

Climate Change Adaptation in LIBERIA

Liberia is vulnerable to the impacts of climate variability and change, such as warmer temperatures, increases in annual rainfall, and increases in the frequency of heavy rainfall events. These climate change impacts present challenges to the country's socio-economic development. Liberia's low adaptive capacity to respond to climate change is partially due to the detrimental effects of the 1989-2003 civil war. Since the war, the government, along with various international and national institutions and organizations, has been taking actions to better understand and address climate change challenges throughout the country. Remaining needs include data on short- and long-term climate change impacts and vulnerabilities within the country, as well as the financial, technological, and human resources to identify adaptation priorities and implement appropriate adaptation plans and strategies.



CLIMATE IMPACTS AND VULNERABILITY

Historic Weather and Climate

- Observations indicate that average annual temperatures increased by 0.8°C from 1960-2006, an average of 0.18°C per decade.
- Average annual rainfall in Liberia has decreased since 1960.
- Intense rainfall and flooding events during the rainy season have increased since 1960.

Projected Weather and Climate

While projections for Liberia vary across models depending on assumptions, the majority of climate models suggest:

- An average increase in annual temperatures from the 1970-99 average of 0.9-2.6°C by the 2060s, and of 1.4-4.7°C by the 2090s.
- More rapid warming in Liberia's interior than in coastal areas.
- An overall increase in average annual rainfall, as well as in the number of heavy rainfall events.
- A rise in sea level of 0.6-1.0 m by 2100.

KEY SECTOR VULNERABILITIES

Food Security

Agriculture supports 75 percent of the population in Liberia and comprised 61 percent of the country's gross domestic product in 2009. Changes in climate can affect agricultural lands and production, and threaten agricultural livelihoods. Increases in total annual rainfall and in the number of heavy rainfall events may cause floods that erode and inundate agricultural land surfaces, subsequently reducing soil quality and threatening crop yields. Changes in climate also influence livestock grazing and survival, pest and weed resistance, and the prevalence of animal diseases. If not properly managed, the negative impacts of climate change on agricultural production can lead to an increase in food prices, reduced access to and availability of food, and an increase in nutritional deficiencies in vulnerable populations and families. In addition, warmer temperatures can lead to a decline in fish stocks, potentially exacerbating non-climate stressors threatening fisheries, such as overfishing, increased demand for fish, lack of surveillance and control of industrial and artisanal fishing activity, civil war, and pollution. Non-climate stressors that pose a threat to agriculture and food security in Liberia are increased pressures on land and natural resources, intensified agricultural activity, and poor land and natural resources management.

Coastal Zones

Liberia's coastline hosts about 58 percent of the country's population and is a key location for agricultural and fishing activities. Coastal zones harbor important sources of energy and serve as recreational and residential areas. Sea level rise poses a threat to human and economic activities and ecosystems along Liberia's coast. A rise in sea level can enhance coastal erosion, which can destroy infrastructure, agricultural land, natural resources, and ecosystems. Communities in informal settlements and temporary or poorly-

constructed housing in coastal zones are at particular risk, as they have low adaptive capacity to respond to the impacts of sea level rise. Populations whose livelihoods depend on fishing and farming are vulnerable to coastal flooding, erosion, land degradation, salinization of soil and freshwater sources, sedimentation, and siltation. In addition, sea level rise, higher sea surface temperatures, and stronger winds may affect upwelling patterns and alter the composition of coastal ecosystems. Non-climate stressors that further increase vulnerability to climate change impacts include inadequate drainage systems, high concentrations of human and economic activities such as mining, overfishing, pollution, agricultural runoff, and the lack of embankments.

Water Resources

Liberia's rivers and tributaries, lakes, ponds, and mangroves provide water for households, agriculture, industrial production, and hydropower. They also serve as transportation systems and aquatic habitats for various plant and animal species. Changes in rainfall patterns may negatively impact water resources if not properly managed. Warmer temperatures and shifting rainfall patterns may affect the availability and accessibility of surface and groundwater. Lower water levels heighten the vulnerability of populations dependent on these water sources for potable water and daily activities, agriculture, fishing, and energy. More intense and frequent storms and flooding events may cause contaminated storm water flows that pollute water sources and ecosystems. Intense rainfall, floods, contaminated water sources, and lack of potable water may affect public health by making water- and vector-borne diseases such as malaria, cholera, typhoid, and diarrhea more prevalent. Non-climate stressors, such as pollution from pesticides, households, industrial discharge, and toxic mining waste, and siltation from human and economic activities, may exacerbate climate impacts.

