

# EMPOWERING GRASSROOT CHAMPIONS ON CLIMATE CHANGE ADAPTATION



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## Table of Contents

|   |    |
|---|----|
| GENERAL INTRODUCTION .....                                | 5  |
| TRAINING GOAL .....                                       | 5  |
| OBJECTIVES OF THE TRAINING .....                          | 5  |
| TRAINING OUTCOMES.....                                    | 6  |
| EXPECTED OUTPUTS OF THE TRAINING.....                     | 6  |
| BRIEF DESCRIPTION OF THE MODULES .....                    | 7  |
| MODULE ONE (1): FUNDAMENTALS OF CLIMATE CHANGE .....      | 8  |
| Objectives of the module .....                            | 8  |
| Delivery approach .....                                   | 8  |
| 1.1 Introduction and Definition of key concepts.....      | 8  |
| 1.2 Factors that Influence the Earth Climate .....        | 9  |
| 1.3 Causes of Climate Change .....                        | 11 |
| 1.4 Evidence of Changes in Earth's Climate .....          | 12 |
| MODULE TWO (2): THE IMPACTS OF CLIMATE CHANGE.....        | 15 |
| Module Objective.....                                     | 15 |
| Delivery approach .....                                   | 15 |
| 2.1 Introduction.....                                     | 15 |
| 2.2 Social Impacts of Climate Change .....                | 15 |
| 2.3 Economic Impacts of Climate Change .....              | 17 |
| 2.4 Environmental Impacts of Climate Change .....         | 18 |
| MODULE THREE (3): RESPONSE MECHANISMS TO CLIMATE CHANGE   | 20 |
| Module Objectives .....                                   | 20 |
| Delivery Approach .....                                   | 20 |
| 3.1 Climate Change Adaptation.....                        | 21 |
| 3.1.2 Adaptation Strategies .....                         | 23 |
| 3.1.3 Community-Based and Locally-led Adaptation.....     | 25 |
| 3.1.4 Locally-Led Adaptation (LLA) .....                  | 26 |
| 3.1.5 Nature Based Solutions for Climate Adaptation ..... | 26 |
| 3.1.6 Priority Sector Adaptation Actions .....            | 27 |
| 3.1.7 Challenges in Climate Change Adaptation .....       | 27 |
| 3.2 Climate Change Mitigation .....                       | 27 |
| 3.2.1 Strategies for Mitigation.....                      | 27 |
| MODULE FOUR (4): POLICY CONTEXT OF ADAPTATION .....       | 29 |
| Module Objectives .....                                   | 29 |
| Delivery Approaches .....                                 | 29 |
| 4.0 Introduction.....                                     | 29 |

|   |    |
|---|----|
| 4.1 Climate Policies .....  | 29 |
| 4.1.1 Global Policies.....  | 29 |
| 4.1.2 Regional Policies .....   | 30 |
| 4.1.3 National Policies .....   | 30 |
| 4.1.4 County Policies.....  | 31 |
| MODULE FIVE (5): PRIORITY SECTORS AND INDICATORS .....                | 32 |
| Module Objectives .....   | 32 |
| Delivery Approach .....   | 32 |
| 5.0 Key Priority Sectors .....  | 32 |
| 5.1 Indicators .....  | 32 |
| 5.1.1 Essential characteristics of adaptation indicators.....         | 33 |
| 5.2 Types of Indicators I .....                                       | 33 |
| 5.2.1 Gender-sensitive indicators .....                               | 33 |
| 5.3 Types of Indicators II .....                                      | 34 |
| 5.3 Considerations when choosing indicators .....                     | 36 |
| MODULE SIX (6): CLIMATE FINANCE .....                                 | 37 |
| Learning Objectives.....  | 37 |
| Delivery approach .....   | 37 |
| 6.0 Key concepts in climate finance .....                             | 37 |
| 6.1 History of climate finance .....                                  | 37 |
| 6.2 Sources of Climate Finance .....                                  | 38 |
| 6.3 Types of Climate Finance .....                                    | 38 |
| 6.4 Climate Finance Mechanisms .....                                  | 39 |
| 6.4.1 Types of Climate Finance Mechanisms.....                        | 39 |
| 6.4.2 Importance of Climate Finance Mechanisms .....                  | 40 |
| 6.4.3 Challenges in climate finance.....                              | 40 |
| 6.4.4 Funding Sources at the Local Level .....                        | 40 |
| MODULE SEVEN (7): GENDER AND SOCIAL INCLUSION IN CLIMATE CHANGE ..... | 41 |
| Module Objective.....   | 41 |
| Delivery approach .....   | 41 |
| 7.0 Gender Concepts .....   | 41 |
| 7.1 Justification for gender considerations in climate action .....   | 42 |
| 7.2 Differentiated climate change impacts on men and women .....      | 43 |
| 7.3 Gender in Climate Action.....                                     | 44 |
| 7.4 Strategies for Gender-Sensitive Climate Action .....              | 44 |
| 7.5 Social Inclusion in Climate Change .....                          | 45 |

|   |    |
|---|----|
| 7.5.1 Socially excluded groups.....                               | 45 |
| 7.5.2 The Importance of Social Inclusion in Climate Action.....   | 46 |
| 7.5.3 Inclusion and Climate Impact .....                          | 47 |
| 7.6 Gender Audits in Climate Change .....                         | 47 |
| 7.6.1 Conducting a Gender Audit .....                             | 48 |
| 7.6.2 Key Areas for Gender Audit in Climate Change .....          | 48 |
| MODULE EIGHT (8): TECHNOLOGY AND INNOVATION IN CLIMATE ACTION     |    |
| .....   | 49 |
| Objectives.....   | 49 |
| 8.0 Introduction.....   | 49 |
| 8.1 Context in Africa .....                                       | 49 |
| 8.2 Key concepts .....  | 49 |
| 8.3 Technological Tools and Innovations in Africa .....           | 50 |
| 8.4 Examples from Africa .....                                    | 51 |
| 8.5 Role of Technology & Innovation in Climate Action .....       | 51 |
| 8.6 Examples of Technological Solutions .....                     | 52 |
| 8.7 Practical Project Proposal for the Grassroots Community ..... | 52 |
| 8.8 Challenges and Opportunities .....                            | 54 |



## **GENERAL INTRODUCTION**

Climate Change is one of the most pressing global challenges of our time, characterized by long-term shifts in temperature, precipitation patterns, and more frequent and severe weather events. These changes, largely driven by human activities, have led to increased concentrations of greenhouse gases in the atmosphere. Climate change impacts exhibit themselves through direct impacts on daily life, livelihoods, and local economies. For example, unpredictable rainfall can devastate crops, leading to food shortages and economic strain for farmers. Similarly, severe storms can damage homes and infrastructure, necessitating costly repairs and displacing families. These effects are more pronounced at the local level. Addressing these complex issues requires informed and proactive measures, particularly through locally-led adaptation. Empowering communities to develop and implement their climate solutions ensures that interventions are tailored to specific needs and conditions. These adaptations might include traditional knowledge, innovative farming practices, or community-driven water management systems.

Climate change education and training play a crucial role in equipping individuals and communities with the knowledge and skills needed to respond effectively to the impacts of climate change. By fostering a deeper understanding of climate science, mitigation strategies, and adaptation techniques this training can empower participants to take meaningful action.

The manual aims to enhance the knowledge and skills of local communities, including community leaders, resource users, and other stakeholders, on the concepts and impacts of climate change. It provides a comprehensive understanding of climate change adaptation strategies and the importance of sustainable natural resource management in the context of a changing climate. After the training of the participants, it is anticipated that their participation in the implementation of the LAMA project activities will be enhanced.

## **TRAINING GOAL**

To equip participants with the skills, knowledge, and experiences to raise awareness about climate change, especially its threats to food security, and advocate for preventive measures and recovery from severe weather effects.

## **OBJECTIVES OF THE TRAINING**

- 1) Increase Awareness: Enhance understanding of climate change science, its causes, impacts, and adaptation and mitigation strategies needed to curb it.
- 2) Build Capacity: Develop skills to create and implement effective climate action plans that can be used during practical studies.

- 3) To identify metrics that capture the aspirations of vulnerable communities including various gender groups and how these aspirations can be enabled in adaptation interventions.
- 4) To train trainees on adequate data collection and analysis methods and techniques.
- 5) Foster Collaboration: Engage diverse participants in collective efforts to mitigate and adapt to climate change locally and globally.
- 6) Promote Sustainable Practices: Encourage the adoption of environmentally sustainable behaviors and technologies.
- 7) To come up with practical projects on climate change adaptation.

## **TRAINING OUTCOMES**

1. Enhanced understanding of climate change science, its causes, impacts, and adaptation and mitigation strategies needed to curb it.
2. Capacity of the participants on how to create and implement effective climate action plans that can be used during practical studies built
3. Metrics to capture the aspirations of vulnerable communities and enable these aspirations in adaptation interventions identified.
4. Participants trained on adequate data collection and analysis methods and techniques.
5. Collaboration fostered on how to engage diverse participants in collective efforts to mitigate and adapt to climate change locally and globally.
6. Promote Sustainable Practices on the adoption of environmentally sustainable behaviors and technologies promoted.

## **EXPECTED OUTPUTS OF THE TRAINING**

1. The training program will enhance the understanding of grassroots champions on the causes, impacts, and local manifestations of climate change.
2. Participants will gain a deeper knowledge of climate change adaptation strategies and their relevance to community-level natural resource management and livelihood resilience.
3. The training will equip grassroots champions with practical skills and techniques to plan, implement, and monitor climate change adaptation interventions within their communities.
4. The training program will foster the creation of a network of grassroots champions, facilitating the exchange of experiences, best practices, and lessons learned on climate change adaptation.
5. The champions will be equipped with the skills to document and disseminate their learnings, enabling the scaling up and replication of successful approaches within and beyond their communities.
6. The training program will equip the trainees with necessary knowledge to come up with a practical project to address climate change within their communities.

## BRIEF DESCRIPTION OF THE MODULES

**Module 1: Fundamentals of climate change:** This module begins with key definitions, Weather, climate, climate change, adaptation, mitigation; greenhouse gas (GHG) effect; causes of climate change; history of climate change; trends of climate change

**Module 2: Impacts of climate change-** The module seeks to highlight the impacts of climate change on key areas that are indispensable to human existence; the social, economic, and environmental areas. By understanding the impacts of climate change, the participants will be well versed with knowledge on mitigation, and adaptation strategies on how to control and mitigate climate change impacts to the different sectors.

**Module 3: Response mechanisms to Climate Change-** This module explores the dual strategies of climate change adaptation and mitigation. It provides participants with a comprehensive understanding of these approaches including the actions and policies involved in reducing greenhouse gasses emissions and adjusting to the changes underway.

**Module 4: Policy context of Adaptation-**global policy agenda; how it informs the national, sub-national, and local policy agenda

**Module 5: Priority sectors and indicators;** introduction; National Adaptation Plan (NAP), Priority sectors in the NAP, key indicators

**Module 6: Climate finance:** This module delves into the history of climate finance, key concepts, sources, and types of climate finance. It gives an overview of various types of climate finance mechanisms, the importance of climate mechanisms, and challenges in climate finance.

**Module 7: Gender and Social Inclusion in Climate Change:** This module presents the gendered differences in climate change. It aims to equip the learners with knowledge of the different gender concepts, the role of gender considerations in climate action, and the importance of incorporating a gender lens into climate policies. The module gives an overview of policy frameworks that incorporate a gender lens and an overview of understanding social inclusion in climate change.

**Module 8: Technology and innovation in climate actions:** This module presents how technological tools and innovative approaches can enhance climate adaptation efforts, raise awareness, and provide practical solutions for grassroots champions. It aims to equip grassroots champions with the knowledge and tools needed to harness technology and innovation for climate adaptation, ultimately fostering resilient and sustainable communities across Africa. By leveraging technology and innovation, grassroots champions can significantly enhance climate adaptation efforts. This module provides a foundation for understanding and utilizing technological solutions, including coding for app development, to build resilient communities.

# MODULE ONE (1): FUNDAMENTALS OF CLIMATE CHANGE

## Objectives of the module

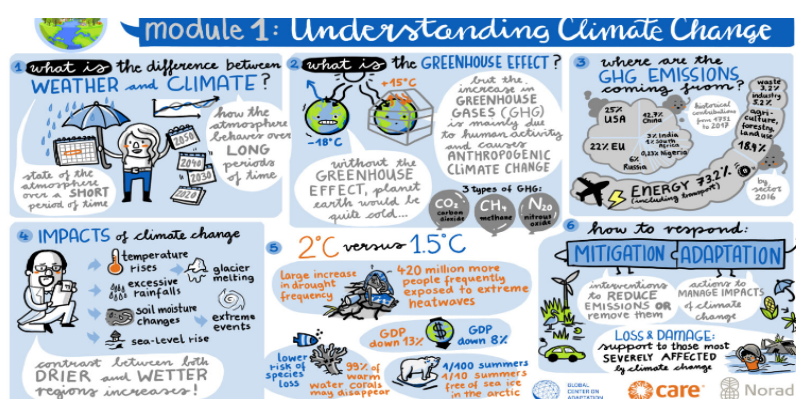
This module introduces participants to the key definitions of climate change and provides information on the causes, history, and trends of climate change. By the end of the module, the participants should be able to:

1. Gain an understanding of the key concepts used in the science of climate change
2. Explain the causes of climate change, giving examples of observable features that demonstrate that climate change is real.
3. Describe the history and trends of past climate change

## Delivery approach

1. Theory lessons delivered through- Classroom case studies, exercises, and group and plenary discussions will used to enhance learning;
2. Field visits on farmer activities that help to mitigate the effects of climate change;
3. Video clips on various aspects of climate change effects and mitigation measures.

## 1.1 Introduction and Definition of key concepts



**Weather:** is the atmospheric conditions experienced over short periods of time (such as hours or days) at a particular location.

**Climate:** how the atmosphere “behaves” over longer periods of time (an average of the past 30 years), which in turn affects how the rest of the climate system behaves.

