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Economy and international financing

The impact of climate change in Sub-Saharan Africa: vulnerabilities, resilience and finance

Climate change is both an immediate challenge and a long-term constraint for Sub-Saharan African (SSA) countries, particularly for the island nations and the states in the Sahel. The resilience of SSA countries is also greatly undermined by the critical importance of agriculture, demographic pressures and low levels of development (minimal rollout of green technologies, for example). National climate strategies and eco-friendly investments must be reinforced, as policies to mitigate and adapt to climate change are a common goal for both national governments and their international partners. Combating climate change represents a mounting challenge for both fiscal and monetary policy but also for the financing of the economy. At the same time, international climate finance is still insufficient with respect to the commitments made by developed countries. This is particularly true for the least developed countries, which struggle to gain access to funds.

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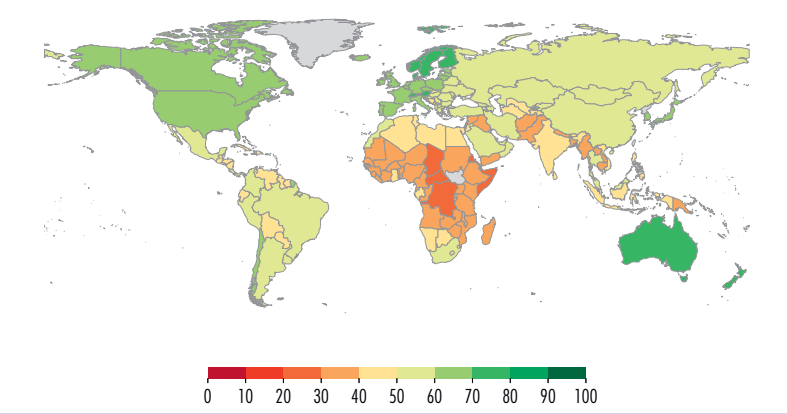
Q58

From 0.3°C to 1.5°C
the increase in temperature observed in different regions of Sub-Saharan Africa in 2017 compared with the 20th century average

15%
the proportion of natural disasters recorded worldwide that hit Sub-Saharan Africa

USD 140 billion to USD 300 billion
developing countries' annual financing needs by 2030 to address climate change

Vulnerability to climate change
(normalised index: 0-100)



Source: ND-GAIN Index, 2017.
Key: 0 =the highest level of vulnerability; 100 =the lowest level of vulnerability.

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Climate change is both an immediate challenge and a rising long-term constraint for Sub-Saharan African (SSA) countries. Gradual changes in temperature and precipitation affect the aridity of soils and, with rising sea levels, contribute to coastline retreat. Moreover, the proliferation and intensification of natural disasters can often accelerate these long-term phenomena.[1] The impact of these different climate phenomena varies depending on each SSA country's intrinsic vulnerability to climate change, which in turn depends on the country's physical geography, while the resilience of each country is a reflection of its economic, sociological and political characteristics.[2]

The implementation of adaptation and mitigation policies,[3] including energy transition strategies, to address climate change poses major challenges in SSA. In a region of primarily low-income countries with restricted administrative capacities, combining both physical vulnerability and poor resilience, the challenges associated with implementing, maintaining and coordinating adaptation policies appear particularly severe. Given the limited financial resources available to SSA governments, the financial sector and the international community play key roles in financing the combat against climate change – a major aspect of SSA countries' sustainable development goals (SDGs).

The combat against climate change is also an opportunity to capitalise on the continent's strengths. SSA has countless natural resources, such as its equatorial forests – one of the world's most important carbon sinks and, with their geothermal capacity, river basins and solar exposure, a potential source of affordable, renewable energy. Lastly, increasing access to digital technologies may help reduce the technology gap to advanced countries.

1 Sub-Saharan African countries are fragile and extremely vulnerable to climate change

Sub-Saharan Africa is increasingly exposed to climate change

SSA countries appear to be particularly affected by rising temperatures and steadily decreasing precipitation (see Charts 1 and 2). Africa – and SSA in particular – is one of the most vulnerable regions to climate change, and there is a high probability that the COP21 objective of limiting the global average temperature increase to below 2°C by the end of the century (IPCC, 2014) will not be met. Compared with the 20th century average, temperatures in SSA in 2017 had increased by 0.3°C to 1.5°C depending on the region (against an average of 1°C globally). A comparison of the average figures for the 20th century and for the 2001-17 period also shows that annual precipitation declined by 8.5 cm in the Economic Community of Central African States (CEMAC), by 4.0 cm in the West African Economic and Monetary Union (WAEMU) and by 7.1 cm in the rest of SSA, against 2.8 cm for the planet as a whole. Rising sea levels also expose coastal countries to the risk of erosion. Furthermore, in recent years the effects of climate change have accelerated significantly, with particularly sharp temperature increases since 2015 (the year of the signing of the Paris Agreement).

