Centre for Social Change
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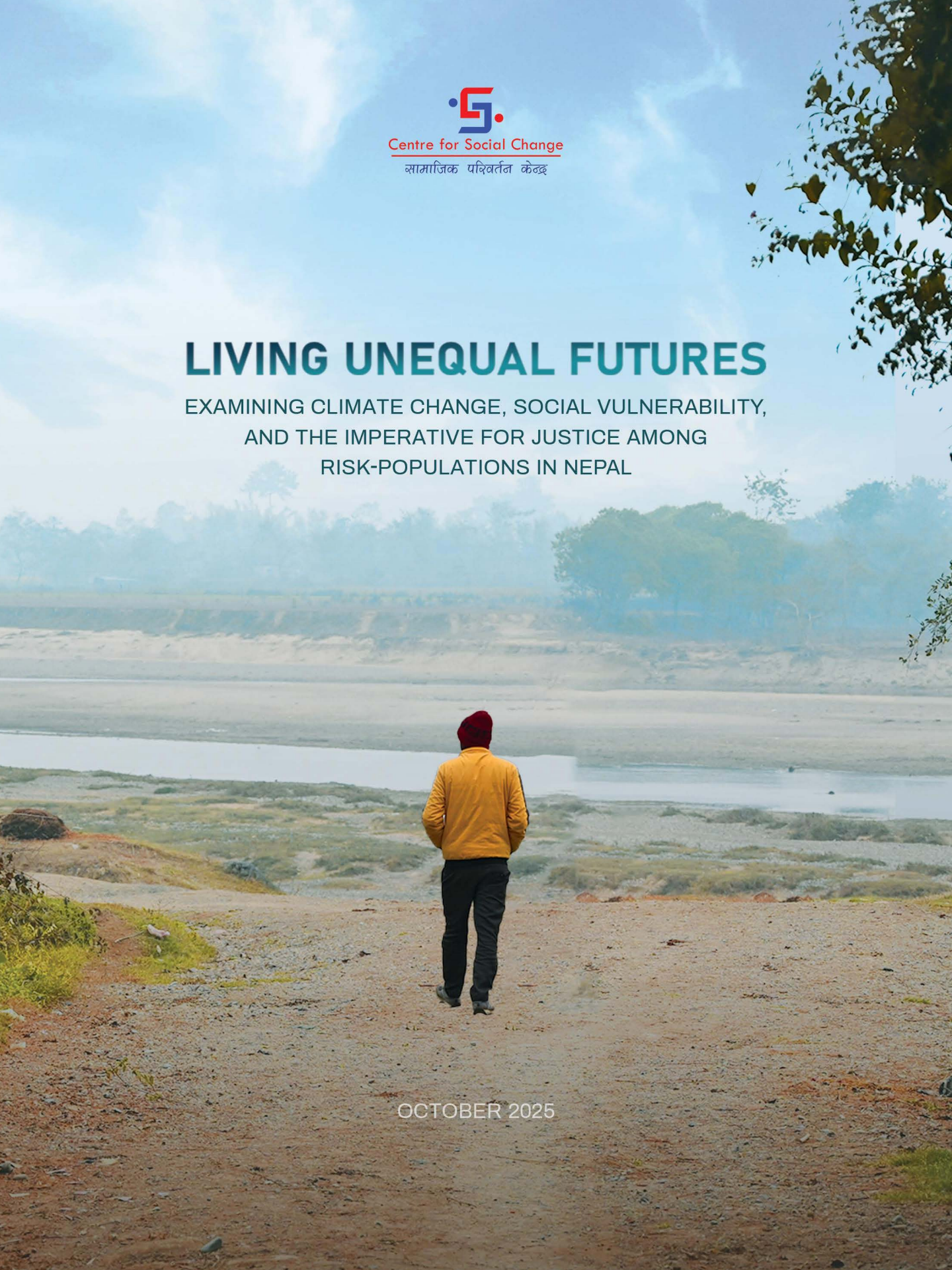
LIVING UNEQUAL FUTURES

EXAMINING CLIMATE CHANGE, SOCIAL VULNERABILITY, AND THE IMPERATIVE FOR JUSTICE AMONG RISK-POPULATIONS IN NEPAL



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Living Unequal Futures: Examining Climate Change, Social Vulnerability, and the Imperative for Justice Among Risk-Populations in Nepal

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At the core of this study are the voices of those we encountered: citizens, local leaders, government officials, civil society representatives, journalists, youth activists, and members of marginalized communities, including smallholder farmers, indigenous groups, women, Dalits, Muslims, and landless households. Their candid reflections, lived experiences, and unfiltered insights into the intersecting crises of climate change, vulnerability, and injustice form the heartbeat of this report, illuminating pathways toward equitable adaptation and resilience. We are particularly indebted to local government representatives and administrative officers who facilitated access and provided essential contextual grounding during our visits to the Hilly and Terai regions.

We also recognize the broader ecosystem of researchers, policymakers, and development practitioners whose foundational work on climate justice, environmental governance, and social equity in Nepal informed our inquiry. This report stands on their shoulders, aspiring to contribute meaningfully to the urgent discourse on transformative, justice-centered climate action.

While we have endeavored for accuracy, balance, and inclusivity, any oversights or limitations are ours alone. We reaffirm our dedication to evidence-based advocacy, amplifying frontline perspectives, and fostering a more just and sustainable future for Nepal's risk-exposed populations.

Centre for Social Change

October 2025

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-Participants across Hilly region

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INTRODUCTION

CHAPTER 1

INTRODUCTION

Nepal, contributing just 0.11% to global greenhouse gas emission (European Commission, 2024), bears the brunt of a crisis it did little to create. Recent events underscore this harsh reality. On 16 August 2024, a Glacial Lake Outburst Flood (GLOF) from the Thyanbo Lakes devastated Thame village in Solukhumbu district, displacing about 135 people and destroying homes, a school, a health post, and lodges.[1] Similarly, on 8 July 2025, a catastrophic flood, likely triggered by the sudden drainage of a supraglacial lake in Tibet, swept through Rasuwagadhi on the China–Nepal border, destroying the Friendship Bridge, hydropower infrastructure, and trade facilities, killing at least 11 people and leaving many, among both Nepali and Chinese nationals, missing.[2] In the Terai Region of Nepal, amidst the monsoon season, the Government declared Madhesh Province a crisis zone on July 23, 2025, due to severe water shortages.[3] From mid-April to mid-July 2025, Nepal recorded 93 disaster-related fatalities (floods, landslides, lightning, fires, animal attacks, etc.) and 22 missing; floods alone accounted for 13 deaths and 22 missing cases[4], highlighting the broad spectrum of climate-intensified hazards. These incidents are not isolated. They exemplify the broader phenomenon of climate change, defined by the Intergovernmental Panel on Climate Change (IPCC) as long-term shifts in temperatures and weather patterns, primarily driven by human activities such as fossil fuel burning and deforestation, leading to global warming and intensified extreme weather events (IPCC, 2021).

Yet, climate change is far more than an environmental disruption, it is a profound amplifier of social inequalities. It disproportionately affects low-income, marginalized, and vulnerable

1 Lord, A. (2024, September 19). *Rethinking Himalayan Cryosphere Risk Assessment in the Wake of Nepal's Thame Disaster* [Issue Brief]. The Stimson Centre. https://www.stimson.org/2024/rethinking-himalayan-cryosphere-risk-assessment-in-the-wake-of-nepals-thame-disaster/

2 Lord, A. (2025, July 19) *Investigating an Emerging Climate Hazard: Transboundary Glacial Floods on the China-Nepal Border* [Issue Brief]. The Stimson Centre. https://www.stimson.org/2025/investigating-an-emerging-climate-hazard-transboundary-glacial-floods-on-the-china-nepal-border/

3 My Republica. (2025, July 23). Madhesh province declared disaster-affected zone amid drought crisis. *My Republica.* https://myrepublica.nagariknetwork.com/news/madhesh-province-declared-disaster-affected-zone-amid-drought-crisis-58-89.html

4 The Kathmandu Post. (2025, July 17). 93 killed and 22 missing in three months of disasters across Nepal. *The Kathmandu Post.* https://kathmandupost.com/national/2025/07/17/93-killed-and-22-missing-in-three-months-of-disasters-across-nepal

communities who contribute least to the problem but bear its substantial burdens. In response, *climate justice* has emerged as an essential framework to understand climate challenges, their impacts and appropriate climate actions. It demands fairness, equity, and inclusion in all climate actions, ensuring the participation of historically weak voices in the decision-making processes (Schlosberg & Collins, 2014; Sultana, 2022). Climate justice also calls for intergenerational justice urging that today's actions safeguard the dignity, rights and wellbeing of the future generations (Roser & Seidel, 2016).

A holistic and strong understanding of climate justice highlights the need to address unequal distribution of climate impacts. In this regard, vulnerabilities to climate change are not equally shared by all individuals or groups. Some groups are far more exposed and less able to cope than others. These include indigenous communities, smallholder farmers using traditional practices, marginalized groups relying on daily wages, the urban poor, and women – especially those managing households alone (Panthi et al., 2016; Aksha et al., 2019; MOFE, 2021). Elderly individuals and persons with disabilities face compounded risks due to limited mobility and restricted access to resources. These disparities further emphasize the need to integrate justice as a core element in climate adaptation and mitigation strategies, as failure to do so may lead to the creation and/or exacerbation of deeper inequity-accelerating feedback loops.

Nepal presents a clear example of how these injustices unfold on the ground. The country is facing increasingly unpredictable and widespread challenges with retreating glaciers, shifting rainfall patterns, and rising temperatures. It threatens not only mountains, lakes, and rivers, but entire communities (Karki et al., 2009; Malla, 2008). These impacts spread across all sectors, with agriculture among the most vulnerable (Selvaraju, 2014). Traditional farming systems, which rely heavily on predictable/consistent climate patterns are being destabilized, leading to reduced yields of staple crops like rice, maize, and wheat (Paudel, 2016). As glaciers continue to melt at an accelerated rate, water resources are coming under significant long-term pressure. Projections indicate a severe decline in glacier ice reserves, increasing the risk of widespread water scarcity (Chaulagain, 2009).

Beyond the natural and environmental impacts, the consequences of climate change are deeply human. Increasing health risks, growing food insecurity, increased disaster-related deaths, disproportionately affect the vulnerable populations like women, children, and elderly people (Tome et al., 2022). Also, climate-driven displacement is already increasing and seasonal migrants in the Himalayan Region face cyclical poverty, severely lacking stable income and basic services (Gautam, 2017). Furthermore, economically fragile communities, such as those in flood-prone areas of Terai Region, endure repeated losses of homes, crops, and livestock due to more frequent and intense disasters (Dulal et al., 2010).