KEY ECOSYSTEM VULNERABILITIES

Forests

About 40 percent of West Africa's rainforest cover is located in Liberia. Tropical forests serve as sources of food, fodder, medicinal products, and energy. They also harbor a diversity of plant and animal species. More intense rainfall events and warmer temperatures all threaten forest resources and biodiversity. Increases in temperatures may lead to a rise in pest infestations, decrease in soil quality, and stunt the growth of plant and tree species. Non-climate stressors that contribute to declines in forest cover and biodiversity include greater pressure on forest resources by large migration flows of internally displaced persons, rising demands for timber, unsustainable logging practices, clearing of forest lands for cultivation and grazing, mining activities, and lack of forest resource management and policy enforcement.

Wetlands

Wetlands in Liberia contain high plant and animal species diversity and provide important resources such as fish, wood, fertile land, and agricultural products. These resources are vital to the survival and livelihoods of populations living in surrounding areas. Wetlands also help to reduce the impacts of heavy rainfall, storms, flooding, high tides, and sea level rise on human settlements, infrastructure, and natural resources. However, when wetlands are not healthy, they are unable to serve as a natural buffer zone. Intense rainfall events, warmer air and ocean temperatures, and sea level rise can contribute to biodiversity loss, declines in fish stock, and the salinization of soil and water in and around wetlands.

NATIONAL STRATEGIES, PLANS, AND INSTITUTIONS RELEVANT TO CLIMATE CHANGE

National Strategies and Plans

- National Adaptation Programme of Action (NAPA) (2008): Identifies relevant stakeholders and suggests measures to help increase the country's capacity to address climate variability and change impacts. The NAPA also highlights the importance of mainstreaming adaptation into sectoral policies and national development strategies, plans, and frameworks; an Initial National Communication has not yet been completed.
- National Environmental Policy (2002): Focuses on the sustainable management of the environment and natural resources in the country.
- National Reconstruction and Development Plan (2002-2007): Liberia's five-year development plan for medium-term economic growth and socio-political development.

Institutional Framework

- The Environmental Protection Agency (EPA) was created in 2005 and is charged with creating and promoting awareness, coordinating and strengthening the activities of environmental organizations, and developing national environmental policy, environmental protection, and management law. The EPA is responsible for leading the implementation of Liberia's NAPA.
- The National Environmental Policy Council is responsible for overseeing policy formulation at the EPA and sets priorities for national goals and objectives for the protection of the environment.
- The National Climate Change Steering Committee (NCCSC) and Secretariat were created in 2010 and are responsible for developing a comprehensive national policy framework to combat climate change in Liberia.

GOVERNMENT ADAPTATION PRIORITIES

Liberia's NAPA identifies agriculture, forestry, wetlands, fisheries, energy, water resources, coastal zone management, and health as priority areas for adaptation, given their vulnerability to climate change impacts. Improved climate monitoring and forecasting is another priority that requires rebuilding and improving the country's meteorological and hydrological monitoring infrastructure destroyed during the

country's recent civil war. This infrastructure will facilitate the collection of data, and weather forecasting; the distribution of meteorological and hydrological data will help improve the adaptive capacity of farmers, foresters, fishers, and the health sector. Adaptation projects for Liberia include:

AGRICULTURE AND FISHERIES

- Improve pest control methods
- Promote integrated crop and livestock farming
- Diversify crops
- Increase intercropping, irrigation, optimization of lowland/swamp farming practices, and adjust crop cultivation according to changes in precipitation
- Promote sustainable fishing practices
- Reduce number of fishing licenses issued to foreign vessels
- Regulate fishing practices to prevent overexploitation and fishing in restricted areas

FORESTS AND WETLANDS

- Switch from fossil fuel to biomass-based energy products
- Finalize forest- and wetlands-related legislation currently in progress
- Maintain fast growing nitrogen-fixing tree species to improve soil fertility, and use multipurpose tree species on farmlands in order to maintain forest cover

WATER

- Increase awareness and sensitization on the importance of water resources management

COASTAL ZONES

- Develop an integrated coastal zone management plan
- Reduce vulnerability of urban coastal areas to erosion, floods, siltation, and degradation
- Control coastal development, and build infrastructure to protect coastal zones

HEALTH

- Promote hygiene and sanitation education and awareness, including clinical interventions and community health education programs
- Identify and disinfect stagnant water sources that are breeding grounds for insects
- Strengthen the Roll Back Malaria program and provide a range of herbal treatments

KEY PLAYERS AND INITIATIVES

Key government entities involved in climate change-related research, assessments, and projects include the EPA, Ministry of Agriculture (MOA), and Ministry of Land, Mines, and Energy (MLME). In addition, several international institutions and agencies, namely the United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), United Nations Industrial Development Organization (UNIDO), and the Swedish International Development Agency (SIDA), have been working in close collaboration with Liberia's national institutions. Most of the projects focus on capacity building and enhancing resilience within the agricultural, coastal zone management, energy, and water resources sectors.

