

CLIMATE RISK COUNTRY PROFILE

GABON

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This profile is part of a series of Climate Risk Country Profiles developed by the World Bank Group (WBG). The country profile synthesizes most relevant data and information on climate change, disaster risk reduction, and adaptation actions and policies at the country level. The country profile series are designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and policy making. This effort is managed and led by Veronique Morin (Senior Climate Change Specialist, WBG) and Ana E. Bucher (Senior Climate Change Specialist, WBG).

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Climate and climate-related information is largely drawn from the [Climate Change Knowledge Portal \(CCKP\)](#), a WBG online platform with available global climate data and analysis based on the latest [Intergovernmental Panel on Climate Change \(IPCC\)](#) reports and datasets. The team is grateful for all comments and suggestions received from the sector, regional, and country development specialists, as well as climate research scientists and institutions for their advice and guidance on use of climate related datasets.

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FOREWORD

Climate change is a major risk to good development outcomes, and the World Bank Group is committed to playing an important role in helping countries integrate climate action into their core development agendas. The World Bank Group is committed to supporting client countries to invest in and build a low-carbon, climate-resilient future, helping them to be better prepared to adapt to current and future climate impacts.

The World Bank Group is investing in incorporating and systematically managing climate risks in development operations through its individual corporate commitments.

A key aspect of the World Bank Group's Action Plan on Adaptation and Resilience (2019) is to help countries shift from addressing adaptation as an incremental cost and isolated investment to systematically incorporating climate risks and opportunities at every phase of policy planning, investment design, implementation and evaluation of development outcomes. For all IDA and IBRD operations, climate and disaster risk screening is one of the mandatory corporate climate commitments. This is supported by the Bank Group's Climate and Disaster Risk Screening Tool which enables all Bank staff to assess short- and long-term climate and disaster risks in operations and national or sectoral planning processes. This screening tool draws up-to-date and relevant information from the World Bank's Climate Change Knowledge Portal, a comprehensive online 'one-stop shop' for global, regional, and country data related to climate change and development.

Recognizing the value of consistent, easy-to-use technical resources for client countries as well as to support respective internal climate risk assessment and adaptation planning processes, the World Bank Group's Climate Change Group has developed this content. Standardizing and pooling expertise facilitates the World Bank Group in conducting initial assessments of climate risks and opportunities across sectors within a country, within institutional portfolios across regions, and acts as a global resource for development practitioners.

For developing countries, the climate risk profiles are intended to serve as public goods to facilitate upstream country diagnostics, policy dialogue, and strategic planning by providing comprehensive overviews of trends and projected changes in key climate parameters, sector-specific implications, relevant policies and programs, adaptation priorities and opportunities for further actions.

It is my hope that these efforts will spur deepening of long-term risk management in developing countries and our engagement in supporting climate change adaptation planning at operational levels.



Bernice Van Bronkhorst

Global Director

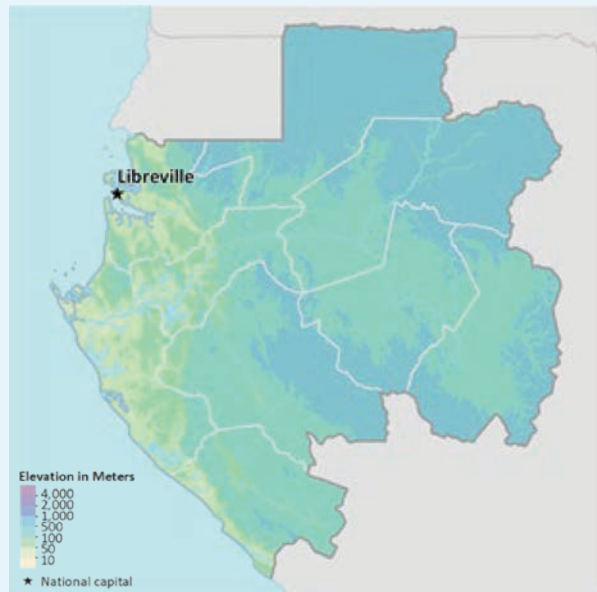
Climate Change Group (CCG)

The World Bank Group (WBG)

COUNTRY OVERVIEW

Gabon is located in West Africa across the equator, between 2°30' North and 3°55' South latitude and 8°30' East and 14°30' East longitude. The western coastal border is along the Atlantic Ocean, south of the Bight of Biafra. Gabon shares land borders with Equatorial Guinea and Cameroon to the north, and Republic of Congo to the east and south. The country has a surface area of 268,000 square kilometers, with forests covering 85% of the territory.¹ Gabon's terrain includes a narrow coastal plain, with central African mangroves, a hilly interior and savanna grassland and forest in the east and south (**Figure 1**). Gabon has over 20 million hectares of forests. The country's sea-front is associated with numerous rivers, resulting in significant marine and continental fish stocks. Over 70% of the country's population lives in the coastal areas, which also houses the majority of economic activities. Gabon also has a wealth of extractive natural resources, primarily manganese, oil as well as its timber and forest reserves.²

FIGURE 1. Topography of Gabon³



Gabon is a relatively sparsely populated country with a population of 2.2 million people (2019), with a population growth rate of 2.5%. The country's Gross Domestic Product (GDP) was more than \$16.6 billion (2019), with a current annual growth rate of 3.4 % (**Table 1**).⁴ The country has one of the highest urbanization rates in Africa (89.7%)⁵ and this is expected to rise to 92% and 95% by 2030 and 2050, respectively. The country's population projected to reach 2.7 million people by 2030 and 3.8 million by 2050.⁶

¹ World Bank (2021). Gabon Country Overview. URL: <http://www.worldbank.org/en/country/gabon/overview>

² Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

³ World Bank (2020). Internal Climate Migration Profile – Gabon.

⁴ World Bank (2021). World Development Indicators: Gabon. URL: <http://databank.worldbank.org/data/reports.aspx?source=2&country=GBN>

⁵ World Bank Group (2020). Gabon. Increasing Economic Diversification & Equalizing Opportunity to Accelerate Poverty Reduction. Systematic Country Diagnostic. URL: <https://openknowledge.worldbank.org/bitstream/handle/10986/34108/Gabon-Systematic-Country-Diagnostic.pdf?sequence=4&isAllowed=y>

⁶ World Bank Open Data (2021). Data Retrieved March 2021. Data Bank: Population Estimates and Projections, Gabon. URL: <https://databank.worldbank.org/data/reports.aspx?source=health-nutrition-and-population-statistics:-population-estimates-and-projections>

Gabon is a high-income country with one of the most developed economies in sub-Saharan Africa; the majority of its income derived from oil revenues. It is the fifth largest oil producer in Africa and has experienced strong economic growth over the past decade due to its and manganese production. On average, over the past five years, the oil sector has accounted for 80% of exports, 45% of GDP, and 60% of budget revenue.⁷ In Gabon, services provide about 66% of employment, agriculture 19% and mining at just 5% to employment; tourism is estimated at approximately 4%. Employment in manufacturing is limited, however, growing sub-sectors like agribusiness and wood manufacturing show promise of ultimately generating more jobs. Agriculture dominates the rural labor market; the public sector and related formal services dominate in Libreville and Port-Gentil.⁸ The country is rich in natural resources and its economy is highly dependent on the extraction of natural resources, such as Oil timber for export.⁹

Significant wealth disparity remains across the country, specifically between the highly urbanized coastal regions (Estuaire and Ogooué-Maritime), areas with extractive activities (Haut-Ogooué), and the less densely populated provinces of Ogooué-Ivindo, Ogooué-Lolo, Nyanga, and Ngounié, which have limited access to resources and services. Over 95.1% of households in urban areas have access to safe drinking water, versus only 30% of households in rural areas have access to safe drinking water.¹⁰ Electricity reaches 86.4% of households overall, but only 37.4% in rural areas. The most recent household budget survey (conducted in 2017) 33.4% of the population are unable to meet basic needs.¹¹ Using the international poverty line of US\$5.50 per capita per day (2011 purchasing power parity), 32% of the population is poor. Approximately, 59.5% of the rural population lives in poverty, compared to 29.4% in urban areas.¹²

TABLE 1. Data snapshot: Key development indicators¹³

Indicator	
Life Expectancy at Birth, Total (Years) (2019)	66.5
Population Density (People per sq. km Land Area) (2018)	8.2
% of Population with Access to Electricity (2018)	93.0%
GDP per Capita (Current US\$) (2019)	\$7,767.00

⁷ World Bank (2020). Gabon Country Overview. URL: <http://www.worldbank.org/en/country/gabon/overview>

⁸ World Bank (2020). Poverty Assessment – Gabon. URL: <https://openknowledge.worldbank.org/handle/10986/33429>

⁹ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

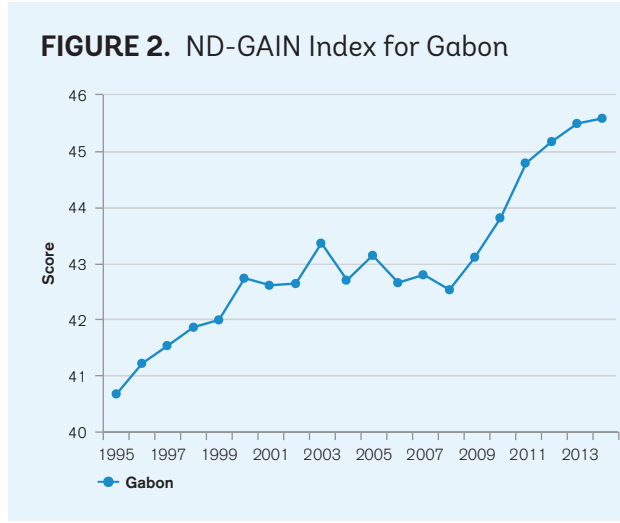
¹⁰ World Bank Group (2020). Gabon. Increasing Economic Diversification & Equalizing Opportunity to Accelerate Poverty Reduction. Systematic Country Diagnostic. URL: <https://openknowledge.worldbank.org/bitstream/handle/10986/34108/Gabon-Systematic-Country-Diagnostic.pdf?sequence=4&isAllowed=y>