The impact of this dual phenomenon varies significantly. While rainfall is declining sharply in the Sahel and North Africa, precipitation models project an increase in East and Southern Africa (IPCC, 2014). The countries of the Sahel (FERDI, 2019) have been particularly badly hit by increasingly prolonged periods of drought. Lake Chad has lost 90% of its surface area since the 1960s. The Sahara expanded by 10% – an area the size of Nigeria – during the 20th century (Thomas et al., 2018). In the Gulf of Guinea, more than half of the littoral of Benin, Côte d'Ivoire, Senegal and Togo is affected by erosion: every

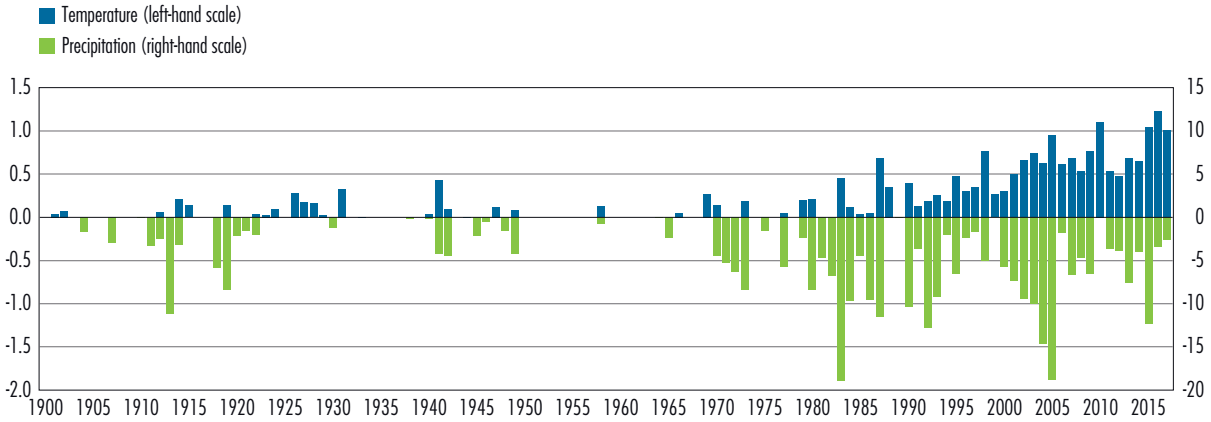
1 INSEE defines a natural disaster as being characterised by the abnormal intensity of a natural agent (flooding, mudslides, earthquakes, avalanches, droughts) where the usual damage-prevention measures either failed or could not be implemented.

2 The Intergovernmental Panel on Climate Change (IPCC) defines resilience as "the ability of a [...] system to absorb disturbances while retaining the same basic structure..."

3 According to the Food and Agriculture Organization (FAO), adaptation involves "measures to deal with the impacts of climate change and have the objective of reducing the vulnerability of human and natural systems", while mitigation measures aim to "address the causes of the problem" by, for example, "reducing greenhouse gas concentration in the atmosphere".

C1 Abnormally hot or dry years in Sub-Saharan Africa

(temperature in °C, precipitation in cm)



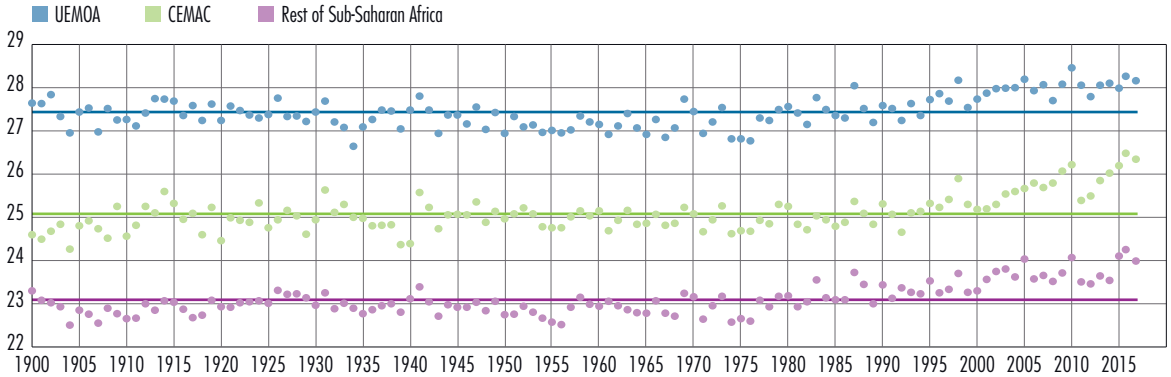
Sources: University of Delaware and Banque de France calculations.
Note: Deviations are measured in comparison to 20th century averages. Only positive temperature deviations and negative precipitation deviations are shown.

year, the coastline retreats by an average of 1.8 metres, menacing the coastal zone, which is home to one-third of the region's population and generates 56% of the countries' GDP (Croitoru et al., 2019).

