GUINEA

AFRICAN DEVELOPMENT BANK

NATIONAL CLIMATE CHANGE PROFILE

PRODUCED IN COLLABORATION WITH:
African Climate & Development Initiative, University of Cape Town;
Climate Systems Analysis Group, University of Cape Town;
Energy Research Centre, University of Cape Town; Cirrus Group.

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GUINEA

CONTENTS

LIST OF TABLES

LIST OF FIGURES

GUINEA

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1. BACKGROUND

1.1. Geographic and socio-economic context

The Republic of Guinea (henceforth 'Guinea', Figure 1-1 below) is a coastal country in West Africa, which extends from the Atlantic Ocean coastline of the Guinea Lowlands, inland towards the east and south interior and rises up towards the Guinea Highlands region. The Guinea highlands are the watershed sources of several of West Africa's major rivers, notably the Niger, Gambia and Senegal Rivers. Guinea's borders are shared by Guinea-Bissau, Senegal, and Mali to the north, and by Sierra Leone, Liberia, and Côte d'Ivoire to the south. The economy of Guinea, with a total GDP of ~USD 6.3 billion, is split between the various forms of subsistence and cash crop agriculture practiced by the rural population (generating ~19% of GDP including staples such as cassava and rice and cash crops such as coffee), and production and export of mineral resources. The latter sector is primarily based on bauxite and alumina; however, Guinea also has large underdeveloped reserves of diamonds, gold and other metals. Despite the considerable potential of Guinea's natural resources (including agronomic, mineral and hydrological resources), at least ~35% of Guineans live below the poverty line of USD 1.90 per day, and the average annual GDP per capita is limited to USD 508 per capita (15th lowest in Africa). Guinea's population of 13.29 million people is growing relatively rapidly (~2.7% per annum, 19th fastest rate in Africa) in addition to which the urban population of the capital (Conakry) and smaller provincial centres are growing at a rate of ~3.8% per annum. As a result of Guinea's high-rainfall tropical climate, extensive surface waters and dense coastal population (~3.09 million people live within 100km of Guinea's coast), both rural and urban populations are vulnerable to climate-related hazards such as flooding. It is estimated that floods resulted in negative impacts on ~395,000 people in the period 1996–2016. Guinea's population is also relatively vulnerable to impacts on the public health system, including a vulnerability to insect vectored diseases such as malaria (estimated to affect 37% of the vulnerable population, the 4th highest rate in Africa) as well as the severe social and economic impacts of the 2015 West Africa Ebola Crisis. Guinea's ND-GAIN index is 39.8. This index is composed of a readiness score and a vulnerability score and summarizes the country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience. Guinea's score indicates that the country has both a great need for investment and innovations to improve readiness and a great urgency for action. Key socio-economic and demographic indicators are further presented and summarised in Table 1-1, overleaf.

Figure 1-1: Map of Guinea

Table 1-1: Socio-Economic Context of Guinea (reference year ranges from 2014 - 2017)

VARIABLE		SCORE/TOTAL	UNIT	RANK (OUT OF 54)
Geography, Socio-Economy and Demographics				
Population[1]		13,290,659	people	26
Population growth rate[1]		2.7	% population. yr^{-1}	19
Population density[1]		54	People/km^2	28
Land area[1]		245,668	km^2	32
% Urban population[1]		35.9	% population	36
% Urbanisation rate[2]		3.8	% population. yr^{-1}	22
Economy: total GDP[2]		6.3	USD billions. yr^{-1}	34
Economy: GDP by PPP[2]		16	billion international dollars. yr^{-1}	36
Economy: GDP/capita[2]		508	USD per capita/yr.	39
Population below the poverty line[3]		35.3	% below USD 1.90 per day	26
Gender Inequality Index[4]		33.7		43
GINI co-efficient[3]		0.41		48
HDI[5]		27.6	% population	35
Access to electricity[6]		13,290,659	people	26
Summary indicators of climate change vulnerability				
Workforce in agriculture[6]		74.8	% workforce	6
Population undernourished[7]		16.4	% population	21
Number of people affected by flood events[8]		394,988	people	22
Population living within 100 km of coast[9]		3,094,899	people	21
Population living in informal settlements[5]		43.3	% urban population	35
Incidence of malaria[7]		368	cases per 1000 population at risk	4
ND-Gain Vulnerability Index[10]	Total	39.8		26
	Readiness	0.32		29
	Vulnerability	0.53		34

2. CLIMATE AND WEATHER

Guinea climate is tropical and characterized by daily mean temperature of 29° C with a single long wet season during boreal summer. Rainfall is highest along the coast and over the southern parts and decreases toward the north-east. The rainfall over the coastal region has a clearly defined rainy season from June to October and dry season from December to April, Rainfall over the interior is more evenly distributed through the year but the core of the rainy season still occurs from June to October.

Many rivers have their origin in Guinea, such as the

Niger River, the Gambia River and the Senegal, however no rivers flow into Guinea from other countries and therefore its water region falls entirely within the country's borders. There are some climate variations within Guinea and therefore two sub-regions are distinguished here. The Guinea regions are illustrated in **Figures 2-1** and **2-2**, below, and summary descriptions can be found in **Table 2-1** below.

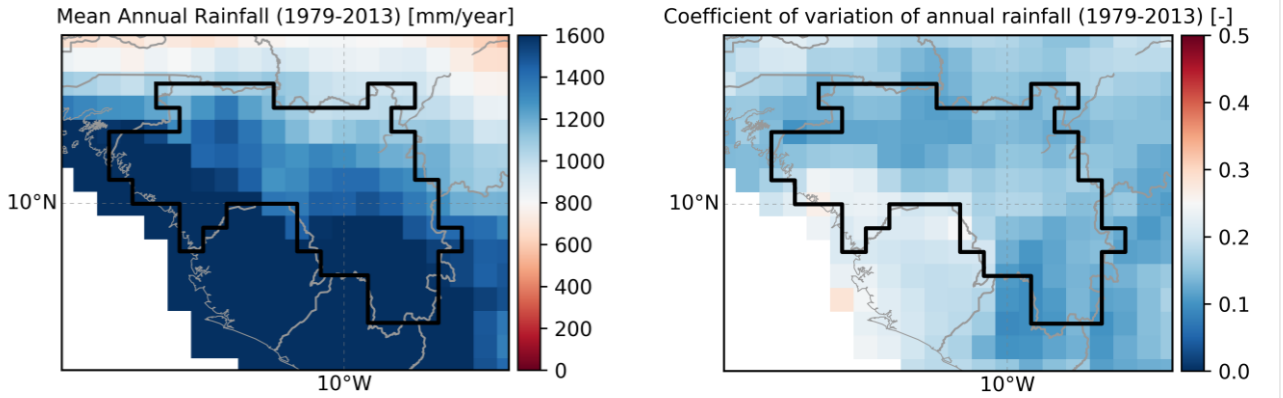
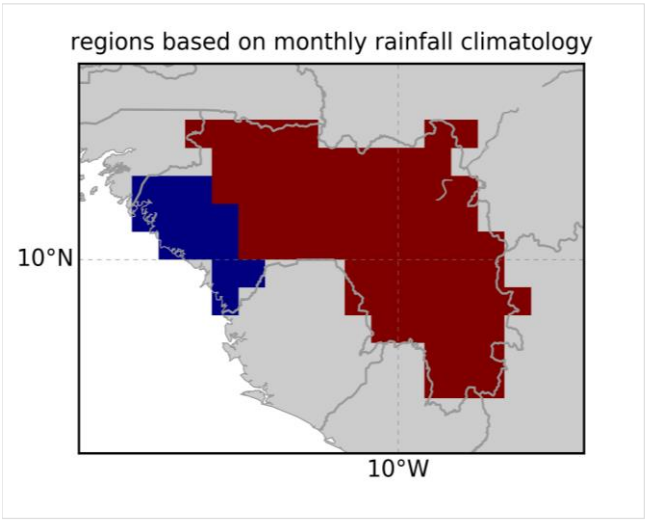


