TRANSBOUNDARY KNOWLEDGE EXCHANGES FOR CLIMATE CHANGE ADAPTATION IN TWO REMOTE, HIGH-ALTITUDE INDIGENOUS COMMUNITIES

Case Study Final Report

Bhutan & Nepal

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MECCE Project Funded Case Study

Transboundary Knowledge Exchanges for Climate Change Adaptation in two Remote, High-altitude Indigenous Communities[1]

EXECUTIVE SUMMARY

This case study explores the use of participatory Transboundary Knowledge Exchanges to raise awareness of climate change and foster tangible climate action within and between two Indigenous communities: Sermathang in Nepal and Merak in Bhutan. These two communities are among the remote and vulnerable countries in the Hindu Kush Himalayan region. This case study explores three questions:

1) What are the common understandings, lived experiences, and impacts of climate change held within the communities of Sermathang, Nepal and Merak, Bhutan?
2) How can locally relevant workshops effectively support locally-led climate adaptation practices to address the unique challenges faced within these communities?
3) How can cross-border knowledge exchange build young people's capacity to act as climate changemakers?

Community members learned about climate change, its impacts, and solutions through a series of workshops on climate-resilient farming practices and documenting environmental changes. These workshops were tailored to the community's lived experiences with climate change to support locally relevant climate adaptation actions. The workshops also helped link community members with local governments with the aim of developing locally relevant climate policies. Workshops were also held with students to teach them about climate change, local challenges due to climate change, and the role of young people in taking climate action.

Data were collected through a household survey, focus group discussions, key informant interviews, and community dialogues. In analyzing across these collected data, the case study reveals that both communities are being profoundly affected by the changing climate, despite community members having little to no prior understanding of the reasons behind the environmental shifts they were experiencing in their everyday lives. Water scarcity, agricultural challenges, and human-wildlife conflicts are among the common climate challenges faced by both communities. Further, community members in Bhutan shared that climate is impacting their livelihoods and health, as tourism declines and mosquito-borne diseases increase. The case study participants also expressed a wide range of emotions related to the impacts of climate change, particularly anxiety, guilt, and fear. Many community members believed that the

[1] The views in the report are not necessarily endorsed by the MECCE Project, which funded the research.

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changes they were experiencing were due to their misdeeds. This belief caused guilt, as they saw environmental degradation as a form of punishment.

The case study also highlights the role of continuous dialogue in developing shared understandings of climate change, and in empowering locally relevant climate action. For example, the intergenerational dialogues allowed participants to explore the intersections of traditional knowledge and locally relevant climate adaptation practices. The youth dialogue session helped the students explore their unique identities as Indigenous people living in at the frontlines of the climate crisis and helped them understand ways to act as changemakers in their communities. The case study participants felt participating in the workshops and dialogues provided them with a sense of empowerment. Of particular importance was the framing climate change as a global issue rather than a local punishment, which helped replace fear and anxiety with the motivation to act.

The case study helped build a platform for transboundary collaboration between Nepal and Bhutan and the leveraging of case study data for policy impact. For example, both countries share a commitment to environmental protection but have different approaches to policy implementation, and the Transboundary Knowledge Exchanges facilitated learning across these borders. While both regions face similar climate impacts, such as reduced snowfall, Glacial Lake Outburst Floods, and human-wildlife conflict, the countries differs in their approaches to climate adaptation policy and practice. Bhutan's focus on conservation and community-led environmental stewardship has offered valuable lessons for Nepal, while Nepal's adaptive agricultural practices in high-altitude farming can be useful for Bhutanese farmers facing similar climate challenges. A key impact of the case study was the integration of community insights into Local Adaptation Plans of Action in both countries.

Underpinning the success of these activities was the collective commitment of the community members, whose dedication to aligning climate action with their spiritual beliefs and traditions played a vital role in ensuring engagement and acceptance of the Transboundary Knowledge Exchanges. This harmonious integration of local values with climate action not only strengthened community support but also ensured that climate actions taken within each community resonate deeply with their unique identities as Indigenous communities.

Ultimately, the case study acts as a testament to the importance of supporting communities on the frontlines of climate change to 1) better understand how climate change is impacting their lives and livelihoods, and 2) how to contribute to local level policy-making to ensure long-term climate resilience.