Due to climate change, natural disasters are also escalating in SSA countries (IPCC, 2014). Even though more than 15% of the world's natural disasters between 2000 and 2017 struck SSA, the estimated economic losses, due to the region's low level of development, remain relatively limited compared with the rest of the world (around 1.5% of total losses worldwide in 2018[4]). The effects of natural disasters – climate change-related or otherwise – are more severe in SSA because of the size of the population, the structure of the economy (heavily weighted towards the primary and informal sectors) and even the layout of cities (insufficient local urban planning). Thus, if we compare the impact of the worst drought to have hit the

C2 Changes in temperature in CEMAC, UEMOA and the rest of Sub-Saharan Africa

(in °C)

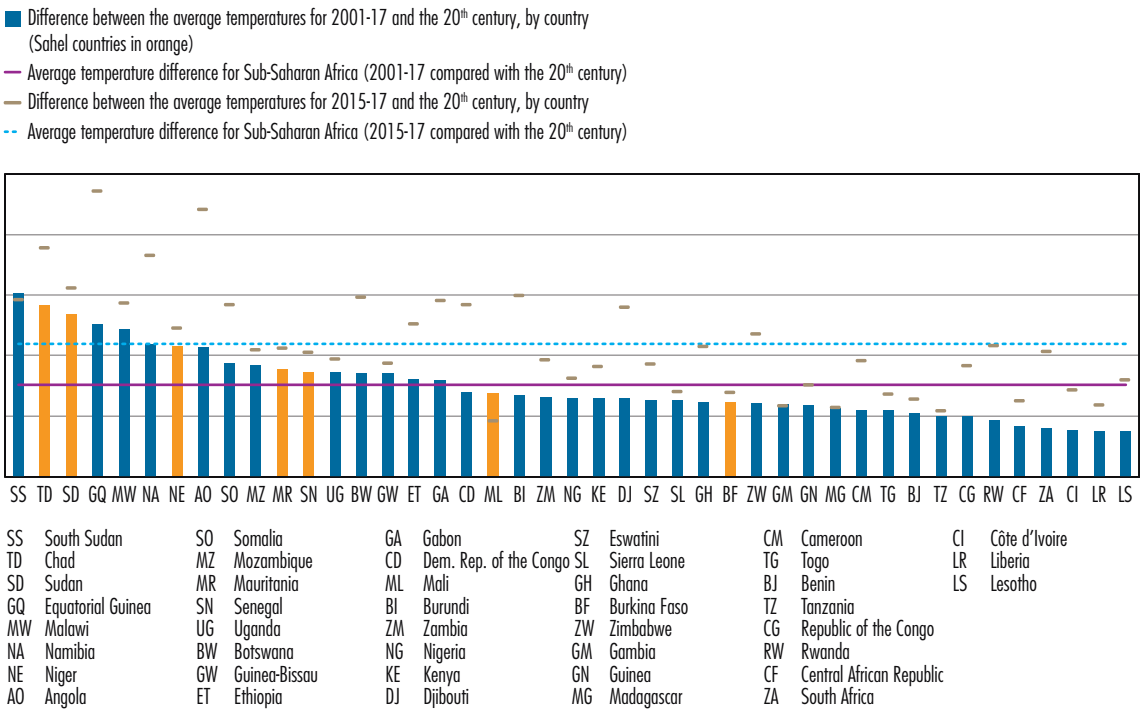


Sources: University of Delaware and Banque de France calculations.
Note: The horizontal lines represent the unweighted arithmetical average for each area.

4 According to the Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT), these data are underestimated due in particular to the weakness of the insurance sector and difficulties in determining the cost of epidemics. While the main natural disasters in SSA are climate related (droughts, flooding), their frequency and intensity in the short term are not necessarily related to climate change.

C3 Differences in temperature for the 2001-17 period and for the period since 2015 compared to the 20th century average

(in °C)