Figure 2-1: Main characteristics (magnitude and variability) of rainfall in Guinea and its region



Coloured regions on the map (above) correspond to the colours used in rainfall and temperature graphs (below)

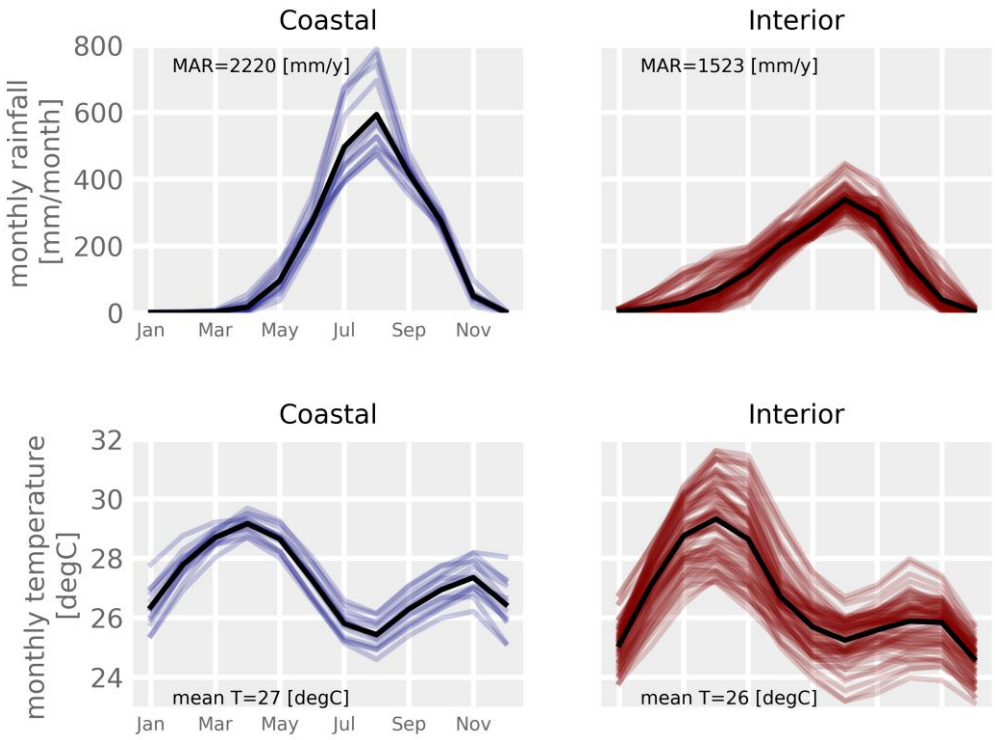


Figure 2 2: Rainfall regions of Guinea based on similarity of standardised rainfall climatology, and their rainfall and temperature climatologies

Table 2-1: Main characteristics of rainfall of Guinea regions

COASTAL	A tropical climate with mean annual total rainfall of 2220 mm/year and daily average temperature of around 27°C. Rainfall is consistently high over the full region. Variations in rainfall from year to year are moderate, especially over the southern half of the region. Rainfall occurs during a well-defined rainy season from June to October peaking at around 600 mm/ month during August. Dry conditions occur from December to April. Temperature remains relatively consistent over the region and only vary through the year by around 4° C, with lowest values occurring during July-August and December-January and warmest temperatures occurring at the beginning, and to a lesser degree at the end, of the rainy season.
INTERIOR	A tropical climate with mean annual total rainfall of 1520 mm/year and daily average temperature of around 26° C. Rainfall is highest over the southern parts and decreases towards the north-east. Rainfall variability from year to year is moderate to low. Rainfall occurs during a single long rainy season from around April to October peaking at around 350 mm/month during August. Some rainfall does occur during the rest of the year. More local differences in temperature are evident in this region, especially during the wet season. Temperatures vary through the year by around 5° C with warmest temperatures just at the beginning of the rainy season (April – May) and with a small secondary peak at the end of the rainy season during October.

2.1 Observed historical climate variations and climate change trends

The majority of Guinea experiences **relatively low to moderate rainfall variability** on an inter-annual basis. On **decadal time scales** Guinea also experiences **significant variability** with some periods being relatively drier or wetter than others. This variability can be seen in the supporting evidence plots provided in the supplementary Appendix **(Figures A-1 to A-4).** **Long term trends** across both regions show statistically significant **increasing temperatures** over the period 1979 – 2015, although that trend appears to be weaker in the last decade of that period. The warming trend is stronger for the Coastal than for the Interior region.

Long term trend in total annual rainfall are not evident in either region. No trend is evident in the frequency of rain events or extreme rain events, except over the Interior Region which shows a positive trend in extreme rainfall frequency. Long term trends and variability in the Guinea regions are summarized in **Table 2-2** below and illustrated further in the supplementary Appendix **(Figures A-1 to A-4).**

Table 2-2: Summary of trends in rainfall and temperature attributes in Guinea (1979 - 2015)

REGION	MEAN T [DEG C/DECADE]	TOTAL RAINFALL [MM/DECADE]	EXTREME RAINY DAYS [DAYS/DECADE]	RAINY DAYS [DAYS/DECADE]
Coastal	+0.20	not evident	not evident	not evident
Interior	+0.14	not evident	+1.8	not evident

2.2 Projected (future) climate change trends, including temperature, precipitation and seasonality

Projected changes in main attributes of climate for the Guinea region are summarized in Table 2-3, below, and described in Sections 2.2.1 and 2.2.1. Additional analysis and visualisation of projections be found in **Figures A-5 to A-8** in the supplementary Appendix.

2.2.1 PROJECTED CHANGES IN PRECIPITATION FROM PRESENT TO 2100

Rainfall projections over both the Guinea regions show no consistent signal in the projections of total annual rainfall. There is a suggestion that the frequency of rain days my decrease into the future, and for the Interior region there is a suggestion that extreme rainfall frequency may increase by the end of the 21st century. It must be noted that these results are derived from GCM projections which may not accurately represent changes in extreme rainfall dynamics. They are, however, consistent with the increased convective rainfall intensity (e.g. thunderstorm-related rainfall) expected in a warmer climate.

