THE NEXT GENERATION

AFRICA CLIMATE BUSINESS PLAN

RAMPING UP DEVELOPMENT-CENTERED CLIMATE ACTION

WORLD BANK GROUP

AFRICA REGION/JUNE 2020

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ABBREVIATIONS

ACBP	Africa Climate Business Plan
ACP	Africa, Caribbean and Pacific
ACRIS	Africa Climate Resilient Investment Summit
ADRF	Africa Disaster Risk Financing
AF	Adaptation Fund
AfCTA	African Continental Free Trade Area
AFD	Agence Française de Développement/French Development Agency
AfDB	African Development Bank
AFRI-RES	Africa Climate Resilient Investment Facility
AFSLD	Africa Food Security Leadership Dialogue
ASA	Advisory Services and Analytics
ASP	Adaptive social protection
AUC	African Union Commission
BAU	Business as usual
BRT	Bus rapid transit
Cat-DDO	Catastrophe Deferred Drawdown Option
CCF	Clean cooking fund
CDC	Center for Disease Control
CDD	Community-driven development
CERC	Contingent Emergency Response Component
CHVA	Climate and Health Vulnerability Assessments
CIF	Climate Investment Fund
CILSS	Comité permanent inter-état de lutte contre la sécheresse au Sahel (Permanent Interstate Committee for Drought Control in the Sahel)
CIWA	Cooperation in International Waters in Africa
CMU	Country Management Unit
COP	Conference of the Parties
COVID-19	Coronavirus disease-2019
CPF	Country Partnership Framework
CRIP	Niger Climate Resilient Investment Program
CRW	Crises Risk Window
CSA	Climate-smart agriculture
CSAIP	Climate-Smart Agriculture Investment Plans
CSO	Civil society organization
DAT	Disruptive agricultural technology
DFID	Department for International Development
DPF	Development Policy financing
DPL	Development Policy Loan
DPO	Development Policy Operation
DRDIP	Development Response to Displacement Impacts Project
DRF	Disaster risk finance
DRM	Disaster risk management
EASI	Enable, avoid, shift, improve
ECOWAS	Economic Commission for West African States

ESF	Environmental and Social Framework
ESMAP	Energy Sector Management Assistance Program
ETR	Environmental tax reform
ETS	Emissions Trading System
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FCV	Fragility, conflict, and violence
FIP	Forest Investment Program
FSCCP	Food Security under Climate Change Program
GCF	Green Climate Fund
GDP	Gross domestic product
GEF	Global Environment Facility
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	Greenhouse gas
GHI	Global Hunger Index
GIZ	German Corporation for International Cooperation
GP	Global Practice
HCI	Human Capital Index
H-CEP	HNP Health–Climate and Environment Program
HFO	Heavy fuel oil
HIV/AIDS	Human immunodeficiency virus and acquired immune deficiency syndrome
HNP	Health, Nutrition, and Population (Global Practice)
IBRD	International Bank for Reconstruction and Development
ICLEI	International Council for Local Environmental Initiatives
ICT	Information and communication technology
IDA	International Development Association
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
ILKP	Indigenous and local knowledge and practices
IMF	International Monetary Fund
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPF	Investment Project Financing
IRM	Immediate Response Mechanism
LCDP	Least-cost (power) development plans
LDCF	Least Developed Countries Fund
LIC	Low-income country
LMIC	Lower-middle-income country
MDB	Multilateral development bank
MFD	Maximizing Finance for Development
MIC	Middle-income country
MIGA	Multilateral Investment Guarantee Agency
MIRO	Multiregion input-output (tables)
NBSAPs	National Biodiversity Strategies and Action Plans
NDC	Nationally Determined Contribution
NEPAD	New Partnership for Africa's Development
NETIP	Northeastern Transport Improvement Project
NGO	Nongovernmental organization
NUSAF	Northern Uganda Social Action Fund
OECD	Organisation for Economic Co-operation and Development
PforR	Program for Results

PIDA	Program for Infrastructure Development in Africa
PoU	Prevalence of undernourished
PPP	Public-private partnership
PRG	Partial risk guarantee
PROBLUE	Global Program for the Blue Economy
PROCLEAN	Pollution Management and Circular Economy Project
PROGREEN	Global Partnership for Sustainable and Resilient Landscapes
QA	Quality assurance
QC	Quality control
RCE	Regional Centers of Excellence
REC	Regional economic communities
REDD+	Reducing emissions from deforestation and forest degradation
REDISSE	Regional Disease Surveillance Systems Enhancement
RFSA	Resilient Food System for Africa
SAWAP	Sahel and West Africa Program
SASPP	Sahel Adaptive Social Protection Program
SCCF	Special Climate Change Fund
SCD	Strategic Country Diagnostics
SDG	Sustainable Development Goal
SERRP	Saint-Louis Emergency Recovery and Resilience Project
Sum4All	Sustainable Mobility for All
SWIOFish	Southwest Indian Ocean Fisheries Governance and Shared Growth Project
UHC	Universal health coverage
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WACA	Western Africa Coastal Areas Management Program
WASH	Water supply, sanitation, and hygiene
WBG	World Bank Group
WHO	World Health Organization
WRM	Water resource management
WSS	Water supply and sanitation

All dollar amounts are US dollars unless otherwise indicated.

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FOREWORD

Africa has contributed the least to global warming, and yet the continent is at the sharp end of its most devastating impacts. Countries can face deeper, longer droughts and the ravages of storms and floods—even in the same year. Farmers see their crops fail; city dwellers see their infrastructure fray; everyone sees globally precious natural biodiversity being eroded. But no counsel of despair will be found in this report.

To the contrary, we believe Africa will seize the opportunity to grow its economies, reduce poverty, and contribute to the global fight against climate change. That is because the world has changed, and increasingly the best way of securing development is through the green route. African countries need not follow old models of industrialization—they can chart a new course. And the World Bank's Next Generation Africa Climate Climate Plan confirms our commitment to support that strongly.

Take the energy challenge—half a billion Africans are still without access to power as 2020 draws to a close. The technology that drives solar power is more efficient, accessible, and cheaper than ever before. The World Bank will partner with governments and the private sector to support 25 countries to strengthen energy sector planning toward transformative pathways that ramp up access to electricity in Africa over the next six years.

Similarly, how shall we meet the imperative to ensure no African goes hungry—to deliver food security for the continent? Climate-smart agriculture—from the field to the markets to the consumer—is central to the answer. The World Bank is already supporting modern agriculture projects in Ethiopia, Niger, and Zambia that benefit poor rural communities. Under this Plan, we are targeting 28 million farmers to secure food and nutrition security across 20 countries.

These are just two of the five main strands in the clear medium-term path in this new Climate Plan, with new investments expected to reach US$22.5 billion by 2025, with at least half of this devoted to adaptation and resilience. Even as this Plan is ramping up, the COVID-19 pandemic has turned so much of our world upside-down. Like climate change, the COVID-19 pandemic underscores how global issues can ripple through economies, disproportionately affecting poor communities. But as Africa navigates through the pandemic, including with "green recovery" steps, it will emerge on the other side better placed to ramp up its development actions in a climate-informed way and grasp new opportunities.

The journey may be somewhat more arduous, but the destination is no less compelling. The World Bank will be with our clients at every step to reduce poverty and keep Africa the world's most climate-friendly continent.

Hafez Ghanem
World Bank Vice President for Africa

Girls run home at the end of the school day across the beach in Zanzibar.

Quirimbas National Park, Mozambique. Area of Cabo Delgado Province. Taratibu Area.

Andrea Borgarello / World Bank

PART I

CONTEXT AND RATIONALE

Economic growth and shared prosperity in Sub-Saharan Africa will be increasingly undermined if vulnerabilities to climate change are not addressed. Climate impacts, which are already being felt will escalate significantly, as early as 2030, causing many low-capacity countries to be even more vulnerable. Given the climate sensitivities of multiple engines of growth—agriculture, natural capital, and infrastructure—the urgency for countries to ramp up climate-smart development at scale and across the growth spectrum is an imperative. The Next Generation Africa Climate Business Plan provides a platform to further galvanize climate action by prioritizing its focus on the region's core development challenges and priorities. The plan is grounded in the World Bank's commitment to support climate-resilient and low carbon development across the developing world and its solid engagement in technical and financial assistance to support climate action in Africa.

A young girl holding a bucket of water stands for a portrait in her house.

Vincent Tremeau / World Bank

CHAPTER 1
Climate and Development in Sub-Saharan Africa

1.1 Climate Context in Sub-Saharan Africa

The year 2019 was the third warmest year on record in Africa. Globally, the five warmest years have all occurred since 2015, with nine of the 10 warmest years occurring since 2005 (NOAA 2019a). In a sample of 30 African countries, two-thirds are warming faster than the world as a whole—a trend expected to continue in coming decades (Bishop 2017). This warming and the increase of global mean temperatures of 0.95°C above the 20th-century average (NOAA 2019b) challenge economies and communities in Sub-Saharan Africa. From the Sahel to the Horn of Africa, and to the south of the continent and the small island nations—all are experiencing the devastating effects of more extreme weather patterns and slow onset changes. Unusual weather conditions exacerbated by climate change have, for example, created ideal conditions for swarms of desert locust numbers to surge, posing a mounting threat in a region already struggling with widespread food insecurity (WMO 2019).

Sub-Saharan Africa has contributed the least to greenhouse gas (GHG) emissions but suffers the most from the impacts of climate change. Scientists have issued an unequivocal warning that warming levels could reach 1.5°C by 2052, and as early as 2030, if carbon-intensive human activities increase at the current rate (IPCC 2018). The call to the global community to step up emission reductions is premised on the findings that climate-related risks for natural and human systems are higher for global warming of 1.5°C than at present, but lower than at 2°C. Global net emissions of carbon dioxide would need to fall by 45 percent from 2010 levels by 2030 and reach net zero around 2050 to keep the warming around 1.5°C. Current emission pathways, however, are off-track to meeting the Paris target of keeping warming to below 2°C[1] (WMO 2020), and are closer to 3°C.[2] Dedicated global action to reduce and plateau off emissions is of utmost urgency alongside ramped-up climate action for resilience.

Significant intensification of the pace and scale of climate impacts will challenge the ability of many countries in Sub-Saharan Africa to reach their economic growth and development goals. The warming over the last 50 years and the increase of global mean temperatures of 1°C is already challenging economies and communities in Sub-Saharan Africa. The additional warming of 0.5°C, possible within a decade or two, could significantly jeopardize Africa's development. Climate impacts will continue to deepen existing vulnerabilities and low capacities, leading to poverty, fragility, conflict, and violence. There is a compelling body of

1 Paris targets call for warming to be *"well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels."* (WMO 2020)

2 See the "Temperatures" web page of Climate Action Tracker website, https://climateactiontracker.org/global/temperatures/.

evidence based on science, analytics, and unfolding impacts that reaffirms how climate change, compounded by climate shocks, will singularly rollback development gains by undermining food, environmental, water, and energy security, while challenging urban transitions and green mobility. It is crucial that Sub-Saharan African countries ramp up development-centered climate action to drive economic growth and get ahead of the curve.

1.2 Climate and Development—Unified Agenda in Sub-Saharan Africa

Development and climate change in Sub-Saharan Africa are inextricably linked, more so than in any other part of the world. Development outcomes cannot be achieved without addressing climate vulnerabilities in the region. Achieving the Sustainable Development Goals (SDGs)—in particular, the goals aimed at *no poverty, zero hunger, sustainable cities, clean water, biodiversity on land and in oceans, universal access to electricity and water services* among others—depends on how climate impacts are addressed and how climate risks are managed. Sub-Saharan Africa is already experiencing more significant impacts of climate variability and change than many other regions, a trend which is expected to continue and intensify.

Climate-smart development can be cost effective over both the short and long term. The *New Climate Economy* report (2014) finds that early and appropriate climate action may yield efficiency gains, delivery of services, and sustained development outcomes (Global Commission on the Economy and Climate 2014). Similarly, the GCA (2019) notes that the overall rate of return on investments in improved resilience can be high, with benefit-cost ratios ranging from 2:1 to 10:1, and in some cases even higher.

Without rapid deployment of inclusive, climate-informed development, 43 million additional people could be pushed below the poverty line by 2030 in Sub-Saharan Africa (Hallegatte and others 2016). Achieving the Bank's poverty goals could also be compromised. Rapid and inclusive development can prevent much of the impact of climate change on poor people if it is climate informed. Climate action must be designed to perform well under changing climate conditions, so that development does not create new vulnerabilities.

In a sample of 30 African countries, two-thirds are warming faster than the world as a whole—a trend expected to continue in coming decades (Bishop 2017). Under the high emissions pathway under which global average warming could reach 4°C above preindustrial levels by 2100, warming in parts of western and southern Africa could be as much as 6°C, which would trigger tipping points that may not be reversible (Dakos and others 2019). While rainfall projections are highly uncertain, many parts of the region are expected to experience more frequent and intense droughts and floods.

Climate impacts in Sub-Saharan Africa vary greatly by location; therefore, solutions and strategies need to adapt accordingly. The region has three major climate types: arid, including desert and steppe subtypes, which are found in parts of west, east, and southern Africa; tropical, including rainforest, monsoon, and savannah subtypes, which cover large parts of west, central, and east Africa; and temperate, found primarily in southern parts of the region. Adaptation, mitigation, and economic transitions need to be tailored to country contexts based on regional and local climatic conditions, with approaches customized for urban and rural contexts.

The magnitude of stakes from a changing climate on low-income economies and their pathways of growth needs to be better understood and addressed proactively across time scales. Globally, economies are losing around US$335 billion annually due to climate

disasters (UN 2019). The human, economic, and developmental costs associated with climate change impacts are significant, particularly in highly vulnerable and poor regions such as Sub-Saharan Africa. With less than a decade left to achieve the SDG goals, and with climate impacts expected to escalate—Sub-Saharan Africa must get ahead of the curve.

1.3 Understanding Sub-Saharan Africa's Engines of Economic Growth

Sub-Saharan Africa's gross domestic product (GDP) grew substantially over the past two decades, with annual GDP growth at 4.6 percent between 2000 and 2018 (OECD 2019). While GDP growth has fallen since the collapse in commodity prices in 2014, it has reached 3.2 percent in 2019 and was projected to rise to 3.6 percent in 2020, before the onset of the novel coronavirus disease-2019 (COVID-19)[3] pandemic (Krogstrup and Oman 2019). The economic shock arising from the COVID-19 pandemic is raising much concern and uncertainty, and indications are that Africa's GDP growth could be reduced from 2.4 percent in 2019 to –2.1 to –5.1 percent in 2020, the first recession in the region in 25 years (Zeufack 2020).

There is substantial heterogeneity in growth performance across the countries in Sub-Saharan Africa, which provides important context for understanding linkages with climate change. Some countries (such as Botswana and Burkina Faso) experienced multiple growth peaks, while others (Ghana, Kenya, and Swaziland) experienced single peaks.[4] In places with sustained growth, there has been progress in lowering infant mortality and increasing life expectancy, an improvement of the preconditions for growth (Fafchamps 2000). Crises related to conflicts, natural disasters (including rapid onset events),[5] and disease outbreaks have contributed to troughs. Four of the fastest growing economies in the world in 2019 were in Africa: Côte d'Ivoire, Ethiopia, Ghana, and Rwanda.

The COVID-19 pandemic could wreak havoc on the health and economy of the Africans while the global economic shock is going to slow Africa's engines of growth and spur the first recession in the region in 25 years. The effects include the reduction of African exports, a decline in services like tourism, remittances and access to financial markets, and will cost the region between US$37 billion and US$79 billion in terms of output losses for 2020 (Zeufack 2020). The earlier and the more aggressive the restrictions of social movement, the quicker the recovery, as policy aims at flattening the "two curves", benefiting both health and the economy (Correia, Luck, and Verner 2020). While a successful containment policy is possible and the experience of African countries fighting the Ebola virus epidemic suggests African solutions can also be effective (World Bank 2020c), the welfare losses, the food insecurity and the political uncertainty will be very high.

Africa's engines of growth are diversified, but agriculture is the largest, representing 15 percent of the continent's total GDP. The relative value of agriculture, forestry, and fishing varies greatly, from 2 percent each in Botswana and South Africa to 50 percent in Chad and 62 percent in Somalia.[6] Agricultural labor shares have gradually declined but still represent almost 70 percent of the total.[7] In Burundi and Madagascar, the shares are more than 80 percent. The engine of agricultural growth is driven by total factor productivity rather than expansion in the amount of land, water, and input usage (Fuglie 2019).

3 COVID-19 (novel coronavirus disease-2019) is the disease; SARS-CoV-2 is the virus.
4 Outlook, African Economic. 2018. "African Development Bank Group."
5 These include intense typhoons (also known as hurricanes or cyclones) or heavy precipitation associated with climate change.
6 See the WDI database, http://data.worldbank.org/data-catalog/world-development-indicators.
7 See the WDI database, http://data.worldbank.org/data-catalog/world-development-indicators, accessed in 2018.

The manufacturing sector, including the extractive sector, has been a notable engine of growth in resource rich countries in Africa, especially in boom years (Cust, J., and others; forthcoming). The extractive sectors have the potential to continue to produce growth for the next two to three decades, serve as inputs to diversify the economy, and provide both fiscal and export resources for governments. The sector has suffered from weak governance and global commodity swings but continues to be central to achieving higher productivity and growth. The oil price shock of March 2020, driven by geopolitics and reduced demand in light of the pandemic, will affect net oil-exporting countries and result in increased liquidity issues, lost tax revenues, and currency pressure (Jayaram and others 2020).

Infrastructure can address supply-side constraints and boost African engines of growth. Investment in infrastructure, especially resilient infrastructure, has a great potential to deliver urban and rural development in power, sanitation, water, waste management, safe transport for access to health, and education facilities. Closing the infrastructure quantity and quality gaps in Sub-Saharan Africa could yield potentially large GDP growth benefits, ranging between 1.7 percentage points and 2.6 percentage points per year relative to the median of the rest of the low-income countries and the best performers, respectively (Calderon, Cantu Canales, and Chuhan-Pole 2018). Overcoming the infrastructure gap is essential for the transition from subsistence agriculture to productive economic activity in agriculture, services, industry and public sectors. The lack of access to modern infrastructure shuts much of Sub-Saharan Africa's population out of the global economy, and the high cost of connectivity in electricity and broadband traps it in poverty by affecting economic productivity and opportunities for income generation and accordingly, the ability to raise living standards. The rise of telecommunications, for example, is an important driver of growth: 73 percent of Africa's population now have a mobile phone subscription, a trend that has opened the way to mobile money. While recent patterns indicate saturation in the traditional urban markets (Calderon and others 2019), the digital economy can unlock more growth, job creation, and poverty reduction. Mobile phone technology can bring services within the reach of poor households, and open new avenues to productivity in all sectors, including agriculture (Fuglie and others 2019).

Domestic demand has been the most important driver of growth, accounting for 69 percent of annual growth between 2000 and 2018 (OECD 2019). As people move out of poverty, this demand is shifting toward more processed goods and is growing 1.5 times faster than the global average (Leke and others 2010; OECD 2019). Further, trade agreements such as the African Continental Free Trade Area (AfCTA), effective from 2019, could address bottlenecks to intra-African trade, create regional value chains, and create a new engine for growth. The African Union's Agenda 2063 provides a long-term vision for a peaceful and prosperous continent, integrated regionally and into the global economy, which coincides with the World Bank Group's (WBG) twin goals of eradicating extreme poverty by 2030 and promoting shared prosperity, and to the SDGs.

Economic performance of countries is mostly evaluated based on national income: wealth has typically been ignored. Used alone, GDP does not reflect depreciation and depletion of assets, whether investment and accumulation of wealth are keeping pace with population growth, or whether the mix of assets is consistent with a country's development goals (Lange, Wodon, and Carey 2018). Human capital, measured as the value of earnings over a person's lifetime, is the most important component of wealth globally. Similarly, natural capital, including renewable natural capital is a unique asset. An endowment of natural resources alone may not ensure rapid development but if managed sustainably, it can produce benefits in perpetuity, in contrast to non-renewables (Lange, Wodon, and Carey 2018). The value of renewable resources can increase by bringing more land into productive use or by using the resource more productively, for example, by improving crop yields or developing nature-based tourism on forestland (Lange, Wodon, and Carey 2018). The importance of

strong institutions and sound policies for managing resource revenues is essential to turn these riches into sustainable development.

Overall, growth has not kept pace with the relatively high population growth in Sub-Saharan Africa; hence the per capita GDP growth in the last two decades has not generated reductions in poverty. While extreme poverty in Sub-Saharan Africa declined from 54 percent in 1990 to 41.4 percent in 2015, between 1995 and 2015 the absolute number of poor people increased from 278 million in 1990 to 416.4 million in 2015 based on the rapid expansion of the population (Calderon and others 2019).

To sustainably reduce poverty, African economies must create more productive jobs and shift capital and labor away from low-productivity sectors toward higher-productivity sectors. This process is called *structural transformation* (Lewis 1954). Investments in human capital can diversify national wealth and the economy, reducing many countries' dependence on natural resources and natural capital (Lange, Wodon, and Carey 2018). The economic gains of lowering fertility and the "demographic dividend" can also be achieved, with a better-educated future workforce and more job opportunities.

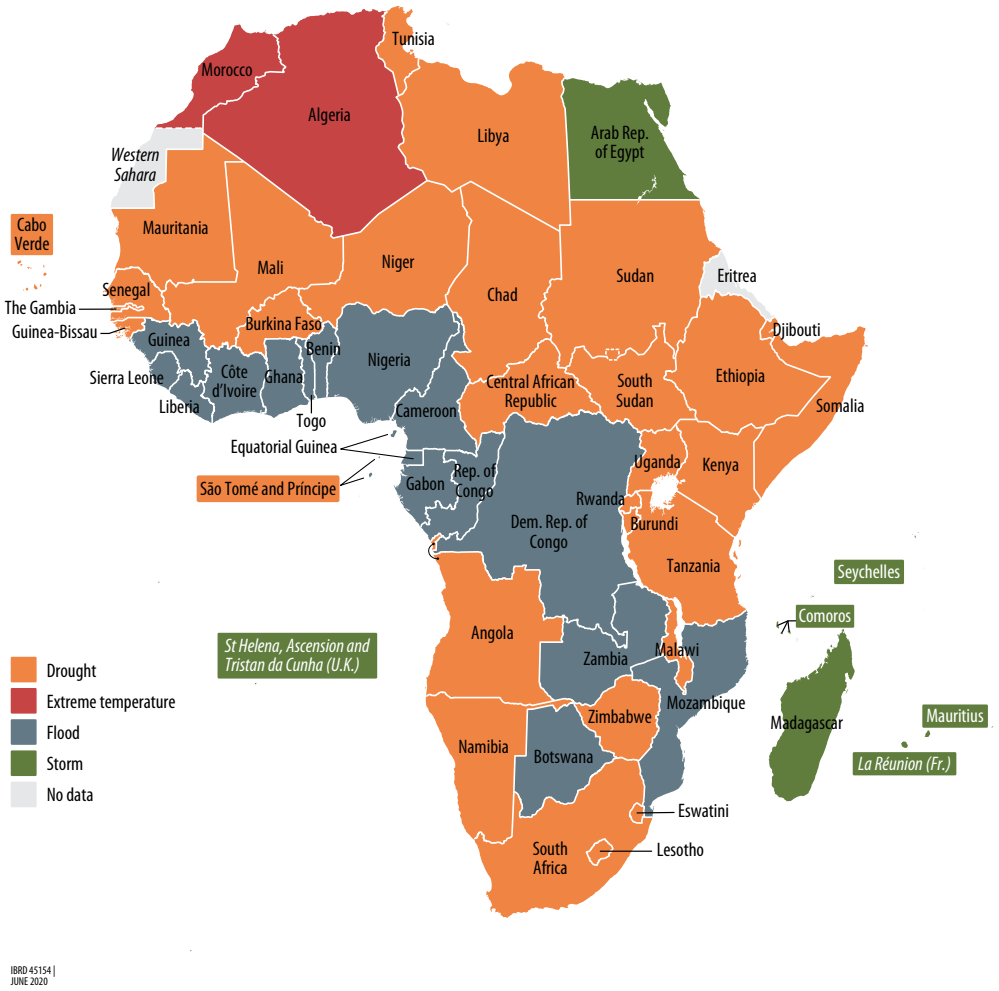
Even as engines of growth have driven GDP growth in Sub-Saharan Africa, a gradient of uncertainties, including climate change, is looming for poverty and economic growth. The renewed intensification of trade tensions and debt vulnerabilities remain high and are projected to negatively impact global growth (Calderon and others 2019). The global pandemic crisis of 2020 is anticipated to slow African infrastructure, exports, and investment levels. At the same time the already unfolding, but escalating impending crises of climate change, acting on and through the engines of growth, has the potential to undermine growth on multiple fronts.

1.4 Increased Stakes for Growth under a Changing Climate

Productive sectors are directly hit by natural disasters and changing climate patterns, which can threaten the engines of growth. The drought of 2016–17 in Somalia, for example, created losses in crop production and livestock that resulted in deceleration of growth of more than one percent (GFDRR 2018). The 2018–19 cyclone season caused an unprecedented level of damage, most notably from Cyclone Idai, which primarily affected Mozambique and Zimbabwe, and caused widespread flooding in both countries affecting nearly 1 million people. The losses for Mozambique translated into a slowdown in real GDP growth to 2.5 percent in 2019, compared with a planned growth of up to 4.7 percent (GFDRR 2018). In low- and middle-income countries, conservative estimates of direct damages from natural hazards to power generation and transport infrastructure alone cost US$18 billion a year, while disruptions costs to households and firms at least US$390 billion a year (Hallegatte, Rentschler, and Rozenberg 2019).

A growing body of scientific evidence shows that climate change will have significant consequences on both the near-term and the longer-term growth in Sub-Saharan Africa, driven by climate sensitivities of key engines of growth and the larger context of countries. Climate change impacts on the region's growth rates are projected to intensify with increased global warming (WMO 2019). Estimates suggest significant long-term negative economic impacts from climate change globally. Africa is particularly affected, including from the impact of disasters and extreme events (map 1.1). Fankhauser and Tol (2005) find that the direct impact (excluding damage to capital stock) of 3°C warming amounts to around 15 percent of GDP. Dell, Jones, and Olken (2014) find that a 1°C increase in temperature reduces economic growth by 1.3 percentage points, on average, in low-income countries. According to Krogstrup and Oman (2019),

MAP 1.1 Disaster type affecting highest number of people by country, 2000–19



Source: CRED (Centre for Research on the Epidemiology of Disasters). 2019. "Disasters in Africa 20 Year Review (2000–2019)." CRED, November 2019. https://reliefweb.int/sites/reliefweb.int/filesresources/CredCrunch56.pdf.

International Monetary Fund (IMF) simulations under a business-as-usual scenario suggest that climate change could reduce GDP by around 9 percent in the average low-income country by 2100, assuming pledges under the Paris Agreement are implemented.

Current and future scale and magnitude of losses in GDP at different levels of warming have been identified (table 1.1). Current levels of warming due to climate change have impacted GDP both directly and indirectly, with a negative impact of climate change on economic growth. Abidoye and Odusola (2015) find that a 1°C increase in temperature reduces economic growth by 0.67 percentage points in much of Africa. For every 1-degree Celsius increase, there would be an estimated decline in average global cereal yields of 3 percent to 10 percent.[8] GDP losses to the economy would be associated to reduced agricultural productivity but also from increases in morbidity, mortality and social instabilities- indirect impacts such as death and disabilities associated with climate change have irreversible economic and welfare consequences.

8 FAO data in Fuglie and others (2019).

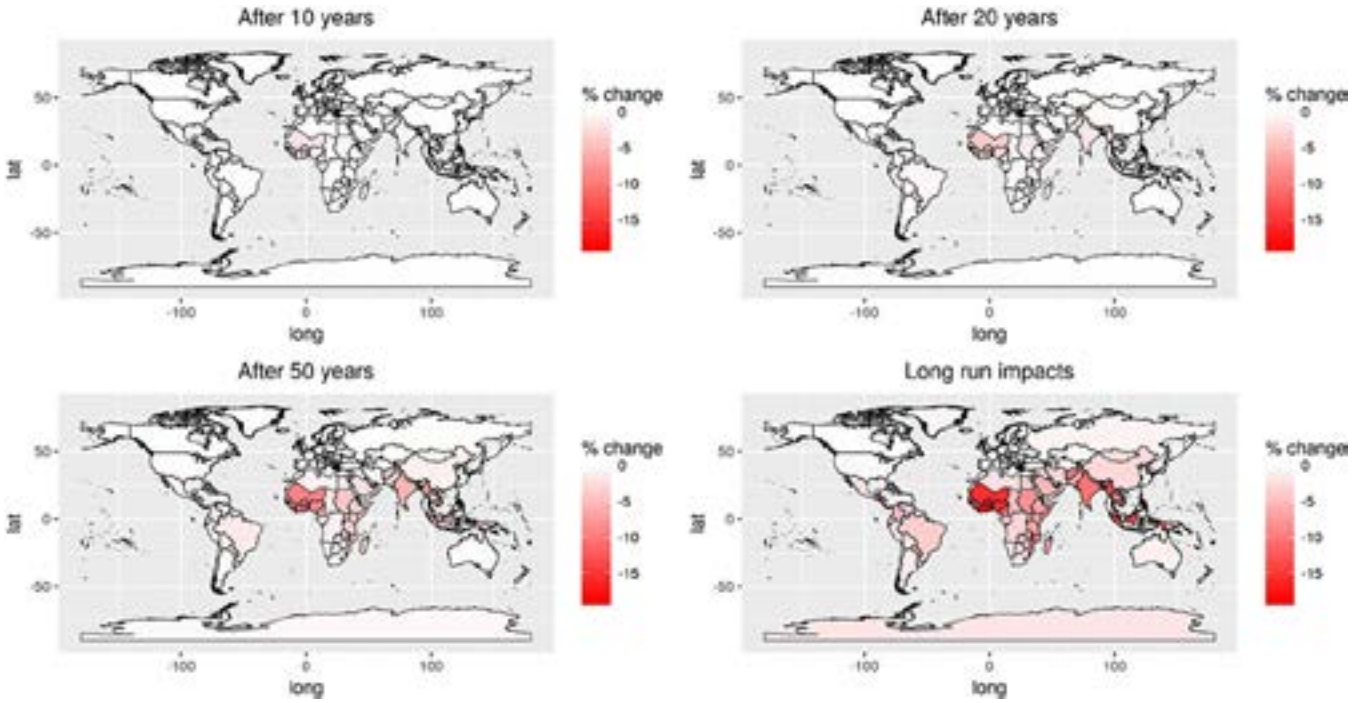
TABLE 1.1 Projected long-run impacts of climate change scenarios on GDP for Sub-Saharan African countries

Impacts of Global Warming (3°C) on the World GDP (% Change/Year					
Country	**2027**	**2037**	**2047**	**2067**	**Long run**
Burkina Faso	−1.576	−3.278	−5.076	−8.829	−17.058
Cameroon	−0.980	−1.989	−3.031	−5.162	−9.396
Cote d'Ivoire	−1.972	−3.988	−6.034	−10.164	−17.528
Ghana	−2.000	−3.999	−6.028	−10.124	−17.571
Guinea	−0.980	−1.939	−2.932	−4.991	−9.896
Nigeria	−1.674	−3.422	−5.217	−8.874	−15.723
Senegal	−1.270	−2.565	−3.905	−6.666	−13.001
Togo	−2.338	−4.553	−6.787	−11.276	−19.032
Rest of Western Africa	−2.334	−4.091	−5.860	−9.409	−15.566
Central Africa	−0.376	−0.783	−1.223	−2.173	−4.977
South Central Africa	−0.289	−0.587	−0.896	−1.549	−3.320
Ethiopia	−0.759	−1.476	−2.197	−3.656	−6.704
Kenya	−0.744	−1.492	−2.254	−3.813	−7.238
Madagascar	−0.726	−1.486	−2.270	−3.881	−7.212
Malawi	−0.983	−1.995	−3.028	−5.133	−9.266
Mauritius	−0.650	−1.359	−2.113	−3.700	−7.458
Mozambique	−0.837	−1.738	−2.681	−4.639	−8.878
Rwanda	−0.766	−1.531	−2.309	−3.888	−7.047
Tanzania	−0.737	−1.479	−2.237	−3.785	−6.988
Uganda	−0.635	−1.268	−1.912	−3.232	−6.328
Zambia	−0.407	−0.831	−1.272	−2.189	−4.414
Zimbabwe	−0.428	−0.849	−1.283	−2.187	−4.423
Rest of Eastern Africa	−0.874	−1.750	−2.644	−4.461	−8.099
Botswana	−0.148	−0.322	−0.523	−0.993	−3.047
Namibia	−0.088	−0.190	−0.310	−0.610	−2.404
South Africa	−0.130	−0.278	−0.443	−0.823	−2.464

Source: Kompas, Pham, and Che 2018.
Note: "Scenarios in terms of their implications for the following climate change policies. (i) The case of 1°C is likely to reflect the lowest emission scenario with the most stringent mitigation policies (or approximately RCP2.6). (ii) Implementation of a climate change agreement (e.g., the Paris Accord) would slow global warming to around 2°C by 2100 (or approximately RCP4.5). (iii) A medium baseline case with less stringent mitigation policies will push global surface temperatures up to 3°C by 2100 (approximately RCP6). (iv) Without any countervailing action to reduce emissions, global warming could increase up to 4°C (or approximately RCP8.5)." (Kompas, Pham, and Che 2018, 1164).

If no drastic actions are undertaken to boost growth, Africa's share of the world's poor population will increase dramatically, from 55 percent in 2015 to 90 percent in 2030 (Calderon and others 2019). An increasing body of evidence projects significant climate impacts on economic growth that will reverse development gains. Fankhauser and Tol (2005), relying on the capital accumulation effect, conclude that climate change may reverse

MAP 1.2 Dynamic impacts of global warming of 3°C on world GDP, % change per year



Source: Kompas, Pham, and Che 2018.

economic growth and for global warming of 3°C, the direct damages to the economy are estimated to be at least 15 percent of GDP. In the business-as-usual scenario, temperature increases will reduce GDP for a typical low-income country by 9 percent in 2100.

Poorer countries are notably more vulnerable to climate change than richer ones, because of the important role of agriculture and water resources and share of populations engaged in the rural economy, and limited adaptive capacity (Tol 2018). The climate impact of numerous elements, including water resources, transport, migration, violent conflict, and energy supply, may be underestimated (Tol 2018).

Global losses are 3 percent of GDP, with largest losses in all cases and for all temperature increases in Sub-Saharan Africa (and parts of Asia) (Kompas, Pham, and Che 2018).[9] Comparatively, the weight on growth is considered to be substantially higher in Sub-Saharan Africa- reflecting the region's lack of resilience and dependence on rain-fed agriculture (map 1.2). Burke, Hsiang, and Miguel (2015) estimate that climate change will reduce global GDP by 23 percent by 2100, and GDP per capita by around 80 percent each in South Asia, Southeast Asia, and Sub-Saharan Africa, based on an assumption of global warming of 3.7°C.

The frequency and intensity of natural disasters has a significant negative impact on medium-term growth, especially droughts. While negative near-term impact on economic activity—substantial for droughts and extreme storms such as cyclones—is often offset by

9 "Using the value of GDP in 2017 from IMF (2018) as the base year, our GTAP-INT results, and economic growth forecasts from SSP2 (Crespo Cuaresma 2017; International Institute for Applied Systems Analysis 2018), the approximate global potential loss is estimated to be $9,593.71 billion, or roughly 3 percent of the 2100 world GDP for 3°C global warming (see table 1.1). At 4°C, losses from global warming increase significantly to $23,149.18 billion. The largest losses in all cases, and for all temperature increases, occur in Sub-Saharan Africa, India, and Southeast Asia." (Kompas, Pham, and Che 2018, 1160)

Box 1.1

The case of cocoa in West Africa

Cocoa provides an illustration of strategic directions taken by policy makers in the face of climate change impacts on this key commodity crop, which drives export production and income generation, as well as being a primary good for smallholder livelihoods. West Africa produces 70 percent of the world's cocoa, with contributions of 7.5 percent to the GDP in Côte d'Ivoire and 3.4 percent in Ghana, the two largest producers in the region. Agriculture is therefore central both to the resilience of populations and to a sustainable low carbon economy.

Cocoa production's challenges include the low productivity of the mostly overaged trees, costly inputs such as mineral fertilizers, and increasing impacts from climate change. Under business as usual emissions by 2050 and given the predicted temperatures in the cocoa-growing regions of Ghana and Côte d'Ivoire (Läderach and others 2013), some current cocoa producing areas will become unsuitable, requiring crop change. Other areas will require adaptations in agronomic management, and in yet others, the climatic suitability for growing cocoa will increase (Läderach and others 2013).

Given these challenges, strategic choices were taken, including through World Bank support. The Cocoa and Forests Initiative, launched in 2017, bringing together cocoa-producing countries and chocolate and cocoa companies for concerted action to end deforestation from cocoa production, created the basis for putting in place verifiable monitoring systems for traceability in the supply chain. Moreover, in Ghana, where forest degradation and deforestation are driven primarily by cocoa farm expansion, coupled with logging and a recent increase in illegal mining, a partnership with the Forestry Commission, Cocoa Board, and private sector, Ghana's program with the Forest Carbon Partnership Facility (FCPF) Carbon Fund seeks to reduce carbon emissions, and a Development Policy Finance seeks to promote reforms that will foster climate-smart cocoa production (Kroeger and others 2017).

foreign financial assistance, remittances, and reconstruction, the response for sustainable solutions for the medium and long term is less clear. If droughts intensify by 10 percentage points, medium-term annual economic growth can decline by almost 0.8 percentage points in Sub-Saharan Africa (IMF 2020). Climate and hydrological extremes are expected to continue and become more pronounced in the future, increasing the frequency and intensity of floods and droughts. Although the impact is not yet fully known, pandemics such as COVID-19 have the potential to create an economic shock that will further challenge the resilience of Sub-Saharan African economies. The national and local effect of the pandemic is going to affect Africa in a unique way, given the stark differences in resources, demography, climate, and the added challenge of fragility of conflict and violence (World Bank 2020a).[10]

Proactive, anticipatory strategies to consider the effect of a changing climate on economies and engines of growth have to be holistic and deploy a range of policy and action-oriented solutions to get ahead of the curve. Countries in West Africa have used this proactive approach in the context of cocoa, a key economic commodity and labor market. They have taken concerted and strategic action to end deforestation from cocoa production, monitoring the supply chain and reducing carbon emissions through the promotion of climate-smart cocoa production (box 1.1).

Similarity of the effects of climate change on economic growth provides opportunities for economies of scale both in terms of mitigation and adaptation through cross-border or regional efforts.[11] In some cases, geographical proximity and the nature of climate impacts require a regional effort to ensure durable outcomes. The World Bank's support to the Horn of Africa Initiative recognizes the importance of a regional approach to resilience, in addition to regional infrastructure, economic and trade integration and development of human capital (World Bank 2020b). Similarly, the Zambezi Basin could resonate: its rich resources have

10 Twenty African countries are classified as FCV (classification of fragile and conflict-affected situations) (World Bank 2020a).
11 Chad and Niger; Benin and Burkina Faso; Cameroon and Congo; Sudan, Tanzania and Uganda; and South Africa and Lesotho are good examples.

presented opportunities for sustainable, cooperative investment in hydropower and irrigated agriculture, with essentially no major infrastructure investment (World Bank 2010).

Climate-smart development applied to key export sectors can bring positive gains to the economy and growth pathways. Needed Investments should be optimized between adaptation and productive capital. Structural changes from economic development can decrease the impacts from climate-sensitive sectors (Millner and Dietz 2011). Diversification of African economies in agriculture, manufacturing, and extractives (as alternatives to fuel sectors) will help the transition to low carbon, climate-resilient pathways (Cust and others 2017).

Opportunities for growth can be available to carbon-rich nations in Sub-Saharan Africa and globally as they face new realities and advances in technology. The process of technological change makes renewables more competitive, and the broadening climate policies may diminish the value of carbon assets that undermine traditional development pathways. The transitioning into low carbon pathways has pros and cons that need considerations specific to each national economy; yet it offers opportunities in the long-term process of diversification of African economies, and in the pursuit of a novel development pathway that is both resilient and low carbon.

1.5 Clarion Call for Development-Centered Climate Action

With the stark warning from scientists that warming could reach 2°C as early as 2030, the path toward a resilient future for Sub-Saharan Africa got harder (IPCC 2018). Warming beyond 2°C would significantly increase the risks and impacts of climate change compared to 1.5°C warming, with some irreversible and far-reaching consequences as warming continues. Climatic conditions, heat, and other weather extremes considered highly unusual or unprecedented today would become the new climate normal. Sub-Saharan African countries not only have to prepare to address the current realities of 0.5°C warming over the last 50 years but also the intensification of climate change impacts that can act as poverty multipliers and undermine growth.

The vulnerability to climate change of key sectors driving Africa's economic performance is substantial. Increased temperatures and heat waves threaten growth in multiple sectors, leading to productivity loss, physical injuries, increased risks of vector- and water-borne diseases and degradation of water and land resources. As the environment changes, new threats to agricultural productivity emerge (Fuglie and others 2019) and to Africa's engines of growth. The on-going droughts in southern and eastern Africa, for example, are threatening the lives of millions. In the Sahel, the Niger Basin's vulnerable population of 112 million faces security threats and resource scarcity, threatening food and energy security, economic development, and driving migration. In the central and southern Africa basins (Congo, Orange, and Zambezi), the power and water sectors could underperform in many climate scenarios and overperform in others, which could translate into lost revenue. There are also potential opportunity costs of not taking advantage of an abundance of exploitable water resources in wetter climate futures (Cervigni and others 2015).

By 2050, work-hour losses by country due to heat are expected to result in GDP loss of 6 percent per annum in the worst-affected regions, such as West Africa. As warming increases, a 2 percent per capita annual loss over 30 years could have cumulative effects—reducing by more than half the overall growth in GDP per capita (SEforALL 2018). In the past five decades, countries such as Botswana, Chad, Sudan, and Uganda have experienced substantial rise in temperature: from 1°C to over 3°C. Increases are starkest in eastern Africa (IMF 2020). For example, Rwanda is especially at risk from the health effects of heat stress. It is

the first country to adopt a road map to adopt model regulations and supporting policies for energy-efficient and climate-friendly cooling solutions.

The inability of most African countries to create jobs in the formal sectors could further strengthen the dependence on climate sensitive sectors, like agriculture. Climate-smart policies can offer opportunities to advance and reinforce a process of structural transformation. Technological change can help address the gap in infrastructure provision by reducing fixed costs, and mobile phone technology can bring infrastructure services within the reach of the poor. Information and communication technology (ICT) opens the door to precision farming systems, such as precipitation detectors combined with irrigation optimization, for real-time crop management advice (Fuglie and others 2019).

Ambitious climate action could deliver a US$26 trillion to the global economy between now and 2030; as well as 65 million additional jobs in 2030 in Africa, providing opportunities as new markets develop, including on renewables (Global Commission on the Economy and Climate 2018). Rural electrification through solar home systems typically replaces kerosene or diesel use, generating financial savings in a two to three years to consumers and GHG reductions. The rapid decline in solar technology costs and the availability of high efficiency devices (e.g., LED lighting) allow bundling of technologies to further lower the costs and raise the quality of services (Global Commission on the Economy and Climate 2018).

Low carbon climate resilient and green pathways provide just the platform for transformation and innovation towards prosperity in Sub-Saharan Africa. The argument that Africa must treat constraints as investment opportunities to create a conducive environment for technological diffusion and harness innovation towards its prosperity (World Bank 2017) is aligned with the opportunity for ramping up climate action. For example, a wide and sustained policy change on clean cooking remains the next frontier for the energy sector in Africa. Thus, the typical biomass user, rural poor households, would retain or increase productivity. There would be a boost in growth to switch away from the consumption from solid biomass combustion, leading to significant GHG implications, while promoting conservation and management of the natural resource base for provision of critical environmental services.

The urgency to ramp up climate action in Sub-Saharan Africa cannot be postponed. The intensification of the pace and scale of climate impacts, which are already being felt and could intensify significantly, as early as 2030, will be particularly challenging in the context of Sub-Saharan Africa where many countries have competing urgent development priorities, and low capacities, yielding them especially vulnerable (IPCC 2018). Managing the impact of climate change on Africa's economy has therefore become an important development challenge (Abidoye and Odusola 2015). Given the climate sensitivities of multiple engines of growth in Sub-Saharan Africa, the urgency for countries to ramp up climate-smart development—at scale and across the growth spectrum—is an imperative.

Within this decade, there is utmost urgency to bend the arc toward secure and long-term sustained development outcomes, while addressing impacts of climate change. Countries are planning for low carbon, climate-resilient strategies through robust long-term strategies through their updated Nationally Determined Contributions (NDCs) (part of their obligations under the Paris Agreement). While adaptation is the priority for Sub-Saharan Africa, countries can leapfrog into low carbon pathways that are pro-poor and that generate local benefits while avoiding being locked into conventional technologies. This Next Generation Africa Climate Business Plan provides a platform to galvanize climate action at a scale and pace commensurate to the challenge, prioritizing its focus on the core development challenges, in support of Sub-Saharan African countries as they stride into a novel climate-smart development pathway.

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Rose Niang and her family stand in front of their house in Bargny, Senegal with a neighbor...

Vincent Tremeau / World Bank

CHAPTER 2
World Bank Commitment to Climate Action

This *Next Generation Africa Climate Business Plan* is grounded in the WBG's commitment to mainstream climate into development, as set out in the Corporate 2025 Climate Targets and Actions and the IDA19 commitments (World Bank 2018a). Recognizing that climate change is a major risk to achieving the Bank's development goals of poverty eradication and boosting shared prosperity, these Bank Group commitments are driving support for countries to take ambitious climate action, with a strong focus on increasing adaptation; leveraging private sector finance and supporting increased systemic climate action at the country level. This provides an ideal opportunity to link with countries' NDCs, which are also seeking to increase climate ambition and action.

2.1 World Bank Group's 2025 Targets to Step Up Climate Action

The WBG announced a major new set of climate targets for fiscal years 2021–25, doubling its current five-year investments to around US$200 billion (World Bank 2018a), ahead of the United Nations Framework Convention for Climate Change (UNFCCC) 24th Conference of the Parties (COP). The US$200 billion across the Group is made up of approximately US$100 billion in direct finance from the World Bank (comprised of the International Bank for Reconstruction and Development [IBRD] and the International Development Association [IDA]) – and approximately US$100 billion of combined direct finance from the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA) and private capital mobilized by the WBG. Its goal is to support countries to take ambitious climate action, with a strong focus on increasing adaptation (as set out in the Adaptation and Resilience Action Plan [World Bank 2019b]), leveraging private sector finance and supporting increased systemic climate action at the country level. This Bank Group wide comprehensive package will boost action on five fronts:

- **Systematically increasing direct financing** (US$133 billion from the WBG), and deepening climate mainstreaming throughout World Bank, of which at least 50 percent will be for adaptation.
- **Significantly increasing leverage of private finance** (US$67 billion from the WBG) and creating markets for climate business.
- **Boosting support for adaptation** through the Action Plan on Climate Change Adaptation and Resilience, which boosts adaptation financing, and driving a mainstreamed, whole-of-government programmatic approach, with at least 50 percent for direct adaptation financing.

- **Increasing systemic impact** through integration of climate considerations into national policy planning, investment design, budgeting, public procurement, and implementation and evaluation; including increase engagement with ministries of finance and planning.
- **Elevating climate actions in key sectors**, which include the following five-year targets: (i) supporting the generation, integration, and enabling infrastructure for 36 gigawatts of renewable energy; (ii) supporting 1.5 million gigawatt-hours' equivalent of energy savings through efficiency improvement; (iii) in cities, helping 100 cities achieve low carbon and carbon-resilient urban planning and transit-oriented development; (iv) in food and land use, increasing integrated landscape management in up to 50 countries, covering up to 120 million hectares of forests.

Subsequently at the One Planet Summit in 2019, it was announced that the Bank will channel US$22.5 billion to Sub-Saharan Africa for climate adaptation and mitigation for five years (FY21–25), of which at least 50 percent of the resources would be for adaptation financing.

2.2 Alignment with IDA19 Climate Commitments

Under the special theme for climate change, the IDA19 replenishment calls for deepening of climate mainstreaming through boosting support on adaptation and resilience; driving systemic impact at the country level; and facilitating economic transformation through low carbon and resilient transition (World Bank 2019a). Specific Bankwide commitments include the following:

- IDA's climate co-benefits share of total commitments will increase to at least 30 percent on average over FY21–23, at least half supporting adaptation actions.
- All IDA operations with more than 20 percent of climate co-benefits will incorporate at least one climate-related results indicator to increase the focus on climate outcomes.
- Develop new resilience metrics to give increased incentives for more effective climate adaptation actions, including through enhanced disaster resilience of infrastructure developments, and pilot them in at least 20 IDA operations.
- Support at least 25 IDA countries to reduce the risks of climate shocks on poverty and human capital outcomes by supporting programs that incorporate adaptive social protection (ASP) into national systems or reduce climate threats to health.
- Support at least 15 IDA countries to systematically implement and update national climate-related action plans, including NDCs, in cooperation with the NDC Partnership.
- For all IDA countries, where appropriate, set climate-related or NDC-based objectives or results indicators in the Country Partnership Frameworks (CPFs).
- Support at least 15 IDA countries to implement or update their National Biodiversity Strategies and Action Plans (NBSAPs), covering terrestrial and marine biodiversity or similar national action plans through new IDA-supported activities during IDA19.
- Facilitate further penetration of renewable energy in IDA countries in the context of energy access, affordability, and security by mobilizing concessional climate finance and public investments for 5 gigawatt-hours of battery storage.

This Climate Plan will support, for the Africa region, delivery of the climate agenda as set out for IDA19, the WBG's 2025 Climate Targets and Actions, and the Action Plan on Climate Change Adaptation and Resilience all of which seek to drive deeper climate action through a shift from input and process-oriented commitments to results-oriented ones. This creates a focus on long-term, systemic impacts, ensuring measurable and actionable commitments with tangible results.

2.3 Africa Regional Strategy

The Africa Regional Strategy Update in 2019 recognized climate change as one of the six core areas for increased ambition by 2023. The other core areas—growth and poverty, maximizing finance for development (MFD), digital moonshot, human capital, and fragility—are directly impacted and influenced by a changing climate. Climate-related targets in the regional strategy seek to (i) support integrated landscape management in 20 countries over a total of 60 million hectares; (ii) improve livelihoods of 10 million farmers through climate-smart agriculture; and (iii) increase renewable energy generation capacity from 28 gigawatts to 38 gigawatts and are aligned with the corporate commitments. The upcoming Regional Integration Strategy for the Africa region includes a pillar on resilience with linkages to climate (including climate change), and three other pillars focused on connectivity, trade and market integration, and human capital.

2.4 Learning from the first Africa Climate Business Plan Portfolio

This new Climate Plan builds on the success and achievements of its predecessor – the Africa Climate Business Plan (ACBP). A total of 346 projects and more than US$33 billion of World Bank financing (IDA and IBRD) has been delivered (as of June 2020), and 29 percent climate co-benefit in FY20. These targets exceed the World Bank resource mobilization target set out for 2020 under the first Plan. Annual reporting on the ACBP has generated valuable insights on key challenges, lessons, and best practices that will inform the scale-up and transformation sought under this new Climate Plan (box 2.1).[12] This Climate Plan will ramp up climate informed policy, programs and projects to meet the urgency for accelerated action in the region commensurate to the intensifying scale of the challenge.

