Training manual and Materials of Climate Change

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MAY 2025

Institute for Resource Management and Technology Nepal (IRMT Nepal)

1. Module One

Training duration: 1 day

Introductory Session	Training opening, Introduction of participants, Introduction of the training, Expectation collection; Objectives of the training, Pre-training evaluation
Session 1-2	Basic Concepts, terminologies and definition related to Climate Change • Weather and climate • Climate change, causes of climate change and signs of climate change • Global warming and extreme climate events • Climate variability • Greenhouse gases (GHG) and sources of GHG emissions • Adaptation and mitigation • Other key terminologies related to climate change
Session 3	Climate change impacts in different sectors (Agriculture, livestock, forestry, water resources, GEDSI and marginalized and vulnerable groups)
Session 4	Climate change related policies in Nepal

Introductory

- Training opening,
- Introduction of participants,
- Introduction of the training,
- Expectation collection;
- Objectives of the training, and
- Pre-training evaluation

Session 1: Basic Concepts, Terminologies and Definition related to Climate Change

Duration: 1 Hour 30 Minutes
Materials required: Projector, Market pen, Whiteboard, Newsprint, Stationary for the participants and materials for games and energizers, as appropriate
Venue: Training Hall with furniture, ventilated and separate toilet for male/female
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

This session will discuss the basic concepts related to climate change and the fundamental understanding and definitions of terminology associated with climate change. This session aims to enrich participants' understanding of climate change, its main causes, consequences, and terminologies and definition of the terminology commonly used in climate science.

Objectives of the Session

By the end of this session, participants will be able to:

- Understand the concept of climate change, and causes and signs of climate change
- Become familiar with the terminologies commonly used in climate science
- Explain the difference between weather and climate.
- Understand the meaning of climate change adaptation and mitigation
- Identify the main factors that cause climate change.

Session Delivery

- The session begins with asking the participants what they understand by 'climate' and 'weather' and what is the difference between 'climate' and 'weather'? The key differences reported by the participants can be noted down in a whiteboard.
- Then the participants will be asked what they understand by 'climate change' and how it occurs (or what the causes of climate change are). The participants will be requested to express their understanding with examples. The key points can be noted down in a whiteboard or newsprint.
- Then, the session can be moved forward by discussing the changes that have occurred (or the participants have observed/experienced) in the climate over the past 20-30 years.
- For this, participants can be asked to do a short group exercise on the Weather Calendar (**मौसमी पात्रो**) (*Exercise No. 1*). Facilitation will guide the participants on how to prepare a *Weather Calendar* using the below table.

Exercise 1: Discuss the changes that have occurred in the climate over the past 20 - 30 years and prepare a weather calendar by filling in the table below to analyze the state of climate change.

विवरण	समय	बैशाख	जेठ	असार	श्रावण	भाद्र	असोज	कार्तिक	मंसिर	पुष	माघ	फाल्गुन	चैत	बैफियत
मनसुनी वर्षा	पहिले													
	अहिले													
हिउँदे वर्षा	पहिले													
	अहिले													
.....	पहिले													
	अहिले													
.....	पहिले													
	अहिले													

नोटः पहिले – २०/३० वर्ष अगाडि अहिले – २/३ वर्ष यता

- Once the *Weather Calendar* is prepared, review it in bigger group, and have participants discuss the following questions:
  - What are the differences in weather conditions between 20/30 years ago and now?
  - What could be the main causes of this change, and are the changes due to climate change?
  - What types of disasters has it caused due to differences in weather conditions?
- The Facilitator will then clarify the basic concepts related to climate change and the main factors that cause it. For this, the reference material provided below (Reference Material 1) can be used. The above exercise and discussion helps to make participants understand basic concept of climate change.
- Following that exercise, the facilitator can discuss the terminology commonly used in climate science with the participants. For this, presentation and discussion method can be used. The reference material provided below (Reference Material 2) can be used.
- Towards the end of this session, the facilitator can ask the participants the following questions to ensure participants' understanding on:
  - What is the difference between weather and climate?

    - What are the four main factors that cause climate change, and what are five main measures that can be taken to address them? Which gases fall under greenhouse gases?
    - What is the definition of global warming?

- Finally, facilitator can conclude the session by summarizing the points discussed throughout the session and thanking the participants for their active participation and cooperation.

Reference Material 1

Difference between Weather and Climate

Weather: Weather refers to the state of the atmosphere at a specific time and place. It describes the short-term conditions we experience daily or even hourly. It's characterized by various meteorological elements, including: Temperature (how hot or cold it is), Precipitation (rain, snow, sleet, hail), Wind (speed and direction), Humidity (amount of moisture in the air), Atmospheric pressure, Cloud cover, Sunshine, etc. Weather is a short-term phenomenon, ranging from minutes to hours, days, and up to a few weeks. For example, the forecast for tomorrow in Sindhuli, predicting sunny skies and a high of 25°C, is describing the weather. A sudden thunderstorm this evening is also a weather event. Weather is highly variable and can change rapidly. A day can start sunny and end with a downpour.

Figure 1: Difference between Weather and Climate

Climate: Climate, on the other hand, describes the long-term average of weather conditions in a particular region. It represents the typical or characteristic atmospheric conditions over an extended period, usually 30 years or more. Climate is determined by analyzing the average and variability of weather elements over this long period, including temperature and precipitation patterns, as well as the frequency and intensity of extreme weather events. For example, the climate of the Bagmati Province is characterized by a subtropical highland climate with distinct wet (monsoon) and dry seasons, and average temperatures that vary with altitude. Climate is a long-term phenomenon, reflecting patterns that persist over decades, centuries, or even longer. While individual weather events can fluctuate dramatically, climate is relatively stable over shorter periods. Climate change, however, refers to significant shifts in these long-term averages and patterns.

What is Climate Change?

Climate change refers to long-term shifts in these average weather patterns and an increase in the frequency and intensity of extreme weather events. For a place, this could mean changes in the timing and intensity of the monsoon, more frequent heatwaves, altered precipitation leading to droughts or floods, and shifts in temperature averages over the coming decades, even though the weather on any particular day might still be sunny or rainy within the typical range.

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change in Article 1, paragraph 2[1] 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."*

Causes of Climate Change

The primary cause of climate change is the enhanced greenhouse effect**,** driven by a significant increase in greenhouse gas concentrations in the Earth's atmosphere. This increase is overwhelmingly attributed to human activities**,** primarily since the Industrial Revolution. The major contributing factors to the climate change are:

- Burning Fossil Fuels: The combustion of coal, oil, and natural gas for energy production (electricity, heating), transportation, and industrial processes releases large amounts of carbon dioxide (CO_2) and other greenhouse gases like nitrous oxide into the atmosphere. CO2 is the most significant long-lived greenhouse gas.
- Deforestation and Land Use Change: Clearing forests for agriculture, urbanization, and other purposes reduces the number of trees that absorb CO_2 from the atmosphere through photosynthesis. Burning forests also releases stored carbon. Agriculture and changes in land use contribute significantly to greenhouse gas emissions, including methane and nitrous oxide.

Figure 2: Causes of climate change

- Agriculture: Livestock farming, particularly cattle and sheep, produces significant amounts of methane (CH_4) during digestion. The use of nitrogen-based fertilizers in crop production releases nitrous oxide ($N2_O$), a potent greenhouse gas. Rice cultivation in flooded fields also generates methane.
- Industrial Processes: Some industrial processes release greenhouse gases directly, such as production of cement (releases CO_2) and use of fluorinated gases (HFCs, PFCs, SF6) in various applications, which can have a very high global warming potential.
- Waste Management: Landfills release methane as organic waste decomposes.

[1] https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf

Carbon dioxide emissions, identified as a major contributor to greenhouse gases, are considered a primary driver of global warming and climate change. While developing countries like Nepal are not the main cause of climate change, the impacts of global climate change are increasingly affecting various sectors, including the Himalayas, human life, socio-economic development, biodiversity, and tourism development. Consequently, the risk of natural disasters such as heavy rainfall, drought, floods, landslides, and avalanches is also increasing. The negative impact of this is not limited to the regions near the Himalayas but has also affected the environmental balance of South Asia and the entire world.

In essence, human activities are adding substantial quantities of greenhouse gases to the atmosphere, trapping more of the sun's heat and leading to a warming planet and subsequent climate change.

Signs of Climate Change

The key signs of climate change are:

1. Rising Global Temperatures:
   - The average temperature of the Earth's surface and oceans has been steadily increasing. Each of the last several decades has been warmer than the previous one.
   - Relevance in Nepal: One might observe warmer summers and milder winters compared to historical records in Nepal.

2. Changes in Precipitation Patterns:
   - Some regions are experiencing more intense rainfall and flooding, while others are facing prolonged and severe droughts.
   - Relevance in Nepal: The Bagmati Province might be experiencing more erratic monsoon patterns, with either very heavy rainfall events leading to floods and landslides, or longer dry spells affecting agriculture and water availability.

3. More Frequent and Intense Extreme Weather Events:
   - Heatwaves are becoming hotter and lasting longer. Tropical storms and cyclones can be more intense due to warmer ocean temperatures. The frequency and intensity of other extreme events like wildfires can also increase.
   - Relevance in Nepal: Nepal is vulnerable to increased risks of intense rainfall leading to floods and landslides, as well as heatwaves, particularly in the lower altitudes.

4. Melting Ice and Snow:
   - Glaciers around the world are shrinking at an accelerated rate. Snow cover in many regions is decreasing, and snow is melting earlier in the spring. Sea ice in the Arctic is declining significantly.
   - Relevance in Nepal: The Himalayan region of Nepal, is witnessing a significant melting of glaciers and snowpack. This has implications for river flows, water availability, and the risk of glacial lake outburst floods (GLOFs) in the mountainous areas.

5. Sea Level Rise:
   - Global sea levels are rising due to thermal expansion of water and the melting of ice sheets and glaciers.
   - Relevance in Nepal: While Nepal is landlocked country, sea-level rise is a global indicator of climate change and can have indirect impacts through global economic and migration patterns.

6. Warming Oceans:
   - Oceans have absorbed a significant amount of the extra heat trapped by greenhouse gases, leading to a rise in ocean temperatures.

- Warmer oceans contribute to more intense storms and can harm marine ecosystems.
- No relevance in Nepal.

7. Changes in Plant and Animal Life:
    - Many species are shifting their ranges and migration patterns in response to changing temperatures and habitats.
    - Flowering and other seasonal events in plants are occurring earlier in the year.
    - Relevance in Nepal: In the Bagmati Province, you might observe changes in the timing of flowering of local plants or the appearance of certain animal species at different altitudes than historically recorded.

Some major signs of Climate Change observed in Nepal and the Himalayan Region are:

- Accelerated glacial melt: As mentioned, this is a prominent sign with direct impacts on water resources.
- Changes in monsoon patterns: Irregular and intense rainfall, as well as shifts in the timing of the monsoon.
- Increased frequency of extreme weather events: More instances of heavy rainfall leading to floods and landslides, and potentially heatwaves in lower elevations.
- Upward shift of vegetation zones: As temperatures rise, plant species may migrate to higher altitudes.
- Impacts on agriculture: Changes in temperature and precipitation affect crop yields and agricultural practices.
- Drying water sources: Many communities in the hills and mountains report decreasing water availability, particularly during the dry season.

In Nepal, the maximum temperature is increasing at an average rate of 0.056 degrees Celsius per year[2]. This is significantly higher than the global average rate of increase. Moreover, the rate of temperature increase is even higher in the high mountainous regions. Climate change further exacerbates poverty, and marginalized and vulnerable groups may face even greater hardship. Poor people have very little land for farming, and they depend on wage labor for their livelihoods. They are at higher risk from climate change because their very low income provides little to no capacity, skills, and access to adapt their agriculture, healthcare, or other protective measures to cope with the challenges of the changing conditions.

Climate change has affected all sectors, including agriculture, forestry, water resources, biodiversity, climate-induced disasters, tourism, health, and ecosystems. In the agriculture and food security sector, climate change alters fundamental elements such as water availability, soil moisture, pollination processes, and soil temperature, leading to a decrease in agricultural production. Similarly, changes in the natural rainfall cycle disrupt the balance of traditional cropping patterns, directly impacting agricultural output.

[2] Department of Hydrology and Meteorology, 2017.

Reference Material 2

Some Important Definitions and Terminologies related to Climate Change

Adaptation: Adaptation, as defined by the Intergovernmental Panel on Climate Change (IPCC) and UNFCCC documents, refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It involves changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. Key aspects of adaptation within the UNFCCC context include: Reducing vulnerability, enhancing resilience, integrating climate change into development planning, and promoting sustainable development.

Adaptive Capacity: The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. The potential to adjust in order to minimize negative impacts and maximize any benefits from changes in climate is known as adaptive capacity. The whole of capabilities, resources and institutions of a country or region to implement effective adaptation measures is the adaptive capacity of the country or region.

Adverse effects of climate change: The UNFCCC (Article 1, paragraph 1) defines adverse effects of climate change as:

> *"changes in the physical environment or biota resulting from climate change which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare."*

***Biodiversity*:** The numbers and relative abundances of different genes (genetic diversity), species and ecosystems (communities) in a particular area is known as biodiversity or the total diversity of all organisms and ecosystems at various spatial scales (from genes to entire biomes).

Carbon Sequestration: Terrestrial, or biologic, carbon sequestration is the process by which trees and plants absorb carbon dioxide, release the oxygen, and store the carbon. Geologic sequestration is one step in the process of carbon capture and sequestration (CCS), and involves injecting carbon dioxide deep underground where it stays permanently.

***Climate Change Impacts*:** The effect of Climate Change on natural and human systems is known as Climate Change Impacts. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts

Climate Change Mitigation: Strategies and policies that reduce the concentration of greenhouse gases in the atmosphere either by reducing their emissions or by increasing their capture is known as Climate Change Mitigation.

Climate Hazard: The harmful effect of Climate Change on livelihoods and ecosystems is known as climate hazard. They can be caused by gradual climate variability or extreme weather events. Some hazards are continuous phenomena that start slowly such as the increasing unpredictability of temperatures and rainfall. Others are sudden but relatively discrete events such as heat waves or floods.

Climate variability: It refers to the natural fluctuations and deviations in climate conditions (such as temperature, precipitation, wind patterns) around the average or mean state over

different timescales. These variations can range from seasonal, year-to-year, to decadal and even longer periods.

***Climate vulnerability*:** Climate change vulnerability is a concept that describes *how strongly people or ecosystems are likely to be affected by climate change*. Climate Vulnerability Assessments identify what species, habitats or communities may be most vulnerable based on their exposure to projected changes in the environment (e.g., warming oceans) and their sensitivity or adaptability to handle those changes based on their life history characteristics (e.g., reproductive rates, diet etc).

***Climate-induced disasters*:** Climate-induced disasters refer to the potential dangers and devastating impacts, whether direct or indirect, on livelihoods, natural systems, and ecosystems due to climate change. Rising temperatures, droughts, floods, storms, pests, and hurricanes can be considered climate-induced hazards. The nature of these impacts, caused by both rapid weather events and gradual climate change, is numerous (high in number) and diverse (different types).

***Coping Capacity*:** The ability of people, organizations and systems, using available skills and resources to face and manage adverse conditions, emergencies or disasters is known as coping capacity. The capacity to cope requires continuing awareness, resources and good management, both in normal times as well as during crises or adverse conditions. Coping capacities contribute to disaster risks reduction.

***Deforestation*:** Those practices or processes that result in the conversion of forested lands for non-forest uses are deforestation. The UNCCD (The United Nations Convention to Combat Desertification) defines land degradation as a reduction or loss, in arid, semi-arid, and dry sub-humid areas, of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest, and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation or conversion of forest to non-forest.

***Disaster Risk*:** The potential disaster losses, in lives, health status, livelihoods, assets and services which could occur to a particular community or a society over some specified future time period is known as disaster risk. The definition of disaster risk reflects the concept of disasters as the outcome of continuously present conditions of risk.

***Ecological vulnerability*:** Ecological vulnerability refers to the extent to which a species or ecosystem is susceptible to the effects of stressors, taking into account factors such as exposure, sensitivity, and recovery capacity at the population level.

***Ecosystem*:** The complex system of plant, animal, fungal, and microorganism communities and their associated non-living environment interacting as an ecological unit. Ecosystems have no fixed boundaries; instead their parameters are set to the scientific, management, or policy question being examined. Any natural unit or entity including living and non-living parts that interact to produce a stable system through cyclic exchange of materials is called ecosystem. Depending upon the purpose of analysis, a single lake, a watershed, or an entire region could be considered an ecosystem.

***Emissions*:** The release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time.

***Extreme climate events*:** Extreme climate events are weather occurrences that deviate significantly from normal weather patterns and are often destructive. In a geographically complex country like Nepal, these events have a significant impact. The major extreme climate events in Nepal include floods and landslides, droughts, glacial lake outbursts (GLOFs), extreme rainfall, cold waves, and heat waves. Climate change, Nepal's geographical structure, and uncontrolled development activities are the primary causes of these extreme climate events. The main impacts of these events are: economic loss, environmental damage, impact on agriculture, food security and livelihood; and Loss of life and property.

Glacier, Glacier Lake and Glacial Lake Outbrust Flood (GLOF): A multi-year surplus accumulation of snowfall in excess of snowmelt on land and resulting in a mass of ice at least 0.1 km^2 in area that shows some evidence of movement in response to gravity. A lake formed by glacier melt water located either at the front of a glacier, on the surface of a glacier, within the glacier or at the glacier bed is known as glacial lake. A glacial lake outburst flood (GLOF) is created when water dammed by a glacier or a moraine is released.

Global warming: It refers to the long-term increase in Earth's average surface temperature. This is the progressive gradual rise of the earth's surface temperature thought to be caused by the greenhouse effect and responsible for changes in global climate patterns. This warming trend has been unequivocally linked to human activities, primarily the release of greenhouse gases into the atmosphere. This has caused several impacts in Nepal, particularly the problem of melting Himalayan snow, extreme rainfall and drought, landslides and floods, loss of biodiversity, and a decrease in agricultural production. To stop global temperature rise, measures such as reducing greenhouse gas emissions, adaptation, and international cooperation need to be adopted.

***Greenhouse effect*:** The greenhouse effect is the process by which radiation from the sun is trapped in the atmosphere, which warms the Earth's surface. Greenhouse gases cause the greenhouse effect, which increases the Earth's temperature. However, if this process did not exist, the Earth would be too cold, and life would not be possible. The problem arises when human activities cause an excessive increase in the amount of greenhouse gases. This accelerates the process of the Earth's temperature rising excessively, leading to global warming. The use of fossil fuels, deforestation and degradation, agricultural activities, and industrial activities are the main causes of the increased greenhouse effect. As the greenhouse effect intensifies, it leads to various negative impacts such as climate change, an increase in natural disasters like floods, landslides, droughts, forest fires, and cyclones, rising sea levels, melting of Himalayan snow, loss of biodiversity, impacts on human health due to pollution and temperature increases, and effects on the economy.

Greenhouse gases: Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrochlorofluorocarbons (HCFCs), ozone (O_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). In Nepal, the major sources of greenhouse gas emissions include deforestation, agriculture and animal husbandry activities, the exploitation of non-renewable energy sources such as fossil fuels, industrial sector emissions, and environmental changes.

***Habitat Fragmentation*:** Habitat fragmentation is a process during which larger areas of habitat are broken into a number of smaller patches of smaller total area, isolated from each other by a matrix of habitats unlike the original habitat.

Intergovernmental Panel on climate Change (IPCC): The IPCC was established jointly by the United Nations Environment Programme and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC is also looked to as the official advisory body to the world's governments on the state of the science of the climate change issue.

Mitigation*:* In the context of climate change, mitigation is a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings and expanding forests and other sinks to remove greater amount of carbon dioxide from the atmosphere. Tackling climate change by limiting greenhouse gas emissions is known as mitigation. In Climate Change policy, "mitigation" is defined differently, being the term used for the reduction of greenhouse gas emissions that are the source of Climate Change.

Phenology: The timing of natural events, such as flower blooms and animal migration, which is influenced by changes in climate. Phenology is the study of such important seasonal events. Phenological events are influenced by a combination of climate factors, including light, temperature, rainfall, and humidity.

Renewable energy**:** Energy obtained from sources that are essentially inexhaustible, unlike, for example, the fossil fuels, of which there is a finite supply. Renewable sources of energy include wood, waste, geothermal, wind, photovoltaic, and solar thermal energy.

Resilience: The capacity of a system, community or society potentially exposed to hazards to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure is known as resilience. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures. The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to 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. It is the amount of change a system can undergo without changing state.

Sensitivity: The degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise).

United Nations Framework Convention on Climate Change (UNFCCC): The Convention was adopted on 9 May 1992 in New York and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Community. Its ultimate objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." It contains commitments for all Parties. Under the Convention, Parties included in Annex I aim to return greenhouse gas emissions not controlled by the Montreal Protocol to 1990 levels by the year 2000.

Vulnerability: The IPCC's working definition of climate vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. It is a combination of exposure to climatic conditions, how sensitive the community is to those conditions, and the capacity to adapt to geographical, climatic, social, economic, physical, environmental, development related changes. It is the

degree to which a system is susceptible to or unable to cope with adverse effects of Climate Change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity

***Vulnerability assessment*:** A range of tools that exist to help communities understand the hazards that affect them and take appropriate measures to minimize their potential impact is known as Vulnerability Assessment. Assessment of vulnerability to climate change mainly involves research into the exposure, sensitivity and adaptive capacity levels of a system in the presence of a specific impact, for example, rising frequency of floods. *Vulnerability assessments* are used to ascertain the susceptibility of a natural or human system to sustaining damage (or benefiting) from *climate* change.

Session 2 and 3: Climate Change Impacts in Different Sectors

Time: 1 hour 30 minutes
Required Materials: Projector, marker pen, whiteboard, newsprint
Location: Suitable training hall
Method: Lecture/presentation, brainstorming, small group discussion

Background

This session will discuss the impacts of climate change on various sectors or thematic areas. The session will focus on how changes in climate patterns affect different social, economic, and environmental sectors, particularly agriculture, forestry, and water resources. The session will also discuss about differential vulnerabilities to women and other marginalized/vulnerable groups due to climate change.

Objectives

By the end of this session, the participants will be able to:

- **Describe social, economic, and environmental impacts of climate change patterns and climate variability on different sectors such as agriculture, forestry, water resources, etc.**
- **Identify the negative consequences of the impacts.**
- **Present examples of the impacts of climate change on different sectors.**

Session Delivery

- **At the beginning of the session, the trainer will engage the participants in brainstorming on the impacts of the identified climate change patterns on different sectors that are directly linked with their livelihoods, especially agriculture, livestock, forestry, water resources, and GEDSI/marginalized groups.**
- **Then, the subject can be discussed in small groups. The participants can be divided into small groups of 4-6 people and ask them to discuss in their small groups how changes in climate patterns have affected various production and development sectors that are linked with their livelihoods. About 30 minutes time can be allocated for this discussion. The following table can be used to summarize the findings of the discussions:**

SN	Impacts of Climate Change	Negative Consequences of the impacts
Sector: Agriculture		
1		
2		
3		
…		
Sector: Forestry		
1		
2		
3		
…		

- **Each group will present their group discussion findings, and discuss them in the plenary.**
- **Following the group discussion and presentation, the facilitator can further clarify the impacts of climate change on different sectors by using the lecture method. The reference material provided below can be used for this purpose.**

- **Towards the end of this session, the facilitator can ask the participants the following questions to ensure the participants' understanding:**
    - **What are the major impacts of climate change on agriculture and livestock sector?**
    - **What are the major impacts of climate change in forestry sector?**
    - **What are the impacts of climate change on water resources?**
    - **How the climate change has disproportionately impacted women, girls, socially excluded and other marginalized and vulnerable people and groups?**

- **Finally, the facilitator can conclude the session by summarizing the key points discussed in this session and thank the participants for their active participation and cooperative.**

Resource Materials

Climate Change Vulnerability Factors in the Country Context:

- **Diverse Topography and Altitudinal Range: Nepal's dramatic variation in altitude, from low-lying plains to the highest peaks, makes it particularly susceptible to diverse climate change impacts.**
- **High Dependence on Natural Resources: The significant reliance of a large portion of the population on forests for fuelwood, timber, grazing, and other livelihood resources increases their vulnerability to forest degradation caused by climate change.**
- **Limited Adaptive Capacity: Nepal's status as a least developed country with limited economic resources, infrastructure, and institutional capacity constrains its ability to effectively respond to and adapt to the adverse effects of climate change on forests.**
- **Forest Degradation: Existing forest degradation, often driven by unplanned development and unsustainable resource use, further weakens the resilience of forest ecosystems to climate change impacts.**

Climate Change Impacts in Agriculture and Livestock Sector of Nepal

Climate change presents significant and escalating challenges to the agricultural sector globally. In Nepal, given the country's diverse geography (Terai, Hills, Mountains), heavy reliance on agriculture for livelihoods (employing over two-thirds of the labour force) and GDP (contributing about one-third of GDP), and high dependence on monsoon rains (around 64% of cultivated land is rain-fed), the country is exceptionally vulnerable to climate change. The key impacts on agriculture sector in Nepal are described in this section.

1. **Rising Temperatures & Shifting Agro-Ecological Zones:**

The following points effectively capture how rising temperatures are reshaping Nepal's agricultural landscape and posing serious challenges to traditional farming systems, biodiversity, and food production.

- **Accelerated Warming: Nepal, particularly its Himalayan region, is indeed experiencing warming at a rate significantly faster than the global average (the 0.06°C/year figure is often cited[3].).**
- **Shifting Agro-ecological Zones: This rapid warming is pushing climatic zones upward, creating potential new opportunities for cultivation at higher altitudes but simultaneously disrupting established agricultural practices and crop suitability in the traditionally fertile Terai and mid-hill regions.**

[3] Upadhayaya, R. P. & Baral, M. P. 2020 Trends of climate change in some selected districts of western Nepal. Janapriya Journal of Interdisciplinary Studies 9 (1), 148–158. https://doi.org/10.3126/JJIS.V9I1.35284.