2.2.2 PROJECTED CHANGES IN TEMPERATURE FROM PRESENT TO 2100

Air temperature is projected to be about 1.5 to 2.5˚C warmer in the Guinea regions by the 2050s. By 2100 the range of projected temperatures is even greater with the projected increases of 3˚C to 6˚C.

Table 2-3: Summary of projected climate changes across regions of Guinea for key climate variables by 2050

REGION	AVERAGE TEMPERATURE [˚C]	TOTAL ANNUAL RAINFALL [MM/YEAR]	NUMBER OF HEAVY RAINFALL [DAYS/YEAR]	RAINY DAYS [DAYS/YEAR]
Coastal	**Increasing** +1.5˚C to +2.5˚C by 2050s but changes evident in next decades	No consistent signal in projections	No consistent signal in projections	**Normal to decreasing**, ranging from no change to a decrease of up to 35% by 2100
Interior	**Increasing** +1.5˚C to +2.5˚C by 2050s but changes evident in next decades	No consistent signal in projections	**Normal to increasing**, generally ranging from no change to an increase of up to 50% by .2100	**Normal to decreasing**, ranging from no change to a decrease of up to 25% by 2100

2.3 Expected climate vulnerabilities

NOTE: Determining vulnerability of different sectors to climate variations or change is extremely challenging as there are many factors involved in vulnerability and different approaches can yield different results. The vulnerabilities presented here based on UNFCCC reporting documents such as national communications or national adaptation plans of action where available, and other literature where UNFCCC documents are not available.

In tropical Guinea coastal lowlands extend into the Guinea highlands where some of the watershed sources of several of the major West African rivers are located. With increasing temperature trends and depending on the as of yet inconclusive direction of future rainfall trends, these watersheds may face changes that have implications not only for Guinea but for the countries in the wider region to whom the rivers provide important water sources. Increasing temperatures, as well as possible changes to rainfall patterns, is a concern both for the largely rural population, which to a large extent depends on subsistence and cash crop agriculture, as well as for the economy for which agriculture plays an important role. Only about a third of the Guinean population lives in urban areas, however nearly half of these live in informal settlements with lack of proper access to critical services such as health care, water supply and proper housing, deeming them vulnerable to extreme temperatures and rainfall events, as well as the slower knock-on effects that climate change may have on the economy and agricultural production. Dense coastal settlements are further vulnerable to

sea-level rise and associated stresses.

Table 2-4: Broad scale sectoral vulnerabilities and potential climate change impacts in Guinea

SECTOR	IMPACTS
Agriculture	- Rising sea level and intensified coastal erosion, leading to disappearance or salinization of the rice paddies - Falling crop yields
Fisheries	Rising sea level and intensified coastal erosion, leading to adverse effects on fishery resources, the destruction of infrastructure in coastal towns
Water resources	Reduced flow rate of watercourses
Built infrastructure and human settlements	Rising sea level and intensified coastal erosion leading to the destruction of infrastructure in coastal towns and villages
Human health	Food security is not currently guaranteed in Guinea. The priority is therefore to increase production, despite the risk of falling yields as a result of the impact of climate change

3. CLIMATE CHANGE MITIGATION, GREENHOUSE GAS EMISSIONS AND ENERGY USE

The major carriers of Guinea's energy mix, and the energy demands of major economic sectors, are summarised in Section 3.1, below. The major sources of GHG emissions, described by fuel source and sector, are described in Section 3.2. The latter section also includes summarised statistics on Guinea's agriculture sector, historical land use change and vegetation cover.

3.1 National energy production and consumption

Guinea suffers from major deficits in energy production and electricity access. Approximately ~98% of national energy production, and ~78% of national energy consumption, is accounted for by domestic use of biomass fuels. Electricity is generated through oil-fired generators as well as hydroelectricity, however, access to electricity in Guinea is extremely low as a result of underdeveloped supply infrastructure, high costs and limited generation capacity. The residential sector accounts for the largest share of Guinea's total national energy consumption (the majority of which is provided by biomass fuels), followed by the transport and industrial sectors (the latter of which are supplied by oil, either directly or indirectly as electricity). The total annual GHGs emitted by the abovementioned sectors and fuel carriers are described further in Section 3.2.

Unless stated otherwise, all energy figures are derived from UN Stats (2014) [10]; World Energy Council (2016); [11]; and the World Resources Institute (2013) [12]. Agriculture & forestry-related emissions are also reported from Food and Agriculture Organisation (2014-2017) [14] and Global Forest Watch. (2015-2017) [15].

3.1.1 NATIONAL ENERGY PRODUCTION, PRIMARY ENERGY SUPPLY AND NATIONAL ENERGY CONSUMPTION

The tables and figures below describe Guinea's energy sector, including national electricity production, primary energy supply and national energy consumption by fuel carrier. Total national energy production is ~2.7 MTOE per annum (Table 3-1), which is supplemented by imported oil products to meet total national energy consumption demands of ~3.1 MTOE (Table 3-2). Total consumption of electricity is estimated to be ~0.1 MTOE, of which 0.04 MTOE is generated by hydroelectricity (Tables 3-1&3-2).

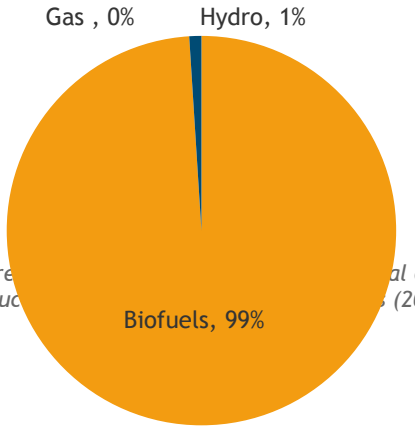
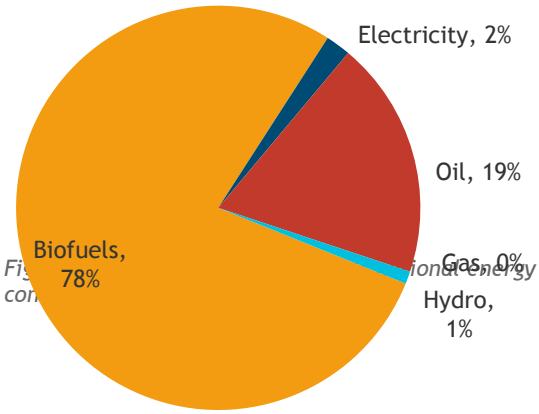


Figure … al energy produc… (2014-2016)

Table 3-1: National energy and electricity production in Guinea (2014-2016)

NATIONAL ENERGY PRODUCTION		
Source	**Total (MTOE)[1]**	**% of total energy production**
Hydro[11]	0.04	1.5
Biofuels[12]	2.7	98.4
Total national energy production	2.7	100.0

