Federal Ministry
for Economic Cooperation
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Climate Risk Profile: Côte d’Ivoire

Summary

This profile provides an **overview of projected climate parameters and related impacts** on different sectors in Côte d’Ivoire until 2080 **under different climate change scenarios** (called Representative Concentration Pathways, RCPs). RCP2.6 represents the low emissions scenario in line with the Paris Agreement; RCP6.0 represents a medium to high emissions scenario. **Model projections do not account for effects of future socio-economic impacts.**

Agriculture, biodiversity, health, infrastructure and water are highly vulnerable to climatic changes. The **need for adaptation in these sectors has been stressed in Côte d’Ivoire’s NDC targets and should be taken up in the climate mainstreaming efforts of the German development portfolio** in the country.

Depending on the scenario, **temperature** in Côte d’Ivoire is projected to **rise by between 1.7 and 3.7 °C by 2080**, compared to pre-industrial levels, with higher temperatures and more temperature extremes projected for the north of Côte d’Ivoire.

Precipitation trends are highly uncertain with projections ranging from little change to an **annual precipitation decrease of up to 65 mm by 2080**. Future dry and wet periods are likely to become **more extreme**.

Under RCP6.0, the **sea level** is expected to **rise by 39 cm** until 2080. This threatens Côte d’Ivoire’s coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs.

Climate change is likely to cause **severe damage to the infrastructure sector** in Côte d’Ivoire. Especially transport infrastructure is vulnerable to extreme weather events, yet essential for trading agricultural goods. Investments will need to be made into climate-resilient infrastructure.

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

Agro-ecological zones might **shift, affecting ecosystems, biodiversity and crop production**. Models project an increase in species richness in response to climate change while tree cover projections are uncertain.

Per capita water availability will decline by 2080 mostly due to population growth. Model projections indicate that **water saving measures are expected to become particularly important in northern Côte d’Ivoire.**

The **population affected** by at least one **heatwave** per year is projected to **rise** from 9 % in 2000 to 31 % in 2080. This is related to 94 more very hot days per year over this period. As a consequence, **heat-related mortality** is estimated to **increase by a factor of five** by 2080.

Context

Côte d'Ivoire is a **West African country** with direct access to the Atlantic Ocean and more than **500 km of coastline**. The current **population is 25 million with an annual demographic growth rate of 2.6 %** [1]. The majority of the inhabitants live in the forested south and on the Atlantic coast, while the north remains less populated, mainly due to a drier climate [2]. With a real GDP per capita of 1 692 USD, Côte d'Ivoire counts as a **lower-middle-income country (LMIC)** [1]. Its economy is dominated by the services sector, contributing 43.4 % to the country's GDP in 2018, followed by industry with 25.2 % and agriculture with 19.8 % [3]. **Important staple crops include yams, cassava, rice, plantains and maize,** in addition to sorghum and millet [4]. With 40 % of the world production, Côte d'Ivoire is the largest producer and exporter of cocoa beans, with the major destination being the Netherlands [5]. Other important exports include nuts (cashew, coconuts, Brazil nuts), refined petroleum, rubber and gold [5]. Nonetheless, agriculture remains the backbone of the country's economy with **46 % of the population employed in farming or livestock rearing** [6]. Therefore, concerns are rising over the effects of climate change including increasing temperatures, reduced availability of water and the occurrence of floods and other extreme weather events. **Agricultural production in Côte d'Ivoire is primarily subsistence-based and rainfed,** as currently, only 0.2 % of the total national crop land is equipped for irrigation [7]. Hence, especially smallholder farmers suffer from the impacts of climate variability, which can reduce their food supply and increase the risk of hunger and poverty. **Limited adaptive capacity in the agricultural sector underlines the country's vulnerability to climate change.**

Côte d'Ivoire has an **immigrant population of approximately 2.6 million,** mainly resulting from its booming economy and seasonal work opportunities on cocoa plantations [8]. The majority of **migrants comes from Burkina Faso** (1.4 million) **and Mali** (520 000) [8]. Due to its **ports in Abidjan and San-Pédro**, Côte d'Ivoire is an important transit corridor for its landlocked neighbours [9].