- **Biodiversity and Crop Loss: The threat to endemic and local crop varieties (like specific landraces of rice, wheat, maize) is a major concern for agricultural biodiversity and future resilience.**
- **Impacts on High-Altitude Systems: Sensitive high-altitude agriculture, including horticulture (apples), medicinal herbs, pastures vital for livestock like Chauri, are directly affected by these changes.**
- **Horticultural Challenges: Changes in temperature patterns directly impact the phenology (flowering/ripening times) and quality of fruits and vegetables, leading to issues like poor fruit set, quality reduction, and sunburn.**

2. **Erratic Precipitation and Water Stress:**

In the recent years, Monsoon patterns in Nepal are becoming unpredictable, with delays in onset, shifts in timing (e.g., rains moving later into the season), decreased total rainy days, but increased intensity of rainfall events. Such unpredictability of Monsoon patterns and water availability creates complex interconnected problems in agriculture productivity.

Agricultural Vulnerability: The shift towards delayed onset and fewer rainy days, coupled with increased intensity, creates a double whammy for agriculture. Winter and spring crops suffer from drought due to reduced off-season rainfall, while the risk of intense floods during the monsoon devastates standing crops, as highlighted by the examples from the Terai. This directly threatens food security and livelihoods.

Water Scarcity: The drying up of traditional water sources like springs and wells, especially in the hills, is a critical concern. This not only affects irrigation for agriculture but also has severe implications for access to drinking water for communities. The intense rainfall, instead of replenishing groundwater, contributes to rapid runoff, exacerbating this scarcity.

Increased Disaster Risk: The rise in water-induced disasters such as flash floods, GLOFs, and landslides poses a direct threat to both farmland and vital productive infrastructure, such as irrigation dams and irrigation canals. These events can lead to significant economic losses, displacement of communities, and long-term setbacks for development.

Understanding these interconnected impacts is crucial for developing effective adaptation and mitigation strategies. Addressing these challenges will likely require a multi-pronged approach involving:

- **Improved Water Management: Implementing strategies for efficient water use in agriculture, rainwater harvesting, and the sustainable management of groundwater resources.**
- **Climate-Resilient Agriculture: Promoting crop varieties and farming practices that are more tolerant to drought and flooding, as well as exploring alternative irrigation techniques.**
- **Disaster Risk Reduction: Investing in early warning systems, strengthening infrastructure to withstand extreme weather events, and implementing land-use planning to minimize vulnerability.**

- **Community-Based Adaptation: Empowering local communities to understand the changing risks and develop their own coping mechanisms.**
- **Policy and Governance: Developing and implementing policies that support climate resilience and sustainable water management across different sectors.**

3. **Crop Yields and Food Security:**

Overall, climate variability is linked to declining crop production. Although some studies suggest potential increase in yields for rice and wheat under certain temperature scenarios, climate variability usually has negative impacts in crop yields due to water stress/extreme events. These losses ripple through the economy, affecting farmers' livelihoods and national food supply. This is a significant concern, because reduced yields exacerbate food insecurity, particularly in the already vulnerable remote hill and mountain districts. This is potentially a reason contributing to Nepal's shift from a rice exporter country to an importer.

This reinforces the urgency of addressing climate change impacts on agriculture through targeted interventions and underscores the need for crop-specific adaptation strategies. This could include:

- **Investing in Climate-Smart Agriculture: Promoting practices that enhance resilience to climate variability, such as drought-resistant crop varieties, efficient irrigation techniques, and sustainable land management.**
- **Strengthening Early Warning Systems: Improving the accuracy and reach of weather forecasts and agricultural advisories to help farmers make informed decisions.**
- **Developing Social Safety Nets: Implementing programs to support vulnerable populations during climate-related shocks and ensure food access.**
- **Investing in Agricultural Research: Focusing research efforts on understanding the specific impacts of climate change on different crops and regions in Nepal and developing appropriate adaptation strategies.**
- **Improving Market Access and Infrastructure: Enhancing transportation and storage infrastructure to reduce post-harvest losses and improve market access for farmers, particularly in remote areas.**

4. **Livestock Impacts:**

Climate change impacts extend beyond crops to significantly affect livestock, a vital part of Nepal's agricultural system and rural livelihoods. The vulnerability of livestock to a changing climate is highlighted by the following points:

- Heat Stress: **The direct impact of rising temperatures leads to heat stress in livestock. This not only affects their immediate well-being but also has cascading effects on their health, reducing fertility rates and overall productivity in terms of milk and meat yield.**
- Water and Fodder Scarcity: **Changes in rainfall patterns and the drying up of water sources as a result of climate change impacts directly impact the availability of drinking water for animals. Furthermore, shifts in vegetation and pasture growth due**

to altered temperatures and precipitation affect the availability and quality of fodder, a primary feed source for livestock.

- Disease Proliferation: **Alterations in temperature and humidity create more favorable conditions for the survival and spread of various animal diseases and pests. The potential for these diseases to expand into higher elevations, previously less affected, poses a new threat to livestock populations in those regions.**

These impacts on livestock can further exacerbate food insecurity and economic vulnerabilities, particularly for communities that heavily rely on animal husbandry. Addressing these challenges requires specific adaptation strategies for the livestock sector, such as:

- **Providing Shade and Cooling: Implementing measures to protect livestock from extreme heat, such as providing shade structures and improving ventilation in animal shelters.**
- **Ensuring Water Availability: Developing reliable water sources for livestock, especially during dry periods.**
- **Improving Fodder Management: Exploring drought-resistant fodder crops and sustainable pasture management practices.**
- **Strengthening Animal Health Services: Enhancing disease surveillance and veterinary services to detect and control emerging diseases.**
- **Promoting Climate-Resilient Breeds: Identifying and promoting livestock breeds that are more tolerant to heat stress and disease.**

Integrating livestock considerations into broader climate change adaptation plans is essential to safeguard the livelihoods of many livestock-dependent communities and ensure the resilience of the agriculture sector as a whole.

5. **Pests, Diseases, and Soil Degradation:**

Farmers report that increased incidence of pest, disease, and invasive weeds, which are new or previously uncommon. These incidences are likely linked to changing climate conditions, and are significant concerns for the development of agriculture sector in Nepal. As farmers themselves are noticing, changing climate conditions, particularly rising temperatures, often create more favorable environments for pest reproduction and survival. The example of late blight in tomatoes being linked to climate fluctuations underscores the direct connection between altered climate patterns and specific agricultural challenges. This necessitates the development of new pest and disease management strategies.

The intensification of rainfall events directly contributes to accelerated soil erosion, especially on the vulnerable slopes of the hills and mountains, and barren lands in Terai. This leads to land degradation, a decline in soil fertility, and reduced agricultural productivity in the long term. The loss of topsoil also has implications for water retention and can further exacerbate water scarcity issues.

These concerns need immediate attention and action, which could include:

- **Integrated Pest and Disease Management: Developing and promoting integrated pest and disease management (IPM) strategies that are adapted to the changing**

pest and disease landscape. This may involve research into new resistant varieties, biological control methods, and timely forecasting of outbreaks.

- **Sustainable Land Management and Farming Practices: Implementing and promoting sustainable land management and farming practices to prevent and mitigate soil erosion. This includes terracing, contour farming, agroforestry, conservation farming and use of cover crops.**
- **Strengthening Agricultural Extension Services: Equipping agricultural extension workers with the knowledge and resources to advise farmers on how to manage these emerging challenges related to pests, diseases, and soil erosion in the context of a changing climate.**
- **Investing in Research: Prioritizing research to understand the specific links between climate change and the emergence of new pests, diseases, and invasive weeds in different agro-ecological zones of Nepal.**

6. **Socio-Economic Costs and Vulnerability:**

Nepal's ranking among the top 10 countries most vulnerable to climate change based on the Long-Term Climate Risk Index (2000–2019)[4], highlights the nation's inherent susceptibility to the adverse effects of a changing climate. This vulnerability is due to a combination of factors, including its geography, reliance on climate-sensitive sectors like agriculture, and the limited adaptive capacity of a significant portion of its population. The increased vulnerability of agriculture sector due to climate change impacts has significant socio-economic consequences that the country is already facing, which is projected to worsen.

Climate change has disproportionate impact on vulnerable people and groups. Smallholder farmers, who often have limited resources, landholdings, and access to irrigation, bear a disproportionate burden of climate change impacts. Marginalized communities, facing existing socio-economic challenges, often lack the capacity and resources needed to adapt to these changes, further exacerbating inequalities.

The estimated economic losses of 1.5-2% of GDP annually due to climate variability from events like floods and droughts are substantial and likely to be even higher in extreme years[5]. The future projections of agricultural losses may reach to overall climate impacts costing 2-3% of current GDP annually by mid-century[6], if no significant adaptation strategies are adopted, which clearly highlights the potential economic burden of climate change in Nepal, which can severely hinder Nepal's development progress.

Climate change has negative impacts on livelihoods and employment. Higher production costs for farmers due to factors like increased pest pressure, need for new inputs, and losses from extreme events coupled with reduced farm revenue directly impact livelihoods, income, and employment opportunities, particularly in rural areas where

[4] German Watch, 2021. Global Climate Risk Index 2021.

[5] MoSTE, 2014. Economic Impact Assessment of Climate Change in Sectors in Nepal. Government of Nepal, Ministry of Science, Technology and Environment (MoSTE), Kathmandu, Nepal.

[6] ibid

agriculture is a primary source of income. This can lead to increased poverty and migration.

In conclusion, climate change is severely impacting Nepal's agriculture sector through multiple pathways – altered weather patterns, reduced water availability, declining yields, shifting crop suitability, increased pests/diseases, and devastating extreme events. This poses a serious threat to the livelihoods of a significant portion of population, national food security, and the country's economy, highlighting the critical need for robust adaptation strategies and support for vulnerable farming communities. This stresses the urgency for action at all levels – from individual farmers adopting climate-smart practices to national policies prioritizing climate resilience in the agricultural sector.

Climate Change Impacts in Forestry Sector

Nepal's forestry sector (forests and other wooded land), which covers 44.74% of the country's geographical area[7] and supports the livelihoods of approximately 60% of the population directly[8], is highly vulnerable to the impacts of climate change. Forest resources are the second largest natural resource in Nepal after water and play a crucial role in the country's economic development. These impacts manifest in various ways, posing significant threats to forest ecosystems, biodiversity, and the communities that depend on them. The major climate change impacts in forestry sector are as below:

- Forest Fires: **According to the 2021 Long-Term Climate Risk Index, Nepal ranked 10th globally, highlighting the worsening effects of forest fires due to increased hot and dry conditions. These conditions have made the country highly vulnerable to an escalation in fire incidents, as they create favorable circumstances for the accumulation of dry fuel, increasing the risk of fires even from minor sparks. Nepal's temperatures have been rising at a faster rate than the global average, with an annual increase of 0.056°C compared to 0.03°C, globally. Furthermore, climate change has disrupted rainfall patterns, resulting in below-average precipitation. With below-average rainfall and higher temperatures, Nepal faces the risk of abundant dry fuel and the consequent threat of similar disasters, putting wildlife and habitats at risk due to abrupt climate changes.**

  Rising temperatures and prolonged droughts have exacerbated the frequency and intensity of forest fires, which occur annually in all physiographic regions of Nepal. Forest fires lead to forest degradation, loss of biodiversity and significant greenhouse gas emissions. Moreover, wildfires make a forest more vulnerable to pests. Fires not only destroy existing biomass and reduce productivity in the short term but can also lead to long-term changes in forest type and productivity by favoring fire-tolerant species. Annually, forest fires in Nepal are estimated to emit a significant amount of carbon, contributing to further climate change and hindering forest recovery. Records show that forest fires destroy over 40,000 hectares of Nepal's forest area annually, and its impacts continue to severely affect the people,

[7] MoFSC, 2016. Forestry Sector Strategy (2016 – 2025), Ministry of Forests and Soil Conservation (MoFSC), Government of Nepal, Babarmahal, Kathmandu, Nepal.

[8] Forest Research and Training Centre. (2019). An Assessment of Nepal's Forestry Sector's Contribution to Sustainable Development Goals (SDGs), Forest Research and Training Centre (FRTC), Ministry of Forests and Environment, Kathmandu, Nepal.

wild animals, birds, and other species native to these forests[6]. The highest number of forest fire incident typically occur during the months of March and April of each year, and year 2021 recorded a staggering 6,279 forest fire incidents, while Nepal experienced 2,781 forest fire incidents in 2024[9].

- Changes in Forest Composition: **Climate change is altering tree physiology and phenology (the timing of biological events like flowering and fruiting). Studies predict shifts in vegetation zones with potential replacement of coniferous forests by broad-leaved forests in over 3% of the total forest are and vice versa depending on altitudinal gradients and changing climate variables like temperature and precipitation[10]. There's also evidence of upward shifting of vegetation zones, potentially leading to the loss of valuable medicinal plants in alpine regions and changes in forest cover and species composition. As temperatures rise, tree species are expected to migrate to higher altitudes where conditions are cooler. This can lead to the disappearance of certain species from their current ranges and the colonization of new areas, altering the overall forest composition at different elevations. For example, there's concern about the habitat shrinkage of medicinal and aromatic plants in higher altitudes.**

  Altered phenology **is another significant impact of climate change. Studies have also reported shifts in flowering and fruiting times for various plant species[11]. Changes in temperature and precipitation patterns are affecting the timing of biological events in trees, such as flowering, fruiting, and leaf flushing. Early flowering has been observed in several species in Nepal, including *Ficus religiosa*, *Bombax ceiba*, *Magnolia sp.*, and *Rhododendron sp.* These phenological changes can disrupt ecological interactions, such as pollination and seed dispersal, potentially leading to shifts in species dominance over time.**

- **Changes in Forest Productivity: Changes in temperature, precipitation, and atmospheric carbon dioxide levels can directly influence tree growth rates and overall forest productivity. While increased CO_2 can sometimes enhance growth, this effect may be limited by other factors like water and nutrient availability, which are also being affected by climate change. Drought stress, for example, can significantly reduce tree growth and even cause mortality. Climate change impact has also altered regeneration in the forests of Nepal. Changes in climate can affect seed production, germination, and seedling survival, impacting the natural regeneration of forests. Shifts in temperature and moisture availability may favor some species over others, leading to changes in the future composition and productivity of forests.**

[9] https://nepaleconomicforum.org/what-is-flaring-nepals-issue-of-forest-fires/

[10] Malla, R., Neupane, P.R. and Kohl, M., 2023. Climate change impacts: Vegetation shift of broad-leaved and coniferous forests, *Trees, Forests and People*, 14 (2023) 100457.

[11] Rana, N., Manish, K and Pandit, M.K., 2025. Effect of cliamte change on the flowering phenology of Rhododendron arboretum Sm. in the Western Himalaya, Journal of Asia-Pacific Biodiversity, 18 (1): 197-203.

NTFPs form more than 5% of Nepal's national gross domestic product and are facing threat due to anthropogenic drivers and changing climate[12]. The changes in climate patterns and extreme events ultimately impact the provision of non-timber forest products (NTFPs) which provide mountain communities with food, fuel, materials, and many other benefits, consequently affecting their livelihoods and well-being. Climate change has been affecting the distribution, abundance, and productivity of NTFPs, which are crucial for the livelihoods of many communities in Nepal. Studies predict both increases and decreases in the distribution range of various NTFPs by 2050 due to climate change, highlighting the potential for significant socio-economic impacts. Moreover, studies suggest that climate change has increased invasive plant and insect pests, threatening NTFPs[13].

- Increased Invasive Species: **Climate change can create favorable conditions for the establishment and spread of invasive alien plant species, which can outcompete native species and alter forest structure and composition. In Nepal, the changing climate has increased the invasion risk at a higher level. Since the majority of invasive species are native to tropical America, their distribution is also expanding in the southern lowland with tropical to subtropical climates[14]. Five invasive alien species are most common and troublesome in Nepal's forests: *Chromolaena odorata*, *Mikania micrantha*, *Lantana camara*, *Ipomoea carnea*, and *Parthenium hysterophorus*[15]. The distribution patterns of invasive species in Nepal and their colonization shows that it may have a serious impact on the biodiversity, if steps are not taken to control it immediately.**

- **Increased Pests and Diseases: Warmer temperatures and altered precipitation patterns can create favorable conditions for the proliferation of forest pests and diseases, impacting forest health and productivity. Spread of invasive alien plants, insect pests and pathogens has been contributing to degrading forest ecosystem services in Nepal. For example, over the past decade, climate change has led to an increase in bark beetle damage to mountain pines in parts of the West. Similarly, insect attack and pathogen infection in *Shorea robusta*, teak leaf defoliation by white moth, leaf gall in Eucalyptus species are some of the examples of increase pests and diseases in the forests of Nepal[16].**

- **Impacts on Biodiversity:** Nepal is a part of a biodiversity hotspot and lies at a transition zone comprised of six floristic regions. There are six biomes occurring in Nepal, including as many as 35 forest types and 118 ecosystems. It is in 49th position in the world's biodiversity

[12] Chitale, V., Silwal, R. and Matin, M., 2018. Assessing the impacts of climate change on distribution of major non-timber forest plants in Chitwan Annapurna Landscape, Nepal. ICIMOD Publications 7 (4).

[13] Gurung, L. J. et al., 2021. Climate change adaptation for managing non-timber forest products in the Nepalese Himalaya, Science of the Total Environment 796 (2021) 148853.

[14] Karki, D. et al., 2023. Diversity and distribution of invasive alien plant species along elevation gradient in Makawanpur district, Central Nepal, Journal of Ecology and Environment (2023) 47:08.

[15] **Bhatt S, Siwakoti M, Shrestha BB. Invasive alien plants in the protected areas of Nepal: diversity, impacts and management. In Integrating biological resources for prosperity. Kathmandu: Botanical Society of Nepal; 2021. p. 100-15.**

[16] DFRS, 2018. Forest, pests and pathogens problems in different forest types of Nepal. Department of Forest Research and Survey, Babarmahal, Kathmandu.

and over 22,000 species are reported from Nepal, which is 1.3% of the global biodiversity[17]. Additionally, Nepal's wetlands, which cover about 2.6% of the country's area, are rich in biodiversity, supporting numerous species of plants, birds, and freshwater fishes.

Climate change-induced habitat loss, altered migration patterns, and increased extreme weather events threaten Nepal's rich biodiversity. Climate change plays a major role in the decline of biodiversity, as increasing temperatures have negatively altered both terrestrial and aquatic ecosystems. Changing climatic patterns and rising global heat have resulted in the loss of many species, increased diseases, and mass mortality of plants and animals. For example, there has been loss of historic range of flagship species like tiger[18]. Similarly, the rise in temperature due to climate change can be challenging for the reproduction of crocodiles, as it might impact the nesting time, incubation period and sex ratio of crocodiles[19]. Changes in forest composition can also impact forest-dependent fauna.

- **Impact on Water Availability: Another key ecosystem service that forests provide is water for drinking, irrigation, recreation, and other uses. Droughts, wildfires, rising temperatures, and reduced snowfall and snowpack due to climate change can all limit a watershed's ability to provide these services. For example, some Indigenous peoples rely on forests for medicine, food, or ceremonial practices. If they cannot access these resources, their diet, mental health, and cultural identity may be impacted. Tribes in remote or rural areas may already lack access to safe drinking water supplies. Climate impacts on the forest watershed can worsen these Tribes' water security.**

  Erratic rainfall and reduced snowfall are affecting water availability in many regions of Nepal, impacting forest ecosystems and the communities that rely on them for water supply and irrigation. Glacial melt, accelerated by rising temperatures, further threatens long-term water security. Water unavailability or drought can weaken trees and make a forest more vulnerable to wildfire or insect outbreaks.

- **Reduced Carbon Storage: Climate change is expected to affect forests' ability to provide key ecosystem services, including carbon storage, clean air, water supply, recreation, and wildlife habitat. One of the most important ecosystem services forests provide is absorbing carbon dioxide from the atmosphere and storing it in roots, soil, aboveground tree growth, and the forest floor. Climate change can affect carbon storage in several ways. For example, it may bring more frequent and intense rainfall to some regions. Heavy precipitation and flooding can erode forest soils and cause stored carbon to be released back into the atmosphere. Damage to forests from more wildfires, insects, and disease outbreaks can also release stored carbon.**

  When the carbon stock in a forest is reduced, several significant consequences arise, impacting the environment, climate and potentially local communities' livelihoods. Forests act as crucial carbon sinks, absorbing carbon dioxide (CO_2) from the

[17] NBRCC, 2025. **Nepal's biodiversity at a glance. Nepal Biodiversity Research and Conservation Centre.**

[18] Poudel, A. et al., 2014. Impact of cliamt echange on forests and biodiversity and current adaptation practices – A case study of Nepal, Sambriddhi, Journal of Development Studies, 6-18 pp.

[19] https://carefornature.org.np/biodiversity-and-climate-change/#:~:text=Nepal%20is%20home%20to%20over,meadows%20in%20the%20high%20Himalayas.

atmosphere through photosynthesis and storing it in their biomass (trees, roots, leaves), deadwood, litter, and soil. When the carbon stock is reduced, the stored carbon is released back into the atmosphere, primarily as CO_2. CO_2 is a major greenhouse gas, and increased CO_2 in atmospheric concentrations contribute to the enhancement of the greenhouse effect, leading to global warming and climate change.

Similarly, a forest with a lower carbon stock has a diminished capacity to absorb and store additional CO_2 from the atmosphere in the future. This weakens nature's ability to regulate atmospheric carbon levels and mitigate climate change. Likewise, reduced forest cover can lead to decreased rainfall, increased temperatures, and more extreme weather events at a local level.

Forests also help regulate water cycles by influencing evapotranspiration, groundwater recharge, and reducing soil erosion. Loss of carbon stock often coincides with forest degradation, disrupting these processes and potentially leading to droughts, floods, and reduced water quality.

In conclusion, reduced carbon stock in Nepal's forests can exacerbate climate change impacts, threaten biodiversity, and negatively affect the livelihoods of forest-dependent communities. Maintaining and enhancing forest carbon stocks through sustainable forest management, reforestation, and reducing deforestation and degradation are crucial for Nepal's environmental sustainability and the well-being of its people.

Adaptation Strategies:

Recognizing the significant threats posed by climate change on forests, biodiversity and forest ecosystems, various adaptation strategies are being implemented in Nepal's forestry sector:

- **Climate-smart forestry practices. Forest managers and users can use strategic climate-smart forest management options, such as removing wildfire fuel, thinning trees, or managing controlled burns to address the specific climate change vulnerabilities facing that area.**
- **Sustainable Forest Management (SFM): Promoting practices that ensure the long-term health and productivity of forests while maintaining their ecological integrity. This includes measures to reduce deforestation and forest degradation, and prevent spread of invasive species.**
- **Community Forestry: Strengthening the role of local communities in forest management, as community-managed forests have shown potential in enhancing resilience, supporting livelihoods, and reducing disaster risks. Integrating climate change adaptation into community forestry plans is crucial.**
- **Agroforestry: Integrating trees and shrubs into farming systems to enhance soil health, conserve water, provide additional income sources, and increase overall resilience.**
- **Forest Fire Management: Developing and implementing effective strategies for forest fire prevention, early detection, and control, including community participation and awareness campaigns.**

- **Grazing Management: Implementing sustainable grazing practices to prevent overgrazing and reduce pressure on forest regeneration.**
- **Reforestation and Afforestation: Undertaking tree planting initiatives with climate-resilient species to restore degraded lands, enhance carbon sequestration, and improve ecosystem services.**
- **Watershed Management: Implementing integrated approaches to manage water resources and protect watersheds, considering the impacts of changing precipitation patterns.**
- **Biodiversity Conservation: Implementing measures to protect vulnerable species and habitats, including habitat restoration, species translocation where necessary, and controlling invasive species.**
- **Research and Monitoring: Enhancing research on climate change impacts on forests and biodiversity, and establishing robust monitoring systems to track changes and evaluate the effectiveness of adaptation measures.**
- **Policy Integration: Mainstreaming climate change considerations into forest policies and development plans at all levels of governance.**
- **Capacity Building and Awareness: Enhancing the knowledge and skills of local communities, forest managers, and other stakeholders to understand and respond to climate change impacts.**
- **Promoting Alternative Energy Sources: Reducing dependence on fuelwood by promoting the use of alternative energy sources like solar energy and biogas.**

Addressing the impacts of climate change on Nepal's forestry sector requires a multi-faceted approach involving government agencies, local communities, civil society organizations, and international partners. Integrating climate resilience into forest management practices is essential to protect these vital ecosystems and the livelihoods they support.

Climate Change Impacts in Water Resources

Water resources are a precious resource for Nepal to meet its aspirations to grow hydropower capacity for exports and expand irrigation for food security and higher-value crop exports. The impacts of climate change on water resources are multifaceted and pose significant challenges globally, including Nepal. These impacts affect the availability, quality, and timing of water, with consequences for ecosystems, human health, agriculture, energy production, and overall socio-economic development. Nepal is particularly vulnerable to the impacts of climate change on water resources due to its diverse topography, including the high Himalayas, and its reliance on monsoon rainfall and snow/glacier melt for water supply.

- Melting Glaciers and Snowpack: **While water is among Nepal's most abundant yet unharnessed natural resources, rising temperatures threaten the future of high mountain glaciers, which constitute a critical supply of freshwater to the region. The Himalayan glaciers, a critical source of water for major river systems in Nepal, are melting at an alarming rate. Nepal has experienced 28 GLOF events in the recent past, several of which have caused considerable damage and loss of life, for example, the Bhote Koshi Sun Koshi GLOFs of 1964 and 1981, the Dig Tsho GLOF of 1985, and**

Thame GLOF in 2024[20]. There are 47 potentially dangerous glacial lakes that lie within the Koshi, Gandaki and Karnali river basins of Nepal.

Climate change is increasing the risk of glacial lake outburst floods (GLOFs) in the short term and threatening long-term water security by reducing dry-season flows in rivers. Studies indicate that glaciers in the Nepal Himalayas are shrinking rapidly and could significantly reduce in size within the next century if current melting rates continue.

