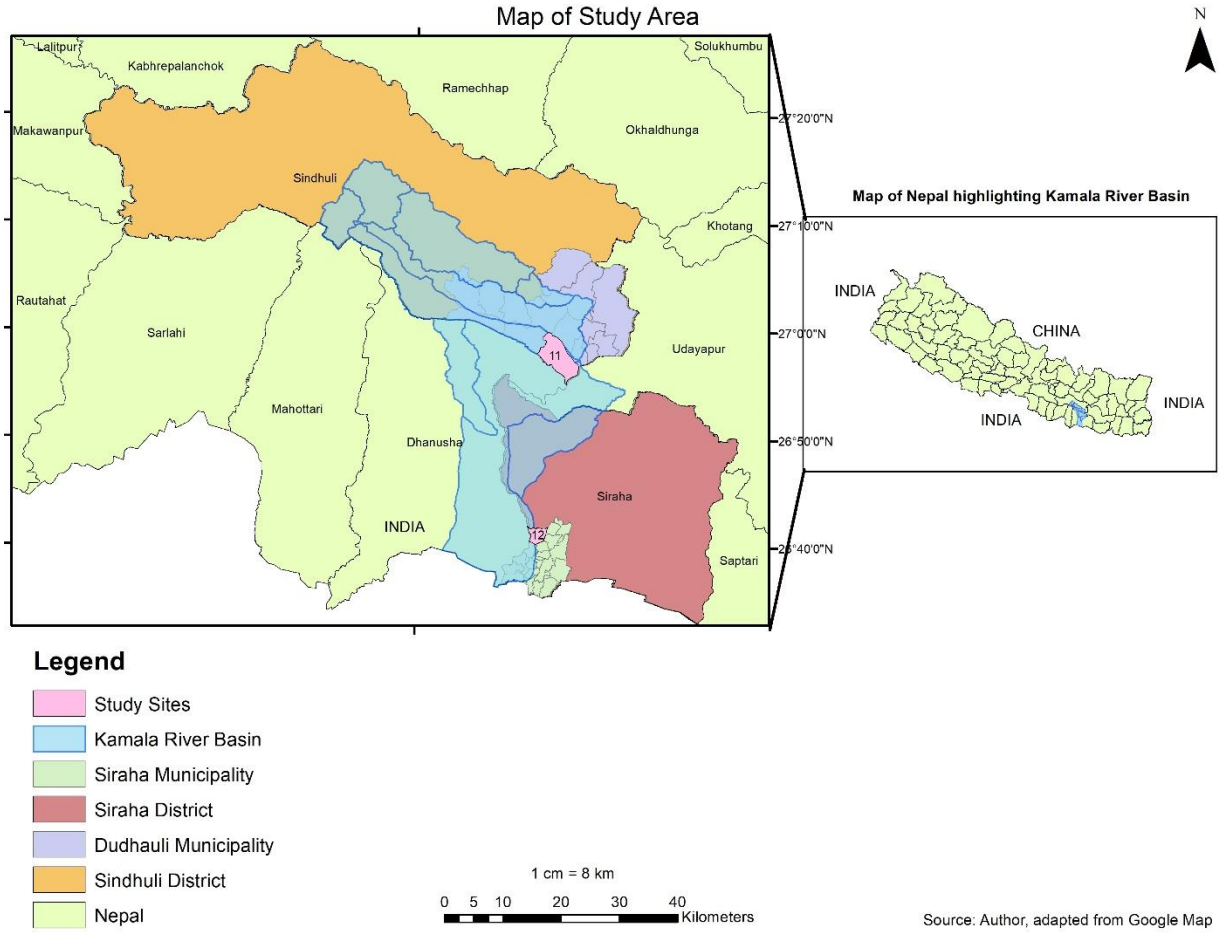

Figure 2: Kamala River Basin and District boundaries

This study employs a mixed-method design integrating quantitative and qualitative approaches to evaluate climate change and DRR policies in Nepal through a lens of community resilience and enables triangulation of institutional and community-level evidence to strengthen the validity of the findings (Creswell & Clark, 2018). The methodological approach was guided by the study's conceptual framework, which outlines the pathways through which national policies shape local implementation and influence community outcomes. A structured household survey was conducted in 408 households. The sample size was calculated using Yamane's formula (1967) with 95% confidence level and 5% margin of error (Yamane, 1967). The sample was distributed proportionally across two study sites based on population size. These households were selected based on the following criteria: 1) reside in the study area for more than 10 years. 2) directly exposed to climate related hazards (particularly flooding) 3) provided informed consent to participate in the research. These surveys collected data on demographic characteristics, livelihood patterns, disaster experience, recovery time, community participation, and governance effectiveness.

