Federal Ministry
for Economic Cooperation
and Development

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Climate Risk Profile: Cameroon*

Summary

This profile provides an **overview of the projected climate parameters and related impacts** on different sectors in Cameroon until 2080 **under different climate change scenarios** (called Representative Concentration Pathways, RCPs). RCP2.6 represents a low emissions scenario that aims to keep global warming likely below 2 °C above pre-industrial temperatures. RCP6.0 represents a medium to high emissions scenario that is likely to exceed 2 °C. **Model projections do not account for effects of future socio-economic impacts unless indicated otherwise.**

The models project an **increase in crop lands exposed to drought**. Yields of maize, millet and sorghum are projected to decline, while yields of cassava, groundnuts and rice are projected to benefit from CO_2 fertilisation. Farmers will need to adapt to these changing conditions.

If agro-ecological zones shift, then ecosystems will be affected as well as biodoversity and crop production. Models project varying trends in species richness, depending on the region in Cameroon, while projections of tree cover are uncertain.

Agriculture, biodiversity, health, infrastructure and water are highly vulnerable to climate change. The **need for adaptation in these sectors has been stressed in Cameroon's Nationally Determined Contributions (NDC)** targets and should be addressed by cooperating partners in the country.

Per capita **water availability will decline by 2080 mostly due to population growth**. According to nationally aggregated data, thresholds for water scarcity and water stress will not be passed. However, it is likely that some regions will experience lower water availability than others.

Depending on the scenario, **temperature** in Cameroon is projected to **rise by between 1.6 and 1.9 by 2030 and up to 3.8 °C by 2080**, compared to pre-industrial levels. Higher temperatures and more temperature extremes are projected for the northern part of the country.

The share of the **population affected** by at least one **heatwave** per year is projected to **rise** from 3.2 % in 2000 to 13.3 % in 2080. This is related to 51 more very hot days per year over this period. As a consequence, **heat-related mortality** is projected to **increase from 2.5 deaths in the year 2000 to 9.1 deaths** in the year 2080, which is a factor of more than 3.5. However, this trend will already be felt earlier in the century, with an increase to 4.1 deaths by 2030.

Precipitation trends are uncertain with projections indicating an **increase in annual precipitation**: This trend will be already felt in the near future, with an increase of 27 mm by 2030, but particularly towards the end of the century, with an **increase of up to 68 mm by 2080.** Future dry and wet periods are likely to become **more extreme** under both scenarios.

Under RCP6.0, the **sea level** is expected to **rise by 39 cm** until 2080. This **threatens Cameroon's coastal communities** and may cause **sea water intrusion** in coastal waterways and groundwater reservoirs.

Climate change is likely to cause **severe damage to the infrastructure sector** in Cameroon including roads, railways and other infrastructure. As roads are the backbone of the country's transportation network, investments will need to be made to make roads and other infrastructure more climate-resilient.

* Further in-depth information on climate impacts and selected adaptation strategies in the agricultural sector can be found in a complimentary climate risk analysis for Cameroon, which will be finalised in spring 2022.

Published in July 2022

Context

The Republic of Cameroon is located in the **western most part of Central Africa** and has access to the Atlantic Ocean through more than 400 km of coastline. The country had a **population of 26.6 million** people in 2020 with an annual demographic **growth rate of 2.6 %** [1]. The **majority of the population lives in Douala**, the largest city in Cameroon, and in **Yaoundé**, the capital city, with **major population clusters in the northern and western parts of the country**. With a real GDP per capita of 1 420 USD in 2020 [1], the country is a **lower-middle-income country**. Cameroon's economy is dominated by the services sector, contributing 52.0 % to the country's GDP in 2020, followed by the industrial sector with 23.3 % and the agricultural sector with 17.4 % [2]. Cameroon's key export is crude petroleum, which goes primarily to China, Italy and the Netherlands [3]. Important food exports include cocoa beans, coca products and bananas [3]. Although Cameroon's economy has been diversifying, the **agricultural sector** continues to be the **primary means of livelihood** for the country's population, especially in rural areas. An estimated 44 % of the working population are employed in the agricultural sector, however, this share is likely to be much higher [4]. Important **staple crops are maize, sorghum, groundnuts and cassava** [5]. As **agricultural production** in Cameroon is primarily **subsistence-based and rainfed**, especially smallholder farmers suffer from the impacts of climate change [15]. This is also reflected in the 5.3 % of the total population who suffered from undernourishment in 2018–2020. **Limited adaptive capacity in the agricultural sector**, such as limited access to agricultural inputs, formal credit or extension services, **underlines the country's vulnerability to climate change.** In 2018, only 0.3 % of the total national crop land and 9 % of the land suitable for irrigation (290 000 ha) were equipped for irrigation [6], [7]. Different environmental challenges further add pressure on agricultural production in Cameroon, including deforestation and overgrazing, which in turn lead to erosion, desertification and reduced quality of agricultural land [8].

Cameroon served as a **destination for approximately 506 000 migrants and refugees**, especially from the Central African Republic and Nigeria [9]. In turn, many Cameroonians migrate to Gabon or outside of Africa, mainly to France and the United States [9]. In this way, Cameroonians contributed a total of **340 million USD in remittance flows** in 2020, which accounted for 0.9 % of the GDP in the same year [10].

Quality of life indicators [4], [11]–[13]

Human Development Index (HDI) 2020	ND-GAIN Vulnerability Index 2019	Gini Index 2014	Real GDP per capita 2020	Poverty headcount ratio 2014	Prevalence of undernourishment 2018–2020
0.563 **153 out of 189** (0 = low, 1 = high)	**39.2** **145 out of 181** (0 = low, 100 = high)	**46.6** (0–100; 100 = perfect inequality)	**1 420 USD** (constant 2015 USD)	**26.0 %** (at 1.9 USD per day, 2011 PPP)[1]	**5.3 %** (of total population)

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[1] Poverty headcount ratio for the year 2012 adjusted to 2011 levels of Purchasing Power Parity (PPP). PPP is used to compare different currencies by taking into account national differences in cost of living and inflation.