- Altered Precipitation Patterns: **Nepal is experiencing changes in the monsoon patterns, with trends of decreasing pre-monsoon rainfall in some high-altitude areas and increasing intensity of rainfall events in other regions. There's also a projection of increased mean annual rainfall but greater variation in surface water flow between wet and dry seasons. This erratic rainfall can lead to both increased flooding and prolonged droughts, impacting water availability for drinking, irrigation, and hydropower generation. Unavailability of water affects small-scale hydropower and agriculture, with food security implications for many livelihoods, including indigenous peoples and those living at or just above subsistence. Water for agricultural uses may not be sufficient at critical cropping times, with prolonged and more intense droughts resulting in crop failures and productivity losses.**

- **Drying Water Sources: Many communities, particularly in the hills and mountains of Nepal report drying springs and a decrease in the volume of water in rivers and streams, particularly during the dry season. This is attributed to longer dry spells, irregular rains, and high-intensity rainfall leading to increased runoff and less infiltration.**

- **Impacts on Drinking Water: Climate hazards like floods, droughts, and landslides are affecting the functionality and access to rural water services. Water sources become turbid after heavy rainfall, and prolonged dry spells lead to the depletion of water sources. Infrastructure like tubewells and water supply intakes are damaged by floods and landslides.**

- **Water Quality Issues: Increased runoff during heavy rainfall events washes pollutants into water sources, degrading water quality. Warmer temperatures can also increase the risk of bacterial and algal growth in water storage facilities. Saltwater intrusion in groundwater in the Terai region during the wet season has also been reported as a concern.**

- **Impacts on Hydropower: Changes in river flow regimes, particularly reduced dry-season flows and increased frequency of floods, can affect the reliability and efficiency of hydropower plants, a significant source of energy for Nepal.**

- **Agriculture: The agriculture sector in Nepal, heavily reliant on rainfall, is vulnerable to changes in precipitation patterns and increased drought. Drying water resources and altered rainfall timings can lead to crop failures and impact livelihoods.**

[20] ICOMOD, 2024. GLOF from Thyanbo glacial lake sweeps away Thame Village.

Addressing these challenges requires integrated water resource management strategies that consider the impacts of climate change, including:

- **Developing water storage and efficient water use technologies.**
- **Implementing integrated watershed management practices.**
- **Promoting rainwater harvesting technologies**
- **Protecting existing water sources**
- **Promoting water-efficient technologies**
- **Improving water infrastructure resilience to extreme events**
- **Enhancing monitoring and early warning systems for water-related disasters**
- **Raising awareness and building the capacity of local communities to adapt to changing water availability.**

The future water security and socio-economic development of Nepal are closely linked to how effectively the country can understand and respond to the impacts of climate change on its vital water resources.

Climate Change Impacts to GESI and Marginalized Groups

Climate change significantly impacts Gender Equality and Social Inclusion (GESI) across the globe, and Nepal is no exception. These impacts exacerbate existing inequalities and create new vulnerabilities for marginalized groups. Different groups of people within a society are affected by climate change risks, shocks, and stresses in different ways and to varying degrees. This is because their exposure to the hazard, their sensitivity to its impacts, and their capacity to cope and adapt are shaped by a complex interplay of social, economic, political, and environmental factors. The differential vulnerabilities - how climate change affects women and girls and other marginalized groups is discussed here.

a) Differential Vulnerabilities

Gender: Women and girls often face disproportionate impacts due to existing gender inequalities. In many societies in Nepal, they have less access to resources, information, and decision-making processes. Hence climate change impact is high on women, girls and other socially excluded marginalized groups. The major disproportionate impacts to women and girls are:

- **Increased workload: Since women and girls are the primary collectors of water and firewood of a household, climate change-induced water scarcity and deforestation increase the time and effort women and girls spend collecting water and firewood.**
- **Food insecurity: As primary caregivers and often responsible for food security, women are severely affected by climate-related agricultural losses. They may eat last and least during food shortages, impacting their health and well-being.**
- **Health impacts: Reduced access to clean water and sanitation after climate disasters disproportionately affects women and girls' health, including reproductive health. Increased incidence of climate-related diseases can also burden women as primary caregivers.**
- **Increased risk of violence: Climate-related disasters and resource scarcity can exacerbate social tensions and increase the risk of gender-based violence,**

including domestic violence, sexual assault, and trafficking. Displacement due to climate change can also increase these risks.

- Limited mobility and access to resources: **During disasters, women may have less access to early warning systems, transportation, and relief efforts due to social norms restricting their mobility or lack of ownership of assets, and hence suffer the most.**
- Reduced participation in decision-making: **Increased burdens and displacement can further limit women's participation in community and political decision-making processes related to climate change adaptation and mitigation.**

Social Exclusion: Climate change impacts intersect with other forms of social exclusion, affecting marginalized groups such as:

- **Indigenous Peoples: Indigenous People's livelihoods and cultural identities are often closely tied to natural resources, making them particularly vulnerable to climate change impacts on land, water, and biodiversity. In Nepal, indigenous communities rely on forests and agriculture, which are highly susceptible to climate change.**
- **Dalits: As historically marginalized groups with limited access to land, resources, and infrastructure, Dalits in Nepal face heightened vulnerability to climate-related disasters and resource scarcity.**
- **Persons with Disabilities: Persons with disabilities may face greater challenges during climate-related disasters due to mobility issues, lack of accessible information, and exclusion from disaster preparedness and response efforts.**
- **LGBTIQ+ individuals: They may experience discrimination and exclusion in humanitarian responses and have specific vulnerabilities that are often overlooked in climate change policies and programs.**
- **Poor and low-income households: These groups have limited financial and social capital to cope with climate shocks, making them more dependent on climate-sensitive livelihoods and less able to recover from disasters.**
- **Elderly people: They may have reduced mobility and health issues, making them more vulnerable to extreme weather events and displacement.**
- **Children: They are particularly vulnerable to the health impacts of climate change, including malnutrition and disease, and their education can be disrupted by climate-related disasters.**

In Nepal, the impacts of climate change on GESI are evident in various sectors:

- **Agriculture: Erratic rainfall and droughts disproportionately affect women farmers who often have less access to irrigation and climate-resilient agricultural practices.**
- **Water Resources: Reduced water availability increases the burden on women and girls for water collection and can lead to social disputes.**
- **Forestry: Changes in forest health and productivity can impact the livelihoods of marginalized communities who depend on forest products.**

- **Disasters: Climate-induced disasters like floods and landslides have a greater impact on vulnerable groups with limited resources and access to support.**

b) Aggravation of Existing Inequalities:

- **Climate change acts as a "threat multiplier," worsening existing social, economic, and political inequalities. For example, if women have limited land rights, climate-induced agricultural losses will disproportionately affect their livelihoods and economic independence.**

c) Challenges in Adaptation and Mitigation:

- **Climate change adaptation and mitigation efforts may not always be gender-sensitive or socially inclusive, potentially exacerbating existing inequalities or creating new ones. For instance, promoting certain agricultural technologies might benefit men more than women if women lack access to credit or information at the cost of increased workload of women.**

Addressing GESI in Climate Action:

- **Integrating GESI perspectives into climate change policies, plans, and actions in Nepal is crucial for ensuring:**
    - **Equitable outcomes: Climate actions should benefit all members of society, particularly those most vulnerable.**
    - **Effective solutions: Incorporating diverse knowledge and perspectives leads to more sustainable and appropriate solutions.**
    - **Resilience building: Addressing underlying inequalities strengthens the ability of marginalized groups to adapt to climate change impacts.**

- **There exists opportunities for GESI empowerment for Climate Action. Recognizing the differentiated impacts of climate change also presents opportunities to empower marginalized groups.**
    - **Women as agents of change: Women possess valuable traditional knowledge and skills related to natural resource management and adaptation that can be crucial in developing effective climate solutions.**
    - **Inclusive decision-making: Engaging women and other marginalized groups in climate change planning and policy-making ensures that their needs and perspectives are considered, leading to more effective and equitable outcomes.**
    - **Targeted interventions: Climate finance and programs can be designed to specifically address the vulnerabilities of marginalized groups and enhance their adaptive capacity.**

The Government of Nepal has recognized the importance of GESI in climate action, as reflected in policies like the National Climate Change Policy 2019, which aims to mainstream GESI across relevant sectors. However, effective implementation and ensuring that climate finance reaches and benefits marginalized groups remain critical challenges.

Session 4: Climate Change related Policies in Nepal

Duration: 1 Hour 30 Minutes
Materials required: Projector, Market pen, Whiteboard, Newsprint, materials for games and energizers, as appropriate
Venue: Training Hall with furniture, ventilated and separate toilet for male/female
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

Nepal is facing serious impacts of climate change. To address this problem, the Government of Nepal has introduced various policies and programs. These policies aim to reduce the impact of climate change, enhance adaptive capacity, and promote sustainable development. This session will mainly discuss the key policies formulated to combat the climate change impacts.

Objectives of the Session

By the end of this session, participants will be able to:

- **Explain the main policies formulated by the Government of Nepal to combat climate change impacts.**
- **Understand the scope of the policies in relation to climate change impacts.**

Session Delivery

- **At the beginning of the session, the facilitator will divide the participants into three or four small groups and ask them to do a group exercise on what are the main policies and strategies adopted by the Government of Nepal to combat climate change impacts.**
- **The participants will write their group-wise answers on the newsprint and present to the plenary.**
- **After the presentation, the facilitator will use the lecture method to present a list of the main policies formulated and implemented by the Government of Nepal to combat climate change impacts and gradually discuss the objectives and main points of those policies. The facilitator can use the Reference Materials provided below as guide.**
- **Towards the end of this session, the facilitator will ask the participants the following questions to ensure participants' understanding on:**
    - **What are the main policies formulated and implemented by the Government of Nepal to combat climate change?**
    - **What is the main objective of the National Climate Change Policy, 2076 (2019)?**
    - **What does the Long-term Strategy for Net-Zero Emissions emphasize?**
    - **What are the main objectives and achievements of the National Adaptation Programme (NAP)?**
    - **What does the National Framework for Local Adaptation Plan emphasize?**
    - **How has the Nepal's Gender Equality and Social Inclusion Action Plan for Climate Change (2020-2030) ensured the participation of women and marginalized groups in climate adaptation and mitigation?**

- **Finally, conclude the session by summarizing the points discussed in this session.**

Reference Materials

Nepal has developed several policies and plans to address the impacts of climate change. Here are some of the key ones:

1. National Climate Change Policy, 2019 (राष्ट्रिय जलवायु परिवर्तन नीति, २०७६):

This is the overarching policy document guiding Nepal's climate action. It aims to build a climate-resilient society and contribute to socio-economic prosperity by reducing climate change risks.

Objectives include:

- **Enhancing the adaptive capacity of vulnerable individuals, families, communities, and ecosystems.**
- **Building the resilience of ecosystems threatened by climate change.**
- **Promoting a green economy through low-carbon development.**
- **Mobilizing financial resources for adaptation and mitigation.**
- **Conducting research, technology development, and information sharing.**
- **Mainstreaming climate change into policies and plans at all levels.**
- **Integrating gender equality and social inclusion (GESI) into climate action.**

The policy identifies eight thematic areas:

- **Agriculture and food security;**
- **Forests, biodiversity, and watershed conservation;**
- **Water resources and energy;**
- **Rural and urban settlements;**
- **Industry, transport, and physical infrastructure;**
- **Tourism and natural/cultural heritage;**
- **Health; and**
- **Disaster risk reduction and management**

The policy focuses on four cross-cutting areas to achieve its goals, which are:

- **Climate Finance**
- **Gender Equality and Social Inclusion**
- **Awareness and Capacity Building, and**
- **Research, Technology Development and Promotion**

2. National Adaptation Plan (NAP) 2021-2050:

The National Adaptation Plan (NAP) 2021-2050 for Nepal provides a comprehensive roadmap for the country to adapt to the impacts of climate change over the short-term (until 2025), medium-term (until 2030), and long-term (until 2050). It was prepared by the Government of Nepal with support from the Green Climate Fund (GCF) and the United Nations Environment Programme (UNEP).

The NAP's vision is to contribute to the socio-economic prosperity of Nepal by building a climate-resilient society and reducing the risks of climate change impacts on both people and ecosystems through the integration of adaptation across all sectors and levels of government. The overarching goals of NAP, informed by the National Climate Change Policy (2019), are to:

- **Build the adaptive capacity and resilience of key natural, social, and economic sectors that are vulnerable to and at risk from climate change, as well as service providers.**
- **Integrate climate change issues into the policies, strategies, plans, and programs of all sectors at the local, provincial, and federal levels, emphasizing Gender Equality, Social Inclusion (GESI), livelihoods, and governance.**

The NAP builds upon the National Climate Change Policy and identifies 64 priority adaptation programs within nine thematic sectors and four cross-cutting themes.

- **The NAP aims to integrate climate change adaptation into policies, plans, and activities at all levels of government and across society.**
- **The total estimated budget for implementing the NAP until 2050 is USD 47.4 billion, with an annual requirement of USD 2.1 billion for the medium term.**
- **It also serves as Nepal's Adaptation Communication under the Paris Agreement.**
- **The implementation of the NAP and adaptation interventions will be reviewed every five years, and the NAP itself will be updated in 2031 to reflect changes in the country's context and climate risks.**

The NAP aims to:

- **Reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience.**
- **Facilitate the coherent integration of climate change adaptation into relevant new and existing policies, programs, and activities, particularly development planning processes and strategies, within all relevant sectors and at different levels.**
- **Inform the planning, coordination, and implementation of adaptation actions needed at all levels of government and across society and ecosystems.**
- **Provide guidance on integrating adaptation considerations into policies, programs, and activities.**

In essence, the National Adaptation Plan (NAP) 2021-2050 is Nepal's strategic framework for building a climate-resilient future by systematically addressing the diverse impacts of climate change across various sectors and ensuring that adaptation is integrated into the country's overall development efforts.

2. Nepal's Long-term Strategy for Net-Zero Emissions:

This strategy outlines the country's vision to achieve net-zero emissions by 2045. This ambitious goal reflects Nepal's commitment to global climate action, despite its minimal contribution to historical emissions and its vulnerability to climate change impacts. It provides a comprehensive framework for transitioning towards a low-carbon future across various sectors, highlighting the importance of renewable energy, sustainable land management, and international collaboration.

3. Climate Change Action Plan (CCAP) 2021-2025:

- **This action plan provides a shorter-term roadmap for implementing climate actions aligned with the National Climate Change Policy and the NAP.**
- **It outlines specific activities and steps to be taken within a five-year timeframe.**
- **Priority themes include climate-smart agriculture, water resources, resilient natural capital, climate-resilient cities and towns, clean energy, climate-smart transport, and human development for economic and environmental resilience.**

4. Nepal’s REDD+ Strategy, 2018

Nepal, being a party to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement, has been fulfilling its international obligations while working in accordance with national priorities and needs. REDD+ is a mitigation approach adopted to address the problem of climate change. It is the collective set of activities aimed at preventing deforestation, preventing forest degradation, conserving forests and their carbon stocks, sustainably managing forests, and enhancing forest carbon stocks. The five activities under the REDD+ program include: (1) reducing emissions from deforestation, (2) reducing emissions from forest degradation, (3) conservation of forest carbon stocks, (4) sustainable management of forests, and (5) enhancement of forest carbon stocks.

The Ministry of Forests and Environment, as per the decision of the Government of Nepal (Honorable Minister for Forests and Environment level) dated April 19, 2018 (Baisakh 6, 2075 BS), approved and implemented the Nepal National REDD+ Strategy (2075-2079 BS / 2018-2023 AD). The vision of the Nepal National REDD+ Strategy is "to enhance carbon and non-carbon benefits of forest ecosystems to contribute to people's prosperity," and its mission is "to enhance the resilience of forest ecosystems for emissions reduction and enhancement of environmental, social, and economic benefits by improving policy and institutional mechanisms with the inclusion and capacity and efficiency enhancement of all stakeholders."

5. Framework for Local Adaptation Plans for Action (LAPA)

The Government of Nepal prepared a framework for Local Adaptation Plans for Action (LAPA) in 2010 (B.S. 2067) and has been successfully implementing LAPAs formulated according to this framework. This framework has gained international recognition, and various countries have reused its provisions. The National Climate Change Policy, 2076 (2019) aims to mainstream climate change issues into the policies, strategies, development plans, and programs of all levels of the state and thematic sectors. This policy specifically states that the implementation of national policies, strategies, and plans related to climate change management will be carried out by local levels.

In this context, the format of the Local Adaptation Plan for Action (LAPA), 2067 (2010), based on the old governance structure, has been revised and made more relevant to the current times. This revised framework will help local governments manage the impacts of climate change at the local level and identify and implement long-term climate-friendly development plans. It will also assist in the formulation and implementation of community-based adaptation plans to be formulated by local communities in accordance with environmental protection laws. Furthermore, it will facilitate the implementation of international commitments related to climate change adaptation, disaster risk reduction and management, and sustainable development by building consensus on the implementation of local activities through regular collaboration and dialogue among various stakeholders at the local level.

6. National Adaptation Programme of Action (NAPA):

- **Formulated in 2010, NAPA identified urgent and immediate adaptation needs and priorities for Nepal.**
- **It focused on community-centric approaches to local adaptation planning (LAPA).**
- **While the NAP has superseded it as the guiding adaptation strategy, NAPA laid the groundwork for adaptation planning in Nepal.**

7. **Nepal's Gender and Social Inclusion (GESI) Action Plan for Climate Change Policy, 2020-2030 (2077-2087)**

Nepal's National Climate Change Policy, 2076 (2019) prioritizes mainstreaming gender equality and social inclusion in climate-friendly policy formulation and implementation. Additionally, the policy emphasizes reducing the risks of climate change impacts and developing adaptation capacity for women and groups deprived of basic rights. In this context, the GESI Action Plan targets to achieve increased adaptive capacity of women and vulnerable communities by increasing their access in decision making process and resources related to climate change, adaptation and mitigation. It provides a framework for integrating gender equality and social inclusion principles into climate change policies, plans, and programs. It recognizes that climate change impacts vulnerable groups, including women, Dalits, indigenous communities, people with disabilities, and other marginalized populations, disproportionately due to existing social, economic, and cultural inequalities.

The Action Plan has envisioned contributing to building a prosperous nation through climate-resilient development with gender equality and social inclusion. Its main goal is to enhance the adaptive capacity of women and vulnerable communities by increasing their access to decision-making processes and resources in climate change adaptation and mitigation. The Action Plan has identified eight sectors for adoption of the gender-responsive and inclusive strategies, in accordance with the priorities of the National Climate Change Policy 2076 (2019).

8. Sector-Specific Policies and Plans:

Various sectors have also developed their own climate change strategies and action plans aligned with the national policy framework. Examples include:

- **Health National Adaptation Plan (H-NAP) (2023-2030): The Plan aims to minimize the health impacts of climate change.**
- **Agriculture Development Strategy (ADS) 2015-2035: While not solely focused on climate change, the ADS recognizes climate change as a significant challenge to the agriculture sector. It promotes climate-smart agriculture practices, the development of climate-resilient crop varieties, and improved irrigation management to enhance the resilience of the agricultural sector to climate impacts.**
- **National Agroforestry Policy, 2019: This policy promotes the integration of trees and shrubs into farming systems as a climate-smart practice that can enhance soil health, conserve water, provide additional income, and increase overall resilience to climate change.**
- **National Forest Policy, 2018: This policy recognizes the crucial role of forests in climate change mitigation and adaptation. It emphasizes sustainable forest management, increasing carbon stocks through afforestation and reforestation, reducing deforestation and forest degradation (REDD+ initiatives), and promoting community-based forest management for both conservation and climate resilience.**
- **Watershed management policies and programs increasingly integrate climate change considerations to protect water sources, reduce erosion, and enhance the resilience of water-dependent ecosystems.**

- **National Water Resources Policy, 2020: This policy aims for the sustainable conservation, management, and multipurpose development of water resources, explicitly considering the vulnerabilities and risks posed by climate change. It promotes integrated water resources management, climate-smart irrigation, and measures to address water-induced disasters.**
- **Strategies are in place to enhance the resilience of hydropower infrastructure to climate change impacts like altered river flows and increased sedimentation.**
- **Policies promoting renewable energy sources like solar and biogas contribute to climate change mitigation by reducing reliance on fossil fuels and can also enhance energy access in rural areas vulnerable to climate impacts.**
- **National Disaster Risk Reduction Policy, 2018: This policy aims to reduce disaster risks, including those exacerbated by climate change, and enhance the resilience of communities and infrastructure. It emphasizes preparedness, early warning systems, risk assessment, and integrating DRR into development planning.**
- **Local Disaster and Climate Resilience Plan (LDCRP) Framework (2021): This framework guides local governments in developing integrated plans to address both disaster risks and climate change impacts at the community level.**
- **GESI (Gender Equality and Social Inclusion) is increasingly being mainstreamed across these sector-specific policies and plans, recognizing the differential vulnerabilities and the need for inclusive climate action.**

6. International Commitments:

- **Nepal is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, and other international agreements related to climate change.**
- **Its Nationally Determined Contributions (NDCs) outline Nepal's commitments to reduce greenhouse gas emissions and adapt to climate change. Nepal's current policies are considered 1.5°C compatible when compared to its fair share contribution.**

Key Features and Trends in Nepal's Climate Policies:

- **Strong Focus on Adaptation: Given Nepal's vulnerability to climate change impacts, adaptation has been a central focus of its policies.**
- **Integration of GESI: Recognizing the differential vulnerabilities, there is an increasing emphasis on mainstreaming gender equality and social inclusion in climate action.**
- **Multi-Level Governance: Policies aim to integrate climate change considerations at the federal, provincial, and local levels.**
- **Community Participation: Engaging local communities in adaptation planning and implementation is a key principle.**
- **Emphasis on Green Economy: Promoting low-carbon development pathways and sustainable resource management is increasingly prioritized.**
- **Mobilization of Finance: Securing both national and international financial resources is crucial for implementing climate actions.**

It's important to note that while Nepal has a robust policy framework for addressing climate change, the effective implementation of these policies and plans remains a significant challenge. Factors such as financial constraints, institutional capacity, and coordination among different stakeholders need continued attention.

2. Module Two

Tittle: Participatory Gender-sensitive Assessment of Climate Change Risks, Hazards and Vulnerabilities, and Identification of Adaptation Options
Duration: 2 Days

Day 1: Theoretical Session	
Session 1	**Basic concepts of Climate Risk, Hazards, Exposure, Vulnerability, Sensitivity, Adaptive Capacity and Resilience**
Session 2-3	**Participatory gender-sensitive assessment of climate risks and vulnerabilities: Assessment methods and tools**
Session 4	**Identification of Adaptation Options (Including Nature-based solutions)**
Day 2: Practical Session (Field Assessment) **Participatory Climate Change Risks, Hazards and Vulnerability Assessment and Identifying Adaptation Options**	
Full Day **(Session 1-4)**	• **Participatory climate risks and vulnerabilities assessment (sector-specific)** • **Identification of suitable/appropriate adaptation options based on the assessment** • **Reporting on participatory climate risks and vulnerabilities assessment**

Session 1: Basic Concepts of Climate Risk and Hazard, and Dimensions of Vulnerability (Exposure, Sensitivity and Adaptive Capacity)

Duration: 1 Hour 30 Minutes
Materials required: Projector, Market pen, Whiteboard, Newsprint
Venue: Training Hall with furniture
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

This session will discuss the basic concepts of climate risks and hazards, and introduces three dimensions of vulnerability, i.e., exposure, sensitivity, adaptive capacity. This session aims to enrich participants' understanding of these concepts for improving their skills and knowledge on climate change risks and vulnerability assessment.

Objectives of the Session

By the end of this session, participants will be able to:

- **Understand the concept of climate risks and hazards**
- **Become familiar with three dimensions of vulnerability (exposure, sensitivity, and adaptive capacity as a measure of resilience)**
- **Describe the connections between hazard, vulnerability and risk.**

Session Delivery

- **The facilitator can facilitate the session by dividing the contents into two parts – climate risks and hazards as the first part, and dimensions of vulnerability as the second part.**
- **The facilitator can begin this session with asking the participants what they understand by 'climate risks' and 'hazards' and what is the difference between these two terms? The key responses from the participants can be noted down in a whiteboard or newsprint for reviewing later.**
- **Then the facilitator will present the participants the definition and meaning of climate risks and hazards with examples by using the Powerpoint presentation, and encourage them to discuss on the concepts with respect to their local context and experiences. The participants will be engaged to discuss the concepts with respect to different sectors, such as agriculture, forestry, water resources, etc.**
- **Once the participants are familiar with climate risks and hazards, the facilitator asks them about their understanding of the three dimensions of vulnerability, that is, exposure, sensitivity and adaptive capacity or resilience. The concept of resilience will also be discussed for understanding the adaptive capacity dimension of vulnerability. The key points raised by the participants can be noted down in a whiteboard or newsprint for reviewing later.**
- **The facilitator then describes the vulnerability dimensions in details using the Powerpoint presentation (lecture method). The presentation focuses on how the three dimensions constitute vulnerability of a system with real examples.**
- **Then the facilitator describes the connections between hazards, vulnerability and risk using an illustration and real examples. The facilitator can encourage participants to share their experiences and or observations on the connections.**
- **Towards the end of the session, the facilitator can ask the participants the following questions to ensure participants' understanding on the subjects discussed in this session:**
    - **What is the difference climate risk and hazard?**
    - **What are the three dimensions of vulnerability? Explain them with examples.**
    - **Which is the connection between hazards, vulnerability and risk?**
    - **How the climate risks can be minimized and resilience of a community or system is increased?**
- **Finally, facilitator can conclude the session by summarizing the points discussed throughout the session and thanking the participants for their active participation and cooperation.**

Reference Materials

Climate Risk

Climate risk refers to the potential for negative consequences on human and ecological systems due to the impacts of climate change. It arises from the interaction of climate-related hazards (such as extreme weather events and long-term climate shifts) with the exposure and vulnerability of societies and ecosystems. Understanding and assessing climate risk is crucial for developing effective strategies to mitigate its impacts and build resilience. Risk is defined as the combination of the likelihood (probability of occurrence) and the consequences of an adverse event (e.g., climate hazard). Major elements of risk are: hazard (magnitude), probability of climate hazard and vulnerability[21]. Climate risk is often expressed as a function of magnitude and frequency of climate hazard and vulnerability, i.e.,

Risk = Probability of climate hazard x Vulnerability

Nepal is highly vulnerable to the impacts of climate change due to its mountainous terrain, reliance on agriculture, and high levels of poverty. The country faces various climate risks. Some examples of Climate Risks on different sectors are as given below:

- **Agriculture and food security: Prolonged droughts and altered precipitation patterns can lead to reduced crop yields, impacting food availability and prices. Extreme weather events like floods and storms can destroy crops and livestock.**
- **Water resources: Changes in precipitation and increased evaporation due to higher temperatures can lead to water scarcity in some regions and increased flooding in others, affecting water supply for drinking, agriculture, and industry.**
- **Infrastructure: Extreme weather events can damage transportation networks (roads, railways, ports, airports), energy infrastructure (power plants, transmission lines), and buildings. Sea-level rise threatens coastal infrastructure.**
- **Human health: Heatwaves can lead to heatstroke and other heat-related illnesses. Changes in vector ecology can spread diseases like malaria and dengue fever. Air pollution, exacerbated by climate change, can worsen respiratory problems.**
- **Ecosystems and biodiversity: Climate change can cause habitat loss, species extinction, and disruptions to ecosystem services (e.g., pollination, water purification). Coral reefs are particularly vulnerable to ocean warming and acidification.**
- **Financial stability: Climate risks can lead to significant economic losses from disasters, disrupt businesses, and devalue assets, potentially triggering broader financial crises.**

The climate risk can be assessed using two different approaches – (a) natural hazards-based approach that emphasizes on the biophysical aspects of climate related risks, and (b) vulnerability-based approach that emphasizes on the socio-economic aspects of climate risks. However, these two approaches are complementary and can be developed separately or together.