Quality of life indicators [1], [10]–[12]

Human Development Index (HDI) 2018	ND-GAIN Vulnerability Index 2018	GINI Coefficient 2015	Real GDP per capita 2019	Poverty headcount ratio 2015	Prevalence of under-nourishment 2016–2018
0.516 **165 out of 189** (0 = low, 1 = high)	**38.9** **142 out of 181** (0 = low, 100 = high)	**41.5** (0 – 100; 100 = perfect inequality)	**1 736 USD** (constant 2010 USD)	**28.2 %** (at 1.9 USD per day, 2011 PPP) [1]	**19.0 %** (of total population)

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[1] Poverty headcount ratio for the year 2015 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

Côte d'Ivoire is mainly characterised by **flat plains** with altitudes gradually rising to almost 500 m at the northern border. Higher mountains are only located in the west, with **Mount Nimba** being the country's highest peak at 1 752 m. The country can be divided into **three major agro-ecological zones (AEZ)**: The Southern Guinea Savannah, the Derived Savannah and the Humid Forest [13][2]. Each of these zones is characterised by specific temperature and moisture regimes and, consequently, specific patterns of crop production and pastoral activities. The country has a **tropical climate along the coast and a savannah climate in the north**. Seasons are distinguished by rainfall, which occurs between March and November (Figure 1). **Four major rivers** flow through Côte d'Ivoire – the Bandama, Cavally, Komoe and Sassandra – all of which enter into the Gulf of Guinea. Other important sources of water include **Lake Kossou and Lake Buyo**, which are both artificial lakes formed by the construction of dams. Côte d'Ivoire has **one of the highest levels of biodiversity in West Africa** with over 1 200 animal species and 4 700 plant species [14]. With **one of the highest rates of deforestation worldwide**, the country lost more than 3 million hectares of forest between 2001 and 2019, which is equivalent to a 20 % decrease [15]. Other environmental challenges include soil and coastal erosion as well as pollution from sewage, mining and industrial waste [2], [16]. Extreme weather events including heavy precipitation and severe droughts are expected to intensify in the context of climate change, highlighting the **need for adaptation measures to protect biodiversity and maintain fragile ecosystems and their services** [17].

Present climate [18]

Côte d'Ivoire has a tropical climate in the south and a savannah climate in the north with mean annual temperatures ranging from 25 to 27 °C across the country.

Annual precipitation sums range from 1 000 to 1 600 mm with higher amounts in the north and south and lower values in the centre of the country. The evergreen forests in the south-west of Côte d'Ivoire receive annual precipitation sums of up to 2 200 mm.

In the north, Côte d'Ivoire has a single rainy season from March to October (unimodal precipitation regime), while the south is characterised by a bimodal precipitation regime with two rainy seasons from March to July and from October to November, respectively.

Figure 1: Topographical map of Côte d'Ivoire with agro-ecological zones and existing precipitation regimes.[3]

[2] It should be noted that there are different classifications of AEZs in Côte d'Ivoire. We focused on a commonly used classification of three zones.

[3] The climate graphs 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 — best estimate
RCP2.6 — likely range
RCP6.0 — 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 Côte d'Ivoire is projected to rise by between 1.7 to 3.7 °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 Côte d'Ivoire amount to approximately 1.8 °C in 2030, 2.0 °C in 2050 and 2.1 °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 3.1 °C in 2080.

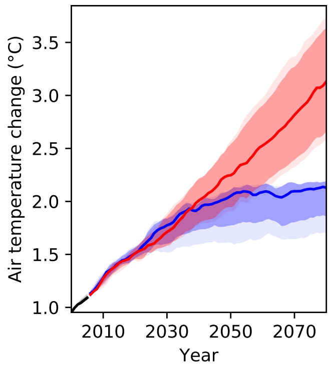

Figure 2: Air temperature projections for Côte d'Ivoire for different GHG emissions scenarios.[4]

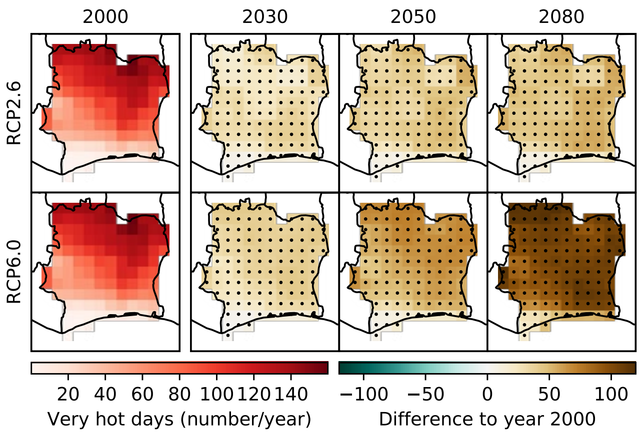

Figure 3: Projections of the annual number of very hot days (daily maximum temperature above 35 °C) for Côte d'Ivoire for different GHG emissions scenarios.