Qualitative data collected through 21 key informant interviews (KIIs) were conducted with officials from the Ministry of Forest and Environment (1), Department of Hydrology and Meteorology (2), government officials working on climate change and DRR from Dudhauli,

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Kamalamai and Siraha municipality (4), DRR committee members from Siraha (2), NGO representatives working on climate and DRR (2) and community residents (10). Key informants were selected purposely, based on their direct involvement in climate change related activities like DRR planning and implementation and demonstrate knowledge of climate adaptation or disaster risk reduction in the study area. However, in selecting community people we consider both their experience with disaster response and their recognition within the community.

Two focus group discussions (FGDs) were conducted, one with 4 participants and other with 6 participants. These participants were from women groups including marginalized communities, school teachers and youth to ensure diverse perception of climate risks, coping strategies and access to services.

Policy instruments including the Climate Change Policy (2019), National Adaptation Plan (2021-2050), Disaster Risk Reduction Management Act (2017), National DRR policy and Strategic Plan (2018-2030), Land Use Policy (2015), Local Adaptation Plan of Action, Paris Agreement, Sustainable Developments Goals (SDGs), National Adaptation Plan (2021-2050) and Local Disaster and Climate Resilience Plans (LDCRP) were analyzed for policy coherence, institutional coordination, resource allocation provision, and mechanism to strengthen local governance. Additionally, municipal profiles, annual plans, and budget documents were reviewed to understand institutional responsibilities and the degree of policy alignment. The review focused on policy objectives, institutional roles, coordination mechanisms, provision for localization, inclusion and resilience building. Furthermore, social, economic, institutional, infrastructural and environmental/ecological dimensions of resilience are assessed based on the following indicator as shown in Table 2.

Table 2: Resilience dimensions and their indicators

S. No.	Resilience Dimensions	Indicators
1.	Social	Education, Age and Migration
2.	Economic	Employment and Food Security
4.	Institutional	Disaster Response Plan, Capacity Development Programs, Proximity to Service Center
5.	Infrastructural	Settlements, Roads and Buildings
5.	Environmental/Ecological	Availability and Utilization of disaster protection measures

Survey data were coded and analyzed using SPSS version 26. Descriptive statistics and comparative analysis were done to investigate patterns of vulnerability, preparedness, and adaptive capacity across the study area. Data from policy reviews, interviews and focus groups were transcribed and analyzed thematically to answer the research question.

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The study follows the research and ethics guidelines of the School of Arts, Kathmandu University and received ethical approval on 20 June 2024. Following the guidelines researchers obtained verbal research consent from the participants before data collection, with the option of voluntary withdrawal from the engagement at any time during the study. Personal identity of the participants was removed during data processing to ensure confidentiality and anonymity throughout the study period. Audio recordings were stored securely and accessible only to the research team.

Findings

The findings are structured to answer two interrelated questions. The answers were gathered and analyzed from policy documents, qualitative and quantitative data and direct observation in both municipalities during field visits in the year 2024-2025.

Community Perceptions and Interpretation of Climate and DRR Policies

Survey data reveal that communities have low awareness of the disaster management plans and response mechanisms. More than 70% of respondents reported being unfamiliar with formal disaster response procedures and municipal disaster management mechanisms (Figure3). Most of them were unable to identify any structured disaster preparedness measures, response procedures or institutional mechanisms at municipal level in both municipalities. While Siraha shows a slightly higher percentage of positive responses indicating the overall awareness was low in both municipalities.

Similarly, the level of understanding of disaster management plans was found to be predominantly low with only minor differences between the two municipalities. The data show that more than 90% possess inadequate knowledge of disaster management plans in both municipalities (Figure 4). This indicates that beyond limited awareness of response mechanisms, there is an even deeper gap in understanding formal planning processes and their functionality at the municipal level. The statistical tests further illustrate and show statistically significant association between education level and understanding of disaster management plan in χ^2 test with p (0.030) and df (2) indicating people with higher education have more understanding of disaster plans. This suggests advanced education facilitates access to or retention of disaster preparedness information.