¹¹ International Household Survey Network (2017). Enquête pour l'Évaluation Pauvreté 2017. URL: <https://catalog.ihns.org/index.php/catalog/7826>

¹² World Bank (2020). Poverty Assessment – Gabon. URL: <https://openknowledge.worldbank.org/handle/10986/33429>

¹³ World Bank (2020). DataBank – World Development Indicators. URL: <https://databank.worldbank.org/source/world-development-indicators>

The ND-GAIN Index¹⁴ ranks 181 countries using a score which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to improve resilience. This Index aims to help businesses and the public sector better identify vulnerability and readiness in order to better prioritize investment for more efficient responses to global challenges. Due to a combination of political, geographic, and social factors, Gabon is recognized as vulnerable to climate change, ranked 117 out of 181 countries in the 2020 ND-GAIN Index. However, relative to other countries, Gabon's current vulnerabilities are manageable but improvements in readiness will help the country better adapt to future challenges. While Gabon is the 94th most vulnerable country, it is the 40th least ready country; its combined scores places it in 117th position out of 181 countries. The more vulnerable a country is the lower their score, while the more ready a country is to improve its resilience the higher it will be. Norway has the highest score and is ranked 1st. **Figure 2** is a time-series plot of the ND-GAIN Index showing Gabon's progress.



Given Gabon's geographic location, hydrographic outlay and that the majority of the population and economic activities are located along the coast, the country is highly vulnerable to climate change impacts. Increasing temperatures, rising seas, and changing precipitation patterns present significant pressure on vulnerable groups, urban infrastructure, and the economy. Furthermore, while Gabon is reliant upon rainfed agriculture for its agriculture sector and food security. Gabon submitted its [Second National Communication to the UNFCCC \(NC2\)](#) in 2011 and its [Nationally Determined Contributions \(NDC\)](#) in 2016. The country's adaptation priorities include protecting its coastal zone, fishing agriculture and forestry sector. The country is committed to improving its agricultural sector in support of the country's continued economic development efforts.

Green, Inclusive and Resilient Recovery

The coronavirus disease (COVID-19) pandemic has led to unprecedented adverse social and economic impacts. Further, the pandemic has demonstrated the compounding impacts of adding yet another shock on top of the multiple challenges that vulnerable populations already face in day-to-day life, with the potential to create devastating health, social, economic and environmental crises that can leave a deep, long-lasting mark. However, as governments take urgent action and lay the foundations for their financial, economic, and social recovery, they have a unique opportunity to create economies that are more sustainable, inclusive and resilient. Short and long-term recovery efforts should prioritize investments that boost jobs and economic activity; have positive impacts on human, social and natural capital; protect biodiversity and ecosystems services; boost resilience; and advance the decarbonization of economies.

¹⁴ University of Notre Dame (2020). Notre Dame Global Adaptation Initiative. URL: <https://gain.nd.edu/our-work/country-index/>

Climate Baseline

Overview

Located along the equator, the country is largely composed of plateaus and hills, covering 3/4 of the country, with the highest mountain reaching 1,000 meters (m). Gabon has an extremely dense hydrological network that feeds two rivers: Ogooué and Nyanga, as well as high basins of small northern coastal rivers. The country has a moist, hot climate of typically tropical regions. Precipitation is abundant, ranging from 1,500 millimeters (mm) to 3,500 mm per year and spread almost throughout the year. Gabon's climate is influenced by the Inter Tropical Convergence Zone (ITCZ) and the northeast trade winds from the high Sahara Desert as well as the humidity stemming from the ocean on its western coast.¹⁵

Temperatures are high and relatively constant throughout the year. Analysis of data from the World Bank Group's Climate Change Knowledge Portal (CCKP) (**Table 2**) shows historical information for 1901–2020. Gabon experiences average temperatures year-round of 25°C to 27°C in coastal lowlands and 22°C–25°C inland. The country has a single wet season between October and May, when an average of 200 mm–250 mm of rainfall is received. January to April is typically the hottest season.¹⁶ The country has experienced some of its highest temperatures along the coast and in the capital city of Libreville. The country's two seasons are clearly defined by the country's rainfall patterns, shown through its most recent climatology, 1991 to 2020 (**Figure 3**). **Figure 4** shows the spatial variation of observed average annual precipitation and temperature across Gabon.

TABLE 2. Data snapshot: Summary statistics

Climate Variables	1901–2020
Mean Annual Temperature (°C)	25.0°C
Mean Annual Precipitation (mm)	1,807.0 mm
Mean Maximum Annual Temperature (°C)	29.3°C
Mean Minimum Annual Temperature (°C)	20.9°C

¹⁵ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

¹⁶ McSweeney, C. and Ligzcano, G. (2011). UNDP Climate Change Country Profiles: Gabon. University of Oxford. URL: https://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Gabon/Gabon.hires.report.pdf

FIGURE 3. Average monthly temperature and rainfall of Gabon for 1991–2020¹⁷

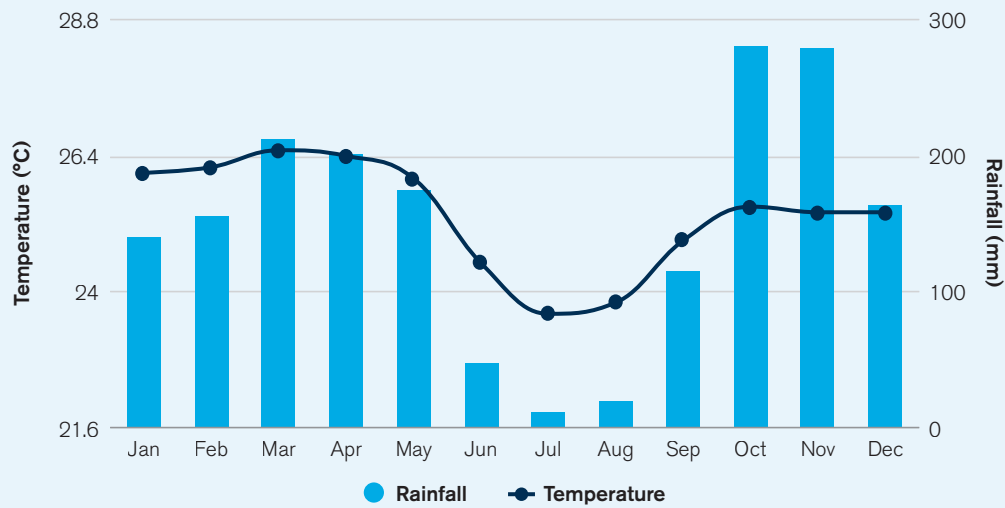
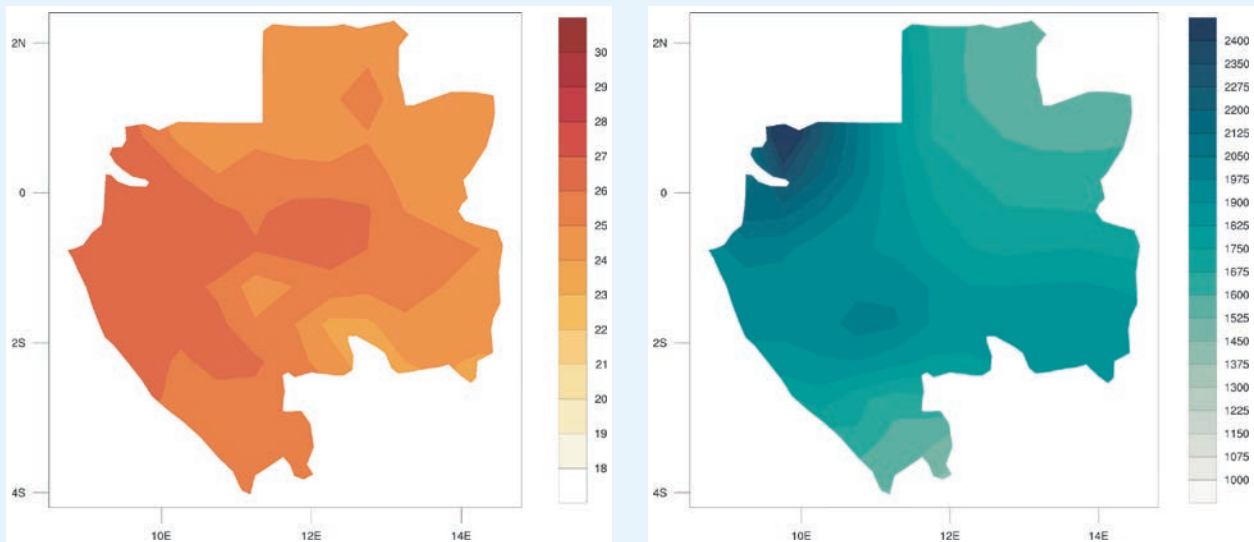


FIGURE 4. Map of average annual temperature (°C) (left); annual precipitation (mm) (right) of Gabon, 1991–2020¹⁸