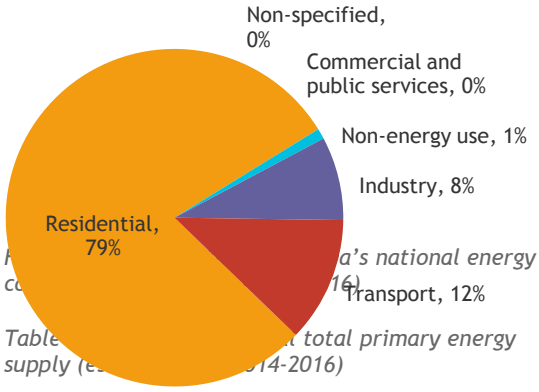
[1] *Energy is expressed in 'Megatonnes of Oil Equivalent', where 1 Tonne Oil Equivalent = 11,630 KiloWatt hours (KWh)*



Fi… …ional energy co…

Table 3-2: Guinea's national energy consumption by energy source

CONSUMPTION BY ENERGY SOURCE	
Source	**Total (MTOE)**
Oil[12]	0.6
Gas[12]	0.0
Hydro[13]	0.03
Biofuels[12]	2.4
Electricity[12]	0.1
Total national energy consumption by source	3.1



…a's national energy co… …16)

Table … …l total primary energy supply (e… …014-2016)

Table 3-3: Guinea's national energy consumption by sector (2014-2016)

CONSUMPTION BY SECTOR[12]	
Source	**Total (MTOE)**
Industry	0.3
Transport	0.4
Residential	2.5
Commercial and public services	0.01
Non-specified	0.0
Non-energy use	0.03
Total national energy consumption by sector	3.1

TOTAL PRIMARY ENERGY SUPPLY[12]	
Source	**Total (MTOE)**
Oil	0.8
Gas	0.0
Biofuels	2.7
Electricity	0.0
Total primary energy supply	3.5

3.3 National greenhouse gas emissions by source and sector

As a result of Guinea's minimal consumption of fossil fuels, standardised data to report on total GHG emissions is generally of a poor quality and not readily available. National statistics on the fuel sources which drive Guinea's GHG emissions are of a poor quality and not available in consistent and updated formats (such as through databases managed by WRI CAIT or IEA). However, as described in Section 3.1, the two primary fuel sources used in Guinea are biomass fuels, primarily used by the domestic/residential sector, and oil for use by the residential, transport and industrial sectors.

3.3.1 GHG EMISSIONS FROM PRIMARY ENERGY CONSUMPTION, BY SOURCE AND SECTOR

Guinea's total national GHG emissions are estimated to be ~27.8 MT CO_2e per annum, of which the majority of Guinea's GHG emissions are attributable to the sectors of agriculture (~11.3 – 11.9 MT CO_2e, and land use change and forestry (~14.1 MT CO_2e) (Table 3-5, 3-6). In addition, the sectors of industry (likely to include emissions related to mining and processing of minerals) and waste management contribute an additional ~1.7 MT CO_2e. Section 3.2.2, below, describes the GHG emissions resulting from activities in the Agriculture, Forestry and Other Land Use (AFOLU) sectors.

Table 3-5: Guinea's national greenhouse gas emissions from primary energy consumption (estimated for 2014-2016)

NATIONAL GHG EMISSIONS FROM FUEL COMBUSTION BY FUEL SOURCE AND SECTOR[14]		
Source / Sector		**Total emissions (MT CO_2e)**
Energy	Other fuel combustion	0.7
	Energy sub-total	0.7
Industrial processes		0.2
Agriculture		11.9
Waste		1.5
Land use change and forestry (LUCF)		14.1
Total emissions (including LUCF)		28.4

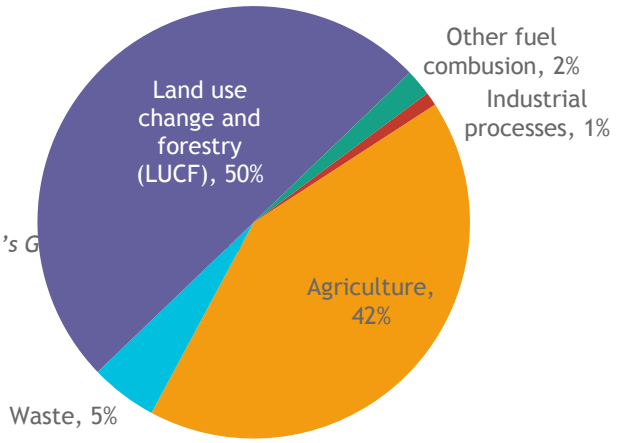


Figure 3-4: Distribution of Guinea's G

3.3.2 GHG EMISSIONS FROM AGRICULTURAL PRACTICES

Table 3-6, below, summarises GHG emissions from Guinea's agriculture sector (derived from Food and Agriculture Organisation statistics). Guinea's agriculture sector contributes ~11.3-11.9 MT CO_2e (Tables 3-5, 3-6). Activities contributing to emissions including multiple sources related to the livestock sector, including enteric fermentation, manure left on pastures and various other manure management practices (contributing 3.8, 2.8, and 0.3 MT CO_2e, respectively). Emissions generated by rice cultivation, management of crop residues and cultivation of organic soils contribute an additional 2.3, 0.3 and 0.1 MT CO_2e, respectively. In addition, burning of savanna contributes ~1.7 MT CO_2e, much of which is driven by domestic use biofuels collected from woodland areas as well as clearance of land for establishment of crops and grazing.

Guinea's national GHG emissions also include significant contributions from land use change and forestry, totalling ~14.1 MT CO_2e - emissions from the latter areas include 12.5 MT CO_2e from deforestation and/or degradation of woodland areas, as well as an additional 1.0 MT CO_2e from burning of biomass fuels generated in wooded areas (primarily confined to the humid central and southwest regions). Additional information on Guinea's vegetation cover and land use change is provided in Table 3-7.

Table 3-6: National annual greenhouse gas emissions from agricultural practices, forestry and other land use in Guinea (estimated for 2014-2017)

VARIABLE		ANNUAL EMISSIONS (MT CO_2E)
Annual GHG emission from agricultural practices [15]	Burning - crop residues	0.1
	Burning - savanna	1.7
	Crop residues	0.3
	Cultivation of organic soils	0.1
	Enteric fermentation	3.8
	Manure management	0.2
	Manure applied to soils	0.1
	Manure left on pasture	2.8
	Rice cultivation	2.3
	Synthetic fertilizers	0.0
	Sub-total (Agricultural practices)	11.3
Annual GHG emission from land use change [15]	Grassland	0.1
	Cropland	0.7
	Forest land	12.5
	Burning biomass	1.0
	Sub-total (Land use change)	14.1
Total emissions		25.4

Guinea's land area includes extensive areas of woodland, mixed gallery forest and dense tropical rainforest (Table 3-7). It is estimated that ~88% of the country includes some form of tree cover, including ~14 million hectares of woodland (canopy cover ~10-30%, largely occurring as various forms of Guinean savanna) and ~7.5 million hectares of forest (all forms of forest with canopy cover greater than ~30%). As a result of demand for biomass fuel, timber, forest products and expansion of agricultural lands, the rate of deforestation in Guinea's woodlands ranges from ~0.1% in sparse woodland areas (~10-30% canopy cover) and up to 0.6% within the tropical and sub-tropical forest areas (where canopy cover > 30%). In total, Global Forest Watch estimates the stored biomass carbon content of Guinea's forests and woodlands to be ~605 million tonnes of carbon.