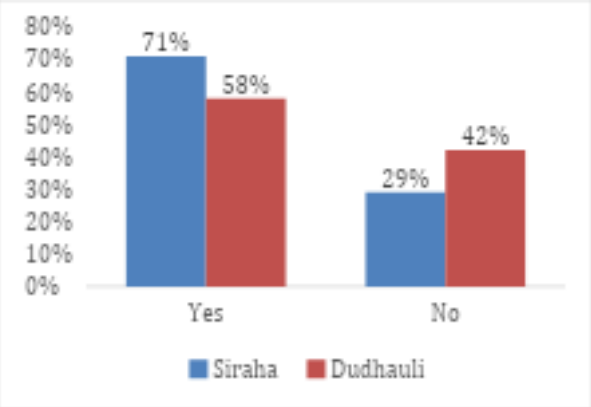

Figure 3. Awareness of Disaster Response Mechanisms

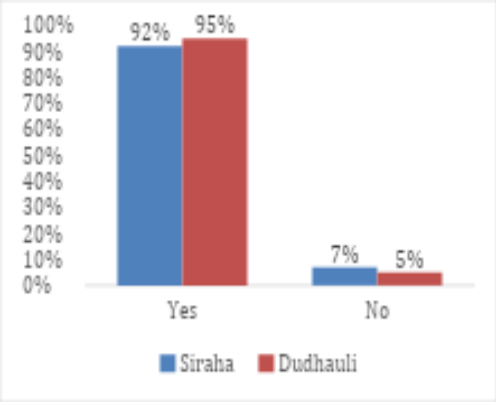

Figure 4. Understanding of the Disaster Management Plan

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Furthermore, few females and a male participants revealed that communities' people, although perceived climate change and associated risks, most of them were unaware of preparedness and local disaster management plans. We also observed people are living with the climate impacts such as increase of temperature, increment of hotter days, less and intense precipitation. This shows the prevalence of weak vertical coordination in both study sites. In addition, a high school teacher of Dudhauli argues that due to limited integration of climate education in the school curriculum and community programs, wider understanding is constrained to foresee and act against climate disaster. This situation underscores the need for climate knowledge, combined with adaptive capacity is required to strengthen community resilience. Qualitative evidence from KII supports these findings indicating limited education and training affect the localization of climate and DRR policies. A participant added:

"*Absence of community-based planning and awareness, limited capacity-building approaches, shortcomings in climate and disaster preparedness, and insufficient integration of development plans are the major barriers to the localization of climate change and disaster policies in the community" (KII-Community- 5).*

Community perception reveals that marginalized groups, particularly women and landless households, often feel excluded from the planning process. Due to limited consultations and training/awareness programs people were unable to enhance adaptive capacity, as a result community-based awareness campaigns, and capacity-building programs are required. These gaps in participation and capacity building were reflected in community practices, where reliance on informal coping mechanisms remains prevalent. In addition, field evidence further supports that the existing vulnerability pushes community towards crisis:

"We were always marginalized and vulnerable, the changing climate patterns and increased warming are making our livelihoods more vulnerable and pushing us towards a crisis" (FGD-Community- 2).

Furthermore, participants rely on temporary relocation during flood events including informal support networks (family networks and neighboring support) and spontaneous evacuation practices. However, these responses demonstrate social cohesion, and people indicate the absence of institutionalized preparedness systems. This situation was reflected by a male participant of Siraha:

"*Community relies on reactive coping mechanisms such as temporary relocation or informal community support rather than proactive risk reduction measures* and *the people tend to react only after flood water rises without following established early warning or preparedness protocols" (KII-Community-1).*

Challenges in Localizing Climate and DRR Policies

While community perceptions highlight limited awareness of formal disaster policies, the analysis of national policy frameworks revealed a different picture. Nepal has developed a relatively comprehensive set of policies addressing climate change and disaster risk management. The Climate Change Policy (2019) promotes low-carbon and climate-resilient development pathways and emphasizes cross-sectoral coordination including gender and social inclusion. The Disaster Risk Reduction and Management Act (2017) established a multi-tier

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governance structure involving federal, provincial, and local governments. The National DRR Policy and Strategic Action Plan translate these commitments into a long-term framework for strengthening institutional capacity, early warning systems, and community-based disaster preparedness. All these policies emphasized resilience, institutional coordination, and the integration of climate adaptation into development planning. However, the implementation and localization of climate and disaster policies in the study area remain uneven and largely dependent on external projects.