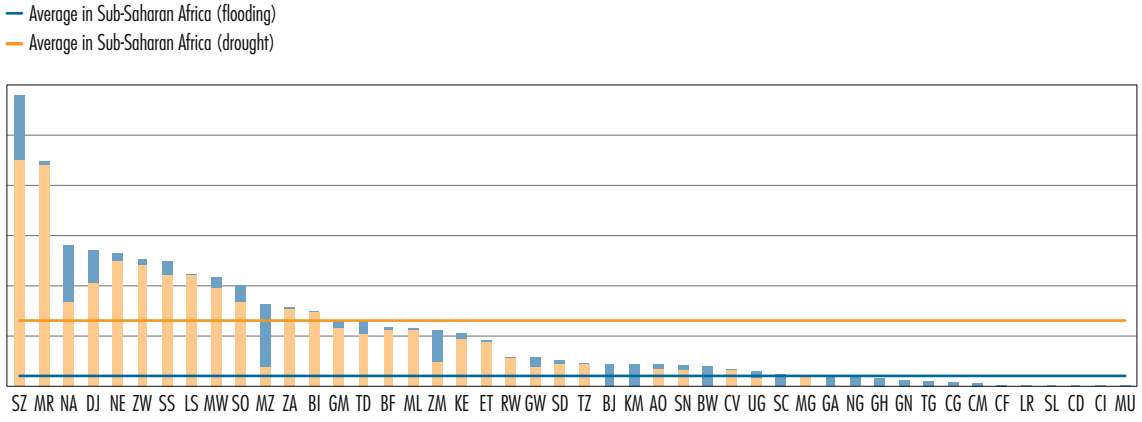


SS	South Sudan	SO	Somalia	GA	Gabon	SZ	Eswatini	CM	Cameroon	CI	Côte d'Ivoire
TD	Chad	MZ	Mozambique	CD	Dem. Rep. of the Congo	SL	Sierra Leone	TG	Togo	LR	Liberia
SD	Sudan	MR	Mauritania	ML	Mali	GH	Ghana	BJ	Benin	LS	Lesotho
GQ	Equatorial Guinea	SN	Senegal	BI	Burundi	BF	Burkina Faso	TZ	Tanzania		
MW	Malawi	UG	Uganda	ZM	Zambia	ZW	Zimbabwe	CG	Republic of the Congo		
NA	Namibia	BW	Botswana	NG	Nigeria	GM	Gambia	RW	Rwanda		
NE	Niger	GW	Guinea-Bissau	KE	Kenya	GN	Guinea	CF	Central African Republic		
AO	Angola	ET	Ethiopia	DJ	Djibouti	MG	Madagascar	ZA	South Africa		

Sources: University of Delaware and Banque de France calculations.

C4 Maximum proportion of the population affected by drought and floods in Sub-Saharan Africa, since 2000

(in % of total population)



SZ	Eswatini	MW	Malawi	ML	Mali	BJ	Benin	MG	Madagascar	CF	Central African Republic
MR	Mauritania	SO	Somalia	ZM	Zambia	KM	Comores	GA	Gabon	LR	Liberia
NA	Namibia	MZ	Mozambique	KE	Kenya	AO	Angola	NG	Nigeria	SL	Sierra Leone
DJ	Djibouti	ZA	South Africa	ET	Ethiopia	SN	Senegal	GH	Ghana	CD	Dem. Rep. of the Congo
NE	Niger	BI	Burundi	RW	Rwanda	BW	Botswana	GN	Guinea	CI	Côte d'Ivoire
ZW	Zimbabwe	GM	Gambia	GW	Guinea-Bissau	CV	Cape Verde	TG	Togo	MU	Mauritius
SS	South Sudan	TD	Chad	SD	Sudan	UG	Uganda	CG	Republic of the Congo		
LS	Lesotho	BF	Burkina Faso	TZ	Tanzania	SC	Seychelles	CM	Cameroon		

Sources: Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT), World Bank (population data), Banque de France calculations.
Note: Droughts are indicated in orange, floods in blue. Averages do not include zero values.

various parts of the world between 2000 and 2018, 26% of the population on average was affected in SSA, against 23% in East Asia and the Pacific and less than 5% in the Middle East and North Africa. The drought in 2009 hit up to 50% of the population of Niger (7.9 million people) and 21% of the population of Chad (2.4 million people), while in April 2019, the lives of 345,000 people in the Comoros were affected by cyclone Kenneth (40% of the population).

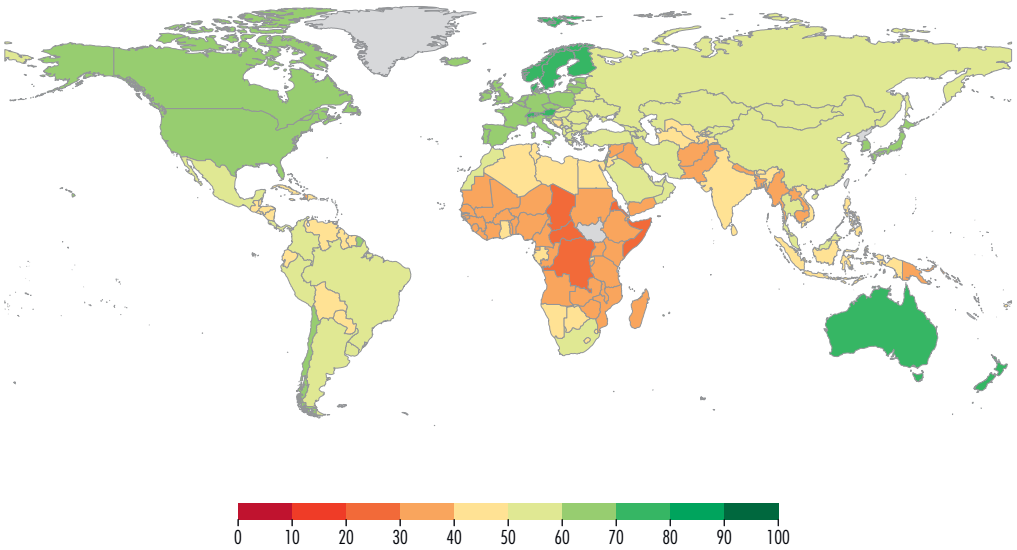
The vulnerability of SSA countries restricts their resilience to climate change

The impact resulting from these physical vulnerabilities[5] is exacerbated by demographic, economic and institutional factors. The continent is thus increasingly vulnerable to climate change (see map below) and to the mounting risks of epidemics.