Hazard

[21] Jones, R. and Boer, R., 2005. Assessing Current Climate Risks, Technical Paper 4. Available from: https://www4.unfccc.int/sites/NAPC/Country%20Documents/General/apf%20technical%20paper04.pdf

A hazard is a source of potential harm or adverse health effects on something or someone. It can be a substance, activity, process, or situation that has the potential to cause injury, illness, death, property damage, environmental damage, or other losses. There are different types of hazards: natural hazards, technological hazards, biological hazards, psychological hazards, ergonomic hazards, chemical hazards, and physical hazards.

Climate hazards: Climate-related hazards are specific climate-related events or conditions that have the potential to cause harm to people, property, infrastructure, livelihoods, and the environment. They are the physical manifestations of changes in the climate system. These hazards can be sudden and intense, like a hurricane, or they can develop more slowly, such as a drought. A climate hazard can be defined as a weather-related or hydro-meteorological event or a long-term climate trend with the potential for negative impacts. Examples of climate hazards are tropical cyclones, droughts, floods, or conditions leading to an outbreak of disease-causing organisms (plant, animal or human). They are sometimes referred to as extreme weather events. Probability can be associated with the frequency and magnitude of a given hazard.

Vulnerability and its Dimensions

Certain people, places and systems are more susceptible to the negative impacts of climate hazards. This is because of the specific vulnerabilities of different groups and systems. For example: a heavy rainfall event (a climate hazard) will have very different consequences depending on whether it falls on a well-drained area with robust infrastructure or on a densely populated, low-lying area with poor drainage and flimsy housing. The latter is more vulnerable to flooding.

Vulnerability can be defined as the propensity or predisposition of human societies or ecosystems to be adversely affected by climate-related hazards. It encompasses a range of factors that make individuals, communities, assets, or ecological systems more susceptible to harm and less able to cope with, adapt and recover from the impacts of climate change. For example, older populations are more sensitive to heat-stress and have limited physical capacity to adapt, therefore highly vulnerable during a heatwave.

Key Dimensions of Vulnerability

Vulnerability is a complex interplay of several factors. The key dimensions of vulnerability are: exposure, sensitivity and adaptive capacity.

- **Exposure: The term exposure refers to the degree to which a system is exposed to a given hazard (e.g. flooding). Exposure is the presence of people, assets, infrastructure, species, ecosystems, or economic activities in hazard-prone areas. High exposure increases vulnerability. For example, settlements built in floodplains are highly exposed to flood hazards.**

- **Sensitivity: Sensitivity refers to the degree to which they could be harmed or directly affected by a climate hazard. In the context of a risk assessment, the term sensitivity refers to the degree to which a system is affected by, or responsive to a hazard. In other words, sensitivity captures the potential of a system to be impacted by a hazard. For example, agricultural systems that rely heavily on rain are highly sensitive to changes in precipitation patterns (droughts or excessive rainfall).**

Similarly, older individuals and those with pre-existing health conditions are often more sensitive to heatwaves.

- **Adaptive Capacity: Adaptive capacity is the degree to which a community or system could mitigate the potential for harm by taking action to reduce exposure or sensitivity. Adaptive capacity of a system describes its ability to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC 2014).This is the ability of a system, institution, human, or other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Low adaptive capacity increases vulnerability. This can also be thought of as a measure of resilience. Various factors influence the adaptive capacity of a person or system, which include:**
  - **Economic resources: Wealthier communities and individuals generally have more resources to invest in protective measures and recover from losses.**
  - **Technology: Access to and ability to use technology (e.g., early warning systems, drought-resistant crops) can enhance adaptive capacity.**
  - **Infrastructure: Well-maintained infrastructure (e.g., drainage systems, transportation networks) can reduce vulnerability to hazards.**
  - **Education and awareness: Knowledge about climate risks and adaptation strategies can empower individuals and communities to take action.**
  - **Social networks and support systems: Strong social connections and community support can aid in coping and recovery.**
  - **Governance and institutions: Effective policies, regulations, and institutions play a crucial role in planning and implementing adaptation measures.**
  - **Health and well-being: A healthy population is generally more resilient to shocks.**
  - **Access to information: Timely and accurate information about hazards and risks is essential for preparedness.**

Vulnerability and Climate Change Impacts

A community may be highly vulnerable to a low impact climate hazard because of high sensitivity or low adaptive capacity. For example, a densely populated settlement built on a low-lying are could be easily inundated with a minimal flood from storm and, due to the challenges imposed by poverty, they have great difficulty recovering from this event.

Another community can have a lower vulnerability to even high-impact climate hazards because of low sensitivity or high adaptive capacity – for example, a wealthy tourist destination built to withstand flooding from storm surge may suffer a temporary setback when hit by a major hurricane but would be more likely to have the resources to rebuild than a low-income neighborhood.

Therefore, climate hazards can result in highly variable impacts because of the variations in vulnerability dimensions (exposure, sensitivity and adaptive capacity) in time and space.

Understanding the specific vulnerabilities of different groups and systems is important to tailor adaptation strategies to effectively reduce the negative impacts of climate

hazards and build a more resilient future for the community. Disadvantaged groups of people are inherently more vulnerable to climate hazards than others. The poor, women and girls, the very old or very young, the sick, and the physically or mentally challenged are often vulnerable.

Resilience and Adaptive Capacity

The concept of resilience is important for understanding the adaptive capacity dimension of vulnerability to climate hazards. The resilience of a community is its ability to use available resources to recover and grow from adverse situations, just as a resilient person can more easily bounce back from a setback than a less resilient person. Resilient communities can learn from past experiences and use that knowledge when confronting future problems. Systems with high adaptive capacity are therefore resilient and able to make the necessary changes to deal with climate hazards. Systems with low adaptive capacity are much less resilient and much more vulnerable to climate hazards.

Addressing vulnerability is key to building climate resilience. This involves:

- **Reducing Exposure: Avoiding development in high-risk areas.**
- **Decreasing Sensitivity: Implementing measures like diversifying agricultural practices, improving public health systems, and building more resilient infrastructure.**
- **Enhancing Adaptive Capacity: Investing in education, infrastructure development, social safety nets, early warning systems, and strengthening governance.**

Connections between Hazard, Vulnerability and Risk

Hazard and vulnerability dimensions are interconnected elements that determine the level of risk. The frequency and intensity of the climate hazards interact with a diverse set of climate processes, landforms, infrastructure, and social systems to harm people and things they value. Hence, any decision making to reduce the risk of a community or system to climate hazards needs to understand the connections between hazards, vulnerability and risk.

Hazard, vulnerability, and risk are intricately linked (as shown in the figure below), forming the core of how we understand and address the dangers posed by climate change and other threats. The risk arises from the combination of a potentially harmful event (hazard), the presence of things that could be harmed (exposure), and the susceptibility of those things to being harmed (vulnerability).

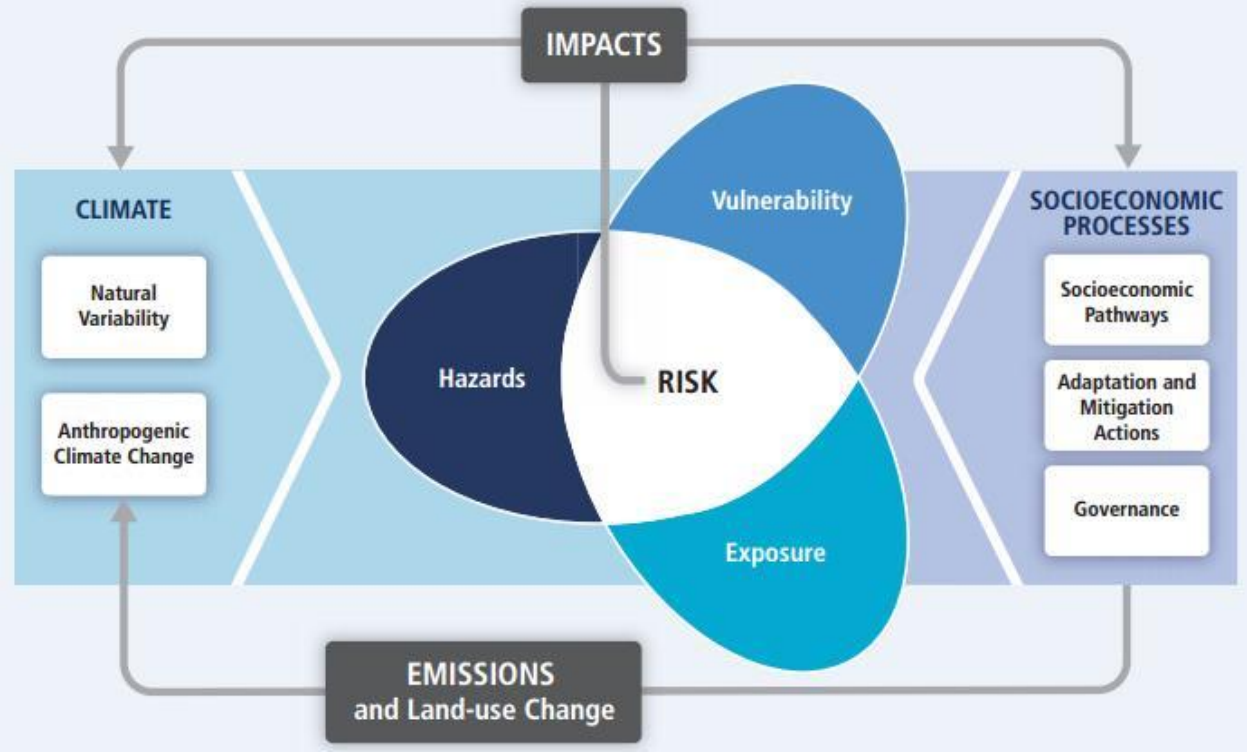


Figure: Illustration of the fundamental concept and connections between hazards, vulnerability and risk to climate change (Source: IPCC, 2014[22])

How are they Connected?

1. **Hazard as the Trigger: The hazard is the event or condition that has the potential to cause harm. Without a hazard, there is no risk, regardless of how exposed or vulnerable something might be. For example, a region with highly vulnerable populations but no history of earthquakes faces no earthquake risk. However, in eastern Nepal (for example), the seismic history establishes earthquakes as a hazard.**

2. **Exposure as the Pathway: Exposure determines what and how much is in the path of the hazard. If there is nothing exposed to a hazard, even a severe one, the risk will be zero (though this is rarely the case with widespread climate hazards). Densely populated areas, critical infrastructure like hospitals and roads, and agricultural lands are all exposed to various hazards like floods, landslides, and heatwaves.**

3. **Vulnerability as the Amplifier: Vulnerability dictates the degree to which the exposed elements will be negatively affected by the hazard. High vulnerability means that even a relatively minor hazard can lead to significant impacts. Conversely, low vulnerability can buffer the effects of a more intense hazard. For instance, well-constructed buildings in earthquake-prone zones have lower vulnerability to damage compared to poorly built structures. Similarly, communities with strong social support networks have a lower vulnerability to the long-term psychological impacts of a disaster.**

[22] IPCC, 2014. Fifth Assessment Report, Working Group 2, Chapter 19, Figure 19-1

Session 2 & 3: Participatory gender-sensitive assessment of climate risks and vulnerabilities: Assessment methods and tools

Duration: 3 Hours
Materials required: Projector, Market pen, Whiteboard, Newsprint
Venue: Training Hall with furniture
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

This session will focus on the climate risks and vulnerability assessment. The methods and tools to use in assessing climate hazards and vulnerabilities are discussed in these two sessions. This session aims to equip participants with the methods and tools for participatory climate vulnerability assessment and reporting the results of the assessment.

Objectives of the Session

By the end of this session, participants will be able to:

- **Understand the concept of participatory climate vulnerability assessment**
- **Describe the methods and tools for participatory climate vulnerability assessment**
- **Explain the process/tools to be used for data collection for assessing climate vulnerabilities**
- **Describe the stages and various tools of participatory climate vulnerability assessment**
- **Become familiar with the climate risk assessment, evaluating risks, identifying climate change adaptation options, and developing risk management plan.**

Session Delivery

- **The facilitator can facilitate the session by linking this session with the previous session. Participants can be asked how they would assess the climate risks and vulnerabilities in a participatory and gender-inclusive way. Their responses can be noted down in newsprint.**
- **Building on the participants' responses, the facilitator can explain what are the gender-responsive participatory climate vulnerability assessment and its importance.**
- **A small group discussion can be conducted to discuss on the stages, methods and tools of participatory climate vulnerability assessment, which will be presented by each group.**
- **The facilitator can take the session further with the group presentation, and present the stages, methods and tools for participatory climate vulnerability assessment.**
- **The facilitator will demonstrate each of the tools with examples. Illustrations are important, because the participants need to understand the theory behind using the tools, so that they can practice the use of the tools in real field situation in the next day's field session.**
- **Towards the end of the session, the facilitator can ask the participants the following questions to ensure participants' understanding on the subjects discussed in this session:**

- **Why do we need to conduct participatory climate vulnerability assessment?**
- **What are the key methods and tools to use for participatory climate vulnerability assessment?**
- **What are the stages of participatory climate vulnerability assessment?**
- **How the participatory climate vulnerability assessment leads to identifying climate change adaption options and developing risk management plan?**

- **Finally, facilitator can conclude the session by informing the participants that they will be going for practical sessions (field assessment) for participatory climate vulnerability assessment. The facilitator can suggest them the materials to bring with them for the field visit, including the dress code (e.g., closed shoes, hat for sun protection, full sleeve shirts, etc.).**

- **The facilitator can end the session by summarizing the points discussed throughout the session and thanking the participants for their active participation and cooperation.**

Reference Materials

Participatory Climate Vulnerability Assessment

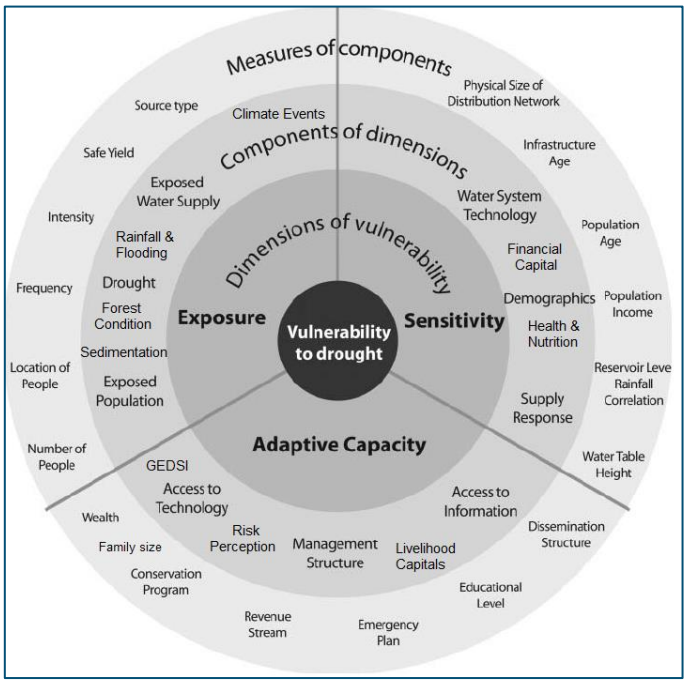
A Participatory Climate Vulnerability Assessment (PCVA) is a process that actively involves local communities and other stakeholders in understanding and analyzing their exposure, sensitivity, and adaptive capacity in the face of climate change impacts. It's a bottom-up approach that values local knowledge and perspectives alongside scientific data to develop effective and sustainable adaptation strategies.

Participatory vulnerability assessment tools emphasize collaboration and the active involvement of community members, local experts, Indigenous Peoples, and other stakeholders throughout the assessment process. The assessment aims to collect qualitative, often visual, information for:

- **Understand local risks: Identify how climate change and other hazards affect lives and livelihoods at the community level (understand local climate risks).**
- **Determine which individuals, groups, and assets are most susceptible to climate impacts (analyze vulnerabilities).**
- **Recognize existing strengths, resources, and strategies that communities use to cope with hazards (assess capacities).**
- **Co-create locally relevant actions to reduce vulnerability and enhance resilience (develop adaptation strategies).**
- **Provide a basis for integrating climate and disaster risk considerations into community development plans and projects (inform planning).**
- **Increase understanding of climate change issues among community members and stakeholders (raise awareness).**

Assessing Climate Vulnerability

Assessing vulnerability is a critical step in understanding and managing climate risk, especially in a context where various socio-economic and environmental factors can amplify the impacts of climate hazards. It involves systematically identifying and evaluating the factors that make individuals, communities, systems, or regions susceptible to harm from these hazards.



Assessing vulnerability of a person, place or system is a complex task. A typical example of the Vulnerability Scoping Diagram has been developed as vulnerability assessment tool (Figure below). The tool divides vulnerability into its three dimensions (exposure, sensitivity and adaptive capacity), defines components of these dimensions and then assigns measures of these components.

Data Collection Process/Tools for Assessing Climate Vulnerabilities

Climate risks and vulnerability assessment adopts a participatory and community-driven approach. The methodology will ensure maximum ownership and understanding by community members. It not only ensures the long-term relevance and sustainability of any interventions, but also serves as a capacity building exercise for the community.

The following matrix shows the data collection process, which includes type of information, source of information and process/tools to be used to collect information required for climate risks and vulnerability assessment. Both primary and secondary information will be collected from various sources.

Table: Data collection matrix with data collection process and tools

Type of Information	Source of Information	Process/Tools	Timeline	Remarks
Site selection		**Discussion/consultation** **Site visits** **Literature review**		
Settlement history		**Historical timeline** **Social mapping** **FGD/KII** **Literature review**		
Vulnerability Assessment/ Disaster		Resource mapping Transect walk Historical timeline		

Type of Information	Source of Information	Process/Tools	Timeline	Remarks
Mapping		Hazard mapping Pairwise ranking Seasonal calendar		
Current socio-economic situation		**Questionnaire survey** **FGD/KII** **Seasonal calendar** **Wellbeing ranking**		
Gender-based social and power mapping		**Women mobility mapping** **GESI records/practices** **FGDs/KIIs** **Literature review**		
Trend of Precipitation Temperature		**Consultation with experts** **Data from meteorological stations** **Consultation with local community**		
Financial mapping				
Impact assessment of climate change		**Community consultation/ Site visits** **Consultations with experts**		

Stages of Participatory Climate Vulnerabilities Assessment

While specific methodologies may vary, a participatory climate vulnerability assessment often includes these stages:

Step 1: Preparation:

- **Building relationships and trust with the community.**
- **Defining the scope and objectives of the assessment.**
- **Gathering existing secondary data (e.g., climate information, socio-economic data).**
- **Identifying and engaging key stakeholders.**

Step 2: Data Collection: This is a crucial step that utilizes various participatory tools to gather information and facilitate data analysis. The methods and tools for collecting primary data from the field include:

a) **Community consultations and discussions: Open forums for sharing experiences and perspectives.**

b) **Focus group discussions: Targeted discussions with specific groups (e.g., women, farmers, elderly people, persons with disabilities, Indigenous Peoples, etc.).**

c) **Transact walk: The transact walk is a participatory method used to systematically observe, explore and understand a community or area. It is a powerful tool for gathering rich, contextual information about hazards, vulnerabilities, and capacities. It involves walking along a defined path (the transect) with community members and key informants to observe, discuss, and document various aspects of the environment, social structures, resources, and potential issues.**

Transact walk method is used in hazard identification and vulnerability assessment. It is a tool for gathering qualitative data that can significantly inform and enhance the hazard identification and ranking process. During the walk, participants can point out existing and potential hazards within the community. Transact walk also helps to understand vulnerability and exposure by identifying who and what are exposed to these hazards. Moreover, this method facilitates the participants to assess livelihood practices and climate change impacts on the community people's livelihoods through observations and discussions during the walk. Information such as frequency of past hazard events, severity of past impacts, local knowledge or risks can be gathered during the walk.

Moreover, the method helps to identify existing capacities and coping mechanisms. It can reveal local resources and strategies that communities already use to cope with hazards and climate risks. This information is crucial for understanding the overall risk context and for developing effective risk reduction measures.

d) **Hazard mapping matrix: Hazard mapping matrix is a tool used to identify and visually represent climate hazards (or areas that are susceptible to specific hazards), their impacts and contribution to vulnerability. The following matrix can be used to map hazards, which can be natural (like floods, earthquakes, landslides, wildfires) or human-induced (like industrial accidents or pollution).**

Hazards	Impacts	Contribution to Vulnerability

Landslide		
Flooding		
Drought		
……		
……		

e) Hazards ranking (Pair-wise ranking):

Hazard ranking is a process used to evaluate and prioritize potential hazards based on their likelihood of occurrence and the severity of their potential impacts. It is a systematic approach to identify which hazards pose the greatest risk to human health, the environment, or other assets. There are two common criteria usually used in hazard ranking, which include:

- **Probability of Occurrence: This assesses how likely the hazard event is to occur within a specific timeframe. It is often categorized using terms like:**
  - **Rare: Very unlikely to occur (e.g., less than 10% chance in 10 years).**
  - **Occasional: Possible to occur (e.g., above 10% chance in any given year, or likely within 10 years).**
  - **Frequent: Likely to occur every year or likely within every 2-4 years.**

- **Impact/Severity: This evaluates the potential consequences if the hazard event occurs. Impacts are often considered across different categories:**
  - **Population/Health: Potential for injuries, illnesses, or fatalities.**
  - **Property: Potential for damage or destruction of buildings, infrastructure, and other assets, often expressed as a percentage of total replacement cost.**
  - **Economy: Potential for economic losses, including business disruption, loss of revenue, and costs associated with recovery.**
  - **Environment: Potential for damage to ecosystems, natural resources, and sensitive environments.**

Hazards Ranking (Pair ranking of hazards): The most common method of ranking hazards is the pair ranking or paired comparison of hazards. It is a method used to rank a set of hazards by comparing them two at a time. A consistent criterion or set of criteria needs to be considered to decide which hazard in the pair is 'more significant' or poses a 'higher risk'. The following questions can use used to decide on criteria for hazards ranking:

- **Which of these two hazards is likely to have a more severe impact if it occurs?**
- **Which of these two hazards is more likely to occur?**
- **Considering both likelihood and severity, which of these two hazards poses a greater overall risk?**

Once all the applicable hazards are listed, they are compared against the chosen criteria using a simple matrix (an example illustrated as below) to keep track of the results.

Table: Hazards ranking matrix

Hazard	Flood	Landslide	Drought	Invasive species	Pest and disease	Wind	Fire
Flood							
Landslide	Flood						
Drought	Flood	Landslide					
Invasive species	Flood	Landslide	Drought				
Pests/disease	Flood	Landslide	Drought	Invasive species			
Wind	Flood	Landslide	Drought	Invasive Species	Pest/ Disease		
Fire	Flood	Landslide	Fire	Fire	Fire	Fire	
Priority Frequency	6	5	3	2	1	0	4
Rank	1	2	4	5	6	7	3

Once all pairs have been compared, a score (or priority frequency) will be calculated for each hazard based on how many times it was preferred over other hazards. A simple method is to count the number of 'wins' for each hazard. Finally, the hazards will be finally ranked based on their scores (priority frequency). The hazard with the most score is generally considered the highest-ranked hazard. In the above example, Flood is the highest-ranked hazard, while wind is the lowest-ranked hazard.

Hazards ranking by settlements*:* The hazards can also be ranked directly against certain criteria or requirements. For example, for ranking hazards of a sub-watershed, the following matrix can be used. The hazards are listed across horizontally and the settlements vertically in the matrix. Using a participatory approach (community perception), hazards is ranked for each settlement based on their occurrence and severity/impact, and the name of the hazard is put in the matrix. Once the ranking is completed, the frequency of each hazard for all settlements within the sub-watershed is counted, which will be used to rank the hazards in the sub-watershed.

Table: Hazards ranking by settlements of a Sub-Watershed

Hazards → / ↓ Settlement	First	Second	Third	Fourth	Fifth	Sixth	Seventh
1	A	B	D	C	F	G	E
2	A	B	C	D	E	G	F
3	A	B	D	D	F	E	G

Hazards → / Settlement ↓	First	Second	Third	Fourth	Fifth	Sixth	Seventh
4	A	B	C	D	F	E	G
5	B	A	E	C	D	F	G
6	A	B	C	E	G	D	F
7	A	B	C	D	G	E	F
Frequency	A = 6	B = 6	C = 4	D = 4	F = 3	E=3	F=3, G=3
Ranking	Fire	Landslide	Drought	Fire	Wind, Invasive Species, Pest Disease		

A= Flood, B=Landslide, C=Drought, D=Fire, E=Wind, F=Invasive Species, G= Pest Disease

Settlement level hazard ranking matrix

The following matrix can be used for hazard ranking of settlements within a sub-watershed area, or hazard ranking of wards within a municipality.

Table: Illustration of settlement level hazard matrix

Settlement Name	A	B	C	D	E	F	G
A							
B	B						
C	A	B					
D	A	D	C				
E	A	B	C	E			
F	F	B	C	D	F		
G	G	G	G	G	G	G	
Frequency	3	4	3	2	1	2	6
Rank	3	2	3	4	5	4	1

f) Community mapping (Resource and hazard mapping): This is a participatory process/tool, where community members draw maps of their area identifying important resources, hazards or areas prone to specific hazards (flood, landslides, etc.), vulnerable zones or locations, vulnerable people (Indigenous Peoples, etc.), and key livelihood assets. Such mapping helps to understand spatial distribution of resources and risks, facilitates discussion and shared understanding.

