

## UNIT 6: CLIMATE CHANGE

### Climate Change: Causes and Effects

#### 6.1. Definition of Climate Change

Climate change refers to significant, long-term changes in the global climate, particularly in temperature, precipitation, and wind patterns. It is driven by both natural processes and human activities, leading to a systematic change in the Earth's climate over decades or longer.

##### 6.1.1. Causes of Climate Change

###### 1. Natural Causes:

- **Solar Radiation:** Variations in solar energy received by Earth.
- **Volcanic Activity:** Eruptions release greenhouse gases and particulates.
- **Earth's Orbit:** Changes in Earth's orbit and axial tilt affect climate patterns.

###### 2. Anthropogenic (Human-Induced) Causes:

- **Greenhouse Gases (GHGs):** Human activities significantly increase GHG concentrations, altering the Earth's energy balance. Key GHGs include:
  - **Carbon Dioxide (CO<sub>2</sub>):** Major source is the burning of fossil fuels (coal, oil, gas), which releases CO<sub>2</sub> and traps heat.
  - **Methane (CH<sub>4</sub>):** Emitted during livestock digestion, rice cultivation, and landfills.
  - **Nitrous Oxide (N<sub>2</sub>O):** Released from fertilizers and industrial processes.
  - **Hydrofluorocarbons (HFCs) and Perfluorocarbons (PFCs):** Used in industrial applications and refrigeration.

###### 3. Greenhouse Effect:

- **Mechanism:** GHGs trap heat in the atmosphere, preventing it from escaping into space, thus warming the Earth. This effect is crucial for maintaining habitable temperatures but is intensified by human activities.

#### 6.2. Effects of Climate Change

##### 1. Temperature Changes:

- **Rising Global Temperatures:** Increased heat due to higher concentrations of GHGs.

## 2. Extreme Weather Events:

- **Heatwaves:** More frequent and severe.
- **Heavy Precipitation:** Increased rainfall leading to floods.
- **Storms:** Higher intensity due to increased atmospheric moisture.

## 3. Sea-Level Rise:

- **Melting Ice:** Polar ice sheets and glaciers are melting, contributing to rising sea levels.
- **Thermal Expansion:** Warming oceans expand, raising sea levels.

## 4. Ecosystem Impacts:

- **Biodiversity Loss:** Altered habitats force species to migrate or face extinction.
- **Ocean Acidification:** Increased CO<sub>2</sub> levels lead to higher acidity in oceans, affecting marine life.

## 5. Agriculture:

- **Reduced Productivity:** Changes in temperature and precipitation patterns can lower crop yields and disrupt food supply.

## 6. Forests:

- **Disturbances:** Increased frequency of pests, diseases, and wildfires can diminish forest health and productivity.

## 7. Health Impacts:

- **Heat-Related Illnesses:** More heatwaves lead to higher risks of heatstroke and related conditions.
- **Vector-Borne Diseases:** Altered climates can expand the range of diseases like malaria and dengue fever.

## 8. Natural Disasters:

- **Increased Intensity:** Higher global temperatures can lead to more severe droughts, storms, and flooding.
- **Rising Sea Levels:** Flooding of coastal areas due to melting ice and thermal expansion.

Understanding these causes and effects of climate change is essential for developing strategies to mitigate its impact and adapt to its consequences.

### 6.3 International Conventions on Climate Change

Climate change is a global issue that requires international cooperation and coordinated action. Various international conventions and agreements have been established to address climate change and its impacts. Here's an overview of key international conventions and Ethiopia's role in implementing them:

#### 1. The United Nations Framework Convention on Climate Change (UNFCCC)

- **Overview:** Established in 1992, the UNFCCC is the primary international treaty aimed at combating climate change. Its goal is to stabilize greenhouse gas concentrations in the atmosphere to prevent dangerous human interference with the climate system.
- **Key Objectives:**
  - To prevent dangerous anthropogenic interference with the climate system.
  - To achieve stabilization of greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system.
- **Ethiopia's Role:** Ethiopia is a party to the UNFCCC and has been actively involved in its initiatives, including national climate action plans and adaptation strategies.

#### 2. The Kyoto Protocol

- **Overview:** Adopted in 1997, the Kyoto Protocol is an international agreement that extends the UNFCCC. It commits industrialized countries and economies in transition to limit and reduce greenhouse gas emissions based on agreed targets.
- **Key Provisions:**
  - Industrialized countries were legally obliged to cut their greenhouse gas emissions by an average of 5% below 1990 levels during the first commitment period (2008-2012).
  - The protocol introduced market mechanisms, such as emissions trading, to help countries meet their targets.
- **Ethiopia's Role:** While developing countries like Ethiopia were not required to reduce emissions, the protocol encouraged them to adopt policies that promote sustainable development and green growth.

### 3. The Paris Agreement

- **Overview:** Adopted in 2015, the Paris Agreement represents a significant milestone in international climate policy. It aims to strengthen the global response to climate change by keeping global temperature rise well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C.
- **Key Provisions:**
  - Each country is required to submit Nationally Determined Contributions (NDCs) outlining their climate action plans and targets.
  - The agreement emphasizes adaptation to climate impacts, enhancing climate resilience, and aligning financial flows with low greenhouse gas emissions.
- **Ethiopia's Role:** Ethiopia has committed to the Paris Agreement's goals through its Nationally Determined Contributions, focusing on reducing greenhouse gas emissions, enhancing climate resilience, and supporting sustainable development.

### 4. Implementation of Conventions in Ethiopia

- **Green Legacy Initiative:** Launched in 2019, this initiative aims to plant 20 billion trees over four years to combat deforestation and enhance climate resilience. It includes efforts in agroforestry, urban greening, and integrated water and soil resource management.
- **Great Ethiopian Renaissance Dam (GERD):** The GERD is a major hydroelectric project on the Blue Nile River, designed to generate 5.15 gigawatts of electricity. It supports Ethiopia's climate resilience and economic development by addressing energy shortages and promoting regional cooperation.
- **Climate Resilient Green Economy (CRGE) Strategy:** Endorsed in 2011, this strategy aims to build a climate-resilient economy by promoting sustainable practices, reducing greenhouse gas emissions, and enhancing adaptive capacity.

Through these conventions and national initiatives, Ethiopia demonstrates its commitment to addressing climate change and contributing to global efforts to mitigate its impacts.