This new Climate Plan will build on the successes and innovations of its predecessor. The portfolio in Sub-Saharan Africa has adapted a wide range of tools, instruments, and approaches to drive climate resilience and mitigation rendering them ready for scale-up and replication (table 2.1). Customization of these tools from wider sector practices is contributing to learning and knowledge generation. For example, in the case of climate-smart agriculture (World Bank 2018c; 2020) adoption of a range of context-specific climate-smart technologies and practices to meet their food security and improved livestock production is increasingly prevalent, along with improved water management, conservation agriculture, and agroforestry. Application of digital technology in the design and delivery of integrated weather and market advisories to inform farmers' decisions to adequately respond to, and when possible, capitalize on the changing conditions is novel and contributing to positive outcomes.

This Climate Plan calls for embedding and leveraging proven tools to drive systemic change and transformational outcomes for low carbon and climate resilient outcomes, so as to reach each last beneficiary. The portfolio will benefit from success stories to replicate and scale-up low carbon and resilience operations more effectively and expeditiously through mobilization of proven tools and instruments.[13] For example, the Solar Lighting project, which started with Lighting Africa, has now evolved to Lighting Global. It is and rolling out financing innovations of pay-as-you-go, which enable low-income populations to access

12 The first ACBP was launched in 2015. For further information on progress and achievements see the World Bank website, https://www.worldbank.org/en/programs/africa-climate-business-plan.

13 See the website of the Africa Climate Business Plan for an interactive display of projects showcasing how these tools and innovations have been mobilized for addressing climate risks and opportunities, https://www.worldbank.org/en/programs/africa-climate-business-plan.

Box 2.1

Highlights of achievements through the first Africa Climate Business Plan

The first ACBP was launched in 2015 at the Paris Climate Conference to galvanize and accelerate climate action. The Plan has supported 346 projects with more than US$33 billion of World Bank financing (International Development Association [IDA] and International Bank for Reconstruction and Development [IBRD]) as of June 2020. It has also helped deliver the Africa region's 29 percent climate co-benefit in FY20. These targets exceed the World Bank resource mobilization target set out for 2020 under that Plan. Below are highlights of key ACBP components under the Plan.

Climate-smart Agriculture. A total of 57 climate-smart agriculture (CSA) projects (US$1.8 billion) have aimed to improve livelihoods of 6.6 million farmers and increase climate resilience and productivity of more than 2.9 million hectares. CSA Investment Plans (CSAIPs) were prepared for five countries, and CSA country profiles for 10 countries.

Energy. The World Bank has approved lending for six grid-connected solar projects in five countries; total solar generation capacity is up to 650 megawatts, and 460 megawatts of hydropower. The Nachtigal Hydropower Project in Cameroon is an example of Maximizing Finance for Development (MFD). The Scaling Solar Initiative reached financial closure in two countries, and construction has started (e.g., in Senegal and Zambia). Ten projects approved by the Board have significant solar off-grid components (mini-grid and solar home systems).

Landscapes. Sustainable landscape management projects in Ethiopia, targeting 800,000 hectares and more than 400,000 household and more recently through the Climate Action for Landscape Management through a program for results instrument; a project in Sudan covered 100,000 hectares. For forest-related projects, 10 countries prepared performance-based payments for reducing emissions from deforestation and forest degradation (REDD+) and enhanced carbon stocks; FCPF is ongoing in at least 15 countries and 11 countries from the Forest Investment Program (FIP).

Social. In several countries, including Ethiopia, Kenya, Mauritania, Madagascar, Mozambique, Lesotho, Niger, Senegal, Uganda, safety net programs have scaled up to respond to shocks, based on early warning information ranging from the use of seasonal assessment and humanitarian appeals to the creation of new triggers based on data from satellites.

Cities. Target of developing resilience plans in 20 cities has been surpassed, with commitments of US$2.27 billion to support investments for climate- and disaster-resilient operations (including ones in Saint-Louis, Freetown, Accra, Antananarivo, Dakar, Dar es Salaam, and Ibadan). Stronger capacity for integrated risk management is expected to benefit more than 100 cities and about 70 million people.

Climate-Smart Ocean Economy. Fisheries (SWIOFish) operations continue to strengthen fisheries' governance in multiple countries (Comoros, Madagascar, Mozambique, Seychelles, and Tanzania). The first blue bond was issued by Seychelles, and there has been knowledge work on fisheries and the Fisheries Transparency Initiative to institutionalize transparency in the sector.

Coastal resilience in West Africa. The US$225 million West Africa Coastal Resilience program is operating in six countries and through four regional institutions to address coastal erosion, flooding, and improved watershed management and to support pollution control. There is also a US$2 billion knowledge and financing platform to leverage the private sector for scale-up action.

Water. A strong focus on strategic river basins (e.g., Niger River Basin, Lake Victoria, Zambezi Basin) saw the development of the Niger Basin Climate Resilient Investment Plan with counterparts of a priority set of investments and a cost estimate of US$1.9 billion, and strategic planning for a US$2 billion common investment framework with eight riparian countries. Strategic planning to frame resilience-focused lending has expanded across operations, including through multi-phased programmatic Development Policy Operations.

Transport. There has been a commitment of US$9 billion for 15 climate-informed projects to improve the resilience of transport infrastructure and carbon efficiency, accompanied by a shift from reactive to proactive business models.

Addressing drivers of migration. Several large operations of more than US$300 million have been approved in East Africa and the Great Lakes to address the impact of forcible displacement and increase integrative approaches to refugee and host communities.

Source: World Bank (2018) Accelerating Climate Resilient and Low Carbon Development: Africa Climate Business Plan – Third Implementation Progress Report and Forward Look. *https://www.worldbank.org/en/programs/africa-climate-business-plan*

modern clean solutions (box 2.2). Others like the Northern Uganda Social Action Fund Project that have combined insurance-based disaster risk financing, satellite-based innovation linked to derive drought triggers, and social safety nets to avert food crises are ready for scale-up (box 2.3) (Poulter and 2018). The Africa region is seeing an increase in Development Policy Financing

TABLE 2.1 Proven and tested tools and instruments to drive climate-informed development

Financial products	Analytical tools	Technology & digital innovation
▶ Disaster risk financing (Uganda) ▶ Livestock insurance (Kenya) ▶ Crop insurance (Kenya) ▶ Bonds (Nigeria) ▶ Maximizing Finance for Development (MFD) (Cameroon) ▶ Climate insurance (Malawi) ▶ Pay-as-you-go (Solar lighting – Benin, Burkina Faso, others) ▶ Catastrophe Deferred Drawdown Option (Cat-DDO) (Cabo Verde, Kenya, Malawi) ▶ Green bonds (Nigeria) ▶ Blue bonds (Seychelles)	▶ Multi-hazard mapping (Mozambique), ▶ City-Strength; City resilience scan (Ghana) ▶ Infrastructure Vulnerability assessment ▶ Post-Disaster Needs Assessment (Mozambique) ▶ Green Roads for Water (Ethiopia), ▶ Basin Planning Exercises; Flood risk mapping ▶ Community mapping and OpenStreetMap (Senegal), ▶ Utilities of the Future ▶ Decision-making Under Uncertainty (Mozambique) ▶ Watershed Management Plans ▶ Coastal Risk Mapping ▶ Solar Atlas Mapping	▶ Satellite data (Uganda, Lake Victoria), ▶ Artificial intelligence for weather forecasting ▶ In-situ hydromet monitoring ▶ Drones (Uganda, ▶ Cell-phone and mobile data ▶ Big data (▶ Digital solutions for electronic payments (Mozambique) ▶ Satellite Monitoring and Ocean Surveillance for Fisheries
Green instruments	**Tools to inform policy**	**Policy instruments**
▶ Excellence in Design for Greater Efficiencies (EDGE) certification (Kenya, Ghana) ▶ Forest certification ▶ Payment for environmental services (Cocoa in Ghana, Coffee in Ethiopia) ▶ Nature based solutions (Sahel) ▶ Certified Emission reductions ▶ Water storage	▶ Climate aware macro-model (Uganda) ▶ Computable General Equilibrium (CGE) modeling (Ethiopia, Nigeria) ▶ Carbon pricing ▶ Climate budget tagging (Uganda), ▶ Climate screening (Ethiopia, Uganda) ▶ Greenhouse Gas (GHG) accounting ▶ Risk modelling (Kenya)	▶ Social Safety Nets, ▶ including cash transfers and cash for work Development Policy Operations (DPOs) ▶ Community Credit Associations ▶ Women's Credit Associations ▶ Social resilience (West Africa Coastal areas)

Note: The website of the Africa Climate Business Plan has an interactive display of projects showcasing how different instruments, tools and innovations have been mobilized for addressing climate risks and opportunities.

with a Catastrophe Deferred Drawdown Option (CAT-DDO) like the one in Kenya that supports reforms to improve the country's capacity to improving disaster risk management, while honing both socioeconomic and fiscal resilience (box 2.4).

2.5 Shifting to the Next Generation Plan

Broad-based internal and select external consultations emphasized the need for a bolder and more ambitious climate outcomes, through a next generation plan to secure and bolster Africa's development in the face of escalating climate impacts. Key messages that have informed the new Plan include:

- Center on core development challenges in Sub-Saharan Africa which will be jeopardised or challenged in the face of intensifying climate impacts.
- Mobilize the Bank's Global Practices (GPs) to fostering an enabling environment in countries to achieve the desired outcomes within and across sectors and thematic issues,

Box 2.3

Contingency financing in the Northern Uganda Social Action Fund

The World Bank–financed Northern Uganda Social Action Fund (NUSAF) III project has a US$12 million disaster risk finance component. It provides additional post disaster support to vulnerable households by automatically scaling up the NUSAF III's Labor Intensive Public Works' activities during crises to build resilience of beneficiary households. The 2016 El Niño caused widespread drought in the Karamoja region. The parametric index developed under the NUSAF project captured the drought and triggered a scaling up of the Labor-Intensive Public Works. As a result, US$4.1 million was disbursed to finance disaster assistance to approximately 30,000 households, or 150,000 people, in Karamoja. It is estimated that the disaster risk finance component of NUSAF III will finance the cost of scaling up to aid 80,000 additional households (400,000 people) over the lifetime of the operation.

Source: See the World Bank *« Disaster Rick Financing and Insurance Program », https://www.worldbank.org/en/programs/disaster-risk-financing-and-insurance-program.*

Box 2.4

Catastrophe Deferred Drawdown Option approved for Kenya

Extreme climatic events have long threatened development progress in Kenya, where 84 percent of the land is classified as arid or semi-arid, and where droughts and floods are estimated to cost the economy over 2 percent of GDP each year, on average. (World Bank 2018b)

In June 2018, the World Bank approved a US$200 million Development Policy Loan (DPL) with a Catastrophe Deferred Drawdown Option (Cat-DDO) for Kenya. This innovative contingent line of credit provides immediate liquidity in the aftermath of a disaster resulting from an adverse natural event. The Cat-DDO is the first World Bank development policy operation in Kenya in the last 10 years and will be a foundation for policy dialogue and support the Government of Kenya's proactive efforts to manage disaster and climate risks with a comprehensive program of reforms.

Preparing this instrument involved discussing prior actions between the Africa Disaster Risk Financing (ADRF) team and the government to strengthen the country's institutional, technical, and financial capacity to manage the impact of natural hazards, and to improve the country's fiscal resilience. As one prior action, the government approved the National Disaster Risk Financing Strategy. This marks the first DRF strategy to be implemented in Sub-Saharan Africa, and the project received 100 percent climate co-benefits. This milestone paves the way for other countries to develop similar instruments and develop risk financing strategies.

Source: http://pubdocs.worldbank.org/en/789321545341964161/Case-study-Kenya-Cat-DDO-final-12-19-2018.pdf

- The Climate Plan should seek to deliver agreed corporate commitments that the Region will contribute to.
- Use a systemwide, integrative approach to address climate in the region, including through the use of climate-sensitive, macroeconomic assessments and fiscal risk to drive shifts in policies, planning, and regulatory frameworks.
- Harness technology and innovation, including uptake of digital and disruptive technologies (through use of big and small data) and innovations in risk financing (e.g., insurance) to bring these approaches to scale.
- Focus on thematic issues that need to be strengthened or integrated, including social resilience, gender, and the role of the private sector.
- Strengthen partnerships, including with regional institutions and initiatives, to foster acceleration of climate action.

Box 2.2

The World Bank Group's Lighting Global Program

The World Bank–IFC Lighting Africa program was created with the aim of providing off-grid solar lighting to 250 million people living without a grid connection in Sub-Saharan Africa by 2030. Since the first pilots' kick-off in Kenya and Ghana in 2009, the Lighting Africa program has spread across the continent and across the globe, evolving into Lighting Global.

Lighting Global is the World Bank Group's initiative to rapidly increase access to off-grid solar energy for the 1 billion people living without grid electricity around the world. The program works with manufacturers, distributors, governments, and other development partners to build and grow the modern off-grid solar energy market. Lighting Africa, along with Lighting Global, provide market intelligence, quality assurance, consumer education, business support services, and support for access to finance at the global, regional, and country levels. Based on the current market growth, it is expected that Lighting Global will benefit about 740 million people by 2022.

Lighting Global is poised to address new markets and opportunities that emerge as the off-grid energy sector evolves. Program activities now include support for the productive use of solar (e.g., solar irrigation and milling), community services (e.g., for schools and health centers), super-efficient household appliances (e.g., fans, TVs, household refrigeration), and innovative pay-as-you-go business models that enable rural, low-income populations to access modern clean energy solutions.

As of June 2018, more than 44.5 million people were meeting their basic (Tier 1) energy needs through products meeting Lighting Global Quality Standards. Lighting Global and its related regional programs are active in 39 countries around the world.

Source: See the World Bank "Lighting Africa" web page, *https://www.lightingafrica.org/about/.*

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Woman in Benin farming..

Andrea Borgarello / World Bank

PART II

STEPPING UP CLIMATE AMBITION AND ACTION

This section presents a robust body of evidence, based on science and analytics, underscoring the urgency to address climate risks if we are to contain poverty and deliver sustained growth and the SDGs for Sub-Saharan Africa. Through a focus on development priorities that underpin the region's economic growth, this section of the Next Generation Africa Climate Business Plan presents compelling narratives to frame a set of five Strategic Directions and two special areas of emphasis to shift countries' trajectories toward climate-smart development. The Climate Plan, to be implemented over two IDA cycles (IDA19–20; FY21–26), lays out priority areas of action and dedicated targets aligned with the Bank's corporate and IDA commitments.

A young boy from Utajo Village in Kenya studies at school.

JL Warehouse / Shutterstock

CHAPTER 3
Framing the Next Generation Africa Climate Business Plan

3.1 Value Proposition of the Next Generation Africa Climate Business Plan

With less than a decade left for Sub-Saharan Africa countries to achieve their SDGs, managing the impact of escalating and intensifying climate change on the region's economies is a crucial development challenge (Abidoye and Odusola 2015). This Climate Plan will serve as a game changing, galvanizing platform for the World Bank to support its client countries in the region to achieve their SDGs through the following value propositions.

First, adaptation and resilience must be the cornerstone of climate action for Sub-Saharan Africa to secure core development priorities such as food, water, and environmental and human security. The pace and scale of this action must be commensurate to the escalating nature of climate impacts such as floods, droughts, and sea-level rise, among others. A far-sighted approach to planning for climate-smart institutions, policies, and capacities must be accompanied with the deployment of integrated, innovative, and resilient solutions, while ensuring preparedness to address climate shocks and pandemics more holistically.

Second, a manifold increase in energy access that is green and clean will enable countries to reap economywide pro-poor mitigation benefits. This includes avoiding pollution, rolling out green mobility, boosting job growth, and securing community resilience through increased access to schools, health clinics, and economic diversification. In Sub-Saharan Africa, where energy access in almost all countries remains low, falling costs of renewables provide a real opportunity for deployment at scale of green, clean energy. This shift will ensure that the countries leapfrog to low carbon technologies instead of being locked into conventional carbon-intensive technologies and models.

Third, the imperative for climate adaptation and resilience, coupled with green, clean energy, provides an ideal platform for Sub-Saharan African countries to pursue novel climate-smart development toward low carbon, climate-resilient pathways. These long-term strategies are especially important in a region in which much of the infrastructure, cities, and transportation systems are yet to be built. In addition, persistent food, water, and environmental crises, amplified by climate impacts, can lead to protracted fragility, conflict, and distress-driven migration. This novel business model in Sub-Saharan Africa will be unlike those of polluting economies that are having to retrofit their cities or infrastructure and

address pollution cleanup. Greater resilience, stability, and security of the entire population will provide for more vibrant economies. This convergence will amplify the opportunities to deliver green resilient action as part of the COVID-19 recovery packages by boosting economic growth, resilience, and low carbon outcomes, while supporting increased climate ambition and action through countries' NDCs.

These value propositions take on an even greater importance in the face of multiple megatrends that are unfolding alongside climate change in the region. These include demographic change, urbanization, technological innovation, biodiversity loss, disease outbreaks, and pandemics. Therefore, proactivity and long-term strategies are critical for driving transitions and deploying systemic shifts toward sustainable outcomes.

A proactive stance for low carbon, climate-resilient action is in the interest of Sub-Saharan African countries and the global community. A stable, secure, and resilient population is less likely to be beseeched by fragility, conflicts, or distress-driven migration. In addition, a green and clean Sub-Saharan Africa would reduce the region's future carbon footprint and contribute to the collective action as part of countries' NDCs. Supporting Sub-Saharan Africa through these short- and long-term transitions must be addressed decisively and at scale, ensuring they have access to the necessary financial, technical, and human support.

3.2 Strategic Directions and Special Areas of Emphasis

This Climate Plan is the World Bank's response for scaled-up and transformational climate action in Sub-Saharan Africa to meet the twin goals of ending absolute poverty and boosting shared prosperity in a sustainable manner, and help countries achieve their SDGs.

The Climate Plan identifies five strategic directions that are critical for Sub-Saharan Africa to achieve climate-smart growth and shared prosperity (figure 3.1). These strategic directions are highly interconnected with gender, community engagement, fragility, and social inclusion as components of transformational climate action. These focus areas were validated through extensive technical consultations and vetting processes with internal actors and externally.[14] The Strategic Directions are as follows:

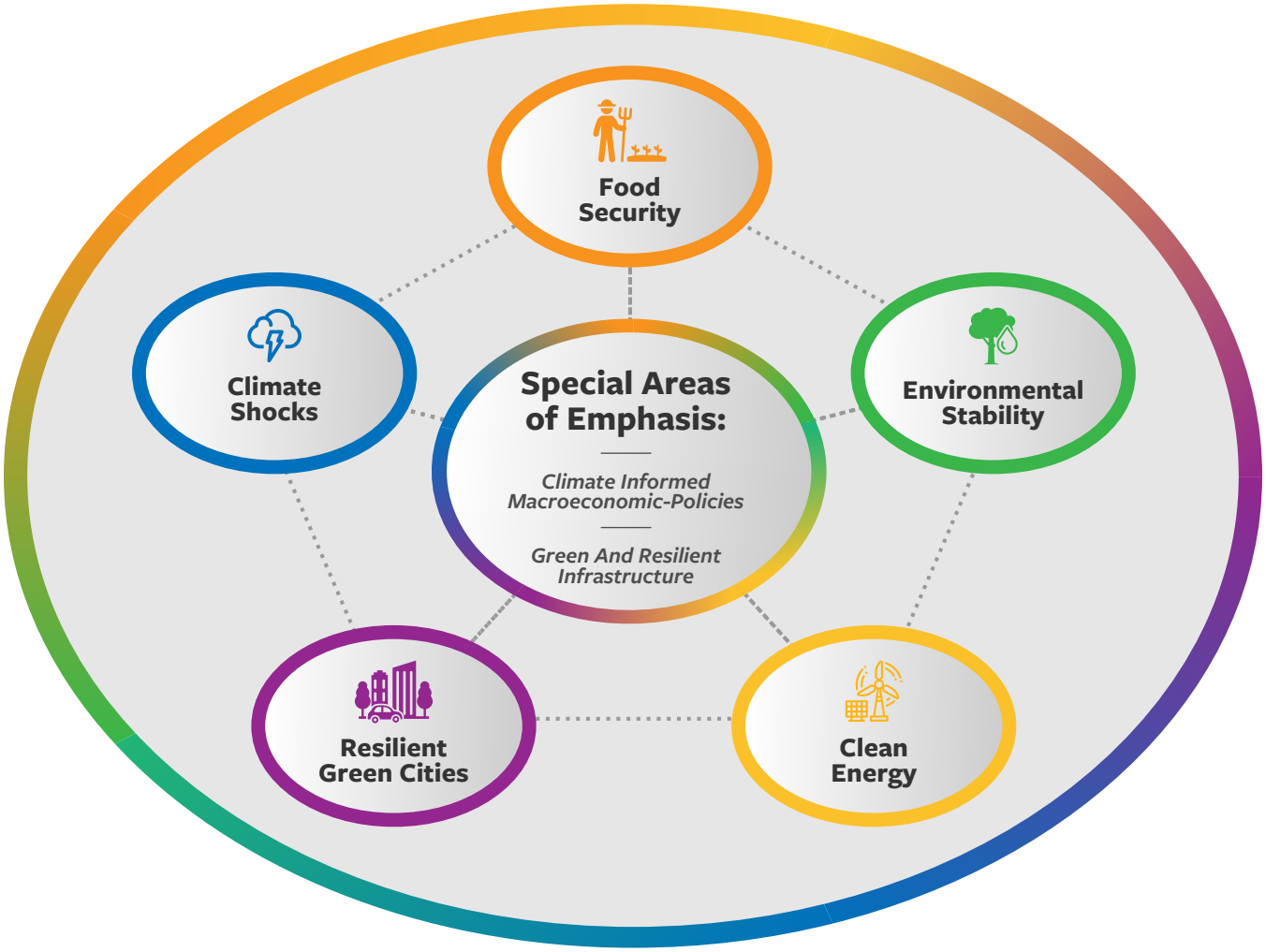
- Food security and a resilient rural economy
- Ecosystem stability and water security
- Low carbon and resilient energy
- Resilient cities and green mobility
- Climate shocks and risk governance

The Climate Plan includes two cross-cutting areas of special emphasis needing systemic and systematic attention to drive transformative change. These include:

- **Promoting climate-informed macroeconomic policies.** Climate change is predicted to slow economic growth in Sub-Saharan African countries and presents fiscal sustainability challenges. There are many opportunities to implement policies that result in better fiscal management and improve environmental, climate, and social outcomes. Some examples include the reduction or better targeting of fossil fuel subsidies, carbon taxes, or moving some of the income tax burden to consumption taxes that reduce pollution and carbon

14 This year-long process included a multi-stakeholder consultation at COP 25 of the UNFCCC in Madrid, and engagements with GPs and the Country Management Units at the World Bank. The Strategic Directions are in some places referred to in their abbreviated form (see Figure 3.1).

FIGURE 3.1 Strategic Directions and Special Areas of Emphasis for climate action in the Next Generation Africa Climate Business Plan



emissions. Fiscal policies can foster the mainstreaming of climate adaptation investments, such as government-subsidized flood insurance for properties that are compliant with flood zone restrictions and punitive taxes for properties that are not.

- **Strengthening green and resilient infrastructure.** Sub-Saharan African countries must address their large infrastructure gap by building infrastructure that is robust and resilient to climate risks. The infrastructure should use less carbon-intensive materials and technologies and incorporate green infrastructure and nature-based solutions. By embedding climate risks into planning, maintenance, and design standards, and harnessing the private sector and other financing, the built infrastructure can serve as engines of growth and yield multiplier effects.

These Strategic Directions are mutually reinforcing dimensions to secure low carbon, climate-resilient development under a changing and sometimes uncertain climate future. While each Strategic Direction has clear entry points, meeting the outcomes on the ground will require integrative actions and cross-sectoral efforts. Designing programs and projects will require a consideration not just of synergies but also trade-offs, requiring decision making under uncertainty in some cases with respect to climate change.

The Climate Plan serves as a framework to support climate action in Sub-Saharan Africa, recognizing that the selectivity and prioritization of action will be determined at the national and local levels (and regional, as relevant). African countries are very heterogenous in their economic context and energy mix, threat from disasters and climate change, and capacity to mitigation and adapt. As a result, this Plan cannot provide a small set of interventions that would make sense in every country. Instead, it offers a framework and menu of options that will need to be refined and prioritized at the country level. For this reason, this Plan gives a lot of weight to initial planning and prioritization through the country engagement processes—the World Bank's Strategic Country Diagnostics (SCDs) and CPFs—and countries' NDCs, which will have the objective of transforming the long list of objectives and instruments listed in this Plan into a short list of country-relevant priorities, which may include regional action or regional cooperation.

As the largest financier for climate action, the World Bank will use its vital financial and technical assistance to deliver lending, analytical, and advisory services and knowledge sharing to drive climate action and mainstreaming throughout the portfolios and through its country engagement to advance countries' development agendas. Countries in Sub-Saharan Africa are already increasing their ambitions on climate action in the updates of their NDCs in support of the Paris Agreement. This Plan will support the countries in their endeavor.

This Climate Plan provides a concrete road map and action plan extending over two IDA cycles (IDA19-20), spanning 6 years (FY21-26). Chapters 4–9 present, for each Strategic Direction, (i) compelling evidence-based narratives as basis for climate action; (ii) priority areas of action for bold and sustained climate-smart action underpinned by a Theory of Change; and (iii) targets aligned with the World Bank's Corporate and IDA19 commitments. The business elements of the Climate Plan are discussed in chapter 10, setting out the modalities for delivery and the importance of leveraging broad-based partnership and advocating for climate financing for Sub-Saharan Africa.

3.3 Linkages with COVID-19 response and recovery and the Africa Human Capital Plan

This Climate Plan will be implemented against the backdrop of the COVID-19 response and recovery and must seek to harness this reality and opportunity to maximize positive outcomes for the client countries. The inherent links between COVID-19 and climate change, acting through environmental pathways, call for stronger and more focused attention on habitat conservation and low carbon pathways. Seventy percent of emerging human infectious diseases have wildlife hosts or vectors (including the likelihood of this in the case of the coronavirus) (Johnson, de Roode, and Fenton 2015). Increased pollution from fossil fuels, and other manmade factors, affect human health and vulnerability of the population to viruses and other diseases. The composite set of Strategic Directions, with the focus on ecosystem stability, helps to ensure that the underlying causes of habitat fragmentation and destruction are addressed. These linkages reinforce the need for elevated attention from policy makers to take holistic action from economic, environmental, social, and climate perspectives.

Low human capital in Sub-Saharan Africa is a critical barrier to achieving resilience to climate impacts which in turn undermines achievement of sustainable growth and poverty reduction. With a Human Capital Index (HCI) of score of 0.4, compared to a global average of 0.57, children born in Sub-Saharan Africa today will harness only 40 percent of their full productivity and potential (World Bank 2019). Education has been shown to increases risk perception and the ability to employ nondeteriorating coping strategies, mitigate loss, and recover from shocks (Muttarak and Lutz 2014).

Climate-related impacts can have protracted and intergenerational consequences on human capital on learning and educational attainment.[15] Climate-related disasters can negatively affect human capital by hindering livelihood opportunities, leading to unemployment, destruction of productive assets, and increased poverty, and can affect human capital formation if families take their children out of school. In the Sahel region, stunting rates range between 17 percent of children under age five in Senegal, and more than 40 percent in Niger.[16] In the face of climate change, moderate and severe stunting could increase by 31 percent to 55 percent in Sub-Saharan Africa by 2050. Reduced feeding in the first 1,000 days of a child's life as a consequence of droughts can have long-lasting effects on a female's reproductive prospects (Bodewig 2019).

Strengthening and investing in human capital is a cornerstone of resilience and low carbon approaches across the Strategic Directions and cross-cutting areas. For example, the Resilient Cities and Green Mobility and Clean Energy Strategic Direction have a strong focus on investment for the next generation's set of skills, talent, and workforce to support a climate-smart economy. Investments in human capital to attain the right knowledge, training, and skills must be accompanied with sectoral investments to support healthy, safe populations that are resilient to climate impacts by harnessing their full potential over the next few decades. The Climate Shocks Strategic Direction will support people-centered, customized solutions through bottom-up and inclusive processes to strengthen the abilities of the poorest and most vulnerable populations to counter risks more effectively and sustainably. The Food Security Strategic Direction will enhance climate-smart agriculture and technology-based skills to nurture the full potential of farmers—with a focus on youth and women, while greater food security will help counter malnutrition which is anticipated to increase in the face of climate change. As part of the Ecosystem Stability and Water Security Strategic Direction, as well as the COVID-19 response, support for labor-intensive interventions such as reforestation, landscaping, flood protection, and environmental management programs can have longer term benefits.

15 See the World Bank's "Human Capital Project" website, www.worldbankgroup.org/humancapital, accessed in 2019.
16 See the World Bank's Human Capital Index (HCI) web page for Niger, 2018, https://databank.worldbank.org/data/download/hci/HCI_2pager_NER.pdf.

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Food Security

OUTCOMES

- **On-farm and productive landscape solutions:** Increased smallholder agricultural productivity; and increased income of the rural poor.
- **Food value chain solutions:** End-to-end food delivery systems operational; and food access secured.
- **Enabling Solutions:** Strengthened macro-economic policy and planning for CSA; and secured financing and leap-frogging solutions.

SCOPE OF OUTPUTS

- Context-specific CSA and policy interventions implemented which are Inclusive and gender sensitive
- Targeted safety net programs to counter climate risks established.
- Market-based approaches and financing innovations that connect smallholders to agricultural value chains implemented.
- Uncertainty on food access for rising urban demand and for rural poor addressed.
- Digital technology to foster game-changing solutions implemented.

A woman farmer in Kenya's highlands harvests high-quality tea leaves.

Jen Watson / Shutterstock

CHAPTER 4
Strategic Direction I: Food Security and a Resilient Rural Economy

4.1 Agriculture, Food Insecurity, and Climate Change

CONTEXT

Africa's structural situation makes climate action an imperative for the region's growth and sustainable development. Most of the region's population and the vast majority of its poor (82 percent) derive their livelihoods from natural resource-based occupations, including agriculture, pastoralism, and fishing. The agricultural sector has a pivotal role in employment in Sub-Saharan Africa, employing more than half of the total workforce (OECD/FAO 2016a). While agriculture, forestry, and fishing are highly susceptible to the impacts of climate change and variability, their value added is estimated at 16 percent of Sub-Saharan Africa's GDP. Recent research suggests that agriculture is also the primary source of livelihood for 10 percent to 25 percent of urban households (OECD/FAO 2016a).

With the shift from agrarian to urban economies in Sub-Saharan Africa, the share of GDP contribution from agriculture has declined to less than a third, but the sector still employs 54 percent of the work force (Sy 2017). The agricultural sector and the families relying on agricultural activities are highly susceptible to the effects of climate change, particularly as a consequence of reduced yields and crop failure and the impact of economic slowdowns on food production and prices. Low productivity, low efficiency, and policy weaknesses prevail and continue to challenge food security for both the rural and urban populations.

Hunger is rising in almost all subregions, and the share of people exposed to severe food insecurity has increased since 2014, reaching 277 million in 2018,[17] representing 22 percent of the population. Including for moderate food insecurity, the number rockets to 676 million people (52.5 percent of the population)—with direct impacts on gender inequalities and child stunting (FAO and others, 2019). Even as food security is projected to improve in the coming decade, this will be dampened by rapid population growth and relatively low per capita income growth in much of the region. The trends are not homogenous; in Central Africa, for example, conflicts and food disruptions will continue to drive an increase in the number of food-insecure households in the next decade (Thome and others 2019).

17 Severe food insecurity: people experiencing severe food insecurity have typically run out of food and, at worst, gone a day (or days) without eating. Moderate food insecurity: people experiencing moderate food insecurity face uncertainties about their ability to obtain food, and have been forced to compromise on the quality or quantity of the food they consume.

CLIMATE IMPACTS, CROP PRODUCTIVITY, AND FOOD SECURITY

Climate shocks and crises can quickly exacerbate food insecurity, especially in Sub-Saharan Africa, where the vulnerabilities are high. The number of people facing acute food insecurity in the face of the COVID-19 crises has increased globally by 130 million, with concern highest for Sub-Saharan Africa and the Middle East (Anthem 2020). Unfolding alongside the COVID crises, locust outbreaks, accentuated by climate change, are adding to food insecurity across Africa, with East Africa as the epicenter (Kray and Shetty 2020).

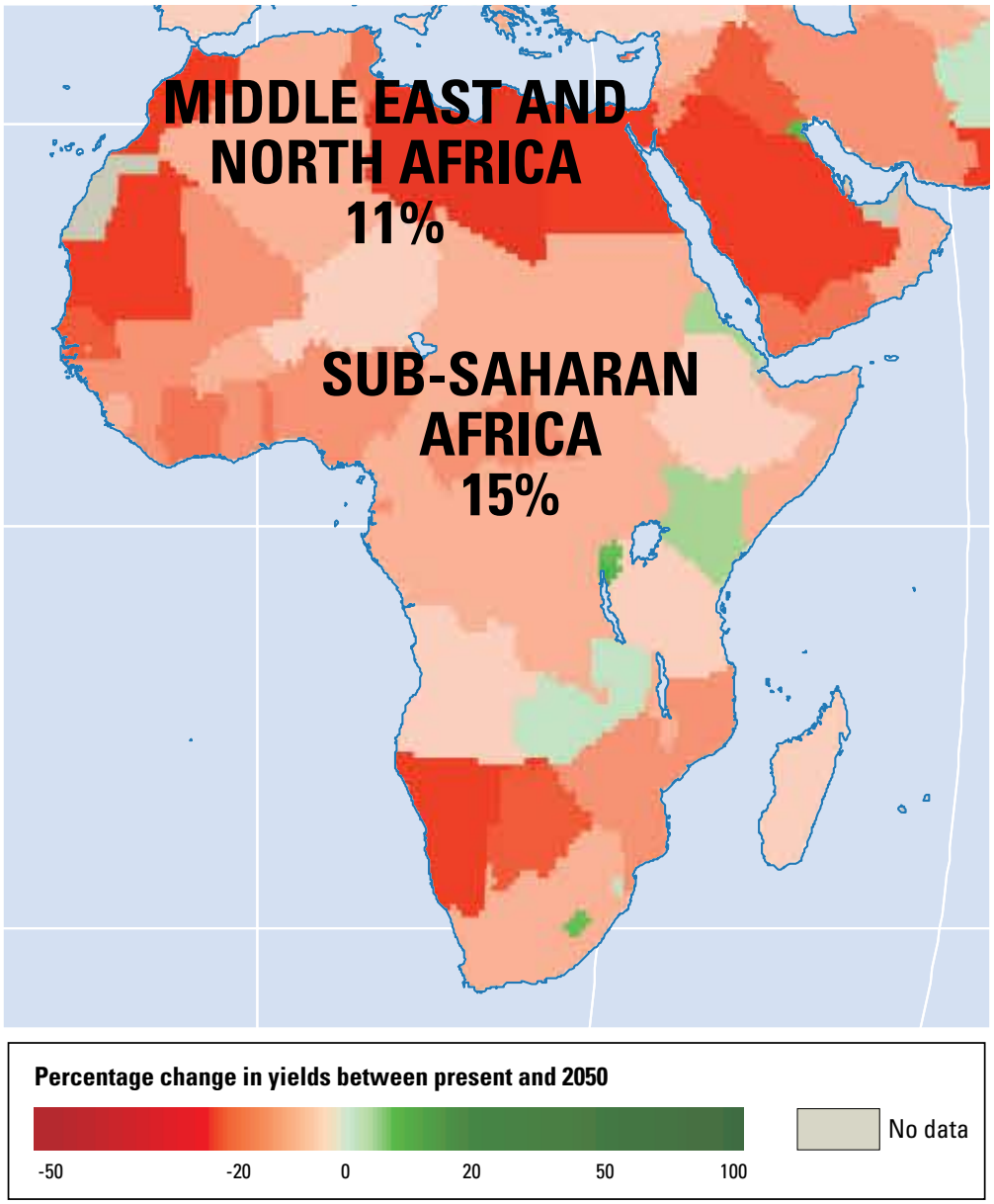
Slow onset climate impacts will affect agricultural yields and the geographic range and viability of crops, and it will disrupt food systems affecting rural livelihoods. These impacts disproportionately affect the livelihoods of the rural poor, who are a large share of the region's overall population and a significant part of its economy -with agricultural labour shares representing more than half of the total. Per capita agricultural output for staple foods such as cassava, rice, soybean, wheat, maize, pearl millet, and sorghum has declined due to the effects of volatile weather and increased frequency of droughts, among other factors (World Bank 2013). The nutritional quality of crops will also be lowered due to increased atmospheric carbon dioxide (CO_2) levels (IPCC 2019). With a projected increase in drought days and shifting weather patterns, both rainfed agriculture (which is practiced in more than 90 percent of Sub-Saharan Africa [OECD/FAO 2016b]) and pasture-based livestock systems are threatened by climate change. In the Greater Horn of Africa, the food security situation deteriorated strongly in 2019 due to the impacts of climate extremes, compounded by displacement, conflict, and violence. For instance, in Somalia and Kenya, the number of people affected by food insecurity increased between late 2018 and late 2019, from 1.6 million to 2.1 million and from 0.7 million to 3.1 million, respectively (WMO 2019).

Climate extremes through high temperatures, droughts, and heavy rainfall—with slow onset changes—drive large ecological effects. For example, the expansion in the ranges of pathogens, diseases, and pests that increase vulnerability of crops, agricultural production, and human health (Rosenzweig and others 2001). Adverse climatic conditions following the 2015–16 El Niño led to food insecurity and nutrition crises in several countries across Eastern and Southern Africa. Unusual weather and climate conditions in East Africa have resulted in the most critical desert locust outbreak in the Horn of Africa in 25 years, and the most serious in 70 years for Kenya, posing a serious threat to the region's livelihoods and food security. Large swarms that have affected Kenya's crop production can eat the same amount of food as 80 million people in a single day, and affected areas can experience the total loss of crops and fodder, exacerbating the risk of food insecurity (WMO 2019). Changing weather patterns have been conducive for this migratory pest to thrive: flood conditions make the sandy soil in arid and semi-arid areas moist. In the last three years, there was an increase in the frequency of cyclones in the Indian Ocean that played a role in breeding this upsurge (FAO 2020a).

Significant crop yield reductions at warming levels of 2°C is expected to have strong repercussions on food security (IPCC 2018). By 2050, Southern Africa will be relatively more impacted by drops in crop yields (map 4.1). Extreme rainfall variation in either direction in East Africa—too much or too little—can increase conflict risks (Raleigh and Dominic 2012) (e.g., due to increased competition over land and water resources, or by causing disruptions in production and markets).

Climate-induced impacts on agriculture and food security by 2050 will coincide with the highest population spike in Africa: an additional 1.3 billion people on the continent. Of the additional 2.0 billion people who may be added to the global population between 2019 and 2050, 1.05 billion (52 per cent) of this would be in countries of sub-Saharan Africa (UN DESA 2019, 6). The rapidly growing population and the rising percentage of people living in new and

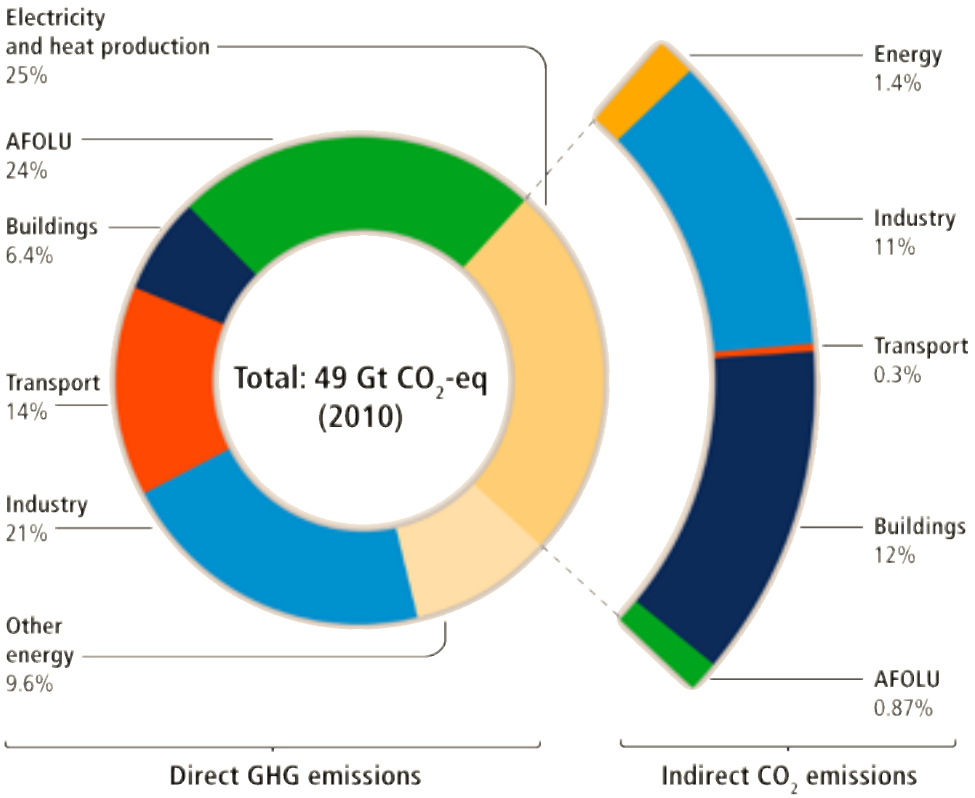
MAP 4.1 Climate change percentage change in yields, 2050



Sources: Müller and others 2009; World Bank, World Development Report 2010.
Note: The coloring in the figure shows the projected percentage change in yields of 11 major crops (wheat, rice, maize, millet, field pea, sugar beet, sweet potato, soybean, groundnut, sunflower, and rapeseed) from 2046 to 2055, compared with 1996–2005. The yield-change values are the mean of three emission scenarios across five global climate models, assuming no CO_2.

expanding urban areas are already placing significant pressure on the region's food systems, which is also affected by weakening ecosystems and ecosystem services. As recognized by the IPBES (2019, 12), "the loss of diversity, including genetic diversity, poses a serious risk to global food security by undermining the resilience of many agricultural systems to threats such as pests, pathogens and climate change."

FIGURE 4.1 Greenhouse gas emissions by economic sector



Source: IPCC 2014.
Note: IPCC (2014) estimates AFOLU's contribution to direct emissions at 24 percent, including land-based CO_2 emissions from forest fires, peat fires and peat decay. IPCC (2019) estimates it at 23 percent.

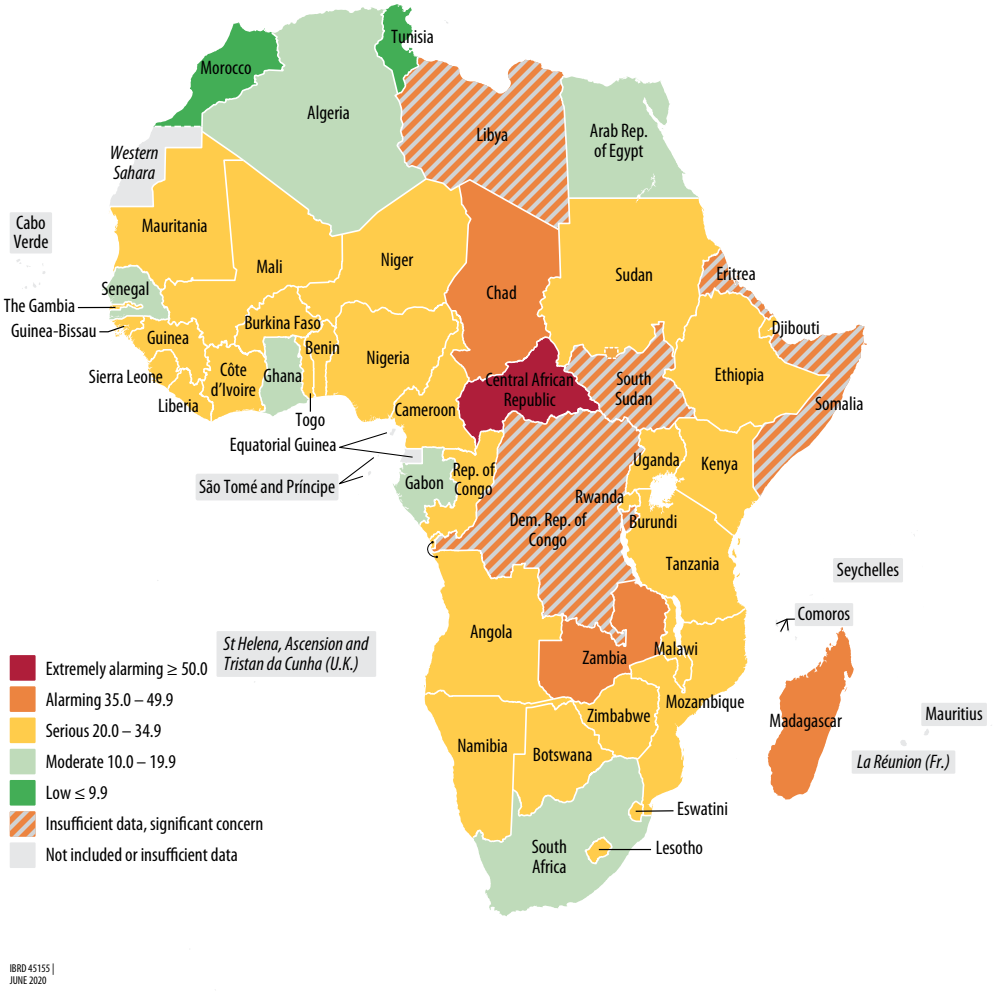
Globally, an estimated 23 percent of total anthropogenic GHG emissions (2007–16) derive from agriculture, forestry, and other land use (IPCC 2019). Other economic sectors such as electricity and heat production, industry and transport contribute 25 per cent, 21 per cent and 14 per cent, respectively, to direct GHG emissions (IPCC 2019, 11) (figure 4.1). Land use change, such as clearing forest to make way for farms, and rapid land use intensification have supported the increasing emissions. Additionally, 44 percent of recent human-driven methane, a potent GHG, has come from agriculture, peatland destruction, and other land-use activities between 2007 and 2016 (IPCC 2019). Land is also a powerful sink of CO_2 emissions. Despite increased deforestation and other land use changes, the world's lands are removing more emissions than they emit. Land removed a net 6 gigatons of CO_2 per year from 2007 to 2016 (IPCC 2019; Levin and Parson 2019).

While reducing carbon emissions continues to be a collective priority, food security and resilience of food systems and livelihoods in Sub-Saharan Africa must take precedence. Pro-poor mitigation strategies that allow countries to leapfrog to low carbon solutions and strategies must be inclusive and not undermine the urgent food security and development priorities of the region. The emergence of technologies and innovative synergies across these priorities must be pursued vigorously.

4.2 Climate Impacts, Malnutrition, and the Economic Context

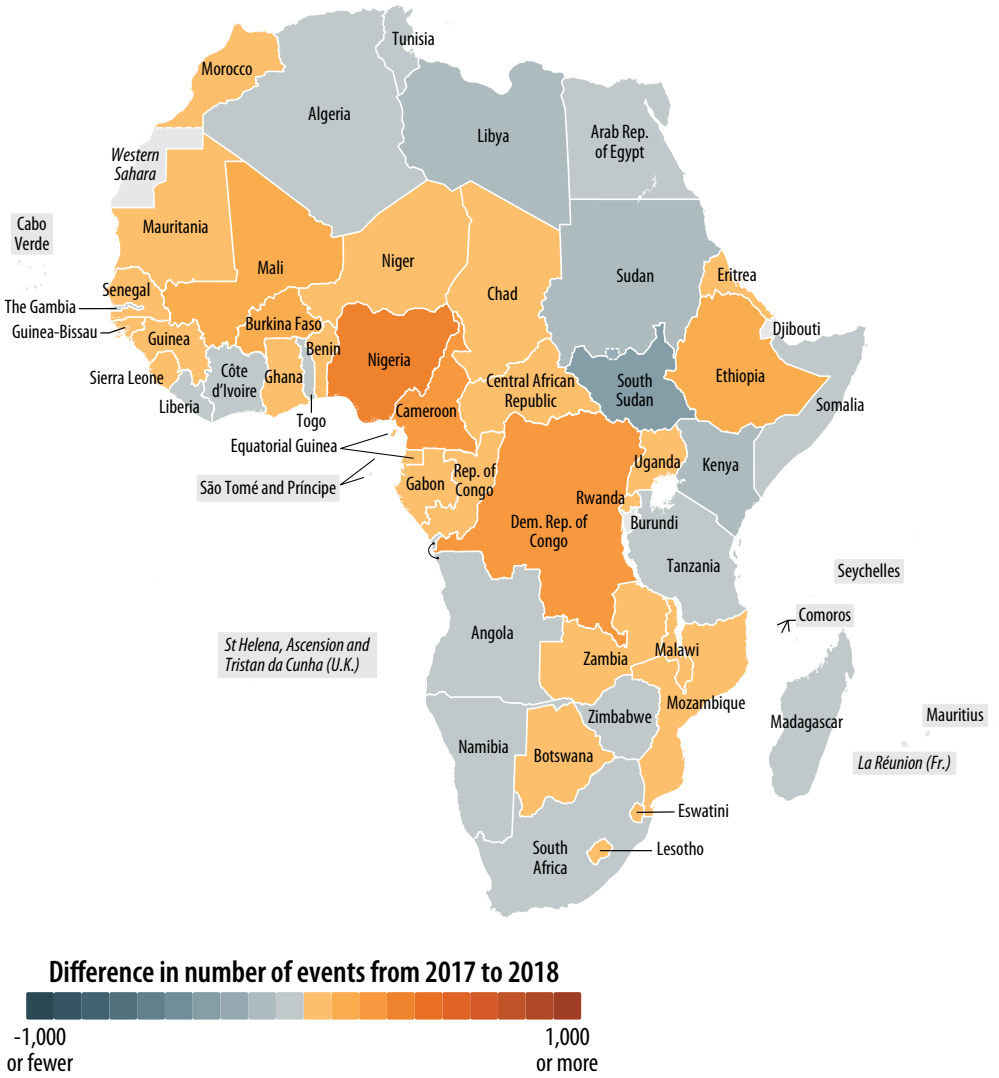
Climate, conflict, and economic slowdown have influenced recent trends in food security and nutrition (FAO/IFAD/UNICEF/WFP/WHO 2019). The proportion of undernourished children in Africa, and those suffering from moderate and severe stunting, is projected to increase with climate change, with the most significant increase of 31 percent to 55 percent for severe stunting. In Sub-Saharan Africa, the number of undernourished people increased by more than 23 million between 2015 and 2018, particularly in countries affected by conflict. The region has one of the highest 2019 Global Hunger Index (GHI) scores in the world at 28.4 (map 4.2), driven up by its undernourishment and child mortality rates, which are the highest of any region, at 22.3 percent and 7.5 percent, respectively. The convergence of areas with high GHI scores and violent events in 2018 (map 4.3) should raise concerns.

