Climate variability and change are increasingly posing a threat to Western Africa’s socio-economic development and environment. Since the 1970’s, observations indicate significant changes in the region’s climate, particularly in relation to temperature and precipitation. The high dependence of Western African communities and sectors on natural resources makes them vulnerable to climate change impacts such as rises in temperature, changes in annual rainfall, more frequent and intense rainfall events, and sea level rise. Pre-existing physical, ecological, and socio-economic characteristics and stressors increase the region’s vulnerability to extreme events such as storms, flooding, and drought, which are anticipated to become more frequent and intense due to climate change. To date, local, national and regional climate change-related initiatives in Western Africa have focused on identifying climate change impacts, threats, and vulnerabilities, developing adaptation strategies, and implementing adaptation policies, programs, and projects. Nevertheless, there is still a pressing need for data, capacity building, collaboration (at national, regional, and international levels), and financial, human, and technological resources to help strengthen efforts to address current and future impacts of climate change.

**CLIMATE IMPACTS AND VULNERABILITY**

**Historic Weather and Climate**
- Observations indicate a general warming trend across Western Africa. From 1961-2000, the incidence of warm spells has increased and the incidence of cold days has decreased.
- There has been an overall decrease in annual rainfall since the late 1960s, ranging from 20-40 percent, depending on the area.
- Arid zones have experienced more prolonged and frequent droughts since the 1970s.
- In tropical and coastal zones, there has been an increase in the occurrence and frequency of extreme weather events such as storms and severe flooding over the past two decades.

**Projected Weather and Climate**
While projections for Western Africa vary across models depending on assumptions, the majority of climate models predict:
- An overall warming trend throughout the region, with an average temperature increase of up to 0.5° C per decade.
- An overall decline in precipitation across the region of 0.5-40 percent by 2025, with an average decrease of 10-20 percent.
- A rise in sea level of, on average, 0.5-1 m over the next century.

**KEY SECTOR VULNERABILITIES**

**Food Security**
Agriculture, which is the main source of livelihoods in Western Africa, is threatened by climate change. In arid zones, dry spells and droughts lead to increased evaporation, which can reduce water resources and diminish soil moisture and fertility, with negative implications for agricultural yields. In tropical and coastal zones, where famine is already widespread, heavy rainfall events, flooding, and reduced overall annual rainfall are among the main climate threats to agricultural production. Such impacts are likely to degrade soil; significantly reduce rice, plantain, and cassava production, and increase food prices and food insecurity. Non-climate stressors threatening agricultural practices and food security in the region include increased demand for food, over-exploitation of natural resources, and extended use of chemical pesticides. In parts of Western Africa, predictions indicate that by 2020, due to both climate and non-climate stressors, there is a potential 50 percent reduction in yields from rain-fed agriculture if additional adaptation measures are not taken. Within the agriculture and food security sectors there are also several transboundary issues that affect Western African populations. Some transboundary issues that may be intensified by climate change are the spread of animal diseases, land degradation and pollution, food contamination, and natural resource management.
Health
The inadequacy of health infrastructure, services, and access to health care in Western Africa make public health vulnerable to extreme rainfall and temperature events such as droughts, heat waves, and storms, which are all expected to increase as a result of climate change. Meningitis, malaria, and acute respiratory infections are especially sensitive to changes in temperature and precipitation. Increased heavy rainfall and flooding events can accelerate breeding rates and the spread of vector-borne diseases such as malaria. Furthermore, flooding may lead to the contamination of water sources, spreading pathogens and increasing the outbreak of waterborne diseases. Both excessive and extremely low rainfall, as well as extreme temperature events, can increase the incidence of diarrhea and malnutrition, especially among children. (See below for a summary of climate change impacts on health.)

Non-climate stressors can exacerbate the impacts of climate change on health, resulting in major economic and social impacts. Long-term adaptation and development strategies addressing climate and non-climate impacts within the sector are vital.

Water Resources
Western Africa has 17 transboundary rivers, and every country in the region shares at least one surface water source with another country. Surface and groundwater sources are essential to communities, ecosystems, and various economic sectors in the region. Over the past 50 years, the transboundary flow of these surface water sources has been declining due to climate change and increased human demands for water. Declines in rainfall, increases in temperature, and more frequent droughts in Western Africa contribute to the decline in surface and groundwater availability and accessibility. Decreases in surface water also may reduce water levels in dams, which serve as sources for irrigation, water supply, and hydropower generation. By 2025, Benin, Burkina Faso, Ghana, Mauritania, Niger, and Nigeria are all expected to experience water scarcity. In some countries, mainly in tropical zones, the frequency of heavy rainfall events may increase, causing more frequent flooding. Dams, rivers, lakes, and other bodies of water may consequently overflow, potentially causing loss of life, agricultural production, and property. Flooding can also exacerbate health and sanitation problems.