Topography and environment

Cameroon has a diverse topography, including coastal plains in the south-west, a plateau in center, mountains in the west and savannah plains in the north. The lowest point of the country is on the Atlantic coast, while the highest point is Mount Cameroon, a volcanic peak, at 4 045 m. **The country has a mostly tropical climate with higher amounts of precipitation in the south and a semi-arid to arid Sahelian climate with less precipitation in the north.** Accordingly, Cameroon can be divided into **five Agro-Ecological Zones** (AEZs): Unimodal Forest Zone, Bimodal Forest Zone, High Plateau Zone, High Savannah Zone and Sudano-Sahelian Zone (Figure 1) [14][2]. Each of these zones is characterised by specific temperature and moisture regimes, and consequently specific patterns of crop production and pastoral activities. Compared to other countries in Africa, Cameroon has **abundant surface water resources**, due to high precipitation amounts throughout most of the year and in most parts of the country. However, surface water availability displays a high **seasonal and regional variability**. Hence, in the dry season, demand may exceed supply, increasing the reliance on groundwater resources. Cameroon's rivers form a complex riverine system, with major rivers being the Sangana River, which flows from eastern Cameroon, discharging into the Atlantic Ocean, and the Benue River, which flows from northern Cameroon to Nigeria, serving as tributary to the Niger River. Climate change is expected to **limit water availability**, particularly in northern Cameroon. At the same time, the **frequency and intensity of flooding is likely to increase**, highlighting the **need for adaptation measures to protect biodiversity and maintain fragile ecosystems and their services** [15].

Present climate [16]

Cameroon's climate is influenced by a variety of factors, including latitude, elevation and proximity to the Atlantic Ocean. Mean annual temperatures range from 20 °C to 29 °C with lower values closer to the coast and in the north-western mountain ranges and higher values in the northern part of the country.

Annual precipitation sums range from 500 mm in northern Cameroon, which has an arid desert climate, to 3 000 mm on the central Atlantic Ocean coast, which is characterised by a tropical climate.

Most parts in Cameroon have a single rainy season (unimodal precipitation regime) from February to December, with decreasing length and precipitation amounts towards the north. Only in some parts in central Cameroon, e.g. in the capital Yaoundé, the rainy season is characterised by a double peak, usually in May and October.

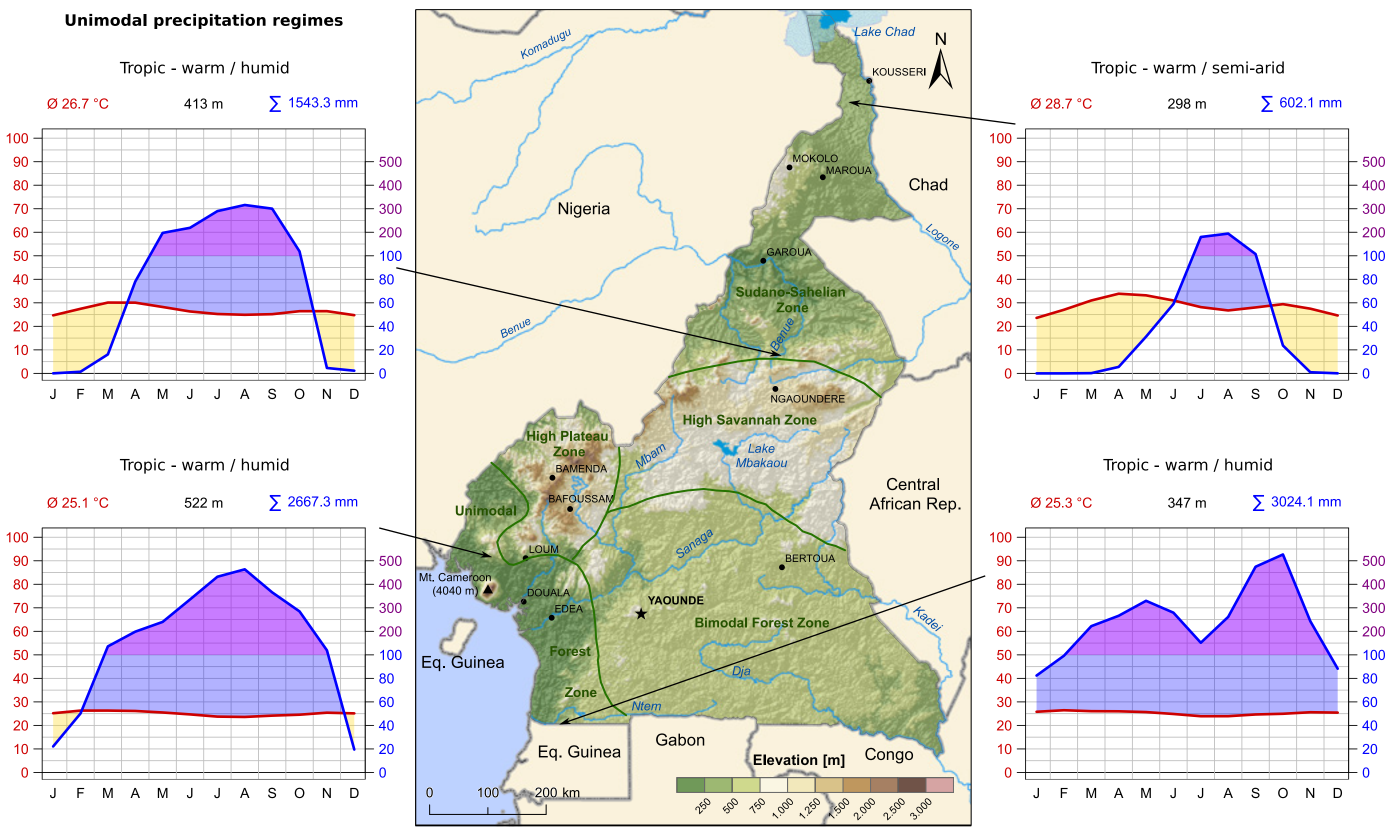


Figure 1: Topographical map of Cameroon with agro-ecological zones and existing precipitation regimes.[3]