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 Côte d'Ivoire (Figure 3). Under the medium/high emissions scenario RCP6.0, the multi-model median, averaged over the whole country, projects **33 more very hot days per year in 2030 than in 2000**, **54 more in 2050 and 94 more in 2080**. In some parts, especially in northern Côte d'Ivoire, this amounts to about 250 days per year by 2080.

Sea level rise

In response to globally increasing temperatures, the sea level off the coast of Côte d'Ivoire is projected to rise (Figure 4). Until 2050, 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 Côte d'Ivoire's coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs, rendering water unusable for domestic use and harming biodiversity.

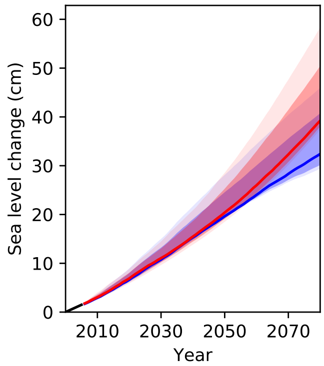

Figure 4: Projections for sea level rise off the coast of Côte d'Ivoire for different GHG emissions scenarios, relative to the year 2000.

Precipitation

Future projections of precipitation are less certain than projections of temperature change due to high natural year-to-year variability (Figure 5). Out of the four climate models underlying this analysis, two models project an increase in mean annual precipitation over Côte d'Ivoire under RCP6.0, while two models show no clear trend under the same scenario. Median model projections for RCP2.6 show **a slight increase in precipitation until 2080**, while median model projections for RCP6.0 show **a stronger precipitation increase of 65 mm by 2080** compared to year 2000. Higher concentration pathways suggest an overall wetter future climate for Côte d'Ivoire.

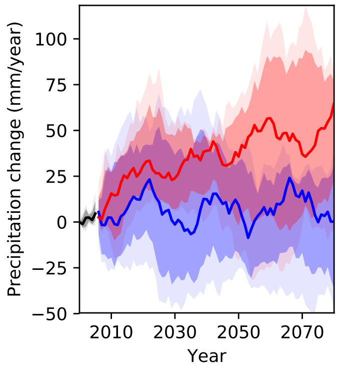

Figure 5: Annual mean precipitation projections for Côte d'Ivoire for different GHG emissions scenarios, relative to the year 2000.

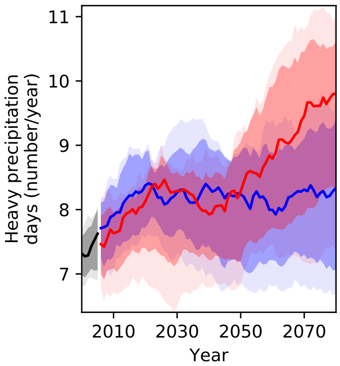

Figure 6: Projections of the number of days with heavy precipitation over Côte d'Ivoire for different GHG emissions scenarios.

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 found in climate projections for Côte d'Ivoire (Figure 6), with climate models projecting **an increase in the number of days with heavy precipitation**, from 7 days per year in 2000 to 8 (RCP2.6) and 10 days per year (RCP6.0) in 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.

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 into higher potential evapotranspiration. **Annual mean top 1-m soil moisture projections for Côte d'Ivoire show a decrease of 3.0 % under RCP2.6 and 1.7 % under RCP6.0 by 2080** compared to the year 2000 (Figure 7). However, looking at the different models underlying this analysis, there is large year-to-year variability and modelling uncertainty, which makes it difficult to identify a clear trend.

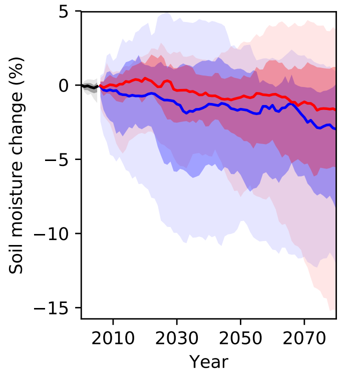

Figure 7: Soil moisture projections for Côte d'Ivoire for different GHG emissions scenarios, relative to the year 2000.