Key Trends

Temperature

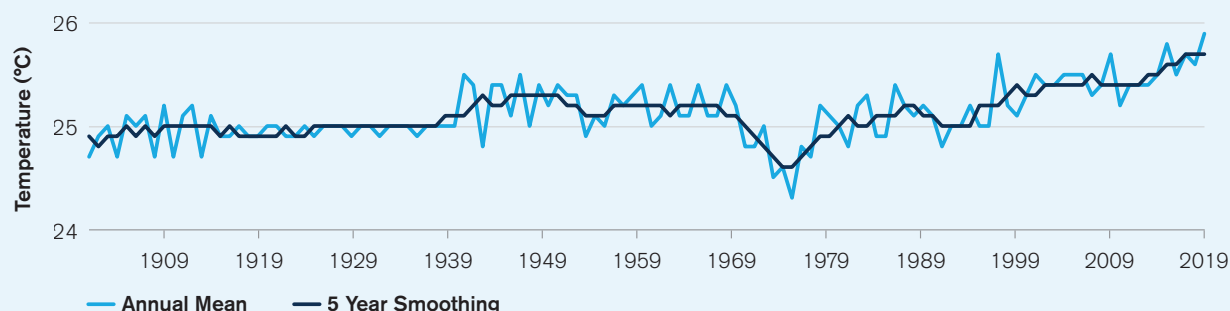
While historical weather data is sparse for Gabon experienced general warming, with mean annual temperature increasing 0.6°C since 1960 (**Figure 5**). While this increase is realized over the whole country, it has been observed to be most rapid in January and February. Over this period, the number of ‘hot’ days and nights have been observed to

¹⁷ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon. URL: <https://climateknowledgeportal.worldbank.org/country/gabon>

¹⁸ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon. URL: <https://climateknowledgeportal.worldbank.org/country/gabon>

increase considerably. Seasonally, temperatures in Gabon have risen more significantly in winter months, dry season temperatures recording increases of 0.69°C in June, 0.68°C in July, and 0.69°C in August.¹⁹

FIGURE 5. Observed temperature for Gabon, 1901–2020²⁰



Precipitation

Mean annual rainfall over Gabon has been observed to have decreased at an average rate of 3.8 mm per month, per decade since 1960 to date. These trends have been observed to be most acute in January and February and during the March, April, May rainfall season, declining at 5% per decade since 1960.²¹ Historical records have observed seasonal precipitation with a slight decrease between January and May. The dry season has observed precipitation to have increased slightly since the 1960s. September and October, have also observed slightly higher precipitation volumes over the past 30 years.²²

Climate Future

Overview

The main data source for the World Bank Group's CCKP is the CMIP5 (Coupled Inter-comparison Project Phase5) data ensemble, which builds the database for the global climate change projections presented in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Four Representative Concentration Pathways (i.e. RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing (cumulative measure of GHG emissions from all sources) pathway and level by 2100. The RCP2.6 for example represents a very strong mitigation scenario, whereas the RCP8.5 assumes business-as-usual scenario. For more information, please refer to the [RCP Database](#). For simplification, these scenarios are referred to as a low (RCP2.6); a medium (RCP4.5) and a high (RCP8.5) emission scenario in this profile. **Table 3** provides CMIP5 projections for essential climate variables under high emission scenario (RCP 8.5) over 4 different time horizons. **Figure 6** presents the multi-model (CMIP5) ensemble of 32 Global Circulation Models (GCMs) showing the projected changes in annual precipitation and temperature for the periods 2040–2059 and 2080–2099.

¹⁹ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

²⁰ WB Climate Change Knowledge Portal (CCKP, 2021). Gabon URL: <https://climateknowledgeportal.worldbank.org/country/gabon/climate-data-historical>

²¹ McSweeney, C. and Lizcano, G. (2011). UNDP Climate Change Country Profiles: Gabon. University of Oxford. URL: https://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Gabon/Gabon.hires.report.pdf

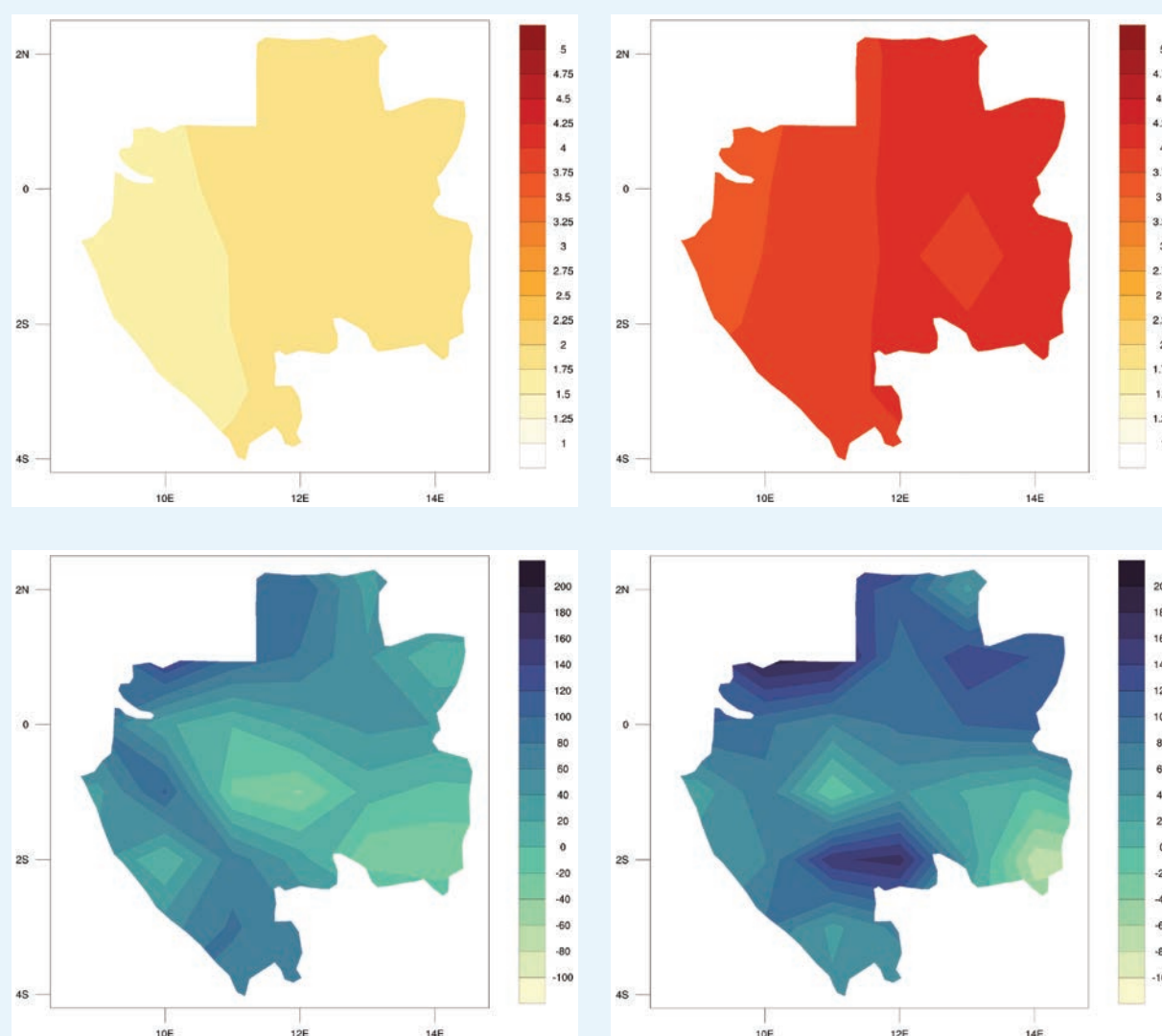
²² Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

TABLE 3. Data snapshot: CMIP5 ensemble projection

CMIP5 Ensemble Projection	2020–2039	2040–2059	2060–2079	2080–2099
Annual Temperature Anomaly (°C)	+0.6°C to +1.3°C (+0.9°C)	+1.3°C to +2.3°C (+1.6°C)	+2.0°C to +3.6°C (+2.5°C)	+2.7°C to +4.8°C (+3.3°C)
Annual Precipitation Anomaly (mm)	-18.2 to +30.6 (6.2 mm)	-15.1 to +52.7 (17.0 mm)	-7.3 to +80.5 (31.5 mm)	-12.0 to +87.3 (37.7 mm)

Note: The table shows CMIP5 ensemble projection under RCP8.5. Bold value is the range (10th–90th Percentile) and values in parentheses show the median (or 50th Percentile).

FIGURE 6. CMIP5 ensemble projected change (32 GCMs) in annual temperature (top) and precipitation (bottoms) by 2040–2059 (left) and by 2080–2099 (right), relative to 1986–2005 baseline under RCP8.5²³



²³ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon Projected Future Climate. URL: <https://climateknowledgeportal.worldbank.org/country/gabon/climate-data-projections>

Key Trends

Temperature

Mean annual temperatures in Gabon are projected to continue to increase through the 2050s by 0.9°C to 2.5°C and as high as a 4°C temperature increase by the end of the century. This projected rate of warming is believed to occur at a faster rate in the inland areas of Gabon, and slower on the coastal regions. Expected trends due to climatic change will not only result in higher temperatures but will increase the frequency of days and nights considered as 'hot' within the current climate. In Gabon, hot days are projected to increase 25–75% annually by the 2060s. Hot nights are also projected to significantly increase.²⁴ Max temperatures are projected to see the greatest degree of change, per decade. Increasing temperature trends are expected to experience significant increase in late summer months (June to October) as well as winter and spring seasons.²⁵

Across all emission scenarios, temperatures will continue to increase for Gabon throughout the end of the century. As seen in **Figure 7**, under a high-emission scenario (RCP8.5), average temperatures will increase rapidly by mid-century. Across the seasonal cycle (**Figure 8**), temperatures above 25°C are expected to stay the same, with potential to increase from October to January. These trends are aggregated at a national level, and temperature variations do exist between the inland areas, which are expected to be hotter than coastal zones. Increased heat and extreme heat conditions will impact human health, agriculture, water resources, and ecosystems.