Despite the severity of these existing and oncoming climate-related challenges, adaptation

measures in Nepal remain uneven. In remote mountainous regions, limited access to services and climate information restricts people's ability to respond effectively to the changing conditions (Gentle & Maraseni, 2012). Households with few resources, such as landless families with minimal livestock or declining natural assets have little capacity to adapt compared to the wealthier farmers who can invest in improved irrigation and climate-resilient crops. These disparities highlight the need to place justice at the heart of all climate-related response strategies, ensuring equitable access to resources and support during the design and implementation of such measures.

In addition to the above discussed issues, climate-induced migration adds another layer of complexity to the justice dimension of climate change. Migrants, especially those displaced by slow on-set of climate-related events like droughts or prolonged flooding, often fall outside formal protection measures. This exclusion leaves them vulnerable to discrimination and denial of their rights to safety and stability (Chu & Michael, 2019). However, when guided by inclusive and equitable approaches, migration can provide pathways for people to diversify their livelihood options and improve access to healthcare, education, and other opportunities (Ghosh & Orchiston, 2022).

These interconnected challenges illustrate the scale of the climate crisis. According to National Aeronautics and Space Administration (NASA) the accelerated climate change, driven largely by fossil fuel consumption and deforestation, is disrupting the planet's delicate weather systems. The global consequences are visible through altered ecosystems, shifting climate patterns, and intensified harm to vulnerable communities. This escalating crisis calls for immediate and unified action (Dietz et al., 2020). Yet, without justice at its core, such actions risk reinforcing the very inequalities it seeks to overcome.

This study thus emerges from an assumption that it is imperative to understand the intertwined nature of climate change and social injustice and at the same time there is an urgent need to amplify the voices of those most affected. This study further argues that in Nepal, the urgency lies not only in environmental degradation but in the deep social and economic inequalities it reveals. Only through collective awareness, inclusive adaptation, and a commitment to climate justice, one can hope to build a resilient and humane future for all.

RESEARCH GOAL AND OBJECTIVES

The goal of this study is to explore how climate change disproportionately affects the livelihoods of vulnerable communities in Nepal, with a particular focus on rural Hilly Region and the Terai Region. It aims to understand how different groups, particularly smallholder farmers, indigenous communities, women, and the marginalized perceive, experience, and respond to climate change. It further aims at exploring how their adaptive strategies are shaped by underlying social, economic, and geographic vulnerabilities. Specifically, the objective is to assess the livelihood challenges faced by these groups and the coping mechanisms they employ. By grounding the research in the real-life experiences of those most at risk, the study seeks to generate insights that can guide to develop just and inclusive climate adaptation policies and strategies that are relevant to all three tiers of governments.

SIGNIFICANCE OF THE STUDY

This study seeks to uncover the lived experiences and human realities of climate change in Nepal. It focuses specifically on the country's vulnerable and often overlooked communities, those living in the rural Hills and the low-lying Terai. These areas, home to smallholder farmers, indigenous groups, women, the elderly, and the economically marginalized, are not just geographically exposed but socially disadvantaged as well. As climate change intensifies, it does not act in isolation; it deepens the pre-existing inequalities and exposes the cracks within already fragile livelihoods. This study is therefore not simply about climate impacts, it is a call to center people and justice at the core of climate discourse.

The experiences of the people at the frontlines of the crises are mainly focused in this study, and by doing so, the study highlights on how the combined forces of poverty, marginalization, and environmental vulnerability make grounds for social injustice. It aims to move beyond the general narratives and statistics, bringing forward the lived experiences of those who lack the platforms for conversations about things that mostly affect their futures. In doing so, the study humanizes the climate crisis, drawing actionable solutions.

More importantly, this study emphasizes the principle of climate justice. It advocates for the urgent inclusion of marginalized voices in both local and national climate decision-making processes and spaces as without the insights, experiences, and leadership of those most affected, adaptation policies will continue to leave out the needs of the most vulnerable groups of the society. This study thus aims to equip policymakers with real ground evidence that can help to develop

just, effective, and inclusive climate justice strategies.

Lastly, the significance of this study lies in its contribution to building more resilient, equitable, and sustainable communities. It aims to bridge the gap between policy and people, and between data and daily life. By exposing injustice and elevating unheard voices, it creates space for transformative climate action that shape a future based on fairness, empathy, and shared responsibility.

02

METHODOLOGY

CHAPTER 2

METHODOLOGY

The study employed qualitative methods to explore lived experiences, subjective knowledge and collective perceptions around climate change and its effects. This approach prioritized participants' voices, offering a ground-based understanding of how climate and environmental disruptions intersect with identity, history, and socio-political dynamics.

The study was conducted across nine municipals in six districts of Nepal. Fieldwork in the Terai Region (Sunsari, Bara, and Rupandehi districts) was carried out from 9 to 26 January 2025. Fieldwork in the Eastern Hill Region (Khotang, Bhojpur, and Sankhuwasabha districts) was conducted between 19 to 26 February 2025.

Table 1. Study locations

Region	District	Municipals (local units)
Terai		
	Sunsari	Koshi Rural Municipality
		Bhokra Narsing Municipality
	Bara	Kalaiya Sub-Metropolitan
		Pheta Rural Municipality
	Rupandehi	Butwal Sub-Metropolitan City
		Suddhodhan Rural Muncipality
Hill		
	Khotang	Diktel Rupakot Majhuwagadhi Municipality
	Bhojpur	Bhojpur Municipality
	Sankhuwasabha	Chainpur Municipality

Site selection for the Hill Region was based on a Multiple Risk Exposure Index incorporating landslides, flood, drought, Glacial Lake Outburst Flow (GLOF), ecological, rainfall, and temperature risk indices, identifying them as high-risk areas (MoE, 2010). The selection of districts in the Terai

Region for this study was guided by demographic relevance and research significance. These areas represent densely inhabited, socio-economically diverse settings where the impacts of climate change are deeply intertwined with livelihood insecurity, resource pressure, and limited adaptive capacity.

The study targeted vulnerable groups as defined by the Ministry of Forest and Environment (2021): indigenous people, marginalized groups, smallholder farmers, women and girls, the urban poor, and the elderly. From these, four primary categories were purposively selected for the study: smallholder farmers, women and girls, indigenous communities, and marginalized groups.

Smallholder farmers were defined as those relying on traditional, subsistence farming with labor sourced primarily from family members, operating outside of commercial agricultural frameworks (Gc & Hall, 2020). Indigenous communities were identified based on unique cultural knowledge systems and their close dependence on nature (Sherpa, 2005). Marginalized groups included those with weak economic status, landlessness, and women excluded from institutional and decision-making processes (Dahal et al., 2014). Including these groups allowed the study to explore the intersection of climate change impacts with socio-economic and identity-based vulnerabilities.

SAMPLING

The study involved 172 participants in total. 99 participants (57.6%) identified as male and 73 (42.4%) as female. By caste/ethnicity, the breakdown was as follows:

Table 2. Caste/ethnicity breakdown of participants

Caste/Ethnicity	Count	Percentage
Hill Brahmins/Chhetris	40	23.3%
Terai/Madhesi Other Castes	32	18.6%
Terai/Madhesi Dalits	30	17.4%
Terai/Madhesi Janajatis/Adivasis	24	14.0%
Hill/Mountain Janajatis	15	8.7%
Muslims	14	8.1%
Newars	10	5.8%
Hill Dalits	6	3.5%
Terai/Madhesi Brahmins/Rajputs	1	0.6%

Among 172 participants, 27 Key Informant Interviews (KIIs) were conducted: three per local government unit. Informants were purposively selected to represent diverse institutional and individual perspectives. They included elected officials, Chief Administrative Officers, officers from agriculture and environment departments, indigenous leaders, and climate experts. These interviews were semi-structured and included questions on local climate scenarios, impacts, adaptation practices, and institutional responses. This method allowed for subtle exploration of community, administrative, and technical dimensions of climate action (Tremblay, 1957).

Similarly, Focus Group Discussions (FGDs) were held at each local unit across the study locations – two FGDs per unit in the Terai and three FGDs per unit in the Hill. These made a total of 21 FGDs. Each session involved 6–8 participants, comprising smallholder farmers, women, indigenous people, informal workers, and migrants, aligning with the study's justice-oriented framework. To account for absenteeism, 20% more participants were invited per session (Wong, 2008). This strategy ensured diverse yet focused group compositions for capturing collective and individual narratives.

To contextualize primary data, a comprehensive review of secondary sources was undertaken. Documents reviewed included national and sub-national climate action reports, sectoral policies from line ministries, local development and spatial planning documents, and budget statements. These sources provided essential insights into institutional priorities, planning practices, and financial mechanisms. They helped link top-down climate policy with community-level adaptation and governance.

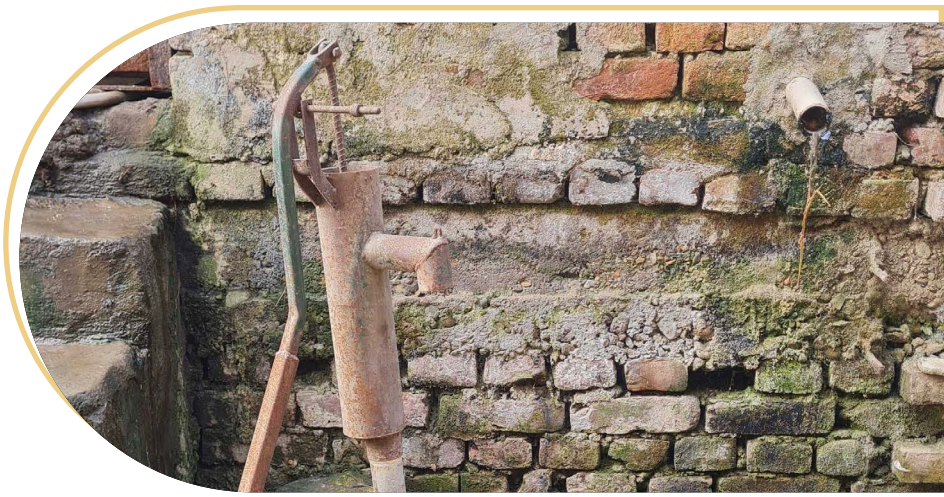
DATA ANALYSIS

Data from KIIs, FGDs, and secondary sources were analyzed following inductive method, focusing on meaning rather than measurement. Transcripts were reviewed, with contextual and observational details integrated into interpretation. This ensured the analysis captured not only information, but also the patterns of participants' and narratives which is crucial for climate justice research.

Further, a thematic analysis identified the patterns within the qualitative data. As manual coding maintained proximity to participant narratives and emotional expressions, codes were clustered into themes aligned with research objectives, such as climate impacts, adaptation strategies, and governance responses. Additionally, the study emphasized voices often excluded from mainstream discourse, including those of women, indigenous people, and economically marginalized groups. The themes evolved through recurring engagement with the data, ensuring they remained grounded in community realities. This method bridged individual experiences with systemic contexts, revealing how climate vulnerability is lived, questioned, and addressed at local levels.