**Climate change** refers to the long-term changes in the Earth’s climate. It causes weather patterns to be less predictable, affecting the balance of Earth’s precious ecosystems. These changes persist for long periods of time, typically decades or more. “A statistically significant variation in either the mean state of the climate or change in

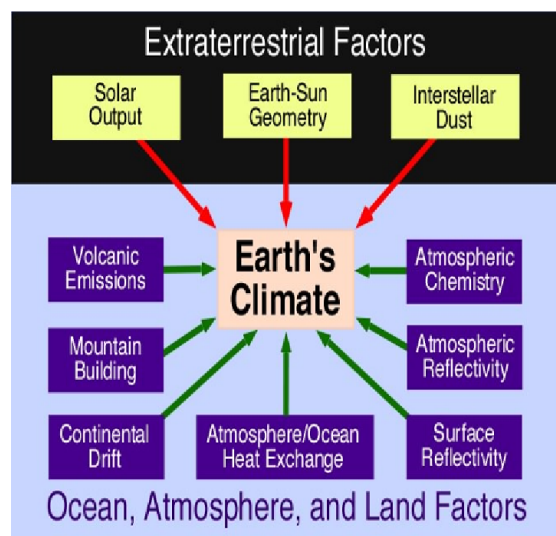
precipitation, temperature and wind, persisting typically decades or longer” - **Intergovernmental Panel on Climate Change (IPCC)**

**Global warming:** refers to a specific kind of climate change in which Earth’s average temperature is increasing.

## 1.2 Factors that Influence the Earth Climate

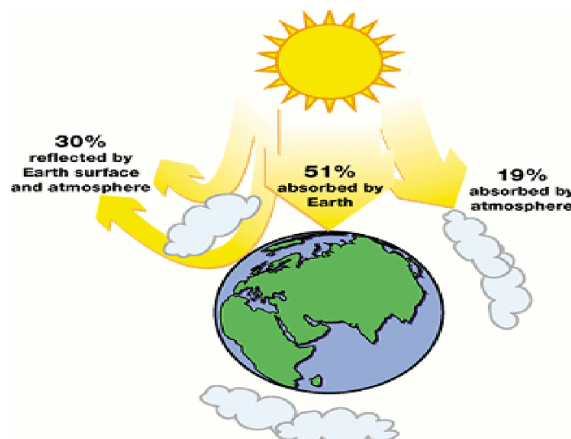
-A variation in the Sun’s output may externally vary the amount of solar radiation received by the Earth’s atmosphere and surface

-Changes in the concentrations of atmospheric gasses, mountain building, volcanic activity, and changes in surface albedo may cause an internal variation in the Earth’s climate



## Greenhouse Gas Effect

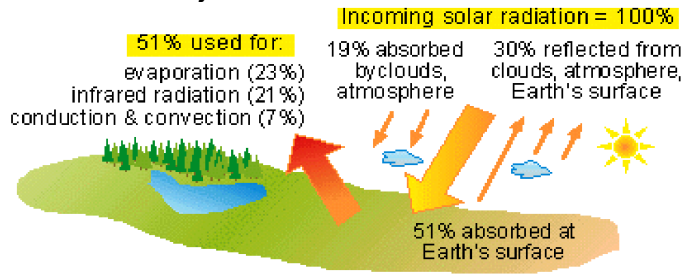
How much solar radiation reaches the earth surface? The Earth’s surface only absorbs **51% of incoming solar radiation**



Energy is transferred from the Earth’s surface by radiation, conduction, convection, radiation, evaporation, and water condensation. The Sun’s heat and Earth’s energy



transfer is a major cause of **weather**.



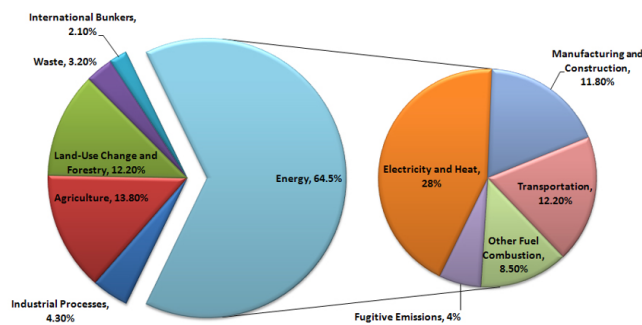
**Greenhouse Gases (GHG):** These are gases in the atmosphere that absorb radiation. The most significant greenhouse gases are:

1. Water vapor (H<sub>2</sub>O)
2. Carbon dioxide (CO<sub>2</sub>)
3. Methane (CH<sub>4</sub>) and
4. Nitrous oxide (N<sub>2</sub>O),

These GHGs **allow** the Sun's energy to enter the atmosphere but **prevent it from leaving**, by trapping it close to the Earth's surface.

Carbon dioxide has a significant impact on global warming partly because of its abundance in the atmosphere. Additionally, CO<sub>2</sub> stays in the atmosphere for thousands of years.

### Global contribution of GHG by sector

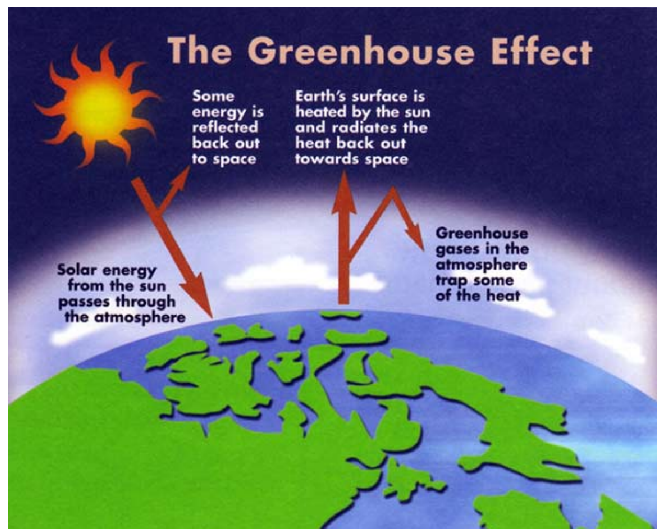


Source: Climate Analysis Indicators Tool, World Resources Institute

### Sources of Greenhouse gasses

Begin by asking the participants in groups to indicate the sources of GhG

- a. **Carbon Dioxide:** burning fossil fuels like coal, natural gas and oil, emissions from vehicles and industries, deforestation, natural sources, decomposition of vegetation, during wildfires, from the oceans etc.
- b. **Methane:** Human activities, such as agriculture- manure management, rice cultivation, cattle, burning oil, gas, and coal for energy, increased production of waste from homes and businesses, natural sources, such as wetlands.
- c. **Nitrous oxide:** agriculture, fossil fuel combustion in the transport sector



### 1.3 Causes of Climate Change

Climate change is primarily driven by a combination of human activities and natural processes. Understanding these causes is crucial for addressing the ongoing climate crisis. Below, we will explore both human-induced and natural factors contributing to climate change;

1. Changes in the atmosphere natural processes e.g. volcanoes, Tectonic plate movement, changes in the sun, shifts in Earth's orbit.
2. Human activities – any activity that releases “greenhouse gasses” into the atmosphere, land use changes-deforestation, industrial activities.

#### Natural Causes of Climate Change

*Changes in solar radiation* - Variations in solar output can influence Earth's climate; however, studies show that changes in solar radiation have had minimal impact on recent warming trends.

*Volcanic activity* - volcanic eruptions can inject large quantities of ash and sulfur dioxide into the atmosphere, which can temporarily cool the planet by reflecting sunlight away from Earth. However, this effect is short-lived compared to long-term greenhouse gas emissions.

*Natural Carbon-cycle variability* - over geological time scales, natural processes such as ocean circulation patterns and changes in vegetation can affect atmospheric CO<sub>2</sub> levels; however, these do not explain the rapid warming observed since the mid-20th century.

#### Human Causes of Climate Change

*Deforestation* - Cutting down forests for agriculture or urban development releases stored carbon into the atmosphere and reduces the number of trees available to absorb CO<sub>2</sub>. Approximately 12 million hectares of forest are destroyed each year, contributing to about a quarter of global greenhouse gas emissions.

*Greenhouse Gas Emissions* - the burning of fossil fuels for energy production is the largest contributor to green gas emissions accounting for over 75% of global emissions.

*Agriculture* - agricultural practices contribute significantly to climate change through deforestation, methane emissions from livestock digestion, and nitrous oxide emissions from fertilizers. The food production system is responsible for a substantial

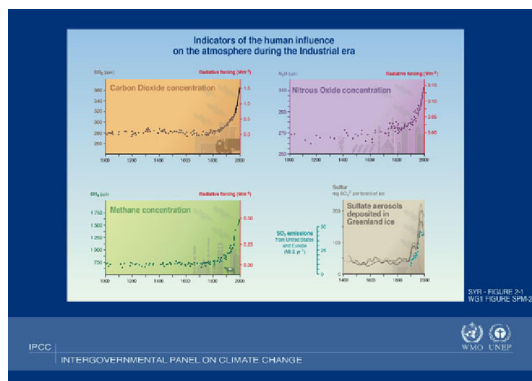
portion of global emissions.

*Transportation* - The transport sector is a major source of greenhouse gas emissions, particularly from vehicles powered by petroleum-based fuels. Road vehicles account for nearly one-quarter of global energy-related carbon dioxide emissions.

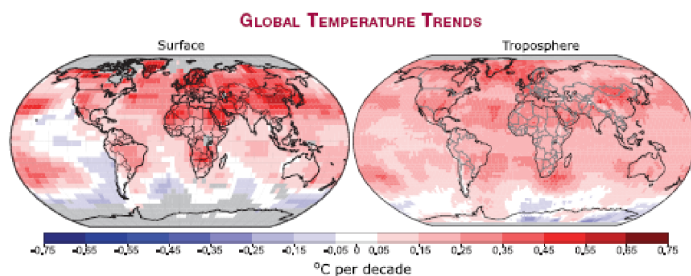
*Industrial processes* - manufacturing goods involve burning fossil fuels for energy and releasing greenhouse gases during production processes. Industries such as cement, steel, and plastics are significant contributors to overall emissions.

## 1.4 Evidence of Changes in Earth's Climate

1. The atmospheric concentration of CO<sub>2</sub>: was 280 ppm for the period 1000 – 1750 but changed to 379 ppm in the year 2000 (368 ppm reported in IPCC TAR )

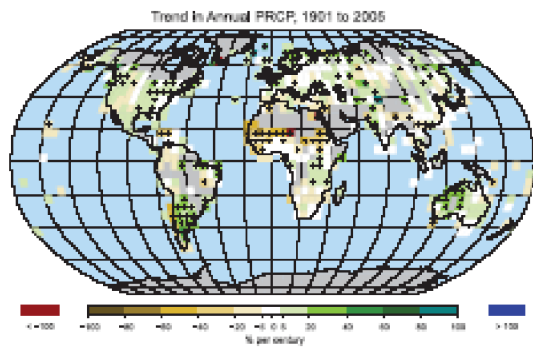


2. **Global mean surface temperature:** 0.74°C increase over the 20th century (land areas warmed more than the oceans)

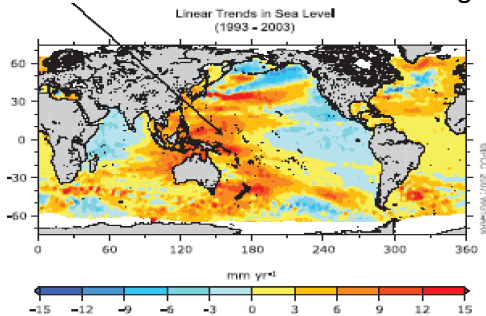


3. **Continental precipitation:** Significant increase in North & South America, northern Europe, and north & central Asia. Drying in Sahel, Mediterranean, southern Africa, parts of South Asia

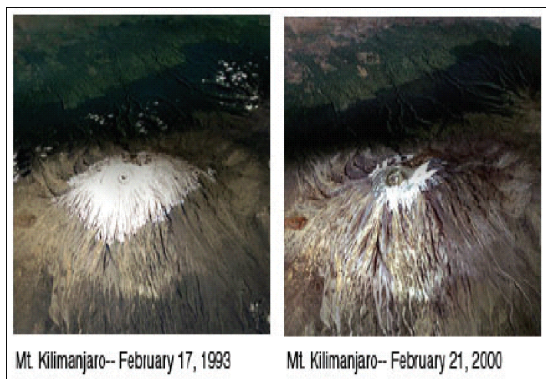
## GLOBAL MEAN PRECIPITATION



### 3. Global sea level rise: Average rate of 1.8 mm per year (1961-2003)



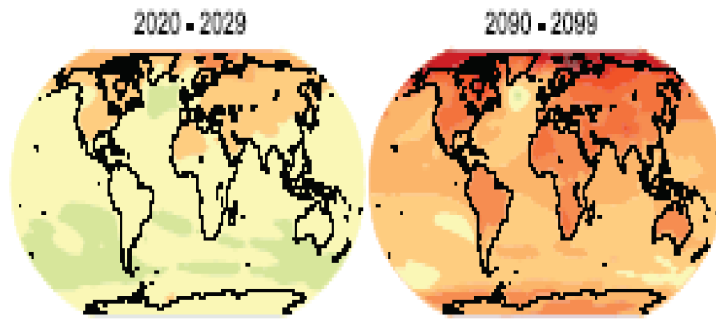
### 4. Non-polar glaciers: Widespread retreat during the 20th century



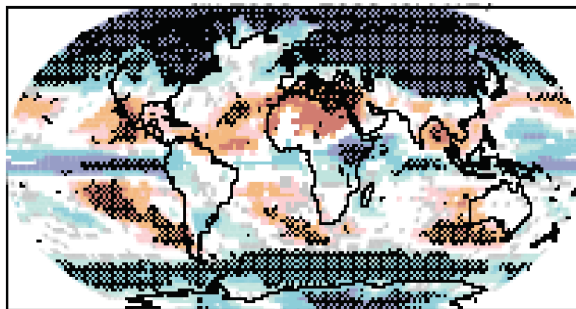
## Projections of Future Changes in Climate

1. For the next 2 decades, a warming of about 0.2°C per decade is projected
2. Increases in the amount of precipitation are very likely in high latitudes, while decreases are likely in most subtropical land regions
3. Hot extremes, heat waves, and heavy precipitation events are expected to become more frequent
4. Likely that future tropical cyclones will become more intense
5. Snow cover is projected to contract.
6. Past and future anthropogenic CO<sub>2</sub> emissions will continue to contribute to warming and SLR for more than a millennium, due to the time scales required for the removal of this gas from the atmosphere.

