

UNIT TWO: CLIMATE OF AFRICA

Introduction

. The climate of Africa is diverse and complex, with various regions experiencing different climate types. Understanding these climate zones is essential for studying the continent's environment, agriculture, and human activities. As you progress through this unit, you will learn more about how these climates impact the lives of people in Africa and the challenges posed by climate change.

Climatic Zones and Regions of the World

Climatic zones are broad areas with similar climate characteristics, often spreading in an east-west direction around the Earth. These zones are classified based on factors like temperature and precipitation. A climatic region is a continuous geographic area where similar climate conditions are observed. While average temperature is the most crucial factor in determining climate regions, precipitation and other weather elements also play significant roles.

Global Climate and Climate Classifications

Global climate refers to the average climate of the Earth, considering all regional differences. Scientists classify climates to better understand the conditions a region typically experiences throughout the year. One of the most widely used classification schemes is the Köppen Climate Classification, developed by German climatologist Wladimir Köppen. This system categorizes the world's climates based on temperature and precipitation data.

Köppen identified five principal climate groups:

- **A (Humid Tropical):** Warm and humid climates.
- **B (Dry):** Climates with low precipitation.
- **C (Humid Middle-Latitude, Mild Winters):** Moderate temperatures with milder winters.
- **D (Humid Middle-Latitude, Severe Winters):** Cold winters with significant seasonal temperature variations.
- **E (Polar):** Extremely cold climates.
- **H (Highland):** Climates determined by altitude, rather than latitude.

World Climate Zones and Regions

Climate zones are determined by the angle at which solar radiation reaches the Earth's surface, causing temperature differences. These zones include:

1. **Tropical Zone (0°–23.5° Latitude):** Near the equator, this zone experiences high temperatures and frequent, heavy rainfall due to the vertical angle of sunlight.
2. **Subtropics Zone (23.5°–40° Latitude):** Characterized by high summer radiation and thinner cloud cover, leading to high temperatures and dry conditions.
3. **Temperate Zone (40°–60° Latitude):** Experiences moderate temperatures and more regular precipitation throughout the year.
4. **Cold Zone (60°–90° Latitude):** Receives the least solar radiation, resulting in cold temperatures and sparse vegetation.

Climate of Africa

Africa's climate is influenced by its position across equatorial and subtropical latitudes, leading to a variety of climate types. Africa lies mainly within the tropical zone, making it a warm continent with diverse climate regions. These regions include:

1. **Equatorial Climate:** Found in Central Africa, this region experiences high temperatures, heavy cloud cover, and frequent convective rainfall.
2. **Tropical Wet-and-Dry (Savanna) Climate:** Characterized by a seasonal rainfall pattern, with a distinct dry season.
3. **Semi-Arid Climate:** Found on the fringes of desert areas, receiving more rainfall than true deserts.
4. **Hot Desert Climate:** Includes the Sahara and Kalahari deserts, with extreme temperature variations between day and night.
5. **Humid Subtropical Climate:** Found in the southeastern coast of Africa, characterized by warm and wet conditions.
6. **Mediterranean Climate:** Experienced in the northernmost and southernmost parts of Africa, with dry summers and wet winters.
7. **Warm Temperate East Coast Climate:** Found along the eastern coast of South Africa, influenced by warm ocean currents and trade winds.
8. **Warm Temperate Continental Climate:** Found in the interior of South Africa, with low rainfall and significant temperature variations.

Factors Controlling the Climate of Africa

Africa's climate is shaped by several key factors that influence temperature and precipitation across the continent. Understanding these factors is crucial for grasping the diverse climatic conditions found in Africa.

1. Latitude and Solar Radiation

Latitude plays a significant role in determining the climate of Africa. The continent spans from approximately 37°N to 34°S, lying mostly within the tropics. Because of its proximity to the Equator, Africa receives high amounts of solar energy year-round. Areas closer to the Equator experience direct sunlight, leading to warmer climates, while regions farther from the Equator receive sunlight at a more oblique angle, resulting in cooler temperatures.

