Climate Change Impacts on Grassroots Communities: Testimonies from Madhesh and Lumbini, Nepal

2025

RRN
Rural Reconstruction Nepal

Foreword

I am pleased to present the report, Climate Change Impacts on Grassroots Communities: Testimonies from Madhesh and Lumbini, Nepal, which reveals the lived realities of climate-affected communities in the country's two most climate-vulnerable provinces. The report is developed through a participatory approach involving community members, local governments, and civil society actors and reflects RRN's continued commitment to centering the voices of grassroots rural communities in climate discourse.

Nepal faces mounting challenges due to rising temperatures, erratic weather patterns, and increasing environmental degradation. These impacts are felt most acutely by rural and Indigenous Peoples and Local Communities (IPLCs), who often have the least capacity to respond but whose traditional knowledge and adaptive strategies offer valuable lessons for resilience-building.

It is a critical time to translate global climate commitments into locally relevant actions. These testimonies shared by women, youth, smallholder farmers, and community forest groups from Madhesh and Lumbini are a powerful reminder that climate change is not a distant threat but a lived experience that shapes daily lives, livelihoods, and wellbeing.

Through this initiative, RRN aims to strengthen the evidence base for inclusive, locally led, and gender-responsive climate action. The findings call for urgent policy action and investment in locally driven adaptation, sustainable natural resource management, and climate-smart livelihoods, while ensuring that no one is left behind.

I would like to extend my sincere appreciation to the community members who shared their experiences, to our local partners for their collaboration, and to our team at RRN for their dedication to amplifying grassroots perspectives. We remain committed to working alongside communities and partners to promote climate justice and resilience, grounded in human rights and equity.

Dr. Arjun Karki
President
Rural Reconstruction Nepal (RRN)

Acknowledgement

Rural Reconstruction Nepal (RRN) is a leading non-governmental, not-for-profit social developmental organization dedicated to improving the lives of poor and marginalised people in rural Nepal. The study was conducted as part of RRN's efforts to document the ongoing impacts of climate change on the grassroots communities of Nepal and strengthen its evidence-based advocacy to amplify the voices of those most affected and least heard.

Firstly, we would like to extend our heartfelt gratitude to all the community members and local stakeholders who generously shared their time, experiences, and insights with us during the focus group discussions. Their insights form the foundation of this work, and we stay committed to honouring their voices.

We express our sincere gratitude to RRN for providing the institutional platform and continuous support throughout the process. We would like to express our gratitude to DGM Nepal for the financial support for the study. We would also extend our gratitude to World Food Forum - Nepal Chapter and UN Women for their partnership while conducting the provincial consultations.

We are particularly grateful to Dr. Madhav Karki and Dr. Chiranjewee Khadka for reviewing this document and providing constructive comments and suggestions. Likewise, to Sudhir Shrestha, Dr. Suresh Tamang, and Dr. Giri Panthi from RRN for acting as the internal reviewers. Finally, we would like to thank our mentor Dr. Arjun Karki for his encouragement throughout the process.

The study was led by Sangam Basnet. Sangam Basnet and Surangana Rajya Laxmi Rana served as the primary authors, contributing to the overall content and structure. Bharat Sharma and Prashamsha Acharya contributed to selected sections relevant to their expertise.

This report is a testament to the power of collaboration and the shared goal of advancing inclusive, equitable, and evidence-informed strategies in the context of climate change.

DISCLAIMER

The perspectives presented in this report exclusively represent the views of Rural Reconstruction Nepal (RRN) based on empirical research.

CONTENT

ABBREVIATIONS

ADB	Asian Development Bank
ANC	Antenatal Care
AQI	Air Quality Index
AQLI	Air Quality Life Index
BCM	Billion Cubic Meters
CBO	Community Based Organization
CBS	Central Bureau of Statistics
CFUG	Community Forestry User Group
DGM	Dedicated Grant Mechanism
DADO	District Agriculture Development Office
DOE	Department of Environment
EWS	Early Warning Systems
FGD	Focus Group Discussion
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
GoN	Government of Nepal
HDI	Human Development Index
HKH	Hindu Kush Himalaya
HWC	Human-Wildlife Conflict
IAPS	Invasive Alien Plant Species
ICIMOD	International Center for Integrated Mountain Development
ILK	Indigenous and Local Knowledge
IPCC	Intergovernmental Panel on Climate Change
IPLC	Indigenous Peoples and Local Communities
LAPA	Local Adaptation Plans of Action
LG	Local Government
NAP	National Adaptation Plan
NCD	Non-Communicable Diseases
NDHS	Nepal Demographic and Health Survey
NTFPs	Non-Timber Forest Products
NGO	Non-Governmental Organization
OWL	Other Wooded Land
PTSD	Post-Traumatic Stress Disorder
PWDs	Persons with Disabilities
PYCCC	Provincial Youth Climate Change Councils
RRN	Rural Reconstruction Nepal
SMEs	Small and Medium Enterprises
SVI	Social Vulnerability Index
WB	World Bank
WHO	World Health Organization

KEY DEFINITIONS

Adaptive Capacity: Adaptive capacity is the ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damage, to take advantage of opportunities, or to cope with the consequences (IPCC, 2007). Adaptive capacity is shaped among others by available resources, institutions, and skills and knowledge.

Exposure: Exposure is the amount and rate of change that a species or system experiences from the direct (e.g., temperature, precipitation changes) or indirect (e.g., habitat shifts due to changing vegetation composition) impacts of climate change (IPCC).

Greenhouse Gases (GHG): Greenhouse gases are gases that trap heat from the sun in our planet's atmosphere, keeping it warm. Since the industrial era, human activities have led to the release of dangerous levels of greenhouse gases, causing global warming and climate change.

Indigenous Knowledge: Indigenous knowledge includes the expressions, practices, beliefs, understandings, insights, and experiences of Indigenous groups, generated over centuries of profound interaction with a particular territory.

Resilience: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management (UNDRR, 2017).

Risk: Risk is the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted, environmental damage) resulting from interactions between natural or human-induced hazards and vulnerable conditions (Conventionally, risk is expressed by the notation Risk= Hazards x Vulnerability (IPCC, 2020). Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability (ISDR, 2004).

Vulnerability: In the context of climate change, vulnerability is the degree to which a system is susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change, and the variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC, 2007).

Youth: Population of the 16-40 years age group is considered as the youth population in Nepal.

EXECUTIVE SUMMARY

Climate change is one of the most pressing challenges of the 21st century, with far-reaching impacts on the environment, livelihoods, and human well-being. Although Nepal contributes minimal to global greenhouse gas emissions, it bears a disproportionate burden of climate-related impacts. These impacts are particularly severe for grassroots communities, especially women, Indigenous Peoples, Dalits, and other marginalized groups, who rely heavily on agriculture and forest resources for their livelihoods.

Grassroots communities possess a wealth of Indigenous and traditional knowledge (ILK) passed down through generations of lived experiences. Their insights are critical for shaping effective, context-specific climate strategies. However, their contributions are often undocumented, undervalued, and unsupported. This study seeks to address this epistemic gap by capturing and centring these communities' lived realities and testimonies. It explores the impacts of climate change on their livelihoods and well-being, identifies their vulnerability and adaptation strategies, and implementation challenges at the local level. In doing so, Rural Reconstruction Nepal (RRN) aims to promote inclusive, equitable, and evidence-informed strategies that genuinely reflect the needs and priorities of Nepal's rural populations.

Recognizing the urgency of climate change and the importance of a needs-based, community-centred understanding, RRN conducted a cross-sectional qualitative study using a phenomenological approach to explore participants lived experiences. The research was carried out in Bhaluwang, Dang (Lumbini Province), and Bardibas, Dhanusha (Madhesh Province), utilizing focus group discussions. The findings were analysed using a thematic analysis approach.

Key findings reveal a rising intensity of climate-related risks, such as erratic weather patterns, crop failures, water scarcity, and an increasing disease burden. These impacts are deeply interconnected and exacerbate pre-existing social and economic vulnerabilities. The impacts on natural resources include increasing forest fires, biodiversity loss, human-wildlife conflict, and the depletion of water sources. Similarly, livelihoods are affected, with declining crop yields, growing dependency on agrochemicals, the emergence of new pests, rising labour migration, and disruptions to education. Health challenges include reduced access to healthcare, growing disease burden, such as kidney diseases, mental health issues, and respiratory conditions, and resurgence of malaria, dengue, and cholera.

Despite these challenges, communities demonstrate resilience through ILK and collective action. However, their efforts remain insufficiently recognized or supported. The study emphasizes the need for an inclusive and participatory approach to climate governance. Strengthening coordination across all levels of government, fostering multisectoral collaboration, and institutionalizing community participation are essential for building long-term resilience. Policies must prioritize local knowledge, allocate resources for community-led initiatives, and address the systemic exclusion of marginalized communities.

Through this research, RRN contributes to a more inclusive climate discourse and advocates for policies and strategies grounded in the lived experiences of those most affected. The findings are intended to guide government agencies, civil society organizations, development partners, and donors in designing and implementing climate strategies that are locally grounded, socially just, and ecologically viable.

1. INTRODUCTION

1.1 Overview: Climate Change in the Context of Nepal

Climate change is one of the most pressing challenges of our times, disproportionately affecting the most vulnerable countries and communities. The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods" (UNFCCC, 1992). Nepal, a land-locked country in South Asia, faces heightened risks from climate change due to a combination of factors, including geographical, physical, socio-economic, and political (Central Bureau of Statistics, 2022). Nepal is highly vulnerable to multiple hazards and ranks 11th in earthquake risk and 30th in flood risk (Khatakho et al., 2021). Globally, it is among the top 20 most hazard-prone countries, with 80 per cent of its population at risk of natural and climate induced hazards (UNDRR, 2019). Some of the most observed impacts of climate change are erratic rainfall, frequent and severe droughts, forest fires, and heatwaves and cold waves.

The frequency and intensity of climate-induced disasters are increasing and reshaping the socioeconomic fabric of Nepal. Despite contributing only around 0.027 per cent of global greenhouse gas (GHG) emissions, Nepal faces disproportionate impacts from climate change (MoFE, 2016). These changes negatively impact the environment, livelihood, and health of Nepali people. Nepal's National Climate Change Policy 2019 has identified energy, agriculture, water resources, forestry and biodiversity, and health as the most at-risk sectors. On average, Nepal loses approximately 0.08 per cent of its GDP annually due to climate-related disasters (2018/19 numbers at current prices) (MoFE, 2021). The World Bank Group's 'Country Climate and Development Report for Nepal' further states that Nepal's GDP could be at least 7 per cent smaller by 2050 due to unchecked climate impacts (World Bank Group, 2022).

While climate change impacts affect everyone, grassroots communities, particularly women, Indigenous peoples, Dalits, and other marginalized groups that depend on agriculture and forests for their livelihood, are the most vulnerable. Many of these groups have faced historical marginalization and exclusion from mainstream development, forcing them to navigate preexisting systemic challenges and deepening inequities. As of 2023, approximately 78 per cent of Nepal's population resides in rural areas, where livelihoods are deeply tied to natural resources and rain-fed agriculture (World Bank Group, 2023). Their heavy reliance on climate-sensitive sectors, high poverty levels, and limited resource access make them exceptionally vulnerable to climate change.

The Government of Nepal (GoN) has developed various policies and frameworks related to climate change, including the National Climate Change Policy 2019, National Adaptation Plan 2021-2050 (NAP), and the Local Adaptation Plans of Action (LAPA) among others. However, there remains a gap between policy frameworks and grassroots realities. Research further indicates that most policies are based on the vulnerable and resilience studies largely shaped by Global North experts, often overlooking local and vernacular knowledge (Clement et al., 2021). As a result, there is a knowledge gap and limited credible climate data and documents that reflects the lived experiences of these communities. Therefore, the study seeks to reposition grassroots voices from the margins of policy to the centre of climate strategies.