## Projection of Surface Temperature



## Precipitation – Projected Change in 2090 - 2099





## **MODULE TWO (2): THE IMPACTS OF CLIMATE CHANGE**

### **Module Objective**

By the end of the training module, the participants should be able to:

1. Describe the environmental, social, and economic impacts of climate change.
2. Give local case studies on how climate change has affected the three named areas of focus.

### **Delivery approach**

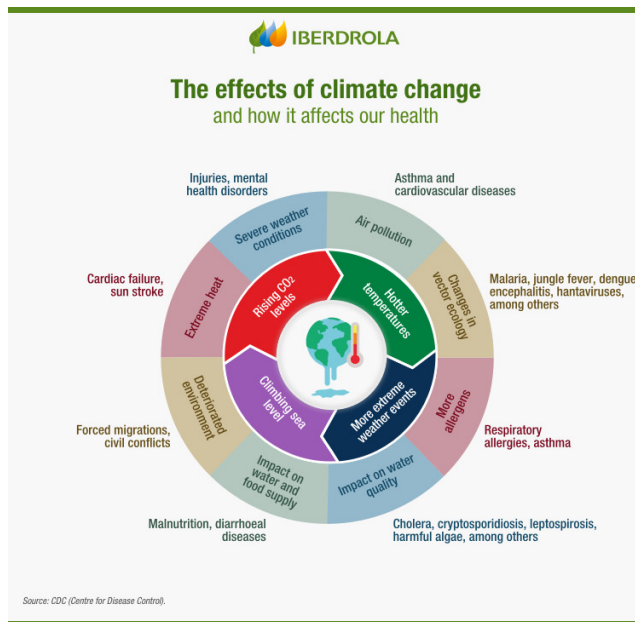
1. Theory lessons delivered through- Classroom case studies, exercises, and group and plenary discussions will be used to enhance learning;
2. Field visits on farmer activities that help to mitigate the effects of climate change;
3. Video clips on various aspects of climate change effects and mitigation measures.

### **2.1 Introduction**

Global human existence and well-being are at risk from both short and long-term effects of climate change. This is anticipated to have a significant impact in Africa, where uncertain social, environmental, and economic conditions are making many communities extremely susceptible to climate risks. The vulnerable groups within the society are likely to be most affected. These include the women, children, girls and people living with disabilities.

### **2.2 Social Impacts of Climate Change**

*Spread of disease vectors:* Climate change impacts the distribution and behavior of disease vectors, leading to shifts in the patterns and increase of vector-borne diseases. The increase in temperatures can cause disease vectors, like mosquitoes, to spread within a wider geographical area. This speeds up the life cycle of the vectors and can result in frequent disease outbreaks as well as rapid population growth of the disease-carrying vectors due to the existence of conducive breeding grounds.



**Food insecurity:** Reduced crop yields can result from changes in rainfall and temperature patterns. Droughts, floods, and storms are examples of extreme weather events that can destroy crops and lower output of the farming ground owing to soil erosion. A wider range of pests and diseases can occur due to warming temperatures and altered rainfall patterns, posing a greater risk to crops and livestock. Soil fertility in Bungoma County has declined, the county being a food basket in Kenya. Mount Elgon is the most affected as it now experiences low food productivity.

**Uncertain water quality and availability:** increased water temperatures can alter the ability to solubility and the rate of reaction of chemicals and waste products, leading to problems with water quality. Climate change can also result in irregular and extreme rainfall patterns, which could cause some areas to endure prolonged droughts while others experience devastating floods.

**Migration and displacement of persons.** Extreme weather conditions i.e. floods, drought, pests and diseases, changing agricultural factors, and rising sea levels all cause migration, which displaces people and puts more strain on host communities and urban areas as a result of population pressure. Muhoroni and Ahero towns were flooded and Kombeyi, Kanyagwal and Kobonyo regions mass displacement took place.

**Mental health problems:** In addition to other mental health conditions like stress, worry, and a sense of powerlessness, extreme weather events can cause post-traumatic stress disorder PTSD and other mental health problems as a result of destruction of properties, loss of jobs and even death of the loved ones, all pointed out to the extreme weather conditions like flooding.

**Cultural erosion:** The loss of cultural identity and tradition can result from the destruction of cultural heritage sites, artifacts and displacement of communities caused by climate change. The changing ecosystems that are caused by climate change provide difficulties for indigenous communities to survive to their new habitats attributed to displacement. Inter-marriage between the host community and the displaced community could also lead to cultural erosion as the offspring may face hindrances in telling the culture to which they belong.

*Social inequality:* Economically disadvantaged and marginalized groups tend to be the most heavily impacted on by climate change mainly because they have limited resources and are less able to respond to the adverse effects of climate change. Social inequality that already exists is even rendered worse by this. Given their position in society, their obligations, and restricted access to resources, women, girls and people living with disabilities are particularly the most affected by climate change.

*Increased mortality and morbidity:* Human well-being is significantly impacted by climate change, which raises both mortality and morbidity rates. The magnitude of increased heat waves puts vulnerable groups like the elderly, young children, and people with medical conditions at risk for heat-related illnesses and deaths. Rising temperatures and heightened atmospheric pollution cause respiratory illnesses such as asthma as well as cardiovascular ailments.

### **2.3 Economic Impacts of Climate Change**

*Food security:* A temperature rise can cause stress in plants, which lowers the growth and development of crops that are highly susceptible to heat. Reduced agricultural production might result from plants undergoing a decrease in water supply due to changing rainfall patterns and droughts. Heavy and more frequent rainfall can result in floods, thereby destroying crops and soil structure, causing shortage of food to both humans and animals.

*Labour productivity:* Rising temperatures have been attributed to negatively impact worker productivity and efficiency, particularly in manual, and outdoor industries like construction and agriculture. Severe weather occurrences like floods and drought can cause disruptions in distribution of services in the markets, which can lead to economic losses.

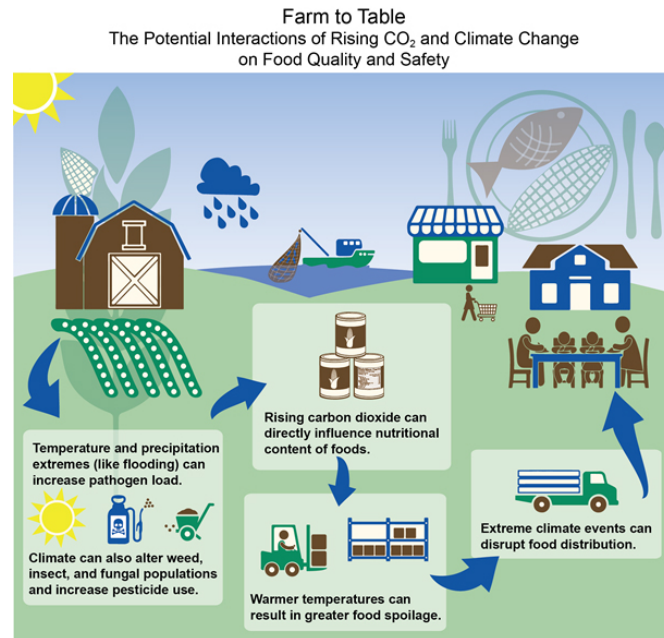
*Destruction of infrastructure:* prolonged heavy rainfall and storms can lead to flooding, and damage of bridges, roads, and buildings. Drainage systems may not withstand the force, strength, and magnitude of the floods, hence urban flooding. The destruction of these infrastructures may lead to increased maintenance and repair costs and disruptions of normal activities. During the recent floods, river Nyando burst its banks, and communities dwelling around the Ahero and Kadibo areas were greatly impacted on.

*Climate change and fisheries industry:* The fisheries industry is greatly impacted by climate change, which has both direct and indirect effects on marine, and sea ecosystems and the communities that depend on them. Water bodies are increasingly becoming acidic due to rising carbon dioxide levels, which can cause water imbalance and distort water pH, affecting the rate at which the fish produce. This might be the case in Siaya County.

*Economic inequality:* Developing countries and vulnerable and low-income earning communities are the most exposed groups to climate change impacts. Their inadequacy of financial muscle, skilled labor, and materials to rebuild after the damage leads to a slow stagnant, and even negative spiral toward economic development.

## 2.4 Environmental Impacts of Climate Change

*Rising temperatures;* Global temperatures have risen resulting in regular and extreme heat waves. This has led to skin infection and even cancer due to exposure to UV rays.



Source: <https://health2016.globalchange.gov/food-safety-nutrition-and-distribution>

*Rise of the sea levels:* The melting of the snow on the mountain caps and the glaciers on the polar regions around the globe have led to an increase in the volume of water across water bodies. This has been attributed to rise of temperatures, which has caused flooding within the coastal ecosystem.

*Climate change on hydrosphere:* Water bodies are a source of water to both animals and humans. The steady increase in temperature has negatively impacted the highly relied-on sources through evaporation to reduce water availability, end result being death of animals, migration hence population pressure to the inadequate remaining sources.

*Extreme weather conditions:* The rampant and drastic changes in weather have led to extreme conditions. Heavy and intense rainfall has led to flooding, and prolonged heat waves on the other hand has led to steady and slow growth of deserts and desert-like climatic conditions in areas where these changes were never experienced. The tropical rainforest in Kakamega is not in a steady state due to increasing heatwaves, causing extinction and drying of indigenous breeds of trees.

*Climate change and atmosphere:* Human activities like mining, industrialization and use of chemicals in the farms have contributed to the build up and increase of greenhouse gasses into the atmosphere. Carbon dioxide, methane, nitrogen dioxide and aerosol sprays concentration has led to massive changes within the atmosphere causing global warming.

*Acidification of the ocean;* Most of the carbon dioxide released through human activities has been absorbed by the oceans, hence controlling the increase of carbon

dioxide. The carbon dioxide and other gasses dissolve in the water, to form carbonic acid which acidifies the ocean. The carbonic acid causes damage to the crucial ocean features like the coral reefs, the aquatic creatures highly depend on and death of fishes.



## MODULE THREE (3): RESPONSE MECHANISMS TO CLIMATE CHANGE

### Module Objectives

By the end of the module, the participants should be able to:

1. Know the definition of climate change adaptation and mitigation and their differences.
2. Types of adaptation actions, adaptation aims, adaptation plans and the challenges and priority adaptation sectors in Climate adaptation.
3. Types, strategies and co-benefits of Climate Mitigation.

### Delivery Approach

4. Theory lessons delivered through- Classroom case studies, exercises, and group and plenary discussions will be used to enhance learning;
5. Field visits on farmer activities that help to mitigate the effects of climate change;
6. Video clips on various aspects of climate change effects and mitigation measures

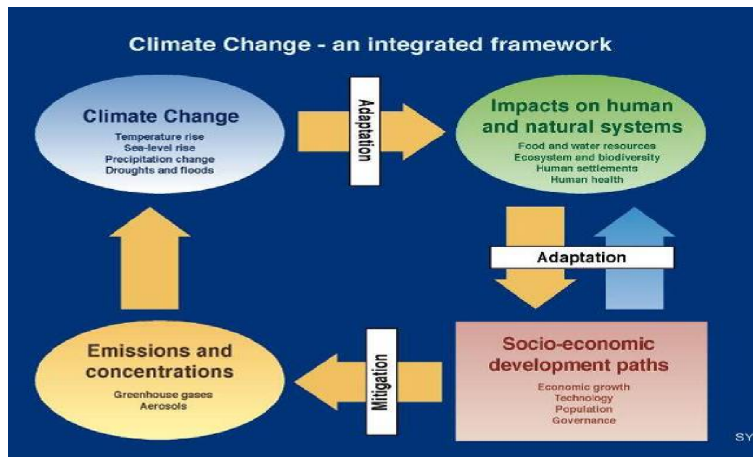


Climate Change is a multifaceted issue that acquires a comprehensive approach when addressing its impacts effectively. The response mechanisms are categorized into two primary strategies; **Adaptation** and **Mitigation**.

**Mitigation** attempts to reduce the causes of climate change.

**Adaptation** attempts to manage the impacts of climate change.

Each of these strategies encompasses various actions and policies aimed at reducing greenhouse gas emissions or adjusting to the changes already underway.



Source: Iceland Liechtenstein Norway Grants

### 3.1 Climate Change Adaptation

This is the process of adjusting to the effects of climate change. These can be both current or expected impacts. Adaptation aims to moderate or avoid harm for people and it is usually alongside climate change mitigation.

**Community-based Adaptation:** Community-based adaptation is a set of climate change adaptation activities developed in partnership with at-risk communities to promote local awareness of, and appropriate and sustainable solutions to, current and future climatic conditions.

**Climate risks:** Is the potential financial, environmental or social harm caused by the impacts of climate change.

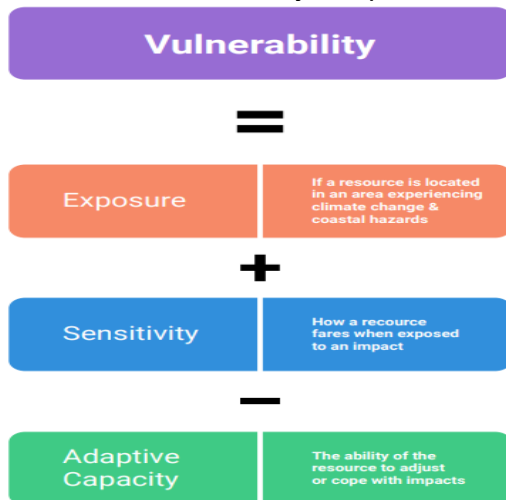
**Vulnerability** refers to “the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impact of hazards

**Climate vulnerability:** Is the degree to which natural, built and human systems are at risk of exposure to climate change impacts.