Despite this conceptual alignment, coordination between climate governance and disaster risk management remains weak in practice. Overlapping responsibilities between the Ministry of Forests and Environment and the Ministry of Home Affairs explain the existence of horizontal coordination contributing to institutional fragmentation. Similar perspectives were collected from interviews with policymakers and municipal officials, who revealed that although both ministries acknowledge the importance of collaboration, the formal mechanisms were absent for joint planning and integrated monitoring. Programs that address climate change and disaster risk often operate independently, leading to duplication of initiatives and inconsistencies in implementation. Furthermore, these initiatives are constrained by limited budget and technical expertise. Despite the existence of formal structures like Local Disasters Management Committees (LDMCs), they lack clear guidelines, trained technical personnel, and regular institutional coordination. Researchers observed communication between communities and municipal offices was irregular. Further, vertical coordination among government tiers becomes active during or after disaster events. A male government official of Dudhauli emphasized that,

"I*ntergovernmental coordination is reactive and often active only during or after the disaster events*" *(KII-Municipal-2)*.

Participants from the federal and local government also shared:

"Lack of clear operational guidelines, regular meetings, and trained personnel at the community level and limited information flow heightened the communication gap from both sides" *(Composite summary of KII- Federal and Municipal government)*.

Additionally, they believed:

"Integration should not be done in isolation but rather requires an integrated approach. For example, localizing policies requires efforts from the government and the people who are directly impacted by climate-induced vulnerabilities. They also agreed that the concept of climate change and DRR is multi-dimensional, where multiple stakeholders have an equal role to respond to minimize its risks" (Composite summary of KII-Municipal government).

Furthermore, the provisions for gender and social inclusion are well articulated in the policy, but they lack clear indicators or institutional responsibilities for ensuring the participation of marginalized and vulnerable groups in decision-making. This shows that equity considerations are mentioned in broad terms, such as 'ensuring participation of women and disadvantaged groups,' without accompanying strategies for capacity development, representation, or benefit-sharing mechanisms. The analysis shows significant gaps between policy assumptions and the

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ground realities. Existing challenges in the policy execution in Nepal is summarized below in Table 3.

Table 3: Barriers to climate and DRR policies localization

Barrier Category	Summary
Institutional fragmentation	Sectoral silos with unclear mandates and weak interministerial coordination
Resource constraints	Underfunded and understaffed local units; project-based donor-dependent funding, inadequate budget and limited technical support for fund generation, profit oriented development in practice
Procedural (limited integration)	Principally aligned policies with limited mechanisms for joint implementation
Capacity building and local empowerment	Limited or uncertain local implementing units and insufficient engagement of community organizations in policy awareness and facilitation
Symbolic inclusion of marginalized groups	Limited indicator for GESI provision, absence of concrete strategies and accountability mechanisms

Disconnection between National Climate and DRR Frameworks

National climate and disaster risk reduction (DRR) frameworks in Nepal are conceptually comprehensive, yet their operationalization at the community level remains markedly disjointed. The findings indicate that despite the establishment of multi-tier governance structures and explicit policy mandates for localization, disaster governance frameworks exhibit limited visibility and functional reach within riverine communities. This disconnection is evident across social, economic, institutional, environmental, and infrastructural dimensions, revealing a systemic gap between policy intent and ground-level resilience outcomes. The disconnection is shaped by socio-economic vulnerabilities. Social conditions differ according to education, age structure and migration status. Survey results demonstrate that respondents in Siraha tend to have higher levels of education, greater proportion of older people and weaker links to migration networks. In contrast, compared respondents in Dudhauli show lower education attainment, relatively younger population profile and engagement to migration networks (Table 4). A single female parent described how limited education and social position constraint her ability to engage with governance processes:

"I never had the opportunity to complete formal schooling, and I feel that limits my understanding of climate change, government policies, and how planning processes actually work. In our community, women like me—especially single parents—are rarely informed or asked for our input during development planning. I am completely unaware of ward-level or national policies on climate change or disaster risk reduction. It feels like these plans are made without us, and we are just left to cope on our own" (KII-Community-7).

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Table 4. Age, education and migration distribution across two study sites in percentage

	Siraha	Dudhauli
Age group		
20-40	53	48
40-60	33	43
60 and above	13	9
Education		
Low education	80	82
Intermediate education	18	14
Higher education	2	4
Migration Status		
High	62	36
Low	38	64

Furthermore, a similar voice from other participants reinforces the pattern of exclusion, where limited access to education and decision-making spaces continue to shape uneven awareness and participation in the local governance process. However, this inconsistency is associated with NGO-supported training programs and disaster drills. Participants considered these initiatives as short-term projects bound interventions rather than sustained governance mechanisms, which rarely extend beyond project cycle and are not systematically integrated into municipal disaster management planning.