1.2 Study Area: Province Background

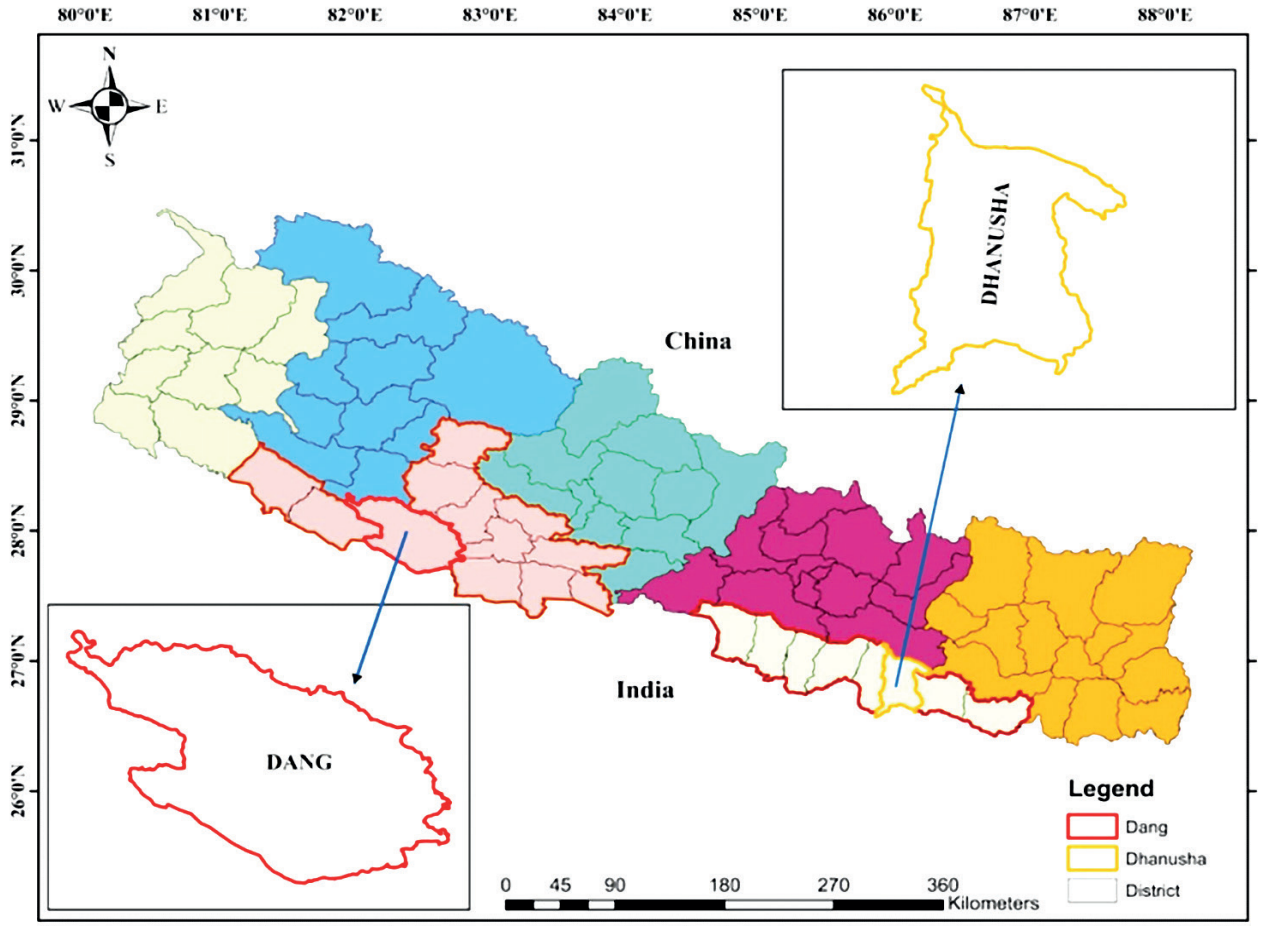

Figure 1: Study Area: Madhesh (Dhanusha District) and Lumbini (Dang District)

The study was conducted in Bhaluwang, Dang District of Lumbini province and Bardibas, Dhanusha District of Madhesh Province.

Madhesh and Lumbini provinces are among the most vulnerable to climate-induced hazards (Danchurch Aid, 2025). The geographic landscape and socioeconomic challenges in the region exacerbate the impact of climate change on grassroots communities. Madhesh and Lumbini have a Human Development Index (HDI) lower than the national average (0.548 and 0.594 per cent respectively), with a higher multidimensional poverty rate that limits their adaptive capacity. Their heavy dependence on climate-sensitive sectors, particularly agriculture, makes them highly vulnerable to climate shocks.

The landscapes of Madhesh and Lumbini are characterized by the fertile plains of the Terai region, stretching along the southern border with India. Madhesh is predominantly lowland, marked by expansive agricultural fields, river systems, and dense settlements. Lumbini, also part of the Terai region, transitions from flat plains in the south to the Siwalik hills in the north, featuring a mix of forests, wetlands, and farmlands. The provinces serve as Nepal's agricultural heartlands and are regarded as Nepal's "grain basket." Both provinces have high population densities with a high concentration of historically marginalized groups, including landless farmers, Dalits, and Indigenous people, many of whom lack secure land tenure.

Madhesh Province covers 9,661 sq. km and is home to 6,114,600 people. It is the most densely populated province and the second most populous province in Nepal (CBS, 2021).

It ranks as Nepal's most vulnerable region to climate change, with a social vulnerability score to natural disaster of 21.84, intensifying pressure on land, water, and infrastructure (Kumar et al., 2024). There are a total of 8 districts and 136 local governments. It includes 1 metropolitan municipality, 3 sub-metropolitan, 73 municipalities, and 59 rural municipalities. It is highly prone to reoccurring floods, intense heatwaves, and droughts causing widespread social and economic disruption.

Lumbini Province covers an area of 22,288 square km and is home to 5,122,078 people. There are 109 local governments, comprising 4 sub-metropolitan cities, 32 municipalities, and 73 rural municipalities, with a total of 983 wards. About 54 per cent of the area belongs to the Terai and inner Terai region, while the remaining is to the hill, mountain, and Himalayan ranges. It has a medium social vulnerability score to natural disaster of 0.18 but is at a high risk of multiple disasters since it faces a broader range of hazards, including floods, landslides, earthquakes, epidemics, fires, lightning strikes, and wind and hailstorms (Dhruba et al., 2019; Kumar et al., 2024).

Table 1: Demographic and Socio-economic Indicators of Madhesh and Lumbini

Indicators	Madhesh Province	Lumbini Province
Area	9,661 km²	22,288 km²
Population	6,114,600	5,122,078
Human Development Index (HDI)	0.548	0.594
People below absolute poverty (%)	22.53	24.35
Multidimensional Poverty Rate (%)	24.2	18.2
Social Vulnerability Index (SVI)	21.84	0.180

Source: Central Bureau of Statistics Nepal, 2021; National Statistics Office, 2021

2. METHODOLOGY

2.1 Study Objective

The imperative for this study lies in the urgent need to align climate strategies with the needs of grassroots communities. While national and international reports often highlight Nepal's climate vulnerabilities, their real-world implications on grassroots communities remain underexplored. The overall objective of the study is to understand grassroots experiences of climate change to bridge the knowledge gap between policy frameworks and community experiences systematically. The specific objectives of the study are:

i. To investigate how the livelihoods and well-being of grassroots communities are affected by climate change and their perceptions of these ongoing changes.

ii. To identify the vulnerability and adaptative capacity of grassroots communities.

iii. To identify policy implementation challenges at the local level and gather community-driven recommendations.

2.2 Conceptual Framework

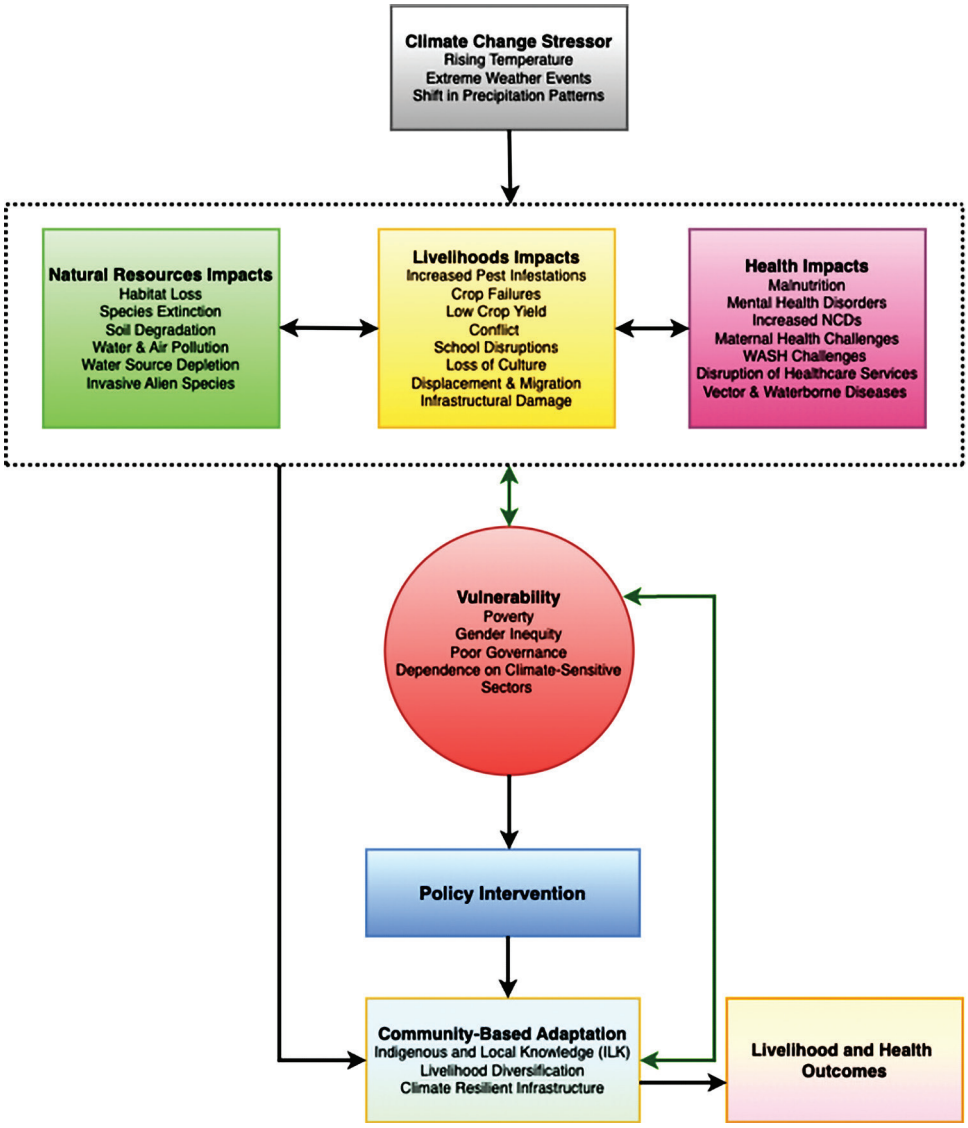

Figure 2: Climate Change Stressors and Interconnectedness Impacts, Vulnerability, Community Adaptation, and Policy Response

The conceptual framework for this study illustrates the relationship between climate change stressors, vulnerability factors, impacts, and community-based adaptation (CBA) strategies. Building on recent climate literature, it incorporates both observed climate trends and projected climate scenarios as foundational elements. It considers that climate stressors such as rising temperatures, extreme weather events, and shifting precipitation patterns impact natural resources, livelihoods, and health. These stressors act as primary drivers that expose natural systems and human communities to adverse effects across agriculture, health, water resources, and infrastructure.

The impact chain is structured as follows: climate stressors (erratic rainfall, heat extremes) lead to exposure, which results in impacts (crop failure, displacement, disease outbreaks) and subsequently invoke adaptive and institutional responses. These impacts are interconnected and intensify the existing vulnerabilities of communities, particularly those engaged in climate-sensitive livelihoods and experiencing structural and systemic inequalities. The framework

highlights vulnerability as both the root cause and consequence of climate impacts, forming a feedback loop that, if left unaddressed, reinforces the cycle of risk and exposure.

To understand and respond effectively to this complex interplay, the framework integrates four interrelated analytical tools: the interconnectedness of impacts, vulnerability assessments, community-based adaptation (CBA), and policy response. CBA rooted in ILK enables context-specific, locally tailored adaptation strategies. Likewise, fostering inclusive policy interventions, ensuring accessible climate finance, and establishing governance systems that prioritize equity are essential to scale and sustain these efforts. The framework underscores the importance of synergizing ILK with holistic, multi-sectoral interventions that integrate climate resilience with sustainable resource management, livelihood security, and health system strengthening.