Such factors include things like people’s income, levels of education, where they live, and access to housing and health care. Vulnerability affects the degree to which people and ecosystems can cope with climate change.

Vulnerability is a function of **exposure, sensitivity and adaptive capacity**

$$\text{Vulnerability} = \text{Exposure} + \text{Adaptive Capacity} - \text{Sensitivity}$$



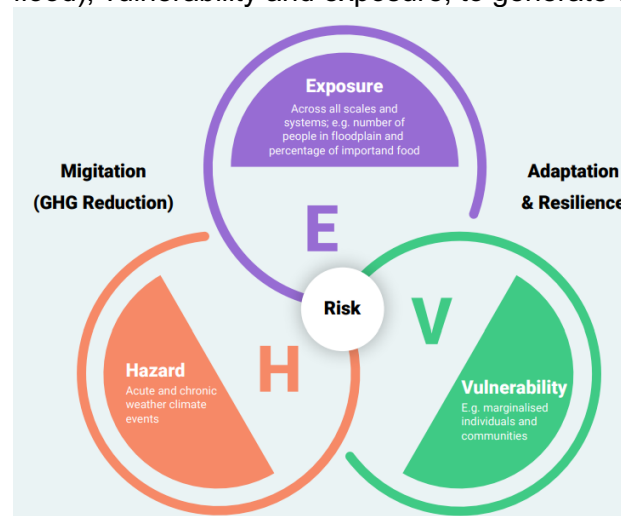
National Park Service, 2022

**Exposure:** is the “presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected. e.g think of a house on a riverbank that often floods in heavy rains. The house has a high level of exposure to flooding.

**Sensitivity:** is the “degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. e.g. to conceptualize this, think of the same house on the riverbank. If it was built of poor-quality materials, it would be more likely to be damaged in the floods and have a higher sensitivity.

**Adaptive capacity:** is the “ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Vulnerability affects the level of climate change risk experienced by communities and countries. Figure below highlights the interaction between a climate hazard (such as a flood), vulnerability and exposure, to generate climate change risks.



Source: Viner et al., 2020

**Climate vulnerability Assessment:** Is a systematic process used to evaluate the susceptibility of species, ecosystem or community to the adverse effects of climate change.

### Aims of Adaptation

Adaptation aims to moderate or avoid harm and exploit opportunities. For natural systems, humans may intervene to make adjustments. The adaptation aims include;

- Reduce risk factors: vulnerability and exposure
- Policy aims
- Increase adaptive capacity
- Strengthening resilience
- Co-benefits/ Synergies with mitigation

### Key types of adaptation actions

There are three main categories for adaptation options, according to the IPCC:

- a. Social,
- b. Institutional, and
- c. Physical

1. **Social adaptation** options include behavioral, educational and informational options such as:

- Hazard and vulnerability mapping
- Land and water conservation techniques

- Agricultural practices
  - Livelihood diversification.
  - Migration and managed retreat
  - Communication campaigns on climate change.
2. **Institutional adaptation options** include economic and policy changes such as:
- Local development plans that include adaptation.
  - Laws for defining no-building zones in flood-prone areas.
  - Defining forest-protected areas to preserve water sources in areas exposed to water scarcity.
  - National or regional climate change strategies.
  - Integration of adaptation into sectoral policies.
  - Financial incentives, including taxes and subsidies
3. **Physical adaptation options** include making changes to the built environment using technology and ecosystem-based services. Examples include:
- Climate resilient infrastructure, such as quality road surfaces to withstand hotter temperatures, and storm-resistant buildings or shelters
  - Traditional technologies, such as floating gardens.
  - Floating houses
  - Ecological corridors
  - Food banks and distribution of food surplus.

### 3.1.2 Adaptation Strategies

There are many adaptation strategies or options that can help manage impacts and risks to people and nature. These adaptation responses fall into four categories; Infrastructural and technological adaptations, Institutional adaptations, Behavioral and cultural and nature-based solutions.

Adaptation is particularly important in developing countries because they are the most vulnerable to climate change bearing the brunt of its effects. Adaptation needs are high for food, water and other sectors important for economic output, jobs and income.

#### **Adaptation Strategies in Agriculture**

Table 10.8. Adaptation measures in agriculture.

| Sectors                                      | Adaptation measures   |
|--|---|
| 1°C temperature increase in June to August   | <ul style="list-style-type: none"> <li>Choice of crop and cultivar: <ul style="list-style-type: none"> <li>• Use of more heat/drought-tolerant crop varieties in areas under water stress</li> <li>• Use of more disease and pest tolerant crop varieties</li> <li>• Use of salt-tolerant crop varieties</li> <li>• Introduce higher yielding, earlier maturing crop varieties in cold regions</li> </ul> </li> <li>Farm management: <ul style="list-style-type: none"> <li>• Altered application of nutrients/fertiliser</li> <li>• Altered application of insecticide/pesticide</li> <li>• Change planting date to effectively use the prolonged growing season and irrigation</li> <li>• Develop adaptive management strategy at farm level</li> </ul> </li> </ul> |
| Livestock production                         | <ul style="list-style-type: none"> <li>• Breeding livestock for greater tolerance and productivity</li> <li>• Increase stocks of forages for unfavourable time periods</li> <li>• Improve pasture and grazing management including improved grasslands and pastures</li> <li>• Improve management of stocking rates and rotation of pastures</li> <li>• Increase the quantity of forages used to graze animals</li> <li>• Plant native grassland species</li> <li>• Increase plant coverage per hectare</li> <li>• Provide local specific support in supplementary feed and veterinary service</li> </ul>   |
| Fishery                                      | <ul style="list-style-type: none"> <li>• Breeding fish tolerant to high water temperature</li> <li>• Fisheries management capabilities to cope with impacts of climate change must be developed</li> </ul>  |
| Development of agricultural bio-technologies | <ul style="list-style-type: none"> <li>• Development and distribution of more drought, disease, pest and salt-tolerant crop varieties</li> <li>• Develop improved processing and conservation technologies in livestock production</li> <li>• Improve crossbreeds of high productivity animals</li> </ul>   |
| Improvement of agricultural infrastructure   | <ul style="list-style-type: none"> <li>• Improve pasture water supply</li> <li>• Improve irrigation systems and their efficiency</li> <li>• Improve use/store of rain and snow water</li> <li>• Improve information exchange system on new technologies at national as well as regional and international level</li> <li>• Improve sea defence and flood management</li> <li>• Improve access of herders, fishers and farmers to timely weather forecasts</li> </ul>  |

**Adaptation Plans:** These are the changes in processes, structures and practices to moderate potential damages or to benefit from opportunities associated with climate change. These plans are integrated into National Adaptation Plans and County Climate Change Adaptation Plans.

**National Adaptation Plans (NAPs)** are comprehensive medium and long-term strategies that outline how a nation will adapt to the changing climate and reduce its vulnerability to the climate related risks.

Adaptation plans are important to **help countries manage climate risks**. Other levels of government such as cities and provinces use adaptation planning so do economic sectors.

Many adaptation measures need to happen at the local level, so rural communities and cities have a big role to play.

Such measures include planting crop varieties that are more resistant to drought and practicing regenerative agriculture, improving water storage and use, managing land to reduce wildfire risks, and building stronger defenses against extreme weather like floods and heat waves.

The objectives of the NAP are to

- Highlight the importance of adaptation and resilience building actions in development
- Integrate climate change adaptation into national and county level development planning and budgeting processes;
- Enhance the resilience of public and private sector investment in the national transformation, economic and social and pillars of Vision 2030 to climate shocks;
- Enhance synergies between adaptation and mitigation actions in order to attain a low carbon climate resilient economy; and
- Enhance resilience of vulnerable populations to climate shocks through adaptation and disaster risk reduction strategies.

**County Climate Change Adaptation Plans** are strategies to enhance the county governments and local communities' capacity to mitigate and adapt to the impact of climate change by creating a resilient and thriving environment and economy using a participatory approach.



### 3.1.3 Community-Based and Locally-led Adaptation

**Community-Based Adaptation** Community-Based Adaptation (CBA) interventions aim to improve the capacity of local communities and individuals to adapt to climate change.

This approach places emphasis on ***building the adaptive capacity of the poorest and most marginalized people.***

In CBA initiatives, organizations, governments and others support communities to act and bring about positive changes in their lives. For example, communities might be supported in changing the time of year they plant crops to better align with changing rainfall patterns or build homes that can better withstand high-intensity cyclones.

CBA can also focus on preserving natural systems. For example, many communities might work together to protect and conserve a river basin or plant trees in natural forest ecosystems.

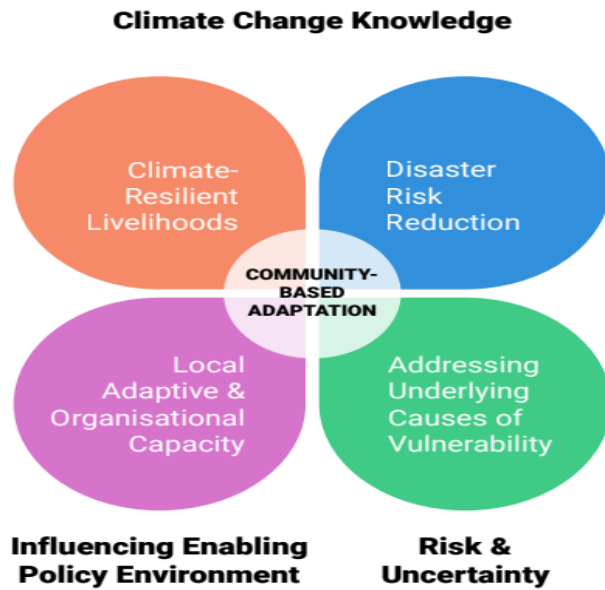
#### **Aims of Community-Based Adaptation**

CBA aims to:

- Generate adaptation strategies with communities and other local stakeholders to improve the uptake and sustainability of the adaptation process and develop a strong sense of ownership within a community.
- Enhance communities' awareness and understanding of climate change and uncertainty to create responsive plans and facilitate more flexible and context-appropriate decisions.
- Embed new knowledge and understanding into existing community structures to expand and strengthen those structures as well as institutional mechanisms.

#### **Four interlinked strategies for Community-Based Adaptation**

1. *Promote climate-resilient livelihoods* *Climate-resilient livelihoods* refer to livelihoods that are less sensitive to climate change. For example, promote new agricultural techniques to improve soil moisture or drought-resistant seeds in areas that are becoming drier.
2. *Promote disaster risk reduction: Disaster risk reduction (DRR)* includes all activities that can help reduce the impacts of disasters, particularly on vulnerable households and individuals. It includes prevention, preparedness, response and rehabilitation measures such as contingency planning, building storage for food, informing communities about safe locations in case of emergency, and developing early warning systems.
3. *Build local adaptive and organizational capacity:* Local adaptive and organizational capacity includes capacity development for local civil society organizations (CSOs) and governmental institutions and local authorities so that they can provide better support to communities in their adaptation efforts. It can include development of local adaptation and contingency plans, and training on climate change for local authorities and CSOs.
4. *Address the underlying causes of vulnerability:* The underlying causes of vulnerability can refer to poverty, poor governance, environmental degradation, unequal access to and control over resources, limited access to basic services, or gender inequality, depending on the context. These can be addressed through advocacy, social mobilization, and other methods.



Source: CARE, 2014.

### 3.1.4 Locally-Led Adaptation (LLA)

Locally Led Adaptation (LLA) aims to put local institutions and communities in control of the actions that affect them. It follows eight principles that were launched in 2021.



Source: ARIN website

### 3.1.5 Nature Based Solutions for Climate Adaptation

Nature-based solutions support climate change adaptation and mitigation by using natural systems and processes to restore ecosystems, conserve biodiversity, and enable sustainable livelihoods.

They are actions that prioritize ecosystems and biodiversity. They are designed and implemented with the full engagement and consent of local communities and Indigenous Peoples.

Examples include planting trees, restoring wetlands, conserving mangrove forests, or switching to regenerative farming practices

### 3.1.6 Priority Sector Adaptation Actions

**Priority sectors** refers to specific areas of economic activity that have been identified as crucial for achieving significant reductions in greenhouse gas emissions and enhancing resilience to climate impacts.

1. Water sector
2. Health sector
3. Energy sector
4. Agriculture sector
5. Transport and Infrastructure sector

### 3.1.7 Challenges in Climate Change Adaptation

- Maladaptation
- Incentivizing private investment in adaptation
- Limits to adaptation
- Trade-offs with mitigation. For instance, compact urban development may lead to reduced greenhouse gas emissions from transport and building. On the other hand, it may increase the urban heat island effect, leading to higher temperatures and increasing exposure, making adaptation more challenging

## 3.2 Climate Change Mitigation

This involves actions that reduce the rate of climate change by limiting or preventing greenhouse gas emissions and by enhancing activities that remove these gasses from the atmosphere.

It is possible to approach mitigation measures in parallel since there is no single pathway to limit global warming. The four types of mitigation measures include;

1. Sustainable energy and sustainable transport
2. Energy conservation
3. Sustainable agriculture and green industrial policy
4. Enhancing carbon sinks and carbon dioxide removal.