[2] It should be noted that there are different classifications of AEZs in Cameroon. We focused on a commonly used classification of five zones.
[3] The climate diagrams display temperature and precipitation values which are averaged over an area of approximately 50 km × 50 km. Especially in areas with larger differences in elevation, the climate within this grid might vary.

Projected climate changes

How to read the line plots

- historical
- RCP2.6
- RCP6.0
- best estimate
- likely range
- very likely range

Lines and shaded areas show multi-model percentiles of 31-year running mean values under RCP2.6 (blue) and RCP6.0 (red). In particular, lines represent the best estimate (multi-model median) and shaded areas the likely range (central 66 %) and the very likely range (central 90 %) of all model projections.

How to read the map plots

Colours show multi-model medians of 31-year mean values under RCP2.6 (top row) and RCP6.0 (bottom row) for different 31-year periods (central year indicated above each column). Colours in the leftmost column show these values for a baseline period (colour bar on the left). Colours in the other columns show differences relative to this baseline period (colour bar on the right). The presence (absence) of a dot in the other columns indicates that at least (less than) 75 % of all models agree on the sign of the difference.
For further guidance and background information about the figures and analyses presented in this profile kindly refer to the supplemental information on how to read the climate risk profile.

Temperature

In response to increasing greenhouse gas (GHG) concentrations, **air temperature over Cameroon is projected to rise by 1.9 to 3.8 °C (very likely range) by 2080** relative to the year 1876, depending on the future GHG emissions scenario (Figure 2). Compared to pre-industrial levels, median climate model temperature increases over Cameroon amount to approximately 1.8 °C in 2030, 2.1 °C in 2050 and 2.2 °C in 2080 under the low emissions scenario (RCP2.6). Under the medium/high emissions scenario (RCP6.0), median climate model temperature increases amount to 1.7 °C in 2030, 2.2 °C in 2050 and 3.0 °C in 2080.

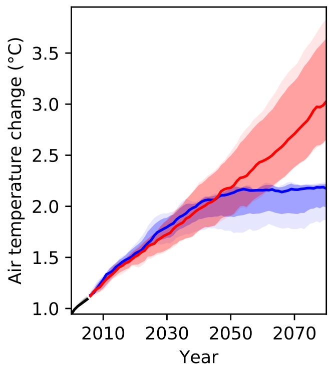


Figure 2: Air temperature projections for Cameroon for different GHG emissions scenarios.[4]

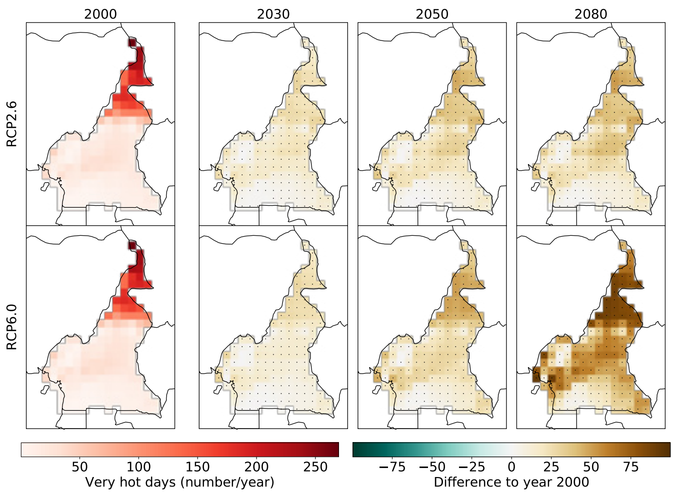


Figure 3: Projections of the annual number of very hot days (daily maximum temperature above 35 °C) for Cameroon for different GHG emissions scenarios.

Very hot days

In line with rising mean annual temperatures, the annual number of very hot days (days with daily **maximum temperature above 35 °C**) is projected to rise substantially and with high certainty, in particular over northern Cameroon (Figure 3). Under the medium/high emissions scenario, the multi-model median, averaged over the whole country, projects **12 more very hot days per year in 2030 than in 2000**, **24 more in 2050** and **51 more in 2080**. In some parts, especially in northern Cameroon, where the number of very hot days is already high today, this could amount to a total of **up to 310 very hot days** per year by 2080.

[4] Changes are expressed relative to year 1876 temperature levels using the multi-model median temperature change from 1876 to 2000 as a proxy for the observed historical warming over that time period.

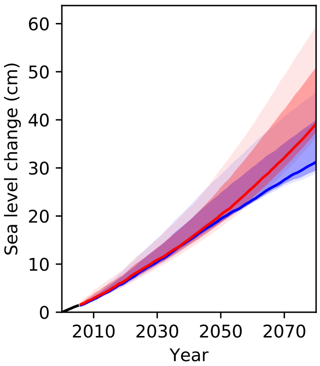


Figure 4: Projections for sea level rise off the coast of Cameroon for different GHG emissions scenarios, relative to the year 2000.