Table 3-7: Vegetation cover and land use change in Guinea (estimated for 2015)

VARIABLE		TOTAL (HECTARES)	TOTAL (% OF LAND AREA)	UNIT
Total tree cover [16]	10-30% canopy cover	14,067,548	57.22	% of total land area
	30-50% canopy cover	5,641,339	22.9	
	50-100% canopy cover	1,931,509	7.9	
	Total	21,640,396	88.0	
Land use change and agricultural expansion	Historical annual rate of deforestation[17]	10-30% canopy cover	0.1	% of previous year
		30-50% canopy cover	0.4	
		50-100% canopy cover	0.6	
	Area of agricultural land[18]	14,247,587	58.0	% of total land area

4. SUMMARISED NATIONAL PRIORITIES FOR CLIMATE CHANGE ADAPTATION AND MITIGATION

Guinea's main priority actions related to climate change are described in the country's submissions to the UNFCCC through the Intended Nationally Determined Contributions (INDC) document. The document includes brief descriptions of the country's major commitments and priorities related to GHG mitigations (Table 4-2, below) as well as major priorities related to adaptation, derived from the draft National Adaptation Plan (NAP) (Table 4-3, further below). Guinea's INDC indicates the estimated level of mitigation as -13% greenhouse gas (GHG) emissions in 2030 as compared to 1994 (Initial National Communication of the Republic of Guinea), excluding Land-Use Change and Forestry (LUCF). Guinea estimates the total investment costs required for proposed adaptation activities to be ~USD 1.7 billion in the period to 2030. With respect to investment needs for proposed mitigation activities, Guinea's INDC estimates the investment costs for the energy sector alone to be at least ~USD 8.18 billion, of which approximately ~USD 6.5 billion is anticipated to be needed from international sources of support.

Table 4-1, below, gives details on Guinea's GHG reduction targets outlined in the country's INDC, with information on target gases and sectors, the use of international markets in achieving targets (e.g. the use of carbon credits), and accounting methods used to quantify GHG emissions (e.g. inclusion of land use and land use change).

Table 4-1: Summary of Guinea's INDC commitments for reduction of GHG emissions

GHG EMISSIONS REPORTED IN INDC (MT CO2E/YR)	BASE LEVEL	REDUCTION TARGET	TARGET YEAR	SECTORS AND GASES	USE OF INTERNATIONAL MARKETS	LAND-USE INCLUSION / ACCOUNTING METHOD
28.87	N/A	A series of policies and measures including a renewable energy target of 30 percent	N/A	CO_2; Energy, forestry	Not mentioned	Forestry included, accounting methodology not specified

4.1 National priorities for climate change mitigation

Guinea's mitigation commitments are cumulatively targeting a reduction in emissions of at least ~87 MT CO_2e by 2030, relative to a 'Business as Usual' scenario. Guinea's mitigation ambitions are arranged within five priority commitments: i) produce 30% of energy (excluding wood-energy) from renewable energy sources; ii) support the dissemination of technologies and practices that are energy- efficient or use alternatives to wood-energy and charcoal; iii) improve the energy performance of the Guinean economy; iv) make the exploitation of mineral resources climate-compatible; and v) manage forests sustainably. Detailed sub-activities within each of the priority mitigation commitments are described further in Table 4-2, overleaf. Proposed activities and investments within each sector are further categorised according to 'Technology Type', based on the categories of technologies listed by the Green Climate Fund's (GCF) impact indicators for mitigation projects (key for technology types provided overleaf Table 4-2)

Table 4-2: Mitigation priorities in Guinea's INDC

PRIORITY SECTOR	SECTOR-SPECIFIC ACTION	TECHNOLOGY TYPE[2]
Energy	Produce ~30% of energy (excluding wood-energy) from renewable energy sources - Commission hydro-power stations producing 1650 MW (127MW in 2011); - Install an additional 47MW (3MW in 2011) of solar and wind power; - Increase the supply of biofuels and other modern energies (40k toe of butane and biogas, 3000 kWc of biofuels).	1
	Support the dissemination of technologies and practices that are energy- efficient or use alternatives to wood-energy and charcoal - organization of local industrial supply chains to enable the introduction of at least 1 million improved stoves; - establishment of 5000 wood carbonization units giving a better charcoal yield; - replacement with butane (40k toe); - extension of pilot initiatives to disseminate improved smokehouses and stabilized earth blocks	1, 6
	Improve the energy performance of the Guinean economy - A 50% improvement in electricity yields in relation to the baseline situation - improving the quality of the transport fleet; promoting public transport; disseminating solar streetlamps and low-energy lamps and electrical appliances; and implementing efficiency standards in building design	1
	Make the exploitation of mineral resources climate-compatible	1
AFOLU	Manage forests sustainably - Stabilize the area of mangroves between present and 2030; - re/afforestation programmes covering 10,000 ha per year; - effective conservation of classified forests and protected areas.	4, 9

[2] **GCF Technology Type Key (derived from GCF's Results Framework for mitigation)*

1. Reduced emissions through increased lower emission energy access and power generation.

2. Reduced emissions through increased access to low-emission transport.

3. Reduced emissions from buildings, cities, industries and appliances.

4. Reduced emissions from land use, deforestation, forest degradation, and through sustainable management of forests and conservation and enhancement of forest carbon stocks.

5. Strengthened institutional and regulatory systems for low-emission planning and development.

6. Increased number of small, medium and large low-emission power suppliers.

7. Lower energy intensity of buildings, cities, industries, and appliances.

8. Increased use of low-carbon transport.

9. Improved management of land or forest areas contributing to emissions reductions.

4.2 National priorities for climate change adaptation

Guinea's INDC articulates multiple adaptation objectives in alignment with the country's policies, strategies and action plans within three major strategic programmes, namely: "i) preserve the quality and quantity of water resources, for the benefit of the people of Guinea and the West African region; ii) put in place the measures needed to protect, conserve and manage ecosystems, revive economic activities and boost the resilience of communities in its coastal zone; and iii) support the adaptation efforts of rural communities to develop agro-sylvo-pastoral techniques enabling them both to continue their activities and preserve the resources on which they rely". Further, Guinea's INDC provides describes detailed adaptation actions within each of the strategic programmes, including activities in the sectors of agriculture, forestry and fisheries, water, renewable energy access, and various community-based and institutional-level actions (Table 4-3, below). Guinea's proposed activities and investments related to adaptation are categorised according to 'Technology Type', based on the categories of technologies listed by the Green Climate Fund's (GCF) impact indicators for adaptation projects (key for technology types provided below Table 4-3).