### 3.2.1 Strategies for Mitigation

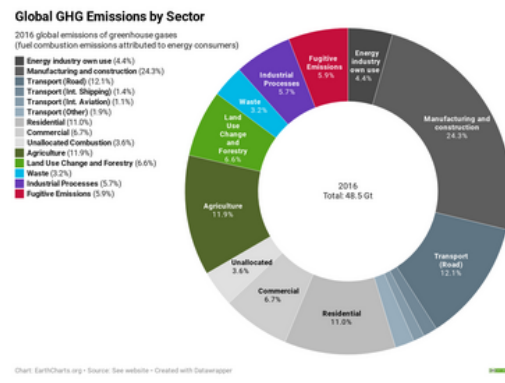
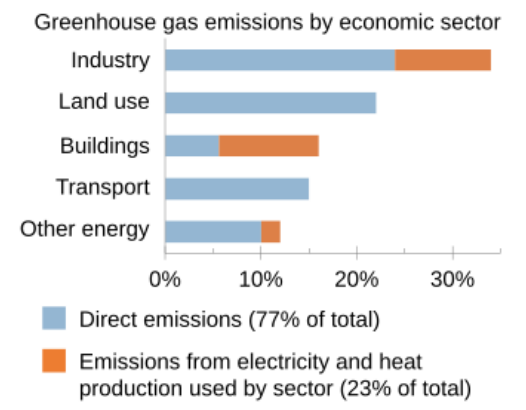
- Reducing emissions
- Enhancing carbon sinks
- Policy measures

To achieve ambitious goals of reducing or avoiding emission of greenhouse gasses, equivalent to at least 1.8 billion tons of CO<sub>2</sub>, mitigation hinges upon two fundamental pillars:

**Pillar 1:** Promoting innovation, technology development and transfer, and enabling policies for mitigation options with systemic impacts.

**Pillar 2:** Fostering enabling conditions to mainstream mitigation concerns into sustainable development strategies:

Just like adaptation interventions can be applied to various sectors, mitigation can too be used depending on various sectors to prevent emission of greenhouse gas emissions. These include; transport, agriculture, energy, buildings, urban planning and industrial sectors



### Co-benefits of Climate Mitigation

1. Employment and economic development
2. Energy security and efficiency
3. Climate change adaptation
4. Health and wellbeing

Mitigation measures also have negative side-effects that is:

- Biodiversity and ecosystem malfunctioning
- Increase threats to conservation areas that are in renewable energy and mining for minerals.

Mitigating climate change requires a multifaceted approach involving emission reductions, enhancement of carbon sinks, robust frameworks, international cooperation and addressing sector specific challenges.

## MODULE FOUR (4): POLICY CONTEXT OF ADAPTATION

### Module Objectives

By the end of the module, the participants should be able to:

1. Have a broad understanding of international climate governance and the main United Nations climate change policy processes.
2. Know about the main climate adaptation policy frameworks at global, national, and local levels.
3. Understand the importance of youth engagement in climate adaptation policy processes and know more about how to engage in these processes.
4. Understand global climate finance mechanisms and some of the challenges in accessing climate funds for adaptation.

### Delivery Approaches

1. Theory lessons delivered through- Classroom case studies, exercises, and group and plenary discussions will be used to enhance learning;
2. Field visits on farmer activities that help to mitigate the effects of climate change;
7. Video clips on various aspects of policy context of adaptation

## 4.0 Introduction

Kenya is a signatory to various international climate change agreements, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement.

These agreements commit Kenya to taking climate action, including mitigation and adaptation measures, and accessing climate finance and technology transfer to support its efforts.

Kenya's climate change legal environment is considered progressive, with the country being one of the first in the African continent to enact robust climate laws and policies that guide national and local action.

### 4.1 Climate Policies

#### 4.1.1 Global Policies

- a. *UN Framework Convention on Climate Change (UNFCCC) (1992)*: This foundational treaty establishes an annual forum for countries to discuss and negotiate actions against climate change. It recognized the need for a collective

- approach to stabilize greenhouse gas concentrations in the atmosphere.
- b. *Kyoto Protocol (2005)*: The first legally binding agreement that required developed countries to reduce their greenhouse gas emissions by an average of 5% below 1990 levels. However, it did not impose similar obligations on developing nations, leading to criticisms regarding its effectiveness.
  - c. *Paris Agreement (2015)*: A landmark accord that requires all countries to set nationally determined contributions (NDCs) aimed at limiting global temperature rise to well below 2°C above pre industrial levels, with efforts to limit it to 1.5°C. This agreement marked a significant shift towards inclusive participation from both developed and developing nations.
  - d. *The Sendai Framework for Disaster Risk Reduction 2015-2030*: The Sendai Framework for Disaster Risk Reduction 2015-2030 is a voluntary agreement that recognizes that the State has the primary role in reducing disaster risk, but that responsibility should be shared with other stakeholders, including local governments, the private sector, and other stakeholders. Kenya adopted the Sendai Framework in 2015.

#### 4.1.2 Regional Policies

- a. *African Union Agenda 2063*: This framework emphasizes sustainable development and resilience against climate change as critical components for achieving economic growth and social equity across the continent.
- b. *EAC Climate Change Policy Framework*: Developed by the East African Community (EAC), this policy aims to provide collective measures for addressing climate change impacts while promoting sustainable social and economic development. It prioritizes adaptation strategies due to the region's high vulnerability.
- c. *African Adaptation Initiative (AAI)*: Launched at COP22 in Marrakech, Morocco, this initiative seeks to enhance adaptive capacity across African nations by mobilizing resources and fostering collaboration among member states.
- d. *African Climate Policy Center 2010*: influences, strengthens and enables the transition to climate resilient development in Africa through responsive plans, policies and programmes towards transformed economies, health ecosystems and human wellbeing.

#### 4.1.3 National Policies

- a. *Kenya Constitution 2010*: A robust framework of policies, plans, and institutions is being progressively established at the National and County levels in Kenya to address climate change. The foundation of the institutional and legal framework for climate change action is the Constitution of Kenya (2010).
- b. *The 2010 National Climate Change Response Strategy (NCCRS)*: the first major Kenyan climate policy document, which aimed to integrate adaptation and mitigation measures in government planning, budgeting and development objectives.
- c. *Climate Change Act, 2016* established a comprehensive legal framework to promote low carbon, climate resilient development in Kenya.
- d. *National Determined Contributions (NDC) 2020* commits to reducing

greenhouse gas emissions by 32% by 2030 relative to a business-as-usual scenario. It aligns with Kenya's sustainable development goals and reflects its ambition to transition towards renewable energy sources, enhance energy efficiency, promote sustainable agriculture and improve waste management systems.

- e. *The National Climate Change Action Plan 2023–2027 (NCCAP 2023–2027)* presents the detailed priority actions that Kenya will embark on to address climate change during the 2023–2027 medium-term planning period. These actions aim to address the impacts of climate change, which include increased frequency and magnitude of extreme weather events in Kenya; as well as reduce greenhouse gas emissions.
- f. *County Climate Change Fund (CCCF) Guidelines 2018*: The national policy supporting climate actions have been realigned with the Constitution of Kenya 2010 to support county governments in developing county-based climate change policies and programs.
- g. *The National Adaptation Plan (NAP) 2015-2030*: The NAP is anchored in the Constitution of Kenya and Vision 2030 – Kenya's blueprint for development. It also aligns itself with the Medium-Term Plan (MTP) and Medium-Term Expenditure Framework (MTEF) planning processes. The NAP is also aligned with the Climate Change Act, 2016.
- h. *Climate Risk Management Framework for Kenya, 2016*: This framework outlines how the government intends to harmonize its climate change and disaster risk policies to bring together the separate fields of disaster risk reduction, climate change adaptation and sustainable development to be pursued as mutually supportive rather than stand-alone goals. This is to ensure that an integrated climate risk management approach becomes a central part of policy and planning.

#### 4.1.4 County Policies

- a. *County Integrated Development Plans (CIDPs)*: County Integrated Development Plans 2023-2027 are comprehensive and forward-looking blueprints that outline the development priorities, strategies, and objectives for Nairobi City County over five years. This plan serves as a guiding framework for shaping the Counties social, economic, and environmental landscape, addressing key challenges and opportunities. Through a participatory and consultative process, the plans incorporate the aspirations and needs of the county residents, businesses, and stakeholders.
- b. *County Climate Change Action Plans (CCCAP)* assesses the current situation of the counties with regard to climate change risk and outlines the NCCAP's agenda for adaptation and mitigation at the county level as a response to the current situation and projected impact.
- c. *County climate change policies*: They focus on the linkages between sustainable development and climate change. Climate change adversely impacts priority critical sectors that are important to the county's economy and society: Environment, Water and Forestry; Agriculture, Livestock and Fisheries; Trade; Energy; Physical Infrastructure; Tourism; and Health.etc These policies, therefore, elaborates intervention measures that can help to achieve the goal of low carbon, climate resilient and therefore sustainable development.



## MODULE FIVE (5): PRIORITY SECTORS AND INDICATORS

### Module Objectives

By the end of the training module, the participants should be able to:

1. Describe the key priority sector as described in the NAPs.
2. Define indicators and state the characteristics of indicators
3. Explain set of indicators as defined within each priority sector
- 4.

### Delivery Approach

1. Theory
2. Classroom discussion
3. Demonstration
4. You tube videos

## 5.0 Key Priority Sectors

Priority sectors at national level are defined within the national climate change action plan. These includes:

- a. *Agriculture:*
- b. *Livestock Development*
- c. *Fisheries*
- d. *Energy*
- e. *Forestry*
- f. *Health*
- g. *Water*

## 5.1 Indicators

**An indicator** is a measurable variable that helps assess the current situation and track change over a period of time

Adaptation indicators are essential to:

1. Monitor progress towards the implementation of adaptation policies, strategies and actions.
2. Target, justify and monitor funding for adaptation programmes.
3. Communicate adaptation priorities to policymakers and stakeholders.
4. Compare adaptation achievements across sectors, regions and countries.
5. Provide inputs for international climate change related processes and mechanisms

### 5.1.1 Essential characteristics of adaptation indicators

- **Specific:** Indicators should be clear and easy to understand and relevant to the context.
- **Measurable:** Indicators should be based on readily available data, or on data that can be made available at a reasonable cost
- **Achievable:** Indicators and their measurable units must be achievable and sensitive to change during the life of the project
- **Analytically Sound:** Its validity should be widely accepted
- **Relevant:** Indicator sets should reflect information that can be used for management or immediate analytical purposes. They should provide a balanced coverage of all key adaptation objectives.
- **Transparent.** The indicators should be transparent and easy to interpret, i.e. users should be able to assess the significance of the values associated with the indicators and their changes over time.
- **Time-Bound:** Progress can be tracked at a desired frequency for a set period of time.

## 5.2 Types of Indicators I

*Process Indicators:* indicators measure progress in implementing adaptation policies, plans, projects or changes in institutional decision-making capacity, which create an enabling environment for adaptation.

*Outcome/ Results Indicators* are used to evaluate whether or not the activity, plan or policy achieved the intended objectives or results.

Results Indicators can be measured at different levels:

- a. **Output indicators** illustrate the change related directly to the activities undertaken within the programme (e.g. percentage of area cultivated with drought resistant varieties)
- b. **Outcome indicators** relate to medium-to-longer term change (e.g. percentage of poor people in drought-prone areas with access to safe and reliable water)
- c. **Impact indicators** measure the long-term effect of programme interventions (e.g. increase in adaptive capacity of farmers in community x, disaggregated by sex of household head\*.)

### 5.2.1 Gender-sensitive indicators

Gender sensitivity. COP 23 adopted the Gender Action Plan and is monitoring gender issues. On the recognition that gender shapes vulnerability and adaptive capacity, frameworks should include sex-disaggregated and gender sensitive indicator

What can the gender-sensitive indicators do:

Measure gender-related change in a condition or situation over time.

Measure benefits to males and females as well as changes in relations between them. Use quantitative and qualitative data disaggregated by sex, age and other socioeconomic variables.

Examples of qualitative gender-sensitive indicators: levels of adoption of high yield varieties amongst male-headed compared to female-headed households; proportion of females compared to male workforce in agricultural organizations; percentage of

male and female trainees who feel their knowledge of adaptation practices has increased.

### 5.3 Types of Indicators II

*Quantitative indicators* – these are the most commonly used. Quantitative indicators provide information on “how much” or “how many”

*Qualitative indicators* - Qualitative indicators capture judgments or perceptions of changes achieved, provide information on how people feel about a situation, how things are done, how people behave, etc

## FAO Tracking adaptation in agricultural sectors

| Main categories                         | Subcategories  |
|---|--|
| <b>Natural resources and ecosystems</b> | 1 Availability of, and access to, quality water resources for agriculture                        |
|   | 2 Availability of, and access to, quality agricultural land and forests                          |
|   | 3 Status of ecosystems and their functioning   |
|   | 4 Status of the diversity of genetic resources in agriculture                                    |
| <b>Agricultural production systems</b>  | 1 Agricultural production and productivity   |
|   | 2 Sustainable management of agricultural production systems                                      |
|   | 3 Impact of extreme weather and climate events on agricultural production and livelihoods        |
|   | 4 Projected impact of climate change on crops, livestock, fisheries, aquaculture and forestry    |
| <b>Socio-economics</b>                  | 1 Food security and nutrition (vulnerability)  |
|   | 2 Access to basic services   |
|   | 3 Access to credit, insurance, social protection in rural areas                                  |
|   | 4 Agricultural value addition, incomes and livelihood diversification                            |
| <b>Institutions and policy making</b>   | 1 Institutional and technical support services   |
|   | 2 Institutional capacity and stakeholder awareness   |
|   | 3 Mainstreaming of climate change adaptation priorities in agricultural policies, and vice versa |
|   | 4 Financing for adaptation and risk management   |

## International Institute for Environment & Development (IIED) – *Tracking Adaptation and Measuring Development (TAMD) framework*

- Indicator 1: Climate change integration into planning
- Indicator 2: Institutional coordination for integration of climate risk management
- Indicator 3: Budgeting and finance
- Indicator 4: Institutional knowledge and capacity
- Indicator 5: Use of climate information
- Indicator 6: Institutional capacity for decision-making under climatic uncertainty
- Indicator 7: Participation, stakeholder engagement in decision-making to address CC
- Indicator 8: Awareness among stakeholders of CC issues, risks and responses
- Indicator 9: Numbers of people better able to cope with climate change and variability (disaster created by gender/age)