The impact of climate change on populations is expected to be severe and is worsened by a faster rate of population growth than in other parts of the world. For example, according to United Nations projections (*World Population Prospects*, 2019), the population of Africa is expected to double by 2050 (up 99%). In comparison, population increases of 25% and as little as 3% are expected in Central and South Asia and East and South-East Asia, respectively. In 2050, the rapid desiccation of Lake Chad could theoretically hit a regional population of 129 million people (40 million in 2018) located in five different countries, raising concerns as to the effect such phenomena are likely to have on migration.

Natural disasters have a major impact in SSA because its people are so highly dependent on agriculture. The intensification of climate change-related natural disasters, such as droughts, flooding and soaring temperatures, may lead to a gradual modification of crop types and the depletion of arable land through desertification or soil degradation. Yields will consequently decline to varying extents from region to region. The pressures exerted by these developments on the agricultural sector as a whole are manifold and require changes to the way in which land is managed and used in both low-income and developed countries (IPCC, 2019). Moreover, the fact that agriculture accounts for almost 16% of SSA's GDP on average makes the region's populations

C5 Vulnerability to climate change
(normalised index: 0-100)



Source: University of Notre Dame, Climate Change Adaptation Project.
Key: 0 =the highest level of vulnerability; 100 =the lowest level of vulnerability.

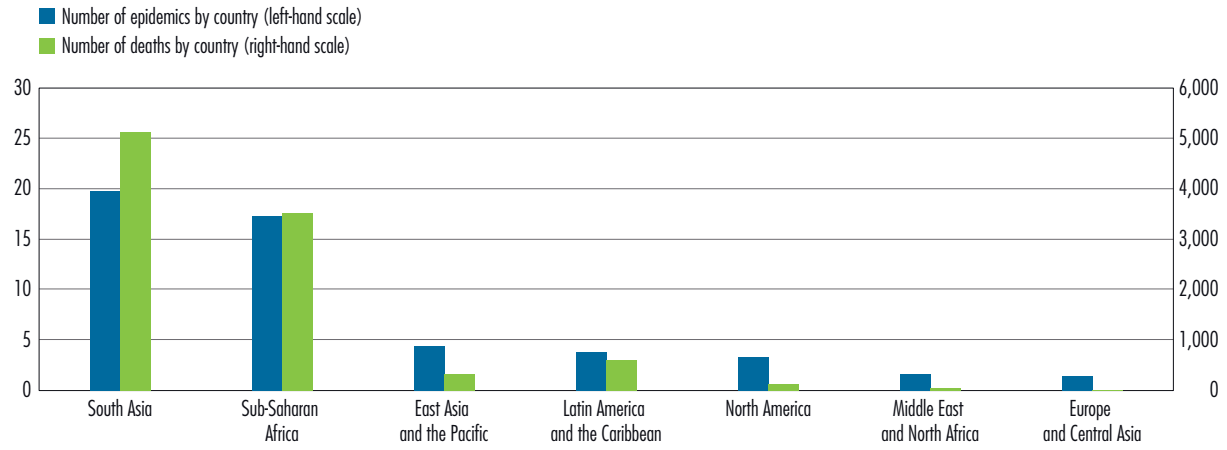
5 The main focus of the work of FERDI's Observatoire de la compétitivité durable.

BOX 1

The vulnerability of Sub-Saharan Africa to epidemics and climate change

Sub-Saharan Africa is particularly exposed to outbreaks of epidemics, and their human consequences are more severe in the region than anywhere else in the world except South Asia. Rising temperatures, as well as biodiversity loss as natural habitats are overrun, can have adverse effects on public health conditions and, as signalled by the World Health Organization,[1] encourage the spread of certain tropical diseases (malaria, dengue, chikungunya) and their vectors. This vulnerability to epidemics reflects both the particularities of Sub-Saharan Africa's climate (tropical diseases) and its weak resilience, particularly in terms of its healthcare systems, raising fears of major hardships should the spread of a virus accelerate and intensify throughout Sub-Saharan Africa.

Epidemics: outbreaks and deaths (1960-2018)



Source: Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT).
Note: On average, between 1960 and 2018, each Sub-Saharan African country was hit by 17 epidemics, resulting in 3,533 deaths.