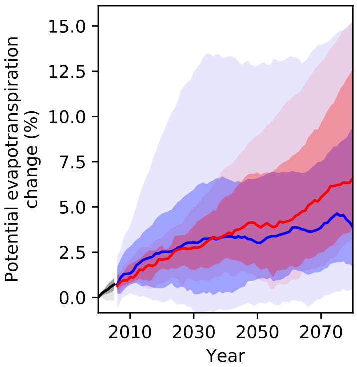

Figure 8: Potential evapotranspiration projections for Côte d'Ivoire for different GHG emissions scenarios, relative to the year 2000.

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.** In line with this expectation, hydrological projections for Côte d'Ivoire indicate a stronger and more continuous rise of potential evapotranspiration under RCP6.0 than under RCP2.6 (Figure 8). Under RCP6.0, **potential evapotranspiration is projected to increase by 2.8 % in 2030, 4.0 % in 2050 and 6.6 % in 2080** compared to year 2000 levels.

Sector-specific climate change risk assessment

a. Water resources

Current projections of water availability in Côte d'Ivoire display high uncertainty under both GHG emissions scenarios. Assuming a constant population level, multi-model median projections suggest no change in per capita water availability over the country by the end of the century under either RCP (Figure 9A). Yet, when accounting for population growth according to SSP2 projections[5], **per capita water availability for Côte d'Ivoire is projected to decline by 55 % under both RCPs by 2080** relative to the year 2000 (Figure 9B). While this decline is primarily driven by population growth rather than climate change, it highlights the urgency to invest in water saving measures and technologies for future water consumption, in particular in the northern part of Côte d'Ivoire, given the already recurring water shortages in that region [19].

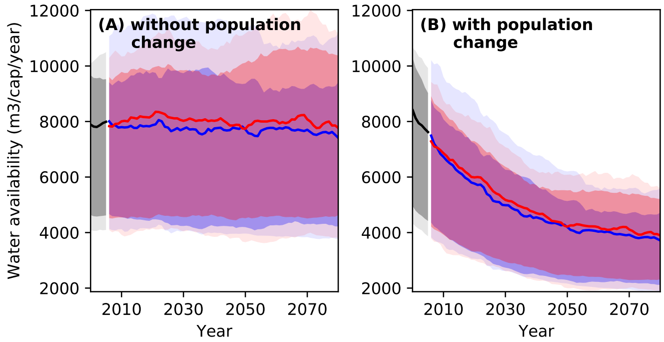

Figure 9: Projections of water availability from precipitation per capita and year with (A) national population held constant at year 2000 level and (B) changing population in line with SSP2 projections for different GHG emissions scenarios, relative to the year 2000.

Projections of future water availability from precipitation vary depending on the region and scenario (Figure 10). Under RCP2.6, **water availability will decrease by up to 20 % in parts of southern Côte d'Ivoire**, with most models agreeing on this trend. The picture is different for RCP6.0: Model agreement is low except for a small patch in the western part of the country which is projected to gain up to 10 % in water availability.

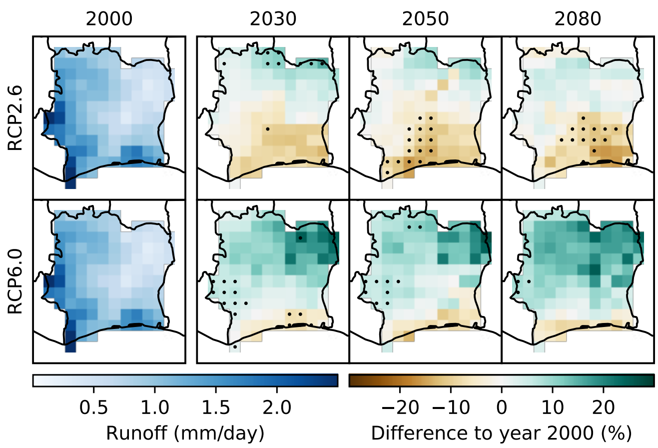

Figure 10: Water availability from precipitation (runoff) projections for Côte d'Ivoire for different GHG emissions scenarios.