Table 4-3: Adaptation priorities in Guinea's INDC

PRIORITY SECTOR	SECTOR-SPECIFIC ACTION	TECHNOLOGY TYPE[3]
Water	Preserve the quality and quantity of water resources, for the benefit of the people of Guinea and the West African region - Preserve and restore the riparian forests at the spring heads and along the banks, in particular on cross-border watercourses; - Ensure the preservation of the banks and beds of national and transnational watercourses. - Seek alternatives to uses and offtake that are detrimental to water quality (brickmaking, dredging of riverbeds to obtain minerals, etc.); - Ensure that the climate change dimension is taken on board in the institutional and legal frameworks and by the organizations responsible for managing and developing cross-border catchment areas; - Set up a system of hydro-ecological monitoring of international rivers.	4, 7
Coastal Zone	Protect, conserve and manage ecosystems, revive economic activities and boost the resilience of communities in its coastal zone: - Update the Mangrove Management and Development Plan (SDAM); - Reduce the sources of mangrove degradation; - Include adaptation in local development plans and spatial planning tools; - Enhance scientific knowledge of the coast as a whole; - Develop rice production by improving yields through use of varieties better able to cope with the impact of climate change (particularly ingress of salt water). - Extend the pilot initiatives already launched, especially the Increased Resilience and Adaptation to Adverse Impacts of Climate Change in Guinea's Vulnerable Coastal Zones (RAZC) project, to all the municipalities on the coast.	1, 7

PRIORITY SECTOR	SECTOR-SPECIFIC ACTION	TECHNOLOGY TYPE[4]

[3] *GCF Technology Type Key (derived from GCF's Results Framework for mitigation)*

1. Reduced emissions through increased lower emission energy access and power generation.

2. Reduced emissions through increased access to low-emission transport.

3. Reduced emissions from buildings, cities, industries and appliances.

4. Reduced emissions from land use, deforestation, forest degradation, and through sustainable management of forests and conservation and enhancement of forest carbon stocks.

5. Strengthened institutional and regulatory systems for low-emission planning and development.

6. Increased number of small, medium and large low-emission power suppliers.

7. Lower energy intensity of buildings, cities, industries, and appliances.

8. Increased use of low-carbon transport.

9. Improved management of land or forest areas contributing to emissions reductions.

[4] *GCF Technology Type Key (derived from GCF's Results Framework for mitigation)*

1. Reduced emissions through increased lower emission energy access and power generation.

AFOLU	Support the adaptation efforts of rural communities to develop agro-sylvo-pastoral techniques enabling them both to continue their activities and preserve the resources on which they rely: - Diversification of agricultural production; - Development of agro-ecological fish-farming techniques; - Low-input varieties and cropping techniques suited to a drier climate; - Controlled irrigation; - Inclusion of the climate change dimension in budgeting and development plans, programmes and projects; - Development of hydro-agricultural schemes; - Development of techniques to conserve and process agricultural, forestry and fish-farming products; - Better management of pastoralism, especially transnational pastoralism, so as to limit degradation of grazing and soil and reduce the risks of usage conflicts.	1, 7

2. Reduced emissions through increased access to low-emission transport.

3. Reduced emissions from buildings, cities, industries and appliances.

4. Reduced emissions from land use, deforestation, forest degradation, and through sustainable management of forests and conservation and enhancement of forest carbon stocks.

5. Strengthened institutional and regulatory systems for low-emission planning and development.

6. Increased number of small, medium and large low-emission power suppliers.

7. Lower energy intensity of buildings, cities, industries, and appliances.

8. Increased use of low-carbon transport.

9. Improved management of land or forest areas contributing to emissions reductions.

5. ASSUMPTIONS, GAPS IN INFORMATION AND DATA, DISCLAIMERS

The observed and projected climate trends described in Section 2 'Climate and Weather' are derived from a combination of publicly-available observational data and CMIP5 climate models. Detailed information is included in Section 6. Appendix 1, including '6.1.b. Historical Trends and Variability Analysis' and '6.1.c. Climate Projections Visualisations'.

Unless stated otherwise, all statistics reported in Section 1 ('Geographic and Socio-Economic Context' and Section 3 'Climate change mitigation, greenhouse gas emissions and energy use') are derived from databases of publicly available datasets managed by international or multilateral agencies including inter alia The World Bank Group, the United Nations, World Resources Institute and International Energy Agency.

Unless stated otherwise, all energy and greenhouse gas emission figures are derived from UN Stats (2014); World Energy Council (2016); the World Resources Institute (2013), and the International Energy Agency (2016). Agriculture & forestry-related emissions are also reported from Food and Agriculture Organisation (2014-2017) and Global Forest Watch. (2015-2017). Full references are provided as a supplementary appendix.

As a result of the use of standardised methodologies and data sources across the 25 countries included in this AfDB Climate Change Profile, statistics and estimates reported herein may differ from other publicly available datasets or national estimates. Readers are advised to always check for updated publications and newly released national datasets.

This AfDB Climate Change Profile series is intended to provide a brief touch-stone reference for climate change practitioners, project managers and researchers working in African countries. The figures and estimates provided herein are intended to inform the reader of the main climate-related challenges and priorities, however these should be used to inform a process of additional research and in-country consultations. The University of Cape Town, the African Development Bank and its Boards of Directors do not guarantee the accuracy of figures and statements included in this work and accept no responsibility for any consequences of its use.

6. APPENDIX 1

1.a Supporting evidence

The climate projections detailed in Chapter 2 (above) are supported by rigorous analysis of observed and model projections data. More details of this analysis and supporting figures can be found below.

1.b Historical trends and variability analysis

The analysis of historical trends and variability of key climate variables is presented below. This analysis uses the WATCH Climate Forcing dataset which has been selected as the most broadly representative of station observations across Guinea. Long term (1979 to 2015) trends as well as inter-annual variability (decade to decade) has been analysed for total annual rainfall, number of rainfall days, number of extreme rainfall days, and daily mean temperatures for each of the six climate regions across Guinea. The plots below detail **inter-annual variability** (dotted lines), **decadal variability** (smooth bold solid curves) and **long term trends** (thin straight lines) for each region and statistic. This allows for comparison of different types of variability against the long term trend. It can be seen that for rainfall statistics, inter-annual and decadal variability are typically fairly large compared to long term trends. For example, for total annual rainfall, the Coastal region has very high inter-annual (1000mm in some years to 2700mm in other years) and moderate decadal variability (1500mm in some decades to 2500mm in other decades). Long term trends are not statistically significant but could be around 90mm over the 30 year period.