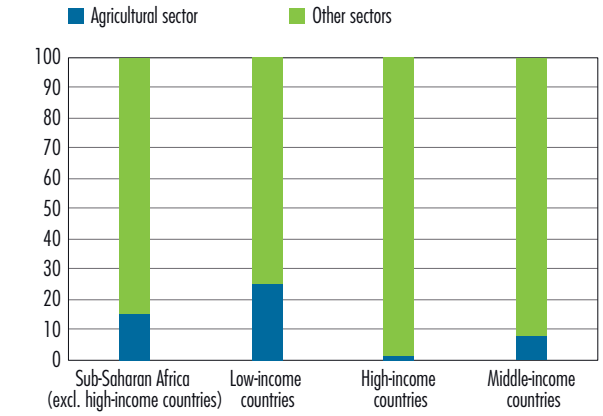
1 *https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health*

even more vulnerable (see Charts 6 and 7 below). Due in part to more modest urbanisation and less intensive production methods than elsewhere, the agricultural sector is a major source of employment for a booming youth population (around 49% in UEMOA and 52% in CEMAC).

This climate pressure represents a major socio-economic challenge, particularly for the most vulnerable populations, as it lowers agricultural output and income and threatens food security and water supply. UEMOA, for example, seems highly vulnerable to the effects of desertification (IPCC, 2019) and to the depletion of fishing resources (projected job losses of around 50%, according to the Food and Agriculture Organization, 2016). This climate pressure exacerbates migration between countries, but also and above all, within countries, pushing people towards urban centres with inadequate infrastructures. Lastly, climate pressure could further impoverish populations, forcing them to increase the proportion of their spending that goes on food (40% of their budget on average) at the expense of education[6]

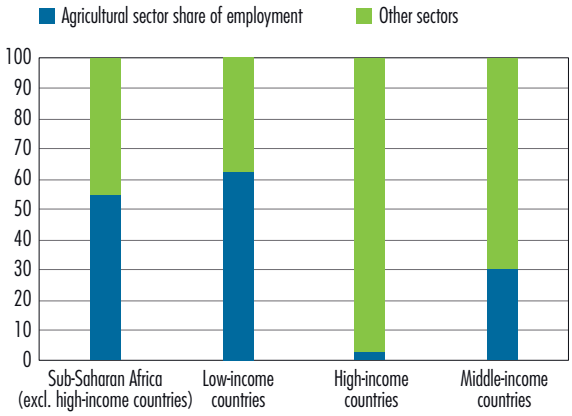
6 School enrolment in Côte d'Ivoire declined by 20% in regions affected by drought (Jensen, 2000).

C6 Agricultural sector contribution to GDP in 2017



Sources: World Bank and OECD (national account data).

C7 Agricultural sector share of employment in 2017



Source: ILOSTAT (International Labour Organization).

and healthcare. SDGs thus become less achievable. However, as the IPCC points out, although the prevalence of agriculture in SSA constitutes a weakness in terms of vulnerability and resorting to deforestation, it can also be a source of resilience, reducing dependency on polluting inputs and increasing the potential for "intelligent agriculture".

Lastly, the resilience of SSA countries to climate change is limited by weak domestic resource mobilisation and the absence of social protection. Combined with high levels of debt and insufficiently selective investments (see the *Annual report for the Franc Zone* 2017), low income from taxation in SSA states (16% of GDP on average in 2018) undermines their capacity to fund adaptation investments, particularly in the context of a health crisis such as the coronavirus or Ebola. Inadequate social safety nets and insurance programmes (80% of the population have no social protection at all according to the World Bank)[7] restrict the redistributive mechanisms, such as benefits and food aid and income transfers, required. Lastly, SSA's weak financial development, in terms of both financial depth (bank deposits or loans as a proportion of GDP) and financial inclusion, continues to restrict the mobilisation of domestic savings towards combating climate change. These constraints go some way to justifying additional commitments for climate finance from developed countries to vulnerable developing countries. But more generally still, sustainable and inclusive economic development is integral to the combat against climate change.

2 Adapting to climate change is a common goal for national governments and their international partners

As our climate is a global public good, the combat against climate change represents a common goal for both developed and developing countries. In order to ensure the participation of developing countries, financing in favour of the least resilient, but also least pollutive, countries was deemed necessary. The aim of financial transfers is to increase resilience, particularly in terms of the adaptation of developing countries, and also to compensate for any possible trade-offs between economic development and climate protection promoting green technologies or sectors.

Strategies for combating climate change in SSA mainly conform with the frameworks adopted in 2015: the Addis Ababa Action Agenda, sustainable development goals (SDGs) and the COP21 Paris Agreement. These frameworks stress the importance of rallying all actors behind coherent national strategies for economic development and combating climate change. SDG 13, for example, insists on the implementation of developed countries' 2009 (COP15)

7 *The Atlas of Social Protection Indicators of Resilience and Equity.*

commitment to mobilise USD 100 billion annually by 2020 to address the needs of developing countries. More recently, COP21 included a "differentiated" agreement recognising developed countries as the main contributors to climate change and acknowledging the need for financial assistance to developing nations.