Water shortage in Côte d'Ivoire has been an issue for decades and is likely to continue in the future. Several studies show that climatic changes in the country have resulted in a decrease in total precipitation amounts, a shift of the onset of the rainy season and an increase in the frequency and duration of droughts [20]–[22]. The first six months of 2019 recorded an **average precipitation decrease of 28 %** in the country, hence the lowest value compared to the average precipitation sums from the period 2014–2018 [19]. Especially rural communities in the northern part of Côte d'Ivoire suffer from recurring water shortages limiting their abilities to improve agricultural activities [19]. The increase in the frequency and intensity of droughts has also led to the **loss of the second crop cycle** among rice farmers [23]. Today, due to decreased precipitation amounts, many farmers must get by with one crop cycle, in some areas not even achieving a full one. However, not only rural but **also urban areas experience the consequences of droughts**: In 2018, Côte d'Ivoire's second-largest city Bouaké was left without running water for three weeks as a result of reduced precipitation and decreasing water levels in the Loka reservoir which supplies 70 % of the city's water [24]. The government used tanker trucks to provide emergency supplies of water, while parts of the population had to migrate temporarily.

[5] Shared Socio-economic Pathways (SSPs) outline a narrative of potential global futures, including estimates 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 Côte d'Ivoire are increasingly challenged by the uncertainty and variability of weather that climate change causes [25]. Since **crops are predominantly rainfed**, yields depend on water availability from precipitation and are prone to drought. However, the length and intensity of the rainy season is becoming increasingly unpredictable and the **use of irrigation facilities remains limited** due to low levels of mechanisation and lack of public investment [7]. The national crop land suitable for irrigation is estimated at 430 685 ha. Currently, only 8 % of this area is irrigated [7].

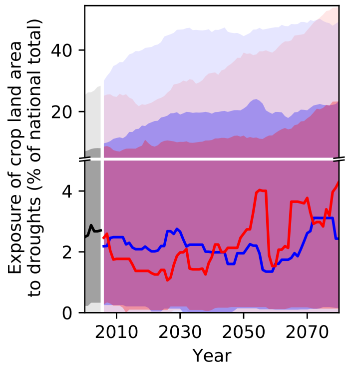

Figure 11: Projections of crop land area exposed to drought at least once a year for Côte d'Ivoire for different GHG emissions scenarios.

The high uncertainty of water availability projections (Figure 10) translates into high uncertainty of drought projections (Figure 11). According to the median over all models employed for this analysis, **the national crop land area exposed to at least one drought per year will barely change in response to global warming.** Under RCP6.0, the likely range of drought exposure of the national crop land area per year widens from 0.2–7 % in 2000 to 0.1–23 % in 2080. The very likely range widens from 0–25 % in 2000 to 0–54 % in 2080. This means that **most models project a significant increase in drought exposure over this time period.**

Climate change will have a negative impact on yields of maize, millet and sorghum (Figure 12)[6]. While maize is sensitive to hot temperatures above 35 °C, millet and sorghum usually tolerate hot temperatures and dry periods better [26]. Still, model results indicate a negative yield trend for all three crops under both RCPs with a stronger decrease under RCP6.0. Compared to 2000, yields are projected to decline by 9 % for maize and 10 % for millet and sorghum by 2080 under RCP6.0. Under RCP2.6, yields of maize, millet and sorghum are projected to decline by 5 %. **Yields of rice and cassava are projected to gain from climate change**. Under RCP6.0, crop yields are projected to increase by 5 % for rice and 22 % for cassava by 2080 relative to the year 2000. Under RCP2.6, yields of rice and cassava are projected to barely change. These positive results under RCP6.0 can be ascribed to the **CO_2 fertilisation effect**, which benefits plant growth. Rice and cassava are so-called C3 plants, which follow a different metabolic pathway than maize (C4 plant) and **benefit more from higher concentration pathways**. However, projections of rice and cassava are characterised by higher modelling uncertainty. Hence, it is likely that crop yields will increase more strongly in some areas and, conversely, decrease more strongly in other areas as a result of climate change impacts.

Overall, adaptation strategies such as switching to improved varieties in climate change sensitive crops should be considered, yet carefully weighed against adverse outcomes, such as resulting decline of agro-biodiversity and loss of local crop types.