CCE PROGRAM OVERVIEW

The Transboundary Knowledge Exchanges took place within and between two remote mountainous communities: Sermathang in Nepal and Merak in Bhutan. Although these communities are both deeply affected by a changing climate, members of both communities had little to no prior understanding of the term "climate change" and the reasons behind the environmental shifts they were experiencing in their everyday lives.

Thus, a series of climate communication and education workshops were held to 1) bridge the knowledge gap and deepen the communities' understandings of climate change; 2) foster locally led climate adaptation strategies and activities in these two communities; and 3) connect the

community's lived experiences with local governmental efforts to support the development of locally relevant climate policies.

Community-based Climate-Resilient Farming Workshops

During workshops conducted on climate-resilient farming, community members learned about sustainable agriculture and agroforestry to adapt their practices to changing weather patterns. Two workshops each were conducted in both countries. One conducted in indoor community spaces included in-depth discussions and theoretical lessons, while the workshop took place directly in the fields to provide the opportunity to develop practical skills. The participants included both farmers and students, which helped the students become acquainted with agriculture and the environment.

Across the two countries, the workshops included topics such as the use of sustainable agriculture, planing drought-resistant crops, water management techniques, and biodiversity conservation techniques. Within the countries, the workshops were tailored to help farmers navigate pressing challenges of climate change that emerged from the community's lived experiences, as identified during a household survey (described in the research methods below).

Community-based Environmental Change Documentation Workshops

During these workshops, community members learned how to record environmental changes they experience, such as crop losses, human-wildlife conflicts, and seasonal shifts in the timing of snowfall and rainfall. The documentation workshops primarily took place as part of community meetings, and community members used photography to collect evidence of environmental changes.

The documentation activity was also designed to help the community become more confident in articulating their challenges around climate change, to enable more effective communication of issues such as crop failures and water shortages to local authorities. As a result, the documentation sessions also taught participants how to vocalize their challenges and ensure their records were precise and focused. Participants also shared their experiences with climate change impacts with one another to seek solutions collaboratively.

It is essential to note that nearly all community members, except local government leaders, had received a formal education and therefore could not write in English or the national language. Some of community members could not even speak the national language and could only communicate in their dialects which do not have a written form. As a result, the documentation process was adapted to their capabilities and was carried out verbally—most often in person, but also sometimes through telephone calls and messages on WhatsApp.

School-based Climate Education and Action Workshops

Students from grades IV to VI & VIII to IX (aged 12-15 years) participated in climate change workshops where they learned about climate change, local challenges due to climate change, and the role of young people in taking climate action. In Bhutan, students from grades IV to VI in Merak Primary School were engaged in five sessions, once a week. Each 30-minute long session took place on Saturday during afternoon study. In Nepal, the student participants were from

Yangrima Boarding School. Students from grades IV to VI participated in five 30-minute long sessions, while students from grades VIII to IX participated in three sessions.

METHODS

Research Questions

The research aimed to address three key questions:

4) What are the common understandings, lived experiences, and impacts of climate change held within the communities of Sermathang, Nepal and Merak, Bhutan?
5) How can locally relevant workshops effectively support locally-led climate adaptation practices to address the unique challenges faced within these communities?
6) How can cross-border knowledge exchange build young people's capacity to act as climate changemakers?

Research Methods

The case study used a combination of household surveys, focus group discussions, and key informant interviews, with data collection taking place over two months. Special attention was paid to the most vulnerable groups within these populations, including women, farmers, and the elderly, who are disproportionately impacted by the changing climate. These methods are described below:

Household Survey

A household survey helped gain a better understanding of how the communities were experiencing climate change in their daily lives at the beginning of the case study. The survey questions covered demographics, perceptions of climate change and its impacts, livelihood impacts, and local adaptation strategies. Stratified random sampling ensured diversity across socioeconomic and gender lines Please see Appendix A for a copy of the questionnaire.

Focus Group Discussions

Four focus group discussions were conducted with 10 women and farmers in each community in Merak, Bhutan and Sermathang, Nepal. Two focus groups each were conducted in each country and the discussions were conducted twice with the same group. The discussions were integrated into existing local structures within the communities, such as farmer gatherings and 'Aama samuha' (Nepal) and 'Amtshu tshogpa' (Bhutan), informal groups formed by the community women in both countries to plan community work and divide responsibility amongst members. The focus groups explored the impacts of climate change on agriculture, household management, and community adaptation. A copy of the focus group questions can be found in Appendix B.