2.3 Study Design

RRN, in partnership with the Dedicated Grant Mechanism (DGM) for Indigenous Peoples and Local Communities (IPLCs) Nepal, conducted a study to document the grassroots perceptions of climate change in Madhesh and Lumbini. A cross-sectional qualitative study approach was adopted in a phenomenological manner to deconstruct the participants lived experiences of climate change.

Phenomenology is defined as a research approach that focuses on understanding the essence of a phenomenon by exploring individual lived experiences (Teherani et al., 2015). Its goal is to describe the meaning of these experiences both in terms of what was experienced and how it was experienced (Teherani et al., 2015). Hermeneutic phenomenology has been used in the study to interpret and make sense of these lived experiences by considering the contextual and subjective meanings embedded within them.

2.4 Data Collection Method

The study utilized Focus Group Discussions (FGDs) as the primary data collection technique, conducting 10 sessions with 79 participants in total. FGD is a qualitative data collection tool that provides in-depth insights into how groups view an issue, capturing diverse perspectives and shared experiences to better understand the complexities of the topic (Eeuwijk et al., 2017). It gives a collective voice to marginalized groups and empowers them to share their opinions about specific issues (Sage Publication, 2010). The FGDs facilitated in-depth discussions to capture the nuanced experiences of diverse populations and stakeholders.

A purposive sampling was used for the selection of participants. All selected participants were residents of Madhesh and Lumbini. Among the 79 participants, 50 were male and 29 were female. The primary data was collected at the community level during two field visits. The first field visit was completed on 24 October 2024, and the second field trip on October 26, 2024, respectively. The FGDs took place in the Bhaluwang, Dang (Lumbini) and Bardibas, Dhanusha (Madhesh). The fieldwork relied on self-reported data from the participants across various districts and communities at the provincial level. A total of 8 moderators and 8 notetakers facilitated the discussions. A multidisciplinary team was formed before the field work and trained on conducting FGDs to maintain the uniformity across the process.

2.5 Data Analysis

The transcripts of the 10 FGDs were transcribed from audio recordings and translated in English by the study team involved. The transcripts were coded and analysed using thematic analysis, following an inductive approach. The thematic analysis was used to make sense of broader patterns, themes, categories, and relationships with the data. The data was organized using an Excel spreadsheet, where themes and sub-themes were coded and categorized in a systematic manner. The analysis was conducted qualitatively through several rounds of reading and coding, with Excel providing an efficient way to track, organize, and refine emerging patterns from the data. These data were triangulated with secondary sources and data available including, policy documents, research articles, organizational reports, and grey literature.

2.6 Ethical Consideration

All study participants were given the option to choose their preferred level of anonymity to mitigate any perceived risks. They were informed about the purpose of the study, and their verbal consent was obtained prior to starting the FGD. Participants were informed that their participation in the study was entirely voluntary and that they could withdraw their consent at any time. Permission was taken from the participants to record the FGD and take notes during the session. The FGDs were transcribed and translated into English for analysis. The confidentiality of the participants has been strictly maintained while presenting the findings of the study. All identifying details were removed, and quotations were paraphrased to prevent traceability. All data were securely stored in the researcher's personal computer, which was protected by password-protected private logins and accessible only to the study team. Audio recordings of the FGDs were permanently deleted after transcription.

3. STUDY POPULATION

This study engages the following stakeholders through FGDs.

3.1 Indigenous Peoples and Local Communities (IPLCs) Representatives

IPLCs are custodians of natural resources and possess valuable indigenous and local knowledge that significantly contribute to environmental stewardship and sustainable ecosystem management. Their traditional practices are deeply rooted in their spiritual, social, and cultural values (The state of Indigenous Peoples' and Local Communities' lands and territories, 2021). Despite their intrinsic connection to natural ecosystems (land, forest, and water), IPLCs frequently face systemic barriers that limit their access to resources and decision-making processes. The accelerating impacts of climate change are directly adversely affecting their livelihoods, cultural heritage, and spiritual beliefs. According to the 2021 Census, Indigenous Peoples comprise 35 per cent of the total population in Nepal (CBS, 2021). Engaging meaningfully with IPLCs allows for an understanding of their lived experiences and perception of climate change and traditional practices. Their perspectives are essential for effectively integrating ILK into the design and implementation of inclusive and culturally grounded climate strategies.

3.2 Women

Climate change is not gender neutral. It disproportionately affects women due to biological, social, economic, and cultural factors. In rural communities, women face compounded

vulnerabilities owing to limited access to rights, assets, resources, and decision-making power (UN Women, 2021). They shoulder the burden of unpaid household care work and are often engaged in small-scale, climate-sensitive agriculture or informal labour with little to no safety nets (Red Cross Red Crescent Climate Centre, 2021). Often, the gender component of climate change policies presents women as victims, rather than acknowledging their roles as leaders, innovators, and drivers of social transformation (UN Women, 2021). In Madhesh and Lumbini, where women constitute 49.86 per cent and 52.08 per cent of the population respectively, their perspectives and experiences are critical to understanding the gendered dimensions of climate change (CBS, 2021). Including women in the discussions ensures a comprehensive understanding of their unique challenges and strengths, thereby enabling the development of gender-responsive climate strategies.

3.3 Youth

Youth play a vital role as agents of change in addressing climate change. In Nepal, 42.5 per cent of the total population constitutes of youth (16-40 years), yet they remain an understudied demographic in climate change research and dialogue (CBS, 2021). In Lumbini, 43 per cent of the total population comprises of youth and 41 per cent in Madhesh (NDHS, 2022). They experience the firsthand disruptions of climate-induced disasters that create uncertainty about their future, impacting access to education, livelihood opportunities, and well-being. Many young people in rural areas are grappling with disrupted education, forced migration, and a growing reliance on precarious informal work. Their perspectives are key to bridging traditional knowledge with innovation, enabling the development of climate resilient strategies that align with the needs and aspirations of future generations.

3.4 Community-Based Organization (CBO) Representatives

CBOs serve as crucial intermediaries between grassroots communities and broader governance structures. In Nepal, CBOs are deeply embedded within local communities and are instrumental in raising awareness, advocating for marginalized groups, and supporting policy development and implementation. They play a critical role in mobilizing resources, facilitating community participation, and implementing locally driven solutions. In the study CBO representative included, Community Forest User Group (CFUGs), private forest users, leasehold forest user groups, and local NGOs. Their knowledge and field-level experience offer valuable perspectives on equity, cultural sensitivity, and practical approaches to climate resilience.

3.5 Local Government (LG) Representatives

LGs are pivotal in planning and implementing climate adaptation and disaster risk reduction strategies. Climate change adaptation requires three tiers of governments to collaborate effectively to build local adaptation capacities (Ishtiaque, et al., 2021). After the adoption of new constitution in 2015, Nepal transitioned into a federal structure where local governments are responsible for building climate resilience, development efforts, and their implementation. The National Climate Change Policy 2019 further underscores this mandate by committing to channel about 80 per cent of climate funds to the local level (Bishwokarma et al., 2021). Engaging with LG representatives offers valuable insights into existing strategies, governance challenges, and policy gaps.

Table 2: Composition of FGD Participants by Group

FGD Groups	Madhesh	Lumbini
IPLCs	8	8
Women	8	7
Youth	10	10
CBOs	10	3
LG	8	7
Total	**44**	**35**

4. LIMITATION

Madhesh and Lumbini provinces were selected based on the presence of DGM project areas and logistical convenience. As a result, the findings are not representative of or generalizable to the entire country, given the contextual and regional variations across Nepal. The analysis relies on participants lived experiences and retrospective incidents that may introduce potential inconsistencies, as community memories may have faded, making it challenging to document the full extent of the impacts. The study's limited timeframe restricted the depth and extent. Moreover, the provinces do not have comprehensive data of the Vulnerability Index and Loss & Damage which may introduce disparities and limit cross-verification.

5. FINDINGS AND DISCUSSIONS

5.1 Impact on Natural Resources

Natural resources play a vital role in maintaining the balance of ecosystems and human development. It regulates the environment and supports the livelihoods of rural communities. The ecologically rich landscape of Nepal is home to over 118 ecosystems, 75 vegetation types, and more than 35 forest types that harbour approximately 3.2 per cent and 1.1 per

cent of world's known flora and fauna respectively (Dhakal et al., 2018). However, climate change is disrupting Nepal's natural resources, with profound impacts on ecosystems and communities that depend on it. Rising temperature, erratic rainfall patterns, and extreme weather events are leading to the degradation of forests, biodiversity loss, and reduction in the availability of water. This growing pressure on natural resources threatens food security, livelihoods, and the resilience of grassroots communities.

5.1.1 Forest and Biodiversity

Nepal is known for its diverse ecosystems, encompassing the Himalayas, tropical forests, and wetland regions. However, these rich natural landscapes face profound threats to forest and biodiversity due to climate change. Rising temperature and precipitation variability is changing plants phenological cycles, such as flowering, fruiting, and leaf shedding. Species like Lali gurans (Rhododendron arboreum), kaphal (Myrica esculenta), and utis (Alnus nepalensis) now bloom 15–30 days earlier than before. These shifts in phenology, combined with broader vegetation changes, and changes in functional and physiological traits, are expected to reshape forest composition and reduce floral diversity. Habitat loss and fragmentation is leading to shifts in species distribution, altered breeding and migration patterns, emergence of invasive species, and creating challenges for biodiversity conservation (MoSTE, 2010; MoFE, 2021).

The total forest cover of Nepal is 43.38 per cent, with 25.86 per cent forest cover in Madhesh and 54.66 per cent in Lumbini, excluding OWL (FRTC, 2024). About 80 per cent of rural households derive some or their entire livelihoods from the forestry sector. (MoFE, 2021b). Climate change is disproportionately impacting the livelihoods of marginalized groups, including women, Indigenous peoples, Dalit communities, and low-income households, that depend heavily on forests for sustenance, income, and employment (MoFE, 2021a). As climate change reduces the availability and quality of forest products such as food, fuel, and medicinal plants their vulnerability deepens, further restricting their access to critical resources (Khanal et al., 2019). This intensifies existing disparities, pushing already disadvantaged communities into greater precarity as their primary means of survival and economic stability erode.

Forest fire is a growing issue, causing widespread destruction in many regions of Nepal. These fires damage forest ecosystem and environment, leading to property damage and human casualties every year. A recent study by Dahal et al., 2025 shows variation in forest fire susceptibility across Nepal's subnational regions over the past two decades, highlighting the overall increase in forest fire susceptibility in Lumbini, Madhesh, and Sudurpashchim provinces. Between 2001 and 2020, Lumbini province recorded the highest number of forest fire occurrences, averaging 545 incidents annually and burning a total of 72,090 hectares (Bhujel et al., 2022). The FGD findings reveal that increasing temperatures, prolonged dry seasons, and shifting rainfall patterns have led to more frequent and intense forest fires across Madhesh and Lumbini. A youth participant from Lumbini stated, ***"These days, forest fires have become more common around here in Dang. Back in 2022, a forest fire in Rajpur Rural Municipality burned down the whole village — nothing was left."*** According to an Oxford Policy Management (OPM) report forest fire is becoming a dominant hazard in Arghakhanchi, Rukum, and Dang (Dhruba et al., 2019).

At the local level, CFUGs play a crucial role in preventing and managing forest fires. A CFUG member and a CBO participant from Madhesh, shared, ***"Forest fire prevention***

is not just a community-level concern—it is a national issue. We lack the necessary equipment to put out these fires and it is crucial for the government to invest in adequate firefighting equipment and prioritize awareness campaigns on prevention and preparedness strategies."

Human- Wildlife Conflict (HWC) refers to conflicts that occur when wildlife poses actual or perceived direct, recurring risks to human interests or needs. It causes communities to suffer from various issues, including crop damage by wild herbivores, killing of livestock by wild predators, damage to infrastructure, and potential human injury or death. During the FGDs, HWC emerged as a growing issue, with habitat loss, fragmentation, and climate change leading to increased encounters, resource competition, and challenges in coexistence. The participants revealed increased encounters with wild boars, Nilgai (blue bulls), and monkeys. A female participant from Madhesh shared, ***"Monkeys and wild boars have made our lives extremely difficult. They raid our crops time and again and we have no proper support or solution to address this issue."*** Similarly, in Lumbini, participants highlighted how unregulated road construction, and habitat destruction have disrupted wildlife corridors, increasing HWC.