LIMITATIONS

This study faced several important limitations that should be acknowledged. First, its geographical scope was limited to only six districts – three in the Hills and three in the Terai. While these sites were purposefully selected to capture climate vulnerabilities across ecological zones, they do not represent the full diversity of Nepal's regions. Second, a major challenge was the lack of reliable empirical data, especially in rural and remote areas. Many communities still lack systematic climate-related data collection, which made it difficult to fully understand the local status of climate action and justice. Finally, socio-cultural barriers played a role in shaping how openly participants shared their experiences. In some cases, respondents, especially women and members of marginalized groups, were hesitant to speak about sensitive topics such as exclusion or institutional neglect. These barriers may have influenced the depth and honesty of some responses.



"Yes, climate change is happening, but it's affecting the whole world, not just us. What good will come from talking about it in a rural village like ours when there is nothing we can do to change it?"

- A local resident of Bhojpur district

03

FINDINGS

This chapter presents the findings of the study; how participants perceive and experience the climate change in their daily lives. It looks at changes in farming, water, and the environment. It shows how the impacts fall hardest on farmers, women, and indigenous and marginalized groups which is observed through the lens of climate justice. It also highlights local ways of coping and ends with the challenges they face in taking climate action.

CHAPTER 3

FINDINGS

3.1 STATUS AND PERCEPTIONS ON CLIMATE CHANGE

Findings from the study revealed varied perceptions of climate change across different aspects, with notable similarities emerging between the Hills and the Terai, as elaborated further based on participant accounts.

HILLY REGION

FGDs and KIIs in the Hilly Region indicated that participants often viewed climate change as an increasingly erratic force disrupting the balance of nature. Participants commonly described unpredictable weather patterns, including untimely rainfall, prolonged droughts, and irregular seasons in terms of timing or characteristics.

"In my 60 years of experience, the rainfall duration and time have dramatically decreased, and this has considerably impacted the farmers, some of whom have reached a miserable state."

One farmer from Sankhuwasabha district, drawing on decades of experience, shared in an interview a perceived shift in rainfall.

Changes in rainfall patterns were frequently cited as a key indicator of climate change and its local effects. In particular, the reported absence or delay of the winter monsoon was seen as disrupting agricultural cycles that had traditionally depended on predictable timing. Participants recalled that in the past, the monsoon arrived reliably, signaling the start of productive seasons, but now uncertainty prevails, with farmers expressing frustration such as, **"माघे झरी खै?"** (Where has the winter rain gone?), as noted by a KII participant in Khotang district. This perceived uncertainty was linked to undermined crop planning and heightened feelings of vulnerability among those reliant on farming.

Participants in Khotang district, including farmers and social workers, described these shifts as contributing to broader environmental changes, such as the climate being described as "no longer human-friendly" amid rising temperatures, decline in mountain snow, frosts and hailstorms. Social workers in the area noted observations of increased frequency of wildfires over the recent years, as dry spells created the perfect conditions for fires that threaten both forests and nearby settlements. This too was seen as a direct consequence of climate change, where the once lush landscapes are increasingly vulnerable to extreme heat and dryness.

Many participants from rural communities recognized climate change as a global phenomenon, yet a recurring theme was a sense of helplessness, with residents feeling they contribute little but suffer greatly.

> *Yes, climate change is happening, but it's affecting the whole world, not just us. What good will come from talking about it in a rural village like ours when there is nothing we can do to change it?"*

As one local resident in Bhojpur district reflected,

> *"These impacts are the result of oppression by wealthy, developed nations, while poor farmers in underdeveloped countries like ours bear the brunt. That's why it's important we talk about it."*

This sentiment illustrated a perceived powerlessness, where the global scale of the problem feels beyond their control, despite the local consequences they face. However, participants raised voices of resistance and awareness, like that of an older resident from Sankhuwasabha district, who expressed the need for dialogue and justice,

TERAI REGION

In the Terai, findings from discussions and interviews showed that participants primarily perceived climate change through experiences of water insecurity and agricultural instability. Changes in rainfall patterns, particularly their unpredictability and intensity, were acutely noted. Locals described rainfall now occurring in heavy, sudden downpours rather than steady showers.

"Nowadays, when it rains, it pours all at once, causing floods. Earlier, rain used to come gradually, even during the winter, like the Maghe Jhari, which helped in good crop production. But now, neither does it rain properly, nor is there the usual cold." – A farmer in Rupandehi district.

Participants reported that this shift disrupts crop production, particularly for rice and wheat, as farmers can no longer rely on the timing of seasonal rains and the cold temperatures necessary for certain crops.

"The water table has dropped from 25 feet to 80 feet over the last two decades," – KII Participant, Bara district.

Water scarcity emerged as one of the most visible signs of climate change in participant accounts from the Terai, with reports of dramatic drops in groundwater levels. Sources like tube wells, once easily accessible, were described as requiring deeper drilling.

"Rupandehi is historically rich in water resources for agricultural purposes. As being in the vicinity of the Chure, we used to have many natural springs throughout the region. However number of those springs have dwindled at present."

An elected representative in Rupandehi district described the loss of reliable water sources as a defining change for farmers-

"Traditional practices and indigenous knowledge are still common in Hilly and Himalayan regions. However, the Terai Region is mostly home to migrated or mixed communities, and because of this, the unique cultural aspects and traditions are gradually disappearing."

In Sunsari district, FGD participants reported water sources drying up and summer water often appearing contaminated.

Alongside water concerns, participants expressed marked worries about biodiversity loss and declining traditional agricultural practices due to erratic rainfall and temperature changes. Farmers described the disappearance of local crop varieties and indigenous methods. One farmer from Rupandehi district shared,

In the study areas, the loss of traditional farming methods and indigenous crop varieties reflects a deeper cultural shift, as communities are increasingly forced to adopt to practices that are foreign to their region's traditional ways.

Additionally, human activities like urbanization, deforestation, and resource over-extraction were seen by participants as compounding climate effects. Deforestation was linked to reduced groundwater recharge and intensified shortages. This degradation was perceived as affecting not only people but also wildlife, with shrinking habitats contributing to biodiversity loss.

Findings across both Hills and Terai showed that climate change affects lives in distinct yet personally profound ways. In the Hills, participants described uneven seasons, with timely rains now delayed or absent, and expressing grief over drying soil and wildfire-damaged forests. In the Terai, the crisis was often linked to water scarcity, with depleted sources, and sudden rains causing destruction. As a result, participants in both regions reported growing fears about unreliable

land for sustenance. While Hill participants mourned lost seasonal patterns, those in the Terai highlighted struggles with water scarcity and cultural losses in farming practices and knowledge. These accounts illustrate how climate change, based on the study's data, manifests not merely as a scientific issue but as a daily reality intertwined with routines, memories, and future aspirations.

Table 3. Summary of major perceptions on climate change as expressed by the participants

Perceptions of people on:	Hills	Terai
Climate change	Viewed as an erratic force disrupting nature's balance and seasonal rhythms	Perceived primarily through water insecurity and agricultural instability
Root causes identified	Attributed to global injustice by wealthy nations oppressing poorer ones	Seen as compounded by local human activities like deforestation, urbanization, and resource over-extraction
Rainfall patterns	Described as unpredictable with short duration, delayed monsoons, and vanishing winter rains	Noted as shifting to heavy, sudden downpours rather than steady showers, with delayed monsoons and absent winter rains
Agricultural patterns	Perceived as causing uncertainty in crop planning and loss of predictable cycles tied to seasons	Viewed as eroding traditional practices, local crop varieties, and indigenous knowledge, forcing adoption of foreign methods
Water resources	Rarely a primary focus, but linked to drying springs and reduced reliability in broader environmental shifts	Strongly observed as severe scarcity, with dramatic groundwater drops, dwindling springs, and contaminated sources
Natural disasters	Interpreted as increased wildfires from prolonged dry spells and extreme heat/dryness	Understood as flooding from intense rains and droughts from irregular patterns
Biodiversity loss	Felt as threats to forests, wildlife, and lush landscapes from fires and habitat changes	Expressed as drying rivers, disappearing species, and shrinking wildlife/aquatic habitats due to degradation

3.2. FARMERS: THE FOREFRONT AT IMPACTS OF CLIMATE CHANGE

FGDs and KIIs revealed how climate change is reshaping agricultural practices and threatening farmers' livelihoods in Nepal's Hilly and Terai Regions. Participants highlighted disruptions in weather patterns, water availability, crop productivity, and soil health, alongside increased pest pressures and economic challenges driving migration.

HILLY REGION

In the Hill districts, farmers reported that the agricultural cycles have been profoundly destabilized. Farmers in Khotang district recalled how rice, once planted in Ashar (June/July), now has to wait until Bhadra (August/September) because rainfall arrives late. Similarly, sudden heavy rainfall, long dry spells, and unexpected cold and heat waves have accelerated ripening and increased pest infestations.

As shared by farmers throughout the Hilly Region within the study, the consequences of these shifting conditions are showing through entire communities. For example, participants observed traditional crops such as maize, soybean, millet, and the local varieties of rice like *Bhotange*, *Marsi*, and *Basmati*, have become increasingly rare, as farmers turn to hybrid seeds that promise higher yields. But these hybrid seeds often fail to adapt well to the land. These hybrid seeds are costly and lack the resilience of the once-reliable indigenous varieties, adding further economic strain to already vulnerable livelihoods. Even high-value cash crops which were a reliable source of income like cardamom now suffer from the combined effects of soil dryness and the erratic climate, as its yields and quality are declining drastically. Even crops once considered resilient to environmental fluctuations, like finger millet and oranges, are struggling to adapt. As temperatures rise, orange cultivations are now migrating upward, climbing from altitudes of 1,000 meters to 1,800 meters in

"LamiDanda was once known for orange farming, but due to climate change, residents now have to buy oranges as production has stopped." – A local farmers in Khotang district.

Similarly, farmers observed that the Junar citrus, a staple in Khotang district, has vanished entirely. The old ways of life are slipping away as once-thriving crops face an uncertain future.

Water shortages were a recurring concern, with drying springs and canals, linked to both climate change and infrastructure like road construction. In Khotang district, farmers noted an increase in bare land, attributing this to water scarcity forcing farmland abandonment. Human-wildlife conflicts were reported as intensifying, with monkeys and porcupines damaging crops due to degraded forests and water shortages.

In a broader picture, participants indicated a compounding loss of biodiversity, food security, and the loss of a way of life and cultural identity. Multiple respondents across the study areas shared that crops are wilting, fruits are falling prematurely, and vegetables suffer from mold due to unpredictable wind patterns. For instance, rhododendrons, which once adorned the hills of Bhojpur district during Baisakh (April/May), now bloom weeks earlier, forever altered by rising temperatures and shifting phenology. Even livestock are affected, with lumpy skin disease spreading rapidly among cattle and buffaloes, decimating herds and further impoverishing rural communities by costing them critical assets.