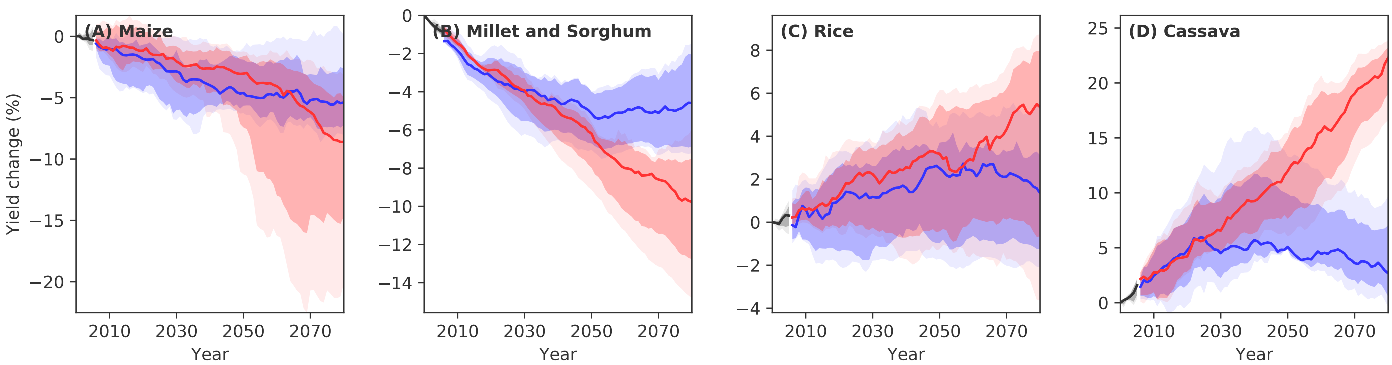

Figure 12: Projections of crop yield changes for major staple crops in Côte d'Ivoire for different GHG emissions scenarios assuming constant land use and agricultural management, relative to the year 2000.

[6] Modelling data is available for a selected number of crops only. Hence, the crops listed on page 2 may differ. Maize, millet and sorghum are modelled for all countries except for Madagascar..

c. Infrastructure

Climate change is expected to significantly affect Côte d'Ivoire's infrastructure sector through extreme weather events. High precipitation amounts can lead to **flooding of roads and railroads, especially in low-lying coastal areas,** while high temperatures can cause **roads, bridges and protective structures to develop cracks and degrade more quickly**. Transport infrastructure is vulnerable to extreme weather events, yet essential for agricultural livelihoods. Roads serve communities to trade goods and access healthcare, education, credit and other services, especially in rural and remote areas. **Côte d'Ivoire's transport is dominated by road transport,** handling almost all of its internal freight traffic [27]. Furthermore, it is closely **linked with landlocked Burkina Faso** through the Abidjan-Ouagadougou corridor, an important route for both road and rail transport [28]. The reliance on only few transport routes increases the sector's vulnerability to climate impacts. Hence, investments will have to be made into building climate-resilient transportation networks.

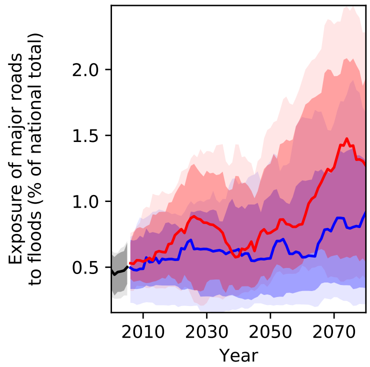

Figure 13: Projections of major roads exposed to river floods at least once a year for Côte d'Ivoire for different GHG emissions scenarios.

Extreme weather events will also have **devastating effects on human settlements and economic production sites**, especially in urban areas with high population densities such as Abidjan or Bouaké. **Informal settlements are particularly vulnerable to extreme weather events**: Makeshift homes are often built in unstable geographical locations including riverbanks and coastal areas, where flooding can lead to loss of housing, contamination of water, injury or death. Dwellers usually have low adaptive capacity to respond to such events due to high levels of poverty and lack of risk-reducing infrastructures. For example, heavy rains in October 2019 have caused **flooding in Abidjan, Aboisso, Grand Bassam, Ayamé and Man**. A total of **12 900 people were affected** by this flooding including **12 fatalities** [29]. **Flooding and droughts will also affect hydropower generation**: Côte d'Ivoire draws 40 % of its energy from hydropower and has been investing in large-scale hydropower projects including the **Soubré Dam**, which was inaugurated in 2017 and is **the country's largest dam with a capacity of 275 MW** [30], [31]. However, variability in precipitation and **climatic conditions could severely disrupt hydropower generation**.

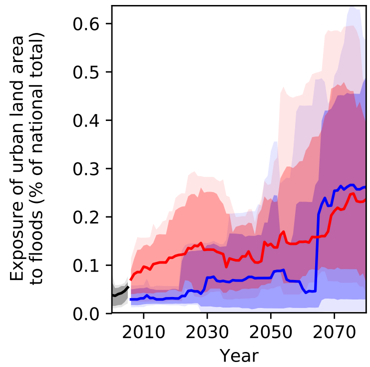

Figure 14: Projections of urban land area exposed to river floods at least once a year for Côte d'Ivoire for different GHG emissions scenarios.