FIGURE 7. Historical and projected average temperature for Gabon from 1986 to 2099 (Reference Period, 1986–2005)²⁶

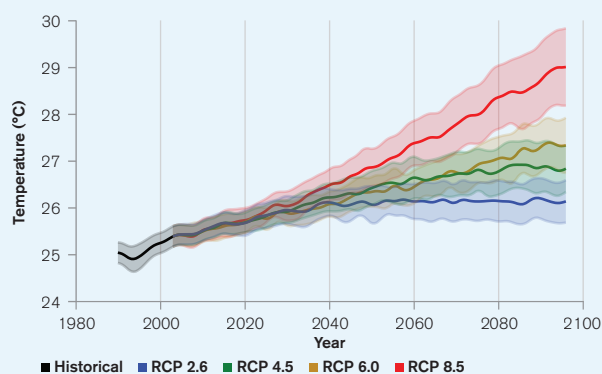
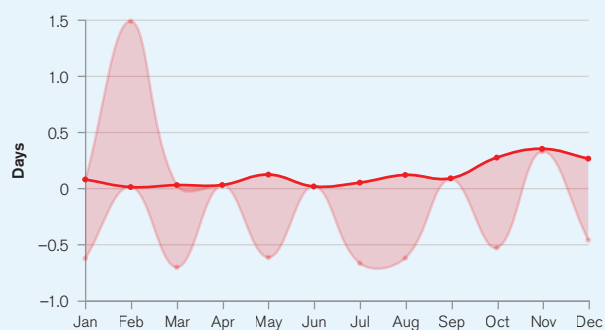


FIGURE 8. Projected change in Summer Days (Tmax >25°C) (RCP8.5 Ensemble, Reference Period, 1986–2005)²⁷



²⁴ Fosto-Nguemo, T. et al. (2016). Assessment of simulated rainfall and temperature from the regional climate model REMO and future changes over Central Africa. *Climate Dynamics*. 48. pp. 3685–3705. URL: <https://link.springer.com/article/10.1007/s00382-016-3294-1>

²⁵ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

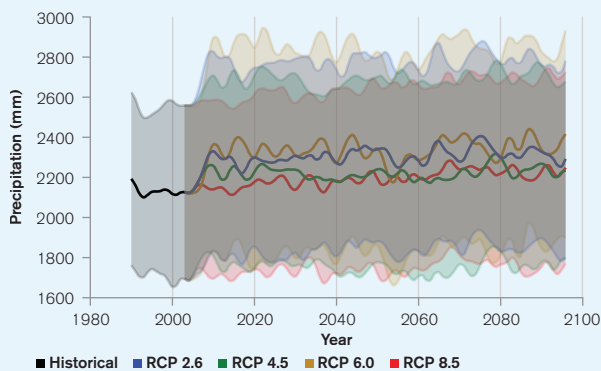
²⁶ WBG Climate Change Knowledge Portal (CCKP, 2021). Interactive Climate Indicator Dashboard - Agriculture. Gabon. URL <https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=GAB&period=2080-2099>

²⁷ WBG Climate Change Knowledge Portal (CCKP, 2021). Interactive Climate Indicator Dashboard - Agriculture. Gabon. URL <https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=GAB&period=2080-2099>

Precipitation

Rainfall is highly variable across Gabon as are projections at the seasonal and geographical level. While inconsistent, models do project a trend of increases in rainfall across all emission scenarios through the 2090s.²⁸ Coastal lowlands are expected to be highly vulnerable to these trends as well as through the anticipated increase of sea-level rise for the region.²⁹ While overall, annual mean precipitation is expected to increase as well as the magnitude and intensity of heavy rain events.³⁰ **Figure 9** below, shows the change in the projected annual average precipitation for Gabon. As seen below, annual average precipitation is expected to decrease slightly by the of the century under a high emissions scenario of RCP8.5. Gabon is projected to experience more rainfall along its coast and in the northwestern zones.

FIGURE 9. Annual average precipitation in Gabon for 1986 to 2099 (Reference Period, 1986–2005)³¹



CLIMATE RELATED NATURAL HAZARDS

Overview

Gabon has a high degree of risk to natural hazards and is highly vulnerable to climate change impacts, which are expected to primarily affect the agricultural, water, and energy and oil and mining sectors, through seasonal flooding, changing precipitation, extreme winds and landslides. Floods impact on average, 0.21% of the total population. The potentially affected areas result in two hotspots in Ogooué-Ivindo and Moyen-Ogooué provinces. This is to be even more likely in future climates; these are key economic areas for the country. The regions more significantly affected by floods are concentrated in the central part of the country along the Ogooué river. The pattern is substantially confirmed under future climate conditions with two hotspots that stem out clearly in the Ngounié and the Ogooué-Maritime provinces. Approximately 21,000 people are annually affected by drought in Gabon, with the possibility of up to \$185 million USD impacted each year due to drought.³² Temperatures are already observed to be increasing,

²⁸ Onyutha, C. (2018). Trends and variability in African long-term precipitation. *Stochastic Environmental Research and Risk Assessment*. 32. pp. 2721–2739. URL: <https://link.springer.com/article/10.1007/s00477-018-1587-0>

²⁹ Fosto-Nguemo, T. et al. (2016). Assessment of simulated rainfall and temperature from the regional climate model REMO and future changes over Central Africa. *Climate Dynamics*. 48. pp. 3685–3705. URL: <https://link.springer.com/article/10.1007/s00382-016-3294-1>

³⁰ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

³¹ WBG Climate Change Knowledge Portal (CCKP, 2020). Climate Data-Projections. Gabon. URL: <https://climateknowledgeportal.worldbank.org/country/gabon/climate-sector-water>

³² UNISDR (2019). Disaster Risk Profile – Gabon. URL: https://reliefweb.int/sites/reliefweb.int/files/resources/Report_Gabon_Final-compressed.pdf

and there likely to be more extreme weather events occurring in Gabon's near to medium term future.³³ This is expected to have primary impact to agriculture and water sectors as well as to wider population health. Vulnerable groups, such as rural communities, the poor and the elderly are particularly at risk to natural hazards and increasing impacts of climate change.

Data from the Emergency Event Database: EM-Dat database, presented in **Table 4**, shows the country has endured various natural hazards, including bacterial and viral diseases, river floods and intense storms.

TABLE 4. Natural disasters in Gabon, 1900–2020³⁴

Natural Hazard 1900–2020	Subtype	Events Count	Total Deaths	Total Affected	Total Damage ('000 USD)
Epidemic	Viral Disease	7	116	18,576	
	Bacterial Disease	1	0	132	0
Flood	Riverine Flood	2	1	87,845	0
Storm	Convective Storm	3	0	4,330	0

Key Trends

Flooding, including coastal, urban and riverine floods, is a particular high-hazard for Gabon and potentially damaging and life-threatening river floods are expected to occur at least once in the next 10 years. Flooding along river areas is also expected as an immediate as well as long-term hazard for both rural and urban areas. Surface flood hazard in urban and rural areas is also expected to occur. Gabon is also at significant risk to sea-level rise and the resulting coastal area flooding, which may also impact coastal cities as well as oil extraction operations.

Natural disasters, such as flooding, in the coastal area is expected to cause significant economic losses for coastal infrastructure and related livelihoods. For example, the Port of Gentil is only four meters above sea level.³⁵ Gabon is not uniformly developed and population density greatly varies throughout the country. Therefore, the same harmful event, such as extreme heat or flooding has different risk of a disaster, depending on the location of the event.³⁶

Figure 10 shows the present risk of river flood and coastal flood.

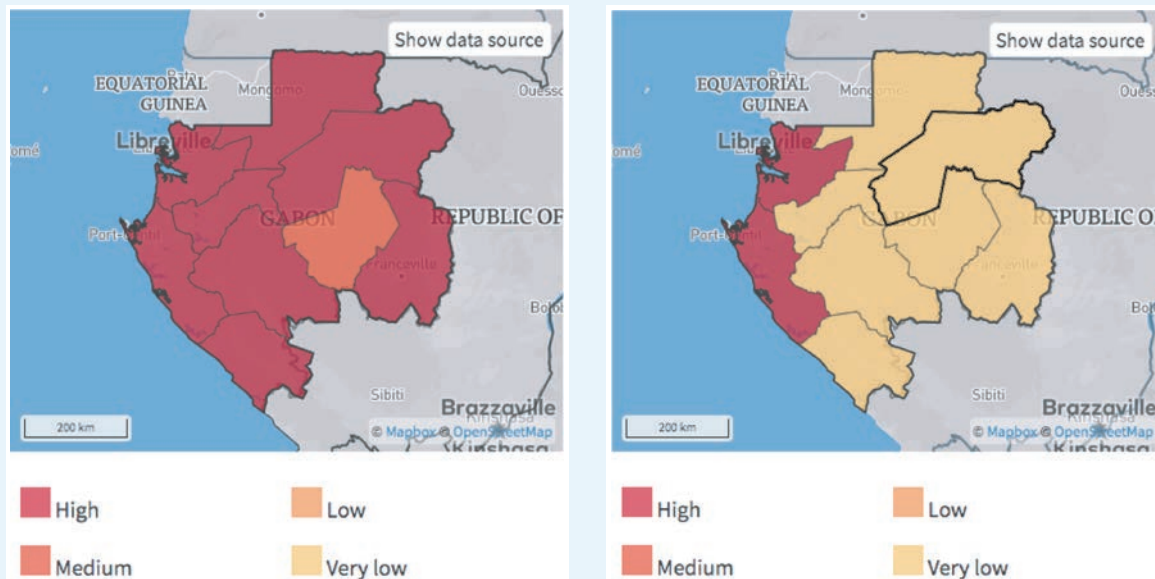
³³ UNDRR (2020). Gabon – Risk Sensitive Budget Review. URL: https://www.preventionweb.net/files/70703_gabonweb.pdf

³⁴ EM-DAT: The Emergency Events Database - Universite catholique de Louvain (UCL) - CRED, D. Guha-Sapir, Brussels, Belgium. URL: http://emdat.be/emdat_db/

³⁵ Nachmany, M. et al. (2015). Climate Change Legislation in Gabon. LSE Grantham Institute. URL: <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/GABON.pdf>