"Sugarcane, which used to grow without chemicals, now requires heavy pesticide use. Pests have increased dramatically," – Farmer, Sankhuwasabha district.

The reliance on chemical fertilizers and pesticides was noted as a shift from traditional practices, with participants reporting declining soil fertility and rising input costs. This was linked to economic strain, with many farmers facing debt and reduced yields. Furthermore, the heavy use of pesticides isn't just harming the soil, but it is also posing serious risks to human health and fragile ecosystems.

The economic toll was associated with rural depopulation, as farmers described migration to

"The rising costs of agricultural production, declining land fertility, and reduced access to water have pushed many farmers to leave agriculture and migrate in search of alternative opportunities."

As participants across the study area in Hilly Region noted,

TERAI REGION

In the Terai, farmers reported acute challenges driven by water insecurity and erratic weather. In Pheta Rural Municipality, Bara district, households shared that handpump installations now need to be deepened almost every year. Many families own multiple non-functional pumps, adding to costs and complicating irrigation access. Erratic rainfall, characterized by heavy, sudden downpours rather than steady showers, was a key concern. The seasons, once easy to predict, are now filled with uncertainty with disrupted planting and harvesting schedules.

"We used to know exactly when it would rain, but now we have no idea,"- shared one farmer in Sunsari district, capturing the deep frustration of the community.

Farmers stressed that traditional seasonal cycles no longer align with agricultural needs, making it impossible to grow crops in accordance with established practices. The reduction in cold waves, a once-regular feature of Terai winters, has had a particularly harsh impact on wheat production, with yields dropping as the essential cold waves that once protected crops from pests are no longer consistent. Farmers who once grew three crops a year, are now struggling to cultivate just two, adjusting their planting schedules in a desperate bid to make ends meet.

As temperatures rise and rainfall becomes increasingly erratic, pest outbreaks have intensified, wreaking havoc on crops and causing immense agricultural losses. Farmers report that pests like whiteflies have become far more persistent, requiring stronger and frequent use of pesticides, which has only increased their reliance on expensive, chemical-laden solutions. Also, the use of chemical fertilizers has skyrocketed, as noted by the farmers and Agriculture Officer from Bara

district themselves, rising from 1 kg to 5 kg per *kattha* (720 square feet) of land. It is making farming increasingly unsustainable and pushing soil fertility to the brink. The once-pristine land, rich in organic matter, now faces the grim reality of soil degradation, as chemical inputs dominate the agricultural landscape.

The consequences of these agricultural shifts in Terai Region are dire. Farmers reported of struggle to grow traditional crops like *Masoor Dal* and *Saba Dhan*, have seen these once-reliable varieties disappear. The rise in pest invasions and the weakening of soil health make it nearly impossible to grow these crops anymore.

"Earlier, we used local seeds, but now they don't grow well, so we have to use hybrid seeds,"
- said another farmer from Rupandehi district.

Even vegetables, traditionally grown with minimal chemical intervention, are now showing signs of deterioration. Although the market demands visually perfect produce, out of every 10 kg harvested, only 2 kg meet the standard, leaving farmers with little choice but to rely on chemical pesticides and fertilizers to meet market expectations.

Additionally, farmers reported the emergence of new insect species with resistance to existing pesticides, further compounding the problem. Therefore, farmers face a battle against nature, where even the most frequent pesticide applications no longer seem effective. The cycle of pesticide use, soil depletion, and reduced yields is a devastating loop, one that feels increasingly difficult to break.

Industrial activities, such as brick kilns in Bara district, were cited as damaging crops with smoke, prompting farmers to use plastic covers that hinder growth. Post-harvest burning of rice stubble was noted as contributing to air pollution, causing respiratory and eye irritation. Economic pressures were evident, with reduced yields and market gluts from simultaneous ripening lowering prices and erasing profits. Farmers reported rising debt from costly inputs and migration to India or Gulf countries as agriculture becomes unsustainable. The shift to cash crops was mentioned but described as risky without adequate support.

Findings across both regions highlighted shared challenges: declining biodiversity, with fish populations in farmlands diminishing due to soil changes or chemical use, and the erosion of traditional knowledge as indigenous crops and practices waned. Increased reliance on chemicals was linked to soil degradation and health risks, while pest outbreaks and livestock diseases like lumpy skin disease compounded losses. Participants in both regions described migration as a response to unsustainable agriculture, with young people leaving for urban or foreign employment, threatening community structures and food security. Localized changes, such as early blooming rhododendrons in the Hills and disappearing crops like *Masoor Dal* in the Terai, underscored the profound impact of climate change on farmers' lives and livelihoods.

Table 4. Summary of the major findings on impacts of climate change on farmers

Areas of impacts	Hilly Region	Terai Region
Weather & Seasons	Unpredictable patterns including sudden heavy rains, prolonged droughts, and extreme temperature swings (e.g., delayed monsoons shifting rice planting from Ashar to Bhadra); seasons no longer follow traditional rhythms, leading to accelerated crop ripening and planning uncertainty.	Erratic heavy downpours replacing steady showers, with reduced cold waves in winters disrupting wheat protection from pests; traditional seasonal predictability lost, forcing adjustments in planting/harvesting and limiting annual crop cycles from three to two.
Crop Yield & Diversity	Declining of traditional staples (e.g., millet, maize, soybean, local rice varieties like *Bhotange*, *Marsi*, *Basmati*); resilient cash crops like cardamom declining in yield/quality due to soil dryness; even hardy crops like finger millet and oranges failing, with orange cultivation shifting to higher altitudes (1,000–1,800 m).	Struggles with traditional crops (e.g., *Masoor Dal*, *Saba Dhan*) becoming unviable due to pests and soil issues; vegetable yields reduced; shift to hybrids amid market demands for "perfect" produce, exacerbating losses from erratic weather.
Pests & Diseases	Sharp rise in outbreaks accelerated by heat waves and irregular rains; routine pesticide use harming health, ecosystems, and soil; examples include dramatic pest surges on sugarcane, requiring heavy chemical intervention.	Persistent pests like whiteflies uncontrollable; emergence of resistant new insect species; intensified outbreaks from rising temperatures/rainfall variability, driving frequent, stronger pesticide applications and compounding agricultural losses.
Farming Inputs & Costs	Heavy dependence on costly chemical fertilizers/pesticides replacing traditional methods; rising input costs fueling debt and economic strain amid declining yields and fertility.	Fertilizer use escalated from 1 kg to 5 kg per *kattha* (720 sq ft), as noted by farmers and agriculture officers; increased reliance on expensive chemicals for pest/soil management, heightening financial pressures and unsustainability.

Soil Health	Declining fertility from chemical overload and loss of organic matter/ structure; bare land increasing due to abandonment, linked to dryness and erosion.	Widespread degradation of once-organic-rich fields, now requiring chemicals for productivity; brink of collapse from overuse, with chemical dominance eroding long-term viability.
Water resources	Drying springs/canals from dry spells and infrastructure (e.g., roads); exacerbating forest fires and farmland abandonment in areas like Khotang.	Vanishing groundwater with tables dropping drastically (e.g., 25–80 ft in two decades); annual deepening of handpumps in Bara; contaminated/dwindling sources near Chure, complicating irrigation.
Seed Use & Dependence	Shift from resilient indigenous seeds to costlier, less-adapted hybrids for yield stability; eroding food sovereignty and cultural practices.	Local seeds failing in erratic conditions, forcing hybrid reliance for market viability; loss of traditional varieties like *Saba Dhan*, deepening dependency cycles.
Livestock & Biodiversity	Lumpy skin disease outbreaks decimating cattle/buffaloes; early rhododendron blooming signaling phenological shifts; human-wildlife conflicts (e.g., monkeys/porcupines) intensifying from habitat degradation; wilting crops/fruits and mold on vegetables.	Drops in livestock productivity from fodder shortages/crop losses; fish populations in farmlands declining due to soil/chemical changes; biodiversity erosion from pollution (e.g., brick kiln smoke, stubble burning).
Economic & Social Impact	Widespread financial losses, debt, and rural depopulation; rapid migration (rural-urban, Hill-to-Terai, abroad) as agriculture becomes untenable; crumbling community structures and cultural identity loss.	Unsustainable farming leading to debt, market gluts/low prices, and migration (to India/Gulf); industrial pollution (e.g., kilns) adding crop damage; threatening food security and social cohesion.

3.3. DISPROPORTIONATE IMPACTS ON WOMEN AND MEN

Climate change exacerbates existing gender inequalities, with women bearing a disproportionate share of the burdens due to entrenched social norms, economic vulnerabilities, and increased responsibilities in both household and agricultural domains. Drawing from FGDs and KIIs in the Hilly and Terai regions, this section highlights how these impacts manifest differently yet similarly for women and men. Women, often positioned as primary caregivers and increasingly as de facto heads of households amid male out-migration, face amplified physical, emotional, and economic strains. Men, while also affected through livelihood disruptions, frequently migrate abroad, shifting additional loads onto women. These findings underscore the intersection of climate stressors with gender roles, revealing patterns of exclusion, health risks, and adaptive challenges that demand gender-responsive climate justice frameworks.

HILLY REGION

In the Hilly districts, where rugged terrain and reliance on rain-fed agriculture amplify climate vulnerabilities, women experience heightened workloads due to erratic rainfall, drying water sources, and male migration. FGD participants in Khotang and Bhojpur emphasized that men's out-migration for foreign employment, driven by declining agricultural viability and climate-induced uncertainties, leaves women to manage both domestic and farm responsibilities. This includes labor-intensive tasks like fetching water from distant springs, which have dried up due to shifting rainfall patterns and prolonged droughts.

> *"With my husband abroad, I handle the farm alone. We barely grow enough."*

As one female participant from an FGD in Bhojpur district noted,

This sentiment echoes broader reports of women navigating unseasonal weather, such as delayed monsoons, which disrupt planting cycles for crops like rice and maize.

The loss of intergenerational knowledge further compounds women's challenges. Traditionally, farming techniques were passed from fathers to sons, but with men absent, women lack access to this wisdom or formal training in climate-resilient practices, such as drip irrigation or pest-resistant crops. Social norms exacerbate this isolation; women reported diminished authority in community decisions, making it difficult to access resources like government subsidies for seeds or fertilizers. Health risks are also pronounced: exposure to pesticides, now used more heavily to combat climate-amplified pests, has led to increased maternal and child health issues, including respiratory problems and skin ailments. In Khotang district FGDs, women linked these to contaminated water sources from droughts and landslides, noting limited healthcare access in remote areas.

Men in the Hilly Region, while facing economic pressures that prompt migration, often return with remittances that provide temporary relief. However, KIIs with indigenous leaders in Sankhuwasabha district highlighted that men's absence increases mental stress among women.