Sea level rise

In response to globally increasing temperatures, the sea level off the coast of Cameroon is projected to rise (Figure 4). Until 2050, very similar sea levels are projected under both emissions scenarios. Under RCP6.0 and compared to year 2000 levels, the median climate model projects **a sea level rise by 11 cm in 2030, 20 cm in 2050, and 39 cm in 2080**. This threatens Cameroon's coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs.

Precipitation

Future projections of precipitation are less certain than projections of temperature change due to high natural year-to-year variability (Figure 5). Nevertheless, all models underlying this analysis project an increase in mean annual precipitation over Cameroon. Specifically, median model projections show a **precipitation increase** of 48 mm under RCP2.6 and **68 mm under RCP6.0**. Higher greenhouse gas emissions suggest an **overall wetter future** for Cameroon.

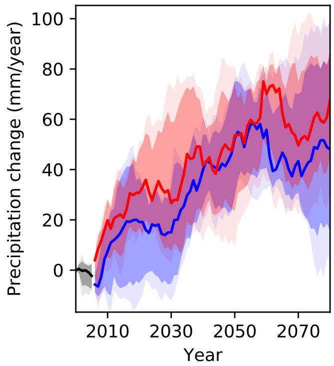


Figure 5: Annual mean precipitation projections for Cameroon for different GHG emissions scenarios, relative to the year 2000.

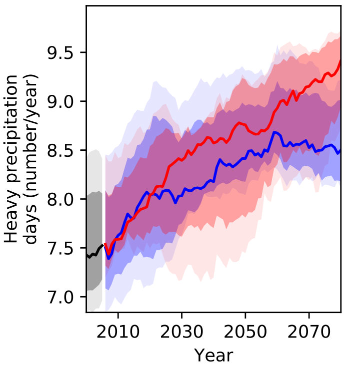


Figure 6: Projections of the number of days with heavy precipitation over Cameroon for different GHG emissions scenarios, relative to the year 2000.

Heavy precipitation events

In response to global warming, **heavy precipitation events are expected to become more intense** in many parts of the world due to the increased water vapour holding capacity of a warmer atmosphere. At the same time, the number of days with heavy precipitation events is expected to increase. This tendency is also reflected in climate projections for Cameroon (Figure 6). The median shows an **increase in the number of heavy precipitation days** for both RCPs, with a difference of 8.5 days under RCP2.6 and **9.4 days under RCP6.0** by 2080.

Soil moisture

Soil moisture is an important indicator for drought conditions. In addition to soil parameters and management, it depends on both precipitation and evapotranspiration and therefore also on temperature, as higher temperatures translate to higher potential evapotranspiration. Projections for annual mean soil moisture for a soil depth of up to 1-metre **show little change under either RCP** by 2080, compared to the year 2000 (Figure 7). Under both RCP2.6 and RCP6.0, models project a **decrease of around 1 %**. However, looking at the different models underlying this analysis, there is large year-to-year variability and modelling uncertainty, with some models projecting a much stronger decrease in soil moisture, especially under RCP6.0.

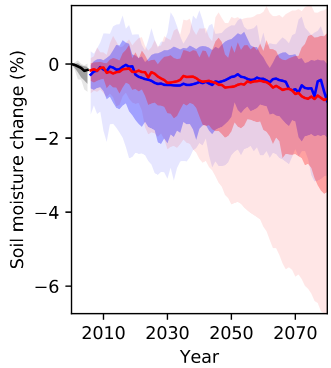


Figure 7: Soil moisture projections for Cameroon for different GHG emissions scenarios.

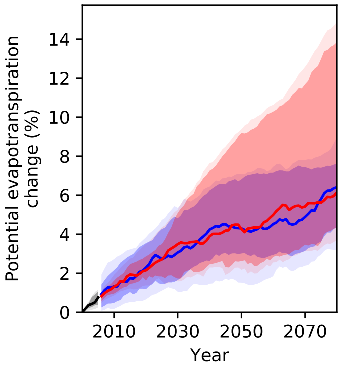


Figure 8: Potential evapotranspiration projections for Cameroon for different GHG emissions scenarios.

Potential evapotranspiration

Potential evapotranspiration is the amount of water that would be evaporated and transpired if sufficient water was available at and below land surface. Since warmer air can hold more water vapour, **it is expected that global warming will increase potential evapotranspiration in most regions of the world.** Until 2040, very similar increases in potential evapotranspiration are projected under both emissions scenarios (Figure 8). Although the median indicates a stronger increase under RCP2.6 than under RCP6.0 at the end of the century, the likely ranges show a different picture: Potential evapotranspiration will likely increase between 4.38 and 7.61 % under RCP2.6 and between 4.35 and 13.80 % under RCP6.0.

Sector-specific climate change risk assessment

a. Water resources

Current projections of water availability in Cameroon display high uncertainty under both GHG emissions scenarios. Assuming a constant population level, multi-model median projections suggest little change from 22 445 m³ in per capita water availability in the year 2000 to 22 412 m³ under RCP2.6 and 22 930 m³ under RCP6.0 by the end of the century (Figure 9A). Yet, when accounting for population growth according to SSP2 projections[5], **per capita water availability for Cameroon is projected to decline** dramatically under both RCPs (Figure 9B). It will reach 9 377 m³ under RCP2.6 and 9 594 m³ under RCP6.0 until the end of the century, both of which is still above the threshold for water stress (1 700 m³) and water scarcity (1 000 m³). While this projected decline is primarily driven by population growth, other factors will further increase the pressure on Cameroon's water resources, including climate. Hence, **investments will have to be made in water saving measures and technologies for future water consumption**.