Climate change has amplified the risk of **Invasive Alien Plant Species (IAPS)**, altering the ecosystem, creating favourable conditions for their spread, and threatening native biodiversity and local ecosystems. IAPS exhibit a higher capacity for rapid niche shifts compared to native species, enabling them to adapt more swiftly to changing climatic conditions (Hellmann et al., 2008). FGD participants observed an increase in IAPS like Banmara (Mikania) resulting in ecological disruptions. An IPLC participant from Lumbini shared, ***"Invasive plant species are harming our native habitats and traditional tree species."*** Likewise, a CBO participant from the Madhesh reported, ***"Invasive plants are becoming a major issue for us. They are disrupting local ecosystems and reducing the productivity of our farmlands. Without proper management, this problem will only get worse."*** IAPS in Nepal are spreading through both natural processes such as dispersal by wind, water, and animals and human-induced factors including introduction for ornamental or soil conservation purposes, transportation via vehicles and agricultural produce, and contamination of transport materials (Shrestha, 2016). Their proliferation poses significant threats to forests and other ecosystems by disrupting native plant regeneration, altering ecosystem functions, modifying species composition, and degrading wildlife habitats. Consequently, these ecological changes also have far-reaching socioeconomic implications for local communities (Dhungana et al., 2024)

Sisau (Dalbergia sissoo) is a valuable tree species in the sub-Himalayan region, widely planted in Nepal. Sisau plantations are integral to subsistence and economic stability for local communities, serving as a primary source of timber production, fuelwood, and microclimate regulation for agroforestry systems (Dhakal, 2008). It holds great significance for some local communities and is important for maintaining the ecological balance. However, it faces growing threats from various biotic stressors, including insect and fungal infections affecting its growth across the region. Common symptoms of dieback disease in sisau trees include drying of leaves and branches, changes in colour, and wilting of the crown, ultimately resulting in the tree's death (Tantau et al., 2005). A CBO participant from Madhesh mentioned, ***"At the rate things are going, we won't see any Sisau trees around here in the next 15–20 years. Our kids might grow up not even knowing about these trees that***

used to be so important for making furniture in our days." Additionally, the participants also reported that there were no significant disease infestations in the past 35-40 years, but now sisau is heavily infested by diseases, further threatening its existence which will led to huge economic loss.

Nepal faces critical **forest management challenges** due to insufficient sustainable practices, resulting in aging stands, poor regeneration, and declining productivity. The limited application of silvicultural techniques (thinning, selective harvesting, enrichment planting) has left forest potential untapped, while fragmented governance and weak policy implementation across government levels exacerbate degradation. (Poudyal et al., 2020). A LG representative from Lumbini emphasized, ***"Older trees are dominating the landscape, leaving little room for regeneration and contributing to lower oxygen production and environmental protection."*** Local perspectives underscore the need for sustainable forest management and the removal of over-mature trees to promote regeneration.

5.1.2 Water

Nepal is endowed with abundant water resources, including glaciers, rivers, lakes, ponds, and groundwater. However, the country faces the paradox of too much and too little water, with challenges of water management and access (Baral et al., 2023). Shifting precipitation and rising temperatures have intensified extreme weather events such as floods and droughts disrupting water availability and increasing the frequency of water-related disasters. Among the Hindu Kush Himalayan (HKH) region, Nepal experienced the highest net reduction in perennial snow and ice, with a 31 per cent decline between 2001 and 2021 due to rising temperatures, diminishing a critical buffer against surface water shortages in major river basins (Khan et al., 2024; USAID, 2021). This has led to recurrent droughts and heightened the risk of forest fires, further degrading watersheds and exacerbating water insecurity (Motiee et al., 2024; USAID, 2021).

Nepal possesses an annual water availability of 225 billion cubic meters (BCM). Among 15 BCM utilized volume; agriculture accounts for 95.9 per cent, domestic use for 3.8 per cent, and industrial purposes for a mere 0.3 per cent (ADB/ICIMOD, 2006). Despite this national abundance, geographical disparities and infrastructural limitations exacerbate water insecurity in monsoon-dependent regions.

During the prolonged dry seasons in Madhesh and Lumbini, there is heightened water scarcity, while intense rainfall events increase the risk of floods and landslides. Participants in Madhesh and Lumbini expressed deep concerns over the drying up of local water sources. In the mid-hill region, where springs serve as the primary water source, their discharge has steadily decreased by 30 per cent over the past three decades (MoFE, 2021a). Meanwhile, in the Terai region, groundwater depletion is reducing the recharge rate and causing a decline in water tables. This has made both drinking water and irrigation increasingly inaccessible to grassroots communities. A CBO representative from Lumbini shared, ***"During the months of March and April, we cannot find water easily and it usually takes twice the amount of time to fetch water from the same sources compared to around five years ago. Most of the water sources in our area have dried up."***

Women and girls, who are primarily responsible for collecting water in Nepal, now bear the additional burden of walking longer distances to fetch water, particularly during prolonged

dry spells. This further limit their time for education, income- generating activities, and overall wellbeing. A female participant from Madhesh shared, ***"We have to wake up at 3-4 am in the morning to fetch water, so that we can do our other daily chores."*** With only one source of water for the whole community, women often stand in long queues where marginalized groups, particularly Dalit women often face systemic exclusion, further reinforcing their vulnerability. An IPLC participant from Madhesh shared, ***"With increasing water scarcity, caste-based violence and resource conflicts have increased. Two such incidents have recently been covered by the local media."***

The decline in water sources is also increasingly threatening agricultural livelihoods. Participants expressed deep concerns over the growing challenge of water scarcity for farming and irrigation. A CBO representative from Madhesh shared, ***"Before, we could get water just 25-30 feet below, but now even at 400 feet, there's hardly any water."***

The Lumbini Province has made remarkable progress, with 76.7 per cent of the population having access to water. Water resources are affected by a province's physical vulnerability to disasters like earthquakes and floods. Merely 25 per cent of water distribution networks are functioning at full capacity. However, approximately 40 per cent of water distribution systems require significant repair. Disasters linked to climate change and changes in rainfall patterns result in a reduction in spring-water output.

Participants in both provinces shared that heavy downpour is increasing the incidents of floods and landslides. While flooding is an annual phenomenon in the region, in recent years, the frequency, duration, and intensity of these events have noticeably increased. In Madhesh, rivers like the Koshi, Bagmati, Kamala, and Lakhandei frequently overflow during the monsoon, inundating settlements, and farmland. Similarly, in Lumbini, rivers such as the Rapti, Rohini, and Tinau pose a constant threat, especially during peak rainfall. A youth participant from Lumbini shared, ***"The situation is getting worse because of deforestation in the Chure hills and unplanned development. Even a few hours of rain is enough to flood our communities now."*** Participants also expressed deep concerns about the extensive damage to property, loss of life, and cases of people going missing during flash floods, along with widespread displacement.

Vulnerable and landless communities residing along riverbanks are disproportionately affected, facing recurrent losses due to increasing riverbank erosion and flood hazards intensified by changing weather patterns. Many families struggle to rebuild in the aftermath. They further highlighted that roads are often damaged or blocked, transportation grinds to a halt, and power supply is frequently disrupted for days.

5.2 Impacts on Livelihoods

Nepal is predominantly an agrarian country with a large portion of its population dependent on subsistence farming, forestry, and livestock for their livelihood. In addition to this, labour migration also forms the backbone of income generation. With climate change posing serious threats to crop yields and growing water scarcity, household income is shrinking, pushing many families into poverty. This economic strain impacts household's food security, educational outcome, and employment opportunities, pushing many youths to migrate urban cities or abroad.

5.2.1 Agriculture and Food Systems

Agriculture is a cornerstone of Nepal's economy, contributing 24 per cent to the GDP and providing employment for nearly 65 per cent of the population. It is the main source of income and livelihoods in rural areas. Major crops such as rice, maize, wheat, millet, tea, coffee, and cardamom are central to the country's agricultural landscape.

Despite abundant agricultural resources 7 per cent of the agricultural land remains uncultivated. The agricultural system is largely composed of smallholder farmers, with each household averaging 0.73 hectares of land, and 55 per cent of households cultivating in less than 0.5 hectares (Catholic Relief Services, 2022).

The impacts of climate change on agriculture are complex and multi-dimensional, deeply interconnected with agroecological, socioeconomic, and political processes that shape food security and agricultural trade. Extreme weather events are anticipated to have profound implications for crop production, particularly in Terai, where rice and wheat yields are expected to decline significantly (Sapkota, 2020). While the hills and mountains may experience mixed effects, overall food production in the country could decrease by 3.5 per cent by the 2050s and 12.1 per cent by the 2080s, leading to potential losses of up to 1.04 million metric tons (Sapkota, 2020). The most pressing concern is the rise in temperatures and water scarcity, which is drastically altering crop physiology and agricultural productivity.

a. Crop Physiology

Climate change has far-reaching effects on plant physiology processes, such as photosynthesis, respiration, transpiration, nutrient intake, mineral balance, and ionic exchange, all of which are crucial for agricultural productivity. Empirical observations reveal

that elevated temperatures are accelerating crop phenology, causing premature maturation of crops before they accumulate sufficient biomass, thereby reducing their yield potential. Participants from Madhesh highlighted their concerns on the detrimental impacts of rising temperatures on crop production. A CBO representative from Madhesh shared ***"Due to climate change, we have observed maize plants developing tassels and silk, but the cobs remain empty without kernel formation."*** This phenomenon could be attributed to heat stress during the pollination phase. High temperatures and heatwaves during flowering can cause asynchronous pollination, leading to pollen sterility, reproductive failure, and diminished grain filling (Ruane & Rosenzweig 2019).

Similarly, unpredictable rainfall patterns including long dry spells during planting and heavy downpours at harvest time have caused widespread crop damage reducing the crop yield. A female participant from Madhesh shared ***"The level of production has declined. During the paddy plantation season there is no rain, but during harvesting time there is so much rain that it destroys our harvests."*** These conditions contribute to declining crop yields, threatening the sustainability of food production systems in the region.

b. Pest Dynamics

Climate variables such as temperature, humidity, and precipitation highly influence the growth, development, and proliferation of pests, including insects, fungi, bacteria, and viruses. As climate change continues to alter these variables, pest populations are expected to fluctuate, leading to shifts in their prevalence and distribution. In Madhesh increasing pest and disease infestations have been reported in agricultural crops, particularly maize and tomatoes. Participants revealed outbreaks of ausi kira (Tuta absoluta) in tomatoes and fauzi kira (fall armyworms) in maize. Similarly, a CBO representative from Lumbini shared ***"Maize production has substantially decreased. New pests like fauzi kira which did not exist before 2018 have emerged and reduced maize production."*** Many crop pests exhibit a "stop-and-go" response to temperature, thriving and reproducing rapidly when conditions are favourable.