Socio-economic conditions are becoming more complicated due to high dependency on agriculture, low-income diversification, and inadequate access to financial and technical support. In line with this, a household survey revealed the majority of the respondents (51%) in Dudhauli and (41%) in Siraha are dependent on agriculture among other occupations including service and business. Households depending on traditional farming practices further enhance vulnerability. Furthermore, climate induced stressors including changing climatic patterns and rising temperatures undermine livelihoods pushing communities towards crisis. Although microfinance institutions provide credit access to loans, it was found the funds were diverted to urgent needs rather than livelihood diversification or resilience building investments. Two female participants noted:

"A*griculture is the major occupation of most of the people; however, they still rely on traditional farming practices that hinder financial capacity on one hand. On the other hand, the accessibility of loans due to microfinance institutions (Laghubitta) played a crucial role in dispersing loans. But the utilization of loans for urgent needs and the high interest rates of such institutions made community people more vulnerable. This even makes the situation worse with high economic losses" (KII-Community-9).*

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This economic fragility reflects a broader policy gap and highlights the strengthening of climate resilient livelihood but lacks localized financing mechanisms, extension services and risk informed agricultural planning.

Institutional fragmentation further reflects the weak translation of national mandates into community level action. Marginalized groups particularly women, landless households, and socially disadvantaged communities report minimal involvement in consultations related to climate or disaster planning. From the qualitative findings a male participants emphasized that community meetings are occasionally organized by local authorities or external organizations, however the participation remains restricted to selected representatives rather than broader community engagement. This limited engagement has reduced opportunities for local knowledge to inform disaster governance and thereby weakens the relationship between communities and local institutions. Although formal structures like Local Disasters Management Committees (LDMCs) exist, they lack clear operational guidelines, trained technical personnel, and regular communication mechanisms. Interviews show that communication between communities and municipal offices is irregular. Likewise, coordination among government tiers often becomes active during or after disaster events. During the discussion, FGD participants and government officials emphasized that lack of clear operational guidelines, regular meetings, and trained personnel in the community level and limited information flow heightened the communication gap from both sides. Another KII participant from the local government also shared, "*Intergovernmental coordination is reactive and often active only during or after the disaster events*" *(KII-Municipal-4)*.

Resource constraint further deepens the disconnect between policy commitments and local implementation. National policies mandate the establishment of climate and disaster management units at provincial and municipal levels, yet many of these units remain understaffed and underfunded. The qualitative findings demonstrate limited technical capacities in both municipalities:

Provincial and local climate disaster units remain understaffed, and the climate finance provisions stated in the climate change policy are not fully realized. Funding remains project-based and dependent on external patterns. The emergency, as described in DRRM Act, has not been translated into sustained financial flows for long-term resilience planning (Composite summary of KIIs and FGDs).

Climate Change Policy (2019) and the DRRM Policy (2018-2030) emphasize environmental management; its execution remains fragile at the local level. Despite policy emphasis on environmental conservation and watershed management, the community reports widespread degradation including frequent flooding, aggravated deforestation in the Chure region, unregulated sand and gravel extraction and unplanned settlement across the basin area. The absence of local environmental monitoring and restoration programs and limited capacity of the ecosystem amplify flood frequency and severity. The survey results also highlight that less than 10% of the respondents observed decrease or no change in frequency of floods in 10 years (Figure 5). While the severity levels vary and predominantly concentrated in extreme and high categories across both sites (Figure 6). While Siraha exhibits slightly spread into the low

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category, Dudhauli presents more uniform results with no cases reporting low impact of flooding.