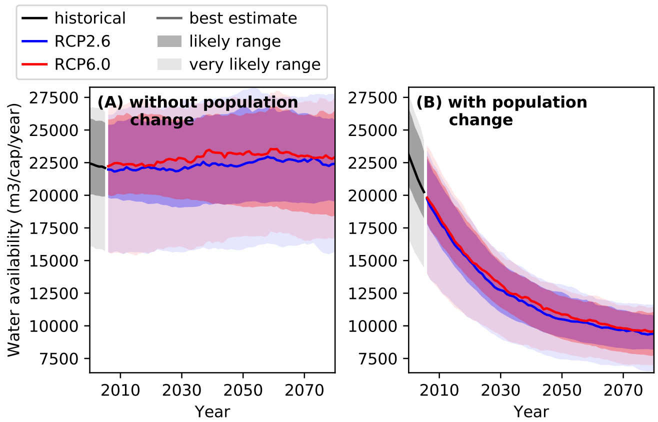


Figure 9: Projections of water availability from precipitation per capita and year with (A) national population held constant at year 2000 level and (B) changing population in line with SSP2 projections for different GHG emissions scenarios.

Projections of future water availability from precipitation vary depending on the region and scenario (Figure 10). Furthermore, they are subject to **low model agreement** on few areas in Cameroon: Under RCP2.6, water runoff is projected to increase by up to 4.8 % in western Cameroon and to decrease by up to 8.2 % in the south-eastern part of the country. Under RCP6.0, model agreement is even lower than under RCP2.6, with the exception of increases in western Cameroon of up to 6.8 % under that scenario. The partial increase in water availability projected under RCP2.6 is based on a constant population level. Hence, **water saving measures are likely to become important for Cameroon's rapidly growing population**.

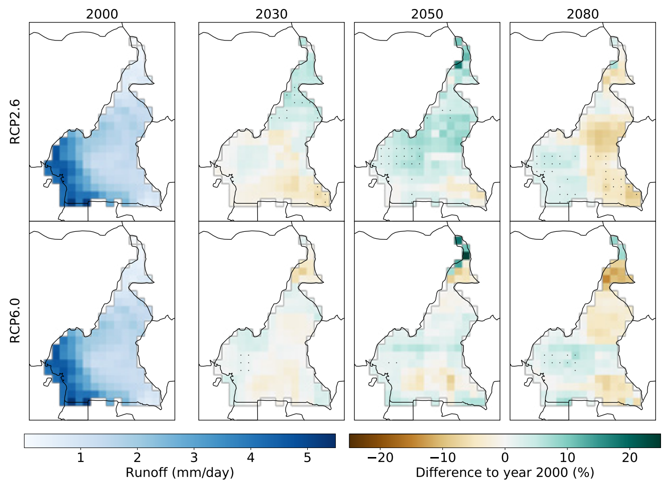


Figure 10: Water availability from precipitation (runoff) projections for Cameroon for different GHG emissions scenarios.

Cameroon is **relatively abundant in water resources**, thanks to high annual precipitation and vast surface water and groundwater resources. Yet, these resources are **unevenly distributed** between the north and the south of the country due to varying topographies and precipitation patterns. While average temperatures increase towards the north, precipitation levels decrease, presenting this part of the country with particular climate risks. **Lake Chad** serves as a prominent example of **water scarcity** in a largely water-abundant country: Due to climate impacts and unsustainable water management, the open **lake surface has shrunk** from approximately 25 000 km² in the 1960s **to a minimum of 1 800 km² in 2010**, affecting the food and water supply of approximately 50 million people in Cameroon and its bordering countries [17]. Despite Cameroon's overall abundance in water resources and low dependence on foreign water resources, various **socio-economic** developments, including rapid population growth, unplanned urbanisation as well as agricultural and industrial intensification [18] have led to unsustainable management of these resources. Poor water governance further limits sustainable management of water resources and thus the availability of safe drinking water for the general population, in particular in rural areas, where only 52.7 % of the population have access to safe drinking water versus 94.8 % in urban areas [19].

[5] Shared Socio-economic Pathways (SSPs) outline a narrative of potential global futures, including estimations of broad characteristics such as country-level population, GDP or rate of urbanisation. Five different SSPs outline future realities according to a combination of high and low future socio-economic challenges for mitigation and adaptation. SSP2 represents the "middle of the road"-pathway.

b. Agriculture

Smallholder farmers in Cameroon are increasingly challenged by the uncertainty and variability of weather caused by climate change [20]. Since **crops are predominantly rainfed**, yields highly depend on water availability from precipitation and are prone to drought. However, both the length and the intensity of the rainy season are becoming more and more unpredictable and the availability and **use of irrigation facilities remains limited**: In 2018, only 0.3 % of the total national crop land and 9 % of the estimated irrigation potential of 290 000 ha are equipped for irrigation [6], [7]. According to the AQUASTAT database, the **main irrigated crop** is **rice**, followed by maize and bananas [6]. Constraints to the implementation of adaptation strategies usually include limited access to financing and credit, insecure and unequal tenure, land disputes, lack of technical advice, e.g. through extension services, and limited access to inputs, e.g. improved seeds [21], [22]. Especially in northern Cameroon, soils are characterized by a clayey texture and are poor in nutrients, which further limits the potential for crop production [23].