MAP 4.2 Global Hunger Index by severity, 2019



Source: 2019 Global Hunger Index Report

MAP 4.3 Countries experiencing more violence, 2018

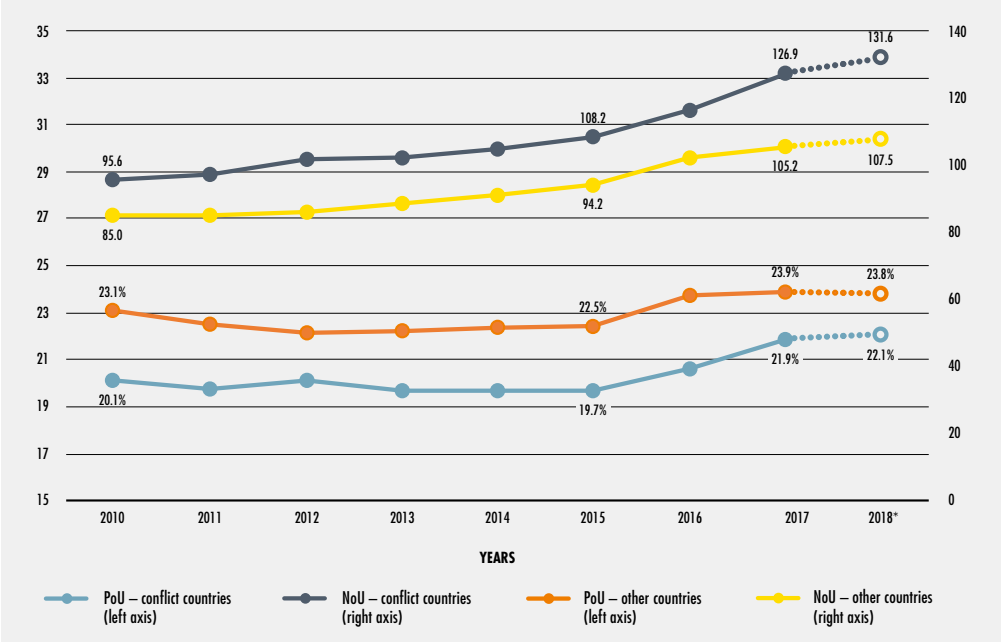


Source: ACLED 2019.

Poor nutrition is linked to multiple health challenges in the region exacerbated by the effects of climate change on food insecurity and production systems. Globally, consumption of foods that support health is suboptimal, and poor nutrition is the leading cause of disease and mortality (GBD 2017 Diet Collaborators 2019). In Sub-Saharan Africa, where 41 percent of adult women are overweight and 17 percent are obese (Development Initiatives 2018), there is a rapidly increasing prevalence of noncommunicable diseases, including cardiovascular diseases, diabetes, and cancers (GBD 2017 Diet Collaborators 2019). Those numbers are projected to increase as countries undergo epidemiologic and nutrition transition, the process linking dietary changes to wealth (Gouel and Guimbard 2018; Popkin 2015)[18] and as climate change impacts on food and nutrition insecurity intensifies (Jomaa and others 2017).

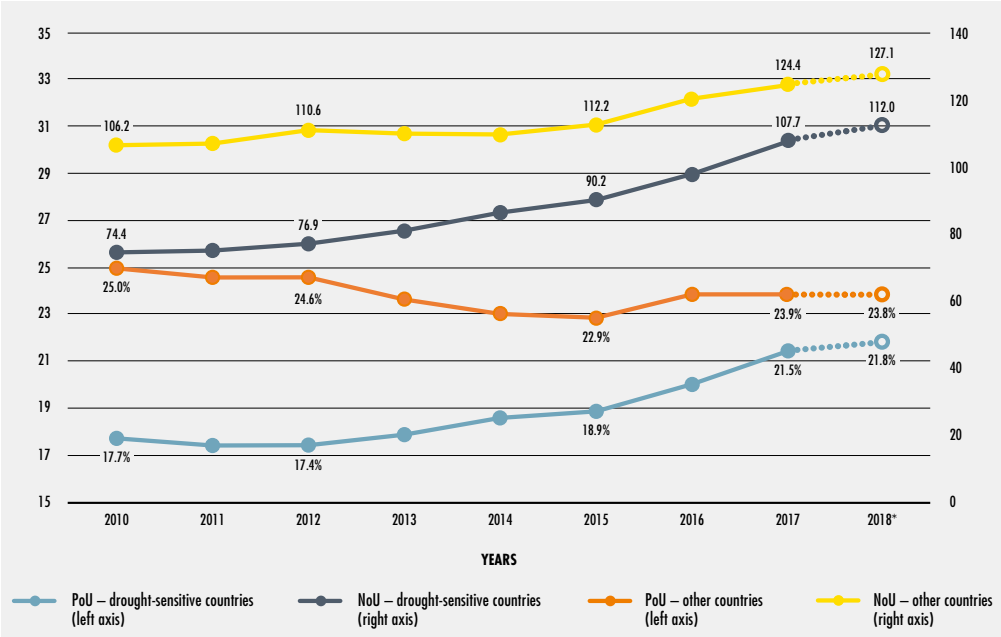
18 Nutrition transition is usually associated with rise in demand for calories associated with income growth; diversification of diets away from starchy staples; and a large increase in caloric demand for animal-based products, fats, and sweeteners. (Gouel and Guimbard 2018)

FIGURE 4.2 Undernourishment increase in Sub-Saharan African countries affected by conflict, 2010–18



Source: FAO and others 2019.
Note: NoU = numbers of undernourished; PoU = prevalence of undernourishment.

FIGURE 4.3 Droughts as a factor behind increase in undernourishment in Sub-Saharan Africa, 2010–18



Source: FAO and others 2019.
Note: NoU =numbers of undernourished; PoU = prevalence of undernourishment.

Slow onset climate factors, such as drought, compound malnutrition in conflict-ridden areas. In addition to direct physical and mental impacts, conflicts reduce economic activity and can result in widespread income and nutritional shocks (Corral 2020). The number of undernourished people in conflict-affected countries in Sub-Saharan Africa increased by 23.4 million between 2015 and 2018. This is a sharper increase compared with countries not exposed to conflicts. The prevalence of undernourishment in drought-sensitive countries in Sub-Saharan Africa has increased from 17.4 percent to 21.8 percent over the last six years (FAO/IFAD/UNICEF/WFP/WHO 2019) (figures 4.2 and 4.3). Armed conflicts and violence heighten vulnerabilities, including food insecurity and forced displacement (World Bank 2019).

Emerging evidence links undernourishment with economic slowdown or stagnation in the region. A report by FAO/IFAD/UNICEF/WFP/WHO (2019) projects that undernutrition will reduce GDP by up to 11 percent in Africa. Malnutrition has significant economic costs and intergenerational consequences (e.g., obesity, overweight- and weight-related diseases, stunted physical growth, chronic diseases) that impact human capital and economic productivity, affecting the region's development pathways.

The links between undernourishment and extent of poverty are compelling in the context of Sub-Saharan Africa, which accounted for 56 percent of the extreme poor in 2015 (FAO/IFAD/UNICEF/WFP/WHO 2019). This may be underpinned by other crucial factors related to the structure of food systems and the distribution and consumption of food.

Addressing land degradation constitutes an area of increasing importance in the context of SSA's food security and resilient rural economy. Over the past two centuries, soil organic carbon, an indicator of soil health, has seen an estimated 8 per cent loss globally from land conversion and unsustainable land management practices (IPBES 2018). Projections to 2050 predict further losses particularly in Sub-Saharan Africa linked to human-induced causes, including the expansion of agricultural land into natural areas, inappropriate land management, the draining and burning of peatlands (IPBES 2018), as well to poor policy incentives to take care of the land.

Climate change exacerbates the rate and magnitude of ongoing land degradation and desertification processes (IPCC 2019). Half of SSA's population, three-quarters of the poor, live in drylands that are particularly susceptible to land degradation, due, among others, to highly variable temperature and rainfall. Land degradation has already had a pronounced impact on ecosystem functions worldwide, including on the region's agricultural productivity and rural livelihoods. In turn, land degradation and desertification are also drivers of climate change through GHG emissions, reduced rates of carbon uptake, and reduced capacity of ecosystems to act as carbon sinks into the future.

4.3 Climate Change, Food Security and Multisectoral Collaboration

Food production, access, and distribution under a changing climate must consider the end-to-end range of impacts from farm to markets through effective multisectoral engagement across agriculture, environment, health, education, roads, social protection, planning, and economic policy stakeholders. For example, beyond exposure and impacts on crop, the provision of financial services to de-risk agriculture through insurance instruments; management of watersheds for more sustained supply of water; provision of genetic diversity to drive development of drought and heat tolerant varieties of crops; through to resilient and weather proof roads to secure food distribution and provision that can be undermined by

Box 4.1

Africa Food Security Leadership Dialogue on food security under climate change

The main outcome of the Africa Food Security Leadership Dialogue (AFSLD), held August 5–6, 2019, in Kigali, Rwanda, was to boost African food system's adaptation to climate change. The high-level inaugural event drew more than 260 participants from more than 34 African countries and 42 organizations. The core AFSLD partners—the Africa Union Commission (AUC), the World Bank, the Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD), and the African Development Bank (AfDB)—signed the Kigali Communiqué expressing commitment to act at three levels:

- **Technical.** Adapt Africa's agriculture by supporting sustainable food systems resilient to climate change shocks, provide healthy diets, reduce loss and waste, and protect the environment and natural resources; expand farmers' access to climate-smart technologies and formal markets; support investment in agribusiness; and build effective food systems.
- **Institutional.** Deepen collaboration with AU, regional economic communities (RECs), national governments, private sector, nonstate actors, and the science and knowledge communities to help harmonize approaches and outputs, reduce duplication, and increase impact at scale.
- **Policy.** Support AU member states to domesticate the Malabo Declaration and align national agricultural policies with climate change adaptation targets in their Nationally Determined Contributions (NDCs), and support climate-smart policies and programs for food and nutrition security.

Source: Africa Food Security Leadership Dialogue, http://www.africafoodsecurity.org/.

Box 4.2

Kenya's National Agricultural Insurance Program

The National Agricultural Insurance Program, a partnership between the government and the private sector, addresses challenges agricultural producers face when there are large production shocks, such as droughts and floods. It was developed with assistance from the World Bank Group and builds on the experience of similar programs in Mexico, India, and China. One program line is focused on livestock insurance, and another on maize and wheat insurance. (World Bank 2016)

With the Kenya Livestock Insurance Program, the government will purchase drought insurance from private insurance companies on behalf of vulnerable pastoralists. Satellite data are used to estimate the availability of pasture on the ground and trigger payouts to pastoralists when availability falls.

The Kenya Agricultural Insurance and Risk Management Program introduced an "area yield" approach. Farming areas are divided up into insurance units; if average production in one of the units falls below a threshold, all insured farmers in the unit receive a payout. This program will also help the Kenyan government reduce the financial burden of natural disasters. From 2005 to 2011, the government estimates that it spent on average more than K Sh 7 billion per year on disaster relief.

Source: https://www.worldbank.org/en/news/press-release/2016/03/12/kenyan-farmers-to-benefit-from-innovative-insurance-program.

climate extremes and the changing climate. Strong partnership can drive these collaborations to scale (box 4.1).

Innovative finance and insurance solutions are important to manage risks (box 4.2). Financial service providers addressing the sector consider climate risks. Based on government policy priorities, the Bank recommends a suite of investments and actions by the public sector to create an enabling environment for the private sector to enhance access to financial services for farmers and pastoralists. The focus is on the provision of public goods

and creating a conducive policy environment to provide finance to the sector (partial credit guarantee schemes, financial support for risk transfer).

Resilient rural mobility is an essential component of ensuring food security in Africa. Climate change is expected to have costly impacts on the unpaved roads that serve farming settlements and rural markets (Cervigni and others 2015). This in turn affects the cost of transporting produce to consumption centers and the affordability of food. Resilient transport infrastructure and logistical services in rural areas will be needed to counteract this trend under the effect of climate change in most African countries.

The ecological foundation of the world's food system is a crucial, cross-cutting factor determining food security (UNEP 2012). Ecosystem services vital to agriculture include soil formation and nutrient cycling, on-farm biodiversity, off-farm biodiversity, and climate conditions (UNEP 2012). Safeguarding the underlying ecological foundations that support food production is key to achieve food security and a resilient rural economy in Sub-Saharan Africa. Ecosystems stability and water security are crucial for the resilience of the broader landscape, including the management of watersheds in agricultural areas and the provision of genetic diversity through wild relatives that may drive development of drought- and heat-tolerant crop varieties. Ecosystem stability plays a crucial role on atmospheric- and land-based water cycles and should be considered in the region's response to climate impacts.

4.4 Priority Action Areas

Food security must outpace risks posed by climate change and demographic growth, and inadvertent conflicts and crises. Action must focus on ensuring long-term sustainability and proactivity to climate extremes, disruptions in food supplies, impacts on households and rural communities as well as urban markers.

I Enhance On-Farm and Productive Landscape Solutions

Raise smallholder agricultural productivity and incomes by strengthening the coping and adaptive capacity of all key stakeholders (including women and youth) through climate-smart agriculture with a strong push for resilience at scale for households.

Climate-smart agriculture. Build and consolidate support to climate-smart agriculture practices through the development and implementation of Climate-smart agriculture Investment Plans (CSAIPs) with a contextualized focus at the local level on:

- Climate-smart soil and water management, including a focus on degraded areas.
- Improved access to production technologies and inputs.
- Crop and livestock diversification and "climate-ready" species, cultivars, and breeds.
- Payment for results (e.g., results-based financing, payment for ecosystem services), to bring climate-smart agriculture interventions to scale.
- Monitoring and managing new trends in pests and diseases.
- Diversified employment opportunities to counter climate sensitivities (e.g., value added processes).
- Vocational skills development and competency-based training along value chains for agricultural transformation, capturing mitigation opportunities.
- Solutions focused on pro-poor mitigation, such as solar-powered irrigation pumps, soil conservation and tillage practices, and off-grid, solar-powered agricultural appliances suitable for smallholder farmers.

It is vital for the Climate Plan to mobilize the resource gap to address the region's land degradation as a key driver of vulnerability for rural livelihoods (e.g. by strengthening water management, reducing deforestation, providing policy incentives/ strengthening policy context) which is being amplified by climate change.

Social protection programs. These include economic inclusion interventions (cash transfers to poor and vulnerable people with a package of an asset grant, entrepreneurship training, life skills coaching, and access to savings accounts) to produce sustainable improvements in livelihoods before a shock hits (e.g., droughts or floods) instead of providing humanitarian assistance afterward (Venton and others 2012).

Shock-responsive safety nets (e.g., provision of temporary cash transfers to the poorest and most vulnerable households) can help to avoid negative coping mechanisms. Enabling lower cost flow of remittances to alleviate the impacts of climate shocks—as well as crisis and disaster risk financing strategies to enable rapid response to shocks and protect development gains—can be instrumental.

II Implement Food Value Chain Solutions

This action area focuses on an end-to-end value chain perspective, effectively connecting smallholders to agricultural value chains while addressing the rising urban demand for higher-value and more processed agricultural products amid a changing climate. It involves actions to strengthen the following aspects of the agriculture value chain, such as value addition, aggregation, and certification of agriculture products; financial instruments to leverage the private sector participation; and e-commerce logistic approaches to agricultural commercialization, market access, and trade; and ICT-empowered market information systems to facilitate regional trade.

Private sector. It is pivotal to ensure service delivery, risk management, and mobilization of capital, and plays a key role in bringing to scale the proven dimensions of food security-related initiatives and climate change strategies through the following:

- **Targeted financing for farmers as an enabler of investment in their farms' credit and savings, which in turn can drive productivity, yields, farmer income, and GDP. Extending access to credit and savings to farmers is needed for ensuring food security, modernizing the agricultural sector, and boosting agricultural GDP.**
- **Rolling out innovative insurance products to reduce the risk of farmers, and to de-risk the sector and incentivize farmers to invest, including investment on adaptation and mitigation solutions.**
- **Expanding access to finance through digital financial inclusion and supporting a financial sector that is more open to innovation.**

III Secure Enabling Solutions

This component focused on strengthening climate-smart agriculture in the macro-economic context through policy interventions and increased investment in agricultural public goods, financing innovation and digital technology to foster game-changing solutions.

Policy interventions need to be looked at from a macro fiscal and planning perspective to support incentives (policies and regulations) needed to change farmers' behavior; create an enabling environment for effective climate action; provide key public goods; and provide

protection to the poorest and most vulnerable populations. This involves increasing public investment key enabling areas that play a key role in climate change adaptation in vulnerable areas (Beegle and Christiaensen 2019):

- Agricultural research and extension
- Agricultural irrigation
- Rural infrastructure

Finance innovations are key to unlock and foster agrifood and agribusiness development and employment generation across the agriculture value chain. They also provide low-cost financial services, including payments, credit, savings, and insurance, to de-risk key sectors (agriculture) and stimulate investment to boost productivity. Other benefits include incentives to financial service providers to expand services (e.g., results-based financing, payment for ecosystem services) to bring climate-smart agriculture interventions to scale.

Digital technology is the widespread adoption of these technologies to provide new opportunities for innovative approaches and solutions to the region's food security challenges and economic transition. Disruptive agricultural technology (DAT) firms (e.g., in Kenya and Nigeria) are operating in advanced agritech ecosystems, with innovations contributing to market transparency, enhancing on-farm productivity, enabling efficient logistics (Choi, Dutz, and Usman 2019), strengthening risk information with the increased availability, and accessibility of satellite data and big data—all of which are also helping to provide opportunities to marginalized groups (Choi, Dutz, and Usman 2019, 125).

4.5 Targets and Indicators

The priority action areas identified for this Strategic Direction will support delivery of corporate and IDA targets as set out in table 4.1 through the portfolio of Bank investments. **Tier 1 targets** correspond to existing IDA19 (FY21–23) and Corporate climate commitments to 2025; and **Tier 2 targets** correspond to complementary contributions that deepen the engagement on food security, as proposed by the GPs.

The Theory of Change for this Strategic Direction presents a mapping of the pathways of change toward the achievement of expected impacts on food security and a resilient rural economy, and the Climate Plan's goal (figure 4.4). This Theory of Change constitutes a live pathway that provides a snapshot of the broader vision of the Strategic Direction and may be adjusted as needed throughout the Climate Plan implementation.

> "Today, our deepening challenge of food insecurity is compounded by the impact of climate change, water scarcity, declining agricultural productivity, and conflicts. The COVID-19 pandemic and an unprecedented locust outbreak in East Africa have further disrupted food supply chains, intensifying the problem. Through the Next Generation Africa Climate Business Plan, the World Bank is helping rural communities, including smallholder farmers and pastoralists, to increase their resilience to current and future shocks, promoting more durable food systems and protecting human health."
>
> ***– Simeon Ehui, Regional Director, Sustainable Development, Africa Region***

TABLE 4.1 Food Security and a Resilient Rural Economy Strategic Direction: Aligning targets with corporate commitments

Targets Sub-Saharan Africa	Targets World Bank
Core Tier 1	
▶ **28 million farmers have adopted climates mart agriculture practices** ▶ **Improved pastoral systems in place in 15 countries.** ▶ **Number farmers with access to improved agricultural services (integrated weather and market information, financial services including savings, credit, payment, insurance)** ▶ **New climate-smart policies and programs implemented for food and nutrition security in 20 countries**	▶ **10 million farmers in 20 countries with climate-smart agriculture** (*Corporate FY25 target*)**.** ▶ **Improve livelihoods of 10M farmers through climate-smart agriculture** (*Africa regional FY23 target*)
Tier 2 (*supplementary targets proposed by the Agriculture GP for Sub-Saharan Africa*)	
▶ **Improvement in capacity to implement CSA policies in 20 countries** ▶ **Integration of CSA into regional agricultural policies across Africa** ▶ **Strengthening of evidence base for CSA policies in 20 countries** ▶ **Adoption of improved CSA policies in at least five countries** ▶ **3.5 million hectares of farmland with CSA-compatible infrastructure and practices.**	

Buying coffee at the market in Bahir Dar, Ethiopia. *Oscar Espinosa / Shutterstock*

FIGURE 4.4 Theory of Change: Food Security and a Resilient Rural Economy

NG-ACBP IMPACT	This Theory of Change focuses on the broader vision of the NG-ACBP's Strategic Direction (SD) on 'Food Security and a Resilient Rural Economy', underpinned by climate informed macro-policies and green and resilient infrastructure. The ToC constitutes a live map and may be adjusted throughout the NG-ACBP's implementation.					
	Strengthen Africa's development pathway towards a climate-smart and secure future by engendering leap-frogging and transformation at scale through the Bank's financial and technical leverage.					
	SPECIAL AREAS OF EMPHASIS: *Climate informed macro policies, Green and resilient infrastructure*					
STRATEGIC DIRECTION IMPACT	*Ensuring that Sub-Saharan Africa's population is food and nutritionally secure and the rural economy resilient in the face of climate risks and opportunities.*					
OUTCOMES (Priority Action Areas)	**ON-FARM AND PRODUCTIVE LANDSCAPE SOLUTIONS**		**FOOD-VALUE CHAIN SOLUTIONS**		**ENABLING SOLUTIONS**	
	Increased smallholder agricultural productivity	Increased income of the rural poor	End-to-end food delivery systems operational	Food access secured	Strengthened macro-economic policy and planning for CSA	Secured financing and leap-frogging solutions
OUTPUTS	▶ Context-specific CSA implemented. ▶ Inclusive, and gender sensitive interventions established. ▶ Targeted safety net programs established to counter climate risks		▶ Market-based approaches that connect smallholders to agricultural value chains implemented. ▶ Uncertainty on food access to rural poor addressed. ▶ Rising urban demand for higher value and more processed agricultural products addressed.		▶ Policy interventions for CSA implemented. ▶ Financing innovations operational. ▶ Digital technology to foster game-changing solutions implemented.	
ACTIVITIES	▶ Implementation of climate-smart soil and water management, including focus on degraded areas. ▶ Diversification of crop and livestock and use of "climate-ready" species, cultivars, and breeds ▶ Provision of access to production technologies and inputs ▶ Monitoring and managing of new trends in pests and diseases		▶ Implementation of measures towards value addition, aggregation, and certification, ▶ Preparation of financial instruments to leverage the private sector participation and e-commerce ▶ Implementation of ICT-empowered market information systems to facilitate regional trade. ▶ Reduction of post-harvest losses and consumer wastage		▶ Development/improvement of monitoring capacity and EW tools to track farming systems and climatic impacts to better align policies ▶ Provision of/expansion of inclusive financial services through mobile technology and FinTech innovation; ▶ Strengthen risk information with the increased availability, accessibility and accuracy of satellite data and Big Data technologies ▶ Development of inclusive, and innovative knowledge management systems	
PROBLEM STATEMENT	▶ Food insecurity in SSA has increased since 2014 and puts at risk the delivery of the SDG goal for zero hunger. SSA's share of severe food insecure people reached 277 million in 2018 -22% of the population	▶ Agriculture employs 54% of the work force. Low productivity, low efficiency, and policy weaknesses prevail and undermine the rural economy, while amplifying food security for both rural and urban populations.	▶ Half of SSA's population and three quarters of the poor live in drylands that are particularly susceptible to land degradation and desertification, processes that are being amplified by climate change. Action to strengthen soil and water management, reduce deforestation, and provide policy incentives to strengthen the (local) policy context is needed.	▶ Climate change will adversely impact crop yields, crop and livestock viabilities and nutritional quality of agricultural produce, and disrupt food systems at large.	▶ Climate change impacts on the agriculture will continue to intensify, through increased fragility and conflict, with inter-generational consequences.	

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Environmental Stability

OUTCOMES

- **Natural capital, macro and sectoral policy:** Land uses that decrease stress to ecosystems and hydrological systems and increase their resilience to climate risks.
- **Landscapes, seascapes and watersheds:** Enhanced management of landscapes, seascapes, and watersheds that increase ecosystems resilience and carbon sequestration; and contributes to socio-economic resilience.
- **Water security:** Strengthened water security to meet increasing and competing demand in the face of climatic uncertainty

SCOPE OF OUTPUTS

- Regulatory policies, incentives, and institutional strengthening that help shape land-use change and decrease stress to ecosystems and hydrological systems supported.
- Drivers of ecosystem degradation addressed, including through nature-based solutions.
- Adaptive capacity to secure resilient livelihoods increased.
- Integrated planning and water resource management at the policy, programmatic and project levels, considering water demand and climate impacts, improved.

A fishing boat sails in Santo Antao.

Van Leggelo / World Bank

CHAPTER 5
Strategic Direction II: Ecosystem Stability and Water Security

5.1 Ecosystems of Africa

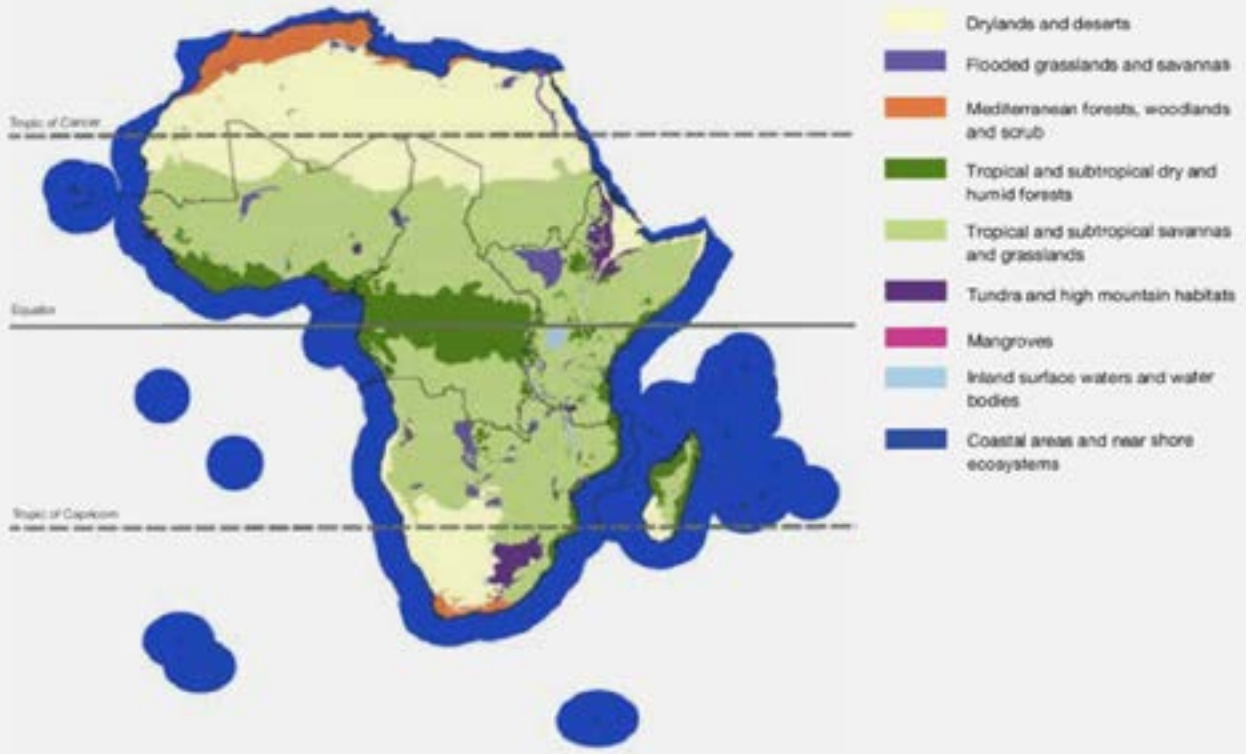
Nature and the biosphere are fundamental to the well-being of humans. Ecosystems, including hydrological systems, deliver critical goods and services, including food and freshwater, and convey intrinsic values of stability, security and sustainability to both natural and social systems. Africa is home to a variety of ecosystems (map 5.1). It is rich in biodiversity and natural capital, and there is a great amount of valuable indigenous and local knowledge of these systems (IPBES 2018). These ecosystem services provide subsistence to millions of people in Africa – particularly in rural areas – and support rural and national economies. The Bank's Changing Wealth of Nations estimates Africa's natural capital to be US$9,225 per capita—more than US$8 trillion in total (Lange, Wodon, and 2018).

Ecosystems in Africa are diverse and rich in biodiversity. Forests and woodlands comprise 23 percent of Africa's total land area (IPBES 2018). Savannahs and grasslands also cover 350 million hectares. Rivers and lakes are found all over the continent, with major human settlements around them. Six large marine ecosystems surround Africa; three of these rank within the four most productive large marine ecosystems in the world (IPBES 2018). Africa's biodiverse ecosystems are a product of interactions with, and adaptation to, an ever-changing environment. They provide an untapped genetic reservoir for crop improvement, medicinal technology, and other applications. This diversity makes food systems resilient to shocks and stresses such as drought and climate change, and it can help with food security.

Africa's ecosystems are increasingly at risk from climate change and other serious challenges. Approximately 14 percent (4 million square kilometers) of the total land area of Africa is protected, including 6 percent of biodiversity-rich tropical evergreen broadleaf forests. These valuable ecoregions, rich in endemic species, are concentrated in such countries as the Democratic Republic of the Congo and Madagascar, where adequate protection is needed (Raven 2000). Some 20 percent of Africa's land surface (6.6 million square kilometers) is estimated to be degraded because of soil erosion, salinization, pollution, and loss of vegetation or soil fertility. This is a result of factors including deforestation, unsustainable agriculture, overgrazing, uncontrolled mining activities, invasive alien species, and, increasingly, climate change. Climate change could result in significant losses of African plant species—over 50 percent of some bird and mammal species—and in the decline of the productivity of Africa's lakes by between 20 percent and 30 percent by 2100 (IPBES 2018). Further, prevention of future epidemics and pandemics has critical links to preventing degradation of habitats and conserving wildlife.

MAP 5.1 African subregions and ecosystem units

Africa comprises five subregions under different climatic conditions: a Mediterranean climate at the northernmost and southernmost fringes; an equatorial and tropical climate characterized by high mean rainfall in Central Africa and across the southern part of West Africa; climates ranging from hyper-arid to semi-arid, with very sparse or no rainfall, in a great part of North Africa and West Africa, and also part of Southern Africa; and a subtropical climate in East Africa and adjacent islands and a great part of Southern Africa. These climatic variations have contributed towards a wide range, and significant richness, of biodiversity at the ecosystem, species and genetic levels. Source: Map layers adapted from Olson *et al.* (2001).[5]



Source: IPBES 2018.

Africa's ecosystem units and hydrological systems are integrally linked and with the climate at local, regional, and global scales; changes in one aspect or area can have cascading impacts in others. The cycling of nutrients, carbon, and water within certain ecosystem units does not occur in isolation from regional or even global patterns. Processes such as afforestation and deforestation in forest ecosystems, for example, bring about changes in the carbon and nutrient cycle, which can lead to declines or increases in rainfall in other areas—a change in the water cycle. At the global scale, the changing climate interacts with ecosystems throughout Africa—with their unique capacities for carbon sequestration—and moisture transport across the Atlantic from South America to Southern Africa (Ramos and others 2018). Complex natural and ecological systems are susceptible to change and collapse through human-induced and other disturbances. Recognizing the linkages between ecosystem units is a first step toward successful conservation and continued provision of ecosystem services, including supporting livelihoods.

5.2 Water Security in Africa

Water is one of the primary channels through which climate change impacts are experienced. Extreme precipitation changes—droughts along with extreme rainfall days—have been observed over much of Sub-Saharan Africa, and these trends are projected to continue with regional variations (Niang and others 2014). The large number of droughts in the Sahel during the 1970s and 1980s is well-documented and understood (Niang and others 2014). Projections suggest an increase in extreme rainfall days over West Africa and the Sahel and more intense and frequent occurrences of extreme rainfall over the Guinea Highlands and Cameroon Mountains. In eastern Africa, precipitation shows a high degree of temporal and spatial variability dominated by a variety of physical processes. Over the last three decades, rainfall has decreased over eastern Africa, and monsoonal precipitation has declined throughout much of the Great Horn of Africa over the last 60 years (Niang and others 2014).

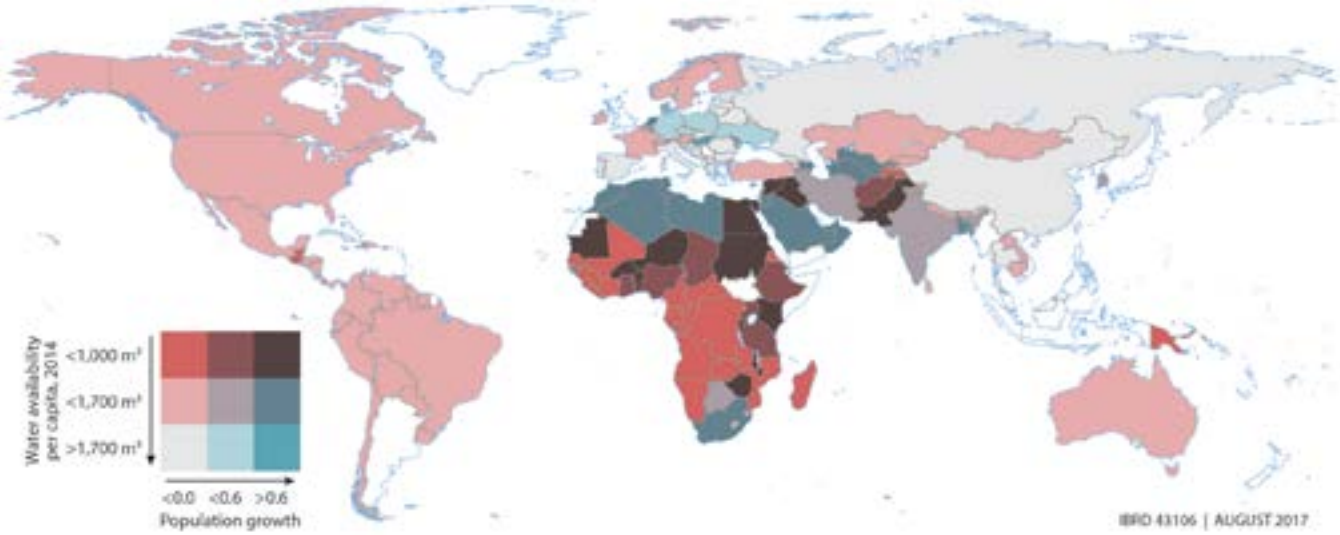
Projections indicate there may be some reversal of these trends in eastern Africa, but there is likely to be high spatial variability. Regional climate model studies suggest drying over most parts of Kenya, South Sudan, and Uganda in August and September by the end of the 21st century (Niang and others 2014). Over southern Africa a reduction of summer precipitation has been reported over its western parts, while modest downward trends in rainfall are found in Botswana, western South Africa, and Zimbabwe. Apart from changes in total or mean summer rainfall, certain intraseasonal characteristics of seasonal rainfall have also changed throughout the region (Niang and others 2014).

Water availability and water quality in Sub-Saharan Africa are increasingly at risk, amplifying stresses on people, ecosystems, and economies. Freshwater resources are stressed throughout the region due to agricultural, industrial, and domestic consumption. Per capita water availability has declined from 5,790 cubic meters in 2002 to 4,019 cubic meters 2014.[19] Future water availability under a changing climate is projected to decrease in most parts of Africa (map 5.2), accentuated by population increase. The Sahel has experienced long-term declines in the density of trees and shrubs as a result of drought stress (Niang and others 2014). Only 61 percent of people in Sub-Saharan Africa have access to at least a basic level of drinking water. Rainfed agriculture, which is practiced in more than 90 percent of the region, is increasingly impacted by the changing precipitation patterns. Less than 4 percent of arable land is irrigated, making Africa extremely vulnerable to rainfall-related shocks (Damania and others 2017). Water quality is particularly affected by agricultural activities due to nutrient runoff, which can devastate ecosystems through eutrophication, where the latter has negative impacts on the economy through impacts on fisheries—and even human health—due to consumption of eutrophic water (Damania and others 2017). Map 5.3 shows water scarcity and water pollution globally. Existing poor management of water resources now faces additional challenges of ensuring reliable and timely water supply in the face of climate change.

Robust and reliable climate information systems are critical to understand and manage current and future climate vulnerabilities and risks associated with the hydrologic cycle to strengthen and secure water security. Understanding the likely future characteristics of climate risk is a key component of adaptation and climate-resilient planning, especially when this involves large investments, long lifetimes, trade-offs, and irreversibility (UMFULA 2019). Some 54 percent of the continent's surface weather stations and 71 percent of its upper air weather stations (where sensors are released into the atmosphere through balloons) are unable to capture accurate data, due in a large part to negligence over the years and the lack of investment in upgrades to the infrastructure (Waruru 2018). The inherent uncertainty

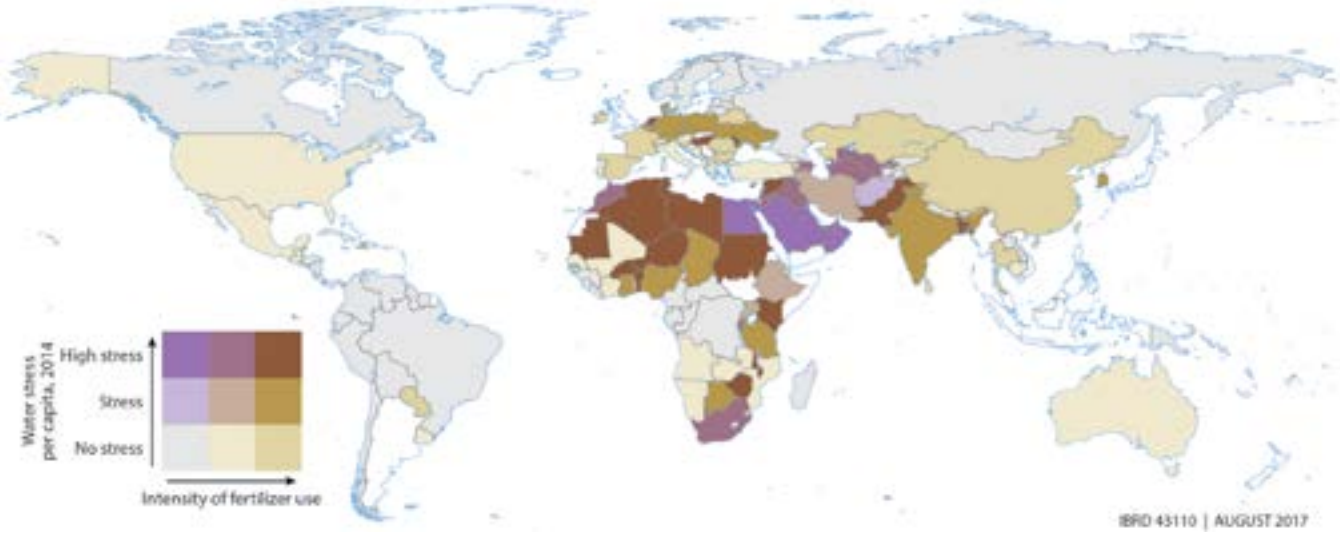
19 See the FAO AQUASTAT data, taken from the World Bank's WDI database, https://datacatalog.worldbank.org/dataset/world-development-indicators, Accessed April 14, 2020.

MAP 5.2 Projected per capita water availability and future population growth, 2050



Source: Damania and others 2017.

MAP 5.3 Water scarcity and water pollution, 2014-2015



Source: Damania and others 2017.

and lack of observational data due to a dearth of weather stations in most of Africa (except South Africa) places a challenge on evaluation climate models for future climate projects. Increasingly, scientists place a high premium to participatory, bottom-up inclusive engagement to understand the local context and characteristics (James and others 2018).

5.3 Critical Ecosystem and Hydrological Services, Economic Growth, and Jobs

Protection of ecosystems and hydrological systems increases their resilience, secures provisioning of services, helps modulate climate extremes such as floods and droughts, and—importantly—contributes to climate change mitigation as carbon sinks. Forests, trees, and other undisturbed vegetation provide protection against erosion from rain, wind, and coastal waves and prevent downstream sedimentation (Miura and others 2015). They contribute to the preservation of good soil structure and maintenance of robust biological activity (Miura and others 2015). Forests and wetlands in catchments decrease the risk of flooding in urban areas (see chapter 7). They also influence hydrology through the control of surface and groundwater flows and improve water quality (Miura and others 2015). As described previously, changes in vegetation impact rainfall patterns at regional and global scales.

Healthy ecosystems also enhance carbon stocks and sequester carbon which make them critical in climate change mitigation. As described, Sub-Saharan Africa is highly vulnerable to climate impacts and adapt to these changing conditions. Protecting the region's ecosystems will increase resilience but has the additional benefit of decreasing GHG emissions and mitigating climate change. Drylands, which cover 45 percent of the region, play a critical role in carbon sequestration.

These ecosystems provide critical services for subsistence to millions of people, especially in the rural areas of Africa, contributing to rural and national economies.[20] Safeguarding the productive aspects of ecosystems and hydrological systems is crucial to secure water and food security. The resilience and sustainability of these systems underpin economies at large, as well as lives and livelihoods beyond their own immediate boundaries. Food and agricultural systems are dependent upon the productive aspects of nature including rainfall and the water cycle, pollinators, and soil nutrients. Rainfed agriculture prevails on 96 percent of the total cropland (World Bank 2010). Nearly 400 million people in the region depend on forests and woodlands for their livelihoods and 65 percent of poor working adults made a living through agriculture in 2016 (Castañeda and others 2016).[21] The direct contribution of marine and coastal resources to the African economy is significant, contributing more than 35 percent of GDP in some regions.

Ecosystem services as part of adaptation and mitigation strategies, add value to jobs and countries' economies, while helping address gender gaps. The contribution of natural ecosystems to countries' economies through jobs, tourism, and mainstream sectors is significant. The value added of agriculture, forestry, and fishing sectors in Sub-Saharan Africa is about US$290 billion, or 16 percent of GDP.[22] Employment in agriculture is 54 percent of total employment, although there is significant variation between countries. It is at higher levels in countries such as Burkina Faso and Burundi and at lower levels in Gabon and South Africa.[23] Fisheries and aquaculture directly contribute US$24 billion to the African economy, representing 1.3 percent of the total GDP in 2011 (de Graaf and Garibaldi 2014). The sector provides employment to an estimated 6.4 million to 25.5 million people (World Bank 2019). In the fisheries sector, fishing jobs are almost entirely taken by men, but 59 percent of the

20 World Bank staff estimates based on the UN Population Division's World Urbanization Prospects: 2018 revision. See "Rural population (% of total population) - Sub-Saharan Africa," https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?end=2018&locations=ZG&start=1960&view=chart.

21 See the UNEP

22 2018 value; World Bank national accounts data, and OECD National Accounts data files taken from the WDI database at data.worldbank.org.

23 ILOSTAT database taken from WDI database at data.worldbank.org.

processing work is done by women (de Graaf and Garibaldi 2014). These jobs have value additions along the supply chain that can drive economies. For example, for every fisherman job, 1.04 additional onshore jobs are created in Mauritania, while this ratio reaches 3.15 in Guinea (World Bank n.d.).

Ecosystem and hydrological integrity are essential for critical services including for livelihoods, jobs, energy, potable water, and other services to communities and economies. These other services include nature-based tourism, which is a key source of revenue and livelihoods and is dependent on the aesthetic quality of nature. The health and sustainability of ecosystems that surround urban areas is also important for their water supply. Ecosystems help the economy through energy security: hydropower is a key energy source in eastern and southern Africa. Ninety percent of national electricity generation in Ethiopia, Malawi, Mozambique, Namibia, and Zambia comes from hydropower (Conway 2017). Hydropower is highly dependent on sufficient water supply and successful water resources management. The role of natural areas in providing catchment for stable and cheap drinking water cannot be overemphasized: almost a third of the 100 largest cities have proximate natural areas that provide this service (Elmqvist and others 2013).

5.4 Climate Change Impacts on Tipping Points, Human Security, and Migration

Severe and repeated stresses could push ecosystems to tipping points beyond which they are unable to recover, thereby threatening food, water, energy, and human security. Tipping points in ecological systems are thresholds beyond which these systems shift abruptly and fundamentally change with the possibility of irreversibility (Dakos and others 2019). The Sahel is indicated as one at global average surface temperature exceeding 3°C (Steffen and others 2018), which could in turn further escalate food, water, environmental and human security. These tipping points grow increasingly imminent in the face of failing global action to plateau our GHG emission pathways. As warming increases, severe climate impacts combined with other anthropogenic stressors can be expected to trigger impact cascades crossing critical thresholds of environmental systems. Precisely where a potential planetary threshold might be is uncertain, but scientists warn that a 2°C warming could activate important tipping elements, raising the temperature further to activate other tipping elements in a domino-like cascade that could take the Earth system to even higher temperatures (Hoegh-Guldberg and others 2018; Steffen and others 2018).

Climate change, compounded by other factors, is putting at risk the foundational and economic contributions of these ecosystems and hydrological systems. For example, in the Chari-Logone subbasin (the Central African Republic, Chad, and Cameroon), uncontrolled development of large-scale irrigation and changes in precipitation could trigger the shrinking of Lake Chard and lead to increased vulnerability of pastoralists to droughts and exacerbate conflict due to food and water insecurity (Vivekananda and others 2019). Demographic pressures and urbanization have led to increased anthropogenic land use change, causing fragmentation and reduction of habitat and vegetated areas, increased risk of overextraction from lakes and rivers, groundwater depletion, increased sedimentation and pollution of water bodies, and degradation of coastal areas (IPCC 2014). These have impacts on livelihoods, economies, and even human security. Activities such as deforestation has led to increased erosion, less aquifer recharge, and more violent runoff, which in turn leads to loss of livelihood activities, including from loss of arable land.

Escalating impacts of climate change are adding to stresses and leading to long-range changes in ecosystems' productivity and compositions, undermining and putting at risk their stability (IPCC 2014). The changing productivity of ecosystems, for example of drylands that are increasingly exposed to water stress and drought, increase climate sensitivity of pastoral livelihoods. Water is one of the primary channels through which climate change impacts are experienced. Africa is particularly variable in water availability and reliability for agricultural production, and this is exacerbated by climate change. For example, drylands, which hold 70 percent of the region's cropland and 82 percent of livestock holdings, experience frequent and severe shocks, especially recurring droughts (Cervigni and Morris 2016). Agricultural resilience to climate change is very low and water is poorly managed. Demographic pressures and conflict, as well as these climate shocks, limit the livelihood opportunities of poor households and undermine efforts to eradicate poverty.

Climate change effects of rising carbon dioxide concentrations and temperature have implications for geographic range of plant and animal species, with far-reaching ecological and development implications. In this spatial change, ecosystem types can be converted. For example, when woody trees receive a competitive advantage over grasses there are land cover transitions, such as grassland to savannah and savannah to forest, with implications on pastoral livelihoods in Africa (World Bank 2013). Total carbon sequestration capacity and rainfall are affected in such transitions depending on the balance of the net change. Such shifts will have direct consequences on current and future livelihoods as well as economic opportunities.

Climate stress on the ecology and hydrology of ecosystems can undermine their viability and challenge livelihoods of communities, leading to increased migration. Shifting productivity of drylands due to droughts and water stress are already challenging pastoral livelihoods and migration routes (Cervigni and Morris 2016). Increasing water stress and sea level rise, compounded by storm surge, decreases ecosystems' viability to support or sustain livelihoods and can lead to increased migration in the coming decades (Rigaud and others 2018). Similarly, decreases in maximum catch potential of marine fisheries pose a threat to livelihoods in coastal areas, especially in the Horn of Africa and West Africa (World Bank 2019).

Water point at Boa Esperança (Good Hope) Primary School in Quinhamel, Guibea-Bissau where a schoolboy drinks water.

Arne Hoel; Visions of Africa

Nigeria is especially vulnerable due to its population in coastal areas, number of fishers, and people involved in the fishery-related sector.

The potential for climate impacts to intensify feedback loops associated with ecosystem stresses that could increase vulnerability associated with livelihoods could have widespread impacts in Africa. For example, decreased rainfall associated with forest loss can contribute to loss in agricultural benefits. Climate change contribution to drought will exacerbate forest loss and further intensify that feedback loop. For example, modeling studies have associated forest loss in the Congo Basin with reduced rainfall and local increase in temperature of the deforested areas (Bell and others 2015). Similarly, ocean acidification and heat anomalies could impact the economies of countries where fisheries are important, such as in West and Central Africa. Fishing communities could face dire challenges to their livelihoods compounded by sea level rise and storm surges (World Bank 2019).

Climate impacts on water resources can affect energy security. Hydropower is susceptible to precipitation changes and warming. Southern Africa could see challenges with hydroelectric power due to reduced stream flow in the Zambezi River Basin associated with increased evaporation and transpiration rates from temperature rise. Ecosystems generally adapt to stresses and shocks and often bounce back into health, except when tipping points are exceeded, leading to irreversibly consequences. This will have implications for food and water security and even energy security through hydropower; all these compound human security and conflict.

5.5 Strengthening Ecosystem Stability and Water Security

The unequivocal contribution of ecosystems and associated hydrological systems as global public goods is the first line of defense to current and future climate impacts and calls for urgent and concerted action as a moral imperative. There is a need to secure both the productive and protective aspects of ecosystems and water systems to secure development in the face of land use and demographic changes, as well as climate change, which is putting additional stresses and shocks in the system. These concerns stem not only from the loss of biodiversity but also changes in the structure and functioning of ecosystems in the context of climate change; for example, changes in pollination can negatively impact crop yields. Changes from climate and other vulnerabilities along the hydrologic cycle and hydrographic boundaries can have cascading impacts on food and agricultural systems. Better land management is needed to tackle climate change, raising urgency about the need for more collective action to ensure the world's forests, farms, and other landscapes are protected and developed in a sustainable way (Levin and Parsons 2019). A multisectoral approach is required for the protection and management of ecosystems and watersheds to prevent degradation while increasing the resilience of dependent communities. All these measures need to assess risks, hazards, and exposures to climate change and other stresses. This is fundamental for delivering on resilience—of people and ecosystems—and livelihood security as well as countering distress-driven migration.

There is a wealth of indigenous and local knowledge of ecological systems and their management. The multisectoral approach described previously should strive for bottom-up inclusive approaches to generate solutions. The genetic diversity of ecosystems in Africa has made food systems resilient to shocks and stresses such as climate change. This is a result of years of breeding of crop and livelihood varieties from their wild relatives by subsistence farmers and small-scale herders (IPBES 2018). Conservation and natural resource management

must use this knowledge, along with the involvement of local and indigenous communities, to complement formal scientific knowledge and methods (IPBES 2018). The co-production of knowledge by researchers and communities contributes to societal and institutional capacity to factor climate risks into long-term planning (UMFULA 2019).

It is important to ensure protection of landscapes, watersheds, and seascapes. Keeping these systems healthy will increase their stability and resilience while delivering both near- and long-term productive services and goods to people and the economies at large. The Africa Forest Landscapes Program active in 17 country programs is harnessing a range of instruments and financing including through performance-based payments for reducing emissions from deforestation and forest degradation (REDD+) and enhanced carbon stocks (World Bank 2010). An emphasis on landscapes and integrated watershed management is critical for building resilience across Africa. Water is a primary channel through which the impacts of climate change are experienced; thus, managing climate vulnerabilities along the hydrologic cycle and hydrographic boundaries is needed for building resilience and can help avoid maladaptation.

Ecosystems' stability and water security plays a foundational role in supporting development outcomes across the Strategic Directions given the strong links and nexus areas between them. The contribution of ecosystems and associated hydrological systems is the first line of defense to current and future climate impacts. The productive and protective aspects of ecosystems are critical to food security through provision of secure water supply and genetic diversity and as a source of resilience of rural economy. Forests, drylands, and coastal and marine resources support key livelihoods, and their degradation can escalate local vulnerabilities, which unaddressed can lead to fragility and a multiplication of risks and conflicts. Hydropower as a clean energy resource benefits from good watershed management. It provides water security to both rural areas and fast-expanding cities in the face of increasing variability and climate stresses. Protective forest- and nature-based solutions modulate floods and disasters that are becoming more frequent and provide opportunities to capture the benefits from carbon markets. Measures like hydroinformatics for water management help early warning systems for climate extremes and shocks. An integrated, multisectoral approach is necessary for effective management of these critical resources.