Key Informant Interviews

We conducted 5 interview sessions in each country (10 interviews total) to gain deeper insights into community perceptions, relevant local policies, and adaptation efforts related to climate change (see Appendix C for a copy of the interview questions). Interviews were conducted with community leaders, including municipality officials, forestry officials, religious figures, and school headmasters. These individuals were identified and recruited through a combination of

direct outreach and snowball sampling methods, with potential additional participants being identified by interviewees. This approach allowed the case study research to include knowledgeable and influential figures with diverse perspectives and valuable insights.

Dialogue Sessions

Within each community, two in-person intergenerational dialogues were held between students (grades VI to X) and Elder community members. These discussions, which included 15-25 participants each, explored changing climate conditions as experienced by young people and Elders.

In addition, one virtual student dialogue session was held between Nepali students (from grades VIII to IX) and Bhutanese students (from grades IV to VI). During the knowledge exchange dialogues, the students shared (in English) their experiences of climate change in their respective communities. Unfortunately, due to the lack of proper internet services in both regions, virtual knowledge exchange session could only take place once, lasting about 30 minutes and experiencing some technical glitches.

Research Participants

- Total Participants:
  - Nepal: 105
  - Bhutan: 80

- Gender Breakdown:
  - Nepal: Male (63), Female (42)
  - Bhutan: Male (43), Female (37)

- Age Group Distribution:
  - Nepal: 12-25 years (20%), 25-35 years (15%), 35-45 years (20%), 45-55 years (25%), 55-65 years (10%), 65 and above (10%)
  - Bhutan: 12-25 years (25%), 25-34 years (12.5%), 35-44 years (18.75%), 45-54 years (18.75%), 55-64 years (7.5%), 65 and above (5%)

- Age Group (12-15 Years Only/ Students):
  - Nepal: 20 participants
  - Bhutan: 12 participants

FINDINGS

Most Important and Interesting Findings

The household survey revealed a significant lack of awareness about climate change among participants in Sermathang, Nepal and Merak, Bhutan. For example, 92% of the respondents had never heard the term "climate change." Despite this, there was a widespread recognition of the symptoms of climate change, with 90% of participants observing that temperatures were rising, and 98% reporting a decline in snowfall.

Across the household survey, focus group discussions, key informant interviews, and dialogues in both communities, the data paint a clear picture of rising temperatures and declining snowfall causing severe disruptions to local water sources and agricultural practices. Climate change is profoundly impacting these two remote communities, even if the communities were previously unaware of the term itself.

- Reduced Snowfall and Water Scarcity: Over the past decades, snowfall has drastically decreased, which in turn has severely impacted water availability. Communities that rely on snowmelt for both drinking and irrigation have experienced critical shortages, making it harder to sustain crops and maintain basic water needs.
- Agricultural Challenges: Changing weather patterns have disrupted planting and harvesting cycles, leading to reduced crop yields and threatening food security. Staple crops such as potatoes are suffering due to erratic rainfall and temperature shifts. Traditional crops such as millet and wheat have also been negatively affected, which has reduced the agricultural biodiversity in the region.
- Biodiversity and Ecosystem Shifts: The warming climate is pushing local flora and fauna out of their traditional habitats. For instance, yak herding—a cornerstone of the Brokpa people's livelihood—is at risk as warming temperatures make it difficult for yaks to graze in their traditional pastures. This shift affects the entire cultural and economic structure of these semi-nomadic communities.
- Human-Wildlife Conflicts: As natural habitats shrink, wildlife such as bears are increasingly encroaching on human settlements. This has led to crop destruction and safety concerns, creating new conflicts between people and wildlife. This issue is particularly concerning for farmers who are already grappling with diminished agricultural yields.
- Migration and Land Use Changes: Economic pressures and worsening human-wildlife conflicts have driven many residents to migrate from rural areas to urban centers, leaving agricultural land barren and accelerating land degradation.
- Health Issues and New Disease Threats: The temperature rise has brought about increased mosquito populations, an entirely new phenomenon in these high-altitude regions. With it has come an uptick in mosquito-borne diseases, adding pressure to already strained local healthcare systems.
- Tourism Decline: The loss of snow, which traditionally covered the scenic peaks of Helambu and Sermathang, has diminished the aesthetic appeal of the region. Fewer tourists are visiting, which has negatively impacted the local economies that rely on tourism for income.