TERAI REGION

In the Terai's flatter, more agriculturally intensive landscapes, women confront similar burdens but intensified by industrial pollution, groundwater depletion, and flood risks. Male migration, fueled by low crop yields from unseasonal rains and pests, shifts agricultural duties to women, including irrigation, pest control, and harvesting. FGDs in Sunsari district revealed that women must hire external labor for heavy fieldwork, yet face disregard and criticism when seeking help, as societal norms deem such tasks "*men's work*."

> *Women don't get attention when we ask for help, and the mental stress increases. Even if men earn money and give it to us, doing both household and outside work increases mental stress, and people start to criticize us."*

A female participant from Sunsari district articulated this:

Health impacts are acute, with women exposed to extreme heat during labor-intensive farming, leading to headaches, fevers, and skin diseases. In Bara district, FGDs linked respiratory issues to crop residue burning and brick kiln pollution, which women encounter more frequently

due to their proximity to fields and homes. Economic vulnerabilities push women into low-wage informal jobs, such as factory work or brick kilns, where conditions are harsh and rights protections minimal.

> *"The shift to low-wage work is not a choice but a survival strategy, as farming becomes less viable due to climate change."*

A female farmer from Bara district described this shift:

Flooding and erratic rains further erode incomes, with women in marginalized communities (e.g., Terai Dalits and Muslims) reporting reduced crop quality and market value.

Men in the Terai, like their Hilly counterparts, migrate for remittances, but KIIs with agricultural officers in Sunsari district noted that this often leaves women managing flood-damaged fields alone, heightening their exposure to waterborne diseases. In communities like the Netuwa in Bara district, marginalized snake-charmers turned smallholder farmers, women face additional risks from heat and chemicals in informal labor, compounded by lack of citizenship, which bars access to services and education for their children.

COMMONALITIES, DIFFERENCES, AND GENDERED POWER DYNAMICS

Across both regions, common themes emerge: women's double burden of household & farm work, and health risks from environmental stressors. Male migration, a key adaptation strategy, inadvertently deepens gender disparities, as women absorb responsibilities without proportional decision-making power or resource access. In FGDs, women consistently reported unrecognized efforts:

> *"As women, our efforts often go unrecognized, even when we work hard. When the main male members are not at home, others also tend to treat us with disregard." – A FGD participant for Sunsari district.*

This reflects lack of women farmers' access to government subsidies, where women are sidelined in favor of male-dominated networks.

Regional differences highlight contextual nuances. Hilly women's challenges are tied to

isolation, knowledge gaps, and water scarcity in hilly terrains, while Terai women grapple with pollution, floods, and economic precarity in densely populated, industrialized areas. Men, though affected by livelihood losses, benefit from mobility and remittances, underscoring patriarchal structures that privilege their agency.

3.4. DISPROPORTIONATE IMPACTS ON INDIGENOUS COMMUNITIES

The impacts of climate change on indigenous communities in both the Hilly and Terai regions were deeply rooted in the loss of traditional knowledge, cultural practices, and livelihoods. However, the way these challenges manifest varied significantly between the regions. They were influenced by both geographical and socio-cultural factors. While both regions have been experiencing visible shifts, the struggles faced by indigenous communities reflected the distinct environmental pressures and historical vulnerabilities that defined each region.

One of the impacts on indigenous people is the loss of culture. In the Hilly Region, particularly among the Rai and Tamang communities, of Bhojpur and Khotang districts, climate change is not only affecting the physical environment but is also undermining centuries-old cultural practices. One of the most significant losses is the loss of indigenous agricultural knowledge, including seed preservation techniques that have been passed down through generations. For example, traditional rice varieties like *Bhotange*, which have long been a staple crop, in Sankhuwasabha district, are now being replaced by hybrid seeds that are not only less resilient but also carry no cultural significance. This shift symbolizes a deeper cultural disruption, as these seeds were not just a source of sustenance, but a marker of cultural identity tied to the land. The disruption was seen extended to rituals and ceremonies that were linked to the seasonal cycles. Rituals around the blooming of rhododendrons in Baisakh (Mid-April/ Mid-May), for example, once celebrated the arrival of Spring, were now being affected as the natural orders that governed such practices are changing. Wildlife-human conflicts, particularly with monkeys and boars, were reported as worsening due to habitat changes, further undermining food security (from Khotang district).

Similarly, in the Terai, the Majhi and Tharu communities of Sunsari district, both of whom have deep ties to their natural surroundings, were facing their own form of cultural wash away, amid with different expressions. The Majhi community, traditionally reliant on fishing, is struggling as riverine resources have started to diminish. This has affected their way of life

The Majhi community in Sunsari district stated, "We face problems but don't know the cause, our traditions are disappearing," reflecting a sense of loss that is both material and deeply emotional.

and their access to food and income. The loss of fishing grounds is not just an economic hardship but a strike to their cultural identity, which is closely tied to their rivers. The Tharu, known for their arts and crafts such as mud pots and mats (*Pateramats),* are facing a similar loss. As raw materials become scarce due to environmental degradation, their traditional crafts, which have been passed down for generations, are slowly disappearing.

As one Tamang resident explained, "We cannot abandon our land."

Further, the Tamang and Rai communities in the Hilly Region exhibited a profound attachment to their land, despite the growing risks posed by climate change. Although soil fertility has been steadily declining, and water sources are becoming increasingly unreliable in these areas, migration is not seen as a viable solution.

This sentiment reflected the deep connection that these communities have with their ancestral lands, a connection that goes beyond mere survival and extends to their cultural and spiritual identity. Even as climate risks intensified, these communities resisted migration, holding on to the land that has sustained them for generations.

In contrast, the Terai Region's indigenous communities are facing more immediate pressures to migrate. The growing environmental degradation in the region, including deforestation and unsustainable sand mining, is forcing the Tharu and other indigenous groups near the Chure hills (in Sunsari and Rupandehi districts) to abandon their ancestral lands. Groundwater depletion, which is essential for their agricultural and domestic needs, has become a critical issue. For the Tharu, who have historically depended on these resources for their livelihoods, the loss of access to water and the destruction of their land represents not only an economic loss but a cultural displacement. Unlike the Hilly communities, who resist migration out of attachment to their land, the indigenous groups in the Terai are being pushed to migrate due to external pressures like lack of employment opportunities and natural calamities that are beyond their control. This divergence highlights how climate change is not only a matter of physical survival but also of identity and belonging.

Resource conflicts were also faced by the indigenous people as both regions have been experiencing increased resource conflict, though the nature of these conflicts differs. In the Hilly

Region, the encroachment of wild animals such as monkeys and boars on farms has affected food security. As climate change and habitats shift, these animals venture further into human settlements in search of food. This has resulted in crop damage and further economic pressures on already struggling farmers. The resource conflict is exacerbated by the decline in soil fertility and water availability, which limits the ability of these communities to produce enough food to sustain themselves.

In the Terai, the resource conflict has taken a different form. The indigenous communities, particularly the Tharu, face the threat of displacement not only from environmental degradation but also from external factors such as deforestation and sand mining. These external pressures, created by powerful and politically active people in the society, have been creating a volatile environment where the communities are not only battling climate change but are also in direct conflict with economic interests that exploit their natural resources. As these indigenous groups face displacement from their land, their access to the resources that sustain their livelihoods whether it be fish, water, or raw materials for crafts are diminishing rapidly.

A critical issue for both the Hilly and Terai communities is the marginalization of indigenous knowledge in climate adaptation strategies. In the Hilly Region, indigenous communities like the Tamang and Rai have traditionally relied on sustainable agricultural practices that have been finely tuned over generations. However, as hybrid seeds and industrial farming methods dominate, these traditional knowledge systems are not being integrated into modern adaptation strategies. Also, the lack of access to climate-resilient farming techniques, coupled with a growing disconnect from their ancestral knowledge, leaves these communities ill-equipped to handle the changing climate.

"In the Terai, we (the Majhi and Tharu people) are left out of the decisions that affect our future. Our lives depend on rivers, forests, and land, but no one asks us when they make climate plans. We have knowledge passed down for generations that could help adapt to the changing climate, but it's being ignored. Without our voices in the process, we're being left to face the impacts alone, without the support we truly need."

Across regions, indigenous voices stressed exclusion from adaptation planning. A participant in Sunsari district summarized:

3.5. DISPROPORTIONATE IMPACTS ON DALITS, MUSLIMS, AND LANDLESS GROUPS IN THE TERAI

Findings from this study indicate that Dalit, Muslim, and landless households in the Terai are among the most disproportionately impacted by climate change. Their social position at the bottom of Nepal's caste and class hierarchy, combined with limited political voice and weak access to state resources, leaves them highly exposed to climate-induced disruptions such as water scarcity, floods, soil degradation, and livelihood collapse. Unlike wealthier or politically connected households, their coping strategies are narrow and fragile, often leaving them to endure the brunt of environmental and social crises simultaneously.

For Dalit and Muslim communities in Bara district, access to safe and reliable water emerged as a defining challenge. Declining groundwater levels have forced communities to depend on deep borings and tanks, but these infrastructures are often distributed through patronage. Respondents explained how local leaders installed borings on their own land, restricting access for marginalized households who were already struggling with water shortages. As one farmer described, the situation leaves them permanently insecure:

> *"If these representatives were no longer in power, we might be restricted to access the boring, cutting off water supply and leaving poor people to face hardships." – Farmer, Bara district.*

This politicization of water deepens existing inequalities. While wealthier and upper-caste households gain secure access, Dalit and Muslim families are left vulnerable to both seasonal droughts and floods. In many cases, households reported pooling scarce resources to install their own pipelines, but these were temporary fixes, easily disrupted by power dynamics. For families already burdened by poverty, these additional struggles with water insecurity push them deeper into cycles of dependency and marginalization.

The Netuwa community, a Dalit caste group traditionally reliant on snake-charming, illustrates a striking case of layered vulnerability. With snake populations declining due to environmental changes and habitat loss, their cultural livelihood has almost disappeared. Men now work in brick

kilns or construction sites under intense heat, often without protective equipment, while women continue snake-showing or enter informal, poorly paid labor. Lacking citizenship documents, many Netuwa are excluded from education, government services, and climate adaptation programs. Children without birth certificates cannot attend school, perpetuating generational poverty. Their makeshift settlements, plastic or tin huts, make them highly vulnerable to floods, storms, and heat/cold waves.

> *"We have no land, no papers, and no rights. When rain pours, we are the first to lose everything."*
>
> *– Netuwa community member, Bara district.*

As one respondent explained:

The challenges for the Netuwa are not only economic but also cultural. Their identity as snake-charmers has eroded alongside ecological changes, threatening a practice that once held symbolic and social meaning. Women in the community noted that carrying snakes into towns now brings ridicule rather than income, and as snake numbers decline, the practice is no longer viable. This erosion of cultural identity, layered on top of social exclusion and statelessness, leaves the Netuwa uniquely isolated in the face of climate change.