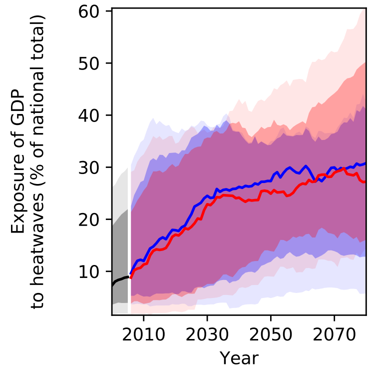

Figure 15: Exposure of GDP in Côte d'Ivoire to heatwaves for different GHG emissions scenarios.

Despite the risk of infrastructure damage being likely to increase due to climate change, precise predictions of the specific location and extent of exposure are difficult to make. 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 5). In the case of Côte d'Ivoire, projections show **a slight increase in the exposure of major roads to river floods under both RCPs:** In 2000, 0.5 % of major roads were exposed to river floods at least once a year, while by 2080, this value is projected to increase to 0.6 % under RCP2.6 and to 1.3 % under RCP 6.0 (Figure 13). In a similar way, **exposure of urban land area to river floods is projected to increase only slightly**, from 0.04 % in 2000 to 0.2 % in 2080 under both RCPs (Figure 14). However, projections of exposure of major roads and urban land area to river floods are characterised by high modelling uncertainty, which is why **no reliable estimations on future occurrence of river floods can be made**.

With the **exposure of the GDP to heatwaves projected to increase** from around 7 % in 2000 to 31 % (RCP2.6) and 27 % (RCP6.0) by 2080 (Figure 15), it is recommended that economic policy planners start identifying heat-sensitive production sites and activities, and integrating climate adaptation strategies such as improved solar-powered cooling systems, "cool roof" isolation materials or switching operation hours from day to night [32].

d. Ecosystems

Climate change is expected to have a significant influence on the ecology and distribution of tropical ecosystems, even though the magnitude, rate and direction of these changes are uncertain [33]. With rising temperatures and increased frequency and intensity of droughts, **wetlands and riverine systems are increasingly at risk of being converted to other ecosystems** with plant populations being succeeded and animals losing habitats. 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 climate drivers, low agricultural production and population growth might motivate further agricultural expansion resulting in increased deforestation, land degradation and forest fires, all of which will impact animal and plant biodiversity.

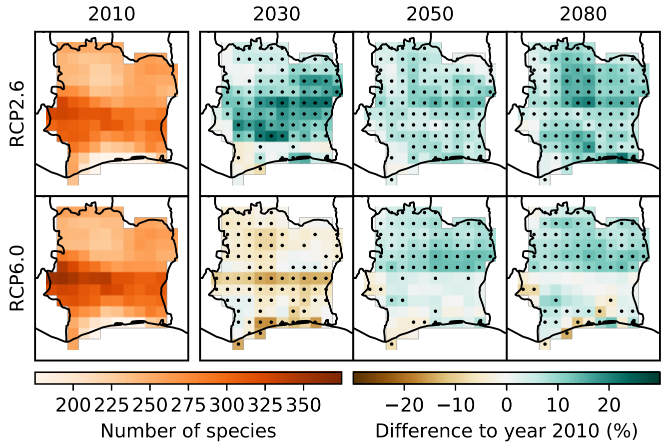

Figure 16: Projections of the aggregate number of amphibian, bird and mammal species for Côte d'Ivoire for different GHG emissions scenarios.

Model projections of species richness (including amphibians, birds and mammals) and tree cover for Côte d'Ivoire are shown in Figure 16 and 17, respectively. **Projections of the number of animal species show an increase by 2080** (Figure 16): Under RCP2.6, models agree that **the number of animal species will increase by up to 20 % all across Côte d'Ivoire**. Under RCP6.0, models agree on a similar trend, yet only for the northern part of the country. With regard to tree cover, model results are far less certain. For RCP2.6, there is model agreement on a decrease in tree cover in small patches across all of Côte d'Ivoire. For RCP6.0, however, model agreement is low and no clear trend can be identified (Figure 17).