5.6 Priority Action Areas

The objective of action is to revitalize landscapes, seascapes, and watersheds by ameliorating negative trends in the face of a changing climate to secure ecosystem and water security across spatial and temporal scales so communities and countries can meet and sustain their core development goals. The following action areas are proposed: (i) enhance considerations of natural capital in macroeconomic and sectoral policy; (ii) enhance management of landscapes, seascapes, and watersheds to increase resilience and enhance carbon sequestration; and (iii) strengthen water security in the face of climate uncertainty through improved planning and management.

I Enhance Considerations of Natural Capital in Macroeconomic and Sectoral Policy

Macroeconomic and sectoral policies can help create an enabling environment and contribute to systemic shifts, changing the way humans interact with ecosystems and water. Improved policy considerations and increased institutional capacity will boost the effectiveness of technical solutions. Cross-sectoral action is important given the overlap of sectors that affect and are affected by ecosystems and water. This calls for improved cross-sectoral coordination

in governance, especially at a national scale. Regulatory policy and incentives could help shape land use change, preventing stresses to ecosystems and increasing their resilience to climate risks. Fiscal policy could also play a role, such as through taxes on pollutants. Institutional investment in research to understand climate impacts and variability at local, national, and regional scales will further boost technical solutions.

The Bank can support this action area through development policy financing (DPF) operations as well as technical assistance. For example, the Bank has a Development Policy Operation (DPO) in Ghana that is aiming to "green" the cocoa sector by increasing incentives for deforestation-free cocoa, which may be replicated in other countries. This work would also support countries' NDCs. The Climate Action through Landscape Management Program in Ethiopia is another example of existing activity in this area. It is providing results-based financing over five years to the Government of Ethiopia to increase the adoption of sustainable land management practices and expanding access to secure land tenure in rural areas.

II Enhance Management of Landscapes, Seascapes, and Watersheds to Increase Resilience and Carbon Sequestration

As emphasized in the previous ACBP, landscape, watershed and river basin approaches move beyond single-sector interventions and toward systems thinking with considerations for resilience of ecosystems and livelihoods. Protecting and revitalizing ecosystems not only supports adaptation and resilience but is also critical for mitigation through carbon sequestration.

Addressing drivers of degradation of ecosystems is recognized in the Bank's Climate Action Plan, Forest Action Plan, the PROGREEN and PROBLUE Initiatives,[24] among others. More than 15 African countries have received funds for technical assistance to identify the key drivers of deforestation and address critical questions on land use and forest resource management. The questions include, within a country, which sectors the main drivers of land degradation and deforestation are, what needs to be addressed concerning incentives to better manage land, including land tenure, and what is the critical institutional landscape. These were prepared with stakeholder consultation. Some of these plans have already led to policy reforms. More remains to be done, and this is based on a solid, existing foundation.

Revitalizing ecosystems through nature-based solutions. Protective infrastructure for coastal areas that includes nature-based solutions should be part of coastal management strategy. Nature-based solutions address both adaptation and mitigation. Many countries have nature-based solutions that they have been working on for several years and can be a springboard for scaled-up action (e.g., Sustainable Land Management in Ethiopia, and the Nigeria Erosion and Watershed Management Project project). For example, in Niger, methods for land use management that enhance adaptation are well known.

Increasing adaptive capacity of communities directly dependent on ecosystems. Communities whose livelihoods are directly linked with ecosystems (e.g., pastoralists, small-holder farmers, fishing communities) can be supported by providing them options for diversified livelihoods, social protection, insurance, and expanded financial services. There is a rich set of experiences in this domain.

24 PROGREEN, the Global Partnership for Sustainable and Resilient Landscapes, is a World Bank Multi-Donor Trust Fund that supports countries' efforts to improve livelihoods while tackling declining biodiversity, loss of forests, deteriorating land fertility and increasing risks such as uncontrolled forest fires, which are exacerbated by a changing climate. Similarly, PROBLUE supports protection and sustainable use of marine and coastal resources.

Financing innovations such as blue and green bonds can help support action. For example, the Bank has been a leader in REDD+ for a number of years.25 It has a solid foundation and timely investment opportunities on results-based payment deals in several countries' land use and forest sector, including payments for reductions in emissions or for complimentary results not linked to emissions, but which can have transformational impact. Green and blue bonds can help attract further investment and support green growth and development through bonds building on the Bank's leadership and role. It has issued 163 green bonds in 22 currencies for a total of US$14 billion equivalent, but only one in Sub-Saharan Africa (Botswana). The Bank is providing technical assistance to the Government of Kenya for the issuance of sovereign green bonds. In 2019 it founded the blue bond market by structuring a sovereign blue bond for the Government of Seychelles. Blue bonds finance ocean-based sustainability projects.

The **private sector** is engaging in land use investments, including through women's farmer groups and decentralized rural platforms. Private sector investment is critical in supplementing public investment and funding from MDBs. This good could be leveraged for green and blue bonds in agriculture, forestry, and water. Both the Bank and the IFC have been issuing bonds in these sectors.

Indigenous and local knowledge and practices (ILKP) is being recognized more widely in environmental science and policy (IPBES 2018). Pastoralism and small-holder farming in Africa are heavily reliant on ILKP. For example, demi-lunes are a method of rainwater harvesting that is part of indigenous practices in West Africa. These reduce soil erosion and degradation and increase crop yields (Aker 2016).

Taking advantage of new technology can help address scale. Disruptive technology will increase capacity in planning and monitoring (through spatial mapping tools) at scale in the fragility, conflict, and violence (FCV) context. Hydroinformatics, surface flow, and weather forecasting can systematically improve understanding of hydrology, which can help flood and drought management and support resilient water systems. Remote sensing can be used for monitoring trends. For examples, the design of a network of national coastal observatories, such as the West Africa Observatory and Knowledge System, provides rich real-time data that can improve governance. Examples in Burkina Faso (Forest Investment Program26) and Mali (Natural Resources Management in a Changing Climate [World Bank 2018]) can establish a foundation for more impactful programs.

III Strengthen water security in the face of climate uncertainty and increasing and competing demand, through improved planning and management.

Strengthening water security requires a focus on policy, institutional, and regulatory interventions to promote systematic change as described previously in the first action area. Key considerations need to be included at the policy, programmatic, and project levels.

Long-term and sustainable investment planning. Water management and planning must incorporate robustness and flexibility in the face of escalating climate impacts (Smith and others 2019). Future variability is increasingly difficult to predict and quantify, making planning and project design challenging. Decision making under uncertainty can allow for a more robust

25 REDD+ stands for countries' efforts to **r**educe **e**missions from **d**eforestation and forest **d**egradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks.
26 See the Climate Investment Funds website, "Burkina Faso," https://www.climateinvestmentfunds.org/country/burkina-faso.

project design process. This must assume nonstationary dynamic futures (Smith and others 2019). Reliance on projections from past data may lead to dire water shortage under extremes. Planning and management must seek to understand what actions can maintain performance and avoid failure of systems, policy, and infrastructure (Smith and others 2019). It must also be flexible and allow recovery from extremes, and reorganization to meet needs when recovery cannot be achieved (Smith and others 2019). Climate-resilient water management has been evolving over the past decade and is a unifying agenda for water management and climate resilience (Smith and others 2019).

Smith and others (2019) have developed an action framework for climate-resilient water management. New guidance on decision making under uncertainty in the water supply and sanitation (WSS) sectors was completed by the Bank in FY20. This complements the work under the Decision Tree Approach, which was applied to the Mwachi Dam in Kenya. This work can be scaled up to design projects to be resilient to climate and other risks.

Cross-sectoral coordination between WSS and water resource management (WRM) can create integrated solutions. Water demand from WSS competes with demand from other sectors, making integrated WRM a key area of focus. Integrated WRM balances demand from urban water supply, rural water supply, agriculture, and industries. Entry points for integrated action should be explored at every stage. For example, water resources need to be managed at the catchment level, and WSS should be integrated at the core WRM processes (Butterworth and Soussan 2001). Integration is important from the perspective of water pollution; insufficient or improper sanitation contaminates water resources and reduces water availability for various sectors. Coordination between all levels of institutions is important, and international coordination is key for transboundary waters.

Water security cannot be achieved through actions solely within the water sector and subsectors. It is imperative to coordinate across sectors such as agriculture, urban development, and transport among others to address water use and management at various stages in order to strengthen water security. For example, a project currently under preparation in Lake Chad, aims to strengthen the resilience of community livelihood around protected areas, promote sustainable and integrated agro-sylvo-pastoral production systems, and create income generating activities. A key activity is a water management plan for the area which will provide input to inform the possible new economic activities which can be safely and sustainably financed under the project while safeguarding existing uses, including the ecosystem, given the fragile context.

Interventions on WSS are further discussed in the Resilient Cities and Green Mobility section. It is important to recognize the wider role of WSS utilities in promoting enhanced resilience of urban water systems. Resilient, inclusive, and efficient utilities are needed. Utilities of the future can improve water security through a circular economy through wastewater reuse and resource recovery. Augmenting water supply through expanded reservoir storage needs to be explored. Improved groundwater management and conjunctive management are needed to strengthen water availability and supply. Groundwater has potential for several countries including Somalia and ones in the Horn of Africa. This presents risks of overexploitation, so better knowledge is required.

Water-related interventions connected to agriculture are described in the Food Security and Resilient Rural Economies chapter. These include improving water allocation and water operations for different water users in contested basins in dry season and scarcity situations; better managing water in rainfed agriculture; improved irrigation and irrigation storage; and catchment management.

Transboundary water activities are critical for water security in the region given the prevalence of cross-border river systems in the region. Investment planning at the river basin scale has been important under the previous ACBP. In addition to the Niger Climate Resilient Investment Program (CRIP) process initiated around the launch of the previous plan, similar work has been undertaken in Tanzania that will frame investment options using a climate resilience lens to identify investments that cut across the portfolio. This work in Tanzania could be a model for replication in other countries across the region.

5.7 Targets and Indicators

The priority action areas identified for this Strategic Dimension of the Climate Plan will support delivery of corporate and IDA targets as set out in table 5.1 through the portfolio of Bank investments. **Tier 1 targets** correspond to existing IDA19 (FY21–23) and Corporate Climate Commitments to 2025; and **Tier 2 targets** correspond to complementary contributions that will further enhance the region's ecosystem's stability and water security, proposed by the GPs.

The Theory of Change for this Strategic Direction presents a mapping of the pathways of change towards the achievement of expected impacts on ecosystem stability and water security, and the Climate Plan's goal (figure 5.1). This Theory of Change constitutes a live pathway that provides a snapshot of the broader vision of the Strategic Direction and may be adjusted as needed throughout the Climate Plan implementation.

TABLE 5.1 Ecosystem Stability and Water Security Strategic Direction: Aligning targets with corporate commitments

Targets Sub-Saharan Africa	Targets World Bank
Core Tier 1	
▸ Integrated landscape management approach for avoiding deforestation, promoting landscape restoration or sustainable forest management, in up to 20 countries and covering up to 60 million hectares (*Africa regional target*)	▸ 50 countries, 120M ha of forests with Integrated Landscape Management (*Corporate FY25*) ▸ Support integrated landscape mgmt. in 20 countries over 60M hectares (*AFR Regional FY23*) ▸ "Average annual deforestation change (%)" (*IDA19 indicator FY23*)
▸ Support at least 10 river basins with climate-informed management plans and/or improved river basin management governance.	▸ 100 river basins with climate informed management plans (*Corporate FY25*)
▸ Support at least 10 countries to enhance management of landscapes, seascapes and watersheds.	▸ Support at least 15 countries to implement or update their National Biodiversity Strategies and Action Plans (NBSAPs) covering terrestrial and marine biodiversity or similar national action plans through new IDA-supported activities during IDA19.
Tier 2 (*supplementary targets proposed by the Environment GP for Sub-Saharan Africa*)	
▸ Interventions that will assist households to reduced exposure to coastal erosion and flooding. ▸ Number of beneficiaries (and women) who help secure protective and productive assets and/or services of ecosystems and hydrological systems.	

FIGURE 5.1 Theory of Change: Ecosystem Stability and Water Security

NG-ACBP IMPACT

This Theory of Change focuses on the broader vision of the NG-ACBP's Strategic Direction (SD) on 'Ecosystem Stability and Water Security', underpinned by climate informed macro-policies and green and resilient infrastructure. The ToC constitutes a live map and may be adjusted throughout the NG-ACBP's implementation.

Strengthen Africa's development pathway towards a climate-smart and secure future by engendering leap-frogging and transformation at scale through the Bank's financial and technical leverage.

SPECIAL AREAS OF EMPHASIS: *Climate informed macro policies, Green and resilient infrastructure*

STRATEGIC DIRECTION IMPACT

Strengthen the integrity of foundational life support systems to secure critical goods and services for rural livelihoods and urban economies; and avert or delay triggers of (irreversible) tipping points.

OUTCOMES (Priority Action Areas)

ON-FARM AND PRODUCTIVE LANDSCAPE SOLUTIONS	LANDSCAPES, SEASCAPES & WATERSHEDS	WATER SECURITY
Land uses that decrease stress to ecosystems and hydrological systems and increase their resilience to climate risks.	Enhanced management of landscapes, seascapes, and watersheds that increase ecosystems resilience and carbon sequestration; and contributes to socio-economic resilience.	Strengthened water security to meet increasing and competing demand in the face of climatic uncertainty

OUTPUTS

- Regulatory policies and incentives in place and institutional strengthening that help shape land-use change and decrease stress to ecosystems and hydrological systems
- Drivers of ecosystem degradation addressed, including through nature-based solutions.
- Increased adaptive capacity of communities in order to secure their livelihoods.
- Improved/integrated planning and water resource management at the policy, programmatic and project levels, considering water demand and climate impacts.

ACTIVITIES

- Support climate analytics and diagnostics
- Identify policy gaps and reforms needed to reflect natural capital considerations in the context of climate change, and inform policy development.
- Support institutional capacity building and skills development
- Address the underlying drivers of ecosystems degradation.
- Support nature-based solutions.
- Support options to diversify livelihoods, and provide social protection, insurance and financial services to communities dependent on ecosystems.
- Support the adoption of innovative tools, instruments and technology use.
- Support innovations at scale in financing, private sector engagement, local and indigenous practices.
- Support climate analytics and diagnostics.
- Support long-term and sustainable planning
- Promote cross sectoral coordination between water supply and sanitation (WSS) and water resource management (WRM) to create integrated solutions.

PROBLEM STATEMENT

- Stresses to SSA's ecosystems and hydrological systems from anthropogenic land-use change are compounded by the escalating impacts of climate change, which will increasingly impair this natural resource base- with economic consequences for the region, heightening vulnerability of food security, sustainable energy production and water security.
- SSA economies are dependent on natural resources that are highly sensible to climatic impacts. The value added of agriculture, forestry, and fishing is 16% of SSA's GDP. Climate shocks and stressors on freshwater, coastal and marine ecosystems increase the vulnerability of rural and urban populations.
- Changing temperatures, rainfall patterns are impacting biodiversity with far ranging consequences on species range, plant and animal reproductive and/or migration cycles. These factors impact the distribution of disease, vectors and water availability, in addition to livelihoods.
- Climate-induced stresses under increased warming exceeding 2C could trigger "tipping points" i.e. thresholds beyond which ecosystems fundamentally change and possibly cannot be reversed. Such changes in Africa's ecosystems can threaten food security, water security, energy security and human security across the globe, but especially in SSA.

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Clean Energy

OUTCOMES

- **Renewable energy supply:** Expanded renewable energy supply.
- **Access to clean electricity for resilience:** Increased community resilience with access to clean resilient energy.
- **Electricity systems planning:** Modernized sector planning, without barriers to deliver reliable, affordable and resilient energy for all
- **Enabling context:** Enhanced policy that enables low-carbon development pathways.

SCOPE OF OUTPUTS

- Strengthened regulatory framework, risk mitigation and grid infrastructure for renewable energy.
- Regional power markets developed to enable large-scale renewable energy investment.
- Scale-up in access to electricity for households, health clinics and schools, and clean cooking solutions.
- Strengthened energy sector planning and execution in support of the NDCs.
- Policies to drive investments for the transition to low-carbon and resilient energy systems.

Victoria Falls, among the most spectacular sites in the world, provides hydropower on the border of Zambia and Zimbabwe.

Yana Zubkova / Shutterstock

CHAPTER 6
Strategic Direction III: Low Carbon and Resilient Energy

6.1 Energy Sector Development

Responding to the Sub-Saharan Africa's growing energy needs is critical to support the economic development of the region, reduce poverty, and build community resilience to climate change. Nearly 450 million people gained electricity access over the past several years, increasing the regional access rate from 39 percent in 2015 to 44 percent in 2017 (IEA/IRENA/UNSD/World Bank/WHO 2019). However, 541 million people still live without electricity. IEA (2019) notes that 530 million will remain without electricity in 2030 under current policies, and 90 percent of people globally without electricity will be located in Africa. Recognizing that the lack of access to reliable electricity and clean cooking have long held back Sub-Saharan Africa development, increased the vulnerability of communities to climate shocks, and have taken a major toll on the population's health, regional governments are striving to achieve universal access to energy. The region aims to deliver affordable, reliable, sustainable, and modern energy services—electricity and clean cooking—for all by 2030. Many countries have adopted ambitious access expansion goals and electrification plans, and some countries, such as Ethiopia, Kenya, Senegal, and South Africa, aim to achieve universal access to electricity before 2030.

Although energy-related CO_2 emissions are currently low (see box 6.1), they are accelerating rapidly and could reach a significant global share of emissions in the future. Rapid population growth and urbanization will drive a fast growth in energy demand and related emissions for the next decades, unless adequate policies are implemented. IEA (2019) shows that Africa will become a key driver of global energy demand growth, and its oil consumption could be larger than that of China in 2040. However, if adequate policies are implemented, it is possible to achieve higher economic growth in the continent by 2040 with lower energy use, thanks to fuel switching, electrification, and energy efficiency policies (particularly in transportation, industry, appliances, and buildings). Given the long-term nature of energy infrastructure, investment and policy decisions in coming years will determine whether Africa will lock itself into uneconomic and unsustainable carbon-intensive infrastructure or accelerate low carbon and resilient energy development in pursuit of SDG 7 and economic diversification. Almost all the NDCs from African countries mention the energy sector—particularly the development of renewable energy—as a key area for climate action.

The shift toward a low carbon development pathway will help prevent countries from being locked into energy investments that favor carbon-intensive development. Such pathways will help reap multiple economywide and pro-poor benefits, such as avoiding pollution, rolling out green mobility, boosting job growth, and securing community resilience

through increased access to schools, health clinics, and economic diversification. Africa's large endowment of renewable energy sources, as well as falling costs of renewable energy, offer an opportunity for the region to pursue such a low carbon development pathway. Renewable energy plays an important role in increasing energy access, for example, off-grid solar energy. Multisectoral and regional coordination are key for ensuring reliable energy services. For instance, managing the impacts of increasing droughts on hydropower necessitates considerations for water security. Pooling and diversifying risk, such as through regional power trade, could help mitigate trade-offs between energy and water security during droughts.

6.2 Harnessing the Opportunities of the Low Carbon Energy Transition

Africa can harness a unique economic opportunity from the pursuit of renewable energy. The region hosts solar, hydro, and wind resources that remain largely untapped today and that could, with adequate policies and infrastructure, deliver sustainable, reliable, and affordable energy. Unlike other regions that already invest in carbon-intensive energy sources, most of investments to meet Africa's energy needs are yet to be made. For example, while Sub-Saharan Africa has developed some of its hydropower resources, the share of solar energy on the continent stands at about 1 percent of installed capacity. Hence, for greenfield investment in the coming decade, Africa can take full advantage of plummeting renewable energy prices,[27] its exceptional renewable energy endowments, energy efficiency and storage technologies, and innovative business models (box 6.1). Figure 6.1 illustrates the technology trends in the energy sector of Sub-Saharan Africa.

To tap the full potential of renewable energy resources and manage variability, the region will have to attract large amounts of public and private sector financing and to overcome the challenges associated with renewable energy deployment for both grid and off-grid solutions. These risks include grid integration technical constraints which will require investments in baseload electricity to absorb the intermittent nature of renewable energy, off-taker financial situations, and weak procurement and planning capacity. There have been some successful examples of competitive pricing for utility-scale solar photovoltaic technology, such as a US$.02 to US$.03 per kilowatt-hour for a 250-megawatt investment in Ethiopia, and less than US$.05 per kilowatt-hour for a 35-megawatt investment in Senegal, whereas negotiated deals tend to have prices 30 % higher or more. However, moving from successful examples to the scale needed to respond to the region's energy objectives will require a system approach to put in place stronger and more comprehensive planning, an enabling policy environment, adequate transmission and dispatch infrastructure, competitive procurement, risk-mitigation measures, and a multiplication of efforts to pilot innovative solutions. Only then can countries integrate large volumes of variable renewable energy into electricity systems (include storage, baseload electricity and other measures to increase the flexibility of electricity systems).

Governments must adopt a system approach to develop renewable energy at scale and eliminate existing barriers. Early and carefully designed modernized energy planning, including power system planning, least-cost transmission and renewable energy integration plans—as well as a set of coordinated and carefully sequenced policy actions—are critical to enable the large-scale development of renewable energy. Competitive and transparent procurement processes, which deliver cheaper and better results than unsolicited and

27 There has been a 75 percent decrease in the price of solar photovoltaics over the past 10 years, and a 50 percent decrease in the price of solar photovoltaics with battery storage over the past 18 months. Continuing price declines are observed in utility-scale onshore and offshore wind power, concentrated solar power with thermal storage, and for distributed energy resources such as rooftop photovoltaics and solar home systems.

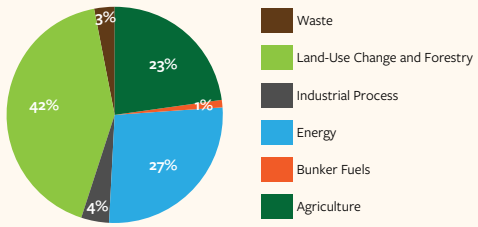
Box 6.1

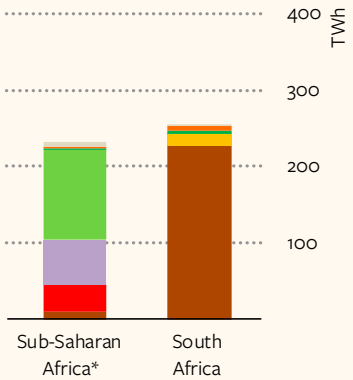
Energy-related emissions in Sub-Saharan Africa

Unlike the situation in other regions of the world, the energy sector is not the biggest contributor to greenhouse gas (GHG) emissions in Sub-Saharan Africa. Most of the region's GHG emissions come from activities related to land use and forestry, agriculture, and waste. Energy-related emissions represent less than a third of the region's emissions (figure B6.1, panels a and b). This highlights the need for cross-sectoral interventions to build low carbon development pathways, such as those described in other chapters of this Climate Plan. Integrated landscape management approaches, effective urban planning, and green mobility will be a critical part of this effort.

FIGURE B6.1 GHG emissions in Sub-Saharan Africa

Electricity Generation
a. Sector in 2016





b. Fuel in 2018

Source: (a) World Resource Institute: https://www.climatewatchdata.org/about/description; (b)International Energy Agency (2019) World Energy Outlook

In the energy sector, about two-thirds of energy-related emissions come from biomass combustion, transportation, and fugitive emissions. Efforts to reduce fugitive emissions from oil and gas sectors, decrease consumption and emissions along the wood fuel and charcoal value chains, and improve energy efficiency will help to limit increased emissions in the energy sector. The World Bank has developed initiatives to address these challenges. Zero Routine Flaring by 2030 brings together governments, oil companies, and development institutions to eliminate routine flaring no later than 2030. Climate-Smart Mining Facility works with resource-rich low-income countries to benefit from the increasing demand for minerals and metals, while minimizing the environmental and climate impacts. The Clean Cooking Fund helps countries to accelerate toward universal access to clean cooking by 2030. Improving energy efficiency in various sectors, including transportation, manufacturing, and extractives, could also help to reduce the increase in energy demand.

Electricity and heating represent only a third of Sub-Saharan Africa's energy-related emissions, and this proportion falls to 11 percent if South Africa is not included. This highlights the staggering discrepancy between South Africa and the rest of the region. Electricity generation in South Africa is larger than the electricity generation of the rest of the region combined and much more dependent on coal (figure 6.1).

negotiated deals, are needed to deliver lower costs. Through its Sustainable Renewable Risk Mitigation Initiative, the World Bank provides technical assistance, critical public investments, and risk mitigation instruments to pursue these goals.

Many African countries suffer from recurrent power outages that are often due to the lack of maintenance of existing energy infrastructure. Energy plans and strategies must include measures to ensure regular maintenance, which could start with a detailed inventory

Figure 6.1 Technology trends that are transforming the energy sector of Sub-Saharan Africa

Solar with storage Rapid recent drop in solar and battery costs provides affordable, continuous, clean energy.	**Smart meters and advanced metering** Two-way communication and real-time monitoring and control for safer, more reliable, and more cost-effective grids (including pay-as-you-go metering)	**Mobile payments** Improved affordability, financial inclusion, and access for unserved or underserved populations	**Satellite imaging** State-of-the-art mapping and imaging for systematic geographic demand, supply, resource analysis, and remote sensing for geological mapping	**High-voltage DC transmission (HVDC)** Significant potential for loss-reduction, compared with conventional AC lines	**Distributed energy (solar home systems and mini-grids)** Private-sector-driven decentralized generation models as scalable, affordable alternatives to grid access in remote or underserved areas
Kenya, Madagascar, Mali, CAR, WAPP	Kenya, Madagascar	Ethiopia, Kenya, Niger, Zambia	Ethiopia, Lesotho, Madagascar, Malawi, Tanzania, Zambia	Ethiopia–Kenya interconnector, DRC Southern Africa Power Market	Ethiopia, Kenya, Madagascar, Niger, Zambia

Source: World Bank staff analysis

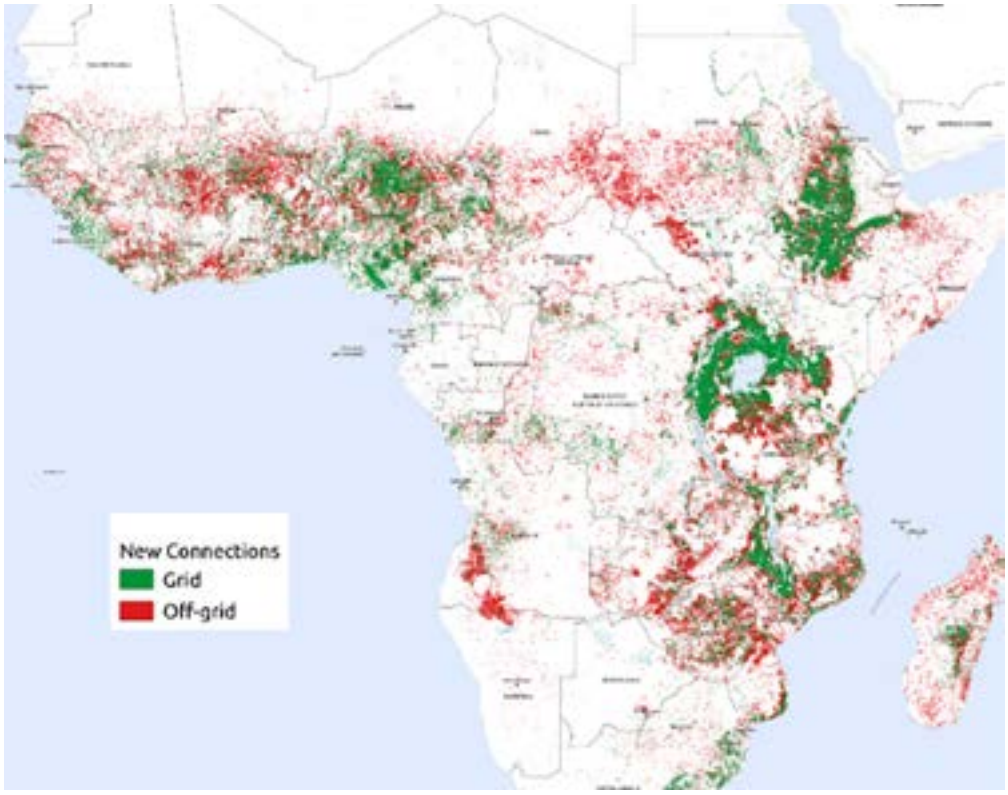
of energy assets and related maintenance needs.[28] Moreover, since energy technology options and costs are changing rapidly, energy plans often fail to recognize them. Energy planning needs to be informed by an adequate understanding of the latest technology options and make the most of modern planning tools, such as geospatial planning for electrification and flood-risk assessment. Energy plans should also be regularly updated to take into account the evolving technology disruption of renewable energy.

Governments must recognize the fast evolution in pricing of energy storage to bring the full potential of renewable energy to scale and deliver reliable, sustainable, and affordable energy. Combined with renewable energy, cheap battery storage could be a game changer both to further integrate renewable energy for grid and off-grid solutions. For a handful of countries in the region, access to domestic hydro and gas resources can help in the transition away from more expensive and polluting diesel, heavy fuel oil (HFO), or coal-fired generation to low carbon resources. In addition, regional power markets can rationalize energy resources and lower overall investment costs to help achieve SDG 7. That said, there are very few data points on price discovery for solar with storage in SSA, and there is role to play for the WBG in this regard.

The rising global demand for batteries and clean energy technologies could foster economic growth and shared prosperity in the region. Some countries, including the Democratic Republic of the Congo, Guinea, South Africa, and Zimbabwe, are home to large reserves of strategic minerals and metals (World Bank 2017) required for batteries and for clean energy technologies. If exploited with high environmental and social standards, these resources could represent a promising revenue potential for the region. Learning the lessons from previous commodity price booms, the region

28 As recommended by Hallegatte, Rentschler, and Rozenberg (2019).

Map 6.1 Optimal technology choices for reaching 100 percent electricity access in Africa



Source: World Bank staff analysis

must ensure that its subsoil wealth (Cust and Zeufack 2020) truly translates into prosperity for all its citizens. Finally, the low carbon energy transition should be accompanied by measures to ensure it is a just transition for all. This includes measures for socioeconomic redevelopment, reskilling, and training to make sure that fossil fuel industries workers as well as unemployed youth can access the new jobs generated by the low carbon transition.

Falling costs of solar energy technology and batteries and innovative business models offer new prospects to accelerate the deployment of mini-grid and off-grid electrification solutions. These can rapidly provide basic electricity access for rural communities at lower cost than fully grid-based electrification. A first-order geospatial analysis suggests that 40 percent of new electricity access can be satisfied economically from renewable, off-grid solutions to achieve universal access to electricity in Sub-Saharan Africa (map 6.1). This represents an historic opportunity to rapidly deliver critical energy services for all, boosting economic development and preventing premature deaths associated to indoor air pollution. However, achieving this objective requires careful planning and governance arrangements. Determining and implementing the optimal mix of solutions to reach universal electrification requires integrated plans. These plans need to be discussed with relevant stakeholders beyond the energy sector and its line ministries, including local governments and sectoral ministries, particularly environment, education, and health. They also need to be informed by detailed analyses, starting with geospatial mapping to identify how to expand electricity access at the optimal cost. These plans can then be translated into pipelines of investments for which public institutions and the private sector both have key roles and for which governance arrangements are defined.

6.3 Increasing the Resilience of People and Power Systems

Pursuit of low carbon energy enhances resilience to climate change in Africa, including in FCV countries. Emergence of renewable, off-grid solutions enable a new approach for electricity access, even in FCV countries and subnational regions, in which grid-based electricity access is challenging due to security concerns, limited governance, and weak utilities. These countries—and populations deprived from access to electricity services—are also often the most vulnerable to climate change. Access to modern energy services brings tangible benefits to empower the communities to be more resilient to climate shocks, such as through the use of communication devices, solar-based water pumping to mitigate drought impacts, increased access to electricity for the storage of agricultural products, and cooling technologies to cope with extreme heat.[29] Moreover, access to clean cooking solutions reduce pressure on deforestation and ecosystem services that are essential to buffer climate shocks.

Climate change will severely affect existing and planned energy infrastructure in many African countries. Madagascar and Mozambique, for example, are exposed to extreme weather events such as cyclones and floods, which will become more frequent with climate change, whereas most of the subcontinent is more vulnerable to more severe flooding events. To ensure energy security, governments must account for climate change impact when planning for new energy infrastructure. Such attention will reduce climate vulnerability of grid infrastructure and help countries to prepare for emergency operations.

Some countries in Africa are heavily dependent on hydroelectric generation, which is vulnerable to hydrological changes associated to climate change. Regional drought has resulted in major power shortages and significant economic impacts in countries like Ethiopia and Zambia that depend on hydropower. Diversifying generation mix with other utility-scale renewable generations, such as solar, wind and geothermal, will help mitigate such risk. Scaling regional power trade is another measure to mitigate such impact. It also important that hydropower development is aligned with other Strategic Directions such as water security, flood control and drought control.

Low carbon energy policies contribute to improving Africa's macroeconomic resilience. In many countries, energy is one of the largest budgetary expenses and external payment obligations in hard currencies. For example, Angola, Nigeria, and Sudan subsidize fuels at a high level, which puts their macroeconomic health at risk. These subsidies make the countries vulnerable to global energy price shocks. In the electricity sector, only half of the Sub-Saharan Africa countries cover operation cost of electricity through tariff revenue (Trimble and others 2016), and only a handful of countries have achieved a fully cost reflective electricity tariff. A suite of policy actions for the low carbon energy sector—which will include phaseout of fuel subsidies, optimizing electricity tariff, lowering cost of energy supply through a shift in the energy mix and improved operational efficiency, and managing energy demand growth—will help countries reduce their energy-related expenditure and create fiscal space to invest in other developmental priorities (see box 6.2). As renewables become more competitive, special attention should be paid to the evolution of demand and prices for various energy sources, particularly for carbon-rich nations (Cust and Manley 2018) that generate much wealth from fossil fuel resources.

29 Nigeria, Mozambique, and Sudan will likely be exposed to heat-related health risks in the absence of access to energy and cooking technologies according to SEforALL (2018).

Box 6.2

More efficient and clean cooling for all in Sub-Saharan Africa

As temperature rise and as urban population and middle class increase in Sub-Saharan Africa, the need for cooling devices (e.g., air conditioning, food and vaccine cold chains, and refrigeration) will increase. This could bring on additional energy and resilience challenges for the region. Cooling devices can bring major benefits for human development and economic growth, particularly in the agriculture and fishery sectors. However, existing inefficient cooling devices not only consume a lot of electricity but also contribute to global warming due to refrigerant leaks. Appropriate regulations, supporting measures, and effective standards will be key to promote the efficiency and affordability of much-needed cooling appliances. Action is also critical in rapidly expanding megacities. Building codes and adequate urban planning can make a huge difference to reduce urban heat islands, in which residents suffer from extreme temperatures. The World Bank launched a new Efficient, Clean Cooling Program to find innovative solutions to mainstream and finance the uptake of sustainable cooling solutions.

Source: https://www.worldbank.org/en/news/press-release/2019/04/24/new-program-to-scale-up-efficient-clean-cooling-in-developing-countries

6.4 Priority Action Areas

To support Africa with the achievement of SDG 7 and fully benefit from low carbon and resilient energy, the Bank will act in four areas:

- Expanding renewable energy supply.
- Increase access to energy.
- Modernize planning.
- Foster cross-sectoral engagement to create the enabling environment for low carbon development pathways.

Interventions will contribute to both low carbon and climate-resilient development in Africa following the MFD approach. These projects will be largely financed by IDA 19, prospective IDA 20 and IBRD resources, and additional climate and trust fund resources. These will be monitored as the Bank's operational commitments toward 2026, which will be implemented during before and after 2026.

I Expanding Renewable Energy Supply

The Bank will provide support for at least 3.5 gigawatts of renewable energy. The WBG will enable the development of renewable energy generation at scale in Sub-Saharan Africa through the following interventions.

Financing national and regional transmission improvements for grid integration, which will require sufficient baseload energy[30] to absorb intermittent renewable energy. Many Sub-Saharan African countries' transmission networks are insufficient to evacuate currently available generation capacity, and largely unprepared to integrate planned variable (solar and

30 The effective integration of a large share of intermittent renewable energy in electricity grids requires the maintenance of a stable frequency which is achieved through the flexibility of baseload energy to ramp up and provide part loads, for instance when the sun no longer shines and when wind speed changes. This can be provided by conventional plants, and eventually by solar with storage plants once they become more competitive. In interconnected grids, utilities can draw on energy generated from conventional plants in neighboring countries if they do not have a sufficient spinning reserve (excess capacity) domestically to provide the necessary inertia. Unless addressed, significant curtailment of variable renewable energy would be necessary to maintain grid stability in small grids.

wind) generation capacity. In some cases, large-scale renewable investment—particularly for hydropower—is constrained by the size of national power system and lack of domestic demand. Strengthening transmission network, including regional cross-border interconnections, grid codes, dispatch systems, and smart controls, are key to substantially scale renewable energy in the region. The Bank will support clients' investments in interconnections, national grid upgrades, improved dispatch technology, and utility capacity building to facilitate the integration of new renewable generation capacity. Regional power trade has a role to play to increase competition, optimize energy resources, and avoid costly generation solutions.

Supporting clear policy and regulatory frameworks. The World Bank will work with governments to build a supportive environment for investment by building clear policy frameworks, such as PPP laws that delineate roles of public and private entities; regulations pertaining to licensing, competitive procurement, standardized contracts, and tariff setting; and building capacity in sector institutions to assess, enhance, and sustain bankability of programs and projects.

MFD and mitigating risks. Recognizing that IBRD and IDA funding will not be enough to respond to the scale of the financing needs, the Bank will use limited concessional resources to leverage other sources of finance, particularly from the private sector. To attract large amounts of private finance, the Bank will support countries by providing financial instruments to mitigate renewable energy investor risks. These include supporting special- purpose vehicles and escrow accounts to mitigate investor risk, as well as restructuring utility debt and aiding financial recovery to reduce off-taker risk for IPPs and enforce payment discipline. The Bank will work with MIGA and IFC to provide risk guarantees (partial risk guarantees [PRGs]), strategic concessional financing, and blended climate finance maximizing synergies with relevant trust funds, with the Green Climate Fund (GCF) and with the forthcoming Climate Investment Facility (CIF) investment program on renewable energy integration.

II Increasing Access to Electricity

The Bank will support significant scale-up in access to electricity and clean cooking solutions through the following interventions.

Enabling access to electricity for households. The effort will complement grid electrification with off-grid solutions, based on effective electrification planning tools. Instruments to unleash private market growth, such as dedicated credit lines and result-based finance facilities, will be employed to maximize the private sector investment into the sector.

Enabling access to electricity for health clinics and schools. Strategic investments will be made with education and health sectors to maximize the impact on human development and enhanced climate resilience of rural communities. Attention will be paid to ensure the sustainability of solar off-grid institutional systems, because the maintenance capability and low ability to pay in such communities are sustainability challenges.

Enabling access to clean cooking solutions households. The Bank will support the development of private sector–led markets for clean cooking and policy planning.

III Modernizing Sector Planning and Eliminating Barriers to Deliver Reliable, Affordable, and Sustainable Energy for All

The Bank will support 25 countries to strengthen energy sector planning and execution in linkage with NDCs. These include the following interventions.

Power system planning with climate lens. Support will be provided to governments to develop national and regional least-cost (power) development plans (LCDP) with consideration of climate factors to ensure consistency with NDCs and future climate impact. Support will ensure consistent development of least-cost transmission plans, as well as variable renewable energy integration plans (World Bank 2019). Such plans will capture the availability of falling cost of renewable energy technologies, opportunities of regional power export and import, grid enhancements to enable the integration of renewable energy, and the social cost of carbon for thermal-based power generation. Opportunities to expand hydropower will also be explored given it contribution to the enabling role for the development of variable renewable energy sources by providing complementary generation and ancillary services. Given the long-lived nature of the power system assets, plans will consider long-term climate risks, including hydrological vulnerability and exposure to intense hurricanes and floods. Technical assistance will help to procure competitively and consistently with the LCDP. Initiatives such as the upcoming Southern Africa Drought Resilience ASA seek to explore drought impacts on hydropower and links with regional power trade under the Southern African Power Pool.

Electrification planning. Analytical support will be provided for countries to develop LCDPs, backed by geospatial data of population and existing infrastructure. The Climate Plan will include on- and off-grid solutions to optimize the cost of electrification. It will help client harness the opportunities for renewable-based electrification solutions, typically provided as a combination of solar photovoltaic panels, power storage, and efficient appliance technologies.

IV Implementing Policies and Investments for the Transition to Low Carbon and Energy-Resilient Systems

The Bank will support cross-sectoral engagements for low- carbon transition. These include the following interventions.

Supporting economywide energy efficiency improvement. Although often overlooked in Sub-Saharan Africa, energy efficiency is one of the most cost-effective interventions to deliver multiple benefits of improved reliability of electricity services and avoid capital investment for additional new generation and grid infrastructure. A significant part of energy efficiency solutions lies outside the energy sector. Because of rapid urbanization in the region, effective urban planning and investment into public transport to minimize energy and carbon footprints are essential. Adequate regulations and incentives are needed to improve the efficiency for vehicles, building appliances, and energy-intensive industrial processes. The Bank will scale interventions in these areas through integration of energy efficiency components into IDA operations as well as a series of analytical works to integrate energy efficiency into sector investment planning.

Continuing supporting energy subsidy reform. When fuels are subsidized and the electricity tariff is underpriced, the Bank will support governments to phase out fuel subsidies and optimize electricity tariffs. Bank will provide analytics to design impact mitigation measures, strengthen social safety nets, and support associated communication strategies. The Bank will also use DPF as an instrument to support governments implement energy subsidy reform, among others.

Piloting fuel switch away from carbon-intensive fuels. Fuel switch replaces fossil fuel usage with cleaner alternatives. Such examples include blending liquid biofuels in vehicle fuels, as well as electric mobility in selected countries. These solutions can help in Africa's journey for low carbon and resilience economy, but so far received limited recognition (IRENA 2015). Some countries achieved fuel switch with economic gains; for example, Senegal achieved fuel switch in the electricity sector from carbon-intensive heavy fuel oil to natural gas. Kenya is phasing out most of its thermal generation to be replaced with geothermal and other renewable resources. However,

Table 6.1 Low Carbon and Resilient Energy Strategic Direction: Aligning targets with corporate commitments

Targets Sub-Saharan Africa	Targets World Bank
Core Tier 1	
▶ Provide direct, indirect and enabling policy support for generation, integration, and for enabling infrastructure for at least 3.5 GW of renewable energy.	▶ IDA19 commitment to add/enable 10 GW of renewable energy (35% increase from 2015) (*Corporate FY25 target*). ▶ Under MFD approach, mobilize US$10 billion private financing for renewable energy (2.5X increase against IDA16–17) (*Corporate FY25 target*). ▶ US$1 billion for battery storage (*Corporate FY25 target*). ▶ 36GW renewable energy (*Corporate FY25 target*). ▶ Increase Renewable Energy Generation Capacity from 28GW to 38GW (*Africa regional FY23 target*) ▶ 1.5 million GWh-equivalent energy savings (*Corporate FY25 target*).
Tier 2 (*supplementary targets proposed by the Energy GP for Sub-Saharan Africa*)	
▶ Support 25 countries to strengthen energy sector planning and execution in linkage with NDCs.	

Note: GW = gigawatt; MFD = Maximizing Finance for Development; GWh = gigawatt hour; GP = Global Practice; NDC = Nationally Determined Contribution

fuel switch may negatively affect industries and their workforce, such as coal and associated workers in South Africa. To make such transition socially just, the workforce needs training and skills development and there needs to be large investments in economic redevelopment of impacted areas. All are relatively new agendas for Africa, for which the Bank will provide support through analytical work and, potentially, through investment operations.

6.5 Targets and Indicators

The priority action areas identified for this Strategic Direction will support delivery of Corporate and IDA targets as set out in table 6.1 through the portfolio of Bank investments. **Tier 1 targets** correspond to existing IDA19 (FY21–23) and Corporate Climate Commitments to 2025. **Tier 2 targets** correspond to complementary contributions that deepen the engagement of low carbon and resilient energy, proposed by the GP.

"As governments in Sub-Saharan Africa ramp up plans to develop reliable, affordable and sustainable, full-scale energy, they must also protect the health and well-being of people. The Next-Generation Africa Climate Business Plan responds to this challenge with renewable energy and low-carbon solutions as well as increased finance for climate action to create new jobs, boost economies, and reduce pollution. Now more than ever, it's vital that countries build systems that support communities now and well into the future."

– Ricardo Riccardo Puliti, Regional Director, Infrastructure, Africa Region

The Theory of Change for this Strategic Direction presents a mapping of the pathways of change toward the achievement of expected impacts on low carbon and resilient energy, and the Climate Plan's goal (figure 6.2). This Theory of Change constitutes a *live pathway* that provides a snapshot of the broader vision of the Strategic Direction and may be adjusted as needed throughout the Climate Plan implementation.

Tier 1 Target: Provide direct, indirect and enabling policy support for generation, integration, and for enabling infrastructure for at least 3.5 gigawatt of renewable energy.

The target captures both on-grid and off-grid interventions, including attributable renewable energy (e.g. solar/diesel hybrid mini-grids, clean cooking using renewable fuels) between FY21-23 aligned with the IDA-19 cycle. The monitoring for this target will align with the methodology being used for IDA.

The IDA definition includes the following.

- **Direct financing.** This category includes financing for the construction of new renewable generation facilities, the addition of generation capacity through rehabilitation or expansion of existing facilities, the conversion from nonrenewable to renewable sources of generation, and the provision of risk mitigation financing to provide incentives for private sector participation. This includes on-grid, mini-grid, and off-grid solutions.

- **Indirect financing.** This category can be further disaggregated into three subcategories, and includes:
  - *Renewable energy generation facilities. Financing for the construction of enabling facilities for investments in renewable energy generation.*
  - *Renewable energy integration. Financing for the construction of infrastructure to integrate renewable generation facilities into the grid and evacuate power from renewable generation facilities (thus avoiding stranded assets).*
  - *Technical assistance. Financing for the preparation of least-cost and master plans, the development of laws and regulations, resource mapping, and data collection; and analyses required for construction, such as feasibility studies, and environmental and social analyses and plans.*

Tier 2 Target: Support 25 Countries to Strengthen Energy Sector Planning and Execution with NDCs.

The target captures recipient-executed or Bank-executed activities supporting energy sector planning that take into account climate risks / renewables / clean energy access. These include electrification planning, clean cooking planning, Variable Renewable Energy grid integration studies, least-cost generation planning, least-cost transmission planning and low carbon strategies. This target is for the period FY21-26.

Knowledge Agenda will include a focus on:

- **Enabling resilience.**
- **Low carbon energy systems for Africa (low carbon studies).**
- **Utilities and the expansion of distributed generation.**

Regional integration of electricity networks and flexibility of electricity systems in Africa

Figure 6.2 Theory of Change: Low Carbon and Resilient Energy

NG-ACBP IMPACT	This Theory of Change focuses on the broader vision of the NG-ACBP's Strategic Direction (SD) on 'Low-carbon and Resilient Energy', underpinned by climate informed macro-policies and green and resilient infrastructure. The ToC constitutes a live map and may be adjusted throughout the NG-ACBP's implementation.			
	Strengthen Africa's development pathway towards a climate-smart and secure future by engendering leap-frogging and transformation at scale through the Bank's financial and technical leverage.			
	SPECIAL AREAS OF EMPHASIS: *Climate informed macro policies, Green and resilient infrastructure*			
STRATEGIC DIRECTION IMPACT	*Africa's achievement of universal access to affordable, reliable, sustainable and modern/clean energy services, contributing to strengthen community resilience and promote economic diversification.*			
OUTCOMES (Priority Action Areas)	**RENEWABLE ENERGY SUPPLY**	**ACCESS TO CLEAN ELECTRICITY FOR RESILIENCE**	**ELECTRICITY SYSTEMS PLANNING**	**ENABLING CONTEXT**
	Expanded renewable energy supply.	Increased community resilience with access to clean resilient energy	Modernized sector planning, without barriers to deliver reliable, affordable and resilient energy for all	Enhanced policy that enables low-carbon development pathways.
OUTPUTS	► Strengthened regulatory framework, risk mitigation and grid infrastructure for renewable energy. Develop regional power markets to enable large-scale renewable energy investment.	► Scale-up in access to electricity for households, health clinics and schools, and clean cooking solutions.	► Strengthened energy sector planning and execution in support of the NDCs	► Policies to drive investments for the transition to low-carbon and resilient energy systems
ACTIVITIES	► Financing national and regional transmission improvements for grid integration. ► Supporting clear policy and regulatory frameworks ► Maximizing Finance for Development and mitigating risks.	► Complement grid electrification with off-grid solutions based on effective electrification planning tools. ► Strategic investments in coordination with education and health sectors . ► Support to resilient, end-to-end energy infrastructure? ► Development of private sector-led market for clean cooking and support associated policy development.	► *Power system planning with climate lens* - through support to governments to develop national and regional least-cost (power) development plans (LCDP) with consideration to low carbon and climate resilience. ► Electrification planning- through analytical support for countries to develop least-cost electrification plan, that is inclusive, and backed by geospatial data	► Supporting policy reforms and incentives for economy-wide energy efficiency improvement. ► Continuing supporting energy subsidy reform. ► Piloting fuel switch away from carbon intensive fuels.
PROBLEM STATEMENT	► Under current policies, 530 million will remain without electricity in 2030 and 90% of people globally without electricity will be in Africa. Currently, 541 million people currently live without electricity in SSA.	► Africa's low-income groups and critical sectors such as food production, education, or health and social services delivery will continue to be challenged by limited energy access, which will be aggravated by climate change impacts.	► Resilience of the infrastructure is key for energy delivery, and also crucial to achieve community resilience. If climate change is not considered upfront in the planning and design phases, it could undermine energy delivery. Synergies of achieving access to clean energy to harness resilience multiplier impact for communities for critical services and jobs.	► Africa's current economic development pathway runs the risk of lock-in to carbon intensive solutions and stranded assets, and could miss opportunities to leap-frog into win-win, pro-poor mitigation policies and help deliver SDG7 goals.

330,000 kVA high-voltage transmission lines along highway T2 in Southern Zambia. *Arne Hoel / World Bank*

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Resilient Green Cities

OUTCOMES

- **Policy reform and planning:** Long(er) term climate smart urban and mobility transitions in place
- **Knowledge and data:** Robust knowledge and data used to inform the design of climate-smart investments
- **Skills, talent and workforce:** Next generation set of skills, talent and workforce available to absorb youth into climate smart jobs supported by mobility-enabling infrastructure and services.
- **Catalyzing financing and partnerships:** Climate action, investments and knowledge sharing between cities, local and national government and the private sector.

SCOPE OF OUTPUTS

- Policy reforms in place and long-term urban planning that integrates multisectoral priorities and addresses resilience and low-carbon growth.
- Enhanced customized knowledge and data to support climate smart investments and policy.
- Investments implemented in skills building, talent and workforce strengthening.
- Strengthened mobility, infrastructure and services that facilitate economic growth and jobs.
- Multi-level climate financing and partnerships in place.

Dar es Salaam's new bus transit system (BRT) is decreasing transportation costs and easing traffic throughout the city.