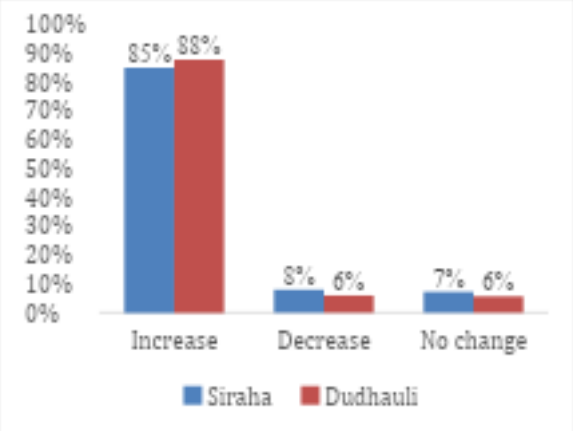

Figure 5. Observed Flood Frequency over Decade

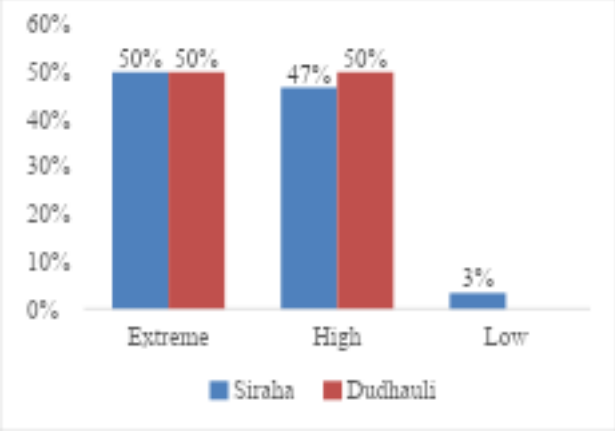

Figure 6. Experienced Severity of Flood over Decade

Interviews also emphasized that river encroachment has amplified both the frequency and severity of flooding. Qualitative data further show:

"Extraction of natural resources like stone, sand, and aggregate is overly used, and these extractions don't meet the criteria as well. Haphazard extraction of riverbed materials led to stream flooding into settlements. As a result, the Kamala River swallows many hectares of agricultural land, human, and livestock annually. But in contrast, forests are being protected by the community as compared to other natural resources; it is somehow preserved (KII-Municipal-2).

While community managed forest demonstrates conservation success in few places, limitation of integrated ecological governance mechanisms undermines policy objectives. Infrastructure conditions, particularly housing quality and public infrastructure represent critical resilience. Majority of the houses retain traditional mud and wood construction and are highly susceptible to inundation and structural collapse during heavy rain and monsoon floods in both sites. Although municipal initiatives to replace earthen roofs with permanent *jasta* structures and elevate foundations are positive steps, these improvements remain uneven and largely depend on household financial capacity. Public infrastructure such as unpaved road networks becomes impassable during rainfall and hinders access to health posts and markets. While poorly maintained embankments and drainage systems exacerbate waterlogging and flood impacts. In addition, a key informant interview revealed that local governments as an authorized entity can work to reduce vulnerability. A participant from the municipality mentioned:

The local government has planned to replace the earthen and temporary roof with a permanent jasta roof. They allocate a budget to protect marginalized communities for the betterment of the people. They focus on maintaining the quality of houses, including sanitation and hygiene" (KII-Municipal-4).

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Nevertheless, it was found that national policies conceptually prioritize risk sensitive infrastructures; their translation into measurable improvement in community level remains limited.

The observed disconnection is synthesized in Table 5, which discovers the existing gaps across five resilience dimensions. This demonstrates that community resilience in KRB is uneven and structurally constrained across all dimensions. Low social preparedness, fragile livelihoods, weak institutional functionality, environmental degradation, and uneven infrastructure investments collectively undermine the ability of riverine communities to anticipate, withstand, and recover from climate-related hazards.

Table 5. Disconnection observed in riverine communities of the Kamala River Basin

Resilience Dimensions	Gaps Identified
Social	Low participation, limited awareness, and inadequate preparedness
Economic	High agricultural dependency, poor economic/livelihood diversification, and inadequate access to financial and technical support
Institutional	Weak coordination, limited local engagement, limited policy awareness or facilitation
Environmental	Ecosystem degradation, deforestation, and weak environmental land restoration
Infrastructural	Highly susceptible housing, and poorly maintained public facilities

Discussion

Policy Coherence and Gaps in Climate and DRR

The analysis reveals that while policy coherence between CCA and DRR frameworks exists at the discursive and conceptual level in Nepal, this alignment is largely superficial and fails to translate into effective, integrated action. Policies frequently remain confined within rigid administrative and sectoral silos, significantly impeding cross-sectoral collaboration and integrated planning, phenomena that perpetuate fragmented implementation at both national and subnational scales. This institutional fragmentation is profoundly consequential for riverine communities, where the intersection of settlement patterns, agricultural expansion, and infrastructure development within floodplains and erosion-prone areas intensifies socio-ecological vulnerabilities (Acharya et al., 2025; Narayan et al., 2022). Despite Nepal's advances in formulating climate and DRR policies, the translation of these frameworks into locally responsive and coherent interventions is notably constrained. Weak policy integration and inadequate localization undermine the effectiveness of adaptation and risk reduction at the community level, echoing broader empirical trends wherein robust policy design is insufficient to compensate for fragmented institutions and insufficient inter-agency coordination (Gentle et al., 2018; Nepal et al., 2018). The resulting parallelism of sectoral initiatives manifests as fragmented governance, inefficiency, and ultimately diminished policy impact, particularly, in complex, multi-hazard environments (Thapa, 2025; Vij et al., 2021).