Shifts in precipitation patterns and longer growing seasons can also expand the availability of host plants, supporting the surges in pest populations. With rising temperatures, these insects may experience faster development and an increased number of generations per season. Studies suggest that a 2°C temperature increase could lead to one to five additional pest life cycles annually, increasing the risk of crop losses and demanding more effective pest management strategies (Shrestha, 2019). In response, farmers are increasingly resorting to pesticides, which exacerbates pesticide resistance and increases the reliance on chemical inputs. A youth participant from Lumbini shared ***"Most people who have returned from abroad are engaged in farming. But we have to deal with many newly emerging pests and diseases. Without insecticides and pesticides, we cannot grow anything."*** Increasing pest infestation resulting in lower production has discouraged many youths from engaging in agriculture and pushing many youths to go abroad for job opportunities.

c. Soil Health

Soil degradation is a gradual process driven by human activities rather than an immediate occurrence. Rising temperatures, erratic rainfall, and extreme weather events further accelerate soil degradation, making it even harder to restore fertility naturally. The decline

in soil fertility in Madhesh and Lumbini has forced farmers to rely heavily on chemical fertilizers to maintain production. A CBO representative from Madhesh shared, ***"Soil fertility has decreased compared to past years due to the use of chemicals. This is also a reason why we haven't been able to fully adopt organic agriculture yet. Before we transition to organic agriculture, the fertility of the soil needs to be restored."***

Excessive chemical fertilizer use, particularly nitrogen-based fertilizers, disrupts soil microbial balance and reduces the population of earthworms that enhance soil aeration, organic matter decomposition, and nutrient cycling. The declining presence of earthworms and other beneficial soil biota further weakens soil structure, making it harder to retain moisture and sustain fertility. Over time, the growing use of agrochemicals have led to the exhaustion of soil nutrients, making farming increasingly dependent on external inputs. An IPLC participant from Madhesh shared ***"Soil fertility has decreased rapidly in the past. We have to use urea for maize production in the hilly regions, without which we do not have any yield."***

Climate change is also pushing farmers toward hybrid seeds due to declining yields. While these seeds offer higher yields, they require intensive fertilizer use, which further accelerate soil degradation. A CBO representative from Lumbini shared, ***"We have overlooked native seeds in favour of imported hybrids, draining resources abroad while increasing dependency on chemical inputs. "*** This shift away from native seeds has not only increased costs for farmers, but also reduced agricultural diversity, making farming systems more vulnerable to pests, diseases, and changing climate conditions. As climate change alters rainfall patterns and temperature extremes, hybrid seeds which often depend on stable environmental conditions may become less reliable, further increasing farmers' reliance on chemical inputs to sustain productivity.

Another major concern in both regions is the growing trend of agricultural land abandonment. As farmlands are left uncultivated due to migration, labour shortages, and urbanization, pressure on remaining agricultural land increases. A youth participant from Lumbini shared, ***"With many people from the hills migrating to Terai or abroad for better opportunities, fertile lands are being left uncultivated. Those who remain are relying more on the market for food rather than growing it themselves, gradually losing their connection to farming."*** To meet the increasing food demand in a shorter time period farmers, turn to high-yield hybrid varieties that promise quick returns. This has contributed to the loss of locally available seeds, weakening traditional farming systems that were once more self-sufficient and resilient. Climate change intensifies these pressures, as more frequent droughts, floods, and heatwaves reduce the viability of farmland, forcing farmers to either abandon agriculture or adopt unsustainable practices to maintain yields.

5.2.2 Education

Education is a fundamental human right, and the Constitution of Nepal guarantees free and compulsory education for all children of school-going age (Ministry of Education, Science and Technology, 2019). Over the past two decades, Nepal has made considerable progress in education (UNICEF, 2022). However, climate change poses a growing challenge to this sector, threatening school infrastructure, access, and learning outcomes.

A study by UNICEF found that the school infrastructure and facilities in Nepal are not 'climate friendly' (Kagawa, 2022). The study highlighted that floods, landslides, and strong winds

are the main causes of immediate and direct damage to school infrastructure. Climate-related shocks have severe and far-reaching impacts on children's education and long-term learning outcomes. A 2020 UNICEF survey in Nepal, found that 78 per cent of respondents reported climate change had affected their education or studies, while 18 per cent noted its impact on their journey to school (UNICEF, 2021).

Participants emphasized that extreme weather events frequently damage or destroy school buildings, leading to prolonged closures limiting children's access to education. A youth participant from Lumbini stated, ***"When floods hit, schools remain closed for days. There is no proper environment to go to school and parents are often scared to send their as well."*** Commuting to school was highlighted as a significant challenge during heavy rainfall and floods.

In Madhesh and Lumbini, summer temperatures reach above 40°C, making it extremely difficult for students to focus on classrooms. Participants highlighted that schools mostly have tin roofs, which intensify indoor heat, leading to unbearable conditions. The extreme heat results in increased student absenteeism, as children experience symptoms such as fainting, dizziness, and loss of appetite.

A youth participant from Madhesh shared ***"Heatwaves have significantly affected the school calendar. Schools remain closed for days during extreme heat, causing delays in completing the syllabus."*** It was revealed that in Lumbini, the LG declared holidays for seven days during extreme heat, five days during floods, and three days during heavy rainfall.

Similarly, during cold waves, schools lack proper insulation and heating, making classrooms extremely cold and uncomfortable for students. This dual challenge of extreme heat in summer and cold in winter underscores the urgent need for climate-resilient school infrastructure that provides a safe and conducive learning environment year-round. A woman participant from Lumbini shared, ***"I have seen how changing weather patterns are affecting education. Students struggle to attend school because of the heat and unpredictable rainfall. It's heartbreaking to see children miss out on learning because of something they have not contributed to and have no control over."***

In addition to this, climate-induced economic hardships also force children out of school. Poor harvests and food scarcity drive families to prioritize survival over education, often leading to child labour. Participants noted that in such situations, young children, especially girls, are more likely to be pulled out of school to contribute to household income.

5.3 Migration

Migration refers to the movement of people from their usual place of residence to a new place, either across an international border or within a state (IOM, 2023). People migrate for various reasons, such as seeking better employment opportunities, improving their living conditions, or fleeing from conflict and natural disasters, among others. In Nepal, political dissatisfaction, lack of quality education, and limited employment opportunities are widely established as the main drivers of migration (Sherpa & Bastakot, 2021). In recent times international labour migration for foreign employment has picked up substantially and is serving as a key livelihood strategy for Nepal's economy (Sherpa & Bastakot, 2021). According to the 2021 Census, 15.2 per cent of the population migrated for work, 0.7 per cent

due to natural disasters, and 3.9 per cent for agricultural reasons (CBS, 2021). However, research on climate-induced migration remains scarce, with limited information (World Bank Group, 2022).

The findings from the FGDs indicate that while migration within and from Madhesh and Lumbini are driven by multiple factors, climate change is playing an increasingly significant role in shaping migration patterns. Both regions, heavily reliant on agriculture, face growing threats from erratic monsoon patterns, prolonged droughts, extreme heatwaves, and frequent floods. Participants expressed deep concern over the declining reliability of agriculture as a livelihood and increased food insecurity as recurrent floods destroy their fields and prolonged dry spells reduce yields.

A youth participant from Lumbini shared, ***"When disasters keep happening, why would one want to live or work in these areas? Recurrent floods, droughts, and landslides leave people with no choice but to leave their hometowns."*** As climate change and its impacts increase in intensity and frequency, and communities do not receive sufficient support to cope with these disasters, they are compelled to migrate, either to urban centres like Kathmandu, Biratnagar or abroad.

Similarly, seasonal cross-border labor migration to India, a long-standing practice in the Terai, and international labor migration to Gulf nations were both reported to be on the rise. Remittances from migrant workers have become a crucial economic safety net for families left behind. In Nepal, one in three households receives remittances that contribute significantly to the economic dynamics of a household (Riyal, 2022). FGD findings indicate that as families become more reliant on remittances, many no longer feel the need to engage in farming. Instead, they purchase goods from the market, signaling a shift away from local agricultural production and a growing dependence on remittances for sustenance.

While remittances play an essential role in sustaining rural economies, they come at a cost. The outmigration of working-age men, coupled with the influx of remittances, has led to significant socio-economic changes in rural communities. While this phenomenon has led to a notable rise in household expenditure, it has also led to the 'feminization of agriculture,' where women have increasingly stepped in to fill the labor gap left by migrating male workers (KC & Race, 2020). This has resulted in an increased workload for women to manage farm work, natural resources, household duties and care responsibilities without corresponding changes in their decision-making power or access to resources. A woman participant from Lumbini shared ***"With my husband working abroad, I have had to take over the farming responsibilities. But the extreme heat and erratic rains have made it nearly impossible for me to sustain our crops. Each season feels more uncertain than the last."***

Migration within Lumbini is also increasing, with many people moving from the hills to lower regions. A report by Sah (2024) indicates that water scarcity is becoming a major driver of migration in hilly areas. The populations in the hills are decreasing as many are migrating downward to the Terai region. An IPLC participant from Lumbini explained, ***"As water sources deplete in the hills, people are forced to move downhill. This disruption is leading to the breakdown of community unity, and the loss of language and culture is becoming more apparent. As a Magar's daughter, I understand my language, but I find it difficult to respond."***

Adding to the concerns surrounding internal migration, a youth participant from Lumbini said,

“The Terai is the food bank of Nepal. People from the hills are coming down here, building houses and roads. Where are we supposed to grow our food when there is no land left?” The increasing migration is putting pressure on available resources and changing the local social structure. This could lead to resentment within the host population and potentially lead to conflicts over a period of time.

Additionally, migration has also led to the decline of cultural practices and traditional ways of life. IPLC participants noted that products such as doko, dhungro, tapari, and others made from forest products have lost their significance as many of the youth no longer know how to make them. In their place, plastic products have become rampant in villages, further eroding traditional craftsmanship and cultural heritage. Participants expressed deep concern that as these practices fade, younger generations are becoming increasingly disconnected from their cultural roots and indigenous knowledge systems. Moreover, as families migrate, the sense of community in rural areas is weakening. Close-knit social structures that once provided informal support systems are gradually disintegrating, leaving behind fragmented communities. The growing link between climate change and migration in Nepal is reshaping rural livelihoods and contributing to multiple and overlapping crises.

5.4 Impacts on Health and Wellbeing

Climate change is increasingly exposing people to both direct and indirect negative health impacts, contributing to rising deaths and growing disease burden (WHO, 2023). Direct effects stem from exposure to extreme weather events and climate-induced disasters such as floods, extreme heat, and droughts (Haines et al., 2006). These include fatalities from floods and landslides, an increase in cardiovascular mortalities during heat waves, and a higher incidence of chronic kidney disease among outdoor workers in high-temperature areas (Heal et al., 2016). Indirect health impacts stem from environmental and ecosystem disruptions caused by changing climate, such as crop failures leading to malnutrition, the geographic expansion of disease vectors, and reduced labour capacity (Heal et al., 2016; Kjellstrom et al., 2016; Mojahed et al., 2022; & Ray et al., 2019). The severity of these health impacts is shaped by level of exposure, individual and community vulnerability, and adaptive capacity. Notably, these health effects disproportionately affect at-risk populations, including children, women, the elderly, and persons with disabilities (PwDs).

In Nepal, the effects of climate change on population health are profound and multifaceted. A study by Lüthi et al. (2023) reveals that rising temperatures, extreme weather events, and air pollution are contributing to an increase in health issues and deaths. Extreme weather events are triggering floods, landslides, and forest fires, destroying homes and displacing families, exacerbating pre-existing health vulnerabilities (MoPE, 2021). Between 1971 and 2019, climate-related disasters accounted for around 65 per cent of all disaster-related deaths in Nepal (excluding road accidents), with an average of 647 lives lost annually (MoPE, 2021).

5.4.1 Non-Communicable Diseases

Non-communicable diseases (NCDs), also known as chronic diseases, are long-lasting health conditions that do not spread from person to person (WHO, n.d.(a)). They arise from a combination of genetic, physiological, environmental, and behavioural factors. In Nepal, the burden of NCDs is increasing, with climate change significantly compounding existing health risks. According to the Nepal Burden of Disease Study 2019, NCDs account for 71 per cent of the deaths in the country (MoHP, 2021).

Air pollution is one of the significant drivers of NCD and a significant public health issue. The increasing frequency of forest fires, prolonged heatwaves that trap pollutants, and accelerating the formation of ground-level ozone are deteriorating air quality. A joint report by the Department of Environment (DoE) and the International Center for Integrated Mountain Development (ICIMOD) revealed severe air pollution in Lumbini. High fine particulate matter (PM2.5) concentrations reached 155 µg/m³ in this region, far exceeding the acceptable limit of 40 µg/m³ (Nepal Forum of International Journalists, 2019).

Air pollution is a major contributor to the escalating NCD crisis. Exposure to polluted air is linked to premature deaths and disability from respiratory illnesses and cardiovascular diseases (Barbier et al., 2023). The WHO classified air pollution as a human carcinogen in 2013. Short-term exposure to fine Particulate Matter (PM2.5) has been linked to reduced lung function in children (Xu et al., 2020) and healthy adults (Int Panis et al., 2017). Long-term exposure is associated with life-threatening conditions such as lung cancer, asthma, COPD, Stroke, heart attack, and disorders affecting the reproductive, neurological, and immune systems (Karki et al., 2010; Zhang et al., 2024). Climate-induced displacement and socioeconomic stressors further limit access to essential healthcare services, creating significant barriers to the prevention, diagnosis, and management of NCDs.