The intergenerational dialogues highlight the importance of developing shared, intergenerational understandings of past and present climates to foster climate-resilient communities. Further, the intersections of traditional knowledge and locally relevant climate adaptation practices were also revealed as being important for climate-resilient agriculture in both communities. During the dialogues, Elders recalled colder winters and deeper snow, while younger participants described less snowfall. Elders shared stories about traditional practices, such as yak herding and growing maize, while the youth described the current environmental

conditions, which differ significantly from what the older generation remembers. In Sermathang, Nepal, Karma Dorje, a 66-year-old man, reminisced, “I remember this place being very cold even when I was young, and we used to have snow knee-deep, it was a real hassle to clear it out”. In contrast, Dolma, a 14-year-old girl, remarked, “Sermathang does not experience much snowfall, it only snows a few times in winter and not every year.” Similar experiences were shared by the community members in Merak, Bhutan. After the dialogues, students whose parents attended reported that their parents now actively participate in storytelling sessions with them, discussing the changes in their environment and how these changes have impacted their lives. In Nepal, the participants shared that agricultural experts taught the participants how to use baoris, a traditional method of storing water, which was helping them overcome water shortages.

The case study also showcases the importance linking climate adaptation to local policies and policy-makers. For example, in Bhutan, greenhouses were traditionally being built using wooden frames, which had to be replaced every two years. As a result of the climate-resilient farming workshops, the community suggested the Local Government Leader provide funding to purchase metal frames for community-based greenhouses.

Finally, during the youth dialogue, the students explored the importance of speaking up about their shared climate challenges, during which they articulated their important roles as changemakers. The students discussed their unique identities as Indigenous people living in communities at the frontlines of the climate crisis as motivation for driving positive change in their communities in the future, inside and outside of school. Despite the logistical challenges faced during the session, the students felt the dialogue was highly transformative.

Climate Justice Aspects

The case study highlights the deep impacts of climate change on two communities that are among the least responsible for climate change, and the importance of teaching communities to advocate for the creation of equitable climate policies that prioritize their needs. For example, by documenting the struggles and adaptation efforts of these communities, and teaching community members how to link with local policies and policy-makers, the community members are being provided with tools to ensure their voices are being amplified in local and regional climate discussions. This emphasis on equity and inclusion is critical in ensuring that the needs of the most affected are not overlooked in the rush to implement broader climate policies.

Marginalized communities, often underrepresented in global climate policy, hold valuable knowledge about adaptation and resilience. Additionally, fostering youth leadership is crucial for sustaining long-term climate action. Engaging these communities not only ensures that their needs are met but also enriches the global conversation on climate action. By empowering the younger generation to take ownership of climate monitoring and advocacy, the initiative created a sustainable pathway for ongoing community engagement and climate resilience.

A particularly significant outcome of this process was the creation of dialogues and discussions centred around these impacts, which had previously gone unaddressed. The communities had never formally discussed the changes they were witnessing in their environments, making these conversations a critical aspect of the case study. These dialogues not only increased awareness amongst community members, but helped shaped how each community is dealing with climate change. The climate impacts identified became the core topics of communication and education

within the community, leading to a shift in how people understood and responded to climate change. The dialogues, which formed the backbone of the Transboundary Knowledge Exchanges, ensure that the challenges faced by the community were not just identified but also actively addressed through both community-based solutions and government-supported adaptation plans.

Action-Learning Aspects

The youth climate education and action workshops and the cross-border knowledge exchanges both aimed to foster meaningful engagement and create a platform for young people to represent their communities and voice local issues. The young people who participated in the case study shared that they feel better able to represent their communities and voice local issues. For instance, two youth representatives were selected with the help of teachers to act as liaisons between Nepal and Bhutan, as well as with local leaders. Both representatives shared that this role gave them a sense of responsibility and empowerment, encouraging them to ask deeper questions about climate change and actively participate in community discussions. In Sermathang, the youth representative took the initiative to open the discussion of the practical workshop, which was followed by local farmers elaborating on the climate challenges and solutions. Similarly, in Merak, the student representative shared about the transboundary knowledge exchange with Sermathang students, emphasizing the importance of passing down knowledge to help students speak up about their communities in the future.

Psychosocial Aspects

Participants involved in the case study expressed a wide range of emotions related to the impacts of climate change, particularly anxiety, guilt, and fear. Many community members, especially those deeply connected to the land through cultural and spiritual practices, believed that the changes they were experiencing were due to their misdeeds. This belief caused guilt, as they saw environmental degradation as a form of punishment.