Figure: Illustration of community resource map

Communities can map areas affected by monsoon flooding, water scarcity, or landslides, identifying critical infrastructure at risk and vulnerable settlements. They can also map important agricultural land and water sources that are sensitive to climate variability.

g) Seasonal calendars: Seasonal calendar is a participatory tool to illustrate changes in weather patterns and their effects on livelihoods throughout the year. Communities create a visual representation of the year, highlighting seasonal changes in weather patterns, agricultural activities, livelihoods, health issues, the occurrence of climate-related hazards, and other relevant seasonal changes occurred due to climate change.

This tool helps to reveal temporal patterns of vulnerability and helps to link climate events with their impacts on natural processes/resources, livelihoods and well-being. For example, using this tool, farmers can illustrate changes in rainfall patterns affecting planting and harvesting seasons. Communities can map the seasonal prevalence of waterborne diseases potentially linked to changing temperatures or water availability.

Table: Seasonal calendar of hazard

Hazard \ Month		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flooding	Now												
	Before												
Landslide	Now												
	Before												
Rain	Now												
	Before												

Hazard / Month		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Draught events	Now												
	Before												
……..	Now												
	Before												
……..…	Now												
	Before												

Before: 20 – 30 years before Now: Recent years (within 3-4 years)

h) Vulnerability and capacity matrices: Vulnerability and capacity matrices are visual tools to analyze different aspects of vulnerability and existing capacities. They are participatory tools used in assessments, particularly in the context of disaster risk reduction, climate change adaptation, and development. They provide a structured way for communities and other stakeholders to analyze and understand the different dimensions of their vulnerability to hazards and their existing capacities to cope with and recover from them. They allow for a comparative analysis of different groups, sectors, or aspects of a community in terms of their exposure, sensitivity, adaptive capacity (related to vulnerability), and their resources, skills, and social networks (related to social capital). A typical template of Vulnerability and Capacity Analysis Matrix[23] is given as below:

Elements	Vulnerabilities	Capacities
Physical/Material • **What is vulnerable?** • **What productive resources, skills and hazards exist in your community?**	• ***Geographical calamities (floods, landslides)*** • ***Lack of infrastructure*** • ***Poverty/poor health***	• ***Skills to be productive*** • ***Access to productive resources***
Social/Organizational • **Who is vulnerable?** • **What are the relationships between people in the community?** • **What are their organizational structures?**		
Motivational/Attitudinal • **What attitudes lead to vulnerability?** • **What capacity exists to improve the situation?** • **How does the community view its ability to create change?**		

[23] https://www.adaptation-undp.org/sites/default/files/resources/6_capacities_and_vulnerabilities_assessment_framework_cva_framework.pdf

i) Livelihood analysis: This tool examines how climate change impacts different livelihood activities. A livelihood analysis tool for vulnerability assessment is a crucial component of understanding how different groups of people are susceptible to various shocks and stresses, including those related to climate change. It helps to identify the resources, activities, and entitlements that individuals and households rely on to make a living, and how these are affected by vulnerabilities. It also helps to identify livelihood strategies.

The following matrix can be used for participatory climate sensitive livelihood analysis and vulnerability ranking of the households in a community.

Criteria/Livelihood Assets	Indicators	No. of Households			
		V1	V2	V3	V4
Economic capital • House • Land holding	• Location and type of house • Land size and food security • Impact of climate Induced hazards (landslide, flood drought etc.)				
Social capital • Membership/Association • Social Acceptance	• Membership to social group • Social Acceptance level				
Human capital • Education • Employment • Access to skill training • Health condition	• Literacy • Employment • Skills/ Experience and knowledge on adaptation activities • Health condition and physical status				
Physical capital • Accessibility • Irrigation facilities, • Access to energy for lighting and cooking	• Access to road and communication, • Access to electricity and TV/Radio, mobile phone • Toilet • Improved cooking stove				
Natural capital • Water, Rivers, forest and access to other natural resources	• Drinking water source and its permanence , • Impacts of climate induced hazard on access to natural resources • Forest types and dependence				

V1 = Least Vulnerable; V2 = Moderately Vulnerable; V3 = Highly Vulnerable; V4 = Very Highly Vulnerable

j) Historical timelines: A historical timeline is a method of highlighting important historical dates, terms, figures, and events in a chronological fashion. It is a visual or textual representation of events arranged in chronological order. It helps to understand the sequence of events, identify patterns, and see how different events relate to each other over time. Historical timelines can be very broad or very specific and can cover a range of topics. In case of climate vulnerability assessment, historical timeline is used for mapping past climate-related events and community responses to the past events. Historical timelines can be presented in various formats, including linear, graphical or interactive.

Key elements of a historical timeline typically include:

- **Chronological order: Events are arranged from the earliest to the latest.**
- **Dates: Specific dates or time periods associated with each event.**
- **Descriptions: Brief explanations or details about each event.**
- **Scale: The period of time covered by the timeline (e.g., years, decades, centuries).**
- **Labels or headings: Clear identification of events or periods.**

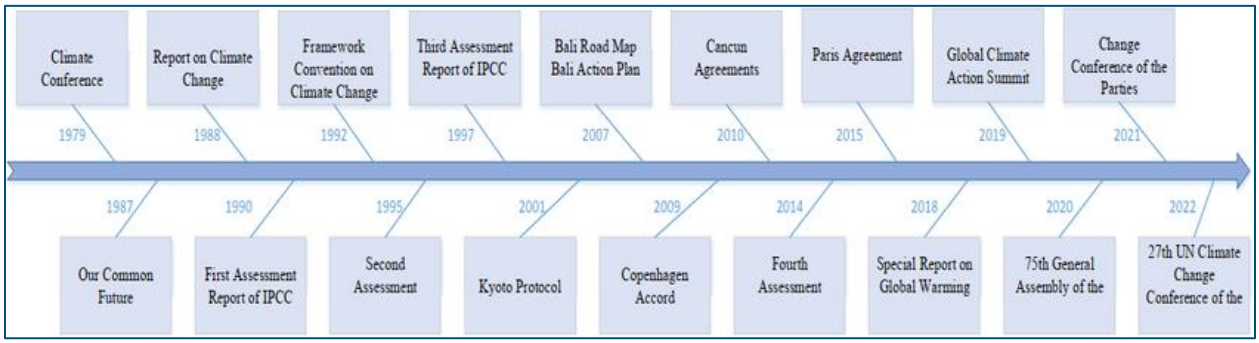


Figure: Historical timeline of global climate change events

k) Participatory photography and video: Allowing community members to document their experiences and vulnerabilities visually.

l) Data Analysis:
   - **a. Synthesizing information gathered through participatory methods and secondary data.**
   - **b. Identifying key vulnerabilities, capacities, and climate risks.**
   - **c. Prioritizing the most significant threats and vulnerable groups.**

m) Development of Adaptation Strategies:
   - **a. Facilitating community discussions to identify potential solutions and actions.**
   - **b. Considering feasibility, effectiveness, and local priorities.**
   - **c. Developing a community-based adaptation action plan.**

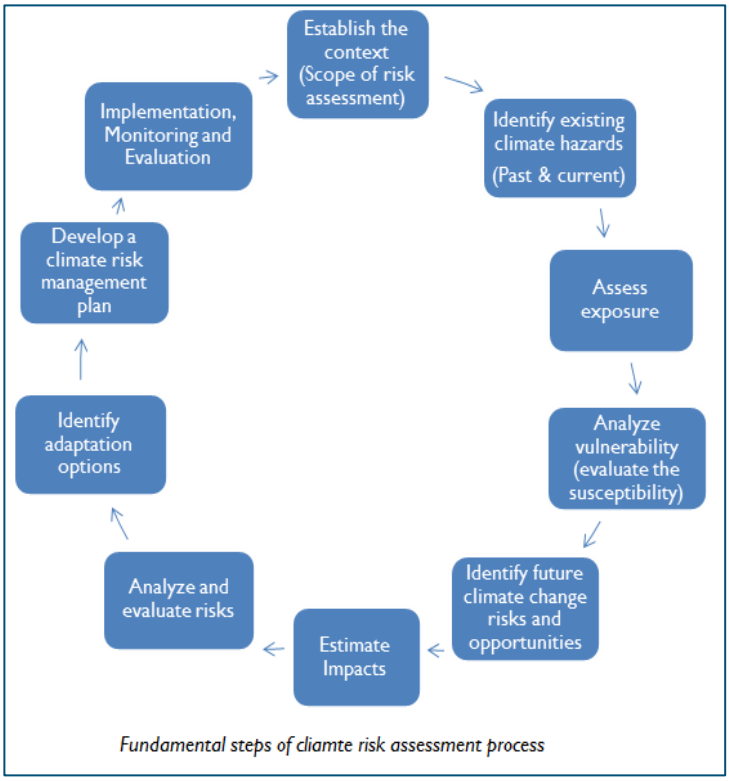
n) Validation and Feedback:
   - **a. Sharing the findings and proposed strategies with the community for feedback and validation.**
   - **b. Ensuring that the plan reflects community needs and priorities.**

o) Implementation and Monitoring:
   - **a. Putting the adaptation plan into action, with active community involvement.**
   - **b. Establishing mechanisms for monitoring the effectiveness of implemented strategies.**
   - **c. Adapting the plan as needed based on ongoing learning and changing conditions.**

Assessing Climate Risks

A risk assessment is an integral part of any climate change adaptation planning process. It is a crucial process for understanding and managing the potential negative impacts of climate change on various systems, including human societies, economies, and ecosystems. It involves identifying, analyzing, and evaluating the likelihood and magnitude of climate-related hazards and their consequences, considering the vulnerability and exposure of the elements at risk. Climate risk assessment involves the following steps:

1. **Establishing the context (Defining the scope and objectives of risk assessment): Clearly establish the purpose, geographical boundaries, and sectors to be included in the risk assessment.**
2. **Identifying existing climate hazards (Past and current): Determine the relevant climate variables (e.g., temperature, precipitation) and extreme weather events (e.g., flood, drought, heatwaves, landslides) that could pose a threat. This includes analyzing trends in temperature increase, changes in precipitation patterns (drier winters, wetter monsoons), glacial melting, and increasing frequency and intensity of floods and landslides in the past and at present.**



Fundamental steps of cliamte risk assessment process

3. Assessing Exposure: **Identify the people, assets, infrastructure, ecosystems, and socio-economic-cultural activities that are located in areas susceptible to climate hazards. This involves mapping populations living in flood-prone areas, infrastructure and cultural heritages vulnerable to climate hazards, agricultural lands dependent on monsoon rainfall, and ecosystems sensitive to temperature and water availability changes.**
4. Analyzing Vulnerability: **Evaluate the susceptibility of the exposed elements to harm and their capacity to cope with and adapt to climate change impacts. This includes considering physical characteristics (e.g., building materials), socio-economic factors (e.g., poverty, access to resources), and institutional factors (e.g., governance, early warning systems). Nepal's high vulnerability is linked to its mountainous terrain, dependence on climate-sensitive sectors like agriculture, high levels of poverty, and limited infrastructure in many regions.**
5. Estimating Impacts: **Determine the potential consequences of climate hazards on the exposed and vulnerable population and elements. This can include direct impacts (e.g., damage to property, loss of life) and indirect impacts (e.g., economic losses,**

food insecurity, health issues). Impacts could range from destruction of homes and farmland due to floods and landslides to reduced agricultural productivity from droughts and altered growing seasons, as well as increased risks of water-borne and vector-borne diseases.

6. Evaluating Risks: **Combine the likelihood of climate hazards with the magnitude of their potential impacts to determine the overall level of risk. This often involves using risk matrices or other frameworks to categorize risks as low, medium, or high.**
7. Identifying Adaptation Options: **Once risks are assessed, identify and evaluate potential actions to reduce vulnerability and exposure, thereby lowering the overall risk. These options can include infrastructure development, policy changes, community-based adaptation measures, and technological solutions. Adaptation strategies might involve building flood-resilient infrastructure, promoting climate-smart agriculture, implementing early warning systems for glacial lake outburst floods, and enhancing water resource management, and others depending on the identified risks.**
8. Developing a Climate Risk Management Plan: **Outline how the identified adaptation options will be implemented, monitored, and evaluated. This plan should also consider risk financing mechanisms for residual risks that cannot be avoided.**

Share the findings of the risk assessment with relevant stakeholders, including government agencies, local communities, and the private sector, to ensure informed decision-making and promote collaborative action.

Tools/Matrices for Climate Risk and Vulnerability Assessment

Four different matrices are suggested as tools for climate risks and vulnerability assessment[24]:

- **Matrix 1: This matrix is used to identify climatic threats and impacts using different information sets, namely community perception and empirical data, in order to assess the validity of assumptions around climate threats for each exposed sector, such as agriculture, forestry, livestock, and water resources.**
- **Matrix 2: This matrix is intended to detail climate change impacts on sustainable livelihoods assets for each exposed sector. The climate change impacts on each livelihood assets will be analyzed based on the significant climate threats identified in Matrix 1.**
- **Matrix 3: This matrix will be used to identify vulnerabilities and existing adaptive capacities for each climate change threats and impacts to the exposed sector. A list of impacts to the exposed sector and providing an associated list of adaptive capacities by the community will help to develop an assessment of vulnerabilities according to climate threat.**
- **Matrix 4: This matrix presents the crux of the vulnerability assessment in the form of proposed broad responses to the identified vulnerabilities. It includes broad**

[24] RECOFTC, 2026. Climate Change Vulnerability Assessment Report: Developing a Demonstration Site in Nepal on Community Forestry, Gender and Climate Change Adaptation. Bangkok, Thailand.

responses to threats and vulnerabilities with consideration of additional assessment factors such as frequency of threat, seriousness, and subjective measures of vulnerability rating.

Matrix 1: Identifying Climatic Threats and Impacts (Community Perceptions and Data Combined Analysis)

Climatic Variable	Empirical Data	Exposed Sector	Impact Assessment	Climate Change Threat
(A)	(B)	(C)	(D)	(E)
Temperature	Maximum, minimum over 30 years, distribution of temperature extremes, changing patterns of temperature extremes	**Agriculture**	**Community perception:**	
			Empirical data:	
		Forestry	**Community perception:**	
			Empirical data:	
		Livestock	**Community perception:**	
			Empirical data:	
		Water	**Community perception:**	
			Empirical data:	
Precipitation	Maximum, minimum over 30 years, distribution of precipitation extremes, changing patterns of precipitation extremes, changes in group water table	**Agriculture**	**Community perception:**	
			Empirical data:	
		Forestry	**Community perception:**	
			Empirical data:	
		Livestock	**Community perception:**	

Climatic Variable	Empirical Data	Exposed Sector	Impact Assessment	Climate Change Threat
(A)	(B)	(C)	(D)	(E)
			Empirical data:	
		Water	**Community perception:**	
			Empirical data:	
Humidity	Changes in relative humidity over 30 years; changes/variation in relative humidity in a day (morning and afternoon)	**Agriculture**	**Community perception:**	
			Empirical data:	
		Forestry	**Community perception:**	
			Empirical data:	
		Livestock	**Community perception:**	
			Empirical data:	
		Water	**Community perception:**	
			Empirical data:	
Wind		**Agriculture**	**Community perception:**	
			Empirical data:	

Climatic Variable	Empirical Data	Exposed Sector	Impact Assessment	Climate Change Threat
(A)	(B)	(C)	(D)	(E)
		Forestry	**Community perception:**	
			Empirical data:	
		Livestock	**Community perception:**	
			Empirical data:	
		Water	**Community perception:**	
			Empirical data:	
……		Agriculture	**Community perception:**	
			Empirical data:	
		Forestry	**Community perception:**	
			Empirical data:	
		Livestock	**Community perception:**	
			Empirical data:	
		Water	**Community perception:**	

Climatic Variable	Empirical Data	Exposed Sector	Impact Assessment	Climate Change Threat
(A)	(B)	(C)	(D)	(E)
			Empirical data:	

Matrix 2: Assessing Threats and Impacts through the Lens of Livelihood Assets

Climate Change Threat *(from Matrix 1, Column E)*	Exposed Sector *(from Matrix 1, Column C)*	Assets	Asset Description *(The assets listed below are only examples)*	Impacted? (Yes or No)	Description of Impacts on Sectorial Assets
A	B	C	D	E	F
Temperature Intense heat More intense dry seasons Changing seasonality **Cold waves**	**Agriculture**	**Natural**	Land, crops including local seed varieties, seed stocks, organic manure, water table, rivers		• Soil losing moisture and becoming hard due to factors including regular intense heat • Loss of water for irrigation, high dependency on rain • Increased invasive species in agriculture fields • …….. • ……..
		Social	Local knowledge of indigenous species and attributes		
		Financial	Crop yields, cash income, seed stock for future years as capital, loans and credit available		
		Physical	Tube wells, connecting roads and East West Highway for easy market access		
		Human	Agriculture wage labor, local entrepreneurs and individuals with higher education relevant to agriculture		
	Forestry	**Natural**	Trees, forests land, rivers, wildlife, biodiversity, ecosystem		
		Social	CFUG, collective action in responding to fires, forest management, regular meetings and Community Forest OP with sustainable use regulations, association with members of FECOFUN, strong FECOFUN presence and support		
		Financial	CFUG account, credit and grants available from DFO, DSCO and others for forest initiatives, interest in 'model site' visits offering potential for income		

Climate Change Threat *(from Matrix 1, Column E)*	Exposed Sector *(from Matrix 1, Column C)*	Assets	Asset Description *(The assets listed below are only examples)*	Impacted? (Yes or No)	Description of Impacts on Sectorial Assets
A	B	C	D	E	F
		Physical	Tube wells, disabled well within community forest that could potentially be connected to river, adjacent river, connecting road and East West Highway for easy market access		
		Human	Association with FECOFUN brings in skills and knowledge in forest management, DFO is supportive and has trained and capable staff		
	Livestock	**Natural**	Cattle (including improved varieties and hybrid mixes), buffalo (hardy but low heat resistance), grasses for fodder, surrounding forest for bedding, fodder and fuel for livestock feed production, adjacent river		
		Social	Women's dairy cooperative, strong gendered dimension providing self-support to women, women groups,		
		Financial	Cash income from dairy, direct market access within community itself, saving and credit mobilization, income generation activities, small-enterprises		
		Physical	Roads to nearby markets, community-based dairy		
		Human	Extensive local and gender-based knowledge on livestock raising and husbandry, respected by community		
	Water	**Natural**	Ponds, lakes, water tables, natural		

Climate Change Threat *(from Matrix 1, Column E)*	Exposed Sector *(from Matrix 1, Column C)*	Assets	Asset Description *(The assets listed below are only examples)*	Impacted? (Yes or No)	Description of Impacts on Sectorial Assets
A	B	C	D	E	F
			depressions in forest areas, seasonal mists and fogs, high humidity levels		
		Social	Membership in water management collective, water user committee, O&M Committee		
		Financial	Potential support through DSCO, municipality and communities own collective fundraising to support improved water access		
		Physical	Hand pumps, tube wells, river irrigation systems, disabled well in forest		
		Human	Knowledgeable technical staff in DSCO, former underground surveys have indicated presence of deep water sources		
Precipitation Drought (extended periods without rain) Flash flooding due to intense inundation	**Agriculture Forestry Livestock Water**	**Natural**			
		Social			
		Financial			
		Physical			
		Human			
Humidity Changing seasonality (increasing fog and mist, increasing atmospheric water vapor during cold season)	**Agriculture Forestry Livestock Water**	**Natural**			
		Social			
		Financial			
		Physical			
		Human			

Climate Change Threat *(from Matrix 1, Column E)*	Exposed Sector *(from Matrix 1, Column C)*	Assets	Asset Description *(The assets listed below are only examples)*	Impacted? (Yes or No)	Description of Impacts on Sectorial Assets
A	B	C	D	E	F
Wind **Drying up of water sources due to evaporation**	**Agriculture** **Forestry** **Livestock** **Water**	**Natural**			
		Social			
		Financial			
		Physical			
		Human			
Flooding **A**ssociated with, but not limited to precipitation	**Agriculture** **Forestry** **Livestock** **Water**	**Natural**			
		Social			
		Financial			
		Physical			
		Human			
	Agriculture **Forestry** **Livestock** **Water**	**Natural**			
		Social			
		Financial			
		Physical			
		Human			

Matrix 3: Identifying Vulnerabilities

Climate Change Threat *(from Matrix 2, Column A)*	Exposed Sector *(from Matrix 2, Column B)*	Impacts *(Synthesized from Matrix 2, Column F)*	Vulnerabilities *(The list below are examples only)*	Existing Adaptive Capacities *(The list below are examples only)*
Temperature Increasing temperatures, intense heat	**Agriculture**	• Decrease in soil moisture, decreased agricultural production • Loss of soil fertility, decreased agricultural production • Reduced work hours, decreased work efficiency, decreased income generation	• Declining availability of water for irrigation • Dependence on single commercial crop requiring intensive management and high economic/ climatic risk • Decreasing agricultural productivity and income due to changing rainfall patterns and shifting seasonality • Drying up of hand pumps for household and livestock water consumption • Declining water levels in wells • Dependence on mono-cropping • Dependence on upstream water usage • Loss of traditional agricultural crop seed • Loss of quality of agricultural • More labor intensive agricultural crops and increasing. labor costs • Spread of invasive alien species and pests/diseases	• Existing water sources • Mulching potential • Low/no till agricultural practices • Traditional agricultural practices, including rotational agriculture, use of manure for compost, legume use in inter-cropping, strengthening agroforestry practices • Drip irrigation practices • Promotion of deep rooted crops • Shelter-wood trees in sugarcane fields • Upstream and downstream water management approaches • Integrated, landscape level farming systems • Construction of retention ponds
	Forestry			
	Livestock			
	Water			
Precipitation	**Agriculture**			

Climate Change Threat *(from Matrix 2, Column A)*	Exposed Sector *(from Matrix 2, Column B)*	Impacts *(Synthesized from Matrix 2, Column F)*	Vulnerabilities *(The list below are examples only)*	Existing Adaptive Capacities *(The list below are examples only)*
Drought (extended periods without rain) Flash flooding due to intense inundation	**Forestry**			
	Livestock			
	Water			
	Agriculture			
	Forestry			
	Livestock			
	Water			
	Agriculture			
	Forestry			
	Livestock			
	Water			
	Agriculture			
	Forestry			
	Livestock			
	Water			

Matrix 4: Identifying Response Options to Vulnerabilities

Climate Change Threats	Frequency of Threat	Vulnerabilities	Seriousness of Impacts	Vulnerability Rating	Possible Adaptation Options
Temperature increase, more intense dry season	• **Prolonged drought, typically every 2-3 years** • **Temperature rise**	**Declining productivity of agriculture crops due to decreasing**		**High, Medium or Low**	**Development of agroforestry plots on private land**

Climate Change Threats	Frequency of Threat	Vulnerabilities	Seriousness of Impacts	Vulnerability Rating	Possible Adaptation Options
	is continuous, but extreme peaks periodically every 3-4 years	quality of soil (a function of extended periods of dryness) More labour intensive and increasing labour costs in agriculture			Introduction of no or low till agriculture practices Water conservation pond construction
Changing seasonality (agriculture)	• Continuously decreasing agriculture productivity • Erratic rainfall • Rainy season being pushed back several weeks				
Changing seasonality (forest ecosystem) Changing forest composition	Gradual incremental change	Changing forest composition Decreasing availability of /multipurpose tree species/NTFPs Declining biodiversity within forest	Indigenous tree species such as Simal are disappearing Shift of tree species northward	Low - Medium	Afforestation Agroforestry Tree seed back Protection of rare indigenous species
Loss of livestock productivity	Outbreak of livestock disease periodically in every 3-4 years	Declining cattle health Less availability of	…. Cattle died due to disease	Medium	Fodder and feed management Use of vaccination

Climate Change Threats	Frequency of Threat	Vulnerabilities	Seriousness of Impacts	Vulnerability Rating	Possible Adaptation Options
		fodder, water Increasing labour intensity for livestock			Increase access to veterinary doctors Cattle-shed management
Drying up of water sources	Seasonal drying up of surface water sources Incremental decline in water tables	Increased women's workload to fetch water by 1-2 hours daily Livelihood activities compromised due to low water availability	Tubewell depth has deepened Water supply maintenance cost increased (electric lifting)	Very High	Rainwater harvesting technologies Efficient water use technology
Flash flooding	Major floods every 8-10 years, small floods every 3-4 years	Settlements and farmlands damaged/ swept away Physical property damage reducing market access	Approx. 70 ha of agriculture eland damaged.	High	Bioengineering structures to control flood Increasing forest cover Upstream-downstream land management

Session 4: Identifying Climate Change Adaptation Options

Duration: 1 Hour 30 Minutes
Materials required: Projector, Market pen, Whiteboard, Newsprint
Venue: Training Hall
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

This session will focus on identifying climate change adaptation options based on the assessment of climate hazards, vulnerability and risks. This session aims to enrich participants' knowledge and skills on identify and prioritize effective climate change adaptation options to build resilience and minimize the negative impacts of a changing climate.

Objectives of the Session

By the end of this session, participants will be able to:

- **Understand the process and key considerations for identifying the climate change adaptation options**
- **Evaluate and prioritize the identified adaptation options**
- **Develop adaptation plan to guide implementation.**

Session Delivery

- **The facilitator will first quickly review the previous session about assessing climate hazards, vulnerability and risks, which provides the background for identifying the climate change adaptation options.**
- **The facilitator then can ask the participants about their understanding so far for identifying adaptation options to build resilience and minimize the negative impacts of a changing climate. The interesting responses can be noted down in a newsprint or whiteboard.**
- **The facilitator will then present the process of identifying adaptation options and key considerations for it. The facilitator can prepare and use Powerpoint slides using the reference materials provided below.**
- **The facilitator need to ensure that the participants have clear idea about identifying, evaluating and prioritizing the options based as the specific criteria or requirements, and relate that to the climate vulnerability and risks assessment.**
- **Before ending the session, the facilitator can ask the participants the following questions to ensure their understanding about the subject matter discussed in this session:**
  - **What are the key steps for identifying adaptation options?**
  - **What are key points to consider while identifying adaptation options?**
  - **How do you analyze and prioritize adaptation options for win-win situation?**
  - **What are the important points for developing an adaptation plan?**
- **The facilitator can conclude the session summarizing the key points discussed in the session and thanking the participants for their active engagement and cooperation.**

Reference Materials

Identifying Climate Change Adaptation Options

Identifying climate change adaptation options involves a systematic process of understanding climate risks and vulnerabilities and then exploring potential actions to reduce those risks and enhance resilience. Several key steps and considerations will be adopted to identify climate change adaptation options. A participatory and iterative approach is crucial for identifying the most suitable climate change adaptation options to build resilience and minimize the negative impacts of a changing climate.