# GLZ adaptation indicators for agriculture from 10 national adaptation M&E systems

|                    |   |
|--------------------|---|
| Climate parameters | <ul style="list-style-type: none"> <li>• Change in annual temperature</li> <li>• Mean monthly temperature</li> <li>• Number of hot days</li> <li>• Change in annual precipitation</li> <li>• Monthly precipitation</li> <li>• Extreme precipitation events</li> </ul>   |
| Climate impacts    | <ul style="list-style-type: none"> <li>• Number of households affected by drought, disaggregated by sex of head of household</li> <li>• % of total livestock killed by drought</li> <li>• Number of surface water areas subject to declining water quality due to extreme temperatures</li> <li>• Number of hectares of productive land lost to soil erosion</li> <li>• % of area of ecosystem that has been disturbed or damaged</li> <li>• Areas covered by vegetation affected by plagues or fires</li> <li>• Shift of agrophenological phases of cultivated plants</li> <li>• Losses of GDP in percentage per year due to extreme rainfall</li> </ul> |

|                    |  |
|--------------------|--|
| Adaptation actions | <ul style="list-style-type: none"> <li>• Percentage of farmers and fisherfolk with access to financial services, disaggregated by sex</li> <li>• Total sum of investments in programmes for the protection of livestock</li> <li>• Number of inventories of climate change impacts on biodiversity</li> <li>• Uptake of soil conservation measures</li> <li>• Percentage of treated wastewater</li> <li>• Percentage of agricultural land with improved irrigation</li> <li>• Number of farmers involved in pilot irrigation messaging projects,</li> <li>• Number of women organised in agricultural cooperatives</li> <li>• Cultivation of varieties of red wine which like warmth</li> </ul>  |
| Adaptation results | <ul style="list-style-type: none"> <li>• % of poor people in drought-prone areas with access to safe and reliable water</li> <li>• Number of cubic metres of water conserved</li> <li>• % of water demand for cash crops being met by existing supply</li> <li>• % of water demand for home gardens and cooking being met by existing supply</li> <li>• % of livestock insured against death due to extreme weather events</li> <li>• % of farmland covered by crop insurance</li> <li>• % of additional fodder for grazing livestock</li> <li>• Increase in agricultural productivity through irrigation of harvested land</li> <li>• Increase in the percentage of climate resilient crops being used</li> <li>• % of cultivated surface cultivated with drought resistant varieties</li> <li>• Turnover generated by agricultural cooperatives</li> </ul> |

## Case study: National adaptation indicators of Kenya MVR+ system

| Top-down county-level institutional adaptive capacity indicators (process)  | Bottom-up vulnerability indicators (outcome)   |
|---|--|
| <ul style="list-style-type: none"> <li>• % of population by gender in areas subject to flooding and/ or drought in the county who have access to information on rainfall forecasts</li> <li>• % of poor farmers and fishermen in the county with access to credit facilities or grants</li> <li>• % of total livestock numbers killed by drought in the county</li> <li>• % of area of natural terrestrial ecosystems in the county that have been disturbed or damaged by what?</li> <li>• % water demand that is supplied in the county</li> <li>• % of poor people by gender in drought prone areas in the county with access to reliable and safe water supplies</li> </ul> | <ul style="list-style-type: none"> <li>• Number of hectares of productive land lost to soil erosion</li> <li>• % rural households with access to water from a protected source</li> <li>• Cubic meters per capita of water storage</li> <li>• % of land area covered by forest</li> <li>• Number households in need of food aid</li> </ul> |

## Case study: Kenya NAP indicators

| National   | Sector  | County (examples)  |
|--|---|--|
| <ul style="list-style-type: none"> <li>• Human development index</li> <li>• % of climate related national loss and damage in the public and private sectors</li> <li>• Population living below the poverty line</li> <li>• National vulnerability index</li> </ul> | <ul style="list-style-type: none"> <li>• Number of sectors planning, budgeting and implementing adaptation actions</li> <li>• National and county performance contracting systems integrating adaptation targets</li> <li>• Amount of loss and damage from climate hazards per sector</li> <li>• Amount of private sector financing for adaptation</li> </ul> | <ul style="list-style-type: none"> <li>• Number of counties budgeting and implementing adaptation programmes;</li> <li>• No of national and county level programmes incorporating adaptation</li> <li>• Number of households with timely access to climate information</li> <li>• Number of public servants trained on adaptation</li> </ul> |

### 5.3 Considerations when choosing indicators

1. *Process and results.* The selection of indicators should comprise both process and result-based indicators
2. *Adaptation at the local level.* Adaptation tracking should accurately capture changes at the local level, since adaptation is first and foremost a local issue
3. *Multifaceted nature of adaptation.* Adaptation is a multifaceted process; therefore, multiple indicators should be used to track to adaptation
4. *Data availability.* The availability and quality of data can be inadequate. To counter this problem, existing data sets, developed for other purposes, may be used.
5. *Institutions and policy dimensions.* Indicators from adaptation programmes and that are implemented within a broader institutional context are to be considered.

## MODULE SIX (6): CLIMATE FINANCE

### Learning Objectives

By the end of this module, the learner should be able to:

1. Define key concepts in climate finance
2. Differentiate between the different sources and types of climate finance
3. Differentiate between the various types of climate finance mechanisms
4. Elaborate on the importance of climate finance
5. Detail the various challenges faced in climate finance.

### Delivery approach

1. Theory
2. Group discussions
3. Case studies

### 6.0 Key concepts in climate finance

| Concept                 | Definition   |
|-------------------------|--|
| Additionality           | The principle that climate finance should provide resources that are additional to existing financial commitments. |
| Blended finance         | Combining public and private resources to increase the overall impact of climate finance.                          |
| Climate Risk Assessment | Evaluating the potential risks that climate change poses to investments and projects.                              |
| Leverage                | Using public finance to attract private sector investment in climate projects.                                     |

### 6.1 History of climate finance

The use of the term climate finance began during the [Rio Earth Summit of 1992](#) which led to the creation of the [United Nations Framework Convention on Climate Change \(UNFCCC\)](#), followed by the drafting and adoption of the [Kyoto Protocol](#) in 1997.

The word finance is only mentioned once in the UNFCCC and once in the Kyoto

Protocol. It is until the [Marrakesh Accords of 2001](#) that the word finance, which was mostly used in reference to adaptation, was finally mentioned.

In the year 2014, the UNFCCC adopted an official definition for climate finance. Its definition was: “*climate finance aims at reducing emissions, and enhancing sinks of greenhouse gasses and aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts*”.

In 2015, climate finance was mentioned 4 times in the [Paris Agreement](#). After this, climate finance has been used more frequently and in various contexts both locally and internationally.

In simple terms, climate finance refers to financial resources such as loans, grants, or domestic budget allocations for climate change mitigation and adaptation initiatives.

## 6.2 Sources of Climate Finance

Climate finance can come from both public and private sources and is usually channeled by different intermediaries like multilateral development banks and development agencies. These organizations play an important role in transferring financial resources from developed countries to developing countries as envisioned under the [United Nations Framework Convention on Climate Change](#) obligations of developed countries.

Some of the public finance sources are:

- National Budgets which include government allocations for climate-related projects.
- Bilateral financial aid which refers to the finances provided by one country to another.
- Multilateral financial aid is finance from international organizations like the World Bank or regional development banks to individual countries.

Some of the private finance sources are:

- Private Investments from businesses, financial institutions, and individuals.
- Climate Bonds which are debt instruments used to raise funds for climate projects.
- Corporate Social Responsibility (CSR) which entails companies investing in sustainable and climate-resilient projects.

## 6.3 Types of Climate Finance

- There are two main types of climate finance. They include adaptation and mitigation finance.
- *Mitigation Finance*: These focus on reducing greenhouse gas emissions and transitioning to low-carbon technologies (e.g. renewable energy projects).



- *Adaptation Finance*: These focus on building resilience and adapting to the adverse impacts of climate change (e.g. disaster risk reduction).

## 6.4 Climate Finance Mechanisms

Climate Finance Mechanism are approaches and instruments used to mobilize and allocate financial resources for climate change mitigation and adaptation projects. They facilitate the flow of funds from various sources to climate-related initiatives, ensuring that the financial support reaches the necessary stakeholders effectively and efficiently.

They are designed to address the financial needs and risks associated with climate change.

### 6.4.1 Types of Climate Finance Mechanisms

1. *Grants*: These are non-repayable financial assistance provided by governments and international organizations to support climate change projects. They are majorly aimed at financing activities that may not generate immediate financial returns but have significant environmental and social benefits.
2. *Loans*: These are repayable financial assistance provided to support climate projects, often with adjustable terms such as low-interest rates and extended repayment periods. Loans provide capital for projects that have the potential to generate income over time, such as renewable energy installations and energy projects.
3. *Equity Investments*: Investments made in exchange for ownership holdings in initiatives that prioritize climate adaptation or mitigation are known as equity investments. Their main purpose is to provide funding for innovative and potentially high-return climate solutions, while sharing the financial risks and rewards.
4. *Guarantees*: These are financial instruments that reduce the risk for private investors by ensuring that there is repayment in case of project failure. They aim to attract private sector investments by mitigating perceived financial risks associated with climate projects.
5. *Insurance*: These are financial resources that provide coverage against climate-related risks. They protect investments and communities from the financial impacts of climate-related events which promote resilience and recovery.
6. *Carbon Pricing Mechanisms*: These are market-based instruments that put a price on carbon emissions, such as carbon taxes. Their main purpose is to put incentives on the reduction of greenhouse gas emissions by making it more cost-effective to implement low-carbon initiatives.
7. *Blended Finance*: This is whereby both public and philanthropic funds are used strategically to attract private sector investment into climate projects. Blended financing mechanism helps in leveraging inadequate public financial resources to unlock more amounts of finance from the private sectors.
8. *Green Bonds*: Green bonds refer to debt instruments specifically used to raise funds for projects with environmental benefits. They provide long-term

financing for large-scale climate projects.

#### **6.4.2 Importance of Climate Finance Mechanisms**

- Climate finance mechanisms help in the mobilization of different financial resources from public, private, and international sources.
- By sharing and managing financial risks, these mechanisms make climate projects more attractive to investors.
- Climate finance mechanisms enable the scaling up of successful climate initiatives by providing the necessary financial support.
- Effective climate finance mechanisms ensure that climate finance reaches vulnerable communities, promoting social inclusion and equity.
- They support the development of innovative climate technologies and solutions.

#### **6.4.3 Challenges in climate finance**

1. The difference between the amount of finance that is needed to address climate change impacts and the amount of available climate finance is significant.
2. Developing countries often face challenges accessing climate finance due to complex application processes and stringent requirements.
3. Private sector investment is not sufficient to meet climate finance needs for adaptation and mitigation.
4. Ensuring that climate funds are used effectively and for their intended purposes is often a challenge.

#### **6.4.4 Funding Sources at the Local Level**

- a. *County Climate Change Fund*: This is a public fund designed to finance local adaptation and managed at the discretion of the county government, CCCFs are capitalized from a variety of sources, including county budgets, the National Climate Change Fund, domestic and international partners. Most of the fund (70 percent) is allocated towards level investment to finance local adaptation, with the remaining 30 percent divided between county-level investments and operational costs. Communities are informed of their budgets in advance of planning to allow identification and implementation of projects that are within the budget.

# MODULE SEVEN (7): GENDER AND SOCIAL INCLUSION IN CLIMATE CHANGE

## Module Objective

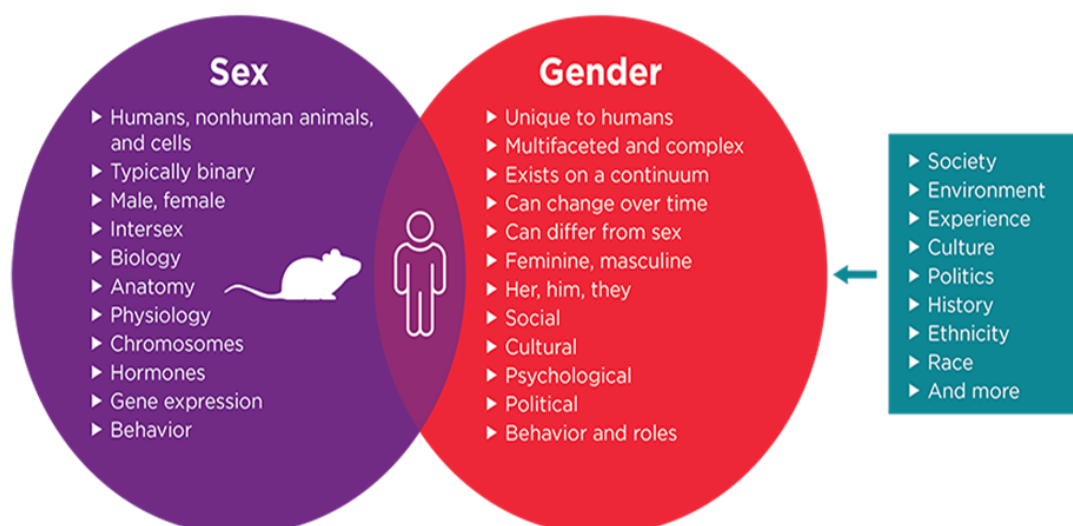
By the end of this module, the learner should be able to:

1. Differentiate between sex and gender
2. Define different gender concepts
3. Identify differentiated climate change impacts on men and women
4. Identify different socially excluded groups
5. Describe the importance of social inclusion in climate action
6. Identify climate related policy frameworks that incorporate a gender lens.