The workshops and dialogues helped alleviate these emotions by framing climate change as a global issue rather than a local punishment. The case study participants shared that they learned that these changes were part of a broader global crisis that was affecting regions far beyond their own. This helped them shift from feelings of personal guilt to a collective understanding of shared responsibility. Moreover, by providing community members with practical tools and strategies to adapt to climate change, the case study participants felt that a sense of empowerment had replaced their fear and anxiety.

Geography and Place

During one of the workshops, the potential consequences of reduced snowfall or rainfall on potato crops, karu harvests, and ultimately, the community's livelihood was discussed. This sparked the students' curiosity about global issues like greenhouse gases, global warming, and Glacial Lake Outburst Floods, which are highly relevant to their region in the Hindu Kush Himalayan area. In Nepal, after seeing the students' curiosity unfurling during the workshop, the teachers expressed a desire to incorporate more climate-related classes into the school curriculum. They requested more engaging materials and expressed interest in using real-life, relatable examples that connect students with the local impacts of climate change.

Cultural and Regional Influences

In both communities, spiritual beliefs and deep cultural ties to the environment influenced how community members understood and responded to climate change. In Nepal, for instance, the Hyolmo community's Buddhist traditions informed their views on environmental degradation, which led the community to initially attribute climate changes to spiritual causes. In Bhutan, the community's livelihoods revolve around yak herding, and as a result, climate change is a significant threat to their cultural and economic survival.

The workshops and dialogue sessions were designed to be sensitive to these cultural contexts, ensuring that discussions about climate change were framed in a way that respected local beliefs while also introducing scientific explanations. This culturally adaptive approach was critical in gaining the trust and engagement of the communities.

CASE STUDY IMPACTS

Influence of the Case Study on Conceptualizations of Quality CCE

Conducting the case study has significantly influenced how the team approach the concept of quality climate education in remote Himalayan communities. One of the most important insights from the case study is the critical role of continuous dialogue. In these remote, high-altitude regions, people often lack information about how global climate change manifests locally. The more these types of communities are able to have conversations about climate change and climate action, the more the hidden realities and lived experiences of the communities come to light.

A key lesson from the case study was the importance of tailoring the way we communicate climate change to young students in these regions. It emerged from the case study that using words like "threatening," "life-damaging," or "death" can be overwhelming and trigger anxiety. Instead, focusing on solutions and actionable steps was found to be more engaging and productive. Connecting climate change to local policies made it easier for students and the community to understand how global climate phenomena influence their day-to-day lives. Through using approachable and less alarmist language during workshops, more effective youth engagement was made possible.

Impacts Beyond the Transboundary Knowledge Exchanges

This case study has influenced local policy and fostered cross-border collaboration. At the local level, the documented impacts of climate change—ranging from water shortages to declining crop yields—have added pressure on local governments to take a more active role in addressing these issues. For example, sharing the documented findings on human-wildlife conflict, especially the conflict with bears, with forest officials led to immediate changes in their practices. In addition, sharing the case study findings with local municipalities helped connect policy gaps and laid the groundwork for the inclusion of these community voices in Local Adaptation Plans of Action (LAPAs). Both municipalities in Nepal and Bhutan are in the process of developing their first LAPAs. Hence, the case study is allowing the insights gained from the community to be reflected in local government strategies.

Moreover, the study helped build a platform for transboundary collaboration between Nepal and Bhutan. The similarities between the challenges faced by both regions—particularly the common threats of reduced snowfall, Glacial Lake Outburst Floods, and human-wildlife conflict—highlighted the need for cross-border knowledge exchange. Bhutan's focus on conservation and community-led environmental stewardship has offered valuable lessons for Nepal, while Nepal's adaptive agricultural practices in high-altitude farming can be useful for Bhutanese farmers facing similar climate challenges. Both countries share a commitment to environmental protection but have different approaches to policy implementation, and this case study facilitated learning across these borders.

In terms of policy, both Nepal and Bhutan have National Adaptation Programmes of Action (NAPAs) and Local Adaptation Plans of Action (LAPAs). However, Bhutan's policies place a stronger emphasis on community-based natural resource management, integrating traditional knowledge into formal conservation strategies. As a result, Bhutan's policies include a focus on the protection of biodiversity through strict environmental regulations, such as preserving wildlife corridors and protected areas like the Sakteng Wildlife Sanctuary. Nepal, on the other hand, has focused more on climate-resilient agriculture, including projects that promote agroforestry and water conservation techniques. These initiatives demonstrate complementary strengths that each country can learn from.