1. Understand the Climate Risks and Vulnerabilities:

a) **Assess Potential Impacts: Identify how climate change (e.g., temperature increases, altered precipitation patterns, extreme weather events) is likely to affect your specific context (community, region) and sector (e.g., agriculture, forestry, livestock, water). Consider both current and future impacts.**

b) **Vulnerability Assessment: Determine who or what is most susceptible to these impacts by analyzing:**
   - **Exposure: The degree to which a system is subjected to climate change.**
   - **Sensitivity: The extent to which a system is affected by climate change.**
   - **Adaptive Capacity: The ability of a system to adjust to climate change impacts.**

c) **Risk Assessment: Evaluate the likelihood and severity of potential negative consequences resulting from climate hazards interacting with vulnerabilities.**

2. Brainstorm Potential Adaptation Options:

a) **Consider a Wide Range of Actions: Think broadly about different types of responses to address the identified risks and vulnerabilities. These can include:**
   - **Structural and Physical Measures: Infrastructure development (e.g., flood defenses, irrigation systems), technological solutions (e.g., drought-resistant crops), and changes in land use.**
   - **Social and Behavioral Measures: Awareness campaigns, educational programs, changes in practices and lifestyles.**
   - **Institutional and Policy Measures: Regulations, building codes, insurance schemes, early warning systems, and governance structures.**
   - **Natural and Ecosystem-Based Approaches: Protecting and restoring ecosystems (e.g., wetlands for flood control, afforestation for erosion control).**

b) **Engage Stakeholders: Involve affected communities, local experts, government agencies, and other relevant groups in the brainstorming process. Their local indigenous knowledge, practices and perspectives are invaluable.**

3. Evaluate and Prioritize Adaptation Options:

a) **Develop Evaluation Criteria: Establish a set of criteria to assess the feasibility, effectiveness, and desirability of the identified options. Common criteria include:**
    - **Effectiveness: The extent to which the option reduces the identified climate risks and vulnerabilities.**
    - **Feasibility: The technical, economic, social, and institutional viability of implementing the option. Consider costs, available resources, and potential barriers.**
    - **Efficiency: The cost-effectiveness of the option in achieving its objectives.**
    - **Equity and Social Considerations: The potential impacts of the option on different social groups, including vulnerable populations.**
    - **Environmental Impacts: The potential positive or negative effects of the option on the environment.**
    - **Sustainability: The long-term viability and resilience of the option under future climate scenarios.**
    - **Acceptability: The degree to which stakeholders support and are willing to adopt the option.**
    - **Flexibility and Robustness: The ability of the option to remain effective under a range of future climate conditions.**
    - **Urgency: The timeframe within which the option needs to be implemented.**

b) **Apply Evaluation Methods: Use appropriate tools and techniques to assess the options against the chosen criteria.**

c) **Prioritize Options: Based on the evaluation, rank the adaptation options to identify those that are most promising and should be prioritized for implementation.**

4. Develop an Adaptation Plan:

a) **Outline Implementation Strategies: Detail how the prioritized adaptation options will be implemented, including timelines, responsible parties, resource requirements, and monitoring mechanisms.**

b) **Integrate Adaptation into Existing Plans and Policies: Mainstream climate change considerations into relevant sectoral and development plans to ensure coherence and efficiency.**

c) **Secure Funding and Resources: Identify potential funding sources and develop strategies for mobilizing the necessary resources for implementation.**

Key Considerations for Identifying Climate Change Adaptation Options:

- **Local context: Adaptation options must be tailored to the specific geographic, environmental, social, economic, and cultural context.**
- **Uncertainty: Climate change involves inherent uncertainties. Adaptation strategies should be flexible and robust enough to address a range of potential future scenarios.**
- **Maladaptation: Be aware of actions that may unintentionally increase vulnerability in the long term or in other sectors/regions.**
- **Equity and inclusion: Ensure that adaptation processes are inclusive and address the needs of women and the most marginalized and vulnerable populations.**

- **Integration with mitigation: Recognize the links between adaptation and mitigation (reducing greenhouse gas emissions) and explore synergies where possible.**

Examples of Climate Change Adaptation Options relevant to MaWRiN Project Area

1. Agriculture Sector

- **Altering cultivation and sowing times: Adjusting planting calendars based on changing rainfall patterns and temperature regimes. For example, planting earlier if the rainy season starts sooner or later if there are delays.**
- **Promoting drought-resistant crop varieties: Mainstreaming the use of crop varieties that are better suited to drier conditions and more frequent droughts into agricultural extension programs and seed distribution systems.**
- **Soil and water conservation techniques: Integrating practices like terracing, contour farming, mulching, and rainwater harvesting into regular agricultural practices to improve water retention and reduce soil erosion.**
- **Agroforestry: Incorporating trees into farming systems to provide shade, improve soil health, and diversify income sources, making the system more resilient to climate shocks.**
- **Diversification of farming systems: Encouraging farmers to grow a wider variety of crops and integrate livestock to reduce reliance on single crops that might be vulnerable to specific climate impacts.**
- **Improved irrigation efficiency: Mainstreaming water-saving irrigation technologies like drip irrigation into water management plans and providing support for their adoption.**
- **Climate information services: Integrating weather forecasts and climate projections into agricultural advisory services to help farmers make informed decisions.**
- **Crop insurance schemes: Mainstreaming climate risk insurance into agricultural finance mechanisms to help farmers cope with losses from climate-related disasters.**
- **Early warning systems: Integrating and expanding early warning systems for extreme weather events into agriculture practices to allow for timely preventative actions. For example, rain forecast helps farmers to decide crop harvesting time.**
- **Social safety nets: Mainstreaming climate-responsive social protection programs to help vulnerable populations cope with climate shocks (e.g., conditional/unconditional cash transfers to vulnerable households for adopting specific climate-smart agriculture practices).**

2. Water Resources Management:

- **Integrated Water Resources Management (IWRM): Mainstreaming climate change considerations into all aspects of water resource planning and management, including allocation, infrastructure development, and ecosystem protection.**
- **Demand-side management: Implementing water conservation measures in urban and rural areas as a standard practice to reduce overall water demand and increase resilience to droughts.**

- **Water harvesting and storage: Integrating rainwater harvesting at household and community levels into water supply strategies. Constructing or rehabilitating water storage infrastructure (reservoirs, conservation ponds) to buffer against water scarcity.**
- **Efficient irrigation technologies: This is crucial for both agriculture and overall water resource management, and includes drip irrigation, sprinklers, improved surface irrigation, etc.**
- **Protection of water sources and ecosystems: Mainstreaming the protection and restoration of natural ecosystems like wetlands and forests, which play a vital role in water regulation and purification.**
- **Groundwater management: Incorporating climate change impacts on groundwater recharge into sustainable groundwater extraction and management plans.**
- **Flood management: Integrating climate change projections of increased flood risks into local level planning and productive infrastructure design (e.g., improved drainage systems).**

3. Forestry Sector

- **Sustainable forest management: This includes practices like selective logging, thinning, and prescribed burning.**
- **Planting diverse and climate-resilient species: This helps forests adapt to changing conditions.**
- **Reducing deforestation and forest degradation: This maintains the carbon storage capacity of forests.**
- **Improving forest monitoring and early-warning systems: This helps in managing climate risks like fires, pests, and diseases.**
- **Integrating climate change considerations into forest management plans: This ensures long-term forest health and resilience.**
- **Promoting agroforestry and community involvement: This diversifies income sources and increases community resilience.**
- **Maintaining and restoring forests: This helps reduce the impacts of extreme events.**
- **Increasing structural diversity in a forest: This can increase resilience to disturbance events and reduce susceptibility to drought and disease.**

4. Livestock Sector

- **Improved breeds and species: Introducing or promoting breeds of livestock that are more tolerant to heat stress, drought conditions, and diseases that may become more prevalent with climate change.**
- **Efficient feed and fodder management: Introducing and promoting the cultivation of grasses and legumes that can withstand water scarcity.**
- **Encouraging and training farmers in fodder conservation techniques, such as silage and hay making to store fodder for dry periods or times of scarcity.**

- **Improved pasture management: Implementing rotational grazing systems to prevent overgrazing and allow for pasture recovery, enhancing resilience to drought.**
- **Water management for livestock: Implementing techniques to harvest and store rainwater for livestock use, such as ponds, tanks, and improved water management in existing sources.**
- **Use of water-efficient watering systems to minimize water wastage.**
- **Animal health management by strengthening veterinary services and disease surveillance and early warning systems.**
- **Climate-smart livestock practices: Improved shed management, improved manure storage and handling to minimize climate change impact.**
- **Diversification of livestock and livelihoods by promoting the rearing of diverse animal species and integrating livestock with other income-generating activities to reduce the overall vulnerability to specific climate impacts.**
- **Insurance schemes: Exploring and implementing livestock insurance programs to help farmers cope with losses due to climate-related events like disease outbreaks or extreme weather.**
- **Capacity building and awareness: Educating livestock farmers on climate change impacts and appropriate adaptation strategies through extension services and community-based programs.**

5. GESI and Vulnerable People

Climate change disproportionately impacts marginalized groups, including those based on Gender Equality and Social Inclusion (GESI) factors like gender, caste, ethnicity, disability, age, and socio-economic status. Adaptation options need to be specifically tailored to address their unique vulnerabilities and empower them to build resilience. Some examples of GEDSI-responsive adaptation options relevant to MaWRiN Project are include, but not limited to;

- **Promoting women, IPs and marginalized groups' leadership in adaptation planning and decision-making**
- **Targeted information and training for women, IPs and other marginalized and vulnerable communities**
- **Supporting women, IPS and marginalized and vulnerable people's access to resources and technologies**
- **Addressing gender-based violence in the context of climate change**
- **Promoting diversified and targeted livelihoods support for women, IPs, and other marginalized and vulnerable households**
- **Tailoring climate change information and early warning messages to the specific languages, cultural contexts, and communication channels accessible to different ethnic and linguistic groups. Ensuring information is also accessible to people with disabilities (e.g., using sign language, audio formats)**

- **Ensuring participation of marginalized groups in climate vulnerability risk assessments and local-level planning**
- **Addressing discrimination in access to resources and opportunities**
- **Developing inclusive disaster preparedness and response plans**

DAY 2

Session 1-4: Practical Session on Hazards Identification, Participatory Climate Vulnerability Assessment, and Identification of Climate Change Adaptation Options (Field Assessment)

Duration: 4 Hours (in field) and 2 hours (in classroom)
Materials required: Notebook, pen, Assessment formats/templates
Venue: Suitable field area (within sub-watershed area), where communities and stakeholders are informed about assessment plan beforehand. The field site should not be too far: about 30 minutes travel time is preferred.
Training method: Consultations with communities and stakeholders, field observation

Background

Field study is an important tool for having hands-on skills on participatory climate vulnerability assessment. Field study refers to the process of directly interacting with the communities and stakeholders, and observing and evaluating climate hazards, vulnerabilities and risks. This session will focus on visiting sub-watershed area for participatory climate vulnerability assessment using the methods and tools discussed in the previous day.

Objectives of the Session

By the end of this session, participants will be able to:

- Exercise the methods and tools to assess participatory climate risks and vulnerability assessment in real field situation
- Understand the practical problems and challenges of conducting participatory climate vulnerability assessment
- Share the practical knowledge and skills of evaluating vulnerabilities, and identify climate adaptation options to address the specific climate hazards, vulnerabilities and risks
- Develop climate risk management interventions and plan.

Session Delivery

- The facilitator will divide the participants into three groups of about 6-7 participants in each group for field assessment, and brief about the activities they are doing in the field.
- Where appropriate, the participants will be provided with the formats/template required for the assessment.
- The participants will travel to the already identified field sites for conducting the assessment, and carry our assessment in the community/area assigned to them.
- Once the field assessment is completed, the participants will return to the training venue (Hall) and summarize their findings from the field. The findings will be summarized in the following areas:
    - Major climate hazards (past and present)

- **Ranking of hazards (pair-wise and settlement-wise)**
- **Analyze exposure**
- **Analyze vulnerability**
- **Estimate impacts**
- **Estimate risks**
- **Identify climate change adaptation options and evaluate the options**
- **Develop a climate risk management plan**

- **Each group will prepare a climate vulnerability assessment report and present the report. The group presentations will be discussed in the plenary, and conclusions and recommendations are drawn.**
- **The facilitator will conclude the session by summarizing the whole day activities and thanking the participants for their active engagement in the field and report preparation/presentation.**

3. Module Three

Title : Mainstreaming Climate Change Adaptation Options in Key Sectors at Local Level
Duration : 1 Day

Session 1-2	***Mainstreaming Climate Change Adaptation Options in Key Sectors at Local Level*** • **What is mainstreaming and why is it important?** • **Examples of adaptation options that can be mainstreams in different sectors** • **Methods and tools for mainstreaming climate change adaptation options at the local level (sector-wise)** • **Challenges of mainstreaming CCA options** • **Moving Forward: Key considerations on mainstreaming adaptation options at local level**
Session 3	• **Local planning process and mainstreaming adaptation options** • **Challenges in mainstreaming adaptation options in local planning process** • **Role of leadership in mainstreaming climate change adaptations at the local level**
Session 4	**Mainstreaming GEDSI in climate change and adaptation efforts**
Closing Session	• **Summarization and review of the training program** • **Post-training evaluation** • **Training evaluation by the participants** • **Closing session**

Session 1 and 2: Mainstreaming Climate Change Adaptation Options in Key Sectors at Local Level

Duration: 1 Hour 30 Minutes
Materials required: Projector, Market pen, Whiteboard, Newsprint
Venue: Training Hall with furniture
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

This session will focus on the methods and tools to mainstream the identified and prioritized climate change adaptation options in key sectors, such as agriculture, livestock, forestry, water resources, and livelihoods at local level. This session aims to enrich participants' knowledge and skills on how the identified climate change understanding of these concepts for improving their skills and knowledge on why mainstreaming the options is important, what is the stakeholders roles and what could be the strategies for mainstreaming the adaptation options to help local communities sustain their livelihoods, manage already scarce resources and enhance resilience.

Objectives of the Session

By the end of this session, participants will be able to:

- **Understand meaning and importance of mainstreaming adaptation options in key sectors**
- **Describe the methods and tools for mainstreaming the adaptation options**
- **Give the examples of adaptation options that can be mainstreams in different sectors**
- **Explain the challenges of mainstreaming CCA options at local level**
- **Describe key considerations on mainstreaming adaptation options at local level for moving forward**

Session Delivery

- **The facilitator can start the session asking the participants what they understand by the term 'mainstreaming' in general and 'mainstream climate change adaptation options', and why it is important in the context of climate change impacts. The key responses can be noted down in a whiteboard or newsprint for discussion later, if any.**
- **The facilitator will then summarize the responses from the participants and make the concept clear by using PowerPoint Slides with lecture method.**
- **Once the participants are clear about the concept and importance of mainstreaming adaptation options, the facilitator can present and explain the methods and tools for mainstreaming climate change adaptation options in key sectors (agriculture, forestry, livelihoods, water resource, GESI) at the local level. Before presenting/explaining the methods and tools, the facilitator can use brainstorming and or plenary discussion methods to get idea and knowledge of the participants on mainstreaming the options.**
- **The facilitator then will ask the participants for a group work dividing them into 4-5 small groups and asking them to list some of the examples of climate change adaptation options that can be mainstreamed in different sectors at local level. Each group can work on different sector. The group will present their findings, and the facilitator can discuss their findings using the PowerPoint Slides s/he has prepared.**

- **The facilitator will then brainstorm the participants for key challenges in mainstreaming CCA at local level. This can also be done in as a small group exercise. The facilitator will summarize the key challenges and present the key challenges using PowerPoint Slides.**
- **With the above discussions, the participants are now ready for describing key considerations on mainstreaming adaptation options at local level for moving forward. The facilitator can present and summarize key considerations for moving ahead.**
- **Towards the end of the session, the facilitator can ask the participants the following questions to ensure participants' understanding on the subjects discussed in this session:**
    - **What is mainstreaming and why it is important in the context of climate change?**
    - **What are the key methods and tools to mainstream climate change adaptation options in key sectors at local level.**
    - **What are the challenges for mainstreaming CCA in key sectors at local level?**
- **Finally, facilitator can conclude the session by summarizing the points discussed in this session and thanking the participants for their active participation and cooperation.**

Resource Materials

Meaning of the term 'Mainstreaming'

The term "mainstreaming" generally refers to the process of integrating or incorporating a particular issue, perspective, or group into the dominant or conventional way of thinking, planning, or operating within a society, organization, or system. It's about moving something from the margins to the center, making it a normal and routine part of how things are done. For example, gender mainstreaming involves ensuring that gender equality considerations are routinely integrated into all stages of policy design, implementation, monitoring and evaluation. Mainstreaming includes the following four key aspects:

- **Integration: Bringing something that was previously separate into the main flow or current of activities and considerations.**
- **Normalization: Make the incorporated element a standard or routine part of processes, policies, or practices.**
- **Broad application: Widespread adoption and application across different sectors/levels**
- **Shifting perspectives or behavior change: Changing mindsets or behavior and ensuring that a particular viewpoint is consistently considered in decision-making.**

In the context of *climate change adaptation*, mainstreaming means integrating climate change risks and adaptation measures into all relevant development policies, plans, and decision-making processes across different sectors (like agriculture, water, infrastructure, forestry, etc.). Mainstreaming is not just about adding climate change considerations as an afterthought; it's about fundamentally rethinking how we plan and make decisions to ensure a climate-resilient and sustainable future for all.

Mainstreaming climate change adaptation options refers to the systematic integration of adaptation considerations into all relevant levels of governance, policies, programs, and decision-making processes. Instead of treating climate change adaptation as a separate issue, mainstreaming ensures that it becomes a routine part of how societies and economies function.

Importance of 'Mainstreaming' Climate Change Adaptation Options

Importance of mainstreaming climate change adaptation options stems from the urgent need to build a resilient and sustainable future in the face of increasing climate risks. Mainstreaming climate change adaptation options in all key sectors at local level is crucial for several interconnected reasons as below:

- **Integrating across sectors: Adaptation is not just an environmental concern, but adaptation needs to be incorporated into different sectors like agriculture, water management, forestry, infrastructure, livestock, etc. For example, when planning new roads, potential climate change impacts like increased flooding or landslides should be considered in the design and material choices.**
- **Ensuring long-term development sustainability: Climate change impacts, such as extreme weather events, flooding, landslides, sedimentation, and altered resource availability, can undermine livelihoods of local communities, particularly of women, Indigenous Peoples and other marginalized and vulnerable communities, while at the same time deteriorating the natural resource base on which the communities depend**

on. By integrating adaptation measures into local level development planning, it can safeguard investments, improve livelihoods, ensure resource management, enhance resilience, and ensure progress is sustainable in the face of a changing climate.

- **Improving efficiency and reducing costs: Addressing adaptation as a separate issue often leads to duplicated efforts and inefficient resource allocation. Mainstreaming allows for a more integrated and cost-effective approach by incorporating climate considerations into existing policies, programs, and budgets. This can prevent maladaptation, where development actions unintentionally increase vulnerability to climate risks, which can be costly to rectify later.**
- **Enhancing policy coherence: Mainstreaming ensures that climate change adaptation goals are aligned with development objectives at different levels. This avoids conflicting policies and maximizes synergies across different sectors and agencies. For instance, agricultural policies aimed at increasing food security should also consider climate-resilient practices.**
- **Leveraging broader resources: Adaptation needs often exceed the funding available through dedicated climate finance mechanisms or other funding sources. Mainstreaming allows adaptation to tap into the much larger financial flows within climate-sensitive sectors like agriculture, water, forestry and infrastructure.**
- **Building resilience across all levels: Climate change impacts every part of society and the economy. Mainstreaming fosters a holistic approach to building resilience at individual, community, institutional, and systemic levels.**
- **Avoiding maladaptation: By systematically considering climate risks in all development decisions, mainstreaming helps to avoid actions that could increase vulnerability in the long run. For example, building infrastructure in areas prone to future flooding without adequate protection measures (e.g., nature-bases solution) would be maladaptation.**
- **Promoting effective governance and coordination: Mainstreaming necessitates establishing clear roles, responsibilities, and coordination mechanisms across different government agencies and local government levels. This strengthens governance and ensures a more coherent and effective response to climate change.**
- **Increasing public awareness and participation: Integrating adaptation into mainstream processes raises awareness about climate risks and the need for action among a wider range of stakeholders, including the public, private sector, and civil society. This fosters greater participation and ownership of adaptation efforts.**
- **Institutional arrangements: Mainstreaming helps to establishing clear roles, responsibilities, and coordination mechanisms across different government agencies and levels to address climate risks. This might involve setting up inter-ministerial committees or incorporating climate change considerations into the mandates of existing institutions.**
- **Financial resources: Mainstreaming helps to allocate or leverage sufficient and appropriate financial resources to support adaptation actions within various sectors and at different levels. This includes budgeting for climate-resilient infrastructure, supporting research on adaptation technologies, and providing financial assistance to vulnerable communities.**
- **Long-term perspective: Mainstreaming recognizes that climate change is a long-term challenge and it requires integrating adaptation into long-term development plans**

and strategies. This involves anticipating future climate risks and building resilience over time.

- **Climate-proofing: Mainstreaming ensures that existing and future development projects and programs are resilient to the impacts of climate change. This means assessing climate risks and incorporating measures to minimize potential negative impacts. For example, when building a school in a flood-prone area, elevating the building and ensuring proper drainage would be climate-proofing measures.**

Examples of adaptation options that can be mainstreamed

1. Agriculture Sector

- **Altering cultivation and sowing times: Adjusting planting calendars based on changing rainfall patterns and temperature regimes. For example, planting earlier if the rainy season starts sooner or later if there are delays.**
- **Promoting drought-resistant crop varieties: Mainstreaming the use of crop varieties that are better suited to drier conditions and more frequent droughts into agricultural extension programs and seed distribution systems.**
- **Soil and water conservation techniques: Integrating practices like terracing, contour farming, mulching, and rainwater harvesting into regular agricultural practices to improve water retention and reduce soil erosion.**
- **Agroforestry: Incorporating trees into farming systems to provide shade, improve soil health, and diversify income sources, making the system more resilient to climate shocks.**
- **Diversification of farming systems: Encouraging farmers to grow a wider variety of crops and integrate livestock to reduce reliance on single crops that might be vulnerable to specific climate impacts.**
- **Improved irrigation efficiency: Mainstreaming water-saving irrigation technologies like drip irrigation into water management plans and providing support for their adoption.**
- **Climate information services: Integrating weather forecasts and climate projections into agricultural advisory services to help farmers make informed decisions.**
- **Crop insurance schemes: Mainstreaming climate risk insurance into agricultural finance mechanisms to help farmers cope with losses from climate-related disasters.**
- **Early warning systems: Integrating and expanding early warning systems for extreme weather events into agriculture practices to allow for timely preventative actions. For example, rain forecast helps farmers to decide crop harvesting time.**
- **Social safety nets: Mainstreaming climate-responsive social protection programs to help vulnerable populations cope with climate shocks (e.g., conditional/unconditional cash transfers to vulnerable households for adopting specific climate-smart agriculture practices).**

2. Water Resources Management:

- **Integrated Water Resources Management (IWRM): Mainstreaming climate change considerations into all aspects of water resource planning and management, including allocation, infrastructure development, and ecosystem protection.**
- **Demand-side management: Implementing water conservation measures in urban and rural areas as a standard practice to reduce overall water demand and increase resilience to droughts.**
- **Water harvesting and storage: Integrating rainwater harvesting at household and community levels into water supply strategies. Constructing or rehabilitating water storage infrastructure (reservoirs, conservation ponds) to buffer against water scarcity.**
- **Efficient irrigation technologies: This is crucial for both agriculture and overall water resource management, and includes drip irrigation, sprinklers, improved surface irrigation, etc.**
- **Protection of water sources and ecosystems: Mainstreaming the protection and restoration of natural ecosystems like wetlands and forests, which play a vital role in water regulation and purification.**
- **Groundwater management: Incorporating climate change impacts on groundwater recharge into sustainable groundwater extraction and management plans.**
- **Flood management: Integrating climate change projections of increased flood risks into local level planning and productive infrastructure design (e.g., improved drainage systems).**

3. Forestry Sector

- **Sustainable forest management: This includes practices like selective logging, thinning, and prescribed burning.**
- **Planting diverse and climate-resilient species: This helps forests adapt to changing conditions.**
- **Reducing deforestation and forest degradation: This maintains the carbon storage capacity of forests.**
- **Improving forest monitoring and early-warning systems: This helps in managing climate risks like fires, pests, and diseases.**
- **Integrating climate change considerations into forest management plans: This ensures long-term forest health and resilience.**
- **Promoting agroforestry and community involvement: This diversifies income sources and increases community resilience.**
- **Maintaining and restoring forests: This helps reduce the impacts of extreme events.**
- **Increasing structural diversity in a forest: This can increase resilience to disturbance events and reduce susceptibility to drought and disease.**

4. Livestock Sector

- **Improved breeds and species: Introducing or promoting breeds of livestock that are more tolerant to heat stress, drought conditions, and diseases that may become more prevalent with climate change.**
- **Efficient feed and fodder management: Introducing and promoting the cultivation of grasses and legumes that can withstand water scarcity.**
- **Encouraging and training farmers in fodder conservation techniques, such as silage and hay making to store fodder for dry periods or times of scarcity.**
- **Improved pasture management: Implementing rotational grazing systems to prevent overgrazing and allow for pasture recovery, enhancing resilience to drought.**
- **Water management for livestock: Implementing techniques to harvest and store rainwater for livestock use, such as ponds, tanks, and improved water management in existing sources.**
- **Use of water-efficient watering systems to minimize water wastage.**
- **Animal health management by strengthening veterinary services and disease surveillance and early warning systems.**
- **Climate-smart livestock practices: Improved shed management, improved manure storage and handling to minimize climate change impact.**
- **Diversification of livestock and livelihoods by promoting the rearing of diverse animal species and integrating livestock with other income-generating activities to reduce the overall vulnerability to specific climate impacts.**
- **Insurance schemes: Exploring and implementing livestock insurance programs to help farmers cope with losses due to climate-related events like disease outbreaks or extreme weather.**
- **Capacity building and awareness: Educating livestock farmers on climate change impacts and appropriate adaptation strategies through extension services and community-based programs.**