Western African countries are highly dependent on and interdependent in relation to water resources. Therefore, long-term declines in water availability, accessibility, and quality may create transboundary conflicts or tensions among communities that share and depend on the same water sources. Non-climate stressors that affect water resources and may influence potential conflicts include a lack of appropriate frameworks for transboundary water resources management, increased demands for water, and pollution from households, mining, and industrial activities.

KEY ECOSYSTEM VULNERABILITIES

Forests and Grasslands
Western Africa’s forests and grasslands are valuable ecosystems. In addition to hosting a vast diversity of plant and animal species, these ecosystems also provide food, herbal medicines, energy, and tourism for various communities. Warmer temperatures, droughts, and declines in precipitation can lead to loss of vegetation and deterioration of land cover. Increased frequency of drought events can dry out water sources that are vital to the survival of plant and animal species. Increases in intense rainfall events can cause floods, which erode land, soil, watersheds, and ecosystems. Non-climate stressors can further exacerbate the impacts of climate change, and include civil war, population growth, rapid urbanization, poaching, pollution, the introduction of exotic species, and increased demands on forest land for agricultural expansion.
Wetlands

Wetlands are high in plant and animal species diversity, particularly bird and fish populations, and can be found in river basins, lakes, and coastal areas in Western Africa. They provide resources such as fisheries, shellfish, fuelwood, medicine, and agricultural products, and protect human settlements, infrastructure, and various other coastal activities from the impacts of heavy rainfall, storms, and sea level rise. Wetlands are also pertinent to tourism in countries such as Senegal, the Gambia, and Ghana.

More intense rainfall events and storms, decreases in annual rainfall, increases in air and ocean temperature, recurring droughts, and sea level rise have all contributed to the degradation and destruction of freshwater ecosystems and wetlands. These climate impacts reduce the ability of wetlands to serve as buffers and provide resources for human and economic activities. Loss of biodiversity, the colonization of invasive plant species, and salinization have been some of the main consequences of climate change on wetlands. In urban and peri-urban areas, population pressures, infrastructural developments, the exploitation of fisheries, and human and industrial waste are among the non-climate stressors that have added to the loss of wetlands.

Coastal Zones

The Western African coastline hosts about 40 percent of the region’s population, as well as significant economic activity, infrastructure, communities, and homes, all of which are likely to become increasingly concentrated as coastal areas and cities continue to experience rapid population growth. With projected rises in sea level, Western Africa’s coastal areas are increasingly vulnerable to erosion, salt water intrusion, and flooding. These impacts threaten ecosystems, fisheries, agricultural land, freshwater systems, and communities that depend on these coastal resources for their livelihoods, food, and fuel.

REGIONAL STRATEGIES, PLANS AND INSTITUTIONS RELEVANT TO CLIMATE CHANGE

Regional Strategies and Plans

Over the past two decades, many Western African countries have proposed structural and economic measures to strengthen their capacity and to adapt to future predicted climate changes in their Initial National Communication (INC) and National Adaptation Programme of Action (NAPA). The INCs present information on key sector vulnerabilities, possible adaptation strategies, and the policy and institutional context for responding to climate change. The NAPAs aim to communicate immediate adaptation needs, strategies, and priorities, as well as possible methods of implementation. In addition, the African Union has made climate change adaptation a priority and plans to support the integration of climate considerations into national and regional, sectoral, and development programs, policies, and activities.

Regional Institutional Framework

The Permanent Interstate Committee for Drought Control in the Sahel (CILSS) is one of the most significant responses to the droughts that have been reoccurring in Western Africa’s arid regions since the early 1970s. The CILSS has been involved in agro-hydro-climatic data collection and management, setting up of an early warning system, as well as research and training through the AGRHYMET Regional Centre for Training and the Application of Agrometeorology and Operational Hydrology.

Members of the Economic Community of West African States (ECOWAS) have increased discussions, meetings, and capacity building efforts to help strengthen their participation in international negotiations on climate change and access funds directly for climate change initiatives. Further, ECOWAS is focused on developing strategies to integrate climate change into its development programs and encouraging the successful implementation of NAPAs in the region.