³⁶ GFDRR (2020). Gabon overview. URL: <https://www.gfdr.org/sites>

FIGURE 10. Risk of river flood (L);³⁷ risks of coastal flood (R)³⁸



Implications for DRM

Many sectors in Gabon do not have risk assessments (i.e. partial flood risk assessment) or strategic climate risk adaptation plans. Furthermore, the country has yet to establish a functional data flow mechanism in order to have comprehensive understanding of natural hazards in all sectors. Additionally, Gabon does not have a central, national database which can systematically collect and analyze disaster loss data. To increase its resilience to natural hazards and climate change impacts, Gabon is working to establish scientific and technical expertise within the Disaster Management Agencies, coupled with appropriate financial support (estimated at 2 billion CFA) with greater regional engagement. At an operational level, the country's Department of Disasters needs to scale up its operational capacities and collaboration across existing sectors, and institute contingency plans and procedures. Development of early warning systems can improve the country's preparedness and resilience.³⁹

³⁷ ThinkHazard! (2020). Gabon River Flood. URL: <http://thinkhazard.org/en/report/89-gabon/FL>

³⁸ ThinkHazard! (2020). Gabon – Coastal Flood. URL: <http://thinkhazard.org/en/report/89-gabon/CF>

³⁹ PreventionWeb (2015). Rapport national de suivi sur la mise en œuvre du Cadre d'action de Hyogo (2013–2015). URL: https://www.preventionweb.net/files/41836_GAB_NationalHFAprogress_2013-15.pdf

Gabon is expected to experience adverse impacts of climate change throughout the country and across key sectors, the most significant impacts being increased temperatures, changing precipitation patterns with areas at risk of annual decreases in rainfall, prevalence of new disease vectors, rises in sea temperature, and increasing number of consecutive dry and hot days. Visible signs of climate change include annual variation in crop yield, increased numbers of deaths of chronic patients, sea level rise, a longer touristic season and the potential development of new touristic destination due to change in local climate.⁴⁰ Variable precipitation and increasing temperatures is resulting in an increasingly riskier agricultural and water availability environment. Furthermore, climate change and global temperature increases are impacting sea level rise, which will also have an impact on the country. Climate change is expected to result in significant economic impacts to the key sectors, such as agriculture. Financial constraints and limited institutional capacity have limited adaptation capabilities and effective response to climatic hazards in the country. This further threatens future sustainable agricultural production as well as opportunity to expand and the country's burgeoning tourism sector.

Gender

An increasing body of research has shown that climate-related disasters have impacted human populations in many areas including agricultural production, food security, water management and public health. The level of impacts and coping strategies of populations depends heavily on their socio-economic status, socio-cultural norms, access to resources, poverty as well as gender. Research has also provided more evidence that the effects are not gender neutral, as women and children are among the highest risk groups. Key factors that account for the differences between women's and men's vulnerability to climate change risks include: gender-based differences in time use; access to assets and credit, treatment by formal institutions, which can constrain women's opportunities, limited access to policy discussions and decision making, and a lack of sex-disaggregated data for policy change.⁴¹

Agriculture

Overview

The Gabonese agricultural sector includes food crops, rubber, and palm oil. It employs approximately 20% of the population, yet the sector's contribution to GDP in 2017 was estimated at 5%. Gabon relies heavily on food imports, which account for the majority of domestic food consumption. Imported food is sourced primarily from France, South Africa, and Cameroon. Gabon has 22 million hectares of forest and just one million hectares of arable agricultural land. Northern Gabon is a prime location for rubber plantations, and the sector has increased markedly in recent years.⁴² Gabon's agricultural sector is particularly vulnerable to climate change, and remains relatively

⁴⁰ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁴¹ World Bank Group (2016). Gender Equality, Poverty Reduction, and Inclusive Growth. URL: <http://documents1.worldbank.org/curated/en/820851467992505410/pdf/102114-REVISED-PUBLIC-WBG-Gender-Strategy.pdf>

⁴² IFAD (2020). Gabonese Republic. Country Strategy Note. URL: <https://www.ifad.org/documents/38711644/40077965/Country%20Strategy%20Note-%202020-2022/36610c0a-bd07-2624-607c-2151aec0d437>

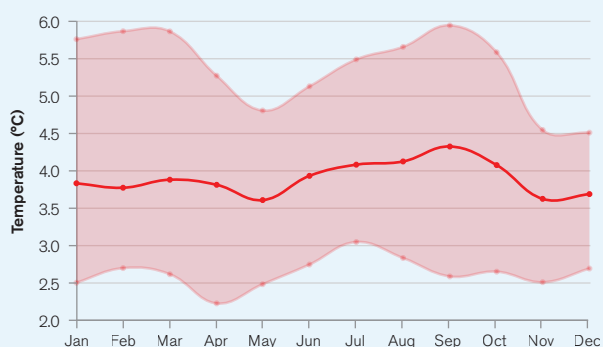
underdeveloped and with farms predominately at subsistence level. The sector's vulnerability to climate change is of distinct concern to the country, especially as an estimated 5% of the heavily forested country is arable and currently used for plantation and subsistence farming.⁴³

Climate Change Impacts

Changes in temperature and precipitation is expected to impact the physical, chemical and biological composition of the country's soil. Agricultural productivity is expected to decrease under a medium warming scenario. Additionally, increased rainfall may result in erosion for some areas and changing soil quality and moisture may also alter the balance of micro-organisms.⁴⁴ Reduced precipitation and increasing heat trends for much of the country's agricultural areas are also expected to be impacted by increasing number of consecutive dry days. Diminished surface water runoff may also affect groundwater levels, affecting drinking water supplies as well as water availability for irrigation.

The projected increased heat will increase stress on crops and is also likely to alter the length of the growing seasons. Decreased water availability is likely to reduce yields and the reduction in soil moisture may alter suitable areas for agriculture or the production of specific crops. Increased heat and water scarcity conditions are likely to increase evapotranspiration, expected to contribute to crop failure and overall yield reductions. An increased likelihood of droughts and prolonged dry periods will also exacerbate land degradation. As temperatures rise, so will the likely increase of pests and risk of fire. Increased frequency and intensity of extreme events may change or impact species composition and alter 'regulating services' such as soil water maintenance, base flows and filtration.⁴⁵ **Figure 11** shows the change for average daily max-temperature across seasonal cycles. These higher temperatures have implications for impacts to soil moisture and crop growth and as seen in the graph below, show an increase throughout the year.

FIGURE 11. Average daily max temperature for Gabon (RCP8.5 Ensemble, Reference Period, 1986–2005)⁴⁶



⁴³ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁴⁴ Adaptation Partnership (2011). Gabon, Review of current and planned adaptation action in Middle Africa. URL: <https://www.preventionweb.net/publications/view/25288>

⁴⁵ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁴⁶ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon Agriculture. Dashboard URL: <https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=GAB&period=2080-2099>

Adaptation Options

Irrigation is one measure which can prevent or minimize the effects of climate change, in particular for areas experiencing decreased precipitation. Given Gabon's dependency upon agriculture as well as existing vulnerability to climate change, key adaptation actions have been recommended such as to conduct necessary research in order to define the critical climate thresholds for local crops; improve the technical capacities to support traditional cultivation practices become more resilient to climate change; implement soil protection and restoration measures in order to improve soil fertility; and initiate agro-forestry projects in an effort to enrich soils.⁴⁷ Gabon also began its National Agricultural Investment and Food and Nutrition Security Plan (2017–2022), which is meant to increase crop and livestock productivity and fish production, increase capacities of smallholder producers and support improved governance for the agricultural and rural sector.⁴⁸ The Gabonese Government is also working to enhance the economic contributions from the country's agriculture to the overall economy and enhance 'non-timber' forest products and further develop livestock and fisheries. These efforts will also improve the country's food security situation and enhance income generating activities.⁴⁹

Water

Overview

Climate change will impact Gabon's water supply, impacting demand from the agricultural sector as well as increasing drinking requirements from population growth. Annual distribution of rainfall is of great interest to the water industry as the distribution of water throughout the year is critical for planning of resources as well as for safety against disasters. While the country is currently listed as a low-risk for water scarcity for drinking, the threat for salinization and coastal flooding remains high. Gabon's vulnerability related to the primary impact of increased rainfall may have in some areas, leading to increased river volumes, erosion and loss of soil and the resulting implication on vegetation, proliferation of marsh lands, fisheries and fish population distributions, as well as water-borne diseases. Additionally, physical infrastructure and habitats remains at risk⁵⁰, and flooding can damage sanitation infrastructure and lead to the spread of fecal waste through flood water. The capital city, Libreville, is built on a flat peninsula, which is bordered by the Atlantic Ocean and Komo and Mondah estuaries. During high tides, seawater flows into all rivers, resulting in surface water resources becoming too brackish to be used for drinking water and the city has been forced to source water from remote rivers (often 45–55 km away).⁵¹

⁴⁷ Adaptation Partnership (2011). Gabon, Review of current and planned adaptation action in Middle Africa. URL: <https://www.preventionweb.net/publications/view/25288>

⁴⁸ IFAD (2020). Gabonese Republic. Country Strategy Note. URL: <https://www.ifad.org/documents/38711644/40077965/Country%20Strategy%20Note-%202020-2022/36610c0a-bd07-2624-607c-2151aec0d437>

⁴⁹ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁵⁰ Adaptation Partnership (2011). Gabon, Review of current and planned adaptation action in Middle Africa. URL: <https://www.preventionweb.net/publications/view/25288>

⁵¹ Collignon B., and Ondo C. (2017). Managed Aquifer Recharge (MAR) to Supply Libreville, a Water-Stressed City (Gabon). In: Renard P., Bertrand C. (eds) EuroKarst 2016, Neuchâtel. Advances in Karst Science. Springer, Cham. DOI: https://doi.org/10.1007/978-3-319-45465-8_26