The importance of implementing national climate strategies

National government initiatives should be built around coherent global warming strategies in order to ensure more effective implementation. In addition to regulatory and legal actions, these national strategies may be rooted in the specific characteristics of SSA countries and involve two types of measures.

- Mitigation measures:
  - Developing environmentally and climate-friendly taxation systems focused either on mitigating climate change (forestry taxation) or on reducing emissions (in the mining, oil and gas sectors) in compliance with the Polluter-Pays Principle.
  - Mobilising the financial resources required to pursue carbon market objectives and allocation mechanisms. As low CO_2 emitters, SSA countries could capitalise on these resources, whose objectives, functioning and distribution are currently under negotiation (Article 6 of the Paris Agreement).
  - Respecting the principle of "additionality" for clean development mechanism (CDM) projects, set out in the Marrakesh Accords of 2001. The Accords specify that "a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity" (CP.7, Article 12, paragraph 43).
- Adaptation measures:
  - Selecting climate investment projects based on the concept of multiple benefits or co-benefits, taking into account secondary effects in terms of growth (through innovation), job creation or reduced migration.
  - Developing climate strategies backed by dedicated national or local funds for both precautionary purposes (in anticipation of natural disasters) and for the financing of medium to long-term investments. In UEMOA and CEMAC, these types of strategies and the associated financing are also implemented through regional economic programmes by UEMOA and CEMAC committees and by development banks, such as the West African Development Bank and its environment and climate programmes.

Policies to adapt the financial systems of SSA countries to climate-related sustainable development objectives may also be put in place. These policies may, for example, involve issuing disclosure recommendations on climate risk management transparency to banks and insurers,[8] or setting up preferential refinancing systems (United Nations Environment Programme – UNEP, 2015; Dikau et al., 2017). The goal of these types of policies is notably to ensure banking and insurance system stability by reining in underestimations of climate-related risks and the consequent implementation of inadequate bank risk management mechanisms. In this regard, the South African Reserve Bank (SARB) published its first financial stability review in 2019 highlighting the risk that climate change poses for financial stability. Such examples show that climate issues are becoming more and more important in the definition of the monetary and financial policies of central banks and regulators of global coordination (see Box 2 below).

The implementation of the development strategy for sustainable finance via capital markets is progressing, as illustrated by the first green bonds issued in Africa in 2013 by the African Development Bank (AfDB) and specific equity indices in countries such as Nigeria and South Africa. Furthermore, Nigeria became the first state in Africa – and the fourth in the world – to issue a green sovereign bond in 2017; Access Bank in Nigeria launched its first certified green corporate

8 For example, in Brazil ("green banking guidelines" in 2008), in China ("green credit policy" in 2007), in South Africa or in Bangladesh ("policy guidelines for green banking" in 2011).

BOX 2

Central Banks and Supervisors Network for Greening the Financial System – NGFS

Climate change is a source of financial risk in that it creates physical risks as well as transition risks that can compromise financial stability. It thus falls within the mandates of central banks and supervisors to ensure the financial system is resilient to these risks.

The NGFS was founded in 2017 by the Banque de France with seven other central banks and supervisors. In April 2020, it had grown to 65 Members and 12 Observers from five continents, including four African central banks (Bank Al-Maghrib, South African Reserve Bank, the Central Bank of Tunisia and the *Banque centrale des États de l'Afrique de l'Ouest*).

The NGFS is a "coalition of the willing". It is a voluntary, consensus-based forum whose objective is to share best practices, contribute to the development of climate and environment-related risk management in the financial sector, and mobilise conventional finance to support the transition to a sustainable economy. On 17 April 2019, the NGFS published its first comprehensive report, *A call for action: Climate change as a source of financial risk*.

Sustainable Banking Network – SBN

The Sustainable Banking Network is a community of banking and financial sector regulatory agencies and banking associations launched in 2012. It is now an NGFS Observer. It is made up of 54 public and private institutions from developing and emerging countries, seven of which are located in Africa. Its goal is to facilitate the implementation of regulatory frameworks incorporating criteria of sustainability in order to encourage a sustainable banking system for society and the environment. The SBN published its latest *Global Progress Report* in February 2018 and has since supplemented it with a series of *Country Progress Reports*.

bond in April 2019; guidelines for the issuance of green bonds were adopted in 2016 in Morocco and in 2019 in Kenya; and the Bank of Ghana supported the adoption of sustainable banking principles for the banking system in 2019.

Caution is required, however, in adapting these policies to SSA's financial systems, particularly given the region's low level of financial development. The rollout of green finance is limited by the lack of depth and minimal liquidity of the domestic financial and money markets (dominated by sovereign bonds), by the associated risks and by the still restricted and intermittent access to international financial markets. Due to significant information asymmetries, the banking system also operates in a high-risk financial environment (non-performing loans), which discourages investors from financing green projects.