Hendri Lombard / World Bank

CHAPTER 7
Strategic Direction IV: Resilient Cities and Green Mobility

7.1 Africa's Urban Transformation

Sub-Saharan Africa is undergoing an urban transformation, which—if successfully managed—can make its cities engines of growth and reduce poverty for the region. The urban population is rapidly increasing; it has more than doubled since the early 2000s to 441 million in 2019, is projected to double again by 2039, and may reach nearly 1.3 billion in 2050 (UNDESA 2018). The urban share of the total population will increase from the current 40 percent to 60 percent in 2050 due to overall population growth, rural-urban migration, expansion of smaller towns, and administrative reclassification of areas from rural to urban (OECD 2016). There is still variation between countries: highly urbanized South Africa's urban population of 67 percent will increase to nearly 80 percent in 2050. Ethiopia, which is also rapidly urbanizing, will increase from 21 percent to 39 percent urban population. These transitions in demography, if properly used, can generate a "demographic dividend" capable of stimulating economic growth for countries and the region. This dividend needs a focus on the youth bulge, which will see a doubling of the youth (aged between 15 and 35 years) from 420 million to 830 million by 2050 (UNEP 2019).

Low-carbon and climate-resilient urban development is essential to develop the potential of Africa's cities. They contribute to 50 percent of the region's GDP: about US$0.5 trillion (Dobbs and others 2011). By harnessing urban growth, attracting investment, and developing scale economies, there is potential for Africa's cities to become efficient, sustainable, resilient, inclusive, and productive (Lall, Henderson, and Venables 2017).

Mobility is key for enabling economic growth in Africa. African countries will need the expanded ports, roads, public transit systems, railways, airports, and waterways that can create and sustain modern global and domestic supply chains and allow their people to participate in the economy beyond their borders. The FY20 Africa Transport Study for the World Bank (2019) outlines that the cost to import a container into Africa is 56 percent higher than the global average, with landlocked countries facing four times the price burden. Roads can be a precursor to other transport investments, and African urban road infrastructure is far less developed than that of other regions. Yet the WBG sectoral strategy and the literature indicate that roads alone cannot address growing urban transport challenges, especially for poor populations (IEG 2017).

Improving planning and decision-making are essential to avoid lock-in to inefficient spatial configurations of infrastructure. Urban growth, planning, and transport investments

have not kept pace with urban population growth, leading to fragmented, less livable, and less productive cities. Unplanned development has made African cities less compact and fragmented. Fragmented cities without dense spatial form increase costs for workers in the form of rent, commuting, and food prices. There is also a shortage of infrastructure and housing due to insufficient capital investment.

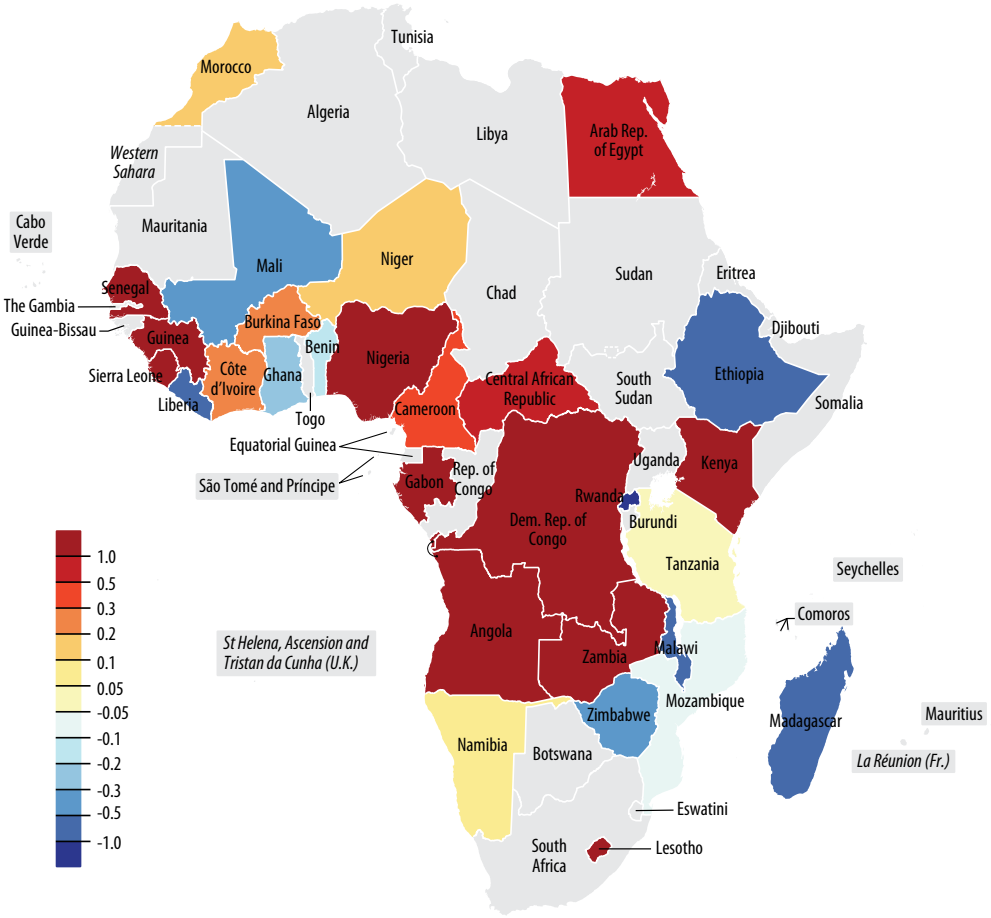
Poverty in Africa is becoming more urban, and poor households are urbanizing faster than the population as a whole (Ravallion, Chen, and Sangraula 2007). Due to the lack of infrastructure, 60 percent of the countries' urban population live in areas classified as slums by the UN Human Settlements Programme, while the average for other low-income countries (LICs) is only 34 percent (Hommann and Lall 2019). While the delivery of services in urban areas is better than in rural areas, access is still low. For example, access to sanitation is at less than 45 percent in urban areas, and high energy costs make even basic levels of electricity consumption unaffordable (IEA/IRENA /UNSD/World Bank/WHO 2019).[31] Municipal waste collection levels are at an average of 44 percent for the region (Kaza and others 2018). Urban households in Africa pay 20 percent to 31 percent more than those in other countries for goods and services (Lall, Henderson, and Venables 2017). Transport investments continue to lag: Africa had a motorization rate of 42 vehicles per 1,000 people in 2015, below the global average of 182 vehicles per 1,000 people (ITDP 2017). The lack of transportation options is a major factor for high levels of informal settlements, forcing urban dwellers to live closer to their workplaces where housing infrastructure is insufficient or unaffordable. This transportation issue also affects firms, preventing them from taking advantage of scale and decreasing efficiency—and ultimately affecting economic growth negatively. The African Development Bank (AfDB) estimates that an approximate US$130 billion to US$170 billion is needed per year to address the infrastructure gap and keep pace with the growing economic demands within the continent (AfDB 2018).

7.2 Cities' vulnerability to climate change

African cities are highly vulnerable to climate change impacts due to insufficient infrastructure, and their large populations in informal settlements, often in risky areas, are particularly exposed. Cities are affected by hazards, with floods, droughts, and heat waves being the most common. These events damage infrastructure, disrupt the lives of people and communities, and pose a health threat. Urban poor populations are highly exposed to extreme events as well as slow onset climate change. Poor urban households in Africa are more exposed to floods on average (map 7.1) (Hallegatte and others 2016). This is more prominent in southwest Africa where poor households are overexposed and in countries with large rivers in West Africa (e.g., Benin, Cameroon, and Nigeria) (Hallegatte and others 2016). The densely populated Niger Delta is directly exposed to sea level rise, storm surges, erosion, and land subsidence. Cities in low elevation coastal zones are affected by seasonal cyclones and tropical storms that regularly cause severe damage and losses, such as along the southeastern coast of the Indian Ocean, primarily in Madagascar and Mozambique (Hallegatte and others 2016). In August 2017, a massive landslide and flooding in Freetown, Sierra Leone, left more than 1,000 missing or dead (Hallegatte and others 2016). Heatwaves particularly affect urban poor populations who live in informal settlements and are likely to work outdoors. Children and the elderly are also very vulnerable to heatwaves. Urban areas have comparatively higher risks during hot periods due to the heat island effect caused by the built environment. Droughts place stresses on water supply and other necessary urban services (box 7.1) and even energy in places dependent on hydropower, for example in southern Africa.

31 See the WHO/UNICEF Joint Monitoring Programme database, https://washdata.org, accessed 2017.

MAP 7.1 Poverty exposure bias for floods in urban areas.



Source: Winsemius and others 2018.

Box 7.1

Cape Town's Day Zero: Understanding need for proactive management and patterns that transcend city borders

During a severe drought in 2018, Cape Town, South Africa, was forced to implement significant water management to avoid running out of water—confronting its "Day Zero." The real-time competition and trade-offs between the urban settlements and the agriculture sectors on water demand hit home as city and provincial decision makers worked out a response. Water allocations to agriculture were transferred to the city in 2017, ahead of Day Zero. Restrictions to limit daily use were imposed on urban residents, and all outdoor usage was restricted. The local government and citizens engaged in positive peer pressure to influence users with high water consumption to change their behavior (Mahlalela and others 2019).

It is likely that such dry conditions will become a more regular occurrence in the future, particularly during the early winter months, but also with a possibility of more frequent dry spells during the winter rainfall season (Mahlalela and others 2019). These changes are in part driven by poleward shifts in the South Atlantic Anticyclone and moisture corridors, which can be traced all the way to the Amazon. To adapt to this likelihood of increased future droughts, diversification of the water supply system and integrated water resource management is critical.

Source: UMFULA 2019.

7.3 Building urban resilience to climate change

Ensuring the resilience of infrastructure and services is critical for cities. Infrastructure systems are the front lines of defense against the physical impacts of climate variability and change, such as increased flooding, storm surges, coastal erosion, tropical storm winds, and other disasters. Climate-resilient infrastructure—planned, designed, built, and operated in a way that anticipates, prepares for, and adapts to changing climate conditions—protects urban populations, assets, and livelihoods from those impacts. To further reduce hazard exposure and vulnerability to climate change, populations, especially vulnerable ones, need adequate access to basic services, such as WSS, storm and wastewater drains, and solid waste management. Improving sanitation and solid waste management will also have public health benefits. Some initiatives are already addressing these challenges through measures to strengthen short-, medium-, and long-term resilience capacities (box 7.2). World Bank activities such as the West Africa Coastal Areas Sustainable Ports Partnership, a partnership of ports associations in 19 countries, have embraced the opportunity to proactively adapt to the impacts of climate change and improve coastal infrastructure resilience through technical assistance and mutual learning. Similar projects, such as the São Tomé and Príncipe Transport Sector Development and Coastal Protection Project, will help ensure coastal communities' resilience by rehabilitating critical stretches of coastal roads and strengthening the roads' technical and management capacity. Investments in resilient mobility are a double gain: helping manage risk to the infrastructure and reinforcing the overall resilience to shocks (because mobility is a foundational component of societal resilience). Mobility also meets urgent security needs, particularly in FCV countries or subnational regions.

Investment in resilient infrastructure is cost-effective and leads to higher returns. The cost of resilient infrastructure depends on the type of assets and the exposure to climate hazards (Hallegatte, Rentschler, and Rozenberg 2019). A World Bank study (2019) in LICs and middle-income countries (MICs) shows that the implementation of resilient assets in the power, WSS, and transportation sectors would cost between US$11 billion and US$65 billion a year by 2030, an incremental cost of 3 percent compared with the overall investment needed. It would result in an estimated net benefit of US$4.2 trillion over the lifetime of the infrastructure: a US$4 benefit for each dollar invested (Hallegatte, Rentschler, and Rozenberg 2019). Upfront costs could be offset by reduced operations and maintenance costs (Hallegatte, Rentschler, and Rozenberg 2019). The additional costs of making new infrastructure resilient in lower-middle-income countries (LMICs) are small compared to the total investments (Hallegatte, Rentschler, and Rozenberg 2019). An analysis in Bangladesh revealed that US$560 million in additional flood protection for energy infrastructure could save up to US$1.6 billion (Hallegatte, Rentschler, and Rozenberg 2019). Some materials and technologies that are more climate resilient could also cost less, such as modular bridge solutions compared to traditional in situ reinforced concrete. Further, decreased disruptions as a result of resilient infrastructure investments would decrease losses to firms and improve economic growth. A survey piloted by the Bank in Tanzania has found that Tanzanian firms are incurring utilization losses of US$668 million a year from power and water outages and transport disruptions (Hallegatte, Rentschler, and Rozenberg 2019).

Securing sound road maintenance practices is critical to minimize and adapt to the impacts of climate change. Analysis conducted by the World Bank (Hallegatte, Rentschler, and Rozenberg 2019) shows that road maintenance is the first and most economical line of defense against climate change. Precipitation caused by climate change is expected to lead to rehabilitation costs 10 times above historical conditions, and stresses imposed by flooding will lead to a 17-fold increase. Based on data from Organisation for Economic Co-operation and Development (OECD) countries, every additional US$1 spent on road maintenance saves on average US$1.50 in new investments (World Bank 2019c). A corollary of this finding is

Box 7.2
Northeastern Transport Improvement Project — Creating a climate-aware corridor connecting Ethiopia, Kenya, and Somalia

Northeastern Transport Improvement Project (NETIP) will focus on improving the movement of people, goods, and digital services in part by upgrading the main transport artery traversing the counties of northeastern Kenya. The design of project roads was reviewed from a climate-resilience viewpoint, examining how additional extreme events and raising temperatures may affect the project. Priority interventions include:

- **Building climate resilience and adaptive capacity**
- **Minimizing cost increases and time for redesign or enhancement of design**
- **Increasing Bank protection for wide floodplains**
- **Providing Bank protection at bridges**
- **Road overtopping protection**
- **Reducing sedimentation rates from sand**
- **Decreasing roadside erosion**
- **Strengthening Lorian Swamp embankments**
- **Supporting maintenance depots and emergency response plans and data collection**

By incorporating these location-specific climate aware design components, this project will contribute to improving road management and maintenance and reduce risks associated with potential climate and geophysical hazards. The road designs for this critical corridor project will be "climate-informed," ensuring adaptability of the road corridor to any potential natural disasters and enhancing mitigation measures.

Source: Sasia 2016.

that current fiscal and governance models for road maintenance are insufficient to sustain the road network under current climatic conditions. Under forecast conditions, they will be overwhelmed, given that maintenance costs are expected to rise by 270 percent from climate-related increases in precipitation, flooding, and temperature (Cervigni and others 2015). In Tanzania, an estimated 70 percent of natural disasters are related to climate change, and the effects cost Tanzania more than 1 percent of GDP (World Bank 2017b). It is therefore worthwhile to consider revolutionizing road maintenance in Africa (and beyond) to strengthen resilience of transport and mobility services. The World Bank has supported the creation of second-generation road funds and road agencies to increase the financial and technical capacity and ensure the sustainability of road investments. A recent World Bank analysis covering most road funds in Africa points out that in some countries, road funds could generate resources based on user charges. These could be dedicated more efficiently to cover maintenance needs combined with rehabilitation investments under performance-based contracts (World Bank/IFC 2019). An additional approach is demonstrated in the First Fiscal Consolidation and Inclusive Growth Development Policy Financing project for Cameroon. It ensures sufficient funding allocated for road maintenance in the annual budget exercise, to be made available in a dedicated account. By strengthening mobility services, overall national resilience improves because mobility of people and goods is a fundamental component of resilience to shocks.

With the growing urbanization of poverty, socioeconomic resilience is an imperative for increasing climate resilience and turning African cities into engines of growth. Beyond natural growth rates, urban growth is attributed to rural to urban migration and massive migration due to extreme events (Elmqvist, Alfsen, and Colding 2008). Without concrete climate and development action, more than 85 million climate migrants could move within countries in Sub-Saharan Africa by 2050 as a consequence of water stress, drops in crop productivity, and sea level stress (Rigaud and others 2018). Failure to invest in socioeconomic resilience can reverse development and push millions back into poverty. Populations of urban people in Sub-Saharan Africa would triple within 30 years, with most characterized as urban poor. The focus on social resilience must transcend an extreme event or disaster to build

Box 7.3

Strengthening resilience in coastal cities—Saint-Louis Emergency Recovery and Resilience Project

Senegal's historical city of Saint-Louis is on the northwest coast at the mouth of the Senegal River. With a population of 232,000, the city has experienced rapid growth over the last 50 years. Langue de Barbarie, a thin, sandy peninsula adjacent to the Atlantic Ocean, helps to protect the city. The shoreline's geophysical characteristics make it susceptible to natural erosion processes, and human activities such as unplanned settlement and climate change impacts exacerbates erosion.

Devastating storm surges took place in August 2017 and February 2018, rendering more than 250 families homeless. Many had been living in very precarious conditions in the flood-prone Khar Yalla relief camp, which lacked access to basic services. In addition to these, all households (approximately 10,000 people) within a band of approximately 20 meters along the sea were within the extremely high-risk zone, leaving them susceptible to losing their homes within the next few years with future storm surges.

In response to the Senegalese government's request for support, the World Bank is financing the US$30 million Saint-Louis Emergency Recovery and Resilience Project (SERRP), which aims to reduce the vulnerability of populations to coastal hazards along the Langue de Barbarie and strengthen urban and coastal resilience planning.

SERRP will support the Government of Senegal to provide temporary accommodation and essential services for affected households, and urgently improve their living conditions in line with global standard practices. The temporary shelter solution will accommodate disaster victims during the transitory phase until a permanent housing solution is available, for an estimated period of two to three years. In the medium-term, the project will support the planned relocation of vulnerable households affected by coastal erosion and living within the extremely high-risk zone. For longer-term resilience building, SERRP will support activities such as reclamation and restoration of the vacated land along the Langue de Barbarie, the design of a coastal risk management solution to protect the Langue de Barbarie shoreline, and development of an urban resilience plan.

Source: World Bank 2018b.

sustained and long-term social resilience. This involves increasing employment opportunities, especially for youth. This in turn requires workforce development through human capital investments, training a new generation of talent and reskilling existing workers to align with skills needed for the future. Affordable housing and mobility are essential for social resilience and for firms' productivity by improving accessibility for workers. Social resilience can further be strengthened through social safety nets.

The protection of ecosystems and nature-based solutions to increase resilience of cities to climate shocks and stresses needs to be integrated into climate-smart city plans. Ensuring a stable and cheap water supply for the growing urban population and managing for the increasing frequency of floods may require cooperation with catchments beyond city jurisdictions—in addition to proximate catchments (Rigaud and others 2018). City governments must partner with subnational and national authorities to ensure that upstream watersheds are well managed to secure water security and flood regulation downstream. The role of nature-based solutions, such as restoration and management of mangrove ecosystems, can reduce the impact of storm surges, decrease climate vulnerability, and increase resilience, as was the case in Beira, Mozambique (see also box 7.3). This is discussed further under the Ecosystem Stability and Water Security Strategic Direction.

7.4 Green mobility's role in sustainable, productive, and livable cities

In addition to addressing resilience and low-carbon development, high-density development and improved mobility would lead to agglomeration and achieve economies of scale, driving economic growth. The low-density spatial development of African cities is a barrier for firms to develop. Less dense cities cannot offer cost efficiencies to firms, which in turn cannot provide sufficient advantages for jobs (Lall, Henderson, and Venables 2017). Approximately 51 percent of all firms in Côte d'Ivoire consider transport to represent a "major" or "very severe" obstacle to their operations; this figure rises to 57 percent in the economic capital of the country, Abidjan (Hommann and Lall 2019; World Bank 2019a).

Transit-oriented design facilitates the accessibility of railway networks, fleet renewal schemes, and accommodations for modal shifts in transportation. It must be incorporated in urban planning, allowing for increased use of public transport. Africa has dramatically low levels of access and mobility (SSATP 2020; World Bank 2019b), with the scarcest supply of urban public transit services of all continents at approximately 3 kilometers of rapid public transit per million urban residents (SuM4All 2017). By contrast, North America and Europe have, respectively, more than 30 kilometers and almost 90 kilometers per million urban residents. Developments in the provision of commuter rail and large bus services either as bus rapid transit (BRT) or through new bus routes are promising for African cities. For example, the Tanzania Intermodal and Rail Development Project is working to assist in providing open access infrastructure on the Dar es Salaam-Isaka rail segment, which is expected to increase the country's logistics performance. The Cameroon-Chad Transport Corridor is financing improvements on the Cameroon metric-gauge railway and on the Ndjamena-Moundou road corridor. The project is part of a comprehensive strategy to improve the multimodal corridor toward Chad and facilitating a modal shift of freight from truck usage on roads to rail-based transport. The Dar es Salaam Metropolitan Development Project financed the development of the Dar es Salaam BRT, which offers an affordable and efficient mobility alternative to cars (World Bank 2015a). The other direction is to improve the informal transit service, by renewing the fleet, improving quality and safety standards, and evolving the organizational structure without necessarily transforming it. For example, the joint effort between the Transport Sector Modernization and Corridor Trade Facilitation projects in both Burkina Faso and Cóte d'Ivoire is working to improve the efficiency of transport services on key transport corridors. These services are central to enhancing the tradable sectors' access to export markets and reduce the cost of imports, in part through truck fleet renewal programs. Port-city integration is also key for continued economic growth. World Bank (2018a), as part of the Greater Abidjan Port-City Integration project, finds that while the Abidjan Autonomous Port "constitutes the main economic pole of the country, accounting for 60 percent of the Ivorian GDP" inefficient port-city integration is a severe constraint (box 7.4) (World Bank 2018).

7.5 Low carbon urban development

Much of the urban infrastructure in Africa is yet to be built, which provides an opportunity to integrate low-carbon measures as well as adaptation and resilience into planning for sustainable growth and development. This allows African cities to leapfrog through low carbon and climate-resilient development. Urban planning and green mobility are fundamental for such development and prevent lock-in of carbon-intensive development patterns and vulnerable infrastructure. Climate considerations should be included systematically in every stage of urban planning. By promoting urban development that is

Box 7.4

How Abidjan uses urban infrastructure to promote economic growth and development

Côte d'Ivoire is one of the most urbanized countries in Sub-Saharan Africa, with Abidjan the most populated city. Fifty-four percent of the country's population lives in urban centers, with urbanization increasing at 5 percent yearly. Despite significant public investments in road infrastructure in recent years, the greater Abidjan area suffers from unreliable urban transport, high transport costs, and growing congestion, which hinders its competitiveness. The Abidjan Autonomous Port is a major industrial hub and is the country's major economic growth driver. However, due to major challenges in the urban mobility system, including informality, lack of coordination, obsolescence, inadequacy, and shortage of system management personnel, the port's ability to continue growing and advancing is inhibited. To address the issues of more seamless port-city integration and urban congestion, the World Bank has two ongoing projects: the Greater Abidjan Port-City Integration Project and the Abidjan Urban Mobility Project.

The Greater Abidjan Port-City Integration Project will support the improvement of urban management, logistics efficiency, port accessibility, and urban mobility in the region. The second component focuses on transportation infrastructure, including constructing the Abidjan bypass (Y4) western section connecting the A1 (Autoroute de l'Est) and A3 (Autoroute du Nord) highways, improving Abidjan Port's access roads and redesigning the Akwaba intersection to increase capacity and reduce delays and accidents. The Abidjan Urban Mobility Project will complement these efforts by improving accessibility to economic and social opportunities and increasing efficiency of the public transport system along the Yopougon-Bingerville corridor and its feeder lines in Abidjan. These efforts will include implementing the East-West BRT corridor between Yopougon and Bingerville. The other three components will address the inefficiencies and shortcomings of the urban mobility sector by (i) supporting the strengthening of the Abidjan Public Transport Company and the restructuring of the formal bus transport network around the two mass transport corridors (North-South Metro line and East-West BRT corridor); (ii) supporting the professionalization of the artisanal transport sector and improving last mile connectivity in the BRT corridor's catchment areas; and (iii) supporting human capital development in the urban transport sector by improving skills and social protection schemes.

Source: World Bank 2018a.

compact, connected, and coordinated, cities can reduce global infrastructure requirements by more than US$3 trillion over the next 15 years, delivering an annual abatement of 0.3 gigatonnes of equivalent carbon dioxide by 2030 and 0.5 gigatonnes of equivalent carbon dioxide by 2050 (Colenbrander and others 2018). Significant financing is required: estimates for African cities (including capital and operations and maintenance) range from a high of 37 percent of GDP in fragile LICs to 10 percent in MICs (World Bank 2015b).

Cities are sites of intensive energy use and sources of GHG emissions, making low carbon growth essential. The transportation sector is responsible for 23 percent on a global scale. According to the World Health Organization ([WHO] 2018), air pollution threats are responsible for 53 percent of deaths in children under five in Africa. Low carbon urban transportation contributes to reducing such emissions. By incorporating transit-oriented development and increasing public transport access, Africa can avoid carbon-intensive transportation growth in urban areas (ITDP 2017). Climate-smart spatial planning and modal shifts in urban transport are essential in low carbon city development. In Africa, where rapid urbanization is expected to persist over a medium-term horizon, rational and efficient spatial planning will be crucial to ensuring the future viability of cities. Unplanned growth supplied with inadequate transport infrastructure and services can lock a city into an unsustainable model that will be substantially more costly and difficult to resolve retroactively—if indeed such a resolution is even possible in practical terms. Avoiding lock-in of unsustainable spatial models is critical: early intervention can bring disproportionate advantages. Adept, early planning of development corridors in urban areas can substantially ease the costs that a firm would bear in relation to logistical costs and employee productivity. Losses for firms due to

disruptions in infrastructure services in LMICs amount to an estimated US$107 billion annually (Hallegatte, Rentschler, and Rozenberg 2019).

Vehicle fleet management and fuel standards need to coincide to mitigate the impacts of climate change; supporting improved fuel efficiency is key to reducing emissions. Vehicle electrification has the potential of reducing GHG emissions resulting from transport. For example, the implementation of the electric BRT fleet in Abidjan is expected to result in a cumulative emissions savings of 1,511,400 tCO_2 (World Bank 2019a). Consideration of fuel standards and efficiency is also critical to reducing GHG emissions. A World Bank study (2011) finds that among other actions, maintenance quality assurance and quality control could help newer diesel buses (four to seven years old) achieve a 4 percent to 5 percent improvement in fuel economy and older diesel buses (seven to 14 years old) achieve a 7 percent to 8 percent increase in fuel economy.

Green spaces in urban areas could decrease flooding and the heat island effect, function as carbon sinks (if sustainably managed), and provide such benefits as improving air quality and lending aesthetic qualities. Urban farming can improve food security while decreasing GHG emissions. Improvements in solid waste management have tremendous potential to decrease GHG emissions through landfill gas capture, recycling, and composting while decreasing the prevalence of vector-borne diseases.

7.6 Urban Human Capital, Knowledge and Governance

Africa's population is projected to reach 1.3 billion by 2050, of which 830 million will be youth, and a skilled workforce is needed for African cities to be engines of growth. Providing education, training, and jobs to youth in the region can power this growth. Private sector and public investment are necessary to create jobs to harness this large population of youth. Investments in education, health, and nutrition, and advanced skills training are essential to address the skills gap and ensure that there is a capable workforce to fill jobs.

Data analysis contributes to the success of climate-smart urban planning. The availability of urban data is a challenge across the world and more so in Africa. Urban planners need urban data, including information on planned constructions (location, size, density); and socioeconomic data (population, income information, education level). Sophisticated data collection, such as big data (mobile and communication data, utilization of drone technology), aids urban development and contributes to multiple sectors such as disaster risk, mass transit, and land management. The implementation of the activities described in previous sections requires good, collaborative governance to drive urban economic growth as well as reduce poverty. Various public sector institutions participate in urban governance, including at the national, state, and local levels, and spanning across sectors. Citizen and private sector engagement at all levels is key to effective urban governance.

Resilient rural and interregional mobility can help to ensure food security in Africa. Climate change is forcing people to migrate into urban areas, and it is expected to have expensive impacts on the unpaved roads that connect farming settlements and rural markets. These impacts will affect the cost of transporting produce to consumption centers and the affordability of food for consumers (Cervigni and others 2015). For example, with 68 percent of the Democratic Republic of the Congo's population employed in agriculture, the cost of reactive responses to the destructive impacts of precipitation and flooding caused by climate change on road infrastructure are approximately US$0.7 billion and US$1.45 billion, respectively (Cervigni and others 2015). As highlighted in the First Fiscal Consolidation and Inclusive Growth Development Policy Financing Project for Cameroon, resilient transport

infrastructure, logistical services, and adequate funding for maintenance in rural areas will be needed to counteract this trend and ensure that food availability in rural and urban areas is not threatened.

Regional connectivity can help to ensure equitable economic growth. Infrastructural connectivity between regions and countries strengthens economic growth by facilitating trade and investments, allowing for more effective transit of people and goods and increasing access to critical services (AfDB 2019). See, for example, the ongoing efforts of the NETIP project connecting Ethiopia, Kenya, and Somalia (box 7.4). Improving connectivity between rural and urban areas is mutually beneficial for the economic growth of both areas (Gebre and Gebremedhin 2019) and can help to ensure economic growth happens more equitably throughout spatial distribution.

This Strategic Direction has overlapping areas and nexus elements with the others. Resilient infrastructure and preventing degradation of landscapes upstream are important under the Disaster Preparedness, Social Cohesion, and Resilience direction and the Ecosystem Stability and Water Security direction. Integrated WRM is part of the Water Security dimension.

7.7 Priority Action Areas

There is increasing urgency to shift toward more integrative and planned approaches—building on the experiences of the previous ACBP. Such integrated approaches are essential given the diversity of sectors involved in planning cities. This new Climate Plan aims to bring together more systematically sectors' efforts toward a holistic, sustained, and climate-smart urban development served by a greener mobility system. Under the Climate Plan, the following priority action areas are proposed for Resilient Cities and Green Mobility:

I. Support policy reform and investments in the built environment that address resilience and contribute to climate change mitigation.
II. Enhance knowledge and data to support climate-smart investments, policy, and planning.
III. Support economic and social resilience through inclusive approaches.
IV. Catalyze financing and partnerships.

I Support policy reform and investments in the built environment that address resilience and contribute to climate change mitigation

The main components fall under climate-smart urban planning and urban mobility.

Climate-smart urban planning. With rapid urban population growth across most of Africa, decisions made around spatial patterns of infrastructure investments and land-use arrangements today will strongly influence whether urban areas will be able to reach net-zero emissions in the second half of the century. Planners should focus on dense, mixed-use development in resilient areas—with integrated transport planning through improved spatial and social planning across sectors (including transport, urban planning and water supply). Climate change vulnerabilities need to be part of urban planning to increase resilience, such as flood protection and stormwater drainage. Ecological planning approaches (e.g., watershed management or protection of mangroves and wetlands on nearby coastlines) should be engaged. The integration of climate resilience and adaptation and mitigation considerations into urban planning and management could be done through land use regulations or compact- or transport-oriented urban development. There is a huge potential in planning for new

Saint Louis, Senegal on a calm day. Sea rise often inundates the city. *Anze Furlan / Shutterstock*

secondary cities, especially compared to costs in retrofitting existing larger cities. Coastal cities require special attention and coordination with environment, energy, food, and water supply sectors due to the concentration of population and economic activities and the inherent risks associated with being in a coastal zone.

Green urban mobility. Transport priorities should reflect the enable, avoid, shift, improve (EASI) framework for low-carbon transport advocated by the World Bank and others (Stucki 2015) Some manifestations are visible in the NDC goals. For Africa, this approach means aligning governance with low carbon development:

- Setting up metropolitan transport authorities, supporting their capacity, and establishing sustainable financing systems
- Minimizing the need for motorized transport through improved spatial planning in urban areas
- Using a multimodal perspective in developing and managing integrated, hierarchical transport systems that are anchored on low carbon, nonmotorized, and accessible mass transit

Urban infrastructure and services. Continued investments in climate-resilient infrastructure that supports both adaptation and mitigation will help cities lower their carbon emissions and adapt to changing climatic conditions. Flood protection and stormwater drainage are essential. Solid waste management provides opportunities for GHG mitigation and provides health benefits. As developed in Europe and other regions, green buildings should be considered, including mitigation investments in energy efficiency, solar rooftops and streetlighting, and green buildings certification. Nature-based solutions present opportunities for both adaptation and mitigation.

Workers drain a flooded thoroughfare after a night of severe thunderstorms in Kisumu, Kenya. *Peter Kapuscinski / World Bank*

Housing should be climate resilient. Cutting edge technology and practices should be used to shift toward highly efficient and sustainable WSS utilities, including circular economy and wastewater reuse and resource recovery. Integrated WRM can ensure urban water security. This requires upstream management of demand that is beyond city jurisdiction.

Upgrading informal settlements. Investments include provision of infrastructure and basic services, such as roads, bicycle paths, pedestrian walkways, street and security lighting, solid waste collection and settlement sorting, stormwater drainage, WSS systems, public parks, and green spaces. Investments can also be made in land tenure arrangements.

The Climate Plan emphasizes the use of policy to support urban planning and governance. The World Bank supports multisectoral DPOs and other measures and incentives to improve implementation of efficient land use and planning regulations, transport regulations, and building regulations. These efforts will help to ensure that national and subnational governments have sufficient and integrated implementation and enforcement capacity to transform urban development. Development and enforcement of sound land use and building regulations must be based on the following:

- Understanding climate change vulnerabilities
- Encouraging dense, mixed-use development in resilient areas
- Engaging in ecological planning approaches (e.g., watershed management or protection of mangroves and wetlands on nearby coastlines)

Similar to that of low-carbon transport, credible analysis of vulnerabilities and reliable assessments of investment priorities must be the foundation of policy and investment in resilient transport systems. Few African countries have included explicit targets for

transport-related adaptation measures in their NDCs, but there is growing recognition that these measures should be addressed. Ebinger and Vandycke (2015) recommend four main pillars of climate resilience in transport systems: sectoral and spatial planning; resilient infrastructure solutions (engineering and nonengineering); enabling environment; and postdisaster risk and recovery support. These share some overlap with the EASI framework for low-carbon transport development—and new measures can complement both. Closer adherence to these pillars across countries' planning and investment portfolios will be a key to successful adoption across Africa.

II Enhance knowledge and data to support investments and policy

Upstream analysis is a priority action area because it can show potential economic and social benefits of investments to better inform Africa's urban planning and development. Also needed is knowledge exchange with other regions that have gone through such transitions. Updated and robust data are critical inputs to upstream analysis across all sectors.

Harnessing data and digital technologies, such as data analytics, mobile communications, and social applications, can transform city operations and service delivery, and help planners to assess and address climate-related urban shocks and stresses. These technologies can enhance the understanding of spatial development and risk patterns, such as (i) open data platforms; (ii) flood, coastal erosion, landslide, and other risk assessments; (iii) population and urban growth patterns; (iv) transport demand, traffic patterns, travel times, and infrastructure repair state; and (v) rainfall, river gauge, and pollution monitoring systems. African cities are leveraging these new technologies to enhance decision-making, improve service delivery, crowdsource solutions, and engage with citizens more directly. In Brazzaville, the Republic of Congo, community mapping was used to collect neighborhood-level geospatial data. Data were made available on Open Street Map and used for capacity building and awareness, as well as to inform local development plans. In Freetown, Sierra Leone, new data-gathering technologies and analytical techniques have been used to identify integrated transport corridors to help transform the city from a congested, vehicle-oriented city to a resilient, people-oriented one, which has improved quality of life for all citizens. In Dar es Salaam, Tanzania, sophisticated drone technology is being used to derive terrain elevation datasets for numerical hydraulic modeling to support development of solutions to increased flood risk. In cities across Niger, high-resolution satellite imagery and other technologies are being used for urban management and development in domains such as solid waste management, assessing school demand, access to markets, revenue collection, and land management.

Enhance the understanding of spatial development and risk partners. The UN Economic Commission for Africa (UNECA) estimates that only 2.9 percent of Africa is mapped at local scales, in contrast to more than 87 percent of Europe. New approaches are needed that can significantly scale the coverage and frequency of data collection. The Urban/DRM team is developing an open database of geo-diverse training samples to support machine learning algorithms and a service to provide quarterly updates of urban growth in Africa. Similar spatial data initiatives in the transport sphere are bringing global best practice to the African context (such as in Freetown, Sierra Leone); these could transform analytical approaches to urban transport planning with other urban services in an integrated way. Scaling up these techniques will be an important action area.

Robust analytics are needed to support investments and policy. As a scaled-up response to climate change adaptation, strategic urban flood risk assessment can operationalize and standardize the process to help task teams identify the most reliable yet pragmatic options for conducting strategic flood risk assessments to inform program and investment design in short time frames.

More structured research or knowledge sharing of informal urban passenger transport is needed due to its dominant role in African cities. More knowledge is needed in these areas:

- Capacity of the sector
- Potential for transformation
- Capacity for investment financing in more favorable conditions
- Potential for application of new technologies and business or service models
- Internal dynamics
- Transferability of experiences from one setting to another

Climate-informed development in the transport sector depends on the availability and implementation of better analysis, which must be positioned further upstream than in the past. Examples include low carbon development studies for generation of investment scenarios, and countrywide infrastructure vulnerability assessments that could lead to prioritized investment plans for resilient transport networks. The unifying factor is operational orientation: these analyses must point toward investments in infrastructure, services, or improvements to the policy environment.

Integrated planning in terms of institutional capacity and governance are critical for technical capacity, implementing zoning regulations, and building codes.

III Support economic and social resilience through inclusive approaches

By ensuring diverse interests and users in the design of urban and transport systems, better economic and development objectives can be achieved.

Strengthen resilience through investment in a skilled workforce. Green jobs could be a part of such measures (UNEP 2019).

Strengthen resilience of highly vulnerable households through socioeconomic inclusion planning, such as community mapping, community threat and asset mapping, community risk reduction planning, and community response planning. All should be completed through inclusive participatory approaches and people-centered technologies. Some considerations related to social resilience and extreme events and disaster will be addressed under the Disaster Preparedness, Social Cohesion, and Resilience direction.

IV Catalyze finance and partnerships

Catalyze financing and partnerships. Given the multilevel and multisectoral nature of urban development, developing partnerships is key. Upstream decisions have far-reaching consequences for cities; therefore, city authorities need to form partnerships at the subnational and national levels as well as with the private sector. This is also important in terms of securing financing. The Bank is a part of the Medellin Collaboration on urban resilience and has been working closely with international partners, including the Cities Alliance, UN Habitat, the Global Facility for Disaster Reduction and Recovery (GFDRR), the Global Environment Facility (GEF), the Rockefeller Foundation and its 100 Resilient Cities initiative, the International Council for Local Environmental Initiatives (ICLEI), the C40 Cities Climate Leadership Group, the German Corporation for International Cooperation (GIZ), and the French Development Agency (AFD). The World Bank is a key member of the Sustainable Mobility for All (Sum4All) coalition, which brings together 55 member groups—including United Nations agencies, multilateral development

banks, civil society, the private sector, and donors—to promote safe, efficient, green, and universally accessible transport. The resources through this network can be used to contribute expertise, capacity, and funding to the actions undertaken under this business plan.

7.8 Targets and Indicators

Table 7.1 summarizes the alignment of targets with corporate commitments under the Resilient Cities and Green Mobility direction. See annex 7A for an overview of the Theory of Change for this Strategic Direction.

The Theory of Change for this Strategic Direction presents a mapping of the pathways of change toward the achievement of expected impacts on resilient cities and green mobility, and the Climate Plan's goal (figure 7.1). This Theory of Change constitutes a live pathway that provides a snapshot of the broader vision of the Strategic Direction and may be adjusted as needed throughout the Climate Plan implementation.

TABLE 7.1 Resilient Cities and Green Mobility Strategic Direction: Aligning targets with corporate commitments

Targets Sub-Saharan Africa	Targets World Bank
Core Tier 1	
Tier 1 Resilient Cities ▶ Integrated planning: multisectoral climate-smart urban and transport plans prepared with up-to-date data for at least five (5) African cities ▶ 30 cities with integrated, city-based resilience approach ▶ Target of US$2 billion in investment financing for urban resilience-building activities ▶ Upstream analysis: integrated transport and urban planning represented in SCDs and CPFs for at least three (3) African countries **Tier 1 Green mobility** ▶ Support 5 new bus rapid transits (BRTs) in fast-growing African cities (making at least 50 percent of jobs accessible within an hour of commute). ▶ Secure maintenance to make at least 100,000 km of African roads climate resilient (*directly supports Africa Transport GP [FY26]*)	▶ 100 cities with low carbon and compact urban planning (Corporate FY25 target) ▶ 100 cities with integrated, city-based resilience approach (Corporate FY25 target)
Tier 2 (*supplementary targets proposed by the Transport GP for Sub-Saharan Africa*)	

- At least one Development Policy Operation (DPO) by promoting combined urban and transport planning with disaster risk management (DRM) or disaster resilience policy measures.
- Upstream analysis: integrated transport and urban planning represented in Strategic Country Diagnostics (SCDs) and Country Partnership Frameworks (CPFs) for at least three African countries.

FIGURE 7.1 Theory of Change: Resilient Cities and Green Mobility

NG-ACBP IMPACT	This Theory of Change focuses on the broader vision of the NG-ACBP's Strategic Direction (SD) on 'Resilient Cities and Green Mobility', underpinned by climate informed macro-policies and green and resilient infrastructure. The ToC constitutes a live map and may be adjusted throughout the NG-ACBP's implementation.			
	Strengthen Africa's development pathway towards a climate-smart and secure future by engendering leap-frogging and transformation at scale through the Bank's financial and technical leverage.			
	SPECIAL AREAS OF EMPHASIS: *Climate informed macro policies, Green and resilient infrastructure*			
STRATEGIC DIRECTION IMPACT	*Ensuring that existing and future cities and mobility systems in SSA are engines of growth that promote low carbon and climate-resilient development in the face of rapid urbanization and escalation of poverty trends amplified by climate change.*			
OUTCOMES (Priority Action Areas)	**POLICY REFORM AND PLANNING**	**KNOWLEDGE AND DATA**	**SKILLS, TALENT, AND WORKFORCE**	**CATALYZING FINANCING AND PARTNERSHIPS**
	Long(er) term climate-smart urban and mobility transitions in place	Robust knowledge and data used to inform the design of climate-smart investments	Next generation set of skills, talent, and workforce available to absorb youth into climate-smart jobs supported by mobility-enabling infrastructure and services	Climate action, investments, and knowledge sharing between cities, local and national government, and the private sector
OUTPUTS	► Policy reforms in place and long-term urban planning that integrates multisectoral priorities and addresses resilience and low carbon growth.	► Enhanced customized knowledge and data to support climate smart investments and policy	► Investments implemented in skills building, talent, and workforce strengthening ► Strengthened mobility, infrastructure and services that facilitate economic growth and jobs	► Multi-level climate financing and partnerships in place
ACTIVITIES	► Development of climate smart urban plans ► Support to regulatory policy and incentives ► Integration of green urban mobility into urban planning ► Support for urban infrastructure and services including Transit Oriented Design approaches ► Upgrading informal settlements	► Address data gaps across sectors to inform climate-smart investments, including harnessing digital technologies ► Enhance the understanding of spatial development and risk ► Generation of robust analytics to support investments and policy ► Research + knowledge-sharing on informal urban passenger transport ► Improvement of institutional capacity.	► *Capacity building and skills development for climate smart jobs, training modalities and curriculum.* ► *Adoption of an inclusive approach to identify stakeholders; use of people-centered technologies.*	► Use the resources available through existing networks (e.g., Medellin Collaboration on Urban Resilience; Sum4All coalition) to contribute expertise, capacity and funding ► Structural payment programs or government policy that support and facilitate funds for flood infrastructure ► Strengthening transport infrastructure to improve growth.
PROBLEM STATEMENT	► SSA is undergoing an urban transition with rapid population growth and expanding cities. Urban population is expanding and will triple from 441 million in 2020 to reach 1.31 billion by 2050; with 60% being youth. Between $130 billion to $170 billion is needed annually to address the infrastructure gap in Africa	► African cities' assets, services and people will face escalated climate impacts in the coming decades. Road maintenance costs are expected to rise by 270% from increased precipitation, flooding, and temperature. Rapid and slow onset climate change will drive migration to cities, adding to poverty and the 60% slum population.	► The region lacks the skills to absorb the large youth bulge into climate-smart jobs. Data gaps, low-density spatial development, including roads, are barriers for growth.	► Urban areas throughout Sub-Saharan Africa face major mobility challenges (e.g., congestion, commute times, overcrowded, insufficient and low-quality transit, fragmented networks), which are sometimes exploited by service providers.	► The security of cities – for water, food, and energy – extends beyond its physical boundaries and needs a consideration of its larger footprint and cooperation with subnational and national entities. Effective multilevel governance and partnerships are needed.

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Climate Shocks

OUTCOMES

- **Targeted people-centered, community-led, customized solutions and delivery mechanisms for climate actions:** Strengthened ability of the poorest and vulnerable to recover quickly and more effectively from climate (and other) shocks.
- **Information systems for early warning and decision support:** Strengthened and enhanced climate information systems for early warning and decision support reaching the poorest and most vulnerable.
- **Institutional and policy response:** Improved institutional, risk financing and macro-fiscal policy to prepare and respond to climate shocks (and pandemics).

SCOPE OF OUTPUTS

- Policy reforms in place and long-term urban planning that integrates multisectoral priorities and addresses resilience and low-carbon growth.
- Enhanced customized knowledge and data to support climate smart investments and policy.
- Investments implemented in skills building, talent and workforce strengthening.
- Strengthened mobility, infrastructure and services that facilitate economic growth and jobs.
- Multi-level climate financing and partnerships in place.

An aerial view of Beria, Mozambique after Cyclone Idai hit in 2019.

Nicole Macheroux-Denault / Shutterstock

CHAPTER 8
Strategic Direction V: Climate Shocks and Risk Governance

8.1 Poverty and Climate Shocks

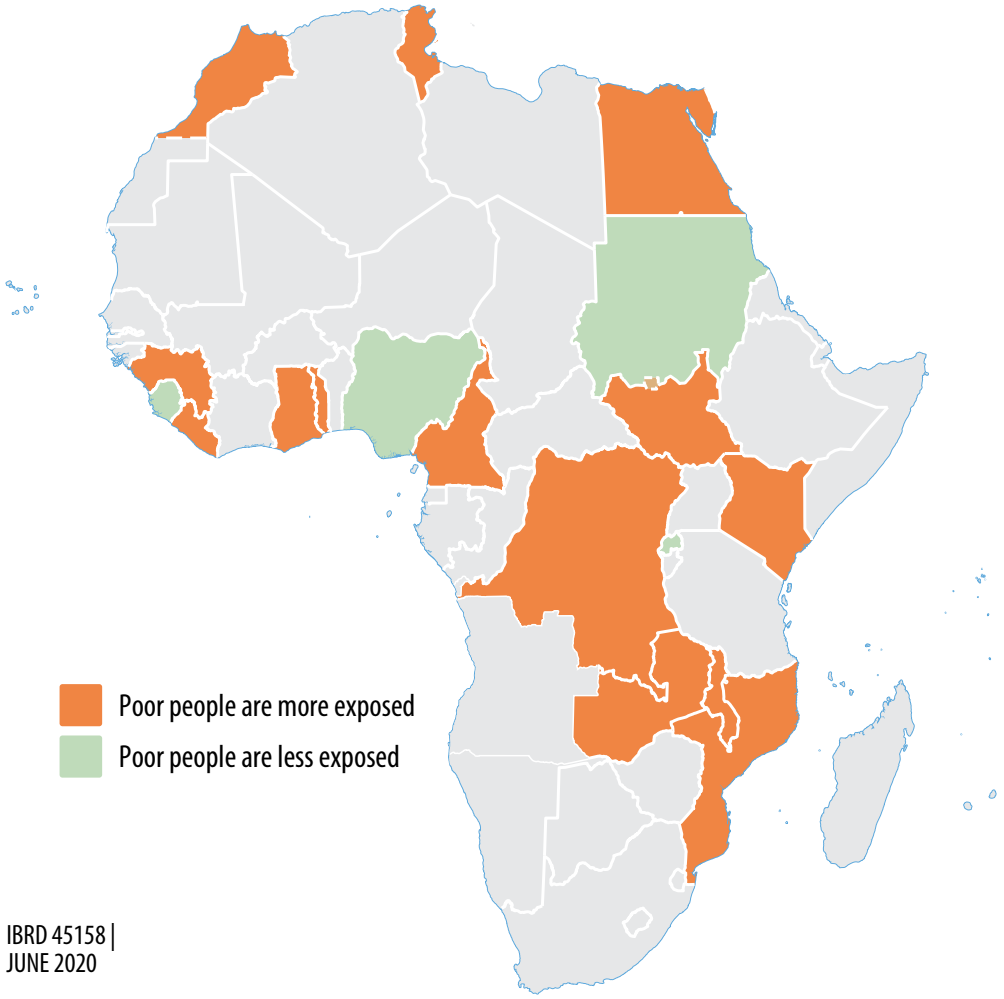
Sub-Saharan Africa accounts for most of the world's poor population. The number of people living in extreme poverty in the region has grown from an estimated 278 million in 1990 to 416 million in 2015 (World Bank 2018b), approximately 41 percent of the population. By 2030 the number of extreme poor who earn less than US$1.90 a day will increase by 43 million (Hallegatte and others 2017). According to Beegle and Christiaensen (2019), climate change in most African countries is predicted to reduce the income of this bottom 40 percent by more than 8 percent by 2030.

Poverty exacerbates the exposure to climate impacts. Poor people are more exposed to floods, drought, and high temperatures than the rest of the population in Africa (maps 8.1, 8.2, and 8.3) due to a higher vulnerability of assets and livelihoods, lower ability to cope and recover from disasters, and the effects of risk on saving and investment behavior (Hallegatte and others 2017). According to the IPCC 1.5°C Special Report (2018), the region has already experienced the dramatic consequences of more frequent and more intense climate extremes over the past decades (Hoegh-Guldberg and others 2018), compounding existing vulnerabilities.

Climate change is a driver of fragility and a threat multiplier that could exacerbate in the face of such emerging megatrends as demographic change, migration, ecosystem collapse, and environmental degradation. The impacts of climate shocks and crisis deepen preexisting fragility and increase the vulnerability of poor populations in fragile and conflict-prone areas. This constitutes an area of growing concern for the region; projections indicate that by 2030 most of the extreme poor will live in fragile and conflict-affected countries (ODI 2018). Without concrete climate and development action, protracted water stress, loss in crop productivity, and sea level rise could yield as many as 85 million internal climate migrants by 2050, and an emergence and spread of hotspots of climate in- and outmigration (figure 8.4, panels a and b) (Rigaud and others 2018).