Landless households (*sukumbasi*) living along rivers and drains in Bara and Rupandehi districts represent another group disproportionately affected. These families, lacking land titles, live in fragile settlements along riverbanks or near polluted canals. Their homes are repeatedly damaged or washed away during floods, while in dry seasons, they contend with stagnating water and garbage accumulation, creating hazardous living conditions. One landless resident summarized their daily struggle:

In Butwal Sub-Metropolitan City of Rupandehi district, quarry workers dependent on sand and gravel extraction reported new layers of vulnerability. Restrictions on quarrying, combined with intensified floods along the Tinau river, have left them with almost no livelihood options. Many acknowledged that they were caught between environmental risks and regulatory exclusions: if they continued quarrying, they faced legal penalties, but without it, their families went hungry. These families remain among the least able to adapt, with climate change tightening the trap of poverty and displacement.

> *"We live by the river because we have nowhere else. When it floods, it takes our houses. When the water dries, it brings waste and smell. Either way, we suffer." – Landless resident, Rupandehi district.*

Overall, findings across Bara and Rupandehi districts illustrate how Dalit and Muslim households, the Netuwa community, and landless groups bear disproportionate climate impacts. Their vulnerabilities are not only material but also structural, shaped by caste discrimination, statelessness, lack of land rights, and political exclusion from adaptation measures. Their testimonies reflect not just economic loss but also a profound sense of abandonment, as adaptation resources are captured by elites while those most exposed to climate risks remain outside systems of support.

3.6. ADAPTATIONS STRATEGIES AT LOCAL LEVEL

Climate change has impacted communities in different forms distributed among different social classes and groups of people disproportionately. The study observed that some of the impacts as common and some were different across Hills and Terai regions. These communities, however, have exhibited some degree of resilience through different adaptive strategies. These strategies combined traditional knowledge, and innovative solutions which aimed at mitigating the adverse impacts of climate change on agriculture, water resources, and livelihoods. This ensured the long-term sustainability of local ecosystems and economies by keeping the sources of livelihoods intact.

Below is an overview of the adaptive strategies in both regions, followed by a comparison to highlight the differences and similarities in their approaches.

ADAPTIVE STRATEGIES IN HILLY REGION:

Table 5. Adaptive strategies in Hilly Region

Categories	Description of Strategies
Sustainable Agriculture and Crop Diversification	Farmers in the Hilly areas have shifted to more climate-resilient crops like Rudraksha, Cardamom, Mustard, Onion, Turmeric, Coffee, Kiwi, and Sugarcane. These crops are better suited to the region's unpredictable rainfall patterns and changing soil conditions. The transition is a direct response to declining soil fertility, erratic rainfall, and pest infestations. Additionally, mushroom farming has emerged as an alternative livelihood, offering high economic returns with minimal water usage. "*Hybrid and short-duration seed varieties are being adopted to ensure stable yields even during periods of uncertain climatic conditions.*" - A farmer in Khotang district. These adaptive strategies have helped to secure both food and income for farmers and provided stability in an increasingly unpredictable environment.
Water Management and Conservation	Water scarcity was a growing concern in the Hilly Region, prompting farmers to adopt efficient irrigation methods. Afforestation and agroforestry efforts, such as planting *Uttis* near agricultural lands were practiced to help improve soil moisture retention and prevent erosion. Community-led afforestation programs also played a crucial role in restoring degraded land, ensuring long-term water availability. These initiatives collectively started contributing to a more sustainable approach to water management, reducing dependency on traditional and increasingly unreliable water sources.

Soil and Pest Management	Some farmers have reported to adopt organic alternatives to maintain soil fertility while reducing dependency on expensive chemical fertilizers. Locally available materials like cow dung, *titepati*, and animal urine were used for composting, ensuring soil health is preserved. For pest management, organic compost and bio-pesticides were employed to mitigate environmental damage while effectively controlling pests and diseases. These methods aligned with the region's emphasis on sustainability, reducing reliance on harmful chemicals and promoting healthier environment.
Modern Approaches in Agriculture	As labor shortages caused by climate change become more evident, mechanized farming techniques are being introduced to enhance productivity. Farmers have also adopted protected cultivation methods like tunnel farming and net-house vegetable cultivation. These modern farming practices were perceived to protect crops from erratic weather conditions and pests, ensuring higher and more stable yields even in the face of climate challenges.
Community Initiatives for Adaptation and Capacity Building	Community-driven initiatives are also playing crucial role in building resilience towards the impacts of climate change. Women's groups have been formed to support skill development in farming techniques, financial literacy, and entrepreneurship. In many places, Agricultural Knowledge Centers (*Krishi Gyan Kendra*) have been active in helping farmers. They have offered farmers with soil testing services, distributed climate-resilient seeds, and offered training in sustainable farming practices. These centers have played an essential role in ensuring that farmers possess the knowledge and resources to cope with changing climatic conditions effectively.
Alternative Livelihoods and Economic Diversification	Respondents stated that people were adopting alternative livelihoods and economic diversification as adaptation strategies to climate change. Traditional farming was facing risks on the brink of climate change. So, many people in the Hilly Region were found diversifying their income sources. Small businesses, labor work, and foreign employment were increasingly common. Moreover, discourses on exploration of carbon trading opportunities were gaining traction. These opportunities not only provide an additional source of income but also contribute to global climate mitigation efforts. This will surely offer rural communities a sustainable financial future. Yet, such practices have been quite rare in the study locations.

ADAPTIVE STRATEGIES IN TERAI REGION:

The Terai Region has its own set of challenges. They are crippled with unplanned urbanization, industrial pollution, and water scarcity to name few. These have intensified the impacts posed by the climate change. In this regard, local communities have begun taking proactive steps to cope with climate change. Many of the strategies mainly focus on sustainable agricultural practices, water conservation, and community-led solutions.

Table 6. Adaptive strategies in Terai Region	
Categories	**Description of Strategies**
Promotion of Sustainable Agriculture	In the Terai, there has been a gradual shift towards organic farming as farmers become more aware of the harmful effects of excessive chemical use. People are more drawn towards vegetable farming as the region experiences unseasonal climatic events hampering other agricultural crops. Local governments are advocating for organic farming, seed preservation, and awareness programs to reduce chemical dependency. While these efforts have been successful in raising awareness, the gap between the demand for organic products and the supply remains a challenge. Financial support and better market access are critical to enabling farmers to fully embrace these sustainable practices.
Climate Adaptation Policies at the Local Governance Level	Local municipals such as Butwal and Kalaiya have reported that they are implementing climate adaptation policies to address the worsening water crisis. Initiatives such as mandatory tree planting, rainwater harvesting in new buildings, improved drainage systems, and small-scale irrigation projects are being prioritized. Additionally, the drilling of deep borewells is being regulated to prevent over-extraction of groundwater. Efforts are also underway to restore traditional ponds and promote sustainable irrigation. However, local communities feel that these policies require better enforcement and regular updates to be effective in the long term.
Afforestation and Reforestation Initiatives	In response to rapid deforestation and land degradation, communities have initiated tree plantation programs to combat soil erosion and landslides. Although these efforts have seen success, the full implementation of sustainable forest management policies remains challenging. Furthermore, waste management has become a pressing issue, with urbanization leading to increased pollution and health risks. To combat this, local governments have launched waste segregation programs, encouraging households to separate biodegradable and non-biodegradable waste. While resistance to change has made these initiatives slow in progress, they reflect a growing desire for cleaner, more sustainable living practices.

MAJOR DISTINCTION IN ADAPTATIONS IN HILLS AND TERAI

Both the Hilly and Terai regions are deeply affected by climate change, but their adaptation strategies differ due to distinct geographical and socio-economic conditions.

a. Agricultural Adaptation: In the Hilly Region, crop diversification to include high-value, climate-resilient crops and the adoption of modern farming techniques like tunnel farming and hybrid seeds are common strategies. In the Terai, the focus has been on organic farming, vegetable cultivation, and seed preservation to adapt to changing conditions. However, in the Terai, there is more of a struggle with financial support and market access, which has hindered the widespread adoption of organic practices.

b. Water Management: Both regions are facing water scarcity, but the Hilly Region has placed more emphasis on afforestation and agroforestry to improve soil moisture retention. The Terai, on the other hand, is focusing more on policies like rainwater harvesting and deep borewell regulation, aiming to address urban water demands and industrial pollution.

c. Community Engagement: Participants from both regions recognize the importance of community involvement, with women's groups and local knowledge-sharing platforms playing a key role in capacity building. However, the Terai has faced more challenges with policy enforcement and slow implementation of waste management programs, while the Hilly Region's community efforts are more integrated into environmental restoration programs.

Table 7. Summaries of key adaptation strategies

Adaptation strategies	Hilly Region	Terai Region	Peculiar Highlights
Farming	Crop diversification (e.g., Cardamom, Kiwi, Mushroom); Hybrid & short-duration seeds; Protected farming (tunnels, net-houses)	Organic & vegetable farming; Seed preservation campaigns	**Hills:** High-value peculiar crops to the Hills **Terai:** Organic push despite market gaps
Water Management	Agroforestry (Uttis) to retain moisture; Community-led conservation	Rainwater harvesting; Borewell regulation; Pond restoration	**Hills:** Nature-based water security **Terai:** Urban water policies in action
Soil & Pest Control	Organic compost (cow dung, *titepati*); Bio-pesticides, minimal chemicals	Awareness on reducing chemical use	**Hills:** Traditional, cost-effective solutions **Terai:** Approaches are still lacking
Tech Integration	Mechanized farming; Climate-resilient seeds via agri-centers	Limited adoption	**Hills:** Technology incorporated in traditional practices
Community Action	Women-led groups & skill building; Active Agri-Knowledge Centers	Climate policies in planning; Waste segregation efforts	**Hills:** Deep-rooted community empowerment **Terai:** Policy-driven but slow rollouts
Livelihoods	Shift to small business, migration	Farming reliant; Informal Jobs	**Terai:** Wage work in industries **Both :** Foreign Labour Migration
Forestation & Waste	Afforestation near farms; Soil conservation	Urban reforestation; Waste management campaigns	**Terai:** Tackling pollution & land degradation

3.7. CHALLENGES OF CLIMATE ACTION

The study areas faces significant developmental and governance challenges in addressing climate change, promoting rural sustainability, and ensuring equitable economic opportunities. Some of the challenges observed during this study are categorized below.

POLICY GAPS AND WEAK GOVERNANCE STRUCTURES

One of the primary issues across the region was the absence of region-specific climate policies, leaving communities without structured guidance to adapt to environmental changes. Without clear policy frameworks, local governments are struggling to implement effective climate adaptation measures. Farmers reported that agricultural policies are often theoretical and fail to reflect the realities of local farming conditions. This disconnect results in ineffective programs that do not adequately address climate risks or support sustainable agricultural practices. Also, farmers face significant losses due to floods, pests, and low market prices for crops. However, there are no accessible crop or livestock insurance schemes to mitigate their risks.