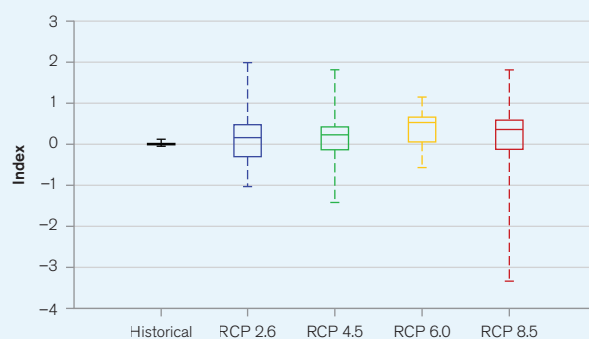
Climate Change Impacts

Projected temperature increases and precipitation trends are also expected to result in hydrological impacts of the country's watercourses, such as catchments, rivers and coastlines. Increasing temperatures will also play an adverse role in evapotranspiration, changes in groundwater inflow, water level in rivers and lakes, and water temperatures. Changes in precipitation will influence not only the discharge, but the intensity, time period and frequency of floods and droughts as well as soil humidity, ground water recharge and the amount of water flowing through rivers. The changing in rainfall patterns and intensity, shown in the graph below by the projected increasing number of days with very heavy precipitation through the end of the century.⁵²

Rainfall and evaporation changes also impact rates of surface water infiltration and the recharge rates for groundwater. Low-water storage capacity increases the country's dependence on unreliable rainfall patterns. Changes in rainfall and evaporation translate directly to changes in surface water infiltration and groundwater re-charge. This has the potential for further decreased reliability of unimproved groundwater sources and surface water sources during droughts or prolonged dry seasons. Increased strain on pumping mechanisms leading to breakdowns if maintenance is neglected and the potential for falling water levels in the immediate vicinity of well or borehole, particularly in areas of high demand. Additionally, temperature increases have the potential to result in increased soil moisture deficits even under conditions of increasing rainfall.⁵³

Figure 12 shows the projected annual Standardized Precipitation Evapotranspiration Index (SPEI) through the end of the century. SPEI is an index which represents the measure of the given water deficit in a specific location, accounting for contributions of temperature-dependent evapotranspiration and providing insight into increasing or decreasing pressure on water resources. Negative values for SPEI represent dry conditions, with values below -2 indicating severe drought conditions, likewise positive values indicate increased wet conditions. This is an important understanding for the water sector in regards to quantity and quality of supply for human consumption and agriculture use as well as for the energy sector as reductions in water availability impacts river flow and the hydropower generating capabilities. As seen in the chart below, in aggregate, Gabon is projected to experience similar dry conditions as present day. However, western areas of the country are projected to increase in aridity, with heavy rainfall events likely to increase in intensity.

FIGURE 12. Annual SPEI drought index in Gabon for the period, 1986 to 2099 (Reference Period, 1986–2005)⁵⁴



⁵² Goldstein et al. (2017). Spatial planning for a green economy: National-level hydrologic ecosystem services priority areas for Gabon. PLOS ONE. DOI: <https://doi.org/10.1371/journal.pone.0179008>

⁵³ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon Water Sector. URL: <https://climateknowledgeportal.worldbank.org/country/gabon/climate-sector-water>

⁵⁴ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon. Water Sector Dashboard. URL: <https://climatedata.worldbank.org/CRMePortal/web/water/land-use/-/watershed-management?country=GAB&period=2080-2099>

Adaptation Options

Climate change adaptation for the water sector in Gabon requires further investments in flood defense, an integrated approach to water resources management and irrigation. For the hydrology and water resources sector, the following research activities related to climate change impacts and adaptation are proposed. The construction of dikes and flood protection infrastructure is recommended to control water flow and protection of embankments against erosion, as well as additional construction of dams and basins for increased water storage capacity. Dredging activities should be carried out to reduce 'water flow resistance' or by enlarging waterways for lower water levels and improved navigability.⁵⁵ The establishment and implementation of early warning systems should be put in place, particularly for the Ogooué Basin in order to manage the area's rapid water rise. Risk prevention plans with a focus on flooding should be put in place in conjunction with mapping exercises to identify at-risk areas.⁵⁶ Social protection measures should be implemented for populations living in at-risk-areas such as resettlement programs, and mainstreaming climate-resilience aspects into technical designs, management and operation of water and sanitation systems in order to make them less vulnerable. Development of a national database and system of rainfall-runoff models to project the effects of rainfall changes (for climate variability and climate change) on runoff and discharges (including peak and low flows). This should be done in important river basins and catchments and linked to an expanded national runoff and flood reporting system.⁵⁷

Energy

Overview

Gabon is one of the top five oil producers in sub-Saharan Africa and one of the leading countries in its oil exploration and production, however the country has been facing declining output for more than a decade. The economy and energy sector remain highly dependent upon the country's oil production, with oil revenues accounting for 45% of total government revenue and crude export accounting for nearly 74% of total export revenue in 2019.⁵⁸ Gabon's electricity supply is through seven hydroelectric facilities. A heavy fuel station was commissioned in 2000 to meet the increasing demands of Libreville, however new studies are underway to find more economical and efficient power generation facilities.⁵⁹ Still, the World Bank estimates that only 60% of Gabon's population has access to electricity. According to the US Energy Information Administration (EIA), nearly 50% of energy consumption is from biomass and waste (wood, crop residues, manure, and charcoal), the rural population's primary method of meeting household cooking and heating needs. Amidst rising electricity demand among both residential and industrial consumers and frequent electricity shortages, Gabon is currently working to expand the electricity supply and meet increasing demand, primarily by building hydropower plants and extending transmission lines. However, expansion of hydropower does not erase concerns regarding electricity reliability, as key business hubs in the country have previously experienced blackouts during periods of low rainfall.⁶⁰

⁵⁵ Goldstein et al. (2017). Spatial planning for a green economy: National-level hydrologic ecosystem services priority areas for Gabon. PLOS ONE. DOI: <https://doi.org/10.1371/journal.pone.0179008>

⁵⁶ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁵⁷ Collignon B., and Ondo C. (2017). Managed Aquifer Recharge (MAR) to Supply Libreville, a Water-Stressed City (Gabon). In: Renard P., Bertrand C. (eds) EuroKarst 2016, Neuchâtel. Advances in Karst Science. Springer, Cham. DOI: https://doi.org/10.1007/978-3-319-45465-8_26

⁵⁸ US Energy Information Administration (2021). Independent Statistics and Analysis, Gabon. URL: <https://www.eia.gov/international/overview/country/GAB>

⁵⁹ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁶⁰ Nachmany, M. et al. (2015). Climate Change Legislation in Gabon. LSE Grantham Institute. URL: <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/GABON.pdf>

Climate Change Impacts

Gabon's energy sector is sensitive to changes in seasonal weather patterns and extremes that can affect the supply of energy, impact transmission capacity, disrupt oil production, and impact the integrity of transmission pipelines and power distribution.⁶¹ A key issue to Gabon's energy sector is water availability and rising temperatures, coupled with growing consumer demand. Increased temperatures with decreased or limited water availability will impact the country's hydropower generation as well as cooling capabilities for power generating systems.⁶² An increased frequency of heavy rains as well as river flooding can also impact hydropower capacity from increased sedimentation. Sea level rise may damage coastal infrastructure and/or transmission and distribution capabilities. Coastal erosion, coastal flooding, or storm surges can also impact supply.⁶³

Cooling Degree Days show the relationship between daily heat and cooling demand, typically sourced through a form of active cooling or an evaporative process. The change in cooling degree days provides insight into the potential for extended seasons of power demand or periods in which cooling demand (power demands) might increase. As seen in **Figure 13**, seasonal increases for cooling demands are expected to increase throughout the year. Warm Spell Duration represents the number of days in a sequence of at least six days in which the daily maximum temperature is greater than the 90th percentile of daily maximum temperature. **Figure 14** shows warm spells are expected to sharply increase in the second half of the century.

FIGURE 13. Change in Cooling Degree Days (65°F) in Gabon for the period 2040–2059 (Reference Period, 1986–2005)⁶⁴

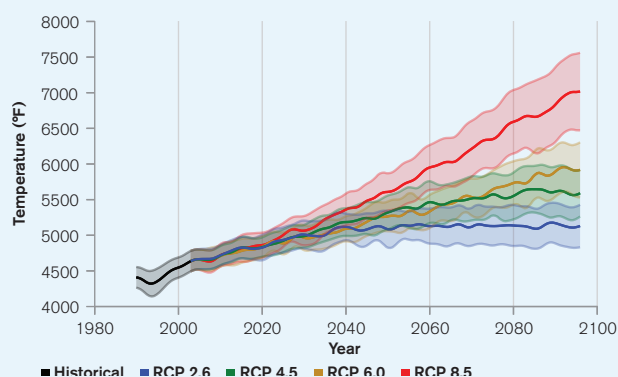
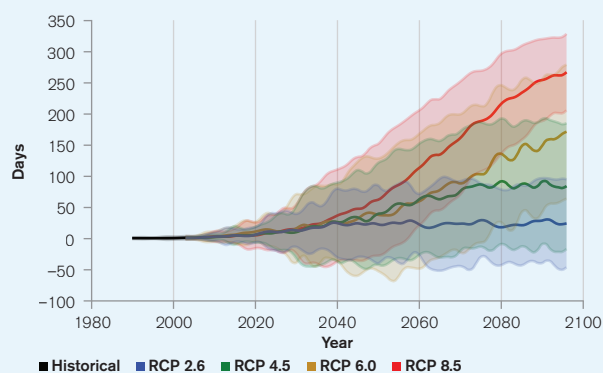


FIGURE 14. Warm Spell Duration Index in Gabon for the period 1986 to 2099 (Reference Period, 1986–2005)⁶⁵



⁶¹ US Energy Information Administration (2021). Independent Statistics and Analysis, Gabon. URL: <https://www.eia.gov/international/overview/country/GAB>