## Delivery approach

4. Theory
5. Group discussions
6. Case studies

## 7.0 Gender Concepts



Source: [Taconic Biosciences](#)

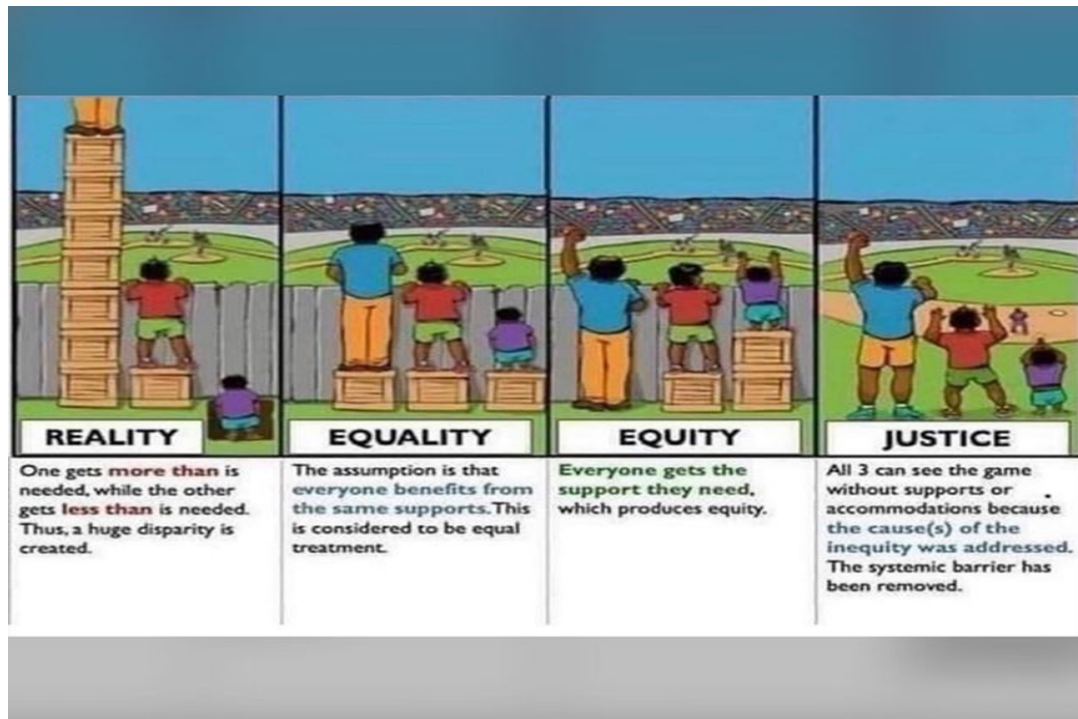
| CONCEPT            | DEFINITION   |
|--------------------|--|
| Gender             | A social and cultural concept that varies widely across different cultures and time periods. They include roles, behaviors and attributes that a given society considers appropriate for men and women.  |
| Sex                | Biological characteristics between males and females, such as chromosomes and hormones.  |
| Gender roles       | Responsibilities that are culturally and socially constructed and considered appropriate for men and women. These roles can vary widely across different cultures and time periods. They influence various aspects of life e.g. career choices, family responsibilities and social interactions etc.               |
| Gender stereotypes | Beliefs about the characteristics, behaviors, and roles of men and women. They are often based on traditional and outdated notions of gender roles and can lead to discrimination and inequality.  |
| Gender equality    | Refers to the freedom of all people to develop their personal abilities and make decisions without being constrained by stereotypes about gender roles. It also suggests that the interests, needs, and priorities of men and women are taken into consideration, acknowledging the diversity of different groups. |
| Gender equity      | It concerns the equitable and just treatment of both sexes, taking into consideration the disparate needs of men and women, cultural hurdles, and historical discrimination against them. Refers to treating men and women equally and ensuring that results and outcomes are equal.                               |
| Gender justice     | Gender justice means that everyone, no matter if they are a girl or a boy, a woman or a man, has the same rights, opportunities, and respect. It's about fairness and treating everyone equally. It helps achieve both equity and equality. (equal outcomes for all).  |

For further reading on gender related concepts refer to [UNICEF Glossary of terms](#)

## 7.1 Justification for gender considerations in climate action

Gender considerations are important in climate action due to the disproportionate impact climate change has on women and girls. Integrating gender perspectives into climate policies ensures that the needs and experiences of women are addressed, leading to more effective and equitable solutions. Furthermore, women possess invaluable knowledge and skills in areas like agriculture and resource management, making their inclusion important for developing sustainable strategies. By empowering women and promoting gender equality, we can build more resilient communities and accelerate progress towards a climate-resilient future

## 7.2 Differentiated climate change impacts on men and women



Source: [National Alliance for Partnership in Equity](#)

**Climate change vulnerability** refers to how likely a person, community, or system is to be harmed by the effects of climate change. It depends on their exposure to climate impacts, their sensitivity to those impacts, and their ability to adapt or cope with them. Climate change disproportionately affects women and girls, aggravating existing gender inequalities. Women, especially in developing countries, are often more vulnerable to the effects of climate change due to their roles in food production, water collection, and caregiving. They may have less access to resources, information, and decision-making processes.

Men might face different risks, such as those related to labor-intensive jobs in agriculture and fishing, which can be heavily impacted by climate variability.

### Women's Increased Vulnerability

- Economic Impact:* Women are often the primary caregivers and food providers in many communities. With changing climate patterns and reduced crop yields, women bear the brunt of food insecurity. They spend more time and energy gathering resources, limiting their opportunities for education, employment, and decision-making.
- Health Risks:* Climate-related disasters and diseases, such as malaria and malnutrition, disproportionately affect women. Increased burdens of water collection and cooking fuel gathering put them at higher risk of physical harm.
- Limited Access to Resources:* Women often have limited land ownership rights and access to financial resources. This hinders their ability to adapt to climate change and rebuild their lives after disasters.
- Decision-Making:* Women are often excluded from decision-making processes related to climate change policies and resource management, limiting their ability to influence solutions that address their specific needs.

## Men's Vulnerability

While women face unique challenges, men are not immune to the impacts of climate change.

- a. *Livelihood Loss*: Men working in agriculture or related sectors are particularly vulnerable to climate-related shocks like droughts and floods, leading to job loss and economic hardship.
- b. *Migration*: Climate change can force men to migrate in search of work, putting stress on families and communities.
- c. *Conflict*: Competition for scarce resources due to climate change can lead to increased conflict, affecting men's safety and well-being.

For further reading on differentiated climate change impacts on men and women please click here: [https://unfccc.int/sites/default/files/resource/sbi2019\\_inf8.pdf](https://unfccc.int/sites/default/files/resource/sbi2019_inf8.pdf)

For further reading on Gender roles and gender stereotypes, please visit: <https://www.ohchr.org/en/women/gender-stereotyping>

## 7.3 Gender in Climate Action

Incorporating a gender lens into climate policies and programs is crucial for several reasons:

- a. *Helps in addressing disproportionate impacts*: Women are often more vulnerable to the impacts of climate change due to pre-existing gender inequalities.
- b. *Leveraging Women's Potential*: Women possess invaluable knowledge about local ecosystems and sustainable practices. Their insights can contribute to effective climate solutions.
- c. *Leadership*: Empowering women in decision-making roles can lead to more inclusive and effective climate policies.
- d. *Building Resilience*: Supporting Community-Based Solutions initiatives can enhance overall resilience.
- e. *Early Warning Systems*: Involving women in developing and disseminating early warning systems can improve disaster preparedness and response.
- f. *Ensuring Equity*- A gender-responsive approach helps ensure that climate actions benefit both men and women equally.
- g. *Rights-Based Approach*- Integrating gender perspectives promotes human rights and social justice.
- h. *Strengthening Climate Action*- Climate policies that consider gender are more likely to be effective and sustainable.
- i. *Public Support*- Addressing gender inequalities can increase public support for climate action.

## 7.4 Strategies for Gender-Sensitive Climate Action

Gender-sensitive climate action involves recognizing and addressing the different impacts of climate change on women and men, and ensuring that climate policies and programs benefit both genders equally. Here are some key strategies:

1. *Data Collection and Analysis*- Collect gender-disaggregated data on how

climate change impacts women and men differently. This data is essential for understanding the problem and designing effective solutions.

2. *Gender analysis*- Conduct gender analysis of existing climate policies and programs to identify gaps and opportunities for improvement.
3. *Gender mainstreaming*- Integrate gender perspectives into all stages of climate policy development, implementation, monitoring, and evaluation.
4. *Gender-responsive budgeting*: Allocate resources specifically for gender-sensitive climate actions.
5. *Women's leadership*- Increase women's participation in climate decision-making at all levels.
6. *Capacity Building*- Provide training on gender equality and climate change to policymakers, practitioners, and community members. Invest in programs that empower women to participate in climate action and leadership.
7. *Local knowledge*- Incorporate traditional knowledge and practices of women into climate solutions.
8. *Access to finance*- Facilitate women's access to climate finance through capacity building and financial literacy programs.

## 7.5 Social Inclusion in Climate Change

**Social inclusion** is the process of ensuring that all people have equal opportunities to participate fully in society and enjoy the same rights and benefits. It involves creating a society where everyone feels valued, respected, and connected, regardless of their background, identity, or circumstances.

### 7.5.1 Socially excluded groups

#### People Living with Disabilities (PWDs)

During climate-induced disasters like floods, PWDs who have mobility challenges, vision or hearing loss, or rely on assistive devices might face difficulties evacuating quickly. Emergency warnings may also not be accessible in formats usable by PWDs especially in the rural areas. These challenges make them vulnerable to climate change impacts.

#### Fishing communities

The Lake Region Economic Bloc (LREB) region hosts a number of fishing communities because of the presence of Lake Victoria. The increasing lake pollution harms fish populations, threatening the livelihoods of fishing communities. Erratic weather patterns also disrupt fishing seasons, making fish harvesting unpredictable.

#### Widows and widowers

Climate change can disrupt economic activities thereby impacting the income that deceased spouses may have provided. Disasters like floods especially along the river Nyando can damage social support networks, leaving widows and widowers feeling more vulnerable.



### **Casual and migrant workers**

In the lake region, extreme weather events, especially floods, have occasionally forced people to migrate in search of safer places to live in. This has subjected these vulnerable populations to loss of work and social institutions like families and communities.

### **Orphaned and Vulnerable Children (OVCs)**

Climate change may cause deaths or displacement, leaving children orphaned and vulnerable. Increased economic hardship can force these children into labor to support their families. Climate change can worsen malnutrition and waterborne diseases, which puts these children's health at risk.

### **Child-headed households**

This is prevalent in the counties of Siaya, Migori and Homabay. Children leading households already face immense challenges. Climate change adds to the burden of caring for younger siblings. These children may struggle to access resources like food, water, and education especially during climate induced disasters.

### **Adolescent Girls and Young Women**

Girls may be pulled out of school to help families cope with climate impacts, limiting their future opportunities. Economic hardship can also lead to child marriages as a survival strategy.

### **The elderly**

Extreme weather events can exacerbate existing health conditions in older adults. Evacuation during disasters may also be difficult for older adults with mobility limitations.

### **Persons Living with HIV**

Climate disasters can disrupt access to essential healthcare services for people living with HIV. Food insecurity caused by climate change can worsen health outcomes for people living with HIV. Moreover, the stress of climate change can exacerbate mental health issues.

It's important to note that these vulnerabilities are not absolute and vary depending on the specific context.

## **7.5.2 The Importance of Social Inclusion in Climate Action**

1. *Equity and Justice:* Climate change disproportionately affects marginalized communities. Social inclusion ensures that these communities are not left behind and have a voice in decision-making processes.
2. *Effective Solutions:* Inclusive approaches lead to more effective climate solutions as they incorporate diverse perspectives and knowledge.
3. *Building Resilience:* Strong social cohesion and inclusivity can enhance a community's resilience to climate impacts.
4. *Legitimacy:* Inclusive climate action builds trust and legitimacy, increasing the

likelihood of successful implementation.

5. *Sustainable Development*: Social inclusion is a fundamental aspect of sustainable development, which is closely linked to climate action.

By prioritizing social inclusion, we can ensure that climate policies and programs are equitable, effective, and sustainable.

### 7.5.3 Inclusion and Climate Impact

#### **Why are socially excluded groups disproportionately affected by climate change**

- **Limited Resources**- Often lack financial resources to prepare for or recover from climate impacts.
- **Vulnerable Living Conditions**- Often live in areas more prone to climate hazards (e.g., floodplains, informal settlements).
- **Health Disparities**- Higher prevalence of pre-existing health conditions make them more susceptible to climate-related diseases. Limited access to healthcare services exacerbates their vulnerability.
- **Restricted Mobility**- Reduced ability to evacuate or relocate during climate emergencies due to financial, physical, or social constraints.
- **Dependence on Climate-Sensitive Livelihoods**- Rely on agriculture, fishing, and other natural resource-based livelihoods that are heavily impacted by climate variability.
- **Social Marginalization**- Limited participation in decision-making processes reduces their influence on climate policies and response strategies. Discrimination and social exclusion hinder their access to support and relief efforts.
- **Inadequate Information and Education**- limited access to information and education on climate risks and adaptation strategies.
- **Inadequate Infrastructure**- Poor infrastructure in their communities makes them more vulnerable to extreme weather events and disasters.
- **Cultural and Language Barriers**- Cultural and language differences can prevent effective communication and dissemination of climate-related information and warnings.

For further reading on Social Inclusion in Climate Change, please refer to the following link: <https://wrд.unwomen.org/explore/insights/people-matter-why-quantifying-inclusion-key-climate-adaptation>

### 7.6 Gender Audits in Climate Change

Gender audits are important tools for assessing how gender is integrated into climate change policies, programs, and projects. By examining the differential impacts of climate change on women and men, these audits help identify gaps and opportunities for improvement. This knowledge is helpful in designing and implementing effective gender-responsive climate actions. Organizations can improve their awareness of gender disparities in climate change, advance gender equality, and produce more sustainable and successful climate action results by carrying out comprehensive gender audits.