"The soil has not been tested, so we don't know what will grow in it. Even when crops are grown, pests attack, and fertilizers are expensive and not available on time. Even if the crops grow, floods destroy them, or pests consume them. The remaining crops have a low market price. Farmers are facing nothing but problems." - A farmer in Bara district.

Budget allocation and bureaucratic delays were some other results of weak governance structures. While Nepal's shift to federalism was intended to bring the government closer to the people, it has created bureaucratic inefficiencies. In this regard, delays in budget allocation and poor coordination between local, provincial, and federal governments have hampered climate action and rural development initiatives.

INFRASTRUCTURE DEFICIENCIES AND MARKET BARRIERS

One key infrastructural gap in the study area was limited market access for local farmers. The rural farmers especially struggled to reach commercial hubs due to poor availability of transportation services and weak supply chains. Even where roads exist, the lack of effective distribution systems hampers economic opportunities, often pushing farmers to abandon agriculture as an occupation or means of sustenance.

A farmer in Sankhuwasabha district said, "With climate change reducing yields and markets remaining inaccessible, many are forced to seek alternative livelihood opportunities."

Further, unregulated infrastructure development was observed as one of the challenges in implementation of proper climate action. In some areas, poorly planned infrastructure projects caused environmental degradation, further exacerbating issues like water scarcity and declining soil fertility.

Moving ahead, limited access to skilled agricultural technicians has caused barriers in meeting the demands of climate action. There is a critical shortage of trained agricultural specialists who can guide farmers on modern, climate-resilient farming techniques. This gap hinders the adoption of innovative agricultural solutions that could enhance productivity and sustainability.

POLITICAL AND SOCIAL CHALLENGES

"When I went to the municipality office for subsidized fertilizers, I was told the stock was finished. Later, I found out that they were saving it for others."- A farmer from Bhojpur district.

Political instability and power struggles in Nepal have significantly hindered climate actions at the local level. Governance in the study areas was often disrupted by political power struggles, where political party interests take precedence over community needs. This instability weakens policy implementation and results in inefficiencies in local governance.

This was further deteriorated by systemic inequalities and discriminatory practices existent in Nepal. Marginalized groups, particularly those from lower socio-economic backgrounds, continued to face discrimination in accessing government resources.

MIGRATION AND RURAL DEPOPULATION

The lack of economic opportunities in rural areas is driving large-scale migration to urban centers and abroad, weakening the agricultural workforce and leaving behind an aging population that struggles to sustain traditional farming practices. Local governments lack a strategic vision to curb migration by improving rural employment opportunities and investing in economic diversification.

WEAK AGRICULTURAL SUPPORT AND ENVIRONMENTAL MISMANAGEMENT

"Fertilizers are expensive and subsidies are not per this, expenses on electricity bill have increased for water upliftment from underground. The deployment of tractors for plowing in the field is rated 2700-2800 Rupees per hour. As a result of all these, the cost of production in agriculture is high." – A young farmer from Bara District.

This study shows that farmers in the study areas often struggled with accessing agricultural inputs like fertilizers and soil testing services on time. Also, the high costs of fertilizers, electricity for irrigation, and mechanized plowing have made farming increasingly expensive

"The government is focusing on road and infrastructure development, but when it rains heavily, crops, fields, houses, and animals all get flooded. There are no facilities like animal insurance or crop insurance. At the same time, medicines and food become expensive." – A Agriculture officer from Rupandehi district.

Further, infrastructure development (roads, industries, and cable cars) was prioritized over climate adaptation and mitigation measures in the study areas, leading to environmental degradation, deforestation, and increased landslides and flash floods. A farmer from the Terai Region noted,

Similarly, failure to regulate deforestation, sand and stone mining, and groundwater extraction has resulted in soil degradation, water contamination, and declining groundwater levels due to excessive deep boring.

To aid to the findings further, farmers in the Terai Region expressed their concerns regarding air pollution from brick kiln industries, which produce excessive dust particles and damage crops in the study areas. Farmers reported several effects on crops, particularly green peas, leading them to abandon their cultivation altogether. Dust particles accumulate on the outer layer of plants which reduces photosynthesis and stunts plant growth, significantly lowering the yields. Additionally, the traditional heating methods and burning crop residues *(Paral)* in the winter season have worsened air pollution, affecting public health as well as environmental conditions.

Table 8. Summary of key challenges to climate action

Challenges	Key Issues	Impacts & Examples
Policy Gaps and Weak Governance Structures	- No region-specific climate policies	- Farmers lack guidance and insurance
	- Disconnected agricultural policies	- Soil untested, pests unmanaged
	-Bureaucratic delays & weak coordination	- Federalism slowed budget flows
Infrastructure Deficiencies and Market Barriers	- Poor transport & supply chains	- Farmers abandon agriculture
	-Environmentally harmful development	- Roads worsen erosion & water loss
	-Shortage of skilled agri-technicians	-Limited support for climate-resilient practices
Political and Social Challenges	-Political instability & power struggles	-Delayed or diverted resources
	- Discriminatory access to subsidies	-Marginalized groups excluded from support

Migration and Rural Depopulation	-Rising rural-to-urban & foreign migration - No vision to retain rural youth	- Aging farm labor force - Traditional farming under strain
Weak Agricultural & Environmental Support	- Expensive agri-inputs & unreliable subsidies -Climate resilience sidelined by infrastructure -Poor environmental enforcement	- High production costs (e.g., Rs. 2700/hr for tractors) -Floods worsen due to unchecked development -Deforestation, sand mining, and over-extraction

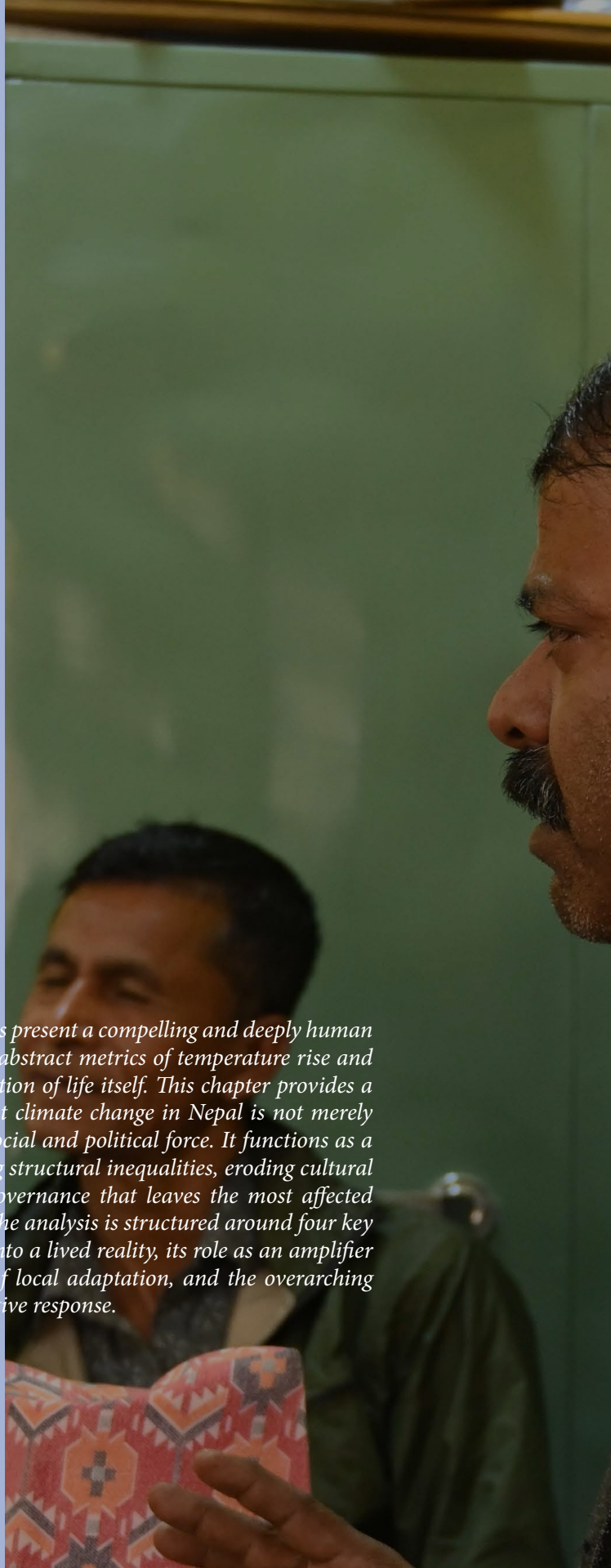
"Women don't get attention when we ask for help, and the mental stress increases. Even if men earn money and give it to us, doing both household and outside work increases mental stress, and people start to criticize us."

- A local resident of Bhojpur district

04

DISCUSSION AND ANALYSIS

The findings from Nepal's Hilly and Terai regions present a compelling and deeply human narrative of the climate crisis, moving beyond abstract metrics of temperature rise and erratic rainfall to document a profound disruption of life itself. This chapter provides a detailed analysis of these findings, arguing that climate change in Nepal is not merely an environmental phenomenon but a potent social and political force. It functions as a vulnerability multiplier, amplifying pre-existing structural inequalities, eroding cultural identities, and exposing a critical deficit in governance that leaves the most affected communities in a state of perpetual precarity. The analysis is structured around four key themes: the transformation of climate change into a lived reality, its role as an amplifier of systemic injustice, the complex paradoxes of local adaptation, and the overarching structural barriers that impede a just and effective response.



CHAPTER 4

DISCUSSION AND ANALYSIS

4.1. FROM DATA TO DAILY REALITY

This study powerfully demonstrates that for communities on the frontlines, climate change is understood not through scientific discourse but through a deeply personal and tangible sense of loss. The local perceptions of a disrupted natural order, from the lament for the vanished winter monsoon, to the grief over drying springs and wildfire-scarred forests, is a manifestations of ecological grief. This is more than just an observation of environmental change; it is a mourning for the loss of a predictable, life-sustaining relationship with the environment that has anchored cultural practices and livelihoods for generations. In the Hills, this grief is tied to the loss of seasonal rhythm, while in the Terai, it manifests as an immediate anxiety over existential resources like water, with groundwater levels plummeting dramatically just in two decades.

This process humanizes the climate crisis by revealing its impact on place-based identity. The upward migration of orange cultivation in the Hills or the early-season blooming of rhododendrons in Bhojpur district are not just phenological shifts; they are events that disrupt the cultural memory and symbolic landscape of a community. They signify an unraveling of the intricate local knowledge systems that are tied to these specific ecological patterns. The disappearance of traditional, resilient crop varieties like *Bhotange* rice and *Masoor Dal* in favor of expensive and often ill-suited hybrid seeds further represents a loss of food sovereignty and cultural heritage. This shift traps farmers in a dependency cycle, aligning with research that highlights how climate pressures can accelerate the erosion of agrobiodiversity and indigenous knowledge (Gentle & Maraseni, 2012).