REGIONAL ADAPTATION PRIORITIES

There are a number of adaptation priorities for the agriculture, fisheries, water, and health sectors in Western Africa. General adaptation priorities include:

- Building the capacity of non-governmental organizations (NGOs) and associations involved in climate change adaptation.
- Increasing public environmental education and awareness.
- Improving weather forecasting and early warning systems.
- Decentralizing local governance of financial resources for climate change.
- Incorporating traditional adaptation strategies to climate variability and extreme events such as drought into adaptation plans.

Overall, these adaptation priorities align with those identified in the NAPAs of countries in Western Africa.

KEY PLAYERS AND INITIATIVES

Regional actors and networks that focus on and fund environmental and climate-change related initiatives in the region include the African Union, African Development Bank (AfDB), Environmental Development Action in the Third World, Organization for the Development of the Senegal River Basin, Niger Basin Authority (NBA), and the Global Water Partnership West Africa. Many initiatives in the region have also been led and/or financed by international agencies, institutions, and NGOs working with regional
partners. Entities include the European Union, United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), United Nations Food and Agriculture Organization (FAO), United Kingdom Department for International Development (DFID), German Agency for International Cooperation (GIZ), International Crops Research Institute for the Semi-Arid Tropics, and French Research Institute for Development. These entities have been involved in initiatives directly and indirectly related to climate change adaptation within the agriculture, food security, water resources, forestry, health, and coastal zone management sectors.

### Selected Initiatives

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Lead Organization</th>
<th>Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengthening the Capacities of Permanent Interstate Committee for Drought Control in the Sahel Member States to Adapt to Climate Change (Burkina Faso, Chad, Gambia, Guinea Bissau, Mali, Mauritania, Niger, Senegal)</td>
<td>AGRHYMET Regional Centre for Training and the Application of Agrometeorology and Operational Hydrology (ARC)</td>
<td>Canadian International Development Agency</td>
</tr>
<tr>
<td>Seasonal Rain and Flow Regimes Forecast Project in West Africa</td>
<td>African Center of Meteorological Application for Development (ACMAD)/ARC/NBA</td>
<td>ACMAD/NBA/ARC</td>
</tr>
<tr>
<td>Africa Water Vision for 2025 – Effective management of droughts, floods, and desertification in half of African countries by 2015 and in all countries by 2025</td>
<td>AfDB/African Union</td>
<td>AfDB</td>
</tr>
<tr>
<td>Adaptation to Climate and Coastal Change in West Africa – Responding to shoreline change and its human dimensions in West Africa through integrated coastal area management (Senegal, Guinea Bissau, Gambia, and Mauritania)</td>
<td>UNDP/United Nations Educational, Scientific and Cultural Organization/Intergovernmental Oceanographic Commission</td>
<td>Global Environment Facility: Strategic Priorities on Adaptation</td>
</tr>
</tbody>
</table>

### PRIORITY CHALLENGES AND CONSTRAINTS FOR DECREASING VULNERABILITY AND INCREASING RESILIENCE

Western Africa is highly vulnerable to climate variability and change, and decision-makers, stakeholders, and civil society need to be better informed about the threats posed by climate change and extreme weather events. Increased availability and accessibility of this information will strengthen their capacity to develop appropriate adaptation strategies to address current and future regional and transboundary climate challenges. Improving networks and collaboration at the regional level will also help the region strengthen its financial, technical, and human capacities to increase its climate resilience. In addition, there are several data, research, and capacity needs. These include:

- Conducting quality local-scale assessments and studies, collecting data to further understanding of climate impacts and vulnerabilities, and helping to identify adaptation options in the following sectors: agriculture and food security, health, energy, water management, forestry, and land use.
- Researching effects of climate change on groundwater.
- Increasing awareness and understanding of regional threats posed by climate change and variability, particularly in the long term.
- Exchanging regional adaptation experiences, best practices, and indigenous knowledge.
- Strengthening the capacity (technical and scientific) of decision-makers and stakeholders involved in climate change and adaptation efforts at regional and national levels through training programs, workshops, and other measures.
- Improving institutional frameworks and structures to facilitate adaptation plans; establishing national climate change committees and specific climate change institutions.
- Mainstreaming climate factors into development and economic planning at national and regional levels.

Mainstreaming adaptation into national and regional economic and social development plans, frameworks, and priorities will be vital in minimizing the effects of climate change on sustainable development.

### KEY SOURCES


### CLIMATE CHANGE ADAPTATION IN WESTERN AFRICA