The number of people displaced from natural hazards, pandemics and disasters in Sub-Saharan Africa continues to rise, with consequences on health and mortality (IDMC 2019). In 2017, drought triggered 434,000 displacements in Ethiopia; Cyclone Enawo displaced 247,000 people in Madagascar; floods displaced 189,000 in Niger; and Cyclone Dineo displaced most of the 170,000 in Mozambique (IDMC 2018). In 2019, Cyclones Idai and Kenneth affected close to 2.2. million people in Malawi, Mozambique,

MAP 8.1 Poverty exposure bias to floods in Africa



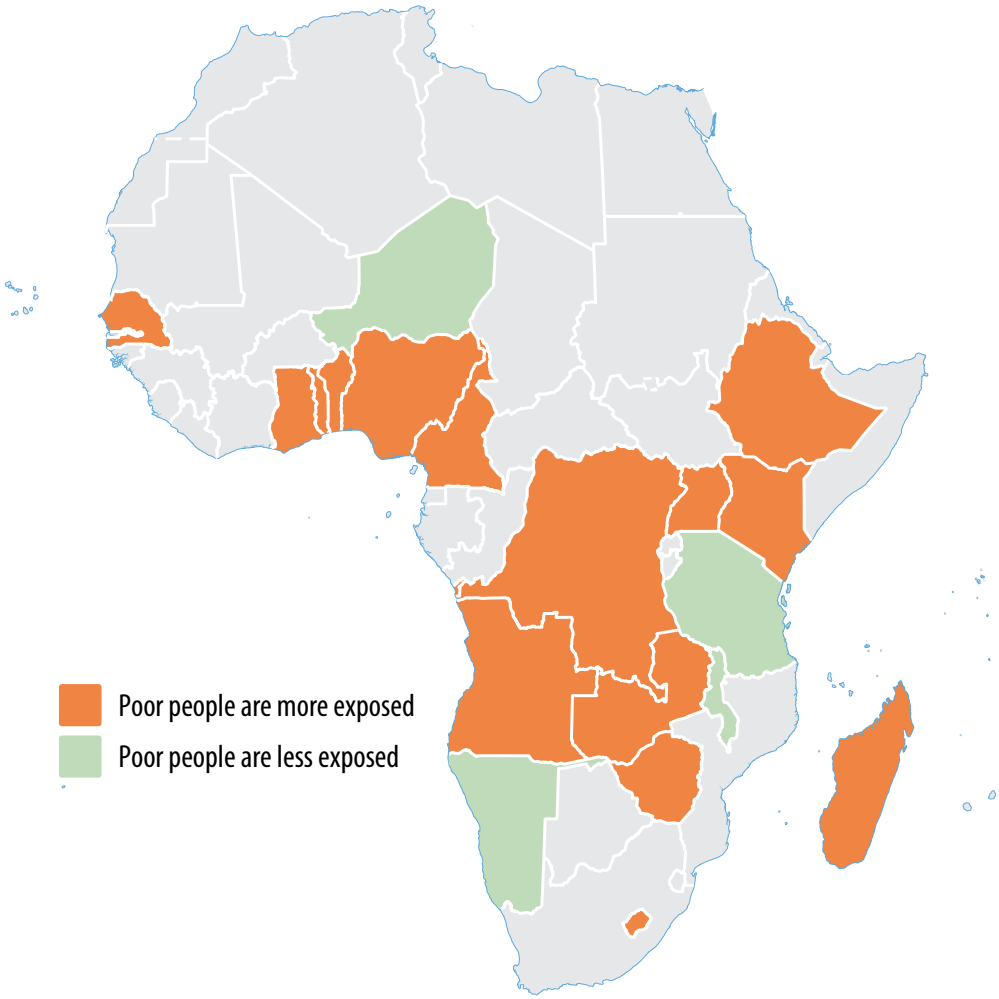
Source: Hallegatte and others 2018.

and Zimbabwe (USAID 2019). In Ghana, high ambient temperatures have been associated with an increase in all-cause mortality, particularly in young children and the elderly (Azongo and others 2012).

Changing climate patterns are also altering the spread of vector-borne diseases such as the Zika virus, dengue fever, and malaria by altering the conditions under which the disease vectors develop, and the pathogens they carry. A billion people will be newly exposed to diseases such as dengue fever as world temperatures rise. Vectors such as Ae. aegypti is likely to expand, particularly in South Asia and Sub-Saharan Africa. While research capacity for monitoring and projecting the health impacts of climate change is limited, WHO estimates that there will be approximately 241,000 additional climate change–related deaths in 2030, with the greatest share coming from Sub-Saharan Africa (approximately 157,000) (WHO 2014).

Climate change impacts also exacerbate vulnerability in the case of global disease outbreaks and health-related shocks, such as pandemics. This is a particular area of concern in the case of crises such as COVID-19. While research capacity for monitoring and projecting the health impacts of climate change is limited, WHO (2014) estimates that there

MAP 8.2 Poverty exposure bias to drought in Africa

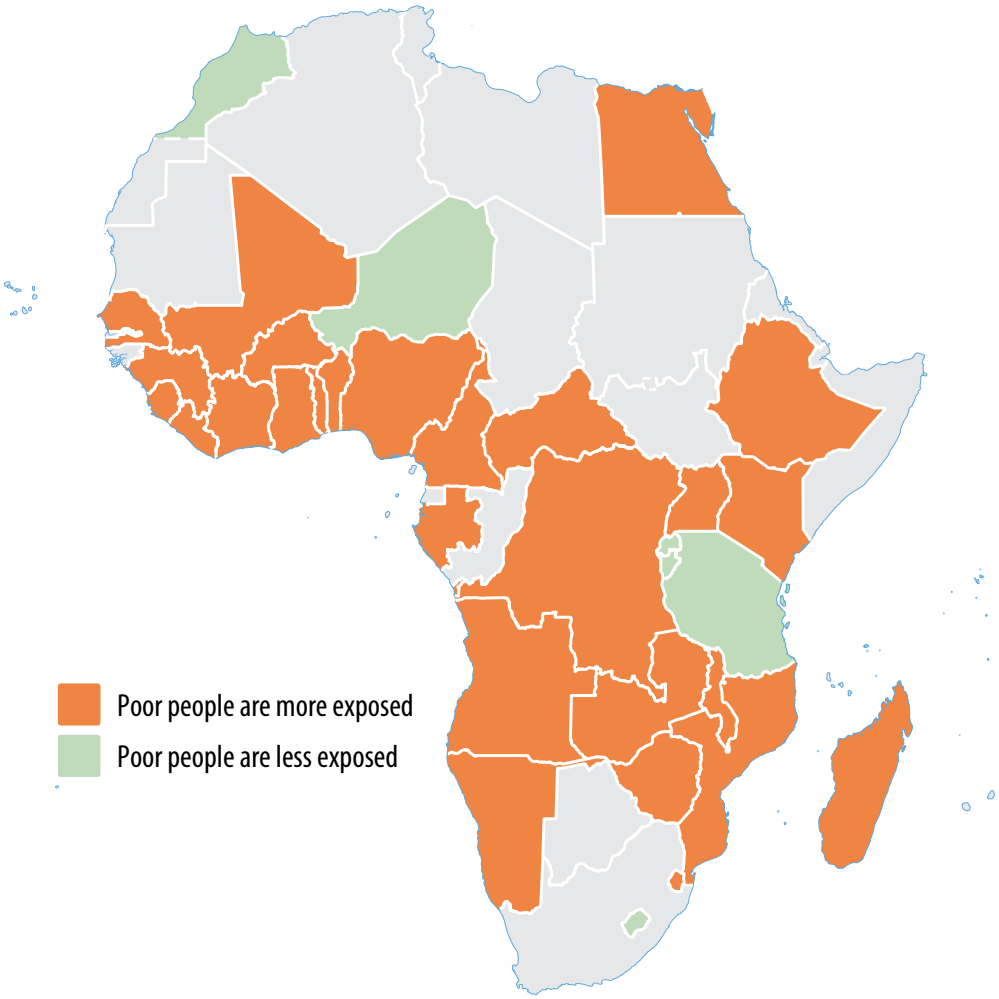


Source: Hallegatte and others 2018.

will be approximately 241,000 additional climate change–related deaths in the year 2030, with the greatest share coming from Sub-Saharan Africa (approximately 157,000) driven by heat extremes, vector-borne diseases, undernutrition, and diarrhea. Pandemic outbreaks can led to decreased investment and cause a substantial loss in private sector growth; unleashed threats to food security through declining agricultural production; and burdened cross-border trade with restrictions on movement, goods, and services—with economywide effects (World Bank 2019c). The magnitude of human, financial, and economic impacts from pandemics highlights the importance of investing in preparedness as a critical dimension of human capital and risk governance.

Evidence that climatic events increase the risk of violence and conflict is growing (Burke, Hsiang, and Miguel 2015). Conflicts drive 80 percent of all humanitarian needs globally and can reduce GDP growth by 2 percent to 8 percent per year on average, undermining development gains. As recognized by the World Bank (2019d), climate change is a driver of fragility and a threat multiplier. Climate change can act as a stress particularly in fragile situations in which governments have limited coping capacities and means to help their populations adapt. It can increase the likelihood of violence through pressures on natural

MAP 8.3 Poverty exposure bias to temperatures in Africa

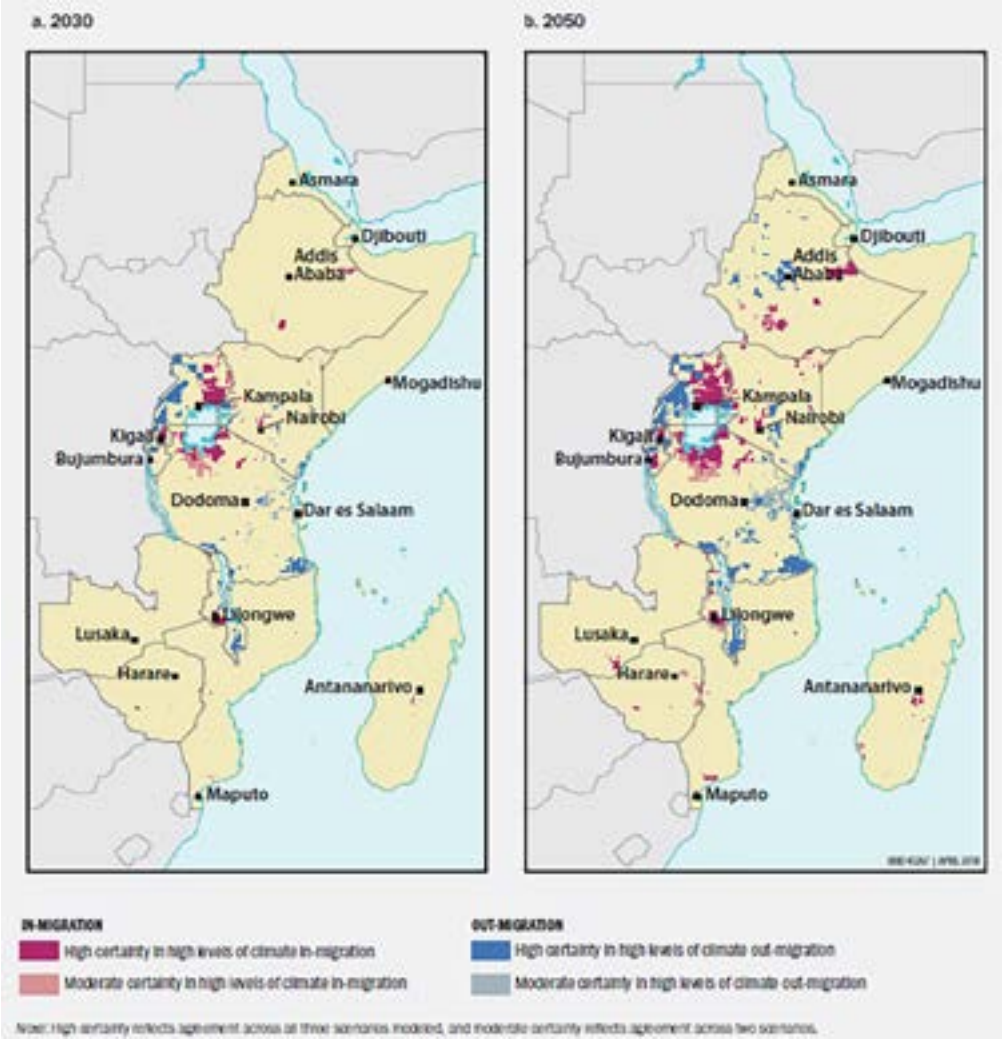


Source: Hallegatte and others 2018.

resources, particularly land and water, natural disasters, and migration. Overall, 65 percent of present conflicts have a significant land dimension, while conflicts around fresh water are increasing, particularly at the subnational level, as that resource becomes scarcer (World Bank 2019d). In parts of Africa, tensions between pastoralists and agriculturists over access to land and water have escalated to violence.

Damage of essential infrastructure systems—water, power, sanitation, telecommunications, roads—due to climate change will affect the well-being of urban and rural households and the productivity of businesses (Hallegatte, Rentschler, and Rozenberg 2019). Resilient mobility is an important component of overall societal resilience because these services allow relief supplies to reach a stricken area, or evacuees to reach safety. Urban flooding in several Sub-Saharan African cities are a significant driver of disrupted traffic flows, affecting the connectivity between firms and supply chains (Hallegatte, Rentschler, and Rozenberg 2019). Disruption of transport links due to climate-related failures of roads or bridges has substantial economic consequences for African countries. The situation is predicted to worsen substantially with climate change (Cervigni and others 2016).

MAP 8.4 Projected hotspots in East Africa with high levels of climate in-migration and out-migration, 2030 and 2050



Source: Rigaud and others 2018.

A 1 percent increase in electricity outages would account for a loss in firms' total factor productivity of 3.5 percent, on average (Mensah 2018).

The intergenerational consequences of climate impacts, especially on the poorest households, can have long-lasting effects on the region's growth pathways. Climate change impacts undermine food security, malnutrition, and health, which in turn can affect human capital formation if families are forced to take their children out of school. Women born during severe droughts bear the marks throughout their lives (e.g., growing up physically shorter, receiving less education) (Damania and others 2017). Insufficient feeding during the first 1,000 days of a child's life (e.g., as a result of drought) leads to child malnutrition and can have long-lasting effects on a female's reproductive prospects and offspring (Bodewig 2019). The changing epidemiology of disease in the region as a result of climate change has implications for health service provision.

Box 8.1

Decentralizing climate finance and action in Kenya

As part of its devolution process, the Government of Kenya is supporting county governments to lead the charge in scaling up locally led climate action. The Kenya Financing Locally-Led Climate Action program is developing an innovative model of delivering climate finance to the local level. The program will strengthen local resilience to the impacts of climate change, natural hazards, and other shocks and stressors by building counties' capacity to plan, implement, and monitor resilience investments in partnership with communities. Counties will be supported to establish the policies, institutions, and mechanisms to engage communities in co-designing climate investment plans, and then provide support to implement those plans. The program will be national in scale, linking local-level action to national-level coordination and planning, and emphasizing the governance, social inclusion, and citizen participation aspects of climate and disaster risk management. The program builds on successful pilot efforts that have worked through county governments to increase their understanding of the importance of investing in climate resilience and in partnering with communities to jointly identify climate solutions: solutions that directly respond to the immediate priorities and needs of communities while building longer-term resilience.

Source: World Bank 2020.

Community participation and citizen engagement in planning, decision making, implementation, and monitoring are crucial for effective climate action, not only for accountability but also to build ownership and sustainability of efforts (box 8.1). There is a need to protect and meaningfully engage those who face a higher risk to climate shocks, or those who due to social, political, or economic marginalization are limited in their ability to benefit from development or resilience investments. Just as climate extremes will affect poor and marginalized groups more severely, policies to promote low carbon growth and climate adaptation can have strong socioeconomic impacts that will not be experienced equally across the income distribution and will need to be accompanied by targeted policies to mitigate the impacts.

Moreover, there is an opportunity to capitalize on the skills and expertise that communities bring to the table. Organized communities have a wealth of risk management knowledge based on their lived experience and should be engaged as partners in climate action decision making rather than beneficiaries. Research has shown that community leaders can set priorities, influence policies, and design and implement investment programs that are responsive to their own needs. In many cases, they are quite innovative solutions, based on indigenous or traditional practices.

8.2 Moving from Coping to Enhanced Socioeconomic Resilience

The extreme poor households must not be disenfranchised in the face of climate shocks. Scaled-up and effective preparedness to climate shocks in the most vulnerable communities and areas, underpinned by enhanced social cohesion and resilience, is crucial to get ahead of the curve. The most vulnerable groups tend to have the fewest opportunities to adapt locally or to move away from risk; when moving, they tend to do so in adverse circumstances. This can increase the probability of migration and forced displacement under distress, often to other areas of risk (Rigaud and others 2018). Several World Bank initiatives address the drivers and impacts of migration in the region by building community resilience and addressing gender-specific vulnerabilities (box 8.2). Pursuing inclusive and climate-resilient development policies with targeted investments can reduce the number of people displaced or forced to migrate.

Box 8.2

Addressing the drivers and impacts of migration

Several large operations, with financing of more than US$300 million, were approved under the regional program Development Response to Displacement Impacts Project (DRDIP) in Djibouti, Ethiopia, Kenya, and Uganda to address the impacts of forced displacement and migration in the Horn of Africa. Through a multisectoral development approach that addresses the unmet social, economic, and environmental needs of the local host communities, the projects seek to improve basic social services, expand economic opportunities, and enhance environmental management for communities hosting refugees in target areas. The regional grant supports the establishment of a Regional Secretariat on Forced Displacement and Mixed Migration, with objectives including an improved understanding of the nexus between socioeconomic development, forced displacement and mixed migration in the Horn of Africa with relevant linkages to the Great Lakes Initiative.

Sources: World Bank website, n.d., "Development Response to Displacement Impacts Project in the HoA," https://projects.worldbank.org/en/projects-operations/project-detail/P152822; World Bank 2016.

Governments must shift from reactive to proactive and anticipatory responses. Addressing crisis hotspots requires urgent and immediate attention. For durable outcomes, these responses must go beyond the proximate causes to address the underlying drivers, including environmental and climate-related factors that jeopardize livelihoods and fuel conflicts. It is essential to step up preventative approaches that anticipate future impacts, and that enable integrated solutions. For example, the World Bank's Regional Sahel Pastoralism Support Project supports transboundary migration as an adaptation strategy for pastoralists threatened by drought and conflict. It provides such interventions as migration corridors, shared water points, surveillance for major diseases and veterinary services, and strengthened early warning systems and crisis response.

Inclusive, people-centered, and locally led approaches can ensure long-term development solutions and transition from emergency assistance. Countering the spread and intensity of climate change impacts requires far-sighted planning and inclusive approaches that complement disaster preparedness and foster social cohesion through bottom-up citizen engagement (box 8.3).

Enhanced human capital is a critical enabler of climate resilience and a central driver of sustainable growth and poverty reduction in Africa. Health and education ensure that climate risks are well-embedded to deliver human capital that is healthy and well-skilled to counter climate impacts. Investing in human capital, strengthening and expanding social protection systems (including delivery platforms and ASP programs), and maximizing good jobs to realize returns to human capital are among the measures needed for socioeconomic resilience. Key linkages between this Strategic Direction and the World Bank's Africa Human Capital Plan are available in chapter 9.

ASP enhances the socioeconomic resilience of vulnerable households by providing triple wins of social protection, climate change adaptation, and disaster risk reduction. Social safety nets allow vulnerable households to avoid costly and often irreversible coping strategies (e.g., selling their most productive assets at low prices or taking children out of school), and boost investment in productive assets that can be used savings (e.g., livestock) (Beegle and others 2018). In fragile states, social safety nets are widely used in response to shocks, including cash transfers and food-based programs (Beegle and others 2018). With community engagement, governments must identify priority investments in public and semi-public goods that help build resilience to extreme events, as well as to the underlying trends (e.g., deteriorating a natural resource base on which livelihoods of most of the most vulnerable depend).

Box 8.3

Promoting social resilience through the Western Africa Coastal Areas Management Program

The Western Africa Coastal Areas Management Program (WACA) is a response to the increasing perils of coastal erosion and flooding, while better tapping the potential of the blue economy. The program mixes technical assistance and investments to strengthen the resilience of coastal communities and their assets against climate and other natural hazards. It uses engineering and nature-based solutions to support the preservation and rehabilitation of natural coastal resources. WACA's approach of providing longer-term development solutions and transitioning from emergency assistance is having a transformative impact.

WACA and investment activities engage coastal communities in decision making not only to protect the rights of those affected by WACA activities but also to partner with communities on sustainable solutions.

In São Tomé and Príncipe, communities have asked for assistance in relocating following recurrent storm surges that washed away homes and assets and claimed lives. The coastal shoreline has been receding the past decades and there is predicted attrition in the coming decades. WACA supports planned relocation by working with four communities to identify those most at risk, identify safe land, and allocate plots in a safer area. National and local leaders in other countries involved in WACA are asking for similar help.

The composition of social safety net portfolios is highly diverse, ranging from ex post emergency responses to ex ante, longer-term socially sustainable tools (figure 8.1). While safety net options are used to respond to climate shocks, if well-designed and integrated as part of larger development strategies, they can also contribute to development goals. For example, the Sahel Adaptive Social Protection Program (SASPP) under phase 1 supported the development of ASP programs and systems across six countries in the Sahel region (Burkina Faso, Chad, Mali, Mauritania, Niger, and Senegal). ASP programs build the resilience of vulnerable households before, during, and after covariate shocks.

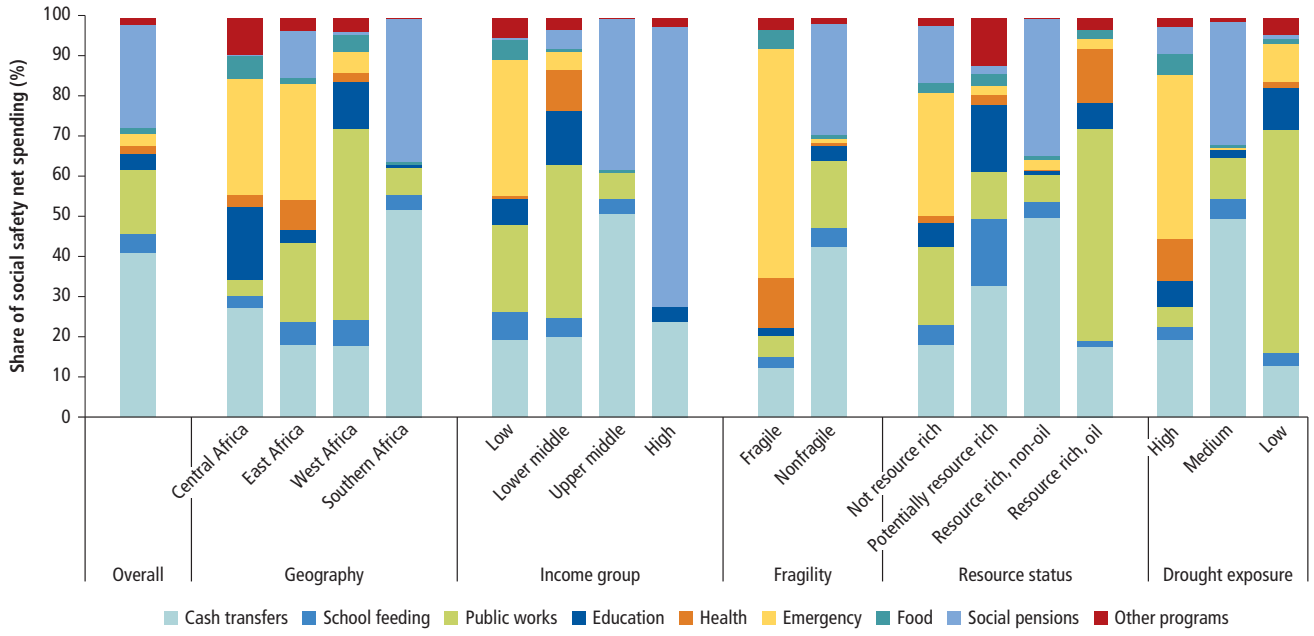
Innovative financing mechanisms help to manage disasters and climate risk using an array of financial protection policies and instruments, including sovereign risk finance, social protection programs, and agriculture and risk insurance programs (box 8.4) (Wesley and Piccio 2019). For example, the Kenya Cat-DDO filled critical gaps in the country's institutional and financial framework and policies for disaster risk management and enabled expansion of its safety net as a response to disasters. Increasing remittance flows in disaster-affected countries builds resilience (World Bank 2018a).

8.3 Macro-Fiscal and Institutional Arrangements for Resilience

Far-sighted planning and effective macroeconomic-resilient policy response cannot be postponed in the face of intensifying climate shocks. Conventional macroeconomic models do not regularly integrate climate shocks and adaption into core macrostructural modelling. Climate change is a whole of economy issue, posing risks to poverty levels, economic growth, and macroeconomic stability. Recurrent occurrence of acute climate shocks and chronic climate impacts in poor and vulnerable localities can quickly erase development gains and set entire households and communities into a spiral of poverty—with intergenerational consequences.

Systematic analysis of the underlying drivers of vulnerability and fragility can help inform the design and delivery of proactive approaches to secure macro-fiscal stability

FIGURE 8.1 Composition of social safety net portfolios



Source: ASPIRE (Atlas of Social Protection Indicators of Resilience and Equity) (database), Administrative data, World Bank, Washington, DC, http://www.worldbank.org/aspire.

Source: ASPIRE database.

Box 8.4

Africa Disaster Risk Financing Initiative

Launched in 2015, the Africa Disaster Risk Financing (ADRF) Initiative works with almost 20 African countries to develop and implement tailored financial protection policies and instruments that can help them respond quickly and resiliently to disasters. The ADRF Initiative is the first program in Africa to focus on the broad disaster risk finance (DRF) agenda. It is financed by the European Union (EU) and implemented by the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR), as part of the Africa, Caribbean, and Pacific (ACP)–EU Program, Building Disaster Resilience in Sub-Saharan Africa. The ADRF Initiative focuses on three areas to pioneer DRF in Africa:

- Gathering and developing disaster risk information
- Developing DRF strategies to achieve national financial protection priorities
- Sharing knowledge and lessons learned

Source: GFDRR 2018.

and socioeconomic resilience. These approaches are key to lift poor households out of the "constant coping cycle" and become thriving communities. An informed, proactive transition that incorporates acute climate shocks and chronic climate stresses into policies, financial, and social structures can help ensure that the poorest individuals are not left behind.

8.4 Priority Action Areas

The wide-ranging consequences from intensifying and recurrent climate shocks on the poorest and most vulnerable people and countries call for strategies that address both proximate and underlying causes of vulnerability to secure sustainable solutions. Crisis preparedness, resilience building, and country support in their national climate-related action plans constitute key areas of focus of IDA19. These include tailored responses to address the drivers of fragility, conflict, and violence, particularly in the Sahel, the Lake Chad region, and the Horn of Africa, as well as earlier response to slow-onset crises such as disease outbreaks and food insecurity (World Bank 2019a; 2019b).

Action on disaster preparedness, social cohesion, and socioeconomic resilience must be escalated in the face of intensifying and more frequent climate extremes. Actions and solutions must be focused on urgent, proximate needs, but underpinned by durable, sustainable outcomes that guard against cyclical emergency responses.

Three overarching priority areas address the climate-development nexus.

- Targeted people-centered, and locally led solutions and delivery mechanisms.
- Strengthened and enhanced information systems for early warning and decision support can reach the poorest and most vulnerable populations.
- Improve the institutional setup for climate change preparedness and response.

I Targeted, People-Centered, and Locally Led Solutions and Delivery Mechanisms for Climate Action

This action is focused on strengthening the ability of the poorest and most vulnerable populations to recover quickly and more effectively from the impact of climate (and other) shocks through adaptable instruments addressing both community and household dimensions (e.g., community-based CDDs, household safety net programs, and productive asset recovery interventions).

Solutions that work are locally led, inclusive, and targeted and are critical aspects of customized solutions that enhance social resilience, strengthen social protection, address the needs of specific groups (e.g., women, persons with disabilities, elders, indigenous groups, migrants), and harness the use of technology, innovative finance, and knowledge co-production. Effective, systemwide actions to strengthen resilience must integrate locally led and bottom up interventions that reflect the voice of local and indigenous communities, strengthen institutional and local capacities and readiness of delivery systems to respond, and foster proactive measures through mobilization of risk financing instruments (e.g., insurance systems, financial protection) among other technological innovations.

Improved social protection delivery systems (social registries, payment systems, grievance mechanisms) are key for speedy and effective response to climate shocks. Strong delivery systems, including social registries, payment mechanisms, and grievance mechanisms, with strong transparency and accountability, can enable speedy responses to

climate shocks. They can also harness the potential of ICT in ensuring most efficient delivery of support, including for example the equitable and efficient use of water.

The timely and quality delivery and deployment of early warning systems, social safety nets, and financing innovations need to be mobilized and scaled up. Participatory and inclusive approaches drawing on local and indigenous knowledge have been yielding successful outcomes and need to be scaled up.

To plan more effective and targeted assistance, disaster risk finance (DRF) diagnostics can help identify the methods of financing disaster response, the use of on and off budgetary instruments, the reliance of ODA and humanitarian assistance, as well as the communities that benefit and are omitted from current disaster financing activities. Mozambique's proactive response to risk during Cyclone Idai illustrates positive outcomes (box 8.5).

Some aspects that should guide the focus of this action area include:

- **Inclusion ensures effective bottom-up solutions that address the populations most vulnerable to climate change impacts.** Low levels of empowerment of women and girls, who are also disproportionally affected by the impacts of climate change, need to be addressed. In the West Africa Coastal Areas Resilience (WACA) Investment Project, women participated in ex ante planning and subproject identification at the local level using CDD approaches.
- **Integrating behavioral change is relevant for adaptation and resilience through promoting household resilience and ensuring effective preparedness and anticipatory approaches to shocks and stresses.** It needs to be considered as part of transformative climate actions.
- **Promoting local leadership, local voice and accountability is key for socioeconomic resilience.** Civil society in Africa (through national-level NGOs and networks and community-based organizations) is extremely active and needs to be engaged as critical stakeholders who can help facilitate community engagement. Grassroots communities have a wealth of knowledge based on lived experience and should be engaged as partners rather than treated as passive beneficiaries.

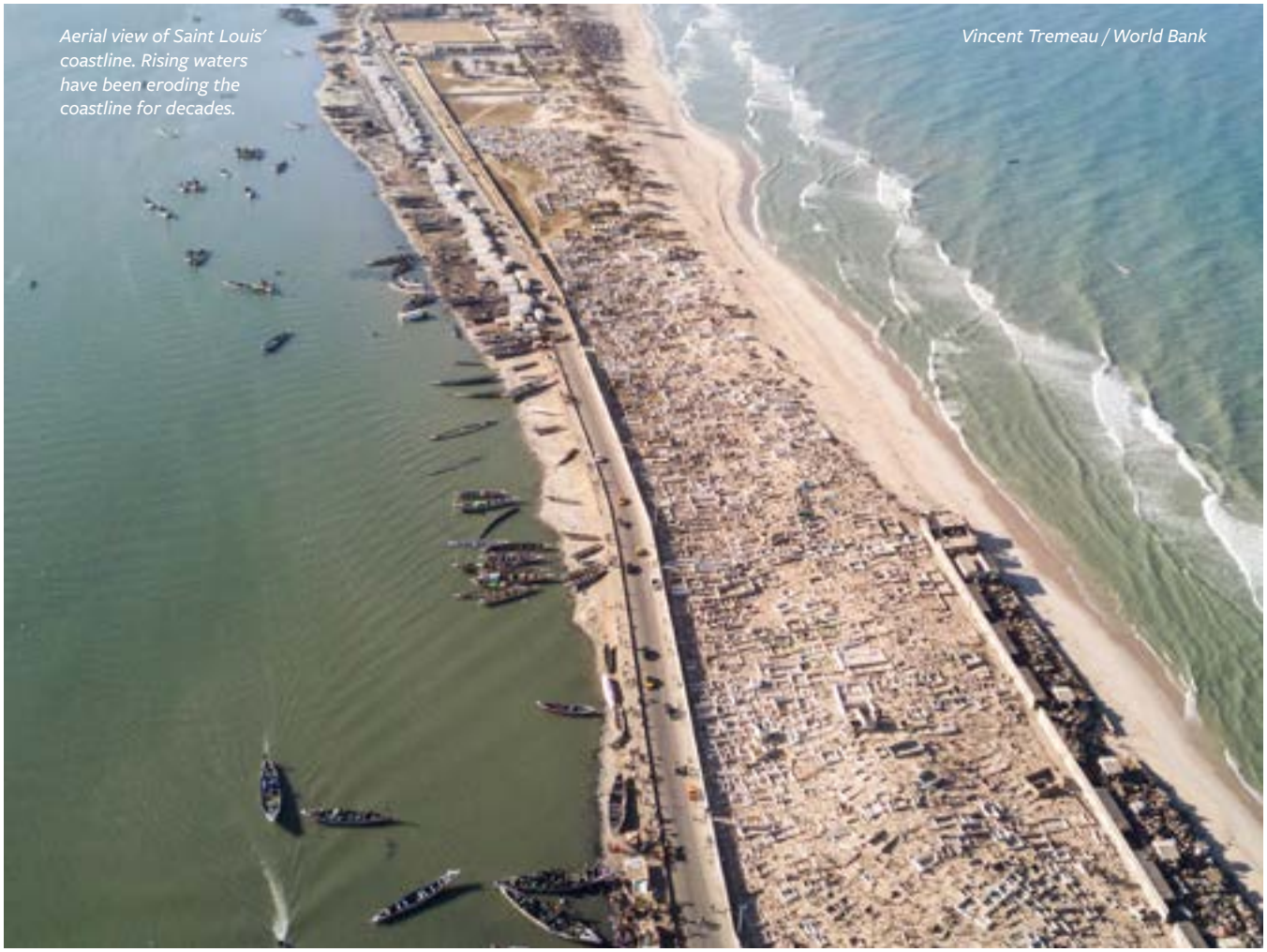
Box 8.5

Proactive response to disaster risk in Mozambique

Mozambican cities have high exposure to coastal and river flooding. Just six months before Idai made landfall, the first stage of the IDA-supported Mozambique Cities and Climate Change Project was completed, upgrading Beira's stormwater drainage system. The new drainage system, which benefits over 250,000 people, including over 70,000 people living in informal settlements, helped divert large quantities of storm water out to the sea. The areas that had benefited from drainage rehabilitation investments under the project suffered little to no flood damage compared to areas not serviced by rehabilitated drainage systems.

The success of this intervention has helped drive institutional support in Beira to undertake other resilience-building projects. "The drainage system and water retention basin worked well during heavy rains earlier this year," said Beira mayor Daviz Simango during the aftermath of the storm. "Even after Cyclone Idai, Beira faced less flooding than other parts of the country. Now we need to extend our drainage network to other parts of the city."

Sources: GFDRR 2019; Yee 2019.



Aerial view of Saint Louis' coastline. Rising waters have been eroding the coastline for decades.

Vincent Tremeau / World Bank

II Strengthened and Enhanced Information for Early Warning and Decision Support

Actions under this priority area are focused on strengthening and enhancing climate information systems for EW and decision support reaching the poorest and most vulnerable

Main Components of Action Area

Improved information systems, including meteorological and hydrological forecasting, early warning and decision making. These include impact-based forecasting and warning services, community-based early warning systems, hydrometeorological service delivery systems, and climate information.

Robust and sustainable hydromet information systems (e.g., good network of hydrometeorological systems and international hydromet data exchange, timely and quality climate and hydromet services) can enable seasonal assessments, inform humanitarian appeals, and help to create new triggers based on satellite data and ground truth observations. For example, the Regional Climate Outlook Forums in Africa are providing seasonal, consensus-based, user-relevant climate outlook products through state-of-the-art technologies, working closely with regional and global stakeholders to reduce climate-related risks. This area includes the following aspects:

Box 8.6

Strengthening Africa's Hydrometeorological Program

The World Bank is supporting the enhancement of climate- and disaster-resilience capacity in Sub-Saharan Africa by strengthening countries' weather, water, and climate (hydrometeorological) services, including early warning, knowledge, and advisory services, and linking national systems with regional and global partners. Its program aims to improve the quality, timeliness, and sustainability of hydrometeorological services by providing the infrastructure, technical assistance, and capacity-building operations needed for integrated modernization. Investment and technical assistance operations are being implemented in 19 countries: Botswana, Burkina Faso, Chad, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Tanzania, Togo, Uganda, and Zambia.

Source: https://www.worldbank.org/en/programs/africa_hydromet_program

- Impact-based forecasting and warning services
- Community-based early warning systems
- Development of sustainable hydrometeorological service delivery systems, leveraging the capacity of public, private and academic sectors (box 8.6)
- Generation of timely and quality climate information services.

Safety net programs to bolster social development, protection, and cohesion can be scaled up based on pre-agreed triggers using early warning and climate information. Social protection addresses the needs of poor populations and can contribute to ensuring food security and disaster preparedness and response. It also builds resilience of vulnerable households through cash transfers (regular and emergency), public works, and productive inclusion interventions.

Deepened cross-sectoral collaboration can strengthen the region's climate change readiness. It requires mobilizing actors across different sectors and levels, including governments, indigenous people, communities, civil society, and the private sector.

III Improve Institutional and Macro-fiscal policy to Prepare and Respond to Climate Shocks (and pandemics)

Climate change impacts on a country's development and broader economic context requires governments to adopt a broader, more holistic view on disaster preparedness in order to prevent, mitigate, and manage the impact of shocks on the GDP and other macro fiscal aspects. Macro-level preparedness involves moving from fragmented risk financing into an integrative approach, to ensure system-wide, anticipatory/proactive strategies. This requires improved institutional and macro-fiscal policy to prepare and respond to climate shocks (and pandemics).

Main Components of Action Area

Governments need strengthened institutional and local capacities to respond to the impacts of climate disasters and slow onset events. Skills are required to prepare and cope with those impacts, including scenario planning and long-term preparedness. These skills help to enable human capital development across key institutions and local actors. End-to- end delivery systems are part of institutional strengthening efforts, too.

At the national level, governments should work to deepen local-national partnerships, accountability, governance, and risk financing, including with the private sector. They

should increase preventative approaches that address the underlying drivers, while anticipating social impacts (including distress-driven migration) to secure social resilience.

Governments should strengthen policies and the enabling context to respond to extremes, including resilient lifeline infrastructure (roads, schools, hospitals), early warning systems, and social protection interventions (regular cash transfers and inclusion interventions to increase vulnerable households' resilience towards climate change). Other measures include deployment of macro-insurance, contingency budgets, Cat-DDOs and other risk financing instruments at scale.

8.5 Targets and Indicators

Priority action areas will support delivery of corporate and IDA targets as set out in table 8.1 through the portfolio of Bank investments. Tier 1 targets correspond to existing IDA19 (FY21–23) and Corporate Climate Commitments to 2025; and **Tier 2 targets** correspond to complementary contributions that will further enhance the region's response to climate shocks including through risk governance.

The Theory of Change for this Strategic Direction presents a mapping of the pathways of change toward the achievement of expected impacts on climate shocks and risk governance, and the Climate Plan's goal (figure 8.2). This Theory of Change constitutes a *live pathway* that provides a snapshot of the broader vision of the Strategic Direction and may be adjusted as needed throughout the Climate Plan implementation.

"The World Bank is responding to Africa's quest for resilient, clean, and dynamic development and job creation. The Next Generation Africa Climate Business Plan offers substantial financing, carefully targeted technical assistance, and tailored policy solutions to do just that. The Plan will help protect people's livelihoods and build low carbon economies that can deliver sustainable, fast growth. It also promotes preparedness to address climate shocks, to enable communities and businesses to rebound quickly to social and economic disruptions."

– Thomas O'Brien, Senior Adviser, Africa Region

TABLE 8.1 Climate Shocks and Risk Governance Strategic Direction: Aligning targets with corporate commitments

Targets Sub-Saharan Africa	Targets World Bank
Core Tier 1	
▶ 150 million people have access to impact-based warnings in at least six (6) countries ▶ Timely and reliable forecasts and warnings are made available at the national, regional, and local levels and efficiently reach end users. ▶ Weather, climate, and hydrological services for key sectors are developed, delivered, and trigger coordinated decisions and actions.	▶ Higher-quality meteorological and hydrological data and forecasts, EWS and user-tailored climate information services to better prepare 250 million people in 30 developing countries for climate risks.
▶ Improved delivery systems for cash transfers and other social protection programs ▶ Increased resilience among poor households across Sub-Saharan Africa	▶ 40 countries to incorporate Adaptive Social Protection in national systems. (*Corporate FY25 target*).
▶ Strengthened financing for disaster risk management and climate change adaptation.	▶ 20 countries by 2025 to respond to disasters with financial protection instruments (*Corporate FY25 target*). ▶ 20 hot-spot countries with HD engagements to implement climate resilience strategies (*Corporate FY25 target*).
Tier 2 (*supplementary targets proposed by the Social Protection and Urban GPs for Sub-Saharan Africa*)	
▶ Partnership on hydromet with global Regional Centers of Excellence, academia, private sector and Civil Society Organizations ▶ Improved identification of most vulnerable population. ▶ At least four countries have implemented decentralized climate finance mechanisms that support locally-led climate action	

FIGURE 8.2 Theory of Change: Climate Shocks and Risk Governance

NG-ACBP IMPACT

This Theory of Change focuses on the broader vision of the NG-ACBP's Strategic Direction (SD) on 'Climate Shocks and Risk Governance', underpinned by climate informed macro-policies and green and resilient infrastructure. The ToC constitutes a live map and may be adjusted throughout the NG-ACBP's implementation.

Strengthen Africa's development pathway towards a climate-smart and secure future by engendering leap-frogging and transformation at scale through the Bank's financial and technical leverage.

SPECIAL AREAS OF EMPHASIS: *Climate informed macro policies, Green and resilient infrastructure*

STRATEGIC DIRECTION IMPACT

Enhanced socio-economic resilience on the poorest in SSA to climate shocks, with effective short term and far-sighted response and delivery systems, and macro-fiscal resilience.

OUTCOMES (Priority Action Areas)

TARGETED, PEOPLE-CENTERED, COMMUNITY-LED SOLUTIONS AND DELIVERY MECHANISMS	INFORMATION SYSTEMS FOR EARLY WARNING AND DECISION SUPPORT	INSTITUTIONAL AND POLICY RESPONSE
Strengthened ability of the poorest and vulnerable to recover quickly and more effectively from climate (and other) shocks.	Strengthened and enhanced climate information systems for early warning and decision support reaching the poorest and most vulnerable.	Improved institutional, risk financing and macro-fiscal policy to prepare and respond to climate shocks (and pandemics).

OUTPUTS

- Targeted and locally-led people-centered solutions and delivery mechanisms, including mechanisms for climate finance and decision making for local governments.
- Improved early warning systems for climate shocks including vulnerability assessments, hazards and exposure mapping, hydrometeorological and climate information systems.
- Scaled-up safety net programs
- Deepened cross-sectoral collaboration
- Macro-fiscal and risk financing policies, incentives, (inter) institutional arrangements and financial instruments in place that enable preparedness, rapid response and long-term planning.

ACTIVITIES

- Implementation of targeted, locally led, gender sensitive and inclusive interventions reflecting the voice of local and indigenous communities.
- Strengthening institutional and local capacities and readiness of delivery systems, including technological innovations.
- Scale-up deployment of early warning systems, social safety nets, and financing innovations.
- Mobilization of disaster risk financing instruments (and diagnostics).

- Improvements of early warning systems, network of hydrometeorological systems and international hydromet data exchange, timely and quality climate and hydromet services, impact-based forecasting and warnings.
- Measures to customize and scale up safety net programs based on pre-agreed triggers, using early warning/climate information.
- Mobilize actors across different sectors and levels for climate readiness.

- *Strengthen institutional and local capacities to respond to shocks, including an end to end delivery system.*
- *Deployment of macro-insurance, contingency budgets, CAT-DDOs and other risk financing instruments at scale, underpinned by robust analytics.*
- *Measures to strengthen the policy and enabling context, including a focus on resilient "lifeline" infrastructure, early warning and social protection.*
- *Support preventative approaches that address the underlying drivers and anticipate social impacts (e.g. migration, conflict).*
- *Deepen local-national partnerships, accountability, and governance, including the private sector.*

PROBLEM STATEMENT

- Climate change is predicted to reduce the income of the extreme poor by more than 8 percent by 2030 in most African countries. The bottom 40% has increased from 278 million in 1990 to 416' in 2015, and more people are sliding back into poverty. By 2030, Africa will represent approximately 87 percent of the global poor.
- Climate impacts on the poor include loss of lives and livelihoods, damage to essential infrastructure and disruption of services, poor health and malnutrition, and lead to an escalation of migration. Productivity loss and impacts on SSA's human capital , which is well below the global average, can have inter-generational consequences.
- The region's lack of preparedness and weak institutional capacities enable climate change impacts to multiply, and potentially exacerbate the effect of health shocks such as pandemics, affecting the region's growth prospects, and the achievement of SDGs
- Climate shocks can have far reaching economic impacts on the region, which need to be addressed through macro economic policies and reform. Climate change can also amplify conflict, especially in fragile situations, where governments have limited coping capacities.

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Climate-informed policies

lead to better fiscal management and improved environmental and social outcomes, and can drive transformation at scale.

Green, resilient infrastructure

can serve as engines of growth and yield multiplier benefits.

A young girl sits outside her school before containment measures sent students home across the continent.

Riccardo Mayer / Shutterstock

CHAPTER 9
Special Areas of Emphasis and Other Cross-Cutting Issues

9.1 Promoting Climate-Informed Macro-policies

9.1.1 Economywide Impacts of Climate Change

After a fast start to the 2010s, Africa's growth slowed. Real GDP grew by more than 5 percent during 2000s. The continent's economies also become increasingly diversified during that decade, with natural resources accounting for only around a third of all economic growth (Leke and others, 2010). Other sectors, such as retail, manufacturing, and agriculture, made significant contributions to growth. This fast pace continued into the 2010, with an average growth of 4.7 percent annually in Sub-Saharan Africa during the first half of the 2010s. Yet growth slowed significantly in the second half of the decade at just 2.2 percent during 2015–18. When adjusting for the prices of goods a consumer buys, the average Sub-Saharan African has seen stagnant income since 2015.[32]

Climate change poses a significant threat to Africa's long-term economic growth. Estimates suggest significant long-term negative economic impacts from climate change globally, but Africa is especially affected. One of the most negative outlooks was reported by Burke and others (2015), which estimate that climate change would reduce global GDP by 23 percent by 2100 with global warming of 3.7°C (compared to what it would be in absence of climate change). GDP per capita would be around 80 percent lower in Sub-Saharan Africa. Fankhauser and Tol (2005) find that the direct impact (excluding damage to capital stock) of 3°C warming would amount to around 15 percent of GDP. They find that including dynamic effects of lower investment could actually reverse economic growth completely. Using a CGE model, Kompas and others (2019) find similar results. They estimate the impacts of 3°C of warming on economic growth in individual countries, incorporating the impacts of investment decisions. Sub-Saharan African countries suffer most. For example, Nigeria sees growth rates over 5 percentage points lower than it would have been in absence of climate change. This wipes out almost all economic growth. Other estimates are not so catastrophic, but still concerning. Abidoyea and Odusolab (2015) find that a 1°C increase in temperature reduces economic growth by 0.67 percentage points in Africa. Dell and others (2012) find that a 1°C increase in temperature reduces economic growth by 1.3 percentage points on average in LICs. The IMF (2019) estimates that climate change would reduce GDP by around 9 percent in the

32 GDP per capita, PPP, 2011 US dollars (WDI database, https://datacatalog.worldbank.org/dataset/world-development-indicators).

average LIC, assuming pledges under the Paris Agreement are implemented. These variations stem from different sources of uncertainty (box 9.1)

Climate change, including the resulting weather shocks, will have economywide impacts that hit poor households especially hard. Shocks include lower agricultural yields due to flooding, drought, or extreme heat; natural disasters that destroy capital, such as homes or roads; health shocks that are influenced by the climate, such as malaria, which can reduce work or school days. Reporting on the impacts of climate change on poverty, Hallegatte and others (2016) find that the threats will increase because poor households tend to be exposed more often than wealthy ones to climactic shocks, and the shocks hit them harder relative to their income or wealth. In addition, they often have less access to support, such as financial tools (Hallegatte and others 2016). Global crop yields may decline by around 5 percent in 2030 and 30 percent by 2080 (Biewald and others 2014; Havlík and others 2015). Food prices are also likely to increase. Extreme poverty is estimated to increase by 1.8 percentage points from climate-induced price increases alone. Extreme poverty could double for poor urban laborers in some of the most vulnerable countries, such as Malawi and Zambia (Hallegatte and others 2016). A study focused on Malawi, Mozambique, and Zambia highlights that proactive adaptation and climate-smart road policies could yield annual savings between US$100 million to US$200 million in the face of climate-related impacts (Chinowsky and others 2015). Poor households will be increasingly hit by health shocks. Climate change means malaria will creep up to higher altitudes, such as into the highlands of Zimbabwe or Tanzania, exposing more people.

People in poorer countries are more likely than those in wealthier countries to suffer from the immediate consequences of overuse of fossil fuels and the resulting costs are high. Burning fossil fuels to generate electricity or make cars move emits pollution, including black carbon or fine particulate matter, that sticks in the lungs. These pollutants are a significant cause of illness and premature death. Globally, an estimated 9 million people die prematurely each year because of pollution, and more than 90 percent of these are in LMICs. The costs to GDP are large: an estimated 6.2 percent of global GDP (Pigato 2019).

Box 9.1

Challenges of modeling economic growth impacts of climate change

There are considerable variations in the estimates of the economic impacts of climate change. This stems from uncertainties in the impacts of climate change and from the uncertain nature of how these translate into economic realities, including human responses.

- **Uncertainties in climate modeling.** Nonlinearities and tipping points introduce a significant source of uncertainty into climate modeling. For example, the melting of the Greenland ice sheet would increase sea levels by up to 8 meters. Recent estimates suggest that the pace of the melting had been significantly underestimated partly due to feedback effects in the climate system (less ice to reflect sunlight means more warming, more melting, and less ice). This uncertainty is reflected in the economic consequences: for example, on the impact of coastal cities.
- **Uncertainties in policy responses.** Greater efforts to curtail emissions of global warming gases will shift climate change off the business as usual (BAU) path and onto pathways with lower global warming, reduced impacts, and lower economic costs.
- **Uncertainties in economic impacts.** Economic consequences depend in part on ability to adapt. For example, is greater use made of drip irrigation as rainfall declines in some areas? Not only are the economic consequences uncertain but they are also unequal. Some global regions stand to benefit. For example, northern countries will see heating costs fall and gain access to new agricultural land and new trade routes as ice melts. Others, particularly in Africa, will see sharp negative consequences as large amounts of arable land becomes unusable due to increased drought or flooding, and there is a shift in the suitability of crops to changing climate patterns. For example, it is possible that in mid and high latitudes, crop productivity will increase (by around 10 percent for a 2°C increase according to Gornall and others [2010]), while it will decrease for low latitude regions, which will suffer from extreme heat increases.

The longer-term economic and poverty impacts of climate change in Africa are driven not by higher temperatures per se but by second-order impacts. Many studies find that higher temperatures hit economic growth in the short term, but major impacts stem from (i) increased intensity of weather shocks, such as flooding and droughts, that impact infrastructure, food security, and lead to displacement of the vulnerable; (ii) protracted impacts from slow onset climate change, including increased warming, water stress, and sea-level rise that undermine viability of urban and rural economies; and (ii) a cycle of lower investment due to increased risks and lower returns driven by both climate shocks and climate stresses. As economic growth takes an initial hit and becomes more uncertain, the returns on investment decline and investment becomes riskier. This discourages further investment, which, in turn, reduces economic growth.

9.1.2 Policies that Mitigate Climate Change while Improving Welfare and Economic Opportunities

Fiscal instruments—the tax and spending choices that governments make—are among the most effective means to tackle climate change and its impacts. One way is to get the price of pollution right while helping countries reap co-benefits from reforms by (i) introducing environmental tax reforms designed to make polluting more costly while raising resources essential to finance development; and (ii) reducing or eliminating subsidies (or tax breaks) for fossil fuels (which tend to benefit primarily wealthier people) and replacing them with improved social protection mechanisms that directly benefit poor or vulnerable.