Ultimately, the widespread sentiment of powerlessness, coupled with the assertion that rural communities are bearing the brunt of a crisis caused by wealthy, industrialized nations, transforms the narrative from one of environmental victimhood to one of profound climate injustice. This lived experience provides a powerful moral grounding for the principles of climate justice, moving it from an abstract international policy concept to a deeply felt personal and collective grievance.

4.2. CLIMATE CHANGE AS AN AMPLIFIER OF SYSTEMIC INJUSTICE

A central argument of this analysis is that climate change does not create new forms of injustice but rather exploits and deepens the pre-existing fault lines of inequality within Nepali society. The findings offer a stark illustration of how climate impacts intersect with gender, ethnicity, caste, and economic status to create compounding layers of vulnerability.

Gendered Impacts and the Double Burden: The phenomenon of male out-migration, a primary household adaptation strategy, inadvertently reinforces patriarchal structures by imposing a "double burden" on women. They are left to manage farms and households with diminished resources, limited decision-making authority, and increased physical and mental stress. In the Hills, this manifests as arduous journeys for water and lack of access to traditional male-held agricultural knowledge. In the Terai, women face social exclusion when hiring labor for "men's work" and suffer acute health impacts from extreme heat and industrial pollution. These experiences are consistent with a growing body of literature that identifies women as bearing a disproportionate share of climate-related burdens due to entrenched social norms and unequal access to resources.

Cultural Erosion and Indigenous Marginalization: For indigenous communities, the climate crisis is both ecological and existential. In the Hills, the Rai and Tamang communities' attachment to their ancestral land is a form of cultural resistance, even as that land becomes less productive. In the Terai, the Tharu and Majhi communities face not only the loss of traditional livelihoods like fishing and crafting but also active displacement due to resource extraction like sand mining. This spatial injustice highlights how vulnerability is compounded, as external economic forces degrade their environment. In both regions, indigenous knowledge, a vital repository of sustainable adaptation practices, is systematically ignored in formal policy-making, a failure that leads to less effective and culturally inappropriate interventions.

Caste, Class, and Climate Precarity: The experiences of Dalit, Muslim, and landless communities in the Terai offer the most visceral evidence of climate injustice. Their vulnerability is structurally determined by caste discrimination, political marginalization, and a lack of land rights. The

politicization of water access in Bara, where local leaders control deep borings and restrict access for marginalized households, demonstrates how climate stress can be weaponized by elites to reinforce social hierarchies. The case of the Netuwa community is particularly damning; their layered vulnerability, encompassing the loss of their cultural livelihood, statelessness that denies them access to education and state support, and exposure to extreme weather in makeshift housing, places them in a position of near-total dispossession. They are not just vulnerable to climate change; they are rendered invisible by the very systems that should protect them.

4.3. NAVIGATING RESILIENCE AND MALADAPTATION

While communities are actively devising strategies to cope with climate impacts, this study reveals a critical paradox: many of these adaptations, born of necessity, carry significant long-term social and ecological costs, blurring the line between resilience and maladaptation.

Grassroots resilience is evident in the diversification into high-value, climate-resilient crops in the Hills and the community-led afforestation and water conservation efforts in both regions. The emergence of women's groups as key actors in building local capacity is a particularly positive sign, reaffirming global evidence on the effectiveness of gender-inclusive climate action. These initiatives demonstrate a high degree of local agency and innovation.

However, many dominant coping mechanisms risk deepening vulnerability over time. Migration, while providing essential remittances, lead to the "hollowing out" of rural communities. It drains the agricultural workforce, severs the transfer of intergenerational knowledge, and weakens the social capital and collective action capacity that are essential for community-based adaptation. Similarly, the widespread adoption of chemical fertilizers and pesticides is a maladaptive response to declining soil fertility and increased pest pressure. While offering a temporary boost in yields, it creates a technological lock-in, degrading the soil, contaminating water sources, increasing farmer debt, and posing significant health risks. These strategies are not proactive choices reflecting enhanced adaptive capacity, but rather reactive survival tactics undertaken in the absence of more sustainable, systemic support.

4.4. STRUCTURAL BARRIERS TO CLIMATE JUSTICE AND EFFECTIVE ACTION

The capacity of local communities to adapt is ultimately constrained by deep-seated structural barriers. The findings point to a systemic failure of governance, where a significant "implementation gap" exists between national climate policies and local realities. Farmers across the study sites reported a profound sense of abandonment, citing a lack of relevant agricultural support, the absence of crop insurance, and discriminatory access to subsidies. This disconnect renders top-down policies ineffective and irrelevant on the ground.

Furthermore, the dominant development paradigm in many areas is actively maladaptive. The prioritization of unregulated infrastructure projects, such as roads, industries, and cable cars, over environmental safeguards exacerbates climate risks like landslides, soil erosion, and flooding. This approach not only undermines the natural resource base upon which communities depend but creates new layers of vulnerability, aligning with literature that critiques development pathways that fail to integrate climate risk.

Finally, the combination of political instability, bureaucratic inefficiency, and deeply ingrained social discrimination creates an environment where climate action is fragmented and justice is unattainable. When marginalized farmers are denied access to resources based on their social identity, it erodes their trust in government institutions and undermines the social contract. This is perhaps the most significant barrier: without accountable, inclusive, and responsive governance, even the most resilient communities will find their capacity to cope overwhelmed. The climate crisis in Nepal is therefore not just a test of environmental management, but a fundamental challenge to the principles of democratic governance and social justice.

"We have no land, no papers, and no rights. When rain pours, we are the first to lose everything."

– A Netuwa community member, Bara district.

05

CONCLUSION AND RECOMMENDATIONS

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

This study shows that climate change in Nepal is not a distant possibility. It is a lived crisis. Its effects are embedded in everyday life, in forms of drying springs, declining harvests, vanishing farming traditions, and growing uncertainty. What began as environmental change is now reshaping social structures, cultural identities, and economic stability. From the drying springs of the Hills to the groundwater depletion of the Terai, climate change has embedded itself in the everyday lives of people, shaping what they grow, how they live, and what they fear for the future. These impacts are not only environmental and economic. They are deeply personal, cultural, emotional, and political. This study has shown how these impacts are perceived and rooted in human experiences of failure of crop production, wiping of traditional practices rather than expressed through empirical observations.

The study highlights that climate change is not experienced equally. Women, indigenous groups, and rural farmers are bearing the heaviest burdens even though they contribute least to the global emissions. And yet, despite their resilience and adaptation efforts, they remain excluded from key policy processes and decisions that affect their lives. This inequality is not incidental. It is systemic. It reflects a broader failure to center justice, representation, and dignity in climate responses. The study offers the geographic analysis contrasting the lived experiences across Hills and Terai. This further exposes the path of differentiation of suffering and adaptations which are generally overlooked in climate action discussions.

Adaptation strategies emerging from these communities are majorly shaped by necessity, not choice, as symptoms of survival. These changes, often invisible in national discourse, represent a silent but profound transformation of Nepal's social and ecological fabric. They expose the urgent need for locally rooted, inclusive, and culturally sensitive climate action. This study reveals that adaptation choices are made often at the cost of identity, heritage and mental wellbeing and hence emotional and cultural aspects of adaptation are equally important along with technical aspects.

What this study makes clear is that climate justice is not simply about reducing carbon emissions, it is about care, equity, and representation. It is about acknowledging historical responsibilities and present vulnerabilities as well. It demands a shift in governance that centers those who are most affected. recognizing them not as passive recipients of aid, but as active agents of change. Thus climate resilience is not technical alone - it is human. It especially lies in afforestation efforts led by local women, in the knowledge of elders preserving indigenous seeds, and in the collective strength of communities protecting what remains. So, adaptation frameworks must include the indigenous knowledge to eradicate the systemic injustices for effective climate action.

To respond to the climate crisis effectively, Nepal must move beyond fragmented policies and reactive measures. It must commit to justice-based climate governance that empowers marginalized voices, strengthens rural infrastructure, values indigenous knowledge, and supports adaptation not as a last resort, but as a dignified right. Failure of national policies to transform to local action is also a form of injustice which can hamper the actions against the impacts of climate change.

In the end, climate change is more than an environmental emergency- it is a human story. It is told in the cracked soil, the unseasonal rain, the silence of lost rituals, and the fading laughter of children whose parents have migrated away. These are not just data points; they are truths that demand to be heard. If climate action is to be just, it must begin with listening: deeply, honestly, and urgently, to those who have been living the crisis all along.

RECOMMENDATIONS

The findings and analysis of this study make it unequivocally clear that addressing the climate crisis in Nepal requires moving beyond fragmented, top-down environmental policies. A just and sustainable future is only possible through a concerted effort to dismantle the structural inequalities that amplify climate vulnerability. Following recommendations are proposed for federal, provincial, and local governments, as well as civil society organizations and development partners to foster a just and effective response to the climate crisis in Nepal. They are grounded on the core principles of climate justice, inclusivity, and local empowerment.

1. Localize climate governance by establishing inclusive, municipal-level climate justice committees with mandated representation for women, indigenous peoples, and Dalits. These bodies should be empowered to co-design region-specific adaptation plans that address the unique vulnerabilities of the Hills and Terai, and oversee transparent climate budgets to ensure resources reach the most affected communities.

2. Integrate indigenous and traditional knowledge into national policy by creating a formal framework to validate and incorporate local expertise. This includes documenting traditional practices like seed preservation, water management, and the use of bio-pesticides, and mainstreaming this knowledge into official agricultural extension services and adaptation strategies.

3. Strengthen economic resilience by establishing accessible local funds and social safety nets to help vulnerable households absorb climate shocks like crop failure and livestock loss. Agricultural support must be reoriented to promote agrobiodiversity, de-risk farming through effective crop and livestock insurance, and invest in sustainable rural economies to provide viable alternatives to maladaptive migration.

4. Empower women as central agents in climate action by ensuring their formal leadership in water and resource management committees. This must be supported by targeted training in climate-resilient agriculture and by equipping local health services to address the specific health risks, such as from heat stress and chemical exposure that disproportionately affect women.

5. Mandate climate-resilient development by enforcing rigorous environmental impact assessments for all infrastructure projects. Priority should be given to nature-based solutions, and the government must strengthen and enforce regulations against polluting industries like brick kilns and unregulated mining that degrade agricultural land, contaminate water, and harm community health.

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LIVING UNEQUAL FUTURES

Examining Climate Change, Social Vulnerability, and the Imperative for Justice Among Risk-Populations in Nepal

Centre for Social Change
सामाजिक परिवर्तन केन्द्र

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