The case study also sparked interest from students when representatives from Nepal visited Bhutan to exchange insights and experiences. Students were intrigued by the cross-border connection, which allowed them to see that the climate issues they were facing were part of a larger regional problem. This cross-country interaction inspired a greater sense of shared responsibility and an eagerness to replicate similar knowledge-sharing initiatives in the future.

Scaling and Applicability to Other Contexts

The cross-border collaboration took place between two climate-vulnerable communities in high-altitude, remote regions that are strongly influenced by local customs and norms. The case study's learnings will be of interest to communities experiencing similar contexts, such as the Andes or Pacific Islands.

Overall, the case study highlights the importance of engaging with culturally rich Indigenous traditions and practices in remote communities with low awareness of climate change. These remote Himalayan communities face shared climate challenges such as reduced snowfall, water scarcity, and agricultural disruptions, yet lacked climate awareness and formal adaptation strategies. In this context, using a community-centred approach to climate learning allowed for global perspectives and practices to align with the local worldviews, traditions, and practices of Indigenous community members. Prioritizing local knowledge, intergenerational dialogue, and youth engagement helped support the development of community-driven solutions and enabled a deeper understanding and high engagement with the Transboundary Knowledge Exchanges.

However, several barriers were encountered during the implementation of the climate communication and education (CCE) workshops which can serve as learning moments for others interested in replicating the approach:

- Initial Reluctance to Engage: Many community members were initially skeptical and hesitant to participate in the CCE, as they did not fully understand why climate change

was relevant to them. This barrier was overcome by connecting global climate concepts to local issues.

- Cultural Beliefs: Some participants initially believed that the changes they were seeing were due to spiritual causes. It took time and sensitive communication to shift their understandings of climate change toward scientific explanations.
- Limited Resources: Implementing large-scale adaptation strategies has proved challenging due to the lack of financial and technical resources in these remote regions. A more fullsome implementation of Transboundary Knowledge Exchanges would require ongoing government support and funding.

FINAL REFLECTION

This case study shows that quality climate communication and education should be inclusive, culturally sensitive, and engaging. It should involve continuous dialogue amongst community members, where the global climate context is effectively interpreted into practical insights that resonate with the lived experiences of local communities.

This case study highlights the importance of culturally adaptive approaches. The communities of Sermathang, Nepal and Merak, Bhutan have aligned global climate action with their norms, spiritual beliefs, and traditions. The active integration of local practices in adapting to climate change helped build a sense of communal ownership of climate action. The integration of community insights into the Local Adaptation Plans of Action was one of the key impacts of the case study. To more fully adopt the proposed adaptation measures, more technical and financial support is needed, alongside continued government support to support the community in becoming more resilient in the face of climate change.

APPENDIX A – SURVEY QUESTIONNAIRE

Demographics

- Name:
- Age:
- Gender:
- Ethnicity:
- Occupation:
- Length of Residence:
- Type of House:

Perceptions of Climate Change

- Have you noticed any changes in the climate over the past 30 years?
    - Yes
    - No
    - Maybe
- If yes, what changes?
- Have you heard about the term "climate change"?

Agriculture and Livestock

- **A.** Could you provide insights into the changes observed in the cropping calendar over the past 30 years?
    - More Crops Added
    - Fewer Crops Grown
    - No Significant Changes
- **B.** List of crops commonly grown:
    - Maize
    - Millet
    - Potato
    - Other
- **C.** Have there been any noticeable changes in the amount of crops produced annually compared to a decade ago?
    - Increased
    - Decreased
    - Remained the same
    - Not Sure
- Which of the following extreme weather events have occurred in the past few years?
    - Flood
    - Droughts
    - Landslides
    - GLOFs
    - Other:
- **D.** Have there been any instances of crop damage or infrastructure destruction due to extreme weather events in your area during the past decades?
    - Yes
    - No
    - Not Sure

- **E.** Have you observed an increase in pest outbreaks or viral diseases affecting crops and livestock over the past 30 years?
    - Yes
    - No
    - Not Sure
- **F.** Have there been any changes in the presence of leeches and mosquitoes in your locality over the past decade?
    - Increased
    - Decreased
    - Remained the Same
    - Not Sure
- How have these changes affected your household or livelihood? *(Open-ended question)*
- Adaptation measures/practices to these changes: *(Open-ended question)*