Project / Initiative	Lead Organization	Funding Source
Enhancing Resilience to Climate Change by Mainstreaming Adaptation Concerns into Agricultural Sector Development in Liberia	MOA/UNDP	Global Environment Facility (GEF): Least Development Countries Fund (LDCF)
Enhancing Resilience of Vulnerable Coastal Areas to Climate Change Risks	EPA/UNDP	GEF: LDCF
Installation of Multipurpose Mini-Hydro Infrastructure (for energy and irrigation)	Liberia Electricity Corporation/MLME/ EPA/UNIDO	GEF: Trust Fund
High Level Support to the Water Supply and Sanitation Commission	UNDP	SIDA
Special Program for Food Security	United Nations Food and Agriculture Organization (FAO)/MOA	FAO
Building National and Local Capacities for Disaster Risks Management	UNDP	UNDP
Land Degradation Project: Mainstreaming and Capacity Building for Sustainable Land Management	UNDP	UNDP/GEF

PRIORITY CHALLENGES AND CONSTRAINTS FOR ADDRESSING VULNERABILITY AND INCREASING RESILIENCE

Informational, institutional, technological, and financial constraints make the effectiveness and development of adaptation efforts challenging. Data, research, and capacity needs include:

- Conducting detailed, location-specific research and assessments on climate change impacts, risks, and vulnerabilities.
- Developing climate models and weather forecasts on inter-annual and inter-decadal rainfall and temperature patterns in Liberia.
- Increasing public awareness, dissemination of information, and outreach, particularly to vulnerable communities such as farmers and coastal settlements, on the impacts and risks of climate change and on adaptation strategies.
- Integrating indigenous and effective coping strategies into national development policy and planning.
- Improving roads, technology, communication, and sanitation infrastructure to facilitate the implementation of adaptation strategies.
- Training policymakers and other relevant stakeholders on local and global climate change science, impacts, and vulnerabilities in order to support decision- and policy-making.
- Developing and implementing necessary regulatory, political, and informational frameworks within national and local institutions for national adaptation to climate change.

In addition, strengthening the capacity of decision-makers and stakeholders to understand and consider climate change issues can help facilitate the future development and implementation of appropriate adaptation strategies and plans. Mainstreaming climate change adaptation into development planning and policies through programs in agriculture, forestry, fisheries, coastal zone management, energy, health, hydrology, and meteorology will be valuable to Liberia's long-term efforts towards post-war reconstruction, sustainable development, and climate resilience.

KEY SOURCES

Environmental Protection Agency (EPA) - Liberia. National Adaptation Programme of Action [Internet]. UNFCCC; 2008 [cited 2011 Sept 19]. Available from: <http://unfccc.int/resource/docs/napa/lbr01.pdf>

McSweeney, C., New, M., and Lizanco, G. UNDP Climate Change Country profiles – Liberia [Internet]. School of Geography and Environment - University of Oxford and Tyndall Centre for Climate Change Research; 2008 [cited 2011 Sept 19]. Available from: <http://country-profiles.geog.ox.ac.uk>

Slunge, D. Draft Liberia Environment and Climate Analysis [Internet]. Environmental Economics Unit, Department of Economics, School of Economics and Commercial Law; 2008 [cited 2011 Sept 29]. Available from: <http://www.sida.se/Global/Countries%20and%20Regions/Africa/Liberia/Environmental%20policy%20brief%20Liberia.pdf>

Brandolini, G. and Tigani, M. Liberia Environmental Profile [Internet]. Government of Liberia and European Commission; 2006 [cited 2011 Sept 29]. Available from: http://ec.europa.eu/development/center/repository/liberia_CEP_preliminary_report.pdf

Wiles, D. Coastal zone vulnerability and adaptation to climate change in Liberia [Internet]. Climate Change Unit – Environmental Protection Agency of Liberia; 2005 [cited 2011 Sept 23]. Available from: http://unfccc.int/files/national_reports/nonannex_i_natcom/meetings/application/pdf/20050419wiles.pdf

Government of Liberia. National Capacity Self-Assessment [Internet]. Government of Liberia; 2010 [cited 2011 Sept 29]. Available from: <http://www.biodiv.be/liberia/implementation/documents-and-reports/national-reports/NCSA.pdf>