2. Pressure Systems, Winds, and the Intertropical Convergence Zone (ITCZ)

Pressure systems and wind patterns greatly influence Africa's climate. The Subtropical High-Pressure Belts, located around 30° North and South of the Equator, control surface wind patterns. These winds converge at the Equator in the Intertropical Convergence Zone (ITCZ). The ITCZ shifts north and south with the seasons, bringing changes in rainfall patterns. For example:

- **In June (Northern summer):** The ITCZ moves northward, bringing rainfall to regions such as West Africa.
- **In December (Northern winter):** The ITCZ shifts southward, affecting areas like the Congo Basin and Madagascar.

3. Major Ocean Currents

Ocean currents influence the temperature and moisture content of winds that pass over them, which in turn affects the climate of coastal regions.

- **Warm Currents:** These include the Guinea Current in West Africa and the Mozambique Current in Southeast Africa. They bring warm, moist air that leads to increased rainfall in coastal regions.
- **Cold Currents:** Such as the Canary Current along the western Sahara and the Benguela Current along the Namibian coast, bring cooler, drier air, leading to arid conditions and the formation of deserts.

4. Distribution of Land and Water

The distribution of land and water bodies also influences Africa's climate. Coastal regions, influenced by large bodies of water like oceans and lakes, tend to have milder climates with more consistent temperatures. In contrast, the interior regions of the continent, far from large water bodies, experience more extreme temperatures, with hotter days and cooler nights. This phenomenon is known as continentality.

5. Altitude

Altitude affects temperature, with higher elevations experiencing cooler temperatures. For every 1000 meters increase in altitude, the temperature decreases by approximately 6.4°C. This is why mountainous regions like the Ethiopian Highlands have much cooler climates compared to lower-lying areas. For instance, Mount Kilimanjaro, located near the Equator, has a snow-capped peak due to its high altitude.

Benefits of Climate for the Life of People in Africa

Climate plays a crucial role in shaping the lives of people in Africa, influencing everything from where they live to how they earn their livelihoods. The diversity of climates across the continent has a profound impact on agriculture, health, water resources, and overall socio-economic conditions.

2.3.1 Climate and Agriculture in Africa

Agriculture is the backbone of Africa's economy, providing jobs for about 70% of the labor force and contributing over 25% to the Gross Domestic Product (GDP). The majority of farming in Africa relies on natural rainfall, making it highly dependent on climate conditions. Farmers need a balanced mix of sun, warmth, and rain to grow crops successfully. However, Africa's vulnerability to climate change, due to its location and limited resources for adaptation, makes agricultural production challenging. Changes in climate, such as unpredictable rainfall patterns and rising temperatures, can lead to reduced crop yields, affecting food security across the continent.

2.3.2 Climate and Health in Africa

Climate has a direct impact on human health, affecting both environmental and social determinants. For instance, floods can cause drownings, while droughts can lead to food shortages and malnutrition. Extreme temperatures increase the risk of heat-related illnesses. Additionally, climate change can exacerbate the spread of diseases by altering the habitats of vectors like mosquitoes, which carry malaria and other diseases. Africa is particularly vulnerable to these health impacts due to its climate variability and the limited capacity of many regions to adapt to these changes.

2.3.3 Climate and Water Resources in Africa

Water is essential for life, and its availability is closely linked to climate. The amount of water in rivers, lakes, and underground reserves is influenced by climate patterns. In Africa, changes in climate can lead to decreased water

supplies, affecting both drinking water and irrigation for agriculture. As climate change progresses, it could result in the shrinking of water sources, making water scarcity a more pressing issue across the continent.

Conclusion

The climate of Africa is diverse, ranging from deserts to rainforests, each influencing the lives of the people living there. The interaction between climate and various aspects of life, such as agriculture, health, and water resources, highlights the importance of climate in determining the socio-economic conditions of the continent. However, the challenges posed by climate change threaten to disrupt these systems, making it crucial for Africa to develop strategies to adapt and mitigate these impacts.