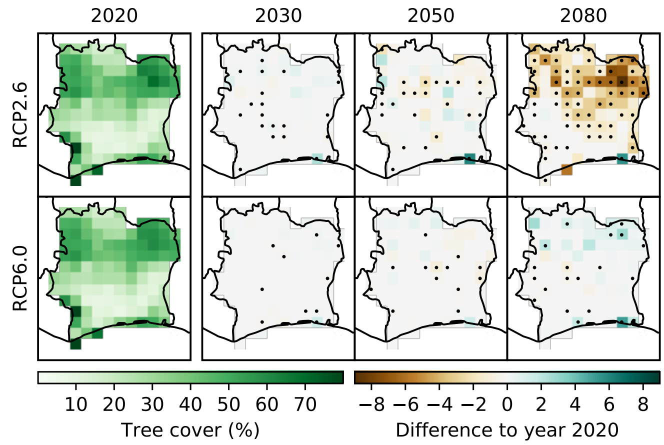

Figure 17: Tree cover projections for Côte d'Ivoire for different GHG emissions scenarios.

It is important to keep in mind that **model projections exclude any impacts on biodiversity from human activities such as land use**, which have been responsible for significant losses of global biodiversity in the past, and which are expected to remain its main driver in the future [34]. For example, rapid growth of agricultural production, uncontrolled fires and logging have resulted in **one of the highest rates of deforestation worldwide:** Côte d'Ivoire has lost 3.03 million hectares of forest cover in the period from 2001 to 2019, which is equivalent to a 20 % decrease [15].

e. Human health

Climate change threatens the health and sanitation sector through more frequent incidences of floods, heatwaves, droughts and storms. Amongst the key health challenges in Côte d'Ivoire are morbidity and mortality through respiratory diseases, HIV/AIDS, tuberculosis, vector-borne diseases such as malaria, and impacts of extreme weather events (e.g. flooding) including injury and mortality as well as related waterborne diseases such as diarrhoea [35]. Many of these health challenges are expected to become more severe under climate change, which is also likely to impact food and water supply, thereby increasing the **risk of malnutrition, hunger and death by famine**. Although severe food insecurity has disappeared, it still remains a challenge in Côte d'Ivoire, in addition to malnutrition: In 2016, the national stunting rate of children under the age of 5 was 21.6 % and the food insecurity rate 10.8 %, with rural communities in western and northern Côte d'Ivoire being disproportionately stronger affected and more vulnerable [36]. Furthermore, **climate change is likely to lengthen transmission periods and alter the geographic range** of various diseases, for instance, due to rising temperatures and changes in precipitation amounts. In 2015, the estimated malaria incidence in the country was 349 cases per 1 000 people at risk [37]. Temperature increases could lead to more frequent outbreaks of meningitis, especially in northern Côte d'Ivoire, while increases in precipitation could heighten the risk of malaria [17].

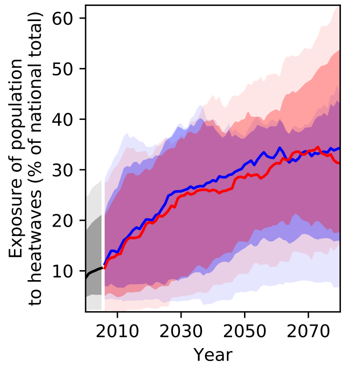

Figure 18: Projections of population exposure to heat-waves at least once a year for Côte d'Ivoire for different GHG emissions scenarios.

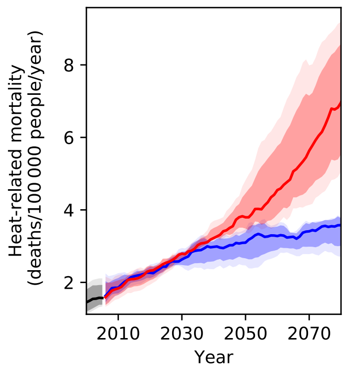

Figure 19: Projections of heat-related mortality for Côte d'Ivoire for different GHG emissions scenarios assuming no adaptation to increased heat.

Rising temperatures will result in **more frequent heatwaves** in Côte d'Ivoire, which will **increase heat-related mortality.** Under RCP6.0, the population affected by at least one heatwave per year is projected to increase from 9 % in 2000 to 31 % in 2080 (Figure 18), and **heat-related mortality will likely increase from 1.5 to 7 deaths per 100 000 people per year**. This translates to an increase by a factor of about five towards the end of the century compared to year 2000 levels, provided that no adaptation to hotter conditions will take place (Figure 19). Under RCP2.6, heat-related mortality is projected to increase to about 3.5 deaths per 100 000 people per year in 2080.

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