Figure A-1: Long term trends and variability in total annual rainfall for rainfall regions

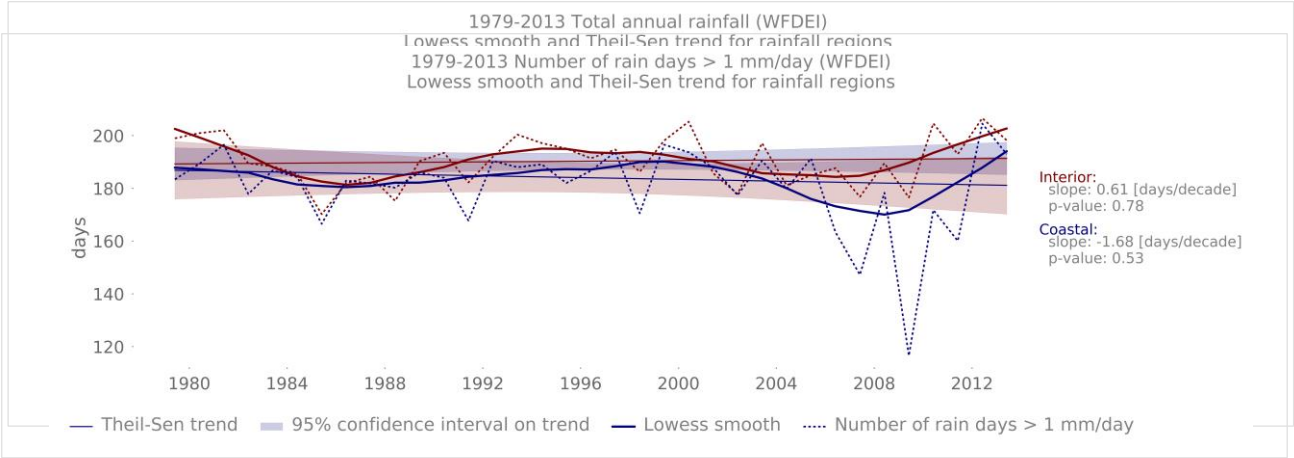


Figure A-2: Long term trends and variability in frequency of rainfall events for rainfall regions

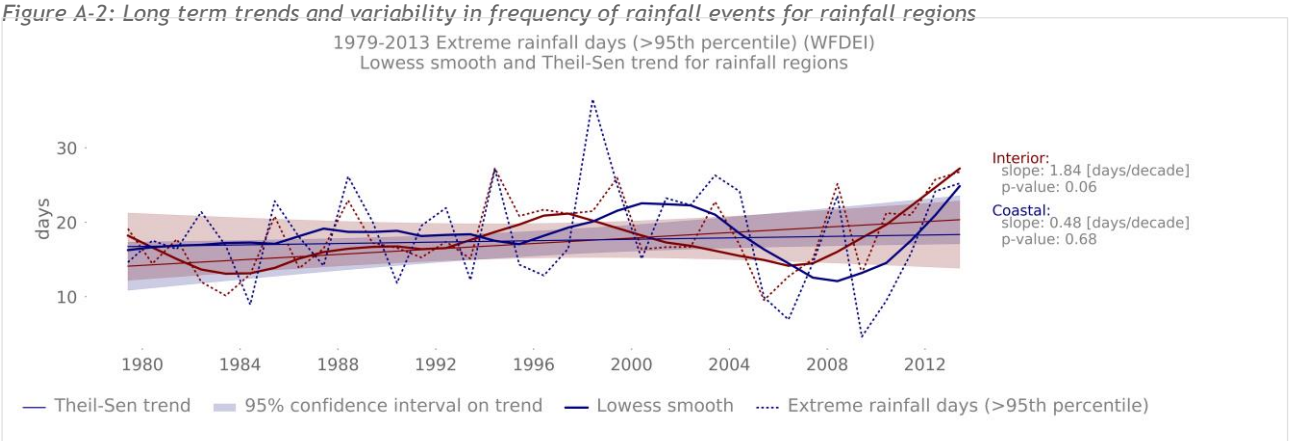


Figure A-3: Long term trends and variability in extreme rainfall events for rainfall regions

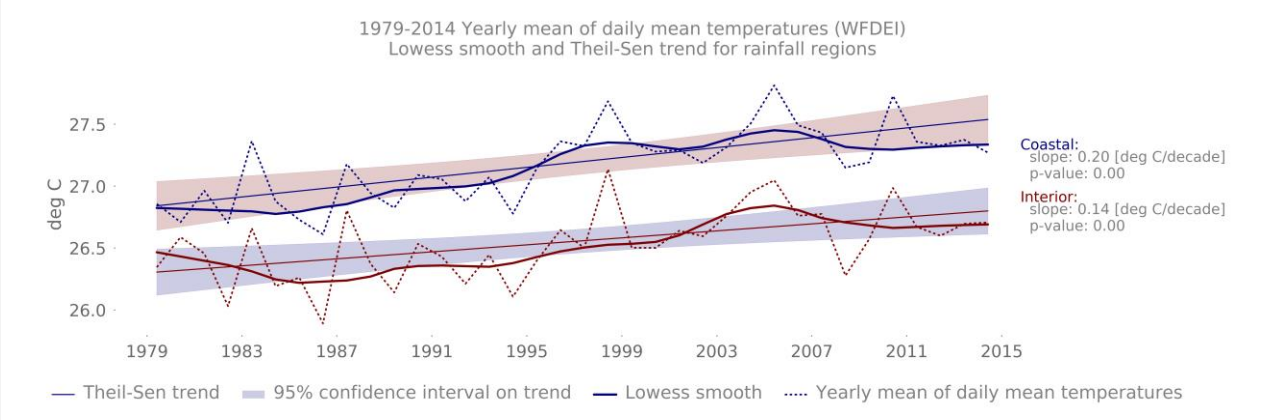


Figure A-4: Long term trends and variability in daily mean air temperatures for rainfall regions

1.c Climate projections visualizations

The plots below (Figures A-5 – A-8) are called plume plots and they are used to represent the different long term projections across the multiple climate models in the CMIP5 model archive used to inform the IPCC AR5 report. The plots show projected variations in different variables averaged over the climate regions. The blue colours indicate variations that would be considered within the range of natural variability, so in other words, not necessarily the result of climate change. The orange colours indicate projection time series where the changes would be considered outside of the range of natural variability and so likely a response to climate change. It is important to note that these are global climate model projections and so likely do not capture local scale features such as topography and land ocean boundary dynamics. They also may not capture small scale features such as severe thunderstorms that can have important societal impacts. Finally, these projections are averages over relatively large spatial areas and it is possible that different messages would be obtained at small spatial scales and if various forms of downscaling are performed.