Air pollution disproportionately affects districts in the Terai region, where communities are already exposed to a high burden of disease. Residents frequently report cases of asthma, Chronic Obstructive Pulmonary Disease (COPD), chronic lung disease, cardiovascular diseases, allergic reactions, and challenges in outdoor labour due to polluted air. Participants in FGDs expressed deep concern over worsening air quality in both provinces, noting an increase in deaths from diseases such as respiratory illness and cancer. While industries are vital for development, participants also raised concerns about industrial pollution, particularly from cement dust and emissions, which contribute to smog and respiratory disease. An LG representative from Lumbini emphasized the growing health crisis, stating, ***"Air pollution has become a growing problem. Respiratory diseases are increasing nowadays, and coughs cannot be treated easily. We are even seeing increasing cases of asthma in children."***

Recent air quality data further underscores the urgency of air pollution. As of March 20, 2025, the Nepal Air Quality Index (AQI) reports that Janakpur's AQI stands at 157, with PM2.5 concentrations 12.8 times higher than the WHO's annual guideline value (Air Quality Index, 2025). A press statement issued by the Air Quality Life Index (AQLI) warns that residents in Nepal's southern belt face a potential reduction of 5.1 years in average life expectancy due to extremely poor air quality, causing cardiovascular and lung diseases (AQLI, 2024). An LG representative from Madhesh expressed concern, stating, ***"The worsening air quality in Janakpur is becoming an increasing concern for us. Residents have been reporting headaches and fatigue more frequently."*** The worsening air pollution and extreme heat are rising burden of NCDs in these communities, creating an additional healthcare burden on at-risk populations, including children and women.

5.4.2 Maternal and Reproductive Health

Maternal health refers to women's physical, psychological, and emotional well-being during pregnancy, childbirth, and the postnatal period, as well as the absence of any morbidities or deaths due to pregnancy or its management (Ojong et al., 2023). Reproductive health encompasses all matters relating to the reproductive system, including its functions and processes, while emphasizing complete physical, mental, and social well-being (WHO, n.d.(b)). Despite increasing efforts to improve maternal and reproductive health, climate change is exacerbating these challenges, particularly among marginalized and rural communities in Nepal.

Heat waves have a profound impact on maternal health, with even slight temperature rise above 20°C linked to a higher risk of low birth weight, preterm births, and stillbirths (McElroy et al., 2022). During pregnancy, a woman's ability to tolerate heat decreases due to physiological changes that raise metabolic demands, increase body temperature, and heighten the risk of heat stress and dehydration. A study by Ha et al. (2017) found that 1°C increase in temperature in the week prior to delivery corresponds to a 6 per cent increased risk of stillbirth. These factors pose a severe threat to fetal health and increase the mother's risk of life-threatening conditions, including excessive bleeding and sepsis (Baharav et al., 2023). A CBO participant from Madhesh shared, ***"We are seeing more health issues in pregnant women, like constant headaches and serious pregnancy complications. Some are even giving birth as early as seven months, way before they are supposed to."***

The increasing frequency and intensity of climate-induced disasters, such as floods and landslides, further disrupt access to essential healthcare services, placing pregnant women and newborns at even greater risk (Kandel et al., 2017). Climate change also exacerbates food insecurity, leading to heightened risks of maternal and child malnutrition. Pregnant and lactating women are particularly vulnerable as their nutritional needs are higher to support both their health and the development of their infants. According to the Resource Mapping and Growth Diagnostic Study of Lumbini Province (2024), the food distribution system is marked by significant inequities, with 52 per cent of households experiencing food insecurity, around 10 per cent facing dietary shortages, and 37.6 per cent of the population suffering from undernourishment due to unequal access to food.

The Maternal Mortality Report 2021 highlights that Lumbini has the highest maternal mortality rate in the country, with 207 per 100,000 live births, and Madhesh with 140 per 100,000

live births (MoHP, 2021). A substantial portion of these deaths are attributed to delays in accessing essential maternal healthcare services. Climate-related disasters worsen the situation, as women often face disruptions in antenatal and postnatal care, compounded by increased incidences of gender-based violence (Poudel et al., 2024). A woman participant from Madhesh shared, ***"Extreme heat, heavy monsoons, and floods make it extremely hard for us to get to antenatal care (ANC) facilities and access healthcare. Because of this, pregnancy complications often go unnoticed, leading to unexpected outcomes."***

Participants also expressed concerns about the effects of climate change on menstrual health. Extreme weather events often disrupt access to clean water, sanitation facilities, and safe disposal options, which are critical for menstrual hygiene management. In rural areas, many girls and women rely on washable clothes during menstruation. A woman participant from Madhesh shared, ***"We mostly use washable cloth during menstruation, but in times of water scarcity, it is difficult to wash the cloth and maintain proper hygiene."*** These challenges highlight that climate change is not gender neutral. It exacerbates existing health and gender inequities. There is a need for gender-responsive strategies and programs that prioritize the health, dignity, and rights of women and girls.

5.4.3 Mental Health

Mental health is an integral part of human health and includes emotional, psychological, and social well-being (WHO, n.d.(e)). It shapes the way we think, feel, and act, guiding how we manage stress, connect with others, and make choices that promote our well-being. Nepal is facing a rising crisis of mental health disorders and has remained a 'silent epidemic,' often overlooked despite its widespread impacts. People are at increased risk of developing mental illnesses due to the combination of extremely stressful environments brought about by the impact of and high vulnerability of climate induced disasters and political instability (NHRC, 2020).

The climate crisis is profoundly affecting mental health through various pathways. Extreme weather events and rising temperatures lead to psychological distress and trauma of loss and displacement. Chronic heat stress can lead to increased stress, anxiety, and cognitive impairment (Rony et al., 2023). Moreover, climate change undermines the social and environmental determinants of health, such as loss and lack of access to safe and secure homes, food, livelihoods, schools, and recreational and cultural places, deepening the psychosocial burden (Dodgen et al., 2016; Lawrance et al., 2022). Research by Allen et al. (2017) further links exposure to air pollution with cognitive decline and neurodegenerative diseases, including Parkinson's and Alzheimer's disease.

Climate-induced disasters also result in the loss of lives, destruction of assets, and erosion of livelihoods, contributing to prolonged grief, insecurity, and fear of the future. This erosion of stability and loss fuels anxiety, depression, and post-traumatic stress disorder (PTSD; Daraz et al., 2024; Shoko Kori, 2023). The psychosocial toll of climate change is particularly pronounced in rural communities, where resilience is already strained by limited resources and economic insecurity (Wright et al., 2021).

Among those most affected are smallholder farmers who heavily rely on seasonal rainfall for agriculture to sustain their livelihoods. Unpredictable rainfall patterns, prolonged droughts, and flash floods have led to crop failures and financial insecurity, driving emotional distress and, in some cases, suicidal ideation. Participants engaged in agriculture from both

provinces spoke of the deep anxiety caused by erratic weather patterns that frequently damage their crops. A woman participant from Madhesh shared, ***"Extreme weather events are destroying our agricultural fields, reducing our primary source of income. This is causing immense stress. It is also contributing to the rising suicide cases among farmers."***

The mental health impacts of climate change are not evenly distributed. Women, children, and marginalized communities are disproportionately affected due to their limited access to mental health resources and coping mechanisms. A youth participant from Madhesh also emphasized the broader impact, stating, ***"The stress caused by climate change is overwhelming. At its core, the issue is resilience; we struggle to feel resilient because we lack the essential resources."*** Despite the increasing psychological burden, access to mental health services remains severely limited, particularly in rural and climate-vulnerable areas.

5.4.4 Vector-borne and Zoonotic Diseases

Vector-borne diseases are illnesses transmitted to humans and animals by vectors, primarily blood-feeding arthropods such as mosquitoes, ticks, and fleas that carry pathogens like parasites, viruses, and bacteria (WHO, n.d.(c)). **Zoonotic diseases**, also known as zoonoses, are caused by pathogens that spread between animals and people (WHO, n.d.(d)). Waterborne diseases are caused by drinking contaminated water containing microbes (WHO, n.d.(f)). Climate change has long-term consequences on human health and the natural ecosystem, significantly influencing the spread of zoonoses, vector- and waterborne diseases (Thomson et al., 2022). Rising temperatures and shifting precipitation patterns create favourable conditions for disease-carrying vectors, particularly mosquitoes (Wright et al., 2021). This leads to an increased risk of infectious diseases, including cholera, malaria, and dengue fever (Mojahed et al., 2021).

In Nepal, vector-borne and zoonotic diseases are recognized as climate-sensitive health outcomes. Dengue fever is traditionally a tropical disease is expanding into new geographic areas. Madhesh and Lumbini provinces are particularly vulnerable to dengue fever due to the lowland geographical landscape and humid conditions (Acharya et al., 2023). Participants reported a noticeable increase in mosquitoes in hilly areas, where it was previously uncommon. A youth participant from Lumbini noted, ***"In the past, mosquitoes disappeared after Ashoj and Kartik (September/ October). Now, they are everywhere, even during Mangsir and Poush (November/ December). You can even find mosquitoes in Jumla."*** The extended mosquito season has contributed to the surge in dengue cases over the past years. This poses increased risks to pregnant women and children due to their immature and weakened immune systems (Rogerson et al., 2007).

Additionally, the Tarai region is highly vulnerable to floods and landslides, which frequently damage water supply and sanitation infrastructure, resulting in poor hygiene conditions and widespread water contamination. According to the Resource Mapping and Growth Diagnostic Study of Lumbini Province (2024), in Lumbini, river flooding is a persistent issue, especially during the wet season, when over 71 per cent of water sources become contaminated with the pathogen Escherichia coli, and approximately 40 per cent of sewage systems require substantial maintenance. These disruptions have led to a rise in waterborne diseases, including cholera and diarrheal illnesses. A youth participant from Lumbini shared, ***"In 2021, there was a cholera outbreak in Kapilvastu that claimed six lives. They said***

that poor sanitation and water leakage may have led to the contamination." The links between climate variability and disease transmission are becoming increasingly evident. As changing climate conditions facilitate the spread of disease vectors and compromise essential water systems, communities, especially those already marginalized, face elevated and intersecting health risks.

Another critical seasonal health issue emerging in Madhesh and Lumbini is **snakebite** incidents, which intensify during the rainy season and periods of rising heat. The combination of extreme heat and rainfall disturbs snakes' natural habitats, pushing them to move into human settlements, farmland, and waterlogged areas in search of dry shelter. This increases risks for rural populations, particularly farmers working barefoot, children playing outdoors, and people sleeping on the ground. In 2024, Lumbini Provincial Hospital recorded 321 snakebite patients in the three months alone, with 187 patients in mid-June to mid-July, 107 in mid-May to mid-June, and 47 in mid-April to mid-May.

Communities in these regions frequently report encounters with venomous species such as kraits and cobras. However, limited access to antivenom, delayed treatments, and inadequate first-aid knowledge contribute to preventable deaths and long-term disabilities. Strengthening local health systems, ensuring timely availability of antivenom, and promoting awareness of snake bite prevention and response are critical to reducing this seasonal health burden.

6. INTERCONNECTEDNESS: THE NEXUS OF NATURAL RESOURCES, LIVELIHOODS, AND HEALTH

Climate change is not a singular event but a web of interconnected phenomena that affects various sectors and systems. Its drivers include increasing GHG, rapid deforestation, urbanization, and industrialization. They have far-reaching consequences across natural resources, livelihoods, and human health, acting as a threat multiplier. These changes are deeply intertwined with community vulnerabilities where change in one area triggers ripple effects across others. The nexus of natural resources, livelihoods, and health is central to understanding how climate change impacts grassroots communities. This interconnectedness is characterized by a series of feedback loops, where environmental degradation, livelihood disruption, and health issues reinforce each other.