5. GESI and Vulnerable People

Climate change disproportionately impacts marginalized groups, including those based on Gender Equality and Social Inclusion (GESI) factors like gender, caste, ethnicity, disability, age, and socio-economic status. Adaptation options need to be specifically tailored to address their unique vulnerabilities and empower them to build resilience. Some examples of GEDSI-responsive adaptation options relevant to MaWRiN Project are include, but not limited to;

- **Promoting women, IPs and marginalized groups' leadership in adaptation planning and decision-making**
- **Targeted information and training for women, IPs and other marginalized and vulnerable communities**
- **Supporting women, IPS and marginalized and vulnerable people's access to resources and technologies**
- **Addressing gender-based violence in the context of climate change**

- **Promoting diversified and targeted livelihoods support for women, IPs, and other marginalized and vulnerable households**
- **Tailoring climate change information and early warning messages to the specific languages, cultural contexts, and communication channels accessible to different ethnic and linguistic groups. Ensuring information is also accessible to people with disabilities (e.g., using sign language, audio formats)**
- **Ensuring participation of marginalized groups in climate vulnerability risk assessments and local-level planning**
- **Addressing discrimination in access to resources and opportunities**
- **Developing inclusive disaster preparedness and response plans**

Methods & tools for mainstreaming climate change adaptation options

Mainstreaming climate change adaptation involves integrating adaptation considerations into all relevant policies, plans, programs, and decision-making processes across different sectors and levels of governance. Mainstreaming climate change adaptation requires a multi-faceted approach that involves various methods and tools. Some of the key methods are as follows:

a) Integrating CCA into existing policies and plans (Policy Integration)

- **Policy review and coherence: Reviewing national, sectoral and sub-national policies and development plans to identify entry points for integrating climate change risks and adaptation measures ensures coherence and avoids conflicting objectives.**
- **Local Adaptation Plans of Action: Developing and implementing comprehensive local level adaptation plans (LAPA) that provide a strategic framework for integrating adaptation across sectors. These plans often involve vulnerability assessments, identifying adaptation priorities, and outlining implementation strategies. Nepal has its National Adaptation Programme of Action (NAPA) and a National Framework of Local Adaptation Plans for Action (LAPA) that will guide to develop and implement LAPAs.**
- **Local Level Integration: Mainstreaming adaptation into local development plans and decision-making processes, recognizing that climate change impacts and vulnerabilities vary geographically. This involves engaging local communities and governments in identifying and implementing context-specific adaptation actions, as emphasized in Nepal's LAPA framework.**
- **Sectoral Integration: Incorporating climate change considerations into sectoral policies and plans, such as in agriculture, water resources, health, infrastructure, and disaster risk management. For example, agricultural policies can promote climate-smart practices, and infrastructure planning can incorporate climate-resilient designs.**
- **Application of climate lens: Applying a 'climate lens" during policy formulation and planning in all sectors at local level to proactively identify potential climate risks and opportunities.**

- **Land-use planning: Incorporating climate change projections (e.g., flood risks, drought, and landslides) into land-use planning decisions at local level to guide development away from vulnerable areas and promote resilient development.**
- **Climate proofing: Ensuring that existing and future development projects and programs are resilient to the impacts of climate change. For example, when building a community building in a flood-prone area, elevating the building and ensuring proper drainage would be climate-proofing measures.**

b) Institutional Strengthening and Coordination

- **Establishing Coordination Mechanisms: Creating or strengthening inter-ministerial and multi-stakeholder platforms to ensure effective coordination and collaboration on climate change adaptation across different government agencies, civil society organizations, the private sector, and research institutions.**
- **Establishing clear roles and responsibilities of different government agencies, local government, other stakeholders and communities to address climate risks and in implementing the climate change adaptation options. In order to champion the the integration of adaptation into their respective work areas, climate change focal points can be appointed within key government ministries and agencies to champion.**
- **Creating and strengthening collaboration and information sharing platforms within local government and sub-watershed levels to promote watershed management approach, not confining to the administrative/political boundary.**
- **Enhancing the technical and institutional capacity of government officials, local authorities, and other stakeholders to understand climate risks, develop adaptation strategies, and implement adaptation actions. This includes training programs, workshops, and knowledge-sharing initiatives.**
- **Integrating climate change adaptation into the mandates and operational procedures of the Sub-watershed Committee formed under the MaWRiN Project.**
- **Incorporating climate change considerations into national and sub-national budgeting processes. This includes allocating resources for adaptation initiatives and ensuring that budget allocations are climate-responsive.**

c) Enhancing Knowledge, Awareness and Participation

- **Community Engagement: Actively involving local communities, especially vulnerable groups, in the identification, planning, and implementation of adaptation actions to ensure that these are relevant and effective. Participatory Vulnerability and Capacity Assessments (PVCAs) are valuable tools for this.**
- **Awareness raising: Developing and implementing targeted awareness raising campaigns to educate the community, policy makers at local government, government line agencies and other stakeholders about climate change impacts and the importance of adaptation. Special consideration should be given to women, Indigenous Peoples, ethnic minorities, and other marginalized and vulnerable people to participate in such education activities.**
- **Stakeholder engagement: Ensuring active involvement of local communities, civil society organizations, the private sector, and research institutions in the**

adaptation planning and implementation processes (e.g., local government's planning process).

d) Improving Economic and Livelihood Opportunities

Integrating climate change adaptation into the livelihoods sector to improve economic and livelihoods opportunities is crucial for building resilience and ensuring sustainable development, especially for vulnerable communities that are highly dependent on climate-sensitive sectors like agriculture. Specific measures will need to be tailored to the local context, considering the unique climate risks, vulnerabilities, and livelihood systems. Some comprehensive methods for achieving this integration are:

- **Climate Risk Assessment: Conduct thorough assessments to identify current and future climate-related risks specific to the economic and livelihoods of the people. This includes analyzing changes in temperature, rainfall patterns, extreme weather events (floods, droughts, landslides), and their potential impacts on agriculture, water resources, forests, and other livelihood sources.**
- **Vulnerability Assessment: Analyze the susceptibility of different livelihood groups (farmers, livestock keepers, small business owners, etc.) to these climate risks. Consider their socio-economic status, access to resources, existing coping mechanisms, and adaptive capacities. Factors like poverty, gender, and social marginalization often increase vulnerability. Hence it is important to understand the vulnerability of the agricultural and other livelihood-related sectors and its impact on livelihoods.**
- **Identifying and Prioritizing Adaptation Options: Engage local communities, including marginalized groups, in identifying and evaluating potential adaptation strategies. Their indigenous knowledge and understanding of local conditions are invaluable.**
- **Livelihood Diversification: Promote a range of income-generating activities that are less sensitive to climate change. This could include beekeeping, off-season vegetable farming, or developing non-farm based skills and enterprises.**
- **Climate-Resilient Agriculture: Introduce and scale up climate-smart agricultural practices such as drought-resistant crops, water-efficient irrigation techniques, conservation agriculture, agroforestry, and integrated pest management.**
- **Sustainable Natural Resource Management: Implement practices that protect and restore natural resources, such as watershed management, reforestation, and soil conservation. These can buffer communities against climate impacts like floods and landslides.**
- **Infrastructure Development: Invest in climate-resilient infrastructure, such as water harvesting structures, flood protection measures, and improved irrigation systems, to support livelihoods.**
- **Social Protection Measures: Strengthen social safety nets, such as insurance schemes and disaster relief funds, to help vulnerable households cope with climate-related shocks.**
- **Mainstreaming Adaptation into Development Planning: Ensure that climate change adaptation is integrated into national and local development policies, plans, and budgets across all relevant sectors.**

- **Institutional strengthening: Build the capacity of local institutions, government agencies, and community-based organizations to plan, implement, and monitor climate change adaptation initiatives in the livelihoods sector.**
- **Awareness and dducation: Raise awareness among community members and stakeholders about climate change impacts and adaptation options through education and training programs.**
- **Partnerships and collaboration: Foster collaboration among government agencies, NGOs, research institutions, the private sector, and local communities to leverage resources and expertise for scaling up adaptation efforts.**

e) Monitoring and Evaluation (M&E):

- **Developing adaptation indicators: Establishing clear and measurable indicators to track the progress and effectiveness of mainstreaming efforts and adaptation actions.**
- **Monitoring frameworks: Implementing systems for monitoring the integration of climate change adaptation into policies, plans, and programs.**
- **Evaluation studies: Conducting periodic evaluations to assess the impact of adaptation measures and identify lessons learned for improving future mainstreaming efforts.**

Tools for Mainstreaming Climate Change Adaptation:

1. **Assessment Tools:**
   - **Climate vulnerability risk and capacity assessments: Methodologies and frameworks for identifying and evaluating current and future climate-related risks and vulnerabilities. It also includes participatory approaches to assess the vulnerabilities of communities or sectors to climate change and identify their existing capacities and resources for adaptation. Examples include hazard mapping, climate modeling, and vulnerability indices.**
   - **Economic Assessment Tools: Cost-benefit analysis, multi-criteria analysis, and other economic tools to evaluate the costs and benefits of different adaptation options and inform decision-making.**
2. **Planning and Guidance Tools:**
   - **Adaptation planning frameworks: Step-by-step guidance for developing adaptation plans at national, sectoral, and local levels, such as the UNFCCC's adaptation planning process guidelines and various handbooks for practitioners.**
   - **Climate information platforms: Databases and portals that provide access to climate data, projections, and information on climate change impacts and adaptation options.**
   - **Decision support tools: Software and online platforms that help users analyze climate information, assess risks, and identify suitable adaptation measures.**
3. **Integration and Mainstreaming Tools:**
   - **Climate lens tools: Checklists and guidelines to help policymakers and planners systematically consider climate change implications in their work.**

- **Sector-specific guidance: Tools and resources tailored to specific sectors (e.g., agriculture, forestry, livestock, water resource) to support the integration of climate change adaptation into their policies and practices.**
- **Mainstreaming frameworks: Methodological approaches, such as the "Five Dimensions Framework of Mainstreaming CCA," to assess the degree of adaptation mainstreaming in different sectors and identify areas for improvement. The five dimensions on a continuum are: (a) Institutional arrangements, (b) Policies and regulations, (c) Range of topics of policies and programs, (d) Financial and human resources, and (e) Public awareness and participation.**

4. **Monitoring and Evaluation Tools:**
   - **M&E frameworks for adaptation: Guidance on developing indicators and systems for monitoring and evaluating the effectiveness of adaptation actions and mainstreaming efforts. The Adaptation M&E Toolbox provides an overview of relevant tools.**
   - **Performance measurement tools: Tools for tracking progress towards adaptation goals and assessing the outcomes of adaptation interventions.**
5. **Financial Tools:**
   - **Climate finance tracking: Mechanisms to monitor and report on climate-related expenditures in the local level specific budgets and development assistance (by sectors, as appropriate).**
   - **Financial risk assessment tools: Methods for assessing the financial risks associated with climate change and identifying strategies for managing these risks, such as insurance schemes and risk transfer mechanisms.**

Challenges of Mainstreaming Climate Change Adaptation Options

Effective engagement of key administrative and decision-making bodies at the local level is paramount for successful mainstreaming. While the concept of integrating climate resilience into development is widely accepted, putting it into practice faces significant hurdles. Even if local bodies are willing, a lack of clear mandates, guidelines, and resources can significantly impede progress. The major challenges for mainstreaming are as below:

1. **Challenges due to limited knowledge and technical capacity**
   - *Limited awareness and poor understanding of the nexus:* **There's often a general lack of awareness and understanding of climate change impacts, vulnerabilities and risks, and adaptation options among policymakers, planners, and even communities. This can lead to underestimation of the problem or difficulty in prioritizing adaptation. Local stakeholders (elected officials, local government staff, and community leaders) may not fully understand the complex interdependencies between climate change impacts and various aspects of local development (agriculture, water resources, infrastructure, health, livelihoods).**
   - ***Lack of localized climate data:*** **National climate models often lack the resolution needed for specific local planning. Local governments frequently lack access to, or capacity to interpret, downscaled climate projections and localized**

vulnerability assessments relevant to their specific context, and knowledge about appropriate adaptation options.

- ***Limited technical capacity:*** **Integrating climate considerations into planning processes requires specific technical skills that may be lacking at the local level. Similarly, some adaptation measures require specialized technical expertise for design, implementation, and maintenance, which may not be readily available at the local level.**
- *Uncertainty about future impacts:* **Climate change involves inherent uncertainties regarding the exact timing, intensity, and nature of future impacts (e.g., landslides, flooding, sedimentation, fire, etc.). This makes it difficult to design adaptation measures that are robust across a range of possible futures.**
- *Prioritization challenges and adaptation options:* **With numerous pressing development needs, local stakeholders may struggle to prioritize climate change adaptation without a clear understanding of its long-term implications.**
- *Integration vs. standalone projects:* **The balance between implementing standalone adaptation projects and truly integrating climate resilience into all development planning and activities remains a challenge, particularly under a watershed management approach as a watershed approach covers different local governments, but local government prefer to implement standalone adaptation projects within their administrative boundaries.**
- ***Maladaptation Risks:*** **Poorly planned or implemented adaptation actions can lead to "maladaptation," which increases vulnerability or creates new risks. This underscores the need for robust planning and rigorous assessment.**

2. **Challenges due to Institutional and Governance Barriers**

- ***Lack of clear mandates and guidelines:*** **Local governments lack clear mandates and operational guidelines (and technical knowledge) on how to integrate climate change adaptation into their planning processes, project cycles, and budgeting. Defining clear roles, responsibilities, and accountability mechanisms for climate change adaptation measures across different government tiers and stakeholders is important, without out it could lead to a lack of ownership or effective implementation.**
- *Conflicting mandates and sectoral silos:* **Traditional planning processes are often sectoral (e.g., agriculture, forestry, livestock, water, infrastructure, health), with limited coordination across departments or government agencies. Climate change is a cross-cutting issue, and integrating it requires breaking down these silos, which can be challenging due to established bureaucracies and competing priorities.**
- *Weak institutional capacity:* **Local governments and district-based government agencies often lack the human, technical, and financial resources to effectively mainstream climate change adaptation options and strategies. This includes a shortage of trained personnel, inadequate tools for analysis and planning, and weak monitoring and evaluation systems.**
- ***Inadequate capacity building support:*** **Policies have not adequately prioritized the capacity building support to the affected communities and local stakeholders. For effective mainstreaming, policies should prioritize and outline strategies for**

continuous capacity building of local stakeholders on climate change and adaptation planning.

- ***Lack of clear monitoring and evaluation frameworks:*** **There is a lack of clear frameworks for monitoring and evaluating the effectiveness of mainstreamed adaptation actions at the local level, which is essential for effective mainstreaming.**
- ***Linkages between national and local policies:*** **There is no clear linkages and coherence between national and local level climate change policies. Ensuring strong linkages and coherence between national climate change policies and local development plans is crucial for effective implementation of mainstreaming of adaptation options.**
- ***Lack of effective coordination collaboration:*** **There is a lack of effective coordination and collaboration among different sectors, authorities and networks to coordinate and collaborate for planning and implementing adaptation efforts at the grassroots level.**
- *Lack of strong political commitment and leadership:* **Without strong political commitment and leadership at all levels (national, provincial, and local), climate change adaptation can remain a less priority agenda item in the development planning at local level, overshadowed by more immediate development pressures (e.g., infrastructure development) or short-term political cycles.**

3. **Challenges due to Financial and Resource Constraints**

- *Insufficient funding:* **Climate change Adaptation actions often require significant financial investment. However, local governments usually lack dedicated funding for climate change adaptation or are inadequate. Local governments may have limited revenue-generating capacities and that are also committed to other prioritized and visible activities, such as physical infrastructure (road, building).**
- ***Lack of innovation funding and resource allocation mechanisms:*** **Climate change policies need to outline clear mechanisms for channeling financial and technical resources to local levels to support adaptation mainstreaming, which is usually lacking at the local level. Moreover, there is often a lack of innovative financial mechanism to mobilize private sector investment or leverage existing development finance for climate change adaptation.**
- ***Difficulty in quantifying benefits of adaptation:*** **Quantifying the benefits of adaptation (e.g., avoided losses, enhanced resilience) can be complex or challenging, making it difficult to justify investments against traditional development projects that offer more immediate and tangible returns.**
- *Dependence on external funding*: **Nepal relies heavily on international climate finance for many adaptation initiatives, which can be uncertain, project-based, and may not fully align with long-term local priorities. For example, the total budget to implement priority programs of Nepal National Adaptation Plan (NAP) is USD 47.4 billion until 2050, of which Nepal's contribution is expected to be USD 1.5 billion and external support totaling USD 45.9 billion[25].**

[25] MoFE, 2021. National Adaptation Plan (NAP) 2021 – 2050. Ministry of Forests and Environment, Kathmandu, Nepal

4. **Challenges due to Socio-cultural and Behavioral Practices**

- *Limited public participation in planning and decision-making process:* **While participatory approaches are emphasized, ensuring meaningful participation from all community segments, especially women and marginalized and vulnerable groups, in development planning and decision-making process is still a challenge. Such limited participation may result in inadequate recognition or integration of traditional knowledge, skills and local adaptation practices.**
- *Competing development priorities:* **In many developing contexts, pressing development needs such as poverty reduction, food security, and basic infrastructure often take precedence over long-term climate change adaptation, especially when resources are scarce.**
- **Perception of climate change as a distant threat: For some communities and decision makers (in government agencies and local government), climate change impacts might be perceived as a distant or abstract threat, leading to a lack of urgency or willingness to adopt new practices.**
- ***Social and cultural norms:*** **Existing social structures, cultural practices, and traditional livelihoods might conflict with or hinder the adoption of certain adaptation measures, challenging implementation of climate change adaptation practices. Recognition and integration of social and cultural norms while identifying and designing adaptation practices is therefore important.**
- ***Equity and justice concerns:*** **Adaptation interventions must be carefully designed to avoid exacerbating existing inequalities or creating new vulnerabilities. Failure to consider equity and justice concerns can create new and complex challenges.**

Moving Forward: Key Considerations on Mainstreaming Adaptation Options at Local Level

The following key considerations are suggested for moving forward on mainstreaming adaptation options at local level:

- **Targeted capacity building programs: It is necessary to develop and deliver tailored training programs for local elected officials, government staff, community leaders and community people/farmers (including women, IPs and other vulnerable groups) on climate change science, impacts, vulnerability assessment, adaptation planning, and mainstreaming techniques.**
- **Development of user-friendly tools and guidelines: Mainstreaming required translating complex climate information and adaptation strategies into accessible and practical tools and guidelines for local-level planning.**
- **Facilitating access to information: Effective mainstreaming requires establishing mechanisms for disseminating relevant climate data, vulnerability assessments, and best practices in adaptation to local stakeholders. Practical and tailored-interventions is very difficult without access to climate data.**
- **Strengthening vertical and horizontal coordination: It is crucial to foster better coordination between national and local government levels, as well as among different local governments and sectors.**
- **Dedicated technical support: It is important to have dedicated technical support staff at the provincial and local level to assist local governments and communities in integrating climate change into their development plans.**
- **Learning and knowledge sharing platforms: Sharing of experiences, knowledge and learning among government agencies and local governments within the watershed and across different sectors is very important for effective mainstreaming. It is required to create platforms for local stakeholders to share their experiences, learn from each other, and access relevant knowledge and resources, and respective local government or the Sub-watershed Coordination Committee can lead creating such sharing platforms.**
- **Integrating climate change into local planning frameworks: It is important to review and revise local planning frameworks at local level to explicitly include climate change considerations and adaptation priorities. Many of the affected communities are not aware of the local-planning process, do not have access to such process, or cannot put their voice even when they participate in such processes. Hence, local-level planning processes are not inclusive and participatory, which needs to be changed.**
- **Incentivizing climate-resilient development: Climate resilient development is the ultimate goal of mainstreaming climate change adaptation options. Hence local stakeholders need to explore mechanisms to incentivize local governments and communities to prioritize climate-resilient development projects.**

Session 3: Local Planning Process and Mainstreaming Climate Change Adaptation Options

Duration: 1 Hour 30 Minutes
Materials required: Projector, Market pen, Whiteboard, Newsprint
Venue: Training Hall
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

This session will focus on local level planning process for mainstreaming adaptation options. This session aims to enrich participants' knowledge and skills on the local level planning process, existing practices on how the CCA options are integrated in the local level planning, what are the challenges of integrating CCA actions in the planning process and how it can be improved. The session will also discuss on the role of local leadership in mainstreaming climate change adaptation at local level.

Objectives of the Session

By the end of this session, participants will be able to:

- **Understand how the local planning process can be made inclusive and mainstream climate change adaptation options at local level planning,**
- **Become familiar with the roles of different stakeholders in mainstreaming and implementing climate change adaptation options.**
- **Explain the existing challenges in mainstreaming adaptation options in local planning process at local level,**
- **Understand the role of leadership in mainstreaming climate change adaptations at the local level**

Session Delivery

- **The facilitator can start the session by asking the participants about their understanding on the local planning process and how it can be used as a tool for mainstreaming of inclusive climate change adaptation options at local level.**
- **The facilitator will then focus the discussion on local planning process as a tool for mainstreaming adaptation options. The facilitator will try to get information on understanding and experience of the participants on local level planning process, their participation and roles, and suggestion for mainstreaming climate change issues in the process. A small group exercise can also be facilitated to explore the information. This will identify the gaps in the existing practices of local planning process at local level.**
- **The facilitator will then present using PowerPoint Slides and lecture method how the local planning process can be used as a tool for mainstreaming climate change adaptation options, and what would be the role of community and stakeholders in the process.**
- **The facilitator will then discuss about different stakeholders and their roles in mainstreaming CCA at local level.**
- **A group work can be done to discuss on the existing challenges of mainstreaming CCA in local planning process.**
- **The facilitator will then discuss on the role of local leadership (leaders of rural/municipalities and district-based government agencies) in mainstreaming CCA at local level.**

- **Towards the end of the session, the facilitator can ask the participants the following questions to ensure participants' understanding on the subjects discussed in this session:**
    - **What is the local level planning process?**
    - **What are the key stakeholders and their roles in mainstreaming CCA at local level?**
    - **What are the challenges of mainstreaming CCA in local planning process?**
    - **What is the role of local leadership (rural/municipality and district-based government agencies) in mainstreaming CCA at local level?**
- **Finally, facilitator can conclude the session by summarizing the points discussed in this session and thanking the participants for their active participation and cooperation.**

RESOURCE MATERIALS

Local Level Planning to Mainstream Climate Change Adaption Options

The local government planning process in Nepal has evolved significantly, shifting from a top-down approach to a more decentralized and participatory model, particularly following the promulgation of the Constitution of Nepal (2015) and the Local Government Operation Act, 2017. This shift aims to empower local communities, mobilize resources, and enhance community welfare. The legal framework for local level planning in Nepal includes:

- **Constitution of Nepal (2015): It establishes the federal structure and grants significant powers to local governments.**
- **Local Government Operation Act, 2017: This is the primary legal instrument guiding local planning. It mandates a structured approach, including criteria for project prioritization, sectoral coverage, and a participatory planning process. It assigns multi-dimensional roles and responsibilities to local governments, including local taxation, health, education, local roads, agriculture, land registration, heritage conservation, and environmental management.**
- **Inter-governmental Fiscal Management Act, 2017): This Act addresses fiscal management and resource allocation among the three tiers of government.**
- **Guidelines for Local Level Plan Formulation (National Planning Commission, 2021) and Local Level Annual Plan and Budget Formation Guideline (MoFAGA, 2017): The Guidelines provide detailed procedures and frameworks for local planning.**
- **Environment-friendly Local Governance Framework, 2021: This Framework promotes sustainable and environmentally responsible decision-making at the local level.**

The 7-Step Planning Process at the Local Government Level

The local level planning process is designed to be participatory and bottom-up, starting from the grassroots level and moving upwards. The participatory planning process, known as the seven-step planning process for annual planning and budgeting is conducted before the start of the fiscal year in order to ensure that plans and budgets for the upcoming fiscal year are prepared during the current fiscal year. Section 5.1.3 of the Local Level Annual Plan and Budget Formation Guideline (MOFAGA, 2017) and Section 4.8 (1.2) of the Guideline for Local Level Plan Formulation (National Planning Commission, 2078) outline seven-step planning process in Figure 1 blow.

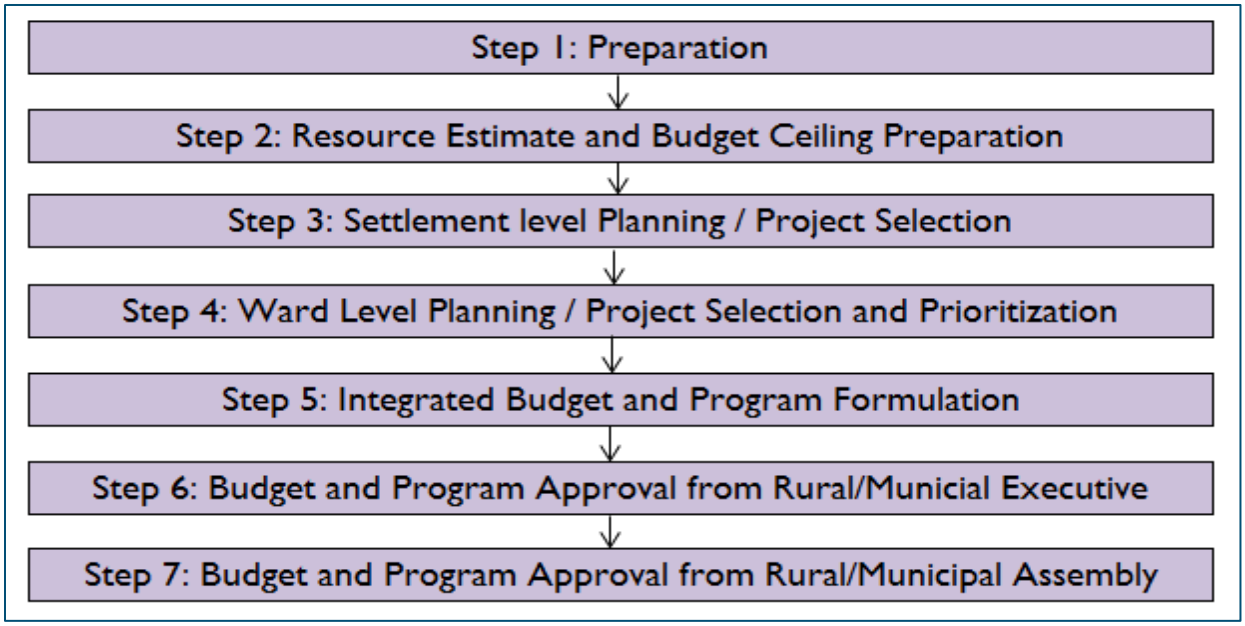


Figure 1: Seven-step local level planning process (NPC, 2021 and MoFAGA, 2017)

The guidelines (NPC, 2021 and MoFAGA, 2017) have outlined Forest, Environment, and Disaster Management as one of the five key thematic areas for local government annual plans. Moreover, climate change adaptation is one of the criteria for project prioritization for local level planning under 'addressing critical cross-cutting issues'. Hence, the climate change adaptation options can be integrated specially in Step 3 and Step 4 of the planning process. Step 3 (Settlement Level Planning) involves consultations at the smallest community units/settlements to identify their needs, problems and priorities to include in the local level annual plan. This is a crucial step for ensuring that the identified climate change adaptation options are incorporated. In Step 4: Ward level Planning/Project Section, the adaptation options/practices prioritized/proposed from the settlement level planning (Step 3) needs to be endorsed at the Ward level as a prioritized project for the Ward. Advocacy and lobbying is important here to mainstream the identified adaptation option into the local plan.