Getting the price of burning fossil fuels right needs to be one key aim of fiscal policies in Africa. Polluting is cheap because those who pollute do not pay for its harmful social and environmental consequences (box 9.2). Direct cash subsidies to fossil fuels amount to close to 2 percent of GDP in Sub-Saharan Africa (Coady and others 2019). Reduced or even zero rated taxes on fossil fuels cost African treasuries around 0.5 percent of GDP per year (Coady and others 2017), and negative externalities—the costs that other people pay in terms of lost days of work or illness, for example—amount to up to 3 percent of GDP in Africa. This mixture of explicit and implicit subsidies that encourage the overuse of fossil fuels (and discourage investment in alternatives) can be reversed through the right fiscal policies. These can bring significant co-benefits (such as increased productivity) and are pro-poor, without putting the climate burden on the African countries.

Done well, African governments can reap a triple dividend from environmental tax reform (ETR): stimulating economic activity while mitigating climate change and raising resources to finance development. Environmental taxes[33] include taxes on energy, transport, pollution, or natural resources that harm the environment. The resulting increased prices discourage pollution or other environmentally harmful practices. Carbon prices can be lower in LICs than in upper-middle-income countries (UMICs) (IMF 2019a).[34] Such pricing not only reduces carbon emissions but also curbs local air pollution that prematurely kills over 8 million people in LMICs annually and causes illness and lost days of school and work.

33 Environmental taxes are defined as taxes whose base is a "physical unit (or proxy of it that has a proven specific negative impact on the environment" (see the OECD website, "OECD Glossary of Statistical Terms." https://stats.oecd.org/glossary/; Pigato 2019).

34 "A $35 per ton carbon tax by itself would exceed the level needed to meet mitigation commitments in such countries as China, India, and South Africa, and it would be about right to meet pledges in Indonesia, the Islamic Republic of Iran, Pakistan, the United Kingdom, and the United States. But even a carbon tax as high as $70 per ton (or equivalent measures) would fall short of what is needed in some countries like Australia and Canada." (Parry 2019)

Box 9.2

Taxing to tackle negative externalities

Governments often use taxes or similar costs on people or businesses whose actions do harm. Prominent examples include high taxes on tobacco, alcohol, and sugar, whose consumption imposes costs on society such as higher medical costs or higher crime. The aim is threefold: higher prices discourage the consumption of harmful goods. Higher prices can encourage the development of alternatives that do less harm. And they can provide resources for governments to use to tackle the harm.

Even though some users in Africa may feel that energy prices are already too high, evidence suggests that users (who tend to be wealthier groups) still do not pay the full cost of their energy use (which can often be borne by poorer groups in terms of worse health, air pollution, and resulting lost days of school or work). Carbon emissions therefore fall squarely into this category, and some countries, such as South Africa and Côte d'Ivoire, have begun to consider or implement carbon pricing. Negative externalities from carbon emissions include climate change and accompanying pollution, which has other consequences, including significant health impacts in cities. Carbon pricing can encourage polluters to reduce their emissions, such as by curtailing unnecessary car trips, to find ways to reduce dependency on polluting energies, such as by becoming more efficient or installing new technologies such as solar panels or filters.

Globally, a price of around US$75 per ton of CO_2e by 2030 is needed to limit global warming to around 2°C.[a] The IMF (2019) reports that under such a scenario, over 10 years, "electricity prices would rise, on average, by 45 percent cumulatively and gasoline prices by 15 percent, for households, compared with the baseline (no policy action)."

Sub-Saharan Africa has significant opportunities to reduce energy costs through a more optimal energy mix, improved operational efficiencies, and rationalizing energy resources across borders.

a Currently, prices tend to be higher in developed countries than in developing ones; yet, in general, the world suffers from significant underpricing of carbon emissions.

Africa's transition to a low carbon economy could be ramped up through financial, technical, and capacity support. While there is a long-term interest for African countries to pursue a low carbon economy, there are short-term barriers and obstacles that must be overcome to ensure that the region's immediate development priorities are not compromised. In 2019 a fifth of global emissions were covered by carbon pricing, including taxes and exchange traded schemes (ETS). Countries that have implemented or passed legislation to implement carbon pricing schemes include China, Colombia, Indonesia, Kazakhstan, Mexico, and Vietnam.[35] South Africa implements a carbon tax, while Senegal and Côte d'Ivoire are considering options. Given the benefits, more African countries should consider ETR. Meeting and reaping benefits from policy changes will need to be supported by technological transfer (e.g., in microgrid technologies) as well as financial support (including US$100 billion of annual transfers agreed upon as part of COP21.

Concerns regarding a loss of firms' competitiveness stemming from ETR seem to be overstated; rather it can help to stimulate economic activity and competitiveness in developing countries when carbon pricing is combined with other sensible policies to protect poor households and make business easier for the private sector. When considering implementing ETR, governments tend to be concerned that higher costs will lead to a loss of competitiveness for exporting companies. Empirical evidence is limited and largely focused on upper-income economies. Yet studies from the 46 national jurisdictions that have implemented carbon pricing[36] tend to find that the overall impacts for output and growth tend to be minimal (either slightly positive or slightly negative) for upper-income economies because reduced opportunities in more polluting sectors are compensated by

35 See the World Bank website, "Carbon Pricing Dashboard," https://carbonpricingdashboard.worldbank.org/. Accessed February 25, 2020.

36 See the World Bank website, "Carbon Pricing Dashboard," for an updated list: https://carbonpricingdashboard.worldbank.org/.

new opportunities in cleaner sectors (IMF Fiscal Monitor 2019). While some sectors are theoretically at higher risk (high-energy exporting companies), these risks can be offset by good policy design. Indeed, among developing countries, emerging evidence suggests that ETR may even boost competitiveness (Pigato, 2019). This stems from four main sources, consistent with good ETR policy design: (i) lower labor and corporate taxes, which can be reduced to stimulate employment and investment; (ii) higher investment in infrastructure, such as roads or energy; (iii) lower risk of tariffs from governments seeking to penalize countries that are not seen to contribute to climate change mitigation; and (iv) companies' use of more efficient production practices.

ETR benefits LICs because some companies are "nudged" into more efficient production practices, although there is limited evidence for individual African countries. Coste and others (2019) analyzed the impact of changing energy prices using a panel of firms across 11 UMICs. It focused on two LICs (Indonesia and Mexico) with traditionally heavily subsidized fuel prices, which distinguishes between the impact of changing prices from different energy sources (fuels and electricity). The study finds that increases in fuel prices are associated with increased firm-level labor productivity and profitability, even for energy-intensive firms. Increased electricity prices do not have the same effect, likely because firms tend to switch away from less-efficient machinery toward more efficient electricity-driven production techniques. This switch can support firms' and countries' international competitiveness and does not appear to come at the cost of job losses. Given that firms in developing countries are more likely to be far away from the efficiency frontier than firms in wealthier countries, ETR that nudges companies toward more efficient production practices and increase their competitiveness in international markets.

African governments need the additional revenue environmental taxes would bring, which are often easier to enforce than other forms of taxation. Tax revenues average around 17 percent in Africa compared to 34 percent in the Organisation for Economic Co-operation and Development (OECD). While LMICs cannot support the levels of taxation that their wealthier counterparts can, there is scope to boost revenues. The IMF (2018) estimates that Sub-Saharan African countries have space to raise revenues by around 3 percent to 5 percent of GDP. Environmental taxation can increase revenues efficiently in countries with large informal sectors and when tax compliance is a challenge. Taxes can often be raised upstream—at the point of production or import—where enforcement is easier than downstream (e.g., on consumers or small firms that may be part of the informal economy). The cost of implementing environmental taxes tends to be lower than that of implementing other taxes (OECD 2018).

Governments have sometimes faced public backlashes from reducing fuel subsidies or increasing fuel prices, but well-implemented policies and communications strategies can reduce these. Despite the considerable advantages of ETR, including for poorer groups, reforms often face protest and can be partly reversed. Countries as diverse as Ecuador, France, Indonesia, Kenya, and Nigeria have seen public reactions against such policies. Governments can also be subject to lobbying from firms or sectors that wish to be excluded from carbon pricing. When implementing ETR, governments should keep several principals in mind to ensure the country can benefit:

- **ETR has the potential to bring significant environmental, health and economic benefits**. Even while many users in Africa (as in wealthy countries such as France) feel that energy prices are too high, evidence suggests that African users (who tend to be wealthier groups) still do not pay the full cost of their energy use (which can often be borne by poorer groups in terms of worse health, air pollution, and resulting lost days of school or work). ETR

therefore tends to be pro-poor because wealthier people tend to consume more fuel while poorer groups tend to live in areas that suffer most from the resulting pollution.

- **Revenues from environmental taxes can be combined with other fiscal instruments** as part of a broader ETR. This can include reducing the tax burden on firms and workers through cuts in labor taxes. It can also include increased spending on infrastructure that can boost firms' productivity. Social protection mechanisms can be given a boost to compensate poorer households for increased fuel prices.
- **Negative consequences on poorer groups can be mitigated through good social expenditure policies**, which can be improved with the resources raised through ETR.
- **Other taxes can be reduced, which can stimulate job creation and reduce pressure on firms**. Exemptions for firms, however, should be rare and carefully considered.
- **Good communication is key to implementation**. Firms and households need time to adjust, and reforms can be phased in according to a preannounced timetable (which must be kept so as to avoid introducing uncertainty).

9.1.3 Fiscal Policies to Help Countries Adapt to Climate Change

African countries need to prepare fiscally for long-term climate change and accompanying climate shocks. Governments can support adaption to climate change by (i) designing public investment policies and processes that are adapted to climate change. These will ensure, for example, that new infrastructure is built with the impacts of climate change in mind; and (ii) building buffers to cope with climate (or other) shocks, including fiscal reserves or national saving funds that can be tapped following shocks and insurance mechanisms, such as catastrophe bonds.

Public investment in infrastructure needs to be resilient to climate change and encourage private investment in adaptation. Global warming magnifies climate shocks. For example, for every 1°C increase in temperature, storm windspeed increases by 7 percent, which increases destructive potential by 23 percent (Climate Reality Project 2017). Early investment in new infrastructure can help to reduce later costs: for example, sea walls in coastal African cities today can prevent flooding with significant damages tomorrow. The design, appraisal, and selection of new infrastructure should include climate considerations. For example, can new water and sewage systems withstand increased rainfall? Hallegatte, Rentschler, and Rozenberg (2019) note that the net benefit of building more resilient infrastructure in low- and middle-income countries would be US$4.2 trillion, with US$4 in benefit for each US$1 invested. New budget processes can include hazard and vulnerability analysis (both globally and for specific investment projects) that look at the likelihood of losses and damages from climate-related shocks (Fozzard 2019). Different (regularly updated) scenarios could be built to consider the changing risks in a changing environment. At the same time, rules and regulations should be developed to encourage private investment in adaptation. This might include efforts as diverse as ensuring that regulations do not block the creation of microgrids or providing small-scale public investments and agricultural extension services that support the development of drip irrigation.

Governments need to develop buffers that safeguard their finances, which would be helpful in the event of climate and other shocks (such as COVID-19). These efforts need to start from the development of credible fiscal rules that minimize wasteful expenditures—for example, growing public wage bills that do little to improve public services—while encouraging the gradual building of fiscal buffers. These savings could be placed in a contingency fund with clear rules for disbursement following climate (e.g., average rainfall above or below a certain threshold) or other shocks. In addition, financial instruments can help shield countries from such shocks. These include conditional lines of credit (such as Cat-DDOs from the World

Bank) or regional insurance schemes, such as the African Risk Insurance Company Limited. Private financial institutions offer an additional option: catastrophe bonds that disburse conditional funds on pre-agreed criteria. These options provide governments with ways to stabilize public finances in the event of a climate or other shock (e.g., pandemic) while providing resources to support families, firms, and infrastructure that are suffering.

Fiscal mechanisms can help to ensure adequate support for families and firms that suffer from shocks, including climate and others (such as global pandemics). These need to start from robust social protection programs that cover poor households with limited leakage to wealthier households. These programs can be bolstered using resources raised as part of an overall ETR. One option is cash transfers to households or firms following a shock. The triggers for disbursement, the size of payouts, and the administrative responsibilities and mechanisms need to be determined well in advance. These cash transfers can moderate the impact of shocks and supporting recovery (Beegle and others 2018).

9.1.4 Role of Ministries of Finance and Planning in Mainstreaming Climate Action at Scale

Finance ministries are key to address the impacts of climate change, but they need support from donors. Global Commission on the Economy and Climate (2018) underscores the opportunities of climate action, which could unlock US$26 trillion globally in investments and create 65 million more jobs through 2030. It recognizes that ministries of finance are the best places to address the mounting impacts from climate to their economies, often augmented with development financing. Finance ministries need to work cooperatively to build the systems, capacity, and tools to drive this change. Options include incentivizing climate-informed public expenditure and using climate fiscal tools such as carbon taxes and emissions trading systems to cut emissions and prioritize low carbon growth.

Strengthening governance and institutional arrangements to systematically address climate action throughout the planning, financing, and implementation processes. Unless climate considerations are systematically embedded into national and subnational processes and systems for driving a whole government approach to climate action, an ad hoc, fragmented, and incremental consideration of climate will persist, and transformative change will not be achieved. Countries in Sub-Saharan Africa are seeking to increase their climate ambition of their NDCs with a call for support for transformational policies, institutions, and investment. Work is underway in some countries to mainstream climate considerations into policies and budgets (Ethiopia, Uganda) and enhance resilient low carbon development (Côte d'Ivoire).

The Coalition of Finance Ministers for Climate Action brings together ministers of finance to share experiences. The Coalition has 50 countries as members, including seven from Sub-Saharan Africa, who have signed on to the Helsinki Principles, a set of six aspirational principles that promote national climate action, especially through fiscal policy and the use of public finance (box 9.3).

9.1.5 Priority Action Areas

Action areas will target policy that support governments' efforts to adapt their economies and fiscal stance to climate change realities, while taking steps to contribute toward pro-poor and leapfrogging climate mitigation strategies. The following strategies are recommended.

Box 9.3

Coalition of Finance Ministers for Climate Action

The Coalition will operate within our national framework, competencies, and mandate to support the following principles:

- **Align** our policies and practices with the Paris Agreement commitments.
- **Share** our experience and expertise with each other in order to provide mutual encouragement and promote collective understanding of policies and practices for climate action.
- **Work** toward measures that result in effective carbon pricing.
- **Take** climate change into account in macroeconomic policy, fiscal planning, budgeting, public investment management, and procurement practices.
- **Mobilize** private sources of climate finance by facilitating investments and the development of a financial sector which supports climate mitigation and adaptation.
- **Engage** actively in the domestic preparation and implementation of Nationally Determined Contribtutions submitted under the Paris Agreement.

Source: See the Coalition of Finance Ministers for Climate Action website, « Helsinki Principles. » http://pubdocs.worldbank.org/en/600041555089009395/FM-Coalition-Principles-final-v3.pdf.

I Supporting environmental reforms to get the price of pollution right

(i) Reducing energy subsidies or tax breaks for fossil fuels
(ii) Exploring a shift toward carbon taxes to raise revenues
(iii) Using the new revenues to boost public investment, social spending and targeted tax cuts in line with the Addis Agenda.

II Fiscal policy support to drive adaptation to climate change

(iv) Designing public investment policies that ensure new infrastructure is built with climate change in mind
(v) Building fiscal buffers to cope with climate (or other) shocks including fiscal reserves that can be tapped following shocks, alongside insurance mechanisms catastrophe bonds.
(vi) Planning for fiscal buffers and other insurance mechanisms to cope with climate shocks.

III Engaging with ministries of finance and planning on climate mainstreaming

(vii) Development of fiscal tools and instruments and capacities to embed climate consideration into fiscal policy and macro models, and institutional mainstreaming
(viii) Long-term models for the design and implementation of climate-smart growth trajectories, and to inform countries' NDCs.

9.1.6 World Bank Group Targets

Through a focus on the priority actions there is scope to support delivery of climate action through the five Strategic Directions, stand-alone policy interventions, technical assistance support for NDCs, and analytics. The targets below are Bankwide targets to which the Africa region will make a contribution.

TABLE 9.1 Existing World Bank Group Targets Related to Promoting Climate-Informed Macro Policies

IDA 19	Scope of commitments
IDA19 targets/ commitments (*Bankwide*)	▶ Support at least 15 IDA countries to systematically implement and update national climate-related action plans, including NDCs in cooperation with the NDC Partnership. ▶ For all IDA countries where appropriate, set climate-related or NDC-based objectives or results indicators in the CPFs (*IDA19*). ▶ Together with the NDC Partnership, support at least 20 countries to systematically implement and update their NDCs and support an increasing number of countries to develop integrated, midcentury low carbon and climate-resilient strategies (*Corporate 2025*)
More generally, under the IDA19 Climate Change Theme there is a call to:	▶ Increase engagement with and support to finance and planning ministries to integrate climate in the national budgets and plans, as well as long-term development strategies. ▶ Focus on concrete and systematic policy actions. ▶ Increasingly engage at a policy level and foster DPF operations (i) to support climate-informed polices and reforms at the sectoral level, where appropriate; and (ii) if the country wishes to focus policy reforms solely on climate change, green growth, or climate change, DPFs can be developed in which all prior actions will address climate change.

Note: CPF = Country Partnership Framework; DPF = development policy financing; IDA International Development Association NDC = Nationally Determined Contribution.

Nairobi, Kenya. *Sambrian Mbaabu /World Bank*

9.2 Green and Resilient Infrastructure

9.2.1 Overview of Infrastructure throughout Sub-Saharan Africa

The growing population and urbanization of Sub-Saharan Africa has led to a higher demand for infrastructure, which is as yet unaddressed by the current rates of investment in infrastructure creation, maintenance, and oversight. With a population growth rate of 2.7 percent in Sub-Saharan Africa[37] and an urbanization rate of 4.1 percent,[38] the rapidly growing demand for adequate infrastructure services continues to be underserved by the existing infrastructure capacities in the region. Infrastructure in Sub-Saharan Africa lags behind the global levels of provision in key infrastructure classes, including energy, transportation, and water services (Lakmeeharan and others 2020). Only 47.7 percent of people living in Sub-Saharan Africa have access to electricity compared to the global average of 89.6 percent.[39] There are an estimated 841 secure Internet servers per 1 million people in Sub-Saharan Africa, whereas this figure sits at 10,050 per 1 million on a global scale.[40] Road access rates in Africa are 34 percent, in contrast with approximate access rates of 50 percent throughout other low-income areas. Furthermore, transport costs are estimated to be 100 percent higher than other low-income equivalents. Due to this increase for demand and need,

37 See the World Bank database, "Urban population growth (annual %)." Accessed May 31, 2020. https://data.worldbank.org/indicator/SP.URB.GROW.

38 See the World Bank database, "Access to electricity (% of population)." Accessed May 31, 2020. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS.

39 See the World Bank database, "Access to electricity (% of population)." Accessed May 31, 2020. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS.

40 See the World Group database, "Secure Internet servers (per 1 million people)." Accessed May 31, 2020. https://data.worldbank.org/indicator/IT.NET.SECR.P6?end=2019&start=2010.

the Program for Infrastructure Development in Africa (PIDA)[41] and the AfDB estimate that Africa's infrastructure requires between US$130 billion and US$170 billion per year to meet the growing demands of the continent, leaving a financing gap of US$68 billion to US$108 billion per year (AfDB 2018).

While there are critical gaps in the existing infrastructure of Africa, there is also significant potential to address the gaps by using climate awareness as a key component. The coming years will be critical for building efficient, equitable cities, which foster economic and environmental growth, while enabling the development of robust and resilient economies (The Global Comission on the Economy and Climate of the Stockholm Environment Institute, 2016). Depending on the efficiencies with which countries are able to approach their infrastructure development, and with the right policies, investments of 4.5 percent of the GDP of LMICs globally could achieve the infrastructure-related SDGs. This would include addressing weaknesses in universal access to water supply, sanitation, and electricity; greater mobility; improved food security; better flood protection; and eventual full decarbonization (Rozenberg and Fay 2019). By meeting the increased demand for infrastructure with resilient and green infrastructure growth, the necessary infrastructure growth can not only address the growing needs of the population, but it can also help to ensure resiliency against the impacts of climate change and contribute to mitigating the larger issues of climate change.

Resilient and green infrastructure contributes to mitigating climate change. While a multitude of sectors contribute to the growing concern of climate change, approximately 70 percent of GHG emissions come from the construction and operation of infrastructure, including power plants, buildings, and transportation systems (Deblina Saha 2018). Low carbon infrastructure approaches are less polluting and generate fewer carbon emissions than do traditional infrastructure approaches. Examples of such infrastructure might include:

- *Railway infrastructure*: modal shift from road to rail can reduce the carbon intensity of freight movement where economically feasible.
- *Urban transport projects* (such as metro and light rail projects): encourage people to shift from private vehicles to mass transit, reducing car usage and traffic congestion, which is one of the more notable sources of carbon emissions.
- *Energy efficient buildings*: use less energy for heating and cooling, reducing overall carbon emissions.
- *Renewable energy projects* (solar, wind, and hydropower): have much lower carbon emissions compared to fossil fuels.

While low carbon infrastructure can help to slow the acceleration of climate change, subsidies from governments for conventional energy sources in the electricity infrastructure sector have been much higher in comparison to renewable energy sources. In 2015, US$325 billion in subsidies were given to support the development of fossil fuels compared to the US$150 billion given to supporting the development of renewable forms of energy. Sub-Saharan Africa is endowed with solar, hydro, and wind resources that still remain developed under their full potential. Falling renewable energy prices present the opportunity for Africa to increase the share of installed renewable capacity (see chapter 6). Transport systems have set a good precedent. Globally, the share of urban transport projects, which have lower carbon emission per unit traveled than private vehicles, tripled to 14% in privately invested infrastructure, after 2010 (World Bank 2020). This shift of investment toward public transport options, such as metro and light rail projects, is a good step forward,

41 Coordinated by the African Union Commission, the New Partnership for Africa's Development (NEPAD), the regional economic communities, and the AfDB, supported by the AfDB.

but significant progress is still needed on this front because road projects still receive almost three-quarters of land transport investment (Deblina Saha 2018).

Resilient and green infrastructure leads to resiliency against the impacts of climate change. In addition to ensuring infrastructure does not contribute to progressing climate change acceleration, it is critical to design infrastructure to be resilient to the future impacts of climate change that are inevitable. The quality and adequacy of infrastructure services varies widely across countries (Hallegatte and others 2019). Governments in low- and middle-income countries invest around 3.4 per cent to 5 per cent of their GDP in infrastructure but many of these countries continue to face the consequences of substandard infrastructure, for example unreliable electricity grids, inadequate water and sanitation systems, and overstrained transport networks (Hallegatte and others 2019). Climate change further increases the strains on these systems.

Resilient infrastructure also helps alleviate system wide impacts and ensure end-to-end delivery of services. Resilient transportation networks are necessary for preventing disruptions to supply chains. Because infrastructure acts as a structural mainstay of society, making investments in infrastructure that increase resilience to the impacts of climate change reduces damages from natural hazards, increases the likelihood for recovery from extreme events and raises the capability of communities to protect the economic strength, public health and security of its citizens.

Resilient and green infrastructure is cross-cutting across sectors. Increasing the resilience of infrastructure often requires multi-sectoral planning approaches across spatial and temporal scales. For example hydropower development needs to be aligned with goals like drought control, water supply, and flood control through climate informed models that consider long-term climate impacts as this infrastructure is long-lived. The lack of resilient infrastructure can also impact low carbon development. Digitalization means that ICT systems underpin powergrids; ICT disruptions will also decrease socio-economic resilience such as by failures of banking systems/ATMs, decreased access to the internet, etc. For example, failure to sufficiently account for climate impacts in hydropower systems causes decreases availability of hydroelectricity under periods of extended drought, often leading to increased utilization of energy from fossil fuel sources.

While there are a large variety of approaches that can be used to shape the approach in which climate-resilient infrastructure is designed and built, the following consists of several principles that can be used in doing so (Hill and others 2019):

- **Proactivity.** Use existing knowledge and foresight to plan and design better infrastructure.
- **Equity.** Ensure the implications of decisions for those who are most vulnerable.
- **Inclusivity.** Engage stakeholders early and often throughout the duration of the investment process.
- **Comprehensiveness.** Ensure all risks, in accordance with their expected likelihood of occurrence, are addressed in planning.

9.2.2 Economics of low carbon, resilient infrastructure

Infrastructure investments geared towards low carbon does not need to cost more than more-polluting alternatives (Rozenberg and Fay 2019). Investing in climate-resilient infrastructure has both short- and long- term benefits. Investing in more resilient infrastructure is robust, profitable and urgent (Rozenberg and Fay 2019). The cost of investing in more resilient infrastructure is estimated to be between US$11 billion and US$65 billion annually by 2030, an

increase of 3 percent over the above annual investments needed, or less than an estimated 0.1 percent of GDP in LMICs (Hallegatte and others 2019). However, this analysis should include the stipulation that such investments need to be made under careful understanding of what areas are at most risk to the impacts of climate change because strengthening the entire network could be 10 times costlier than those estimates. Investing in all three levels of infrastructure resiliency, which includes resilience of infrastructure assets, infrastructure services, and infrastructure users, ensures high-quality infrastructure (Hallegatte and others 2019).

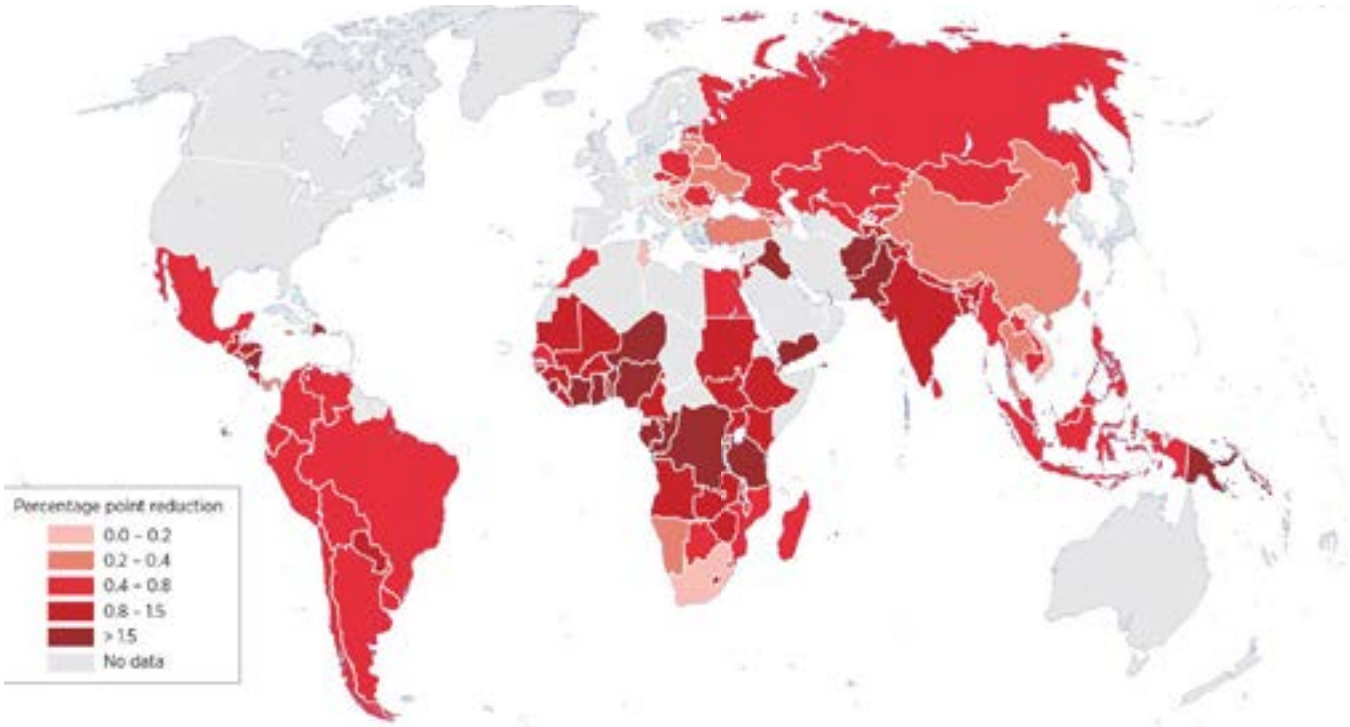
Maintaining infrastructure systems is a cost-effective way to reduce the impacts of climate change over the life cycle of the infrastructure. Good maintenance practices can generate savings of greater than 50 percent of the project cost in transport, water supply, and sanitation infrastructure projects. By investing resources into the operations and maintenance of infrastructure systems, service gaps can be more effectively addressed (Rozenberg and Fay 2019). This approach can be further strengthened by shifting from creating resilient infrastructure assets to more resilient infrastructure services. By working to implement climate resiliency at a systems level, the cost of resilience can be further reduced from when solely looking at an asset level. This is done by assessing for criticality of a system, redundancy within the system for responses to shocks, diversification, and nature-based solutions as viable alternatives (Hallegatte and others 2019). This approach is particularly valuable when assessing large systems and long-lived infrastructure such as dams, roads or water distribution networks.

Nature-based or green infrastructure can be as or even more cost-effective than grey infrastructure (Rozenberg and Fay 2019). For example, strengthening coastlines with wetlands – such as mangroves and salt marshes – can be two to five times cheaper than to construct submerged breakwaters to deal with wave heights of up to half a meter (World Bank/PROFOR/WRI 2018). Nature-based solutions in urban areas are typically more expensive but are more effective. For example, permeable pavements cost two or three times as much as regular asphalt and concrete, but some applications have demonstrated a 90 percent reduction in runoff volumes (World Bank/PROFOR/WRI 2018). Such nature-based solutions can be combined with payment for environmental services, generating additional economic benefits for communities. Grey and green infrastructure can also be combined. The Zimbabwe Idai Recovery Project, which aims to enhance the coping capacity of affected communities from Cyclone Idai, finances key public infrastructure across multiple sectors including water, sanitation, education, health and disaster risk mitigation and preparedness.

A lack of resilient infrastructure is harming the productivity of firms in LMICs. Frequent disruptions in electricity, water, transportation, and communication services often results in systemwide impacts beyond infrastructure assets and services, for example reduced production capacity[42] of firms. Countries in Africa have some of the highest utilization losses due to infrastructure disruptions (map 9.1 and figure 9.1). A dataset analysis of the World Bank's Enterprise Survey reveals that across the 118 countries for which data were available, gaps and issues with power, water, and transport infrastructure provision led to utilization losses of US$151 billion a year, or an equivalent of 0.59 percent of the sample GDP (Hallegatte and others 2019). Table 9.2 outlines the costs of disrupted infrastructure services and the direct impacts on the four primary infrastructure services; power, water, transport, and telecommunications. The study finds that disruptions in transportation services cause the most economic damage, accounting for losses of US$107 billion annually, or 0.42 percent of sample GDP. Issues with electricity supply followed in magnitude, accounting for US$38 billion of lost productivity; water disruptions cause utilization rate losses of US$6 billion a year (Hallegatte and others 2019).

42 An indicator used to measure how effective a firm is in converting resources into revenue.

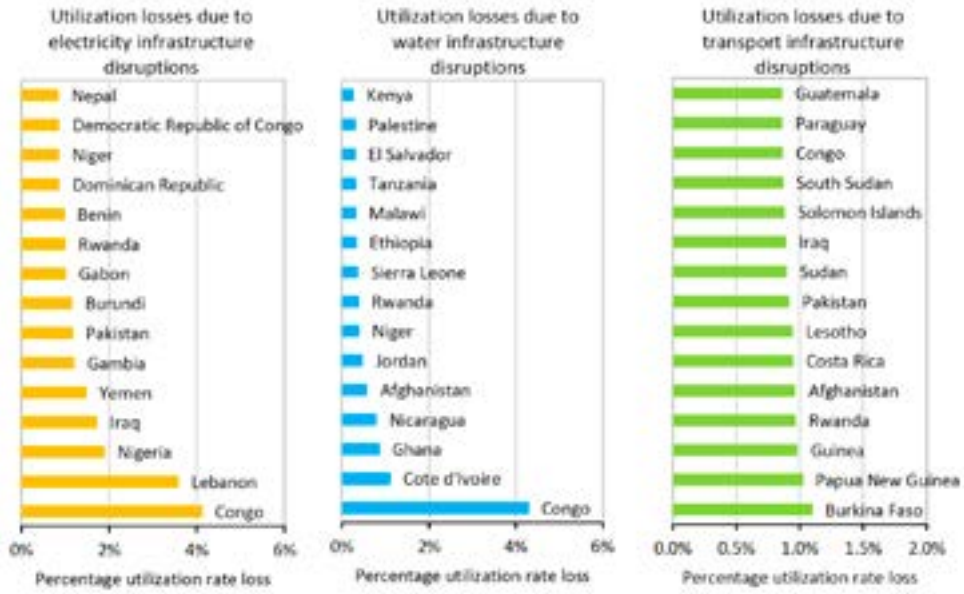
MAP 9.1 Countrywide average utilization rate losses due to electricity, water, and transport infrastructure disruptions



Source: Rentschler and others 2019

FIGURE 9.1 Countries with greatest utilization rate losses by type of infrastructure disruption

Left panel: electricity infrastructure, middle panel: water infrastructure, right panel: transport infrastructure



Source: Rentschler and others 2019

TABLE 9.2 Effects of disrupted infrastructure services on firms, global sample

Sector	Direct Impacts	Coping Costs	Indirect Impacts
Power	▶ Reduced utilization rates ($38 billion a year) ▶ Sales losses ($82 billion a year)	▶ Generator investment ($6 billion a year) ▶ Generator operation costs ($59 billion a year)	▶ Higher barriers to market entry and lower investment ▶ Less competition and innovation due to lack of small and new firms ▶ Bias toward labor-intensive production ▶ Inability to provide on-demand services and goods ▶ Diminished competitiveness in international markets
Water	▶ Reduced utilization rates ($6 billion a year) ▶ Sales losses	▶ Investment in alternative water sources (reservoirs, wells)	
Transport	▶ Reduced utilization rates ($107 billion a year) ▶ Sales losses ▶ Delayed supplies and deliveries	▶ Increased inventory ▶ More expensive location choices, for example, in proximity to clients or ports	
Telecommunications	▶ Reduced utilization rates ▶ Sales losses	▶ Expensive location choices close to fast Internet	

Source: Hallegatte, Rentschler, and Rozenberg 2019.

9.2.3 Existing Gaps and Needs

While the infrastructure gap throughout Africa is growing, it does not seem to be due to a lack of interest in investment. According to a report from the Infrastructure Consortium for Africa from 2018, African state and subnational spending on infrastructure systems increased from US$30.7 billion in 2016 to US$34.4 billion in 2017. Furthermore, commitments from all sources to all sectors were higher in 2017 than they were in 2016. The transportation sector had the largest boost in support, jumping up 30 percent from US$26.2 billion in 2016 to US$34 billion in 2017. Commitments to energy increased during this period by 20 percent, up to US$24.8 billion from US$20.6 billion. Growth in ICT investment grew by 37 percent, from US$1.7 billion in 2016 to US$2.3 billion in 2017. Increase in water commitments grew 8 percent, from US$12.2 billion in 2016 to US$13.2 billion in 2017 (AfDB 2017).

While the proportion of government funding being spent on investments in infrastructure are at an all-time high, there is still a prominent gap in the availability of management and funding for infrastructure projects and development. In spite of the increased growth of funds committed to addressing infrastructure weaknesses by African governments, the total values in the preceding paragraph account for only 42 percent of the total funding allocated to infrastructure projects in 2017. While Chinese investment has moved swiftly to fill in some of the critical gaps in the infrastructure services throughout Africa, the distance between the current investment of 3.5 percent of GDP and the objective of 4.5 percent of GDP will require financing from external sources. . In order to keep pace with other countries, such China which spends 7.7 percent of its GDP on infrastructure, and India, which spends 5.2 percent of GDP on infrastructure, the absolute value of money invested in African infrastructure by local governments would need to double between 2015 and 2025, to US$150 billion (Lakmeeharan and others 2020).

This is an opportunity to capitalize upon the strengths of private sector investment mechanisms and drive climate resilient infrastructure at scale alongside climate change and demographic growth and ensue that African countries leapfrog into new and novel development pathways. If this is the path forward, African infrastructure projects will need to ensure they have several key considerations covered. There should be commercial viability and bankability in which projects have adequate risk returns. Political and currency risks should be primarily mitigated by a perceived degree of political stability. Counterparty and regulatory risks should be managed using a credible off take. Deal flow should be ensured so there is no time crunch on the funds or the deal completion process. There should be active engagement of development finance institutions, which has a multiplier effect on private capital investment. (Lakmeeharan and others 2020) In addition to ensuring the preceding criteria are met to increase the change of success for private investment opportunities, policy makers should consider alternative financial mechanisms, including long-term debt finance, large pools of institutional investor capital, reduction in the overall cost of capital, and accelerating the greening of the financial systems (Global Commission on the Economy and Climate 2016).

In addition to addressing the financing mechanisms of the sector, it is also important to implement policies that support resilient green infrastructure. Governments should support sound transition plans, including measures that ensure clean energy solutions are economically viable in comparison to the true cost of coal and other fossil fuel sources. This entails tackling pricing structures, which support environmentally harmful practices, through phasing out subsidies for fossil fuels and establishing carbon pricing, which can be done through a sectoral approach or mainstreaming at large (see section 9.1 on special emphasis on climate-informed macroeconomic policies). Alternative avenues include strengthening the ways through which financing achieves policy outcomes by supporting implementation of energy consumption transition plans and investments in research and development for clean technology and deployment (Global Commission on the Economy and Climate 2016).

9.2.4 Priority Action Areas

Action areas seek to influence the design of infrastructure to make it resilient and less carbon intensive while also contributing to an enabling environment. The following strategies are suggested:

I Create and enforce standards for resilient and low carbon infrastructure

- Regulations and codes that improve the quality of infrastructure and will contribute to its resilience
- Low carbon standards for infrastructure
- Enforcement and monitoring of these standards and providing incentives for further measures

II Include resilience and low carbon objectives in infrastructure planning

- Planning at various levels of government to include resilience and low carbon objectives informed by robust analytics
- Strengthen institutional capacity to address resilience and low carbon growth, including coordination across sectors and agencies

III Secure financing for resilient and low carbon infrastructure, especially from the private sector

- Make available sufficient capital for resilient and low carbon construction and supporting analytics
- Leverage financing and financing innovations including MFD

9.2.5 Targets and Commitments

Existing Bankwide IDA-19 and Corporate commitments relevant to resilient and green infrastructure are presented in Table 9.3. A concerted focus to secure green and resilient infrastructure and drive transformation at scale will be undertaken in Sub-Saharan Africa through the strategic directions that support these Bankwide targets (see targets under this Climate Plan as presented in Chapters 4-8, and Chapter 10).

TABLE 9.3 Existing World Bank Group Targets Related to Resilient and Green Infrastructure

Sector/ Strategic Direction	Agreed IDA-19 or Corporate commitments - Bankwide
Energy	▶ IDA19 commitment to add/enable 10 GW of renewable energy (35% increase from 2015) (*Corporate FY25 target*) ▶ Under MFD approach, mobilize US$10 billion private financing for renewable energy (2.5X increase against IDA16–17) (*Corporate FY25 target*) ▶ US$1 billion for battery storage (*Corporate FY25 target*) ▷ 36GW renewable energy (Corporate FY25 target) ▷ Increase renewable energy generation capacity from 28GW to 38GW (Africa *regional FY23 target*) ▶ 1.5 million GWh-equivalent energy savings (*Corporate FY25 target*)
Urban	▶ 100 cities with low carbon and compact urban planning (*Corporate FY25 target*) ▶ 100 cities with integrated, city-based resilience approach (*Corporate FY25 target*)
Water	▶ 100 river basins with climate-informed management plans (Corporate FY25)

Note: GW = gigawatt; MFD = Maximizing Finance for Development; GWh = gigawatt hour

Community representatives come to visit a family in the outskirts of Beni, Democratic Republic of Congo to raise awareness of Ebola.

Vincent Tremeau / World Bank

9.3 Climate and Health as a Cross-Cutting Issue

9.3.1 Health Concerns in the Context of the Climate Crises

Health as a cross-cutting issue is relevant to and addressed through this Climate Plan, alongside targeted action on health through the Africa Human Capital Plan, to boost Africa's potential through its human capital—on the health, knowledge, skills, and resilience of its people. Climate variability and change are the greatest global health threats of the 21st century, with far reaching consequences for human capital accumulation, labor productivity and development, and the economy (IPCC 2018). Through direct (e.g., floods) and indirect (e.g., social determinants) pathways, climate change contributes to the number of people suffering from injuries; undernutrition; vector-, food-, and waterborne diseases (e.g., malaria, dengue, diarrhea, schistosomiasis); heat stress; and premature death.

The Sub-Saharan Africa region is projected to see an exponential rise in its already high health burden, particularly those related to undernutrition, infectious and chronic diseases, disaster risks, and pandemic threats—exacerbated by climate change. Health systems across Sub-Saharan Africa remain under pressure despite significant progress being made. The region is still grappling with the challenges of reducing maternal and child mortality and combatting malnutrition and communicable diseases such as tuberculosis, malaria, and HIV/AIDS—and presently with the COVID-19 crises.

Climate change impacts health through a number of complex and interlinked pathways (figure 9.2), which have strong linkages to the Strategic Direction under the Climate Plan. These pathways provide the basis for synergies to manage and avert climate-related risks.

FIGURE 9.2 Impact of climate change on human health

Source: US Centers for Disease Control and Prevention. https://www.cdc.gov/climateandhealth/effects/default.htm

Climate change is a risk multiplier: the health challenges *already faced* by a given population or community are magnified. Poor health in communities and weak health systems increase the likelihood of health-related impacts from climate extremes and climate stresses.

PATHWAYS OF HEALTH-RELATED CLIMATE IMPACTS

I Direct Pathways

Extreme weather events can cause injuries and deaths through trauma or drowning as well as damage to property and infrastructure (with consequent health impacts). These extreme events, such as storms and floods, include an increasing frequency and severity of periods of extreme heat, particularly in large cities. These heat events or heatwaves are often be associated with forest fires and dust storms that adversely impact air quality. They compound and exacerbate the occurrence and intensity of diseases associated with elevated temperatures (e.g., heat exhaustion and heat strokes) and respiratory diseases (e.g., asthma attacks) (Serdeczny and others 2016). For example, Flooding in Kenya in 2018 claimed the lives of 170 people, displaced 300,000, and saw more than 700 people admitted to health facilities with cholera (MSF 2018).

Drought is a type of extreme event that builds gradually over weeks, months, or even years. Many health conditions are affected by the availability and quality of water, with links to illnesses such as diarrhea and neglected tropical diseases, as well as issues with nutrition related to impacts on the agriculture sector.

Changing climate patterns are altering the spread of vector-borne diseases, such as the Zika virus, dengue fever, and malaria, by altering the conditions under which the disease vectors develop and the pathogens they carry. One billion people will be newly exposed to

diseases such as dengue fever as world temperatures rise. Vectors such as Ae. aegypti is likely to expand, particularly in South Asia and Sub-Saharan Africa.

II Ecosystem-Mediated Pathways

Food-, vector, - and waterborne diseases are heavily influenced by seasonal variations in rainfall distribution and temperature, affecting the health and safety of persons directly exposed. Together with habitat degradation and biodiversity loss, these are predicted to lead a resurgence of old diseases (e.g., Rift Valley fever) and change patterns of more prevalent diseases, including malaria, dengue, and Ebola.[43] The rates of malaria are projected to increase for East Africa, Central Africa, and southern Africa. For East Africa, estimates of additional people vulnerable to malaria due to climate change range from 40 million to 80 million under 2° warming, and 70 million to 170 million under 4° warming (Caminade and others 2014). COVID-19 is a zoonotic infectious disease that has its origins in bats (box 9.4).

Agricultural impacts affect the availability and affordability of nutritious food, leading to undernutrition and micronutrient deficiencies. In addition to the reduction in crop productivity, the impact of climate change on other drivers of stunting (e.g., water quality and

Box 9.4
Link between infectious diseases and ecology: Important considerations in the light of COVID-19

Infectious diseases often emerge as a result of interaction between multiple species, including host, vector, or parasite species in complex ecological communities (Johnson, de Roode, and Fenton 2015). About 70 percent of emerging human infectious diseases have wild-life hosts or vectors, for example Ebola, zika, and SARS (Johnson, de Roode, and Fenton 2015), and most recently, COVID-19. Human parasites have spilled over to wildlife, such as measles in mountain gorillas and tuberculosis in Asian elephants (Johnson, de Roode, and Fenton 2015). The COVID-19 virus, SARS-CoV-2, has its origin in bats, similar to SARS and MERS.[a] While there is no firm evidence at this stage, scientists have hypothesized that the virus passed through an intermediary animal before infecting humans (Readfearn 2020). It is further hypothesized that the disease spread between animal hosts and then to humans at a wet market, at which live animals are traded and are in close proximity to each other and humans (Readfearn 2020).

These emerging zoonotic diseases have increased as a result of factors such as habitat fragmentation and land use change (Edwards, Garcia Salinas, and Watkins 2020). Logging, mining, roads, agricultural expansion, and urbanization have encroached on forests and wildlands, bringing humans into closer contact with animal species. Hunting and handling of bushmeat also exposes humans to a number of viruses and pathogens from animals (Peeters and others 2002; Vidal 2020). Habitat fragmentation leads to concentration of animal populations in small areas at unnaturally high densities, which could create new focuses of transmission or novel sources of zoonotic infections (Estrada-Peña 2014). Animal hosts can also be clumped together because of changes in food or other key resources, without changes to the habitat itself, which can also result in intra- or interspecies' parasite transmission (Estrada-Peña 2014).

Decreasing anthropogenic stresses to ecological systems can help prevent infectious diseases. Sustainable natural resource management and conservation of habitat and wildlife could be critical in preventing the increase of zoonotic diseases (Vidal 2020). Analytical tools from disciplines such as community ecology and distributional ecology are useful in understanding the spread of infectious diseases and their control, such as when and why pathogens switch hosts (Johnson, de Roode, and Fenton 2015). These tools help quantify environmental and biological factors governing the structure of complex communities of multiple hosts, vectors, and parasites (Johnson, de Roode, and Fenton 2015).

a See the CDC website on the coronavirus, https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/summary.html.

43 This includes changes in the geographic range of the disease, seasonality, and intensity of transmission (IPCC 2018).

quantity, labor productivity of women, and disease distribution) will increase the prevalence of stunting in Sub-Saharan Africa and Asia (World Bank 2015a). For example, in Niger, children aged two or less born during a drought are 72 percent more likely to be stunted then when there is no drought (Kistin and others 2010). With an already high prevalence of stunting in western, Central, and eastern Africa (31.4 percent, 32.5 percent, and 36.7 percent, respectively), climate change is predicted to contribute an additional 7.5 million stunted children by 2030 in those regions (WHO 2014). The rates of severe stunting, a condition associated with a 4.1-fold increased risk of death in children under five, is projected to increase in eastern and southern Africa by 55 percent each, and in Central Africa by 23 percent (Lloyd, Kovats, and Chalabi 2011).

III Indirect Pathways

Indirect pathways include social processes (e.g., leading to population displacement and conflict) and economies (e.g., impact on national economies and infrastructure limit the provision of health and other services).

Communities and populations of all incomes are vulnerable to climate-related health risks and pandemics, with the most at-risk groups being women, young children, the elderly, people with preexisting health conditions or disabilities and the poor and marginalized (IPCC 2018). These climate-related health impacts will exacerbate existing poor health outcomes, adding excess burden to already weak health systems.

Climate change is emerging as a potent driver of migration (Rigaud and others 2018), and as people move this may affect the health and safety of persons directly through factors such as heat stress, water-borne diseases, malnutrition and stunting as well as the host communities into which the migrants arrive. Mobility of people can amplify the spread and patterns of these infectious diseases. There is a need for urgent and concrete climate and development focused action. A focus on the *human face of climate change* must be at the heart of these actions with a conviction to strive for healthy, safe, and secure communities.

The economic costs of climate-related health impacts are projected to be enormous. In the next 10 years, 80 million jobs could be lost due to heat stress alone (ILO 2019). WHO estimates that the direct damage cost to health could reach US$2 billion to US$4 billion per year by 2030 (WHO 2018). Moreover, millions of people could be pushed into poverty as a result of heath expenditures, lost labor income due to illness or injury, and long-term impact on productivity due to disability (Hallegatte and others 2016). One study projects that the additional costs associated with the excess disease burden related to climate-sensitive diseases (malaria, diarrheal illnesses, and malnutrition) could be between US$4 billion to US$12 billion in 2030 under 750 parts per million scenario (Ebi 2016). At the household level, climate-sensitive diseases impose an immense financial burden, particularly for the poorest households. For example, under climate change conditions, the burden of diarrhea is projected to increase by up to 10 percent, and each episode can cost as much as US$2 to US$4 for treatment, coupled with the loss of three to seven days of work each for the sick and caregiver. Moreover, in Malawi, malaria treatment represents 2 percent of monthly income for the average household, but 28 percent for poor households (Hallegatte and others 2016).

The health sector is an important source of GHG emissions. Healthcare's climate footprint is equivalent to 4.4 percent of global net emissions (2 gigatons of carbon dioxide equivalent) (Karliner and others 2019). While there is no estimate yet as to the carbon footprint of the African health sector, extrapolations project the. Ironically, hospitals in Sub-Saharan Africa, while emitting carbon, also experience energy starvation. One study reveals that among 11 African

countries assessed, only 28 percent had reliable electricity, which therefore leads many hospitals to use generators and other fossil fuel intensive sources (Adair-Rohani and others 2013).

Because energy is so critical in the provision of healthcare, this situation could allow healthcare systems to adopt clean renewable energy such as solar and wind, which will protect the climate, promote health, and advance multiple SDGs. Hospitals need to develop resilience strategies to implement sustainable policies on sustainable cooling (critical for maintaining the cold chain needed for vaccine provision), waste management, procurement, and transportation that will withstand extreme weather events and other climate change impacts.

Adopting the principles of climate-smart healthcare will be critical. This will be needed to both achieve the health sector's universal health coverage (UHC) goals as well as for the wider systems and society to adapt and be resilient to climate shocks as well as turn the tide on rising global GHG emissions.

9.3.2 Integrating Health into the Next Generation Africa Climate Business Plan

Health and climate impacts unfolding through the direct, indirect, and ecosystem-mediated pathways connect with core development priorities related to food, ecosystem water, and energy security across rural and urban areas. For effective health-focused outcomes, the Strategic Directions will seek to deepen their attention to health aspects and explore synergies for action.

- **Strategic Direction I: Food Security and a Resilient Rural Economy.** Nutrition and avoidance of stunting (an indicator in the HCI) are key health outcomes. Stunting provides opportunities for synergy with this Strategic Direction. For instance, the Central African Republic seems to have the most alarming scores. South Sudan, Sudan, and Zambia follow.[44]
- **Strategic Direction II: Ecosystem Stability and Water Security.** It focuses on water supply, sanitation, and hygiene (WASH). Clean and adequate water supplies are critical from a health perspective safety. As the geographic range of key pathogens shift under a changing climate, robust ecosystems and landscapes will play an increasingly important role.
- **Strategic Direction III: Low Carbon and Resilient Energy.** The opportunities should explore (i) combatting the impacts of household air pollution with access to clean energy; and (ii) working to mainstream energy efficiency and renewable energy in healthcare facilities by integrating energy efficiency audits in health projects and developing guidelines for procurement of equipment and building new facilities.
- **Strategic Direction IV: Resilient Cities and Green Mobility.** The urban heat island effect has significant health implications, particularly for a rapidly urbanizing region. Measures such as better building design as well as cooling in the streets through tree planting are important issues. Health impacts from climate change are worsened in areas with poor air quality, underscoring the need to focus on local air pollution. Health co-benefits can be achieved through developing environments that promote lower carbon behaviors. Behavioral shifts toward meat-free diets and infrastructure or street spaces that encourage active travel (walking and cycling) provide synergies for low carbon opportunities as the population in the region ramps up.
- **Strategic Direction V: Climate Shocks and Risk Governance.** Early warning systems, monitoring, and surveillance by the health sector are central following climate shocks. Outbreaks of various vector-borne diseases are possible after a climate-induced

44 See the CIFOR website for other examples: https://www.cifor.org/library/4180.

disaster. Climate variability and change may affect the geographical distribution and may increase the number of vectors and pathogens in certain regions, particularly in Africa. Mosquitoes and other vectors may take advantage of new habitats in altitudes that were formerly unsuitable (Smith and others 2014), which may increase the cases of malaria, schistosomiasis, and other vector-borne diseases that are already endemic in the region. Natural disasters such as flooding provide breeding sites for vectors, which contribute to morbidity and mortality cases.