<u>Forests and Biodiversity</u>

- **A.** Have you noticed any changes in the pattern of forests, including the presence or absence of certain tree species and plants, over the past 30 years?
    - Yes
    - No
    - Not Sure
- **B.** Have there been any new sightings of wildlife species in your area that were not previously present?
    - Yes
    - No
    - Not Sure

<u>Health</u>

- **A.** Have there been any outbreaks of waterborne diseases in your community in the last decade?
    - Yes
    - No
    - Not Sure
- **B.** Have you noticed any changes in the distribution or prevalence of vector-borne diseases such as malaria and dengue fever in your area over the past 30 years?
    - Increased
    - Decreased
    - Remained the Same
    - Not Sure

<u>Governance Process</u>

- **A.** Have you been engaged in the governance and decision-making process within your municipality?

APPENDIX B – FOCUS GROUP QUESTIONS

1. How has the local climate in Sermathang changed in the last few decades according to your experience?
2. What are the most noticeable impacts of climate change you have observed in your community?
3. Are there any adaptation measures for them?
4. Impacts on Livelihood and Economy
5. Impacts on Non-economic loss and damage
6. How has the act Helambu Rural Municipality Climate Change Act, of 2080, influenced local responses to climate change?
7. Support and Recommendations

APPENDIX C – KEY INFORMANT INTERVIEW QUESTIONS

1. What are the main climate change impacts currently observed in Sermathang? सेर्माथाङमा हाल देखिने मुख्य जलवायु परिवर्तनका प्रभावहरू के के हुन्?

Reference: The Act emphasizes the assessment and documentation of climate change impacts, including the preparation of risk and vulnerability analyses (Risk Analysis).

2. What adaptation strategies have been adopted in Sermathang to deal with these impacts? यी प्रभावहरूलाई सामना गर्न सेर्माथाङमा कुन कुन अनुकूलन रणनीतिहरू अपनाइएका छन्?

Reference: The Act mentions the development of an annual adaptation plan that prioritizes support for vulnerable populations and geographical areas more susceptible to climate change (Adaptation Plan).

3. What mechanisms are in place to monitor and evaluate the effectiveness of adaptation strategies?अनुकूलन रणनीतिहरूको प्रभावकारिता निगरानी र मूल्याङ्कन गर्ने तंत्र के के छन्?

Reference: The document details mechanisms for monitoring and inspection to ensure compliance with the Act and the effectiveness of the implemented strategies (Monitoring and Inspection).

4. How are vulnerable populations in Sermathang being supported to adapt to climate change? जलवायु परिवर्तनमा अनुकूलन गर्न सेर्माथाङमा विपन्न जनसंख्यालाई कसरी सहयोग गरिन्छ?

Reference: The Act calls for prioritizing vulnerable groups such as women, Dalits, indigenous tribes, and those living in geographically susceptible areas in the adaptation plans (Support for Vulnerable Groups).

5. How is the Helambu Rural Municipality Climate Change Act, 2080 being implemented in Sermathang? हेलाम्बु ग्रामीण नगरपालिका जलवायु परिवर्तन ऐन, २०८० सेर्माथाङमा कसरी कार्यान्वयन भइरहेको छ?

Reference: The Act outlines the establishment of governance structures like the Policy Committee and Executive Committee to integrate and manage climate change initiatives (Governance Structures).

6. What are the challenges faced in implementing the Climate Change Act at the local level? स्थानीय स्तरमा जलवायु परिवर्तन ऐनलाई कार्यान्वयन गर्ने क्रममा के के चुनौतीहरू छन्?

Reference: While specific challenges are not directly mentioned, the Act's comprehensive structure implies potential difficulties in resource allocation, community engagement, and interdepartmental coordination.

7. What training or capacity-building programs are available for VDC and ward staff regarding climate change management? जलवायु परिवर्तन व्यवस्थापनको बारेमा VDC र वार्ड स्टाफका लागि कुनै प्रशिक्षण वा क्षमता विकास कार्यक्रमहरू उपलब्ध छन् कि छैनन्?

Reference: The Act mentions capacity development for disaster risk reduction and climate change management, including leadership programs and technical capacity expansion (Capacity Development).