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Vertical fragmentation in climate finance further exacerbates governance failures. The findings that a mere 0.01% of public expenditure is allocated to disaster risk management starkly illustrate the disconnection between national commitments and actual resource flows. Such financial bottlenecks are symptomatic of a persistent gap between the rhetoric of decentralization and its operationalization; local governments remain largely deprived of both predictable financing and actionable climate knowledge, thus inhibiting their capacity for sustained adaptation planning (Khatri et al., 2022; Paudel et al., 2013). The proliferation of donor-driven, externally designed projects is often short-term in nature and poorly integrated with local institutions further undermines the long-term resilience of riverine communities, reinforcing cycles of dependency and institutional fragility (Venner et al., 2024).

Nepal's policy architecture, epitomized by the Climate Change Policy, Disaster Risk Reduction and Management Act, and the National Adaptation Plan, ostensibly provides an enabling environment for resilience-building. Yet, the empirical evidence demonstrates that such national frameworks exert minimal influence on local adaptive capacity where institutional functionality, inter-agency coordination, and resource access are structurally weak. Persistent challenges in inter-ministerial coordination, especially, among agencies charged with climate, disaster, and development mandates produce overlapping responsibilities and inconsistent actions, a pattern mirrored in other low-income contexts (Nepal et al., 2018; Adger et al., 2018). Systemic issues, such as entrenched institutional fragmentation and politicized decision-making processes, further impede the operationalization of policy intentions (Khatri et al., 2022; Mizutori, 2020; Suhardiman et al., 2019; Paudel et al., 2013).

Federalization, while theoretically offering new pathways for localized DRR and climate governance, has, at present, in practice introduced further institutional ambiguity, overlapping mandates, and acute capacity deficits at subnational levels (Acharya et al., 2025; Narayan et al., 2022). The enduring fragmentation between key ministries such as MOFE and MoHA reflects deep-seated path dependencies, with sectoral boundaries continuing to constrain both horizontal and vertical coordination (Sharma, 2021; Nepal, 2018). This persistent incoherence cascades down to local implementation, producing policy inertia that remains critically under examined in the context of Nepal's evolving federal landscape.

Resilience Outcomes in Riverine Communities: A BRIC-Based Interpretation

The BRIC assessment underscores that limited policy localization and fragmented governance are directly correlated with uneven and suboptimal resilience outcomes in riverine communities. The study highlights how institutional fragility, environmental degradation, and chronic underinvestment in risk-reducing infrastructure collectively circumscribe community capacities for absorption, adaptation, and recovery in the face of escalating climate shocks. The pervasive lack of climate awareness and preparedness at the community level denotes a fundamental deficit in social support structures, a finding corroborated by McMichael et al. (2025), who argue that adaptation actions are profoundly shaped by local worldviews and values. Institutional resilience in marginalized and resource-constrained settings is further weakened by entrenched structural barriers, a phenomenon repeatedly documented in both Nepal and analogous contexts (Lo et al., 2016). This stands in contrast to more affluent regions,

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such as coastal China, where robust governance structures and stable resource flows underpin comparatively higher levels of institutional resilience (Zhang et al., 2022).

Compounding these vulnerabilities are persistent challenges in environmental governance, particularly in dynamic riverine systems characterized by complex upstream-downstream interactions. The absence of integrated, basin-wide management frameworks amplifies flood risk, riverbank erosion, and resource overexploitation, trends that degrade both ecosystem and livelihood resilience (Pradhan et al., 2021). Structural inequities, including unequal budgetary allocations, intergovernmental mistrust, and weak institutional arrangements, further constrain coordinated river basin governance and environmental protection (Shahjahan et al., 2012). Recent scholarship has also critiqued the continued reliance on conventional, infrastructure-centric flood control strategies, emphasizing their inadequacy in the face of evolving climate risks and highlighting deeper governance and policy limitations (Varma et al., 2025).

The findings collectively reinforce the imperative for adaptive governance, characterized by flexibility, iteration, and responsiveness, to address the multi-scalar and cross-jurisdictional nature of climate adaptation challenges. Merely achieving policy coherence is insufficient; substantive reform is required to align institutional roles, informal practices, and the allocation of material resources (Ahmed et al., 2018; Varma et al., 2025). Effective adaptation demands accountable coordination mechanisms, direct access to climate finance at the local level, and sustained investment in institutional capacity. Without such reforms, the transformative potential of Nepal's climate and disaster policies will remain only partially realized, leaving riverine communities acutely vulnerable to climate-induced shocks (Pandey et al., 2019).