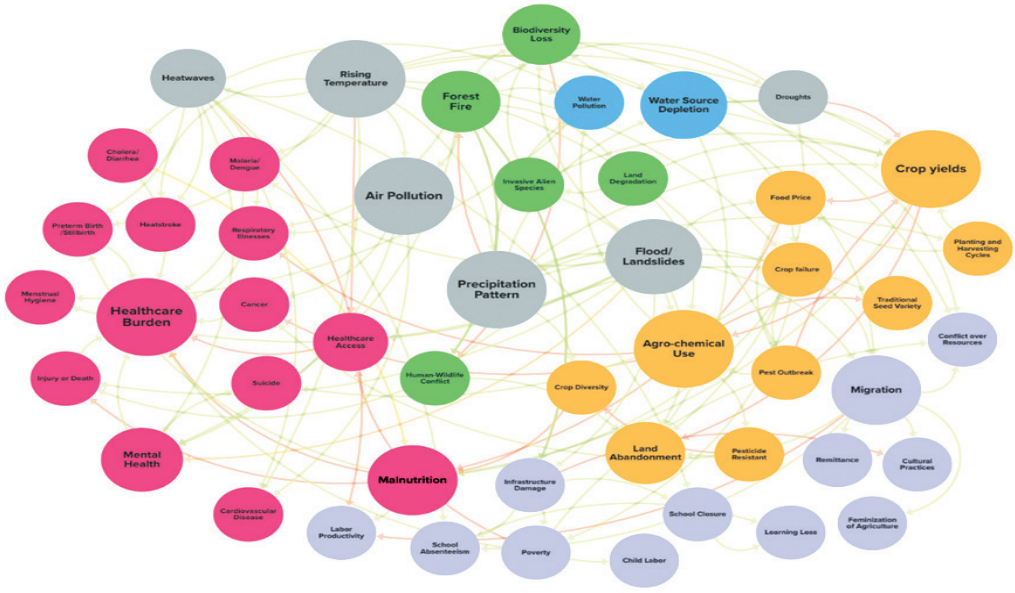

Figure 2: The Nexus of Natural Resources, Livelihoods, and Health

The visual above represents the intricate web of interconnected consequences triggered by climate change. It reveals how environmental stressors such as rising temperatures, erratic precipitation, and extreme weather events initiate cycles of degradation. These disruptions further diminish the availability and quality of natural resources, such as water, fertile land, and forest products, threatening the ecological balance and services that sustain rural livelihoods. For instance, rising temperatures combined with shifting precipitation patterns accelerate the depletion of water sources. In water-scarce areas, this has intensified human-wildlife conflict, by driving wildlife into human settlements in search of water, often resulting in crop damage and physical injuries. Simultaneously, droughts and floods disrupt planting cycles, reduce soil fertility, and promote pest outbreaks, which collectively diminish agricultural productivity.

In response, farmers often resort to overusing chemical fertilizers and pesticides to stabilize yields practices that further degrade the soil and undermine biodiversity. This short-term coping mechanism disrupts local seed varieties and reduces long-term agricultural sustainability, reinforcing the cycles of environmental and livelihood vulnerability. As a result, rural households experience increased food insecurity, and rising food prices, and are often forced into distress migration as a coping strategy. This erosion of agricultural systems and incomes directly affects household nutrition, particularly for women and children. Malnutrition rates rise, with long-term consequences for physical development, cognitive functioning, and overall well-being.

Health outcomes are also deeply linked to the climate-livelihood nexus, with climate change acting as both a direct and indirect driver of adverse health outcomes. Climate-induced disasters including floods, landslides, and droughts contribute to deaths and disability while damaging healthcare infrastructure and compromising healthcare access. Rising temperatures facilitate the spread of disease vectors like mosquitoes and stagnant floodwaters create ideal breeding conditions—intensifying the risk of malaria, dengue, and other water-borne disease outbreaks.

Moreover, the compounding effects of rising temperature, shifts in precipitation, and air pollution contribute to respiratory illnesses, cardiovascular diseases, heat-related illnesses, and menstrual hygiene challenges. These environmental stressors exacerbate both chronic and acute health issues, placing an immense burden on fragile healthcare systems and reinforcing the vicious cycle of poverty. Pregnant women and individuals with chronic conditions are particularly at risk. These stressors place an immense burden on already fragile healthcare systems, exacerbating cycles of poverty and reinforcing inequities.

This complex interconnectedness amplifies negative impacts across multiple sectors and underscores the need for integrated, multi-sectoral responses to climate change. Addressing the impacts of climate change in silos fails to account for the overlapping vulnerabilities of ecosystems, food systems, and public health. A systems-thinking approach rooted in equity, sustainability, and community participation is essential to foster resilient and adaptive communities.

7. Vulnerability and Adaptive Capacity

It was observed that communities in Madhesh and Lumbini were employing a mix of coping mechanisms and adaptation strategies in response to the impacts of climate change. Coping strategies, which are often short-term and reactive in nature, included measures such as

walking longer distances to fetch water and increasing the use of chemical pesticides to combat declining crop productivity, among others. While these approaches alleviated immediate stress for the communities, they are not sustainable. To foster climate resilience, it is crucial to support communities in transitioning toward transformative adaptation strategies, such as promoting traditional knowledge systems, connecting ILK with innovation and technology, diversifying livelihoods, and promoting locally led action. Some of the strategies that communities are employing independently and with the support from LGs are listed below:

a. Mulching and Living Walls

Mulching and living walls are time-tested, nature-based solutions deeply rooted in traditional agronomic knowledge. Mulching involves covering the soil surface with organic or inorganic materials such as crop residues, biological geotextiles, or even crushed stones to prevent erosion, retain moisture, and enhance soil health. It promotes earthworm activity and improves soil structure. Similarly, living walls, locally known as green facades, utilize climbing plants like lauka (bottle gourd), tite karela (bitter gourd), and farsi (pumpkin), grown over bamboo trellises on rooftops or courtyards. These walls yield nutritious vegetables and shield homes and animal shelters from extreme heat.

With rising temperatures and unpredictable rainfall patterns, communities in Rupandehi, Kapilvastu, and Nawalparasi districts of Lumbini are widely adopting these practices. Mulching and living walls are a low-cost, sustainable methods that conserves soil moisture and reduce erosion, control weeds, provides natural insulation, creating cooler microclimates around homes and farmsteads, respectively. Together, they reduce water demand, improve soil fertility, and repurpose agricultural waste. Youth and farmers in Lumbini in are leading the revival of these practices in home gardens and farms, recognizing its potential to enhance food production and build resilience.

b. Riverbed Farming

Riverbed farming is an adaptive agricultural practice that transforms degraded and previously uncultivable land along riverbanks into productive farmlands. Farmers particularly those with limited resources utilize these abandoned sandy and slit–laden riverbeds to grow high-value crops such as vegetables and melons during the dry season. This helps them build a livelihood, boosts their household income, and maximizes land use efficiency.

As climate change accelerates riverbank degradation and disrupts water availability, riverbed farming has emerged as a low-cost, adaptive strategy to sustain income opportunities for poor and marginalized farmers. This approach responds to the periodic erosion and sediment deposition caused by shifting river flows particularly in districts such as Mahottari, Kanchanpur, and Sarlahi in Madhesh. Communities across the flood-prone and land-degraded regions of the Terai are increasingly adopting riverbed farming to make productive use of fallow land. By transforming vulnerable landscapes into sources of livelihood, this practice strengthens both economic resilience and local food security.

c. Recharge Pits

Recharge pits are simple, cost-effective structures designed to harvest rainwater and recharge groundwater reserves. They are constructed by digging shallow pits and layering them with coarse materials like gravel, sand, and stones. This design allows rainwater and

surface runoff to infiltrate into the ground, reducing water loss through surface runoff. This method is vital in replenishing aquifers, especially in areas experiencing declining water tables. As climate crisis threatens water availability, recharge pits have emerged as a local solution to address seasonal water scarcity for agriculture and household use across the lowland regions of Nepal.

Recharge pits are being actively promoted by LGs, farmer groups, and development organizations to capture rainwater during the monsoon and ensure its availability during dry periods. In Rupandehi, Kapilvastu, Mahottari, and Dhanusha districts of Madhesh and Lumbini these pits are being constructed in schools, farms, and community spaces. This practice supports irrigation, and domestic water needs, and reduces surface runoff and minimizes flood risk during intense rainfall events.

d. Natural Pond Conservation

Natural pond conservation is a local initiative to manage water resources and protect ecosystems. They act as seasonal water reservoirs, helping retain surface water during the monsoon and gradually releasing it during dry periods. These ponds, traditionally used for irrigation, livestock, and cultural practices, are now being revitalized by LGs as part of a broader effort to maintain water levels, restore ecological balance, and reduce HWC.

By conserving and rehabilitating these ponds through desilting, strengthening embankments, and planting native vegetation around them LGs aim to improve water recharge, reduce evaporation, and sustain biodiversity. These efforts support local agriculture, provide habitat for aquatic and terrestrial species, and help prevent animals from encroaching on farmland in search of water, thereby reducing HWC. LGs are prioritizing pond restoration in districts such as Kapilvastu, Rupandehi, Pyuthan Sarlahi, and Dhanusha through community participation. These ponds serve multiple functions, including supporting irrigation, recharging groundwater, regulating local microclimates, and preserving the natural ecosystem.

e. Livelihood Diversification through Non-Timber Forest Products (NTFPs)

Non-Timber Forest Products (NTFPs) encompass a diverse range of biological resources harvested from forests, such as medicinal herbs (e.g., Chirayita, Asparagus), resins, wild fruits, mushrooms, and fibres. These resources are integral to rural economies as it provides alternative sources of income for households. Communities rely on NTFPs like Sal leaves (used for disposable leaf plates), Tendu leaves (for bidi cigarettes), and medicinal and aromatic plants (MAPs) to diversify income streams, especially during agricultural off-seasons. These products reflect cultural heritage, traditional craftsmanship, and contribute to environmental conservation. NTFP collection and selling provides a critical cash income, reducing reliance on subsistence farming for marginalized groups, including indigenous Tharu and Musahar communities, especially women.

In Lumbini and Madhesh communities are utilizing resilient NTFP species like bamboo for handicrafts and drought-tolerant medicinal herbs and aromatic plants (MAPs) for herbal soap, shampoo, and candies for alternative livelihoods sources. For instance, the people in both provinces are harvesting medicinal plants including, harro, barro, and amala which thrive even in degraded soils. Local communities are integrating NTFPs with agricultural crops which helps to enhance ecosystem resilience by stabilizing soil and retaining moisture. However, challenges like overharvesting, climate change impacts, lack of formalized trade networks, and limited processing infrastructure persist, hindering the sector's full potential.

f. Youth Initiatives

Youth clubs play a vital role in community development and climate resilience. These clubs are typically mobilized through collaborative efforts involving schools, INGOs/NGOs, and LGs. These partnerships have facilitated the formation of youth clubs and empowered young people to lead grassroots initiatives on a range of issues, including climate change and environmental degradation. These clubs are actively engaged in climate action including awareness campaigns, tree plantation, cleanliness campaigns, and advocacy for climate-smart entrepreneurial ventures.

Some schools have also introduced student-led agricultural plots, where land within the school premises is allocated for farming. Students cultivate vegetables, sell the produce in local markets, and reinvest the profits to support their educational needs. These initiatives build practical skills and encourage youth to view agriculture as a viable and sustainable livelihood option. Additionally, youth are being trained to monitor water levels and rainfall patterns, raise awareness about early warning systems (EWS), and support community preparedness in the face of recurring climate risks. Notably, other programs like youth fellowships and Provincial Youth Climate Change Councils (PYCCC) are also gaining traction, offering platforms for leadership training. These locally grounded efforts are equipping young people with the tools and knowledge needed to respond to the climate crisis and build resilience in their communities.

g. Community Forest User Groups (CFUGs)

CFUGs are grassroots, community-based organizations composed of local residents who collectively manage and govern nearby forest resources. These groups are typically structured around participatory decision-making processes, ensuring equitable access to forest benefits while prioritising sustainable management practices. CFUGs serve as vital agents of localized resilience by legally empowering communities to oversee forest use and balancing conservation goals with socio-economic needs, fostering stewardship that aligns with ecological health.