Currently, the high uncertainty of projections regarding water availability (Figure 10) translates into high uncertainty of drought projections (Figure 11). According to the median over all models employed, **the national crop land area exposed to at least one drought per year will increase from 0.7 % in 2000 to 1.4 % and 2.8 % in 2080 under RCP2.6 and RCP6.0, respectively.** Under RCP6.0, the likely range of drought exposure of the national crop land area per year widens from 0.12–2.61 % in 2000 to 0.30–8.95 % in 2080. The very likely range of drought exposure widens from 0.02–8.27 % in 2000 to 0.03–20.95 % in 2080. This means that **some models project an increase of drought exposure by a factor of 2.5 over this time period.**

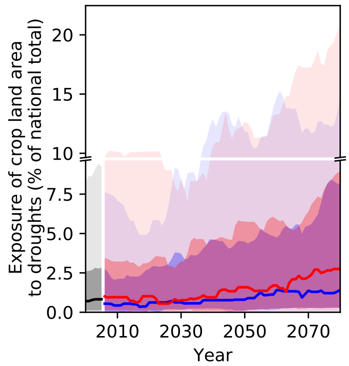
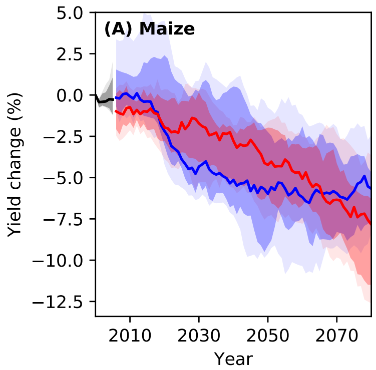


Figure 11: Projections of crop land area exposed to drought at least once a year for Cameroon for different GHG emissions scenarios.

In terms of yield projections, model results indicate a **negative trend for maize, millet and sorghum** under both RCPs (Figure 12)5. By 2080, compared to the year 2000, yields are projected to decrease by 5.7 % and 7.8 % for maize and 5.4 % and 9.1 % for millet and sorghum under RCP2.6 and RCP6.0, respectively. Yields of **groundnuts, cassava and rice**, on the other hand, are **projected to benefit from higher CO_2 emissions**: Under RCP 6.0, yields will increase by 2.9 % for groundnuts, 22.7 % for cassava and 8.9 % for rice. A possible explanation for this positive trend is that groundnuts, cassava and rice are so-called C3 plants, which follow a different metabolic pathway than, for example, maize (C4 plant), and benefit more from the CO_2 fertilisation effect under higher concentration pathways. Although some yield changes may appear small at the national level, such as for groundnuts, they will likely increase more strongly in some areas and, conversely, decrease more strongly in other areas as a result of climate change.



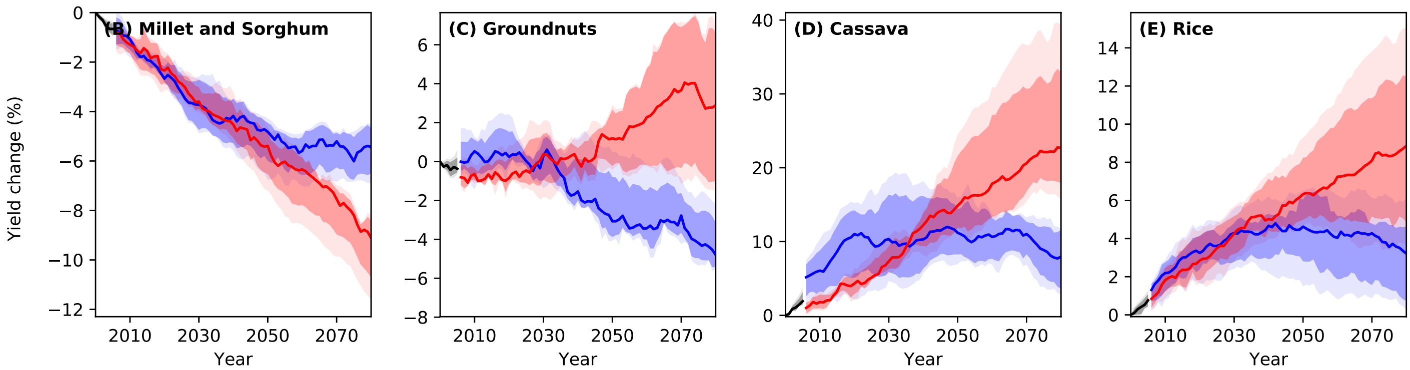


Figure 12: Projections of crop yield changes for major staple crops[6] in Cameroon for different GHG emissions scenarios assuming constant land use and agricultural management, relative to the year 2000.

[6] Modelling data is available for a selected number of crops only. Hence, the crops listed on page 2 may differ.

c. Infrastructure

Climate change is expected to impact Cameroon's infrastructure through extreme weather events. High precipitation amounts lead to the **flooding of roads**, while high temperatures can cause **roads, bridges and coastal infrastructures to develop cracks and degrade more quickly**. Therefore, it is important to climate-proof existing and any new infrastructure in order to avoid higher maintenance and replacement costs. The poorly developed railway network increases Cameroon's reliance on road transportation [24]. Despite adequate levels of funding, maintenance of Cameroon's roads remains poorly planned and ineffective [25]. Furthermore, Cameroon's **road network is characterised by an asymmetry in coverage**, with a much higher connectivity in coastal areas and in the north, compared to the rest of the country. Especially during the rainy season, many of the inland **rural roads are inaccessible**, cutting off villages and communities. Investments will have to be made to build climate-resilient road and railway networks.

Extreme weather events also have **devastating impacts on human settlements and economic production sites**, especially in urban areas with high population densities like Douala or Yaoundé. **Informal settlements are particularly vulnerable to extreme weather events**: Makeshift homes are often built at unstable geographical locations including steep slopes or riverbanks, where exposure to strong winds and flooding can lead to loss of housing, contamination of water, injury or death. Dwellers usually have a low adaptive capacity to respond to such events due to high levels of poverty and lack of risk-reducing infrastructures. Although floods are a yearly occurrence in the country, the second half of **2020** brought **intense and continuous precipitation** in five out of six divisions in the **Far North Region** of Cameroon, causing severe **flooding** [26]. Almost **160 000 people were affected**, with 74 dead, thousands homeless and damages to infrastructures and property, including cultivated land and cattle, which was carried away by the floods [26].