Climate-related issues and challenges can also affect monetary policy, even though it is not directly connected with the combat against climate change. Krogstrup et al. (2019) recently built up a typology of these issues, mentioning, for example, the adaptation of risk analysis frameworks, the choice of collateral used in refinancing transactions or the possibility of differentiated access for banks investing in low CO_2-emission projects. In these small-scale, open economies, foreign exchange policies can also have long-term effects, particularly on growth, economic diversification and, therefore, carbon emissions.[9]

9 *https://www.banque-france.fr/en/foreign-exchange-policy-and-sustainable-development-low-income-countries*

Growing mobilisation of international public financial flows

There has been significant growth in international public climate finance, but it is still insufficient. The financing required solely to cover the adaptation needs of developing countries is currently estimated at between USD 56 billion and USD 73 billion per year, and is likely to increase to between USD 140 billion and USD 300 billion per year by 2030 (UNEP, 2016). Annual public climate finance flows recorded by the Organisation for Economic Co-operation and Development (OECD) increased by 44% between 2013 and 2017 from USD 37.9 billion to USD 54.5 billion. Public funds intended for Africa rose from USD 7.7 billion in 2013 to USD 16.5 billion in 2017 (see Chart 8), corresponding to almost 30% of total finance, of which 46% was destined for adaptation activities. Only 39% was directed to mitigation projects due to the continent's low level of economic development and minor contribution to greenhouse gas accumulation. In the Franc Zone, the *Agence française de développement* (AFD – French Development Agency) has launched numerous projects to combat climate change, such as the "Adapt'Action" tool, which has been rolled out in 15 countries including Niger, Senegal, Cameroon and the Comoros, and has a budget of EUR 30 million until 2021. Climate finance must represent "new and additional financial resources", within the sense of the Kyoto Protocol (CP.1, Article 11).

The allocation of public climate finance varies greatly between recipient SSA countries. The top ten recipient countries (out of 42) received half of the financing approved by multilateral climate funds, with 17% going to South Africa alone (Bird et al. 2017). Only two countries in the Sahel – Niger and Mali – feature in the top ten. While finance allocations reflect a wide range of factors, including SSA countries' different exposures to climate risk in particular, they also depend on countries' ability to mobilise the funding. It would therefore seem advisable that the most vulnerable countries, such as the countries of the Sahel, improve their administrative capacities in order to be able to increase their allocation of climate finance, in line with SDG 13.

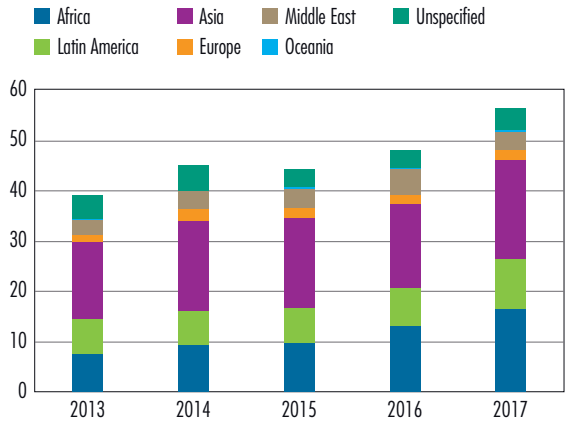
There has also been a proliferation of climate finance mechanisms and the global climate finance architecture now appears particularly complex. As Watson et al. (2019) point out, in addition to international financial institutions, there are also dedicated public, private and public-private partnership funds:

- multilateral funds, such as the Global Environment Facility (GEF), with USD 4.4 billion in funding, and the Green Climate Fund (GCF), worth USD 10.3 billion;
- bilateral funds, such as the International Climate Fund (ICF), with USD 12.7 billion in resources, or the *Internationale Klimaschutzinitiative* (IKI – International Climate Initiative), with around USD 2.6 billion;
- regional and national funds, such as the specialist agency, the African Union's African Risk Capacity (ARC), which primarily operates as a climate risk insurance pool.

The juxtaposition of different finance entities and finance mechanisms (government agencies, non-governmental organisations, etc.) has the advantage of offering a broader choice of financing options, but **complicates access to finance for the least developed countries, whose administrative (and absorptive) capacities are limited**. Enhancing technical assistance to recipient countries and better coordinating stakeholders and financing is therefore desirable, in the same spirit as the Paris Declaration on Aid Effectiveness of 2005, or the expansion of transnational or multilateral cooperation recommended by the COP21 conference in 2015.

C8 Regional breakdown of public climate finance flows from developed countries (2013-17)

(USD billions)



Source: OECD, *Climate finance from developed to developing countries: public flows in 2013-2017*.
Note: Public finance flows include bilateral and multilateral finance and export credits.

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