Local Adaptation Plans for Action (LAPA) Framework to integrate Adaptation Options into Planning Process

National Framework on Local Adaptation Plans for Action (LAPA, 2011) is a cornerstone for mainstreaming CCA at the local level. It provides a structured, bottom-up process for identifying, prioritizing, and implementing adaptation actions, ensuring local ownership and participation. It explicitly links local adaptation priorities with national development plans. It emphasizes a bottom-up, inclusive, responsive, and flexible approach. The key aspects of integrating climate change adaptation into local planning include:

- **Vulnerability and Capacity Assessment (VCA)**
- **Identification and prioritization of adaptation options (based on the VCA)**
- **Mainstreaming the identified adaptation options into the local government plans.**

The LAPA framework mandates active participation of local communities, women and marginalized and vulnerable groups in all stages of planning, from problem identification

to strategy formulation and monitoring. This ensures that adaptation actions are relevant, inclusive and owned by those most affected.

Challenges in Mainstreaming Adaptation Options in Local Planning Process

Despite the progressive legal framework, participatory intent and climate change adaptation as one of the prioritized criteria for project prioritization for local level planning, adaptation options are not adequately integrated in the local level planning. Several challenges persist as below:

- **Limited community participation: While the process aims for participation, participation of local communities and marginalized groups are still sidelined, and hence their views are usually not reflected in project selection. Usually powerful politicians or other elites influence the project selection process.**
- **Resource constraints and capacity gaps: Insufficient financial resources, lack of technical expertise among local officials, and inadequate implementation support hinder effective planning and execution, including effective consultations at the settlement/community levels.**
- **Lack of coordination: Poor inter-governmental agency and sectoral coordination and a fragmented governance structure have led to integrating all sectoral priorities in the plan, resulting in duplication of activities and inefficiencies.**
- **Data/information and knowledge gaps: There exists a big gap of data/information and knowledge among community people as well as local government representatives and officials on climate change and its impacts, identification of effective adaptation options to address climate change impacts and mainstream the adaptation options into the local plans.**

While the legal framework is in place to promote inclusive and effective local level development through local level planning process, addressing the existing challenges, particularly those related to genuine participation, capacity building on climate change, and integrating adaptation options in the local level annual plan, is crucial for mainstreaming the adaptation options in the local planning process and annual plan and budget.

This justifies the need for Training on Climate Change Impacts, climate vulnerability and risk assessment, identifying climate change adaptation options and mainstreaming and implementing the adaptation options incorporating them through the local level planning process.

Key Stakeholders and their Roles in Mainstreaming CCA at local level

Mainstreaming and implementing climate change adaptation options requires a multi-stakeholder approach, as no single entity can address the complexity and scale of the challenge alone. Each stakeholder brings unique strengths, perspectives, and resources to the adaptation efforts, and each group has specific roles that contribute to effectively integrating adaptation into local development planning and implementation.

1. Local Government (Rural Municipalities/Municipalities, Ward Offices)

In Nepal's federal structure, local governments are the cornerstone of localized adaptation. They have the following key roles in mainstreaming and implementing CCA actions.

- ***Lead adaptation planning:*** **They are responsible for leading the LAPA (Local Adaptation Plan for Action) process, which involves identifying local vulnerabilities, assessing risks, and prioritizing adaptation options in a participatory manner.**
- ***Integrate adaptation into local plans:*** **Crucially, local governments mainstream identified adaptation actions into their regular annual and periodic development plans and budgets. This ensures that adaptation is not an isolated project but an integral part of local governance and development.**
- ***Resource mobilization:*** **They allocate local government funds, access provincial and federal climate finance (often with a mandate to channel 80% of climate finance to the local level), and leverage community contributions for adaptation initiatives.**
- ***Coordination and facilitation:*** **Local governments coordinate the efforts of various actors (NGOs, community groups, line agencies) within their jurisdiction. They facilitate multi-stakeholder workshops, dialogues, and planning sessions.**
- ***Implementation and oversight:*** **They oversee the implementation of LAPA activities, ensure adherence to plans, and monitor progress. This includes building climate-resilient infrastructure (e.g., small-scale irrigation, flood protection), promoting climate-smart agriculture, and enhancing early warning systems.**
- ***Capacity building:*** **They organize and support capacity-building initiatives for ward members, local government staff, community leaders, and local residents on climate change impacts and adaptation measures.**
- ***Data and Information Management:*** **They collect local climate data, vulnerability information, and document adaptation experiences to inform future planning and share best practices.**

2. Local Communities

Local Communities are the primary beneficiaries and active participants in local adaptation, and include households, community groups, such as community forest user groups, mothers' group, farmers' group, youth clubs, etc. The role of local communities in CCA mainstreaming and implementation are as below:

- ***Sharing of knowledge:*** **They possess invaluable traditional and local knowledge about climate patterns, natural resources, and effective coping strategies. This knowledge is essential for identifying relevant and effective adaptation options.**
- ***Contribute to vulnerability assessment and CCA project prioritization:*** **Through participatory processes (like those in LAPA), community members can support the vulnerability assessment and climate change adaptation project prioritization process by identifying their specific climate risks, vulnerabilities, and the adaptation actions most relevant to their livelihoods, health, and well-being.**
- ***Actively participate in implementation:*** **Communities can actively participate in implementing adaptation activities, whether it's through labor contributions, resource sharing, or adopting new practices (e.g., planting drought-resistant**

crops, building check dams, managing community forests sustainably). Their active participation and ownership are critical for the long-term sustainability of adaptation interventions, as they are the ones who will maintain and benefit from these initiatives.

- ***Advocacy:*** **The communities can articulate their adaptation needs and priorities to local government and other support organizations, advocating for resources and appropriate interventions. In some cases, communities can develop innovative, context-specific adaptation solutions based on their lived experiences.**

3. Non-Governmental Organizations (NGOs)/Civil Society Organizations (CSOs)

The role of NGOs/CSOs is crucial in mainstreaming and implementing CCA projects, as they often act as facilitators and technical experts, and advocates for climate actions at local level.

- **NGOs/CSOs often facilitate LAPA planning process, mobilize communities, and ensure the participation of marginalized and vulnerable groups (women, Dalits, indigenous communities) in the climate change process.**
- **In general, the NGOs/CSOs provide technical expertise on climate vulnerability assessment, adaptation options, and resilient practices (e.g., climate-smart agriculture techniques, disaster risk reduction measures, water management). They also build the capacity of local government staff and community members on climate change related subjects.**
- **NGOs frequently pilot innovative adaptation technologies and approaches, demonstrating their effectiveness at the local level before wider replication.**
- **NGOs/CSOs advocate for the needs of vulnerable communities and monitor the implementation of adaptation plans, ensuring accountability from local governments and other stakeholders.**
- **Documentation and knowledge sharing: They document best practices, lessons learned, and case studies from local adaptation efforts, contributing to broader knowledge base.**

4. District-based Government Agencies

District-based government agencies have vital role in mainstreaming and implementing cliamte change adaption actions. These are the local government offices of sectoral ministries (e.g., agriculture, forestry, soil conservation, water, infrastructure, health) and provide technical support in their respective sectors. Their key roles in mainstreaming CCA include:

- **Providing technical expertise: These offices offer specialized technical knowledge relevant to their sector. For example, the agriculture office advises on climate-resilient crops and farming techniques; the forest office advises on sustainable forest management for watershed protection.**
- **Integration of adaptation into sectoral plans: The local government offices help integrate climate change considerations into their respective sectoral plans and programs at the local level. They need to work in coordination and collaboration with the local government for effective mainstreaming and implementing CCA.**
- **Service delivery: The district line agencies deliver adaptation-relevant services directly to communities (e.g., providing improved seeds, health campaigns for**

climate-induced diseases, training on water harvesting, training and tools for forest fire management).

- **Data and information: These offices also provide sector-specific data and information relevant for vulnerability assessments and adaptation planning.**

5. Private Sector

The private sector includes local businesses, cooperatives, input suppliers like agrovets, market actors, micro-finance institutions and other private entities working or interested in the field of climate change. Usually private sectors are less prominent; the local private sector has an emerging role in mainstreaming and implementing CCA at local level.

- **Local businesses can offer market-based solutions or climate-resilient products and services (e.g., drought-resistant seeds, water-efficient technologies, small-scale renewable energy solutions, weather-indexed insurance).**
- **Investment: Private sector can invest in local adaptation initiatives that also offer business opportunities for them, such as resilient infrastructure or climate-smart value chains.**
- **Employment and livelihoods: Private sectors can support climate-resilient livelihoods through local businesses that can enhance community adaptive capacity.**
- **Logistics and supply chains: Private sector, especially local businesses can play a role in developing resilient supply chains for adaptation-related goods and services.**

6. Academia and Research Institutions

Academic and research institutions also have vital role in mainstreaming and implementing CCA actions at local level through:

- **Localized research by conducting specific research on local climate impacts, vulnerabilities, and the effectiveness of various adaptation options in the local context.**
- **Generating scientific data that provide downscaled climate projections and scientific information relevant to local decision-making.**
- **Offering capacity building training and educational programs for local stakeholders on climate change adaptation.**
- **Monitoring and evaluation support for robust monitoring and evaluation of local adaptation interventions.**

Role of leadership in mainstreaming climate change adaptations at the local level

Leadership plays a pivotal role in effectively mainstreaming climate change adaptation at the local level. Given Nepal's diverse geography, high vulnerability to climate impacts, and decentralized governance structure established by the Constitution (2015) and the Local Government Operation Act, 2017), the success of planning and implementing of climate change adaptations at local level heavily depends on the commitment, vision,

and actions of local leaders. The local leaders may have the following roles in mainstreaming climate change adaptation options in different sectors at local level.

1. Setting Vision and Strategic Direction

- **Local leaders (e.g., Mayors/Chairpersons of Rural/Municipalities, Ward Chairpersons, Chief Administrative Officers) are the key personnel at the local government level in prioritizing climate change on the local development agenda. They can articulate a clear vision for a climate-resilient community and ensure that it's integrated into local periodic and annual plans.**
- **The local government leaders are also responsible for translating broad national climate policies (e.g., National Climate Change Policy, 2019; Nepal National Adaptation Plan, 2021-2050; and the Green, Resilient and Inclusive Development (GRID) approach, 2021) into context-specific actions and regulations that are relevant to their local communities. This includes identifying specific vulnerabilities and adaptation options for their unique local context, problems and specific needs.**
- **The leaders need to foster a long-term perspective on development, moving beyond short-term political gains to invest in resilient infrastructure and sustainable practices that benefit future generations.**

2. Resource Allocation and Mobilization

- **Leaders have the authority to allocate local government budgets. Their commitment is essential to ensure that sufficient funds are dedicated to climate adaptation initiatives, whether through direct investment in projects or by embedding climate change adaptations into existing sectoral budgets. The National Climate Change Policy (2011) stipulated that at least 80% of climate finance should be allocated to the local level, and leaders play a crucial role in realizing this.**
- **The leaders need to coordinate and collaborate with relevant agencies to attract external funding (from provincial/federal governments, I/NGOs, or international donors) by formulating necessary policy frameworks, demonstrating a clear local vision for adaptation and well-articulated, evidence-based project proposals.**
- **The leaders can also encourage and facilitate community contributions (labor, in-kind, or financial) to adaptation projects, fostering a sense of ownership and collective action.**

3. Improve Participation and Inclusivity in Planning and Decision-Making Process

- **It is the responsibility of the local leaders to ensure that the bottom-up, participatory planning process (e.g., local government planning process, LAPA) is sincerely inclusive and participatory. The leaders can actively promote the involvement of marginalized groups (women, Dalits, Indigenous Peoples, people with disabilities, youth, the elderly) in vulnerability assessments and adaptation planning sessions, and the local government annual planning and budgeting process.**
- **The leaders have the role of fostering an environment where all marginalized groups' voices, including voices of those traditionally excluded, are heard by ensuring those groups access to local level planning/decision-making platforms,**

creating safe spaces for putting their voices, and ensuring respectful dialogue during consultations.

- **Power imbalance is one of the key obstacles to marginalized groups' access to inclusive decision making process. It is the responsibility of a conscious leader to identify and address power imbalances within the community that might hinder the participation and benefit of marginalized and vulnerable groups, thereby truly mainstreaming GEDSI principles in adaptation efforts.**

4. Coordination and Collaboration

- **Local leaders must foster coordination between different local government departments (e.g., agriculture, forestry, water resource, livestock, disaster management, infrastructure) to ensure a holistic approach to climate change adaptation, breaking down traditional "silos" and promoting integrated planning approach and practices.**
- **It is the role of local leaders to promote multi-stakeholder partnership for climate actions. Participation and collaboration of multi-stakeholder partnerships is important for mainstreaming climate change adaptation measures among different sectors. They are instrumental in building partnerships with local civil society organizations, community-based organizations, academic institutions, the private sector, and traditional leaders to leverage diverse expertise, resources, and local knowledge for adaptation.**
- **Vertical integration is equally important for effective mainstreaming of adaption options at local level. So, an effective leader need to ensure a seamless communication and coordination with provincial and federal governments, advocating for local needs, sharing lessons learned, and aligning local plans with higher-level strategies and budgets.**

5. **Capacity Building and Awareness**

- **Leaders at local government need to invest in staff training. They can prioritize training for local government staff on climate change science, such as climate change impacts, vulnerability and risk assessment, adaptation planning tools, and GEDSI integration to enhance their technical capacity.**
- **The leaders can plan and conduct public awareness campaigns to educate citizens about local climate risks, adaptation options, and the importance of collective action, fostering a more informed and proactive community on climate actions.**
- **The local leaders have the role of recognizing and valuing indigenous and local knowledge and practices, and customary rights of Indigenous Peoples for mainstreaming climate change adaptation, and integrating these indigenous knowledge and practices into the time-tested, context-specific adaptation approaches.**

6. Implementation and Monitoring

- **Leaders have the role of overseeing the effective implementation of adaptation projects, ensuring that they are as per the local context and needs, completed on time, within budget, and achieve their intended outcomes for building local resilience.**

- **Local government leaders must establish clear monitoring and evaluation mechanisms, and ensure transparency in resource use and project progress, builds public trust and ensures accountability for climate finance and actions.**
- **Adaptive management is another important aspect of climate change adaptation implementation. Local leaders must be willing to learn from successes and failures, adapting plans and strategies based on monitoring results and changing climate realities, demonstrating flexibility and continuous improvement.**

Challenges or Limitations of Local Leaders

Although the local leaders have vital role in mainstreaming climate change adaptation at local level, they have several limitations or face several challenges as below:

- **Limited technical capacity: Many elected local leaders may lack in-depth technical knowledge about climate science or complex adaptation measures, requiring external support and capacity building.**
- **Pressure for quick wins: Political cycles often incentivize short-term, visible infrastructure projects over long-term, less visible adaptation measures that may have a slower payoff but are crucial for sustained resilience.**
- **Resource constraints: Local governments often operate with limited financial and human resources, making it difficult to implement ambitious climate plans without significant external support.**
- **Conflicting priorities: Balancing climate adaptation with other pressing development needs (e.g., poverty reduction, basic services, and immediate disaster response) can be challenging, especially in resource-scarce environments.**
- **Lack of consistent support from federal/province government: While policies exist, the practical support, coherent guidelines, consistent financial mechanisms, and technical backstopping from federal and provincial levels might still be insufficient or fragmented.**
- **Data gaps: Absence of localized climate data and robust vulnerability assessments can hinder evidence-based decision-making for adaptation.**
- **Governance gaps: Issues like political instability, inequality, power struggles can undermine the effective planning and implementation of climate adaptation initiatives.**

In conclusion

Local leadership drives the mainstreaming of climate change adaptation. Their vision, commitment, and ability to mobilize resources, foster participation, and coordinate efforts are indispensable for building resilient communities in the face of a changing climate. Hence, investing in and empowering local government leaders to effectively understand, plan and implement climate adaptation actions is a strategic need for enhancing climate resilience at local level.

Session 4: Mainstreaming GEDSI in Climate Change Adaptation Efforts

Duration: 1 Hour 30 Minutes
Materials required: Projector, Market pen, Whiteboard, Newsprint
Venue: Training Hall
Training method: Presentation, Lecture, Question-Answer, Brainstorming, Discussion

Background

This session will focus on importance and approaches for mainstreaming GEDSI in climate change adaptation efforts. This session aims to enrich participants' knowledge and skills on what is the meaning of GEDSI mainstreaming in CCA, why it is important, what are the approaches and what are the existing challenges for mainstreaming GEDSI in CCA at local level.

Objectives of the Session

By the end of this session, participants will be able to:

- **Understand the meaning and importance of GEDSI mainstreaming in CCA,**
- **Describe the approaches for mainstreaming GEDSI in CCA,**
- **Explain the challenges or requirements of GEDSI mainstreaming.**

Session Delivery

- **The facilitator can start the session asking the participants what they understand by mainstreaming GEDSI in climate change adaptation and why it is important. The key responses from the participants can be noted down in a whiteboard or newsprint for discussion.**
- **The facilitator will then summarize the responses from the participants and make the concept and importance clear by giving lecture using PowerPoint Slides. The resource materials provided here can be used to prepare the PowerPoint Slides for presentation.**
- **Once the participants are clear about the concept and importance of GEDSI mainstreaming, the facilitator can discuss on approaches for GEDSI mainstreaming in CCA efforts, and explain them to the participants.**
- **The facilitator can then ask the participants what are the challenges they see in GEDSI mainstreaming at local level, discuss this using the PowerPoint Slides, which can be prepared from the Resource Materials provided below.**
- **Towards the end of the session, the facilitator can ask the participants the following questions to ensure participants' understanding on the subjects discussed in this session:**
    - **Why mainstreaming GEDSI in CCA efforts is important?**
    - **What are the key approaches for mainstreaming GEDSI in CCA efforts at local level?**
    - **What is required to address the challenges of mainstreaming GEDSI in CCA?**
    - **What would be your role for mainstreaming GEDSI mainstreaming in CCA?**
- **Finally, facilitator can conclude the session by summarizing the key points discussed in this session and thanking the participants for their active participation and cooperation.**

RESOURCE MATERIALS

Mainstreaming GEDSI in Climate Change Adaptation Efforts

Mainstreaming Gender Equality, Disability, and Social Inclusion (GEDSI) in climate change adaptation efforts is a critical approach that recognizes the differential impacts of climate change on various social groups and seeks to ensure that adaptation initiatives are inclusive, equitable, effective, and sustainable. It moves beyond a one-size-fits-all approach to acknowledge that vulnerability to climate change and the capacity to adapt are shaped by intersecting factors such as gender, age, disability, caste, ethnicity, geographic location, and socio-economic status.

What is Mainstreaming GEDSI in Climate Change Adaptation?

Mainstreaming GEDSI in climate change adaptation means systematically integrating the perspectives, needs, and capacities of diverse groups – women, men, youth, the elderly, people with disabilities, Indigenous Peoples, ethnic minorities, Dalits, and other marginalized communities – into all stages of climate change adaptation planning, implementation, monitoring, and evaluation. It's not about creating separate projects for each group, but rather ensuring that all climate actions consider and address the specific vulnerabilities and strengths of these groups, and promote their equitable participation and benefit-sharing.

Key Principles and Approaches for Mainstreaming GEDSI in CCA:

1. Understanding differentiated vulnerabilities

Climate change impacts are not uniform; it has differentiated impacts on different social groups and in different sectors. Therefore, it is important to understand the differentiated impact of climate change on different social groups for effective mainstreaming. For example:

- **Women often bear a disproportionate burden due to traditional roles (e.g., fetching water and fuel, food production), limited access to resources (land, finance, information), and lower participation in decision-making.**
- **Persons with disabilities: Face heightened risks during disasters due to accessibility barriers, limited mobility, and lack of inclusive early warning systems.**
- **Indigenous Peoples and ethnic minorities' livelihoods are often deeply intertwined with natural resources, making them highly vulnerable to ecosystem changes. They may also face discrimination and have limited voice in mainstream planning.**
- **Children and youth are particularly vulnerable to climate-induced health impacts, disrupted education, and future livelihood challenges. Youth can also be powerful agents of change.**
- **Elderly may have reduced mobility, health issues, and limited access to information, making them more susceptible to climate hazards.**
- **Lower castes/Dalits and other socially excluded groups often reside in more hazardous areas, have insecure livelihoods, and face systemic discrimination that limits their adaptive capacity.**

2. Meaningful Participation and Empowerment

Meaningful participation and empowerment of women, persons with disabilities and other marginalized groups is another approach for effective mainstreaming of GEDSI in climate change adaptation at local level. This can be achieved through:

- **Ensuring that voices from all diverse groups are heard and genuinely considered in climate vulnerability and risk assessments, planning, and decision-making processes. This requires inclusive consultations using accessible language, diverse meeting times/locations, and targeted outreach.**
- **Building the capacity of the marginalized groups providing targeted training and support to enhance their understanding of climate change, adaptation options, and leadership skills, and enabling them to actively participate in CCA.**
- **Promoting leadership and representation of women, persons with disabilities, Indigenous Peoples, and other marginalized groups in climate governance structures, committees, and decision-making bodies at all levels.**

3. Equitable Access to Resources and Benefit-Sharing

Planning, designing and implementation of CCA actions need to ensure that women, persons with disabilities, Indigenous Peoples, and other marginalized groups have equitable access to resources and benefit sharing at all levels. This can be achieved through:

- **Targeted interventions or designing adaptation solutions that specifically address the needs and constraints of different groups, such as gender-sensitive climate-smart agriculture technologies, accessible early warning systems for people with disabilities, or livelihood diversification options for marginalized youth.**
- **Equitable allocation of available resource ensuring that climate finance and other resources are allocated in a way that benefits the marginalized and vulnerable groups and addresses existing inequalities. This may involve specific budget lines or quotas.**
- **Ensuring secure tenure and rights by addressing issues of insecure land tenure or lack of access to natural resources that disproportionately affect marginalized communities, as these underpin their adaptive capacity.**

4. Disaggregated Data and Analysis:

Mainstreaming GEDSI in CCA is effective if disaggregated data in terms of sex, age, disability, caste/ethnicity are available. Collecting and analyzing data that breaks down information by these categories is essential to understand differential impacts, identify specific needs, and track whether adaptation efforts are reaching all groups. Similarly, conducting specific GEDSI analyses at the outset of any climate change project or policy to understand power dynamics, roles, responsibilities, and access to resources for different groups is necessary for inclusive planning and decision-making processes.

5. Transformative Approaches

Beyond simply addressing vulnerabilities, GEDSI mainstreaming aims for gender-transformative and socially inclusive outcomes. This means GEDSI mainstreaming challenges underlying social norms, power imbalances, and discriminatory practices that perpetuate vulnerability. For example, adaptation projects could promote women's

leadership in water management, challenge gendered divisions of labor, or ensure accessible infrastructure for people with disabilities.

Why is Mainstreaming GEDSI Important?

1. ***Equity and Social Justice:*** **Climate change disproportionately affects those who are already marginalized and vulnerable. Mainstreaming GEDSI ensures that adaptation efforts contribute to reducing existing inequalities rather than exacerbating them, promoting social justice.**
2. ***Effectiveness and sustainability:*** **Inclusive adaptation efforts are more effective and sustainable, and they reflect the diverse realities, knowledge, and priorities of all community members. Ignoring the needs of certain groups can lead to maladaptation or undermine the long-term success of interventions.**
3. ***Utilizing diverse knowledge and capacities:*** **Women, Indigenous Peoples, and local communities possess invaluable traditional and local knowledge about their environment, coping strategies, and sustainable practices. Mainstreaming GEDSI allows for the integration of this knowledge, leading to more locally appropriate and innovative solutions.**
4. ***Meeting international commitments:*** **Global climate agreements (e.g., Paris Agreement) and sustainable development goals (SDGs) emphasize gender equality, social inclusion, and human rights. Mainstreaming GEDSI helps Nepal meet these international commitments.**
5. ***Enhanced resilience:*** **By empowering all segments of society and building their adaptive capacity, it contributes to strengthen overall community and national resilience to climate change impacts.**

Challenges in Mainstreaming GEDSI in CCA at local level

Nepal has strong policy commitments to GEDSI and climate change adaptation. For example, the policies like the National Climate Change Policy, 2019 and the LAPA Framework, 2019 have recognized the importance of gender and social inclusion as cross-cutting issues for climate actions. Despite these policy frameworks, there are challenges in translating these commitments into effective action on the ground. Mainstreaming GEDSI in CCA at local level thus requires:

- **Strengthening local capacities by providing training for local government officials, community leaders, and civil society organizations on GEDSI-responsive planning, budgeting and implementation; and importance and approaches of GEDSI mainstreaming in CCA at local level.**
- **Systematically collecting GEDSI-disaggregated data (sex, age, disability, and caste/ethnicity) and utilizing the data in climate vulnerability assessments, planning of adaptation actions and monitoring.**
- **Targeted outreach and participation of women and marginalized groups to ensure their meaningful participation in local planning processes.**
- **Allocation of adequate financial resources specifically for GEDSI-responsive climate actions.**
- **Establishment of accountability mechanisms to ensure that GEDSI commitments are upheld in every policy formulation and decision making processes at local level.**

- **Promotion of transformative change with moving beyond simple representation to actively challenge discriminatory norms and power structures within climate adaptation initiatives.**