While the scope of this study is limited to two wards within the Kamala River Basin, thus constraining broad generalizability, the findings offer crucial insights into the persistent governance barriers undermining resilience in riverine settings. Ineffective coordination across federal, provincial, and local governments perpetuates duplicative efforts, inefficiencies in resource allocation, and insufficient monitoring of resilience outcomes. Accordingly, future research should seek to employ longitudinal and comparative methodologies across diverse ecological zones and river basins, thereby illuminating the dynamic processes of resilience-building and enabling the identification of scalable governance innovations.

Conclusion

This study critically interrogates the disjuncture between national climate change and disaster risk reduction (DRR) policy frameworks and their operationalization within riverine communities of the Kamala River Basin. The empirical findings decisively expose the persistent chasm between the conceptual sophistication of Nepal's policy instruments and their realization in practice. Despite the existence of comprehensive climate and DRR legislation and an articulated multi-tiered governance structure, community awareness of disaster management protocols and formal preparedness mechanisms remain strikingly deficient. The quantitative evidence is particularly revealing that over 70% of respondents reported unfamiliarity with formal response systems, and more than 90% lacked understanding of

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disaster planning processes. This signals a fundamental breakdown in the transmission of policy objectives to those most at risk.

The study demonstrates that while riverine communities display considerable social cohesion and an ability to mobilize informal coping mechanisms—such as temporary relocation and reciprocal support—these adaptive responses are predominantly reactive, episodic, and insufficient for fostering transformative resilience. The marginal involvement of vulnerable groups, the scarcity of meaningful capacity-building initiatives, and the limited institutionalization of climate knowledge collectively undermine the efficacy and sustainability of local preparedness efforts. Thus, community perceptions of climate and DRR policies are primarily shaped by immediate lived experience and sporadic external interventions, rather than by systematic, sustained institutional engagement. This finding directly addresses the first research objective by elucidating the disconnection between policy assumptions and local realities. In addressing the second objective, the analysis highlights entrenched structural and governance-related impediments to policy localization. Institutional fragmentation, weak multi-level coordination, inadequate technical and financial resourcing, and the tokenistic inclusion of marginalized populations persistently undermine the goals of policy integration and resilience-building. Although national frameworks underscore the imperatives of integration, inclusivity, and resilience, the practical implementation of these policies remains fragmented, heavily dependent on short-term project modalities, and insufficiently embedded within the architecture of local governance.

A BRIC-based lens further elucidates the multidimensional and uneven nature of resilience within the study area. Low community participation, precarious livelihoods reliant on climate-sensitive agriculture, deficient institutional capacity, ongoing environmental degradation, and infrastructural deficits converge to circumscribe the adaptive space available to riverine communities. These findings reinforce the argument that resilience is not simply a function of policy existence, but of the effectiveness of policy translation, operational coordination, and genuine local ownership. Structural and operational gaps undermine the transformative potential of policy frameworks, constraining communities' capacity to anticipate, absorb, and recover from climate-induced hazards. The evidence therefore underscores the imperative for enhanced policy coherence that transcends rhetorical alignment, emphasizing the need for robust integration across sectors and governance levels. Strengthening local institutional capacity, developing clear and actionable operational guidelines, improving direct access to climate finance, and embedding participatory and inclusive mechanisms are vital for bridging the persistent gap between policy intent and practice. Without such structural reforms, resilience-building initiatives are likely to remain fragmented, reactive, and overly reliant on transient external interventions, thus perpetuating cycles of vulnerability.

While this study is geographically circumscribed to selected communities within the Kamala River Basin, its findings provide critical empirical insights into the broader governance challenges of policy localization in Nepal's evolving federal context. By systematically linking perception-based evidence with governance analysis, the research advances scholarly understanding of climate and DRR governance, demonstrating how gaps in policy coherence

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and localization manifest as uneven and inadequate resilience outcomes in riverine settings. Ultimately, the study contends that resilience cannot be achieved through policy formulation alone. It demands sustained, adaptive, and participatory governance practices, continuous institutional learning, and durable feedback loops between local communities and policy actors. Bridging the gap between policy reformulation and implementation remains an urgent priority if resilience-building measures are to reach vulnerable populations and contribute meaningfully to long-term community resilience.

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