They play a crucial role in sustainable forest management, enhancing carbon sequestration by restoring degraded lands, curbing deforestation, and expanding tree cover to balance ecosystem. CFUGs are planting drought-resistant, multipurpose trees to stabilize soil, reduce erosion, and provide food and fodder. They are also implementing community-led fire prevention strategies, such as firebreaks and EWS, safeguarding forests that act as buffers against floods and landslides. Their efforts support communities to diversify livelihood opportunities by promoting NTFPs and eco-tourism through the integration of traditional knowledge with innovative practices. This holistic approach conserves biodiversity and strengthens socio-economic networks, enabling communities to adapt proactively to shifting climatic conditions while sustaining long-term ecological integrity.

Policy Implementation Challenges

1. Lack of effective intersectoral coordination across government agencies and beyond for integrated responses.
2. Lack of coordination and collaboration between three tiers of government that hinders policy coherence.
3. Lack of reliable data at the local level for evidence-based planning and prioritization of policy interventions.

4. Bureaucratic inefficiencies and resource constraints resulting into delayed project implementation of effective local initiatives.
5. Lack of evidence-based planning, budgeting, and monitoring mechanism
6. Lack of skilled human resource and limited technical capacity at the local level to effectively implement and monitor policies and programs
7. Limited community engagement and participation in the local governance processes to influence change and enhance community ownership
8. Lack of trust between government and community members for collaboration, compliance, and long-term development goals.
9. Lack of meaningful participation of women and youth in decision making process
10. Inadequate financing for effective policy implementation
11. Corruption, political instability, and interference

8. COMMUNITY RECOMMENDATIONS

The following recommendations were drawn from FGDs in Madhesh and Lumbini:

S.N	Local Recommendations	
1.	**Community Awareness, Education, and Engagement**	**Enhance Climate Literacy and Behavioural Change:** Launch contextual climate awareness campaigns in local languages. Utilize social media platforms, FM radios, and local media to promote sustainable lifestyles, including shifting consumer behaviour toward locally grown, seasonal food, and reducing plastic use. **Strengthen Community Engagement:** Enhance LG's engagement with grassroots communities including with CFUGs, youth clubs, women's groups, and community leaders for integrated climate action.
2.	**Capacity Building and Livelihood Diversification**	**Promote Climate-Resilient Livelihoods:** Support communities, especially youth, women, and IPLCs to engage in diverse, climate-resilient livelihood options such as organic farming, fish farming, and sustainable harvesting of NTFPs through training, and skill development. **Community SME Linkages:** Facilitate system-based linkages among farmers group, local government bodies, and District/ Municipal Chamber of Commerce & Industries with Small and Medium Enterprises (SMEs) to improve market access, enhance value addition, create jobs, and foster rural entrepreneurship. **Foster Youth Technology Synergies:** Empower rural youth by expanding access to digital platforms and mobile applications that provide real-time weather updates, market prices, climate-smart farming practices, and financial services. Establish local innovation hubs or agri-tech incubators where young people can co-create solutions using affordable Internet of Things (IoT) tools, Geographic Information System (GIS), and remote sensing technologies.

3.	**Good Governance**	**Capacity Building and Training for Local Government:** Implement technical capacity-building programs for LGs to improve their capacity to plan, budget, implement, and monitor programs and policies. **Inclusive Plans and Policies:** Ensure regular social audits, participatory planning, and gender-responsive climate strategies to guide policy adjustments and integrate local voices in decision-making. **Effective Coordination among Three-levels of Government**: Strengthen coordination and collaboration among federal, provincial, and local governments to ensure cohesive policy development and effective implementation. **Evidence-Based Planning**: Promote data-driven planning, monitoring, and evaluation, with clear mechanisms for reporting and feedback. Ensure that localized risk assessments and community priorities are systematically integrated into local plans.
4.	**Climate-Resilient Planning**	**Climate resilient infrastructure:** Construct and retrofit schools, health, and community infrastructure to withstand extreme weather events and disasters based on risk informed planning and anticipatory adaptation strategies. This includes using disaster-resilient designs such as elevated foundations, reinforced structures, climate-adaptive roofing, and integrated drainage systems to mitigate risks from floods, landslides, heatwaves, and earthquakes **Ensure Safe Water, Sanitation, and Hygiene (WASH):** Integrate climate-resilient WASH systems. This includes flood-proof toilets, protected water sources, and handwashing stations that function even during climate shocks.
5.	**Improved Water Resource Management**	**Conservation Initiatives:** Support conservation of natural water sources and promote research on groundwater availability and management to combat water scarcity. **Community-Led Water Stewardship:** Encourage locally led adaptation initiatives for rainwater harvesting, watershed management, and sustainable irrigation practices.
6.	**Disaster Preparedness and Early Warning Systems (EWS)**	**Strengthen Disaster Preparedness and EWS:** Ensure the availability of essential resources such as firefighting tools, first aid kits, and trained disaster response teams at the local level. Establish and operationalize EWS tailored to local contexts. **Vulnerability Assessment and Hazard Mapping:** Support technical research to identify climate-vulnerable zones and establish clear safety criteria at the community level. **Strengthen Health Surveillance and Preparedness:** Establish robust community-based disease surveillance systems to detect and respond to climate-sensitive disease outbreaks (e.g., dengue, cholera, diarrhoea, and respiratory infections) in disaster-prone areas, integrating them with local disaster preparedness plans.

7.	**Direct Access to Climate Finance**	**Enhance Community Access to Climate Finance:** Facilitate direct and equitable access to climate finance for grassroots communities, particularly IPLCs. Simplify funding procedures, provide technical support for proposal development, project design, and fund management. **Integrating Climate and Health Financing:** Integrate climate finance mechanisms into local health planning to address contextual public health priorities.
8.	**Improved Forestry and Agriculture Policies**	**Improve Forestry and Agriculture Policies:** Promote policies that support sustainable forest management, traditional farming, native crop varieties, and organic fertilizers to minimize harmful chemical use and enhance soil health. **Supportive Mechanisms:** Simplify agriculture and livestock insurance mechanisms, ensure market linkages, and guaranteed procurement of crops by setting a Minimum Support Price (MSP) for agricultural products. Establish mechanisms for coordination and collaboration between CFUGs and LG for efficient and sustainable forest management.
9.	**Build and Strengthen Partnership**	**Partnership for Innovation:** Partner with government and non–government research bodies, universities, local agriculture institutions, Agriculture Knowledge Center (AKC), and youth led-initiatives to co-develop local and climate-resilient solutions.

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Annex 1: FGD Guidelines (Semi-Structured Interviews)

A. IPLC Representatives

1. Have you observed any noticeable changes in your environment or natural surroundings in recent years? What changes concern you the most?
2. How do these changes compare to what you or your elders remember from the past?
3. Have you noticed changes in the availability or quality of key natural resources? Are there any changes in seasonal cycles or traditional ecological patterns that your community depends on?
4. How are these environmental changes influencing your livelihood, sacred sites, cultural traditions, or spiritual relationships with nature?
5. How have these environmental changes influenced any changes in agriculture and food production in your community? If yes, what are the changes?
6. Are traditional practices for farming, gathering, or herding still working, or do they need to change? If so, how?
7. Is changing climate influencing health? If yes, how is the changing climate affecting the physical and mental health in your community?
8. Are traditional knowledge systems or cultural practices being used to adapt to these changes? How effective have they been? Are they being passed to younger generations?
9. Are you receiving any support from government, NGOs, or external agencies to address these impacts? Is this support helpful and appropriate?
10. Are you included in decision-making processes?
11. What barriers do you face in participating in climate change discussions and decisions at local or national levels?
12. What are your recommendations to ensure IPLCs' knowledge, rights, and needs are better included in climate policies and actions?

B. Women

1. Could you tell us about how does a typical day look like for you?
2. Have you noticed any significant changes in your local environment over the past few years? What changes concern you the most?
3. How have these changes in the environment influenced your household's livelihood?
4. In your opinion, how are these changes affecting women in your community, especially in terms of daily responsibilities, caregiving, and household roles?
5. What are the primary sources of the livelihood for the people in your communities? Have ongoing environmental changes impacted the source of livelihood? If yes, how?
6. Have you observed any changes in the health? If yes, are there any new or worsening health problems that concern you how is the changing climate affecting the physical and mental health in your community?
7. Are there any gender-specific health challenges that women face because of climate-related changes?

8. How are communities adapting to these ongoing changes? If yes, give examples.
9. Are you receiving any support from government, NGOs, or external agencies to address these impacts? Is this support helpful and appropriate?
10. Do you feel your voice is heard in community or local government decisions related to climate change?
11. Are women in your communities included in decision-making processes? Are there any barriers that limit the meaningful participation?
12. What kind of programs or actions do you think the government or local bodies should take to support women in this context?
13. What are your suggestions for increasing women's leadership and participation in climate adaptation and resilience-building?

C. Youth

1. Have you noticed any changes in your local environment and community over the past few years? If yes, what kinds of changes have you observed?
2. How are these changes affecting your community in general?
3. How do you think these environmental changes are affecting young people like you?
4. Have these changes influenced your daily life, routine, or responsibilities?
5. Has environmental change influenced your ability to attend school or pursue further education? If yes, can you describe how these changes have affected school attendance or learning?
6. What are the primary sources of the livelihood for the people in your communities? Have ongoing environmental changes impacted the source of livelihood? If yes, how?
7. Is changing climate influencing health? If yes, how is the changing climate affecting the physical and mental health in your community?
8. How are communities adapting to these ongoing changes? If yes, give examples.
9. In your experience, do people of different genders experience the impacts of climate change differently? If yes, how?
10. Do you feel your voice is heard in community or local government decisions related to climate change?
11. Are you receiving any support from government, NGOs, or external agencies to address these impacts? Is this support helpful and appropriate?
12. Are youth in your communities included in decision-making processes? Are there any barriers that limit the meaningful participation?
13. In your opinion, how important is climate change for youth in your community? Are young people concerned or active about it?
14. If you could ask your local leaders or government to do one thing to support youth in addressing climate change, what would it be?
15. What specific recommendations do you have to improve youth participation in climate action?

D. CBO Representatives

1. Have you observed any noticeable changes in your environment or natural surroundings in recent years? What changes concern you the most?
2. How are these changes influencing the livelihoods of local communities?
3. What are the primary sources of the livelihood for the people in your communities? Have ongoing environmental changes impacted the source of livelihood? If yes, how?
4. Are there specific groups who are more affected in terms of livelihood loss or adaptation challenges?
5. Have you observed any changes in the health? If yes, are there any new or worsening health problems that concern you how is the changing climate affecting the physical and mental health in your community?
6. How are communities adapting to these ongoing changes? If yes, give examples.
7. Do CBOs and local communities have opportunities to participate in climate policy-making or local government planning?
8. What barriers exist to meaningful engagement in decision-making around climate and environmental management?
9. What additional support do CBOs need to be more effective in responding to climate change?
10. What specific actions should local or national governments take to support communities and CBOs in addressing climate impacts on nature, livelihoods, and health?
11. What recommendations do you have for improving coordination, knowledge sharing, and inclusion in climate responses?

E. LG Representatives

1. From your perspective, what climate and environmental changes have you observed in your local area over the past few years? What changes concern you the most?
2. How are these changes affecting local natural resources?
3. Have you noticed any loss of traditional natural resource systems or community-based environmental practices due to these changes?
4. How have climate and environmental changes affected local livelihoods in your municipality or rural area?
5. Which groups in your community are most affected by these ongoing changes?
6. Has climate change led to increased unemployment, reduced income, or migration from your area? If so, how is your office addressing this?
7. What traditional knowledge or local coping strategies have you seen communities using? Are these incorporated into your plan?
8. What are the major challenges your local government faces in responding effectively to climate change?
9. What recommendations would you make to ensure that climate actions are inclusive and responsive to the needs of all community members, especially the most vulnerable?

FOR MORE INFORMATION, PLEASE CONTACT

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ABOUT US

Rural Reconstruction Nepal (RRN) is a Nepali non-government, not for profit organization, has been working with the poor and marginalized people in rural Nepal to empower them in the process of meeting their basic needs, improving livelihoods and building their own institutions. It substantially contributes to rural people's empowerment and socio-economic reconstruction process, by embracing the rights-based approaches to development. RRN is also committed to creating an enabling environment for building a just, equitable, peaceful and prosperous society through social, economic and political empowerment of the rural poor, particularly the poor rural women, peasants, landless people and other disadvantaged and socially oppressed strata of Nepalese society.