⁶² WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon. Energy Sector. URL: <https://climateknowledgeportal.worldbank.org/country/gabon/climate-sector-energy>

⁶³ USAID (2018). Climate Risk Profile – West Africa. Fact Sheet. URL: https://www.climatelinks.org/sites/default/files/asset/document/West_Africa_CRP_Final.pdf

⁶⁴ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon – Energy. URL: <https://climateknowledgeportal.worldbank.org/country/gabon/climate-sector-energy>

⁶⁵ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon. Energy Sector Dashboard. URL: <https://climatedata.worldbank.org/CRMePortal/web/energy/oil-gas-and-coal-mining?country=GAB&period=2080-2099>

Adaptation Options

To ensure the resilience of energy infrastructure to current climate variability and projected future climate change, the continued provision of basic services to the public and industry needs to be provided to enhance the quality of decision making. The Gabonese Government and individual departments should understand the inherent vulnerabilities in this energy sector and develop flexible adaptation strategies for existing and planned infrastructure. These should coincide with the continued need to electrify the rest of the country, particularly in rural areas.⁶⁶

Consideration should be given to the capacity of energy systems to sustain cumulative impacts; the redundancy at peak periods; the sensitivity of regulators to climate change pressures on infrastructure and the possible need for redundant capacity; demand management and energy conservation strategies. Institutionalized measures for energy saving will allow decreasing consumption of primary energy, mainly natural gas. Additional investments can be made in energy efficiency and renewable energy sources; a high priority for both economic (decrease in costs for energy generation) and climate mitigation (decrease in volumes of greenhouse gas emissions).⁶⁷

Health

Overview

Gabon's health sector is plagued by malaria, premature birth, acute respiratory infections, HIV and diarrheal diseases, which are the leading causes of death among children under the age of five. The country has seen an increase in the prevalence of noncommunicable diseases, in particular cardiovascular diseases, diabetes, renal failure and cancers. Gabon bears a double burden of communicable and noncommunicable disease, each with high mortality rates. Through a 2008 health financing reform, Gabon instituted a system of mandatory health insurance and established a national mandatory health insurance and social security fund; currently this fund covers 60% of the population.⁶⁸ In 2010, a new national health policy was adopted, with the goal of improving public health by reducing maternal, infant and child mortality and the prevalence of malaria, HIV/AIDS, tuberculosis, neglected tropical diseases and noncommunicable diseases. The country's health system continues to have a number of obstacles to contend with: some health departments are not operational, the quality of health care is poor, essential medicines are scarce, information systems are dysfunctional, and the community is not involved in the management of health issues. The principal challenges facing the health system are to reduce maternal and infant mortality, and to control communicable and noncommunicable diseases.⁶⁹

⁶⁶ Goldstein et al. (2017). Spatial planning for a green economy: National-level hydrologic ecosystem services priority areas for Gabon. PLOS ONE. DOI: <https://doi.org/10.1371/journal.pone.0179008>

⁶⁷ EIA (2017). Gabon. URL: <https://www.eia.gov/international/overview/country/GAB>

⁶⁸ Sango, N.A. and Yaya, S. (2019). Wealth Status, Health Insurance, and Maternal Health Care Utilization in Africa: Evidence from Gabon. BioMed Research International. Research Article. DOI: <https://doi.org/10.1155/2020/4036830>

⁶⁹ WHO (2014). Country Cooperation Strategy – at a glance. Gabon. URL: https://apps.who.int/iris/bitstream/handle/10665/136840/ccsbrief_gab_en.pdf?sequence=1

Climate Change Impacts

Climate change will pose numerous direct impacts and increasing risks to the country's population health. Higher incidence of hot and dry summers with increased night and day temperatures as well as maximum daily temperatures are expected. More frequent occurrences of heat waves will pose a serious threat to human health, particularly for highly vulnerable groups: elderly and chronically ill. Major identified health risks for Gabon from climate variability are the projected increase in water-borne diseases. Projected increasing annual mean temperatures and the projected change annual mean temperature through the 2050s will impact human and animal health, as well as present more conducive environments for bacteria, pathogens and vector borne diseases.⁷⁰ Warmer and drier conditions as projected by climate scenarios may favor the spread of diseases borne by food or water, such as diarrhea and dysentery.

Rising temperatures are of increasing concern. The annual distribution of days with a high-heat index provides insight into the health hazard of heat. **Figure 15** shows the expected Number of Days with a Heat Index >35°C for the 2090s. As seen in this figure, a sharp increase in these days starting from the mid-century, under the highest emission scenario (RCP8.5). Night temperatures (>20°C), are expected to rapidly rise in a high-emission scenario. The health impacts of heat can be projected and monitored through the frequency of tropical nights. Tropical Nights (**Figure 16**) represents the projected increase in tropical nights for different emission scenarios to demonstrate the difference in expected numbers of tropical nights.

FIGURE 15. Days with a Heat Index >35°C (Reference Period, 1986–2005)⁷¹

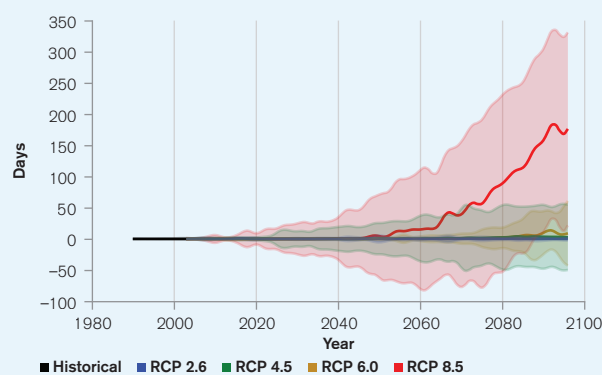
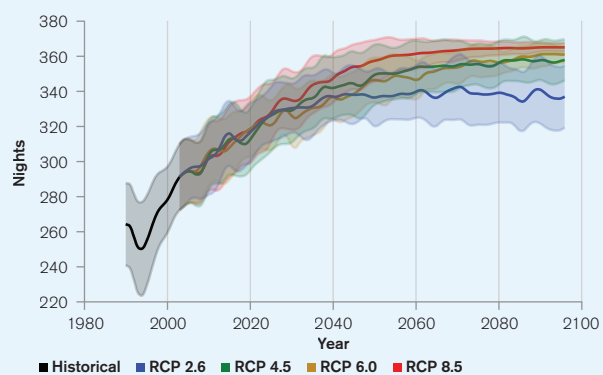


FIGURE 16. Number of Tropical Nights (Tmin >20°C) (Reference Period, 1986–2005)⁷²



⁷⁰ Adaptation Partnership (2011). Gabon, Review of current and planned adaptation action in Middle Africa. URL: <https://www.preventionweb.net/publications/view/25288>

⁷¹ WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon. Health Sector Dashboard. URL: <https://climatedata.worldbank.org/CRMePortal/web/health/systems-and-service?country=GAB&period=2080-2099>

⁷² WBG Climate Change Knowledge Portal (CCKP, 2021). Gabon. Health Sector Dashboard. URL: <https://climatedata.worldbank.org/CRMePortal/web/health/systems-and-service?country=GAB&period=2080-2099>

Adaptation Options

Gabon's health care system personnel are not fully aware of the relationship between climate change and variability and health impacts. There has been no specific training of the personnel in regard to adaptation to climate change and mitigating its negative health impacts. Increases in training and capacity can improve the level of knowledge and skills to prevent diseases connected with climatic factors, however this knowledge remains relatively limited among the general population. Likewise, general awareness campaigns regarding climate change and its impact to human health is critical, especially for most vulnerable groups such as children and the elderly. The expansion of studies on the assessment of climate change impacts on population health have been requested.⁷³

Early warning systems can also be developed to improve the country's resilience by providing timely information on the atmospheric state and effects of such a state on the organism. Additionally, biometeorological forecasts can impact human health through daily public informing on expected meteorological conditions in order to give certain advice on health protection and symptoms prevention. Specific action should be targeted to strengthen the screening for river blindness; implementation for improved drinking water purification and delivery systems; reduced deforestation rates and increased research around the links between population displacement, human health and the risks of climate-related diseases.⁷⁴

Coastal Zone and Sea Level Rise

Overview

Gabon's coastal waters and marine Exclusive Economic Zone represent major economic, social and ecological importance for the country.⁷⁵ Gabon's coastal environment is located in two distinct climatic areas: the equatorial climate of transition in the central area and the equatorial climate of transition in the south-west and central Atlantic coast. The equatorial climate of transition in the central area has the estuarine climate, situated in the coastal area north-west of the country including Coco Beach and Libreville. This sub climate is characterized by high precipitation, varying between 2,000 mm to 3,800 mm per year. Its coast includes Africa's third largest freshwater delta, and possibly one of the most intact across the continent. The wetlands of the Ogooué Delta, known as the Bas Ogooué, and coastal habitats to the north and south are a complex mosaic of freshwater, estuarine and dryland habitats, which provide a wealth of important ecosystem services for people and nature. They filter water and remove sediments and toxins that may arise from upstream urban areas and agricultural, forestry and mining operations; and they absorb water during the rainy season and minimize downstream floods to communities living in the riparian or floodplain zones. The biodiversity of the region supports nesting, rearing and feeding for many fish and other species upon which local communities depend for their livelihoods. The wetlands of the Bas Ogooué also provide habitat for a vast diversity of plants, birds, amphibians, mammals, reptiles and other species.⁷⁶

⁷³ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁷⁴ Adaptation Partnership (2011). Gabon. Review of current and planned adaptation action. URL: <https://www.preventionweb.net/publications/view/25288>