## 7.6.1 Conducting a Gender Audit

A gender audit involves the following steps:

1. **Define the Scope:** Clearly outline the specific climate change initiative or policy to be audited.
2. **Form a Gender Audit Team:** Assemble a diverse team with expertise in gender, climate change, and the specific area of focus.
3. **Data Collection:** Gather relevant data, including policies, plans, budgets, project documents, and statistics on gender-disaggregated indicators.
4. **Gender Analysis:** Analyze the collected data to identify gender differences, inequalities, and biases.
5. **Stakeholder Consultation:** Engage with women and men from different backgrounds to gather their perspectives and experiences.
6. **Identify Gaps and Opportunities:** Based on the analysis, pinpoint areas where gender considerations are lacking and identify potential areas for improvement.
7. **Develop Recommendations:** Propose specific actions to address identified gaps and enhance gender equality in the climate change initiative.
8. **Develop an Action Plan:** Create a detailed plan for implementing the recommendations, including timelines, responsibilities, and monitoring mechanisms.
9. **Monitoring and Evaluation:** Track the implementation of the action plan and measure its impact on gender equality.

## 7.6.2 Key Areas for Gender Audit in Climate Change

- **Policy Analysis:** This entails examining climate change policies for gender-sensitive language, targets, and implementation mechanisms.
- **Project Assessment:** Evaluate how climate change projects address the specific vulnerabilities of women and men.
- **Budget Analysis:** Analyze the allocation of resources to identify gender disparities in funding for climate change actions.
- **Institutional Assessment:** Evaluate the gender mainstreaming capacity of organizations involved in climate change activities.
- **Climate Impacts and Vulnerability Assessment:** Assess the differential impacts of climate change on women and men, including their roles.

For further reading on gender auditing, please refer to the following resources.

[International Labour Organization-Participatory Gender Audit](#)

[International budget partnership](#)

[Gender Audit-European Institute for Gender Equality](#)

## MODULE EIGHT (8): TECHNOLOGY AND INNOVATION IN CLIMATE

### ACTION

#### Objectives

1. Understand the role of technology and innovation in climate action.
2. Identify technological solutions that can aid in climate adaptation.
3. Propose practical projects that leverage technology for climate resilience.

### 8.0 Introduction

Technology and innovation play a pivotal role in addressing climate change challenges. In Africa, where the impacts of climate change are particularly severe, leveraging technological advancements and innovative practices is essential for building resilient communities. This module explores how various technological tools and innovative practices can enhance climate adaptation efforts, create awareness, and provide practical solutions for grassroots champions.

#### 8.1 Context in Africa

Africa faces unique climate challenges, including increasing temperatures, erratic rainfall patterns, prolonged droughts, and more frequent extreme weather events. These changes adversely affect agriculture, water resources, and overall livelihoods, particularly in rural communities. However, Africa also presents unique opportunities for innovation and the application of technology to mitigate and adapt to these climate impacts.

#### 8.2 Key concepts

These concepts are central to understanding how technology and innovation can be harnessed for climate action, particularly in the African context, as outlined in the module.

| Key Concept                     | Definition   |
|---------------------------------|--|
| <b>Mobile Technology</b>        | A powerful tool for disseminating climate information due to high mobile phone penetration. Examples include mobile apps that provide farmers with weather forecasts, agricultural advice, and market prices, enabling informed decision-making. |
| <b>Remote Sensing &amp; GIS</b> | Technologies used to monitor environmental changes, track deforestation, manage water resources, and predict extreme weather events. These tools provide valuable data that guide climate adaptation strategies.                                 |
| <b>Renewable</b>                | Sustainable energy sources such as solar and wind power, used to reduce  |

|  |   |
|--|---|
| <b>Energy Solutions</b>                  | carbon footprints, enhance energy security, and support sustainable agriculture. Examples include solar-powered irrigation systems and community solar projects.  |
| <b>Innovative Agricultural Practices</b> | Techniques and innovations aimed at increasing agricultural resilience. Examples include drought-resistant crop varieties, precision farming techniques, and smart irrigation systems, all of which optimize resource use and improve crop yields under changing climatic conditions. |
| <b>Community-Based Adaptation</b>        | Grassroots innovations driven by local knowledge and practices that play a significant role in climate adaptation. Examples include community-managed reforestation projects, water harvesting techniques, and indigenous seed banks.   |
| <b>Social Media Campaigns</b>            | Utilizing platforms like Facebook, Twitter, and Instagram to disseminate information about climate change impacts and adaptation strategies.  |
| <b>E-Learning Platforms</b>              | Online courses and webinars designed to educate communities about climate resilience and adaptation strategies.   |
| <b>Early Warning Systems</b>             | Tools like flood warning sensors and drought monitoring tools that provide communities with timely alerts about impending climate events, allowing them to prepare and mitigate risks.  |
| <b>Smart Agriculture</b>                 | The use of Internet of Things (IoT) devices for precision farming, including soil moisture sensors and automated irrigation systems, to optimize agricultural practices and resource use.   |
| <b>Community Solar Projects</b>          | Installation of solar panels in community centers to provide clean energy, thereby reducing dependence on fossil fuels and promoting renewable energy use.  |
| <b>Digital Literacy Programs</b>         | Initiatives aimed at enhancing community members' skills in using smartphones, computers, and the internet to access climate information and technological tools for adaptation.  |
| <b>Coding for Climate Solutions</b>      | The process of using coding and software development to create applications that support climate adaptation efforts, such as weather apps, agricultural advisory apps, and energy management apps.  |
| <b>Capacity Building</b>                 | Training and empowering communities to effectively use and maintain technological solutions for climate adaptation, ensuring they can leverage technology for sustainable development.  |
| <b>Policy and Infrastructure</b>         | The development of supportive policies and infrastructure that facilitate the adoption and scaling of technological innovations in climate action, making them more accessible and impactful.   |

### 8.3 Technological Tools and Innovations in Africa

1. **Mobile Technology:** With high mobile phone penetration, mobile technology is a powerful tool for disseminating climate information. For instance, mobile apps can provide farmers with weather forecasts, agricultural advice, and market prices, enabling them to make informed decisions.
2. **Remote Sensing and GIS:** These technologies are used to monitor environmental changes, track deforestation, manage water resources, and predict extreme weather events. They provide valuable data that can guide climate adaptation strategies.
3. **Renewable Energy Solutions:** Africa has vast potential for renewable energy, particularly solar and wind. Implementing solar-powered irrigation systems and community solar projects not only reduces carbon footprints but also enhances

- energy security and supports sustainable agriculture.
4. **Innovative Agricultural Practices:** Innovations such as drought-resistant crop varieties, precision farming techniques, and smart irrigation systems are being adopted to increase agricultural resilience. These practices help optimize resource use and improve crop yields under changing climatic conditions.
  5. **Community-Based Adaptation:** Grassroots innovations, often driven by local knowledge and practices, play a significant role in climate adaptation. Examples include community-managed reforestation projects, water harvesting techniques, and indigenous seed banks.

## 8.4 Examples from Africa

1. **Kenya:** The use of M-Farm, a mobile platform, connects farmers with buyers, provides market information, and offers weather forecasts, helping farmers plan better and reduce post-harvest losses. MFarm Ltd is a software solution and agribusiness company. Their main product, M-Farm, is a transparency tool for Kenyan farmers where they simply SMS the number 20255 (Safaricom Users) to get information pertaining to the retail price of their products, buy their farm inputs directly from manufacturers at favorable prices, and find buyers for their produce. <https://www.farm-d.org/organization/mfarm-ltd-kenya/>

### M-SHAMBA

M-shamba digital platform supports digital learning on agronomy, climate smart interventions and food safety to the farmers through the Interactive Voice Response (IVR) service and interactive SMS. The platform also connects the farmers to the experts in the field through the Cloud Based Virtual Call Centre for real time and personalized support. <https://m-shamba.net/>

2. **Ethiopia:** The Productive Safety Net Programme (PSNP) uses early warning systems and community-based risk reduction strategies to build resilience against droughts and food insecurity.
3. **Nigeria:** The Green Energy Biofuels initiative promotes the use of clean cookstoves and biofuels, reducing reliance on wood fuel and mitigating deforestation while improving health outcomes.

## 8.5 Role of Technology & Innovation in Climate Action

### a. Creating Awareness

- **Social Media Campaigns:** Utilize platforms like Facebook, Twitter, and Instagram to disseminate information about climate change impacts and adaptation strategies.
- **Mobile Applications:** Develop apps that provide real-time weather updates, climate news, and tips for adaptation.
- **E-Learning Platforms:** Online courses and webinars to educate communities about climate resilience.

### b. Technological Solutions

- **Remote Sensing & GIS:** Monitor climate variables, track changes in land use, and identify vulnerable areas.

- **Renewable Energy Solutions:** Solar panels, wind turbines, and biogas systems to reduce dependence on fossil fuels.
- **Smart Agriculture:** Use of IoT devices for precision farming, soil moisture sensors, and automated irrigation systems.

## 8.6 Examples of Technological Solutions

### a. Early Warning Systems

- **Flood Warning Systems:** Sensors and automated alerts to notify communities of impending floods.
- **Drought Monitoring Tools:** Satellite data to monitor drought conditions and predict water scarcity.

### b. Mobile Applications

- **Climate Smart Agriculture (CSA) App:** Provides farmers with weather forecasts, pest alerts, and best farming practices.
- **Disaster Preparedness App:** Educates users on emergency procedures and resources available during climate disasters.

### c. Renewable Energy Initiatives

- **Solar-Powered Irrigation:** Use of solar pumps to provide reliable water supply for agriculture.
- **Community Solar Projects:** Installation of solar panels in community centers to provide clean energy.

## 3. Opportunities for Grassroots Champions

### a. Community Engagement

- **Workshops & Training:** Organize sessions to train community members on the use of technology in climate adaptation.
- **Digital Literacy Programs:** Enhance skills in using smartphones, computers, and the internet for accessing climate information.

### b. Partnerships & Collaborations

- **Tech Companies:** Collaborate with tech firms to develop and deploy climate adaptation tools.
- **Research Institutions:** Partner with universities and research centers for innovative solutions and data analysis.

## 8.7 Practical Project Proposal for the Grassroots Community

**Project Title:** Empowering Farmers through Smart Agriculture Technologies

**Objective:** Enhance the resilience of smallholder farmers to climate variability through the use of smart agriculture technologies.

**Group Work Focus**

**Priority Sectors**

- Agriculture
- Water Management



- Renewable Energy

### Indicators

- **Crop Yield:** Measured in tons per hectare.
- **Water Use Efficiency:** Liters of water used per kilogram of crop produced.
- **Energy Savings:** Kilowatt-hours of renewable energy generated.

### Units of Measurement

- Tons, liters, kilowatt-hours, number of users, and app downloads.

### Innovative Response

- **Smart Agriculture App:** An application that provides tailored farming advice, weather forecasts, pest and disease alerts, and market prices.

### Model of a Farmer Field School (FFS)

1. **Selection of Farmers:** Identify and select a diverse group of farmers interested in adopting smart technologies.
2. **Training Sessions:** Conduct regular training sessions on the use of smart agriculture technologies and the smart agriculture app.
3. **Demonstration Plots:** Establish demonstration plots where farmers can see the technologies in action.
4. **Monitoring & Evaluation:** Regularly monitor the progress and impacts of the technologies on crop yield, water use efficiency, and energy savings.

### Expected Outcomes:

- Increased crop yields and income for farmers.
- Improved water use efficiency and reduced dependency on rain-fed agriculture.
- Enhanced knowledge and adoption of renewable energy technologies.

## 5. Use of Coding to Create Apps for Climate Adaptation and Awareness

### a. Introduction to Coding for Climate Solutions

Coding and software development offer powerful tools for creating applications that can aid in climate adaptation and raise awareness about climate change. By learning basic coding skills, grassroots champions can develop custom solutions tailored to their communities' needs.

### b. Examples of Coding Projects

- **Weather Apps:** Create mobile applications that provide real-time weather forecasts, alerts for extreme weather events, and advice on how to prepare.
- **Agricultural Advisory Apps:** Develop apps that offer farming tips, pest and disease alerts, and market price information.
- **Energy Management Apps:** Build applications to monitor and manage renewable energy systems, track energy usage, and suggest efficiency improvements.

### c. Learning Resources

- **Online Courses:** Platforms like Coursera, edX, and Udacity offer coding courses that can help beginners learn the basics of app development.
- **Community Workshops:** Organize local workshops to teach coding skills and collaborate on developing climate-related applications.
- **Coding Bootcamps:** Intensive coding bootcamps can provide in-depth training and hands-on experience in app development.

#### d. Practical Coding Exercise

**Project Title:** Developing a Community Weather Alert App

**Objective:** To create a mobile app that provides real-time weather updates and alerts to help the community prepare for extreme weather events.

##### Steps

1. **Define Features:** Determine the key features of the app, such as real-time weather updates, extreme weather alerts, and preparedness tips.
2. **Choose a Platform:** Decide whether to develop the app for Android, iOS, or both.
3. **Learn Basic Coding:** Use online resources to learn the basics of the chosen programming language (e.g., Java for Android, Swift for iOS).
4. **Develop the App:** Write the code, test the app, and gather feedback from potential users.
5. **Deploy and Promote:** Launch the app on the relevant app stores and promote it within the community.

##### Expected Outcomes

- Improved community preparedness for extreme weather events.
- Increased awareness of weather patterns and their impacts.
- Enhanced coding skills among grassroots champions.

### 8.8 Challenges and Opportunities

While technological solutions offer great potential, several challenges must be addressed to maximize their impact:

- **Access and Affordability:** Ensuring that technological tools are accessible and affordable for all, especially marginalized and remote communities.
- **Capacity Building:** Training and empowering communities to effectively use and maintain technological solutions.
- **Policy and Infrastructure:** Developing supportive policies and infrastructure to facilitate the adoption and scaling of innovations.

##### Opportunities

- **Collaboration:** Partnerships between governments, NGOs, the private sector, and local communities can drive innovation and resource mobilization.
- **Funding and Investment:** Increased funding and investment in climate-smart technologies and practices can spur further innovation and implementation.
- **Research and Development:** Continued research and development tailored to local contexts can yield more effective and sustainable solutions.