Despite the rising risk of infrastructure damage due to climate change, precise predictions of the location and the extent of exposure are difficult to make and require additional risk assessments to determine the extend of exposure. For example, projections of river flood events are subject to substantial modelling uncertainty, largely due to the uncertainty of future projections of precipitation amounts and their spatial distribution, affecting flood occurrence (see also Figure 4). In the case of Cameroon, median projections show **little impact of climate hazards towards major roads and urban land area to river floods, yet an upward trend for both indicators** (Figure 13). In the year 2000, 0.74 % of major roads were exposed to river floods at least once a year. By 2080, this value is projected to increase to 1.06 % under RCP6.0 and to 0.92 % under RCP2.6. The exposure of urban land area to river floods is projected to change from 0.14 % in the year 2000 to 0.29 % and 0.36 % under RCP 2.6 and RCP6.0, respectively (Figure 14).

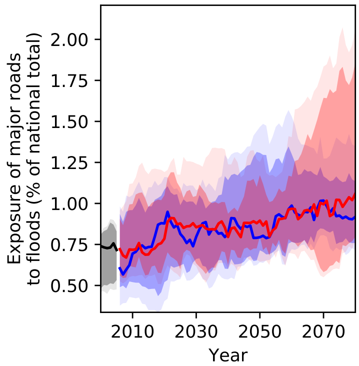


Figure 13: Projections of major roads exposed to river floods at least once a year for Cameroon for different GHG emissions scenarios.

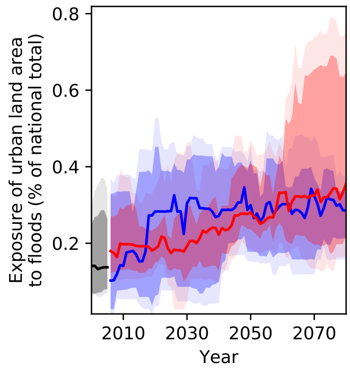


Figure 14: Projections of urban land area exposed to river floods at least once a year for Cameroon for different GHG emissions scenarios.

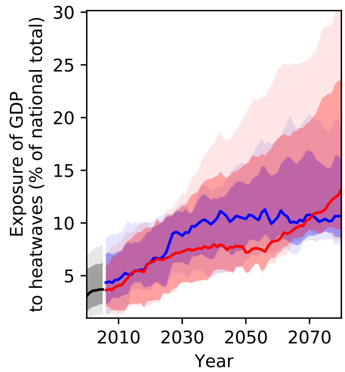


Figure 15: Exposure of GDP in Cameroon to heatwaves for different GHG emissions scenarios.

With the **exposure of the GDP to heatwaves projected to increase** from around 3.1 % in 2000 to 10.6 % (RCP2.6) and 13.2 % (RCP6.0) by 2080 (Figure 15), it is recommended that policy planners start identifying heat-sensitive economic production sites and activities, and integrating climate adaptation strategies such as improved solar-powered cooling systems, "cool roof" isolation materials or switching the operating hours from day to night [27].

d. Ecosystems

Climate change is expected to have a significant impact on the ecology and distribution of tropical ecosystems, though the magnitude, rate and direction of these changes are uncertain [28]. With rising temperatures and increased frequency and intensity of droughts, **wetlands and riverine systems are increasingly at risk of being disrupted and altered,** with structural changes in plant and animal populations. Increased temperatures and droughts can also impact succession in forest systems while concurrently increasing the risk of invasive species, all of which affect ecosystems. In addition to these climatic drivers, low agricultural productivity and population growth might motivate unsustainable agricultural practices, resulting in increased deforestation, land degradation and forest fires, all of which will impact animal and plant biodiversity [29].

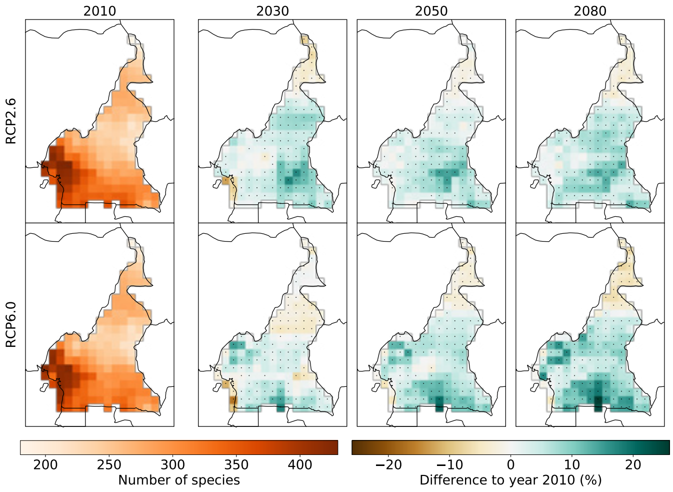


Figure 16: Projections of the aggregate number of amphibian, bird and mammal species for Cameroon for different GHG emissions scenarios.

Model projections of species richness (including amphibians, birds and mammals) and tree cover for Cameroon are shown in Figure 16 and 17, respectively. Results for species richness are characterized by high modelling certainty and a clear trend under both emissions scenarios. Under RCP6.0, **species richness is expected to increase by up to 26 %** in southern Cameroon and to decrease by up to 8 % in the northern part of the country (Figure 16). With regard to **tree cover**, however, results show **low model agreement** as well as differences depending on the region and emissions scenario. Under RCP2.6, tree cover is expected to decrease by up to 9 % in small patches across central Cameroon, while under RCP6.0, the north is projected to see increases of up to 9 % (Figure 17).