⁷⁵ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

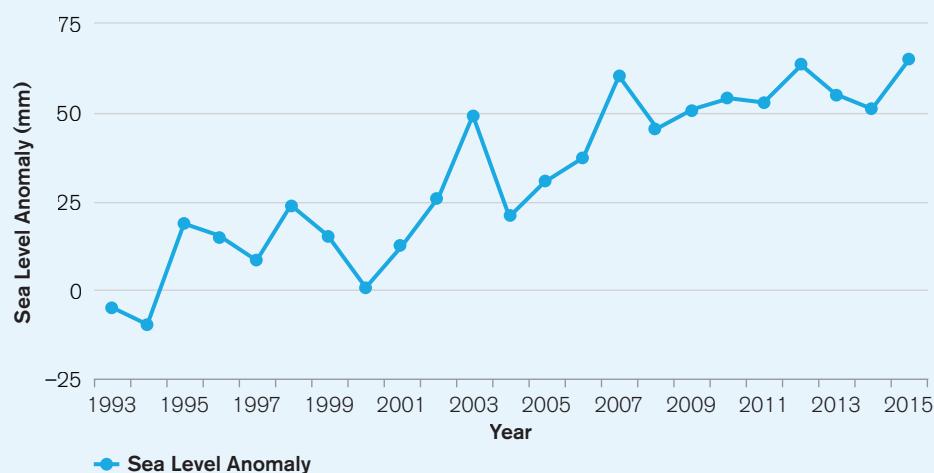
⁷⁶ Faure, F. and Moussounda, C. (2009). Gabon, in Odido M. and Magzilli S. (Eds), UNESCO-IOC. African oceans and coasts, pp. 83–88. URL: http://fust.iode.org/sites/fust.iode.org/files/public/images/odinafrica/Chapter_7_6_Gabon.pdf

Climate Change Impacts

The majority of the population and infrastructure is located along the coast and Gabon's coastal zone includes the Estuaire, Ogooué Maritime and Nyanga. Increasing population growth and demographic pressures of the main coastal towns (Libreville, Port-Gentil, Gamba and Mayumba), unsustainable use of resources, increased coastal storms, coastal erosion and the observed rapid rise in sea level with its indirect impacts (the salinization of water, habitat destruction, erosion), make the Gabonese coast extremely vulnerable.⁷⁷

Gabon has a large maritime area estimated at about 265,000 km², which includes a territorial sea of 12 nautical miles. The large coast and marine waters are rich in mineral and biological resources. Climate change is expected to have substantial implications for Gabon's marine ecosystems and fish stocks. Though the region is highly productive due to major ocean currents, human activities (e.g. pollution, coastal development, over and illegal fishing), and changes in environmental conditions, such as increases in sea surface temperature, ocean acidification, decline in oxygen content, rise in sea levels, and increased ultraviolet exposure, have and will continue to adversely affect marine organisms and the associated ecosystem goods and services derived from them, such as fisheries. Navigation, port activities, exploitation of marine resources, tourism, and coastal development all play important roles in the development of the country. These areas are threatened by rising sea levels, coastal erosion, pollution, and over exploitation. Estimates suggest that the coastal shore erosion has experienced 100 to 250 m shoreline erosion since 1950, most specifically seen along Cap-Lopez to the north of Port-Gentil. Mangrove systems have disappeared at a rate of 50 hectares per year between 1960 and 1990. Expected sea level rise, storm surge and heavy storms are expected to put coastal zone communities, infrastructure and economies at high risk. **Figure 17** shows the annual average sea level change from 1993 to 2015.

FIGURE 17. Sea level rise in Gabon



⁷⁷ Faure, F. and Moussounda, C. (2009). Gabon, in Odido M. and Maggilli S. (Eds), UNESCO-IOC. African oceans and coasts, pp. 83–88. URL: http://fust.iode.org/sites/fust.iode.org/files/public/images/odinafrica/Chapter_7_6_Gabon.pdf

Adaptation

Gabon is working to adapt to the negative impacts of coastal erosion through the construction and expansion of embankments, dykes and walls along the sea front from Pointe Clairette to Point Iguiri. Additionally, the country is implanting beach recharging from Cap Lopez to Pointe Ozouri and the backfilling of the lowlands inland along the Atlantic coastline and the deltaic plain of Mbéga-Mandorové. Investment in municipalities can support basic infrastructure for water treatment. Additional research is needed for the country to better define sea-level rise and ongoing coastal erosion as well as increasing risk of salinization of fresh water sources.⁷⁸ To improve marine and coastal resources management, Gabon has implemented “Gabon Bleu,” a Presidential marine conservation initiative aimed at the sustainable management of Gabon's coastal and oceanic waters, which has included the creation of a comprehensive marine protected area network covering 26% of its exclusive economic zone.

ADAPTATION

Institutional Framework for Adaptation

Gabon's climate change strategies have been led by the Ministry of Forests, Water, Fisheries and the Environment and the Protection of Nature. As a member to the Central African Forests Commission (COMIFAC), Gabon is supporting regional efforts to implement responsible forestry management against climate change vulnerabilities. Gabon is also one of four countries participating in a continent-wide climate change adaptation program.⁷⁹ These efforts are designed to specifically support and build technical capacities and coastal zone resiliency. Gabon established a National Council on Climate Change with its Climate Change Communication Committee in 2010. The Climate Council falls under the President's direct authority, and is charged with preparing and managing the National Climate Plan (developed in 2012) This Climate Plan was developed as an approach to preserve the rainforests and manage industrial emissions. The plan is integrated into the government's broader strategic development goals produced with the National Commission on Sustainable Development and through the newly-created Ministry of Economy and Sustainable Development.⁸⁰

⁷⁸ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁷⁹ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

⁸⁰ Nachmany, M. et al. (2015). Climate Change Legislation in Gabon. Grantham Research Institute on Climate Change and the Environment. URL: <https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/GABON.pdf>

Policy Framework for Adaptation

Gabon issued its First National Communication in 2005 and Second National Communication in 2011. As Gabon has one of the highest levels of development among central-West Africa and is not characterized as a Least Developed Country, and thus is not required to prepare a National Adaptation Program of Action under the UNFCCC. Gabon established a Climate Council in 2010 in an effort to develop specific climate change related activities.⁸¹ The Ministries of Planning, Finance and Environment intend to create a National Adaptation Fund.⁸²

Gabonese Government is working to support climate change planning and adaptation measures are integrated with sectoral adaptation strategies and mainstreamed across government planning; at the time of writing, the country was preparing a new climate law, with estimated completion by the end of 2021. Current government strategies relating to climate change in the country emphasize challenges faced by climate change, with little development of short to long term adaptation and mitigation strategies. Government ministries and national bodies will need to take into account the future effects of climate change when developing their strategic plans for the coming years and decades, including ministries and agencies responsible for the agricultural, energy, tourism and water sectors. Additional evidence to inform policy and adaptation strategies is needed for the development of a more comprehensive adaptation framework. There is potential for the country to develop a low-carbon economy and to begin to actively adapt to climate change. This reality, along with mainstreamed adaptation and resilience planning needs to be driven by concerted government effort, in coordination to the development of effective cooperation and collaboration between relevant government departments to adequately integrate climate change adaptation in existing policies, foster the elaboration of a national climate change adaptation strategy, and national climate change adaptation plan. Gabon has made a firm commitment to reducing emissions by introducing a carbon fee, promoting renewable energy, encouraging energy efficiency, and committing to GHG reductions under the Kyoto Protocol.⁸³

National Frameworks and Plans

- [Nationally Determined Contribution](#) (2016) French
- [Second National Communication the UNFCCC](#) (2011) French
- [Initial National Communication the UNFCCC](#) (2005) French
- [National Strategy on Coastal Adaptation to Climate Change](#) (2013) French
- [National Climate Plan](#) (2012) French

⁸¹ Nachmany, M. et al. (2015). Climate Change Legislation in Gabon. Grantham Research Institute on Climate Change and the Environment. URL: <https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/GABON.pdf>

⁸² Adaptation Partnership (2011). Gabon, Review of current and planned adaptation action. URL: <https://www.preventionweb.net/publications/view/25288>

⁸³ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

Recommendations

Research Gaps

- Increase data collection on the nature and magnitude of physical and biophysical climate change impacts under differing scenarios, specifically for Gabon's health sector and coastal zones
- Undertake risk assessments to develop a better understanding of important indicators of climate change impacts for the future to define key vulnerabilities to the energy, agriculture and fisheries sectors
- Develop monitoring and evaluation systems to observe changes to coastlines and land usage
- Widen the participation of public, scientific institutions, women and local communities in planning and management, taking into account approaches and methods of gender equity
- Invest in necessary technical improvements to national hydrometeorological observation equipment, networks and technical analysis capabilities

Data and Information Gaps

- Improve Gabon's hydro-met database and weather service capabilities, especially coastal storm detection
- Improve data availability for key sectors such as agriculture, tourism, water resources, and others, the data is not available to estimate the impacts of future climate change. Much of the data needed to estimate the future damages from climate change and avoid them through adaptation would also help with existing climate variability and help better target existing policies/ programs. This includes making data openly available which is paid for by the public budget
- Further develop forest maintenance and monitoring capabilities to support efforts of the country's REDD+ goals and related financial mechanisms
- Development of early warning systems about dangerous hydrometeorological phenomena and climate risk management

Institutional Gaps

- Establish institutional capacity for providing timely early warning systems
- Coordinate of the activities of various actors and sectors, including - government agencies, ministries, and private entities and firms⁸⁴
- Integrate of climate into national planning – Sectoral plans should be developed for the coming 20–30 years and beyond and climate and climate change should be incorporated as a factor. This includes the development of physical plans on the coast to minimize the risk from sea-level rise, targeting subsidies in the agriculture sector to reduce climate vulnerability, physical planning and energy planning that will reduce emissions but also take into account changing environmental conditions, being prepared to deal with health problems which may arise from heat waves, and many other areas

⁸⁴ Gabon (2011). Second National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Second%20Nat%20Com_GABON_Complete.pdf

CLIMATE RISK COUNTRY PROFILE

GABON