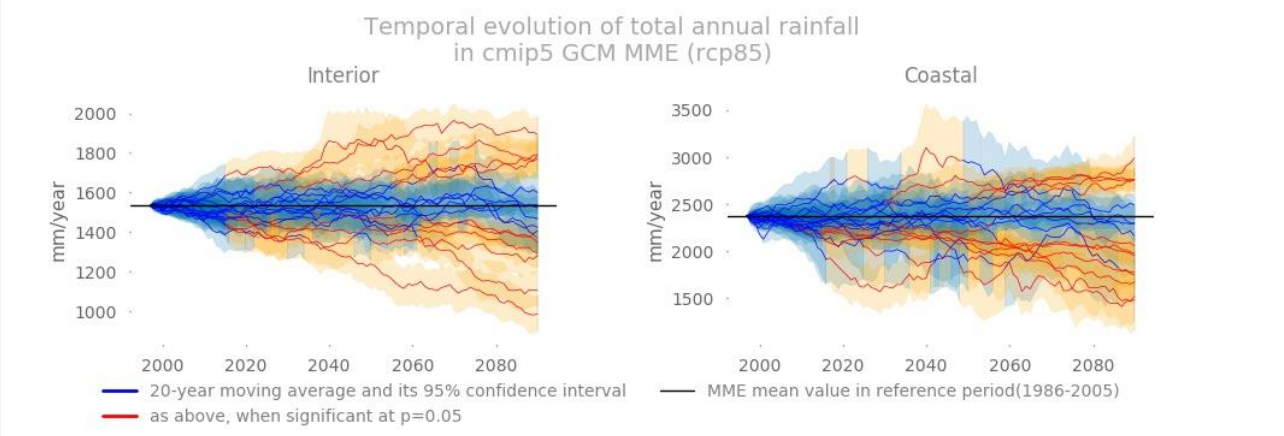


Figure A-5: Projected changes and emergence of changes in total annual rainfall

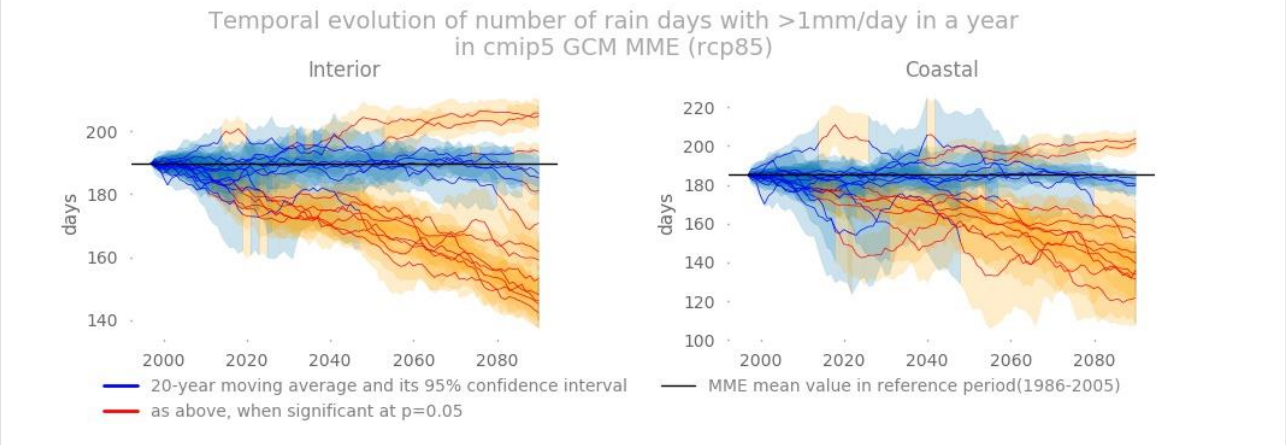


Figure A-6: Projected changes and emergence of changes in number of rain days per year

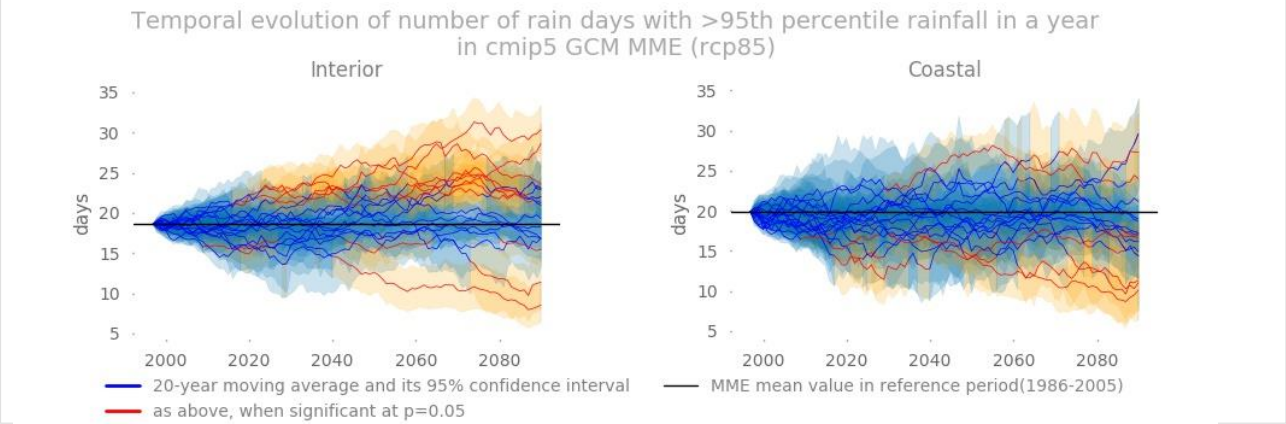


Figure A-7: Projected changes and emergence of changes in number of very heavy rainfall days (greater than 95th percentile) per year

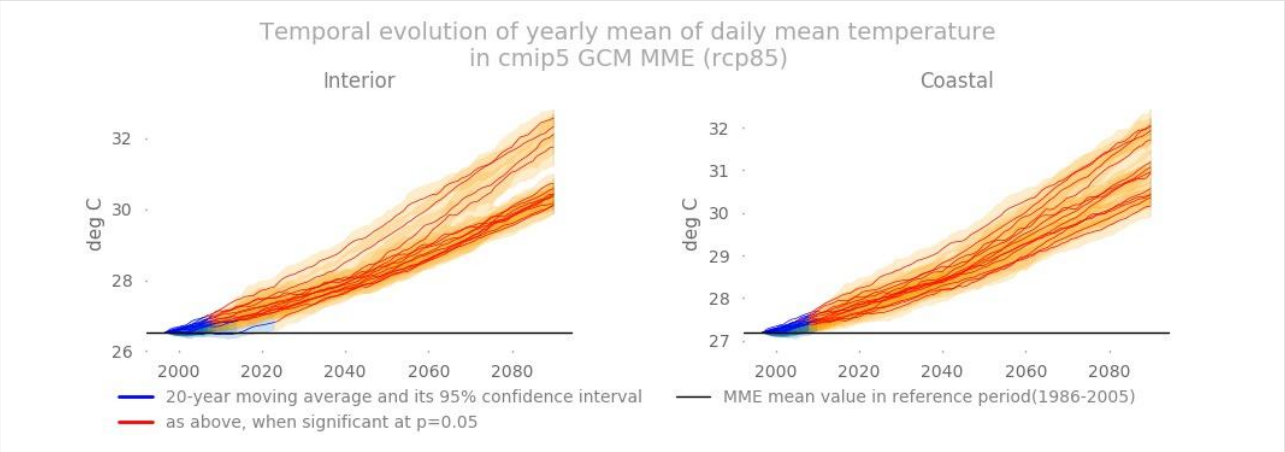


Figure A-8: Projected changes and emergence of changes in annual mean daily mean temperatures

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