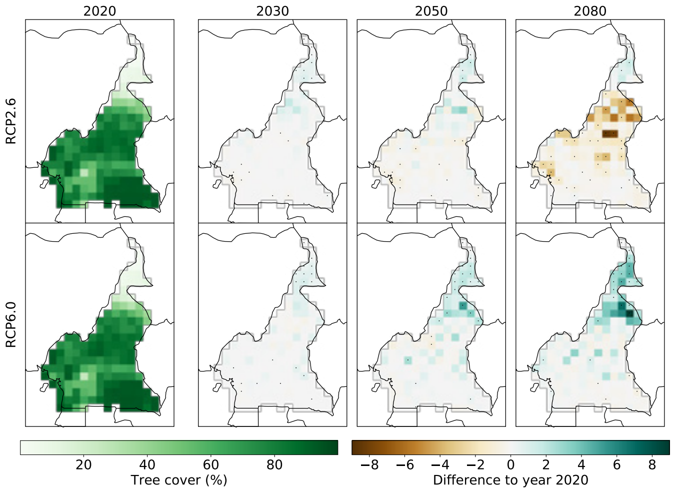


Figure 17: Tree cover projections for Cameroon for different GHG emissions scenarios.

It is important to keep in mind that the **model projections exclude any impacts on biodiversity loss from human activities such as land use**, which have been responsible for significant losses of biodiversity in the past, and are expected to remain its main driver in the future [30]. In recent years, Cameroon's vegetation has experienced profound disturbances, primarily through the expansion of both small and large-scale **crop farming for palm oil and rubber** [31]. Increasing demand for fuelwood and commercial logging present further pressures on Cameroon's forests, in addition to, albeit to a smaller degree, infrastructure and urban expansion [30]. The country has **lost 1.2 million ha of tree cover** between 2001 and 2020, which is equivalent to a **5 % decrease** of national forest area [32].

e. Human health

Climate change threatens the health and sanitation sector through more frequent incidences of heatwaves, floods and droughts. Among the key health challenges in Cameroon are morbidity and mortality through HIV, vector-borne diseases such as malaria, waterborne diseases such as diarrhoea, which are related to extreme weather events, respiratory diseases and tuberculosis [33]. Many of these challenges are expected to **become more severe under climate change**. According to the World Health Organization, Cameroon recorded an estimated 6.9 million cases of malaria including 14 841 deaths in 2020 [34]. **Climate change is likely to have an impact on the geographic range of vector-borne diseases**: In particular temperature increases could expand malaria prevalence to higher-lying areas, as is being observed elsewhere on the African continent, e.g. in the East African highlands or in Madagascar [35], [36]. Malaria is furthermore likely to increase, **due to flooding and stagnant waters**, which provide a breeding ground for mosquitos [37]. **Climate change also impacts food and water supply**, thereby increasing the risk of food insecurity, malnutrition and death by famine, particularly for subsistence farmers. Already today, **food insecurity in Cameroon is high**: Towards the end of 2021, more than 2.4 million people were food insecure [38]. In particular the northern part of the country and regions along the Nigerian border are prone to food insecurity, due to a combination of climatic stressors and violent conflict. **Higher food prices as a result of the COVID-19 pandemic** further aggravate the situation [39]. Access to **healthcare is distributed unequally** in Cameroon, with a sharp divide between urban and rural areas, and even more complicated in regions marked by political crises: In particular Cameroon's North-West and South-West Regions have seen recurring violence between security forces and separatist groups, which has led to the **closure of many healthcare facilities** and limited supply of drugs and medical equipment. Furthermore, more than **700,000 people have been displaced**, many of whom take refuge in the bush or other locations, which are often inaccessible for emergency vehicles [40].

Rising temperatures will result in **more frequent heatwaves** in Cameroon, leading to **increased heat-related mortality.** Under RCP6.0, the **population affected by at least one heatwave per year is projected to increase from 3.2 % in 2000 to 13.3 % in 2080** (Figure 18). Furthermore, under RCP6.0, **heat-related mortality will likely increase from 2.5 to 9.1 deaths per 100 000 people per year by 2080**, which translates to an increase by a factor of more than 3.5 towards the end of the century compared to year 2000 levels, provided that no adaptation measures to hotter conditions will take place (Figure 19). Under RCP2.6, heat-related mortality is projected to increase to 5.2 deaths per 100 000 people per year in 2080.

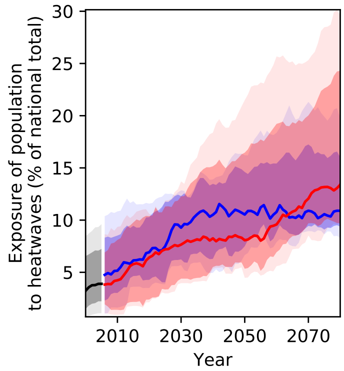


Figure 18: Projections of population exposure to heatwaves at least once a year for Cameroon for different GHG emissions scenarios.

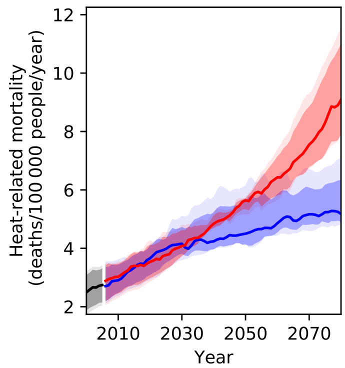


Figure 19: Projections of heat-related mortality for Cameroon for different GHG emissions scenarios assuming no adaptation to increased heat.

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