9.3.3 World Bank's Health Sector Response to Climate Change

At a strategic level, the WBG has stimulated climate-smart healthcare action by raising awareness on the health effects of climate change in global discussions and through the generation of knowledge on the relationship between climate change and health (World Bank 2014; 2015b). These actions highlight opportunities for investing in low carbon solutions and supporting greater climate resilience across the health sector. The Health, Nutrition, and Population (HNP) GP works across the WBG to push action on the health impacts of climate change (box 9.5). This involves coordination with the Human Development Practice Group as well with GPs in the Sustainable Development Practice Group and the Climate Change Group. Dedicated targets and commitments in response to corporate and IDA19 commitments, include:

- By FY25, the Bank will support at least 20 climate-vulnerable countries to integrate Human Development sectors into the countries' climate change strategies and action plans using evidence-based approaches, per established criteria.
- Support at least 25 IDA countries to reduce the risks of climate shocks on poverty and human capital outcomes by supporting programs that incorporate ASP into national systems or reduce climate threats to health.

The WBG has developed tools and approaches that provide guidance to countries on climate-smart healthcare investments that mitigate climate change impacts. The Bank has developed an innovative approach to climate-smart healthcare, which encompasses both low carbon and resilience strategies in an overarching framework. WBG activities are supported and coordinated by the HNP Health–Climate and Environment Program (H-CEP). This support can be broadly divided into two categories: analytical and operational.

Box 9.5

Leveraging multisectoral climate-smart interventions for wider health benefits

The Health, Nutrition, and Population (HNP) GP is working with the Energy Sector Management Assistance Program (ESMAP) to develop the health component of the clean cooking fund (CCF) and associated interventions. This is part of a multisector team whose goal is the reduction of GHG emissions from cooking. For example, the US$7.65 million Rwanda cookstove project (P158411) introduced cookstoves to reduce the use of woody biomass for cooking, which simultaneously supported better nutrition by enabling food to be cooked when fuel is scarce and reduced exposure to toxic pollutants. HNP is also working with the Environment and Natural Resources GP on the Pollution Management and Circular Economy Project, which focuses on reducing ambient air pollution–related impacts on noncommunicable diseases. The interaction between local air pollution and global climate change is well established: many of the same sources are implicated, and health impacts from climate change are worsened in areas with poor air quality. These examples demonstrate that to effectively tackle the health impacts of climate change, a multidisciplinary approach is needed.

Source: World Bank website, "Rwanda - Improved Cook Stoves Project," http://documents.worldbank.org/curated/en/900301488876709987/Rwanda-Improved-Cook-Stoves-Project.

Analytical support. Much of the knowledge on climate and health is weighted toward higher-income settings. The WBG is supporting the development of practical policy information to close this gap. Examples of this include:

- **Carbon footprinting of healthcare systems.** Information from carbon emission and health expenditure databases is used to develop multiregion input-output (MIRO) tables, providing estimates of national-level carbon footprints for between 20 and 35 countries.
- **Mapping of health incorporation into Nationally NDCs.** The WBG has reviewed each of the almost 200 NDCs to understand the extent to which health is incorporated in these documents.[45]
- **The Hotspots project has identified countries to prioritize health and climate action.** The degree of vulnerability varies greatly, yet 33 of the 54 hotspot countries are in the WBG Africa region.
- **Climate and Health Vulnerability Assessments (CHVA).** The WBG is working with countries and task teams to conduct CHVAs. These assessments support countries to understand their climate-related exposures, climate-sensitive health risks, and the capacity of their systems to adapt to current and future changes.

Regional- and national-level projects have progressively incorporated climate co-benefits. The WBG supports work across all sectors, including health, by screening every project for short- and long-term climate and disaster risks to identify exposures and vulnerability to climate change. The findings are used to integrate appropriate resilience, adaptation, and climate mitigation measures in development policies, programs, and projects. These are then assessed for the calculation of climate co-benefits. A guidance document and a menu of interventions have been developed to facilitate this task. There is also a series of training materials being developed to enhance knowledge and skills. This will be initially trialed within the WBG before being rolled out to support governments across the globe, including in Sub-Saharan Africa.

The WBG supports many African governments' commitments toward UHC. Synergies between UHC and climate health are defined in the *Climate and Health Approach and Action Plan* (World Bank 2017). The integration of low carbon and climate-resilient healthcare into country UHC strategies (i.e., climate-smart UHC) will allow African countries to (i) establish systems for fair, efficient, and sustainable financing of HNP services that are also adaptable (i.e., flexible and scalable); (ii) ensure equitable access to affordable, resilient, and quality HNP services; and (iii) leverage climate-smart interventions in other sectors to strengthen HNP results and generate public goods.

45 Based on the analysis of NDCs, health is often at risk from climate change. It is much less frequently identified as needing specific focus to adapt to the impact of climate change. In very few instances was the health sector recognized as needing to contribute to mitigation efforts by reducing its net carbon emissions.

Girls play together on the way home from school. *Riccardo Mayer / Shutterstock*

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Impressive land husbandry activity on the steep hills of the Nyabihu District of Rwanda. *Simone D. McCourtie / World Bank*

PART III

MAKING IT HAPPEN

This section focuses on the delivery of the Next Generation Africa Climate Business Plan. By deploying the Bank's country engagement, lending, policy, and knowledge instruments, the Bank will mobilize its financing to ramp up climate ambition and climate action to deliver concrete targets set out in the Plan.

The Plan must find the right balance to ensure that Sub-Saharan countries, and the poorest individuals, remain resilient in the face of increasing climate shocks and climate stresses, while also availing all the opportunities to leap-frog and transition into low-carbon pathways that deliver economic growth and development. Countering emerging and unprecedented crises must be done in a climate-informed manner—especially when those risks will be amplified by inaction on climate. A continued focus on achieving the twin goals of eliminating poverty and achieving shared prosperity, as well as the SDGs, will be the driving force.

Aerial view of Beni, North Kivu region, Democratic Republic of Congo.

Simone D. McCourtie / World Bank

CHAPTER 10
The Next Generation Africa Climate Business Plan

The enormity of the climate challenge to meet development goals in Sub-Saharan Africa calls for a significant ramping up of climate action. The compelling evidence on the nature and scale of impacts reaffirms that climate action cannot be postponed or delayed—it is, in fact, overdue. The narrowing window of opportunity for early action against escalated climate impacts—as early as 2030—must not be lost. The urgency for end-to-end preparedness, systemic shifts to reduce climate vulnerabilities, and the imperative for proactive and anticipatory strategies is clear—a message accentuated in the face of the unfolding COVID-19 pandemic. Tackling climate change impacts requires collective global action to reduce GHG emissions accompanied by a shift to low carbon pathways. Equally, and especially in the context of Sub-Saharan Africa, resilience at local and national levels needs to go beyond readiness to climate shocks, to secure sustained development outcomes through climate-informed action.

This Climate Plan will ramp up climate action and finance between FY21–26 to deliver on commitments agreed under the World Bank's 2025 Corporate Climate Actions and Targets (including the Adaptation and Resilience Climate Action Plan) and IDA19 (prospective IDA20) agreements. The value proposition is underpinned by the Bank's solid track record and convening power. Building on the success and achievements of the previous ACBP and the invaluable lessons generated, this Plan will promote the scale-up of successful approaches while continuing to support transformation at scale through pioneering and innovative climate action. As the largest climate financer in Africa, the Bank will work proactively with client countries and partners to accelerate climate action and financing in Sub-Saharan Africa.

10.1 COVID-19 as a Game Change

The ongoing COVID-19 pandemic has reaffirmed the leadership and role of the WBG to tackle complex issues and leverage its comparative advantage in lending, investments, knowledge, and convening capacity (World Bank/IMF 2020). Acting alongside other development partners, countries, and stakeholders, the WBG is helping to strengthen countries' health systems, bolster response capacity, and build disease surveillance. It is also supporting safety needs and improved access to critical services, while creating conditions for inclusive and sustainable long-term growth.

COVID-19 must be a centerpiece of the Climate Plan as Sub-Saharan Africa responds to and recovers from the pandemic and its economic consequences. The Climate Plan must maximize support to the COVID-19 recovery while pursuing synergies between green stimulus and investment response packages to contribute to long-term development. The Development Committee

Communiqué calls for support to *"long-term development priorities"* alongside urgent economic needs and to ensure *"affordable energy access, building energy security and resilience to economic and environmental vulnerabilities and climate change"* including "structural reforms" (World Bank/IMF 2020, parag. 7). COVID-19 response must pave the way for the most immediate needs while galvanizing opportunities for inclusive, sustainable, and climate-informed economic growth.

Pursuing synergies for COVID–climate action is paramount because postponement of climate action is not an option in the face of escalating climate change, which will also disproportionately impact the poor and poorer economies. Green and inclusive approaches that support the immediate recovery process by helping to create new jobs, market opportunities, and economic savings should be prioritized. These goals could be achieved through labor-intensive ongoing or temporary projects that provide synergies with climate action, such as reforestation, landscaping, flood protection, and environmental management programs, and energy-efficient projects. For some countries, it may be possible combine immediate support to generate longer-term sustainability and growth benefits, such as consideration of solar and storage for energizing health clinics and hospitals (World Bank 2020a).

Greening the financial stimulus package proposed for the COVID-19 could support the transition to low carbon, climate-resilient pathways for the most optimal long-term outcomes. These stimulus packages could pivot dialogue with decision makers toward policy reform actions that are more climate friendly, and that include fiscal reforms, institutional capacity building, and incentives to promote the introduction of new technologies and green jobs. For example, countries facing fiscal pressure due to the COVID-19 economic slowdown and low fossil fuel prices may take the opportunity to reduce or better target fossil fuel subsidies. Funds to stimulate employment could be directed and green jobs. As part of integrated response strategies and fiscal stimulus packages, these options could deliver local benefits and help countries shift toward low carbon pathways (Strand and Toman 2010).

10.2 Focusing Action through the Strategic Directions and Special Areas of Emphasis

Priority actions areas under the five Strategic Directions of the Climate Plan catalyze low carbon climate resilience, and pioneer and showcase transformation at scale (table 10.1). These action areas emphasize the need for sectoral, cross-sectoral, and enabling policy and institutional aspects to better address climate risks. They highlight the critical importance of data, information, and knowledge to foster a shift to proactive and anticipatory approaches to help communities and countries leapfrog toward low carbon, climate-resilient pathways. A stable, climate-informed macroeconomic context can increase effectiveness of climate action across the Strategic Directions and development landscape. Paying attention to climate risks over longer time scales with emerging trends (urbanization, infrastructure gaps, technology and innovation, and demographics, including youth bulge) will ensure a more robust set of solutions and outcomes.

The Climate Plan will deliver accelerated, development-focused climate action in Sub-Saharan Africa through three elements.

- Delivering climate action using World Bank instruments
- Financing climate action
- Tracking and monitoring results for climate action

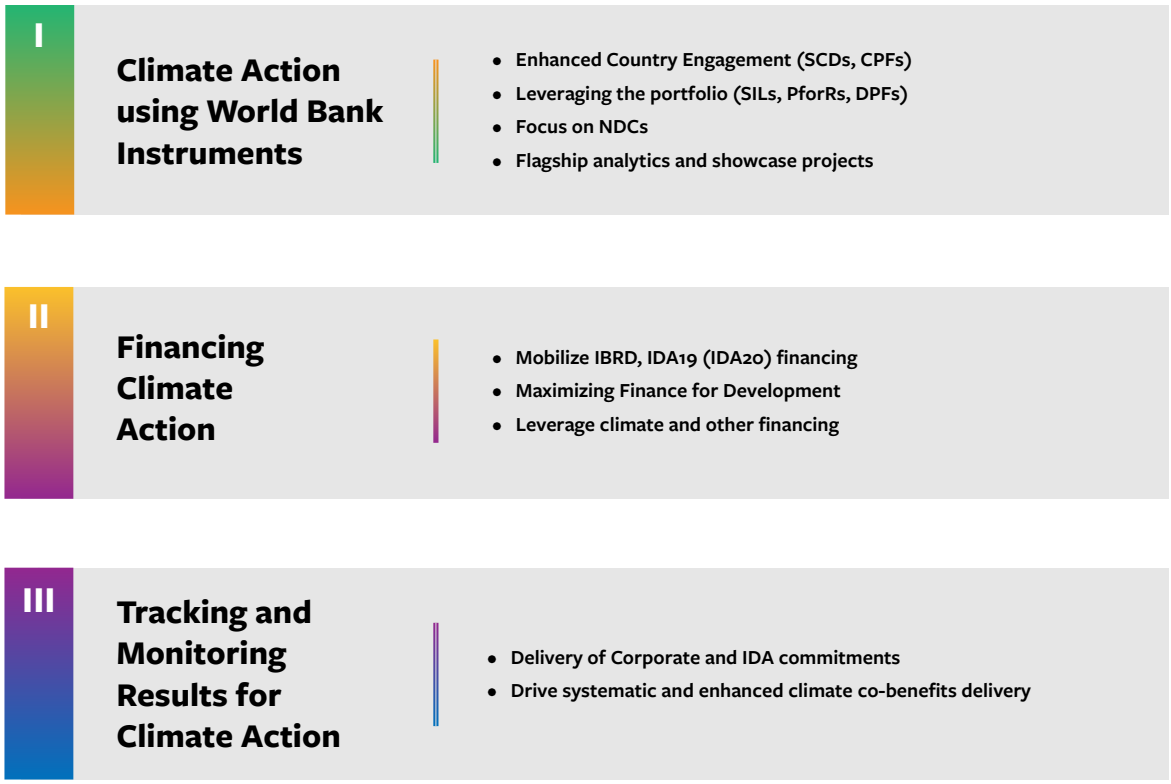
Each part is discussed with respect to the modalities and commitments for Sub-Saharan Africa (figure 10.1).

TABLE 10.1 Priority Action Areas for each Strategic Direction and Special Area of Emphasis

SPECIAL AREAS OF EMPHASIS	
Climate-informed macro policies	**Green resilient infrastructure**
▶ Supporting environmental reforms ▶ Supporting adaptation to climate change ▶ Engaging with ministries of finance and planning	▶ Create and enforce (green) standards for resilient and low carbon infrastructure ▶ Include resilience and low carbon objectives in infrastructure planning across time scales ▶ Secure financing for resilient and low carbon infrastructure, especially from the private sectors

STRATEGIC DIRECTIONS				
Food Security and a Resilient Rural Economy	**Ecosystem Stability and Water Security**	**Low Carbon and Resilient Energy**	**Resilient Cities and Green Mobility**	**Climate Shocks and Risk Governance**
▶ Enhance on-farm and productive landscape solutions ▶ Implement food value chain solutions to bolster Africa's end-to-end food security ▶ Secure enabling solutions (macroeconomic and policy context) to foster game-changing solutions	▶ Enhance considerations of natural capital in macroeconomic and sectoral policies ▶ Enhance management of ecosystems and watersheds to counter climate risks ▶ Strengthen water security through improved planning and management	▶ Expand renewable energy supply ▶ Increase access to clean electricity ▶ Modernize electricity system planning to integrate larger volumes of renewable electricity ▶ Secure enabling environment for low carbon development pathways and cross-sectoral policies and investments	▶ Support climate-smart urban transitions through policy reform and planning ▶ Embed customized knowledge and data to support climate- smart investments ▶ Nurture and build skills, talent, and workforce to support a climate-smart economy ▶ Catalyze financing and partnerships for climate action and multilevel governance	▶ Implement targeted people-centered, community-led, customized solutions and delivery mechanisms ▶ Strengthen and enhance information systems for decision support ▶ Improve the institutional setup for climate change preparedness and policy response

FIGURE 10.1 Key elements of the Next Generation Africa Climate Business Plan, FY2021–26



Note: CPF = Country Partnership Framework; DPO = Development Policy Operations; ESF = Environmental and Social Framework; GP = Global Practice; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; NDC = Nationally Determined Contribution; PforR = Program for Results; SCD = Strategic Country Diagnostics; SIL = Specific Investment Lending

10.3 Delivering Climate Action Using World Bank Instruments

10.3.1 Country Engagement Instruments

The call for scaled-up climate action through SCDs and CPFs in support of NDCs provide a solid basis for deepening efforts underway in several countries (table 10.2). The climate commitments provide a timely and much needed impetus to increase the linkages of climate risks and opportunities with economic growth and poverty eradication, and core development in the rural and increasingly urban environments. The Bank's recent success on several fronts of country engagement provides important lessons.

This Climate Plan will support the integration of long-term climate objectives in at least three SCDs each fiscal year, based on demand by the Country Management Units (CMUs). The Climate Plan will develop a prototype methodology to support these diagnostics to inform key policy actions and game-changing solutions to drive low carbon, climate-resilient development. These pilot SCDs will strengthen the prioritization of climate-smart investments in the pipeline of their CPFs and emphasize areas for technical assistance and institutional strengthening programs through client dialogue and NDC support. This enhanced focus on climate will also inform national-level climate ambition through countries' own NDCs.

TABLE 10.2 Commitments for climate action through country engagement and Next Generation Africa Climate Business Plan

World Bank Commitments
IDA19 Special Climate Change Theme (FY21–23) ▸ Urge all SCDs and CPFs to continue to incorporate climate-related and disaster risk considerations, including being informed by national climate-related action plans, including NDCs. ▸ Urge CPFs to set climate-related or national climate-related action plans, including NDC-based objectives or results indicators in CPFs, where appropriate. Corporate Climate Actions and Targets (FY21–25) ▸ With the NDC Partnership, the WBG will support at least 20 countries to systematically implement and update their NDCs and support an increasing number of countries to develop integrated, midcentury low carbon and climate-resilient strategies.
Next Generation Africa Climate Business Plan Actions
▸ At least three SCDs per fiscal year engaged upstream analytics to inform the CPF, based on CMU demand. ▸ Develop an SCD template for "enhanced" action to integrate climate considerations. ▸ Translate SCD findings into climate-smart investments and policy action through the CPF pipeline[a] ▸ Strategic NDC engagement based on country demand.

Note: CPF Country Partnership Framework; CMU Country Management Unit; NDC Nationally Determined Contribution; SCD = Strategic Country Diagnostics.
a. These have to be done in collaboration with and based on CMU demand.

SCDs provide a natural entry point for an early countrywide assessment of climate sensitivities of key engines of growth. They can signal a need to adjust or shift national development trajectories toward climate-smart development pathways. Done well, robust diagnostics building on climate vulnerabilities, can help to (i) identify climate change as a binding constraint to achieving the twin goals; (ii) analyze the socioeconomic impacts of climate change and identify opportunities for markets and jobs creation; and (iii) as relevant, integrate climate change into sectors, including less traditional sectors such as human development and institutional capacity building. Knowledge gaps can be identified for further exploration. Nigeria's SCD is exemplary in this regard: quantifying the GDP impact of climate inaction for 2020 and 2050. The SCD also identified Nigeria's first sovereign Green Bond (US$30 million) as an opportunity for scaling up green issuance; increasing private sector participation, green jobs, and diversification of the economy; and financing climate change programs in national and subnational budgets.

The game-changing potential for CPFs to drive robust, climate-informed development outcomes, underpinned by sound assessments, must be fully explored. SCDs can bring clarity and strengthen the basis for the much needed structural (or policy) reforms for countries. Coupled with Development Policy Financing (DPF), SCDs can help to reshape the enabling context for the larger portfolio. Sensitization of climate action at the CPF level could help the capture of portfolio-wide climate co-benefits, in support of the increased Bank targets. The Tanzanian CPF's inclusion of an indicator to track climate co-benefits at the country level was exemplary in this regard.

NDCs can allow the Climate Plan to foster transformational climate action in client countries. As a primary platform to deliver countries' obligations under the Paris Agreement and for meeting their SDGs, the NDCs embody the vision of each country to reduce national emissions and adapt to the impacts of climate change. The Africa region is already engaged with more than 10 countries on their NDC programs,[45] which could benefit from more strategic linkages to the Bank's country engagement. The Coalition of Finance Ministers for Climate Action can be harnessed to help build countries' commitment and engagement, drawing on the Bank's convening power with these ministries (World Bank/IMF 2019).

10.3.2 Leveraging the Portfolio

To deliver on the increased ambition for climate action, the Climate Plan will leverage the portfolio of the Africa region. It will harness the proven track record of key products and services, such as Investment Project Financing (IPF), DPF, and Program for Results (PforR).[46] Integrating climate considerations through early screening and assessment of climate risks and designing climate-smart projects and programs will ensure the policies, assets, services, and people in projects and programs are better aligned to low carbon, resilient outcomes. Priority areas of action as identified through the Strategic Directions provide a clear road map to deliver climate action. The Environmental and Social Framework (ESF)[47] also highlights aspects of environmental issues and it could further enhance climate action within the portfolio. Regional instruments will be mobilized under the Climate Plan to foster regional cooperation on resilient transformation, as appropriate.

The value proposition of this Climate Plan lies in strategically altering the direction and trajectory of the World Bank's portfolio to deliver climate-smart development by systematically and proactively addressing climate risks through integrative responses through a set of focused criteria.

Scale. A focus on climate action at scale to address the magnitude of impact needed to have a positive impact on growth and development. Operations should be scalable or seeking to scale up from other successful operations.

Transformation. Shifting trajectories to climate-smart, sustainable pathways. Operations should strive to drive structural shifts, going beyond the narrow boundary of the project, for instance, by informing or influencing the enabling context, and/or macro-economic policies through knowledge products and capacity building.

Systemic impact. A focus on increasing systemic or systematic impact in countries through the integration of climate considerations into policy, planning, investment, and implementation. Increased engagement with ministries of finance and planning in the design and implementation of transformative low carbon and climate-resilient policies is key.

45 Support provided largely through NDC Support Facility, a multidonor trust fund created and designed to facilitate the implementation of NDCs, administered by the Climate Change Group. See the UNFCC website, "Nationally Determined Contributions (NDCs)," https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement/nationally-determined-contributions-ndcs.

46 For full description see the World Bank website, https://worldbankgroup.sharepoint.com/sites/wbunits/opcs/Pages/pc/Products-and-Services-07312018-100020/Financing-08312018-133230.aspx

47 https://www.worldbank.org/en/projects-operations/environmental-and-social-framework

The Climate Plan will exemplify showcase projects that promote leapfrogging technologies and holistic approaches to tackle current and future climate risks. These pioneering projects will reflect *game-changing elements* in their design and delivery, by addressing some of these elements:

- Robust analytics on (underlying) drivers of climate change, fragility, and vulnerability over current and longer-term time scales.
- Factoring for emerging megatrends (e.g., demographics, urbanization, loss of biodiversity, technology adoption, migration and displacement) as appropriate.
- Promoting integrative cross-cutting solutions that are gender-sensitive and inclusive to secure development imperatives, and synergies across adaptation and mitigation solutions.
- Harnessing technology innovations (e.g., big data, geospatial data, and disruptive technologies), as relevant.
- Leveraging financing and driving innovations in finance.

An early assessment of the indicative FY21 pipeline[48] for the first year of IDA19 reveals a strong alignment with the Strategic Directions of the Climate Plan for increased climate action (table 10.3).[49] An investment could be supporting more than one Strategic Direction, addressing upstream climate risks, opportunities and trade-offs more systematically and systemically. Of the 190 projects in the pipeline (for FY21) 93 (or nearly half) can be mapped to the Climate Plan.[50] The remaining projects are primarily led by Education; Governance; HNP; and Digital Development. While some of them do not have a specific climate focus, others have important linkages related to mutual development objectives on human capital, health, education, governance, institutional development, digital development, and private and financial sector improvements. There are more than a dozen DPF projects in the pipeline and at least four PforRs. While the impact on this pipeline in light of the COVID-19 response is still emerging and difficult to predict, there are opportunities for growing back greener and aligning with priority areas of climate action identified for the Strategic Directions.

The ESF, which applies to all new IPFs, includes additional environmental considerations relevant to climate change which can help further identify potential climate action. The ESF was launched in October 2018 and offers broad and systematic coverage of environmental and social risks in IPFs. Under the ESF's standards several aspects are oriented to raise awareness and recognize potential climate change issues in projects. For example, environmental consideration such as the sustainable management of living natural resources, responsible use of resources, conservation of habitats, and water management among others are highlighted in the ESF. These considerations can help identify climate change impacts of the project as well as provide an opportunity to explore risk mitigation measures and examine climate-friendly alternatives. The ESF also highlights more wide-ranging impacts including project-related transboundary and global risks and impacts, such as impacts from effluents and emissions, increased use or contamination of international waterways, emissions of short- and long-lived climate pollutants.

DPFs provide ample opportunities for synergies with climate action through this Climate Plan and the COVID-19 response. The anticipated increase in the use of DPFs for rapid deployment of fiscal stimulus packages to client countries under COVID-19 means that some of the pipeline may be restructured. At the same time, support for the delivery of agreed commitments under IDA19 and Corporate targets (table 10.4) provides opportunities

48 This is an indicative pipeline and is likely to change especially in response to the unanticipated COVID-19.
49 Seventy-five investment lending, of which 12 are additional financing; 13, development policy financing; and four, PforRs.
50 Based on preliminary analysis conducted for NG-ACBP. These 92 projects are led by a range of GPs, including Agriculture and Food, Digital Development, Education, Energy and Extractives, Environment, Natural Resources and the Blue Economy, Health, Nutrition, and Population, Macroeconomics, Trade and Investment, Poverty and Equity, Social, Social Protection, and Jobs, Transport, Urban, Resilience and Land, Water. To note: this was a pre-COVID-19 assessment.

TABLE 10.3 Preliminary pipeline assessment (FY21) in relation to the Next Generation Africa Climate Business Plan
US$, millions

Strategic Direction	Number of projects	Primary SD only	IDA	IBRD	Climate finance (GCF, GEF, CIF, other)	Bilateral, multilateral	Private sector	Domestic sources	Financing gap	Total
I. Food Security and a Resilient Rural Economy	30	22	5,149	195	806	200	—	1,003	706	8,059
II. Ecosystem Stability and Water Security	32	19	4,855	145	91	—	—	3	516	5,610
III. Low Carbon and Resilient Energy	24	20	3,965	1,255	254	367	150	330	135	6,456
IV. Resilient Cities and Green Mobility	20	14	3,632	145	28	—	—	—	250	4,055
V. Climate Shocks and Risk Governance	23	12	3,534	35	779	200	—	1,000	290	5,838
Macro context: Special Areas of Emphasis	12	6	790	535	—	—	—	—	—	1,325
Total under the NG-ACBP	93	93	13,831	1,630	1,161	567	150	1,333	1,091	19,763

Note: Based on FY21 pipeline assessment from Standard Reports. Columns do not vertically add up to the total because one project may be tagged in more than one Strategic Direction. CIF = Climate Investment Facility; GCF = Green Climate Fund; GEF = Global Environment Facility; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; — = not applicable.

TABLE 10.4 Policy commitments and recommendations for policy shifts

Recommendations for Policy shifts	
IDA19	Concrete and systematic policy actions ▸ Climate-informed policies and reforms for sectoral level DPFs ▸ Climate change– and green growth–focused climate change DPFs
Corporate 2025	Increased systemic impacts in countries ▸ Support the integration of climate considerations into national policy planning, investment design, budgeting, public procurement, and implementation and evaluation ▸ Increase engagement with and support to finance and planning ministries to integrate climate in the national budgets and plans, as well as long-term development strategies

Note: DPF = Development Policy Financing.

for green, climate-informed growth through well-conceived policies as part of the COVID-19 recovery. Illustrative examples of policies that could be implemented under a DPF for each Strategic Direction are provided in table 10.5 to embed and mainstream climate action.

Experiences and lessons from past DPOs emphasize the importance of upstream analytical work to inform borrower dialogue on prior actions. The recently approved DPO in Côte D'Ivoire establishes policy and regulatory frameworks for environmentally sustainable investments in multiple sectors, including cocoa, agroforestry, renewable energy, and energy efficiency. Prior actions include forest protection regulations to address deforestation and development of a framework for energy efficiency, including standards for various appliances. The pipeline for the West Africa Regional Energy Trade Development Policy Financing Program (FY21)—for about US$300 million—and the first of the three tranches aims to increase regional electricity trade to increase energy security, lower electricity cost, and support economic growth in the region. Regional electricity trade is expected to increase renewables capacity and fiscal sustainability in the participating countries. This operation is the first to use regional IDA with the DPO instrument.

The PforRs instrument can help to mainstream large-scale and transformative climate action into national programs.[51] For example, the US$500 million Climate Action through Landscape Management PforR will provide results-based financing over five years to the Government of Ethiopia to increase the adoption of sustainable land management practices and to expand access to secure land tenure in rural areas, while helping the country meet its climate resilience and mitigation goals. There is good alignment of the early FY21 pipeline with PforRs and the Strategic Directions, which span multiple sectors and GPs.[52]

The IDA and the IBRD are the primary financiers of the early pipeline, but with indications for increasing leverage and collaborative climate action. The co-financing volumes are indicative and will need to be approved by the governing bodies of the financiers (table 10.3). Together, IDA and IBRD are responsible for almost 80 percent of the financing, followed by special climate funds: GCF, GEF, CIF, Special Climate Change Fund (SCCF), Least Developed Countries Fund (LDCF), and Adaptation Fund (AF); and other development partners: AfDB, AFD, Department for International Development (DFID), US Agency for International Development (USAID), and domestic sources. This picture is not different from the previous plan and reflects in part the difficulty in tracking financial flows of other partners not directly administered by the Bank. The need for more information sharing through data and information platforms or some other mechanism for enhanced collaboration should be pursued. Dedicated climate financing and private sector continues to lag but is now the focus of ongoing work to increase this through a stronger focus on MFD.

Strengthening financial preparedness and resilience is particularly important in tight fiscal positions given the limited options available to governments to respond to the COVID-19 shock. Pre-COVID, several Sub-Saharan African countries were deteriorating fiscally and had increasing levels of debt distress. With the contraction in economies and increased public spending due to COVID-19 response, fiscal space has increasingly constrained. And because most Sub-Saharan African countries are highly exposed to climatic shocks, there is now a severe development threat to the twin goals in the region. Now, more than ever, countries in Sub-Saharan Africa need to prioritize climate resilience, in particular financial resilience, to weather the storms coming. National disaster risk financing, Cat-DDOs, the

51 PforR supports implementation of countries' own programs and linking disbursement to achievement of tangible results, alongside a institutional strengthening and capacity of government systems. Bank financing and due diligence provide assurance on compliance with environmental and social aspects.

52 The PforRs in the pipeline include P171807 Water for Smallholder Agricultural Production Project in Uganda–Water; P173155 Benin Program Support to Value Chains Development–Agriculture and Food; P172891 Nigeria Distribution Sector Recovery Program–Energy and Extractives; P173065 Financing Locally-Led Climate Action Program in Kenya–Social.

TABLE 10.5 Opportunities for policy reforms and "growing back greener" for each Strategic Direction

Strategic Direction 1: Food Security and a Resilient Rural Economy		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Agriculture subsidy programs for short-term support to farmers	Short	▶ *Reduce vulnerability of farmers and enhance food security*: develop agriculture subsidy programs to supplement incomes of farmers, particularly in climate-vulnerable areas and enable them to invest in climate-smart agricultural inputs and technologies.
CSA reforms	Medium	▶ *Increase productivity and resilience of agriculture sector* through sectoral reform, for example by establishing e-voucher programs to increase access to climate-resilient seeds or climate-smart technologies.
Enhancing existing social assistance and public works programs with SDGs	Medium	▶ *Increased investments in employment schemes* of social assistance to include conditional cash transfers for the adoption of more resilient agricultural practices.
Strategic Direction 2: Environmental Stability and Water Security		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Establishing economic and fiscal incentives for a cleaner environment	Medium	▶ *Establish pollution charges to avoid higher consumption of fossil fuels* as a result of low international oil prices, and provide governments with a steady flow of revenues. ▶ *Adopt economic instruments to reduce emissions of air pollutants*, such as cap and trade systems. ▶ *Adopt policy and fiscal instruments to manage single-use plastics.*
Drought and flood policies	Medium to long	▶ *Develop a general policy framework to help countries reduce their hydroclimatic risks* by identifying gaps, constraints, and opportunities for strengthening flood and drought management systems.
Strengthening the medical and hazardous waste management policy framework	Medium	▶ *Produce and update policies and regulatory instruments, environmental standards, and guidelines* for health care waste management, transport, procurement, disposal, and occupational safety, and build capacity in countries to design and implement medicate waste management systems.
Supporting businesses in the green and blue economies	Medium to long	▶ *Incentivize the development of tourism models* that integrate local communities and promote the development of local value chains. ▶ *Establish conditional cash programs* that benefit vulnerable populations in coastal areas and rural areas, such as payment for ecological services. ▶ *Establish adequate regulations to control interactions between humans and animals*, and thereby reduce the risk of zoonosis.
Enhancing existing social assistance and public works programs with SDGs	Medium	▶ *Increase investments in employment schemes of social assistance to include conditional cash transfers* as payments for environmental services, including restoring ecosystems through soil and water conservation, soil restoration, ground water recharge, tree plantations, and land improvement. as well as for water conservation and flood control infrastructure improvements on private lands.

TABLE 10.5 Opportunities for policy reforms and "growing back greener" for each Strategic Direction (Cont)

Strategic Direction 3: Low Carbon and Resilient Energy		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Renewable energy policies *Shifting to low-cost renewables to create fiscal breathing space and strengthen balance of payments*	Short	▶ *Fiscal support to maintain essential operations and supply continuity*; support to cover electricity bill payment subsidies and essential expenses of the utilities for keeping the lights on. ▶ *Commitment to improve energy efficiency by the utility*; develop renewable energy in the medium to long term. ▶ *Moratorium on new coal-fired or fossil fuel power plants.*
	Medium to long	▶ *Adopt least-cost generation, transmission, and electrification plan* aligned with domestic renewable energy targets, aligned with NDC and long-term strategies (if any). ▶ *Adopt detailed renewable energy strategy, legal and regulatory framework* for VRE integration, distributed renewables deployment, and private sector participation.
Domestic clean energy job creation *Enabling the growth of Energy Transition enterprises to strengthen resilience, local supply chains and jobs*	Short	▶ *Provide emergency financial support and equipment to service providers* to ensure provision of essential services, including in remote areas. ▶ Rapid deployment of solar energy systems to ensure energy access for critical facilities.
	Medium to long	▶ *Fiscal incentives and funding for quick, large-scale* programs to encourage the development of renewable energy enterprises, both for on-grid and off-grid, and to drive the retrofit and construction of efficient buildings. ▶ *Adopt adequate framework to set and control energy efficiency* and air pollution standards.
Energy subsidy reforms *Eliminating electricity and liquid fuel price subsidies while strengthening social safety nets*	Short	▶ *Fiscal support to compensate revenue loss for oil-exporting countries*; cash transfers and other social measures implemented to respond to COVID-19 impacts.
	Medium to long	▶ *Structural reforms of fossil fuel subsidies* with adequate measures to mitigate impacts on the poorest households.

Strategic Direction 4: Resilient Cities and Green Economies		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Expanding access to basic services	Medium	▶ *Reduce water stress and enhance resilience of water supply.* Institutional programs that conserve water resources, ensure water availability, and expand water supply coverage, particularly in drought-prone areas, while enhancing the resilience of these systems and their beneficiaries to impacts of climate change. ▶ *Expand sanitation and waste management.* Expand sanitation services, facilitate wastewater treatment, and improve solid waste management infrastructure and practices to reduce methane emissions from open dumping of waste and untreated wastewater. ▶ *Enhance utility performance on climate.* Utility performance benchmarks for service provision, conserving water resources, reducing energy use, among others.

TABLE 10.5 Opportunities for policy reforms and "growing back greener" for each Strategic Direction (Cont)

Strategic Direction 4: Resilient Cities and Green Economies		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Improving living conditions in cities	Medium	▶ *Urban air quality improvement and GHG emission reduction.* Adopt stricter emission standards for vehicles, regulatory frameworks, and financial incentives to promote clean transportation, especially public transit, nonmotorized transport such as bicycles, and electric vehicles regulations that deter car use. such as congestion pricing and parking management. ▶ *Climate-informed urban development.* Integrate climate-related data points in creation and updating of land records; design land use and zoning laws that consider climate-related vulnerabilities in development plans; formulate urban planning and design guidelines that promote public transit and nonmotorized transport. ▶ *Climate-resilient and energy efficient affordable housing.* Adopt national or local climate-informed design guidelines and environmental frameworks for all housing units delivered through government projects; provide financial support for energy efficiency measures to households accessing affordable housing credit lines. ▶ *Climate-smart building design.* Formulate new building codes or revise existing codes to include performance criteria for aspects such as structural stability and safety that integrate climate-related hazards, moisture control, durability, and energy efficiency.
Strategic Direction 5: Climate Shocks and Risk Governance		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Enhancing emergency preparedness and response	Medium	▶ *Enhanced capacity to respond to climate emergencies.* Increase coordination across government in times of climate-related and health disasters by adopting protocols for enhancing the response capacity of government departments to emergencies. ▶ *Disaster risk financing strategy.* Increase government preparedness to natural disasters (including pandemics) by developing a national disaster risk financing strategy and promoting diversification of financial instruments to facilitate a timely disaster response. ▶ *Natural disaster contingency fund.* Increase government liquidity in times of crises by creating a contingency fund to finance emergency response and recovery in the case of a climate-related or health shock.
Cross-cutting/cross-sectoral interventions		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Mitigating negative social impacts	Short	▶ *Climate vulnerability criteria in social protection programs.* Formulate or update relevant protocols and criteria to include climate vulnerability for entry and exit from social protection programs.
Climate considerations in development planning	Medium	▶ Promote investment in low-carbon, resilient development by incorporating green growth principles and climate risk analysis in national development planning.

TABLE 10.5 Opportunities for policy reforms and "growing back greener" for each Strategic Direction (Cont)

Cross-cutting/cross-sectoral interventions		
Policy intervention category	**Time horizon**	**Policy intervention projects**
Strengthening governance and public administration	Medium	▸ *Climate risk assessment in public investment management.* Improve the long-term resilience of public investments by establishing a public investment project review process that screens for and evaluates climate and disaster risks. ▸ *Climate budget tagging.* Promote transparency and climate investments by establishing regulations or guidelines to facilitate the identification, classification, and reporting of climate change and green growth public investment allocations. ▸ *Green public procurement.* Incentivize green innovation and enhance competitiveness by integrating considerations of carbon emissions and climate risks into the guidance, procedures, and methodologies for public procurement.
Transforming fiscal policy to support climate goals	Long	▸ *Carbon pricing.* Incentivize innovation while reducing carbon emissions and raising revenue by introducing carbon pricing mechanisms (e.g., tax or carbon markets). Revenue raised could be recycled in the general budget or used to finance investments in adaptation, mitigation, or other government priorities. ▸ *Fiscal incentives for climate-resilient investments.* Promote innovation and private sector investment by instituting fiscal incentives for climate-resilient solutions such as coastal defense infrastructure, water storage, and conservation measures.
Ensuring a just transition	Long	▸ *Skills development.* Prepare affected workers and communities for the transition by developing strategies and financing mechanisms to provide vocational skills, retraining, and reemployment/alternative livelihood opportunities. ▸ *Social protection for affected communities.* Launch labor market programs to support a smooth transition for workers laid off from carbon-intensive sectors or communities affected by the transition, including measures such as targeted pension and job guarantees, cash transfers, income support, relocation packages, and community grants.

Sources: World Bank 2020a, 2020b, and contribution from the Energy Practice (WB internal notes).
Note: CSA = climate-smart agriculture; GHG = greenhouse gas; SDG = Sustainable Development Goal.

Crises Risk Window (CRW) with its early response financing, Contingent Emergency Response Components (CERCs), Immediate Response Mechanism (IRM) are all instruments of choice.

10.3.3 Flagship Analytics, Knowledge, and Showcase Projects

Under this Climate Plan, knowledge and innovation will be prioritized to drive catalytic and game-changing trajectories toward low carbon and climate-resilient outcomes. This focus requires the mobilization of robust approaches that help to assess and understand climate risks, including the use of credible climate information and appropriate modelling tools, accompanied by capacity building. Robust analysis supports a mindset change away from entrenched and siloed behaviour and practices.

Pioneering and robust flagship analytics under this Plan will drive knowledge and innovation to inform and influence the portfolio at large (see Annex 10.1). For example, the Southern Africa Drought Resilience Technical Assistance will build synergies and learning from

international experiences to scale-up tools and innovations to inform both active and pipeline IPFs; while the Resilient Food System for West Africa-Regional Flagship Initiative will pursue an umbrella programmatic advisory program to key agencies in the region, and deploy evidence, analytics, and delivery mechanisms into investment pipelines (box 10.2). On the basis of robust analytics on climate information and institutional roadmaps, the regional approach to resilience in the Horn of Africa will seek to convene knowledge-based investments to address resilience as a foundational game-changer to addressing recurrent climate shocks. Others will build upon the lessons, experience, and good practices of initiatives that are driving impact at scale, such as the WACA and the SASPP.

The Climate Plan will exemplify showcase projects that promote integrative, leapfrogging technologies and holistic approaches to tackle current and future climate risks. These showcase projects, funded through IDA and leveraged financing, will work proactively to drive policy, financing, knowledge, and innovation to shift development trajectories toward low carbon, climate-resilient pathways. Grounded in robust analytics and good practices, these showcases will exemplify (i) driving impact at scale, as in expansion of WACA, SASPP, and nature-based solutions in the Sahel; (ii) tackling critical issues, as in the West Africa Regional Energy Trade Development Policy Financing Program, and the Regional Off-Grid Electrification Project; or (iii) driving knowledge in new directions, as in the Regional Food System for West Africa projects (informed by the Regional Flagship Initiative), and the Southern Africa Drought Resilience Program (see Annex 10.2).

Sector and or thematically focused trust funds in the Africa region and Bankwide are needed to support analytics, knowledge generation, and capacity building within the Bank and with client countries. Africa Climate Resilient Investment Facility (AFRI-RES) (box 10.1), Cooperation of International Waters in Africa (CIWA), WACA, and the multidonor trust funds for the Sahel Adaptation Social Protection Program (SASPP) are examples of funds in the Africa

Box 10.1

Africa Climate Resilient Investment Facility: A focus on resilience

AFRI-RES is a partnership between the World Bank Group and UN Economic Commission for Africa (UNECA), which leverages the African Union, through a €5 million grant from the Nordic Development Fund. It supports Africa's capacity to systematically integrate climate change considerations into the planning and design of long-lived investments. There are four components under this facility.

Component 1. Provides project-level technical assistance to systematically integrate climate change considerations into the planning and design of long-lived investments. Under the first phase, more than a dozen projects in the Africa region have benefited from this assistance, covering multiple GPs (Agriculture; Energy; Environment and Natural Resources; Social Development; Urban, Disaster Risk Management Resilience and Land; Transport; Water, and Social Protection), with a view to generate broad learning, knowledge exchange, and dissemination. The second round will support a select number of showcase projects to undertake analytics, assessment, and inform project design; it will set out actions to address current and future climate risks through cross-sectoral actions and policy reforms. Learning is a key product (*Led by World Bank*)

Component 2., Outreach dissemination and training will focus on African practitioners, policy makers, scientists, and other stakeholders. (*Led by UNECA*)

Component 3. Learning from the first two rounds of funding will support the work under this component: to generate guidelines, standards, and good practice notes. Work is underway to develop a knowledge product to embed resilience attributes to strengthen the design of climate-resilient interventions into investment projects. (*Led by World Bank*)

Component 4. UNECA will develop a "one-stop" gateway climate portal. (*Led by UNECA*)

Four regionwide Africa Climate Resilient Infrastructure Summits (ACRIS) have been held. ACRIS IV took place in Morocco in February 2018, bringing together 250 participants and convening 10 high-level panels focused on resilience in infrastructure, energy, agriculture, climate information, landscapes, technology, and other key areas. The summit fostered interactions between public and private sector stakeholders to discuss climate-resilient opportunities in Africa (see https://issuu.com/grvglobalacris/docs/acris_pe_report-hr)

region that provide such support. Other funds, such as the NDC Support Facility, PROBLUE, PROGREEN, and Global Facility for GFDRR, provide resources to integrate environment, disaster, and climate consideration into projects, and country-based technical assistance programs. Dedicated funding drives knowledge generation and affects change at scale.

10.4 Delivering and Leveraging Climate Financing

Leveraging financing for mainstreaming climate ambition and action is underpinned by three factors:

- **A recognition that development outcomes cannot be achieved without addressing climate vulnerabilities, while inaction could see a rollback of development gains.** The evidence for this, and escalation of climate impacts in the context of Sub-Saharan Africa, are set out in Part II of the Climate Plan and encapsulated in the rationale of the Strategic Directions and the priority action areas.
- **A formalization of an approach to estimate climate finance** (climate co-benefits) for mitigation and adaptation activities in the development projects—based on an agreed methodology between multilateral development banks (MDBs) for joint reporting (IDB 2019).
- **Formal commitments through Corporate Strategies and through the IDA replenishments for climate co-benefit targets,** in support of increased ambition for climate action and climate finance.

Elevated levels of financing must be mobilized and leveraged for the Climate Plan from various sources to deliver its higher ambition for climate action. Concessional, non-concessional, and private sector financing are needed to deliver the Climate Plan, which will span two IDA cycles over six fiscal years (FY21–26). IDA provides most of the World Bank's funding in Africa, including highly concessional loans (called "credits") and grants to the poorest countries. Nonconcessional financing through the IBRD and the IFC, a private sector arm of the Bank Group, provides additional financing in Sub-Saharan Africa. The WBG's MFD efforts to catalyze foreign direct investment and private capital are a critical component of meeting investment needs for climate action.[53]

Leveraging carbon finance through carbon markets and carbon pricing can help contribute to the significant amount of domestic and international financial resources expected to be required for the achievement of countries' commitments under the Paris Agreement. Climate markets and carbon pricing offer the opportunity to increase resources mobilized from the private sector, reduce the burden of NDC implementation, and increase global ambition. Climate markets have the potential to reduce the costs of implementing countries' NDCs by about half to US$250 billion per year in 2030 (World Bank 2019a). The Climate Warehouse program and the forthcoming Partnership for Market Implementation are designed to assist countries monetize the climate mitigation co-benefit of the US$22.5 billion investment for climate action for Africa by 2025 that the Bank has committed in investments.[54]

The evidence for cost-effectiveness for climate action and benefits continues to grow, but there is a continued challenge of limited resources and competing investments in Sub-Saharan Africa. According to the GCA (2019), there is a high overall rate of return on investments in improved resilience, with benefit-cost ratios ranging from 2:1 to 10:1, and in

53 A World Bank Concept Note P169965: Enabling Private Sector Engagement in Adaptation is underway to harness this financing, including through Maximizing Finance for Development, which will include select countries in Sub-Saharan Africa.

54 See the Partnership for Market Readiness website, https://www.thepmr.org/; and the World Bank Climate Warehouse website, https://www.worldbank.org/en/programs/climate-warehouse.

some cases even higher. The New Economy report (NCE 2018) notes the importance of early and appropriate climate action. These early costs will ensure efficiency gains and delivery of services and sustained development outcomes through an integrated approach to climate-smart development, but this intervention does not solve the persistent upfront financing gap.

10.4.1 IDA and IBRD Financing and WBG Financing for Climate Action

The urgency to harness climate financing, especially for adaptation, remains at the core of Africa's development priorities. However, there is an increasing demand for resources to shift to low carbon pathways to nurture pro-poor mitigation strategies and leapfrog into clean energy. The scale of climate financing flowing to Sub-Saharan Africa continues to lag, and business-as-usual is not an option. The Bank strongly supports and advocates for increased climate financing for Sub-Saharan Africa, and will join national, regional, and global actors to advocate for increased climate financing to complement core Bank resources from IDA and IBRD.

IDA19's unprecedented scale of financing of US$53 billion to support Africa's poorest and most vulnerable countries calls for stronger resilience building to reduce the risks of climate shocks on poverty and human capital. The Climate Plan is well placed to support the delivery of development-centered climate action and deliver on IDA (and Corporate) commitments and results. Additionally, the CRW[55] under IDA19 calls for support to early responses to slower onset crises.

The unexpected emergence and unprecedented impacts from the COVID-19 crises is game changing at multiple levels, and will inform, influence, and shape the climate financing that will be delivered under this Plan. With an overall stimulus package in the range of US$150 billion to US$160 billion (Bankwide) over the next 12 to 15 months, and a call to frontload IDA grants and highly concessional financing (World Bank/IMF 2020, parag. 7), this Climate Plan will seek to maximize support to the COVID-19 recovery while pursuing synergies between green stimulus and investments that contribute to both the immediate and long-term development outcomes. By mobilizing IDA resources, the Bank will seek to deliver the prior agreed climate commitments even as it attends to countries' needs for COVID-19 response.

WBG climate financing targets for 2021–25 of around US$200 billion aim at supporting countries to take ambitious climate action Africa.[56] There will be a strong focus on increasing adaptation, leveraging private sector finance, and supporting increased country-level systemic climate action. Of these resources, US$100 billion is in direct finance from the World Bank (IBRD/IDA), and approximately US$100 billion of combined direct finance from the IFC and the MIGA and private capital mobilized by the WBG.

Targets and timelines around climate finance commitments and targets for Sub-Saharan Africa require concerted action at multiple levels, and the Climate Plan will make a critical contribution to this delivery (table 10.6). The first commitment calls for an increase in IDA climate co-benefits to at least 30 percent over FY21–23. The second is to deliver US$22.5 billion in Africa for climate action, the third commits to devoting at least half of the US$22.5 billion to adaptation and resilience. A fourth commitment (table 10.8) pertains to a Bankwide target of increasing IBRD co-benefits to at least 30 percent by FY20, but this is not Africa-specific, and in general IBRD does not form a large share of the overall funding in the region.

55 IDA19 includes provision for a Crises Response Window (CRW) to support slower onset crises for disease outbreaks and food insecurity with an initial endorsement of a CRW envelope of [US$2.5 billion].
56 These are pre-COVID 10, announced in December 2018.

TABLE 10.6 Financing commitments for the Africa region on climate action

IDA/IBRD	Indicator/commitment	Time period	Relevance to Africa
IDA19	IDA's climate co-benefits share of total commitments will increase to at least 30 percent on average over FY21–23, with half supporting adaptation action.	FY21–23	Africa share of US$53 billion, pro-rated, would mean US$5.3 billion per year from portfolio (or total of US$15.9 billion)
WBG	The WBG is stepping up its climate support for Africa. With continued strong support for IDA, our fund for the world's poorest countries,[a] this will provide US$22.5 billion for Africa for climate adaptation and mitigation for the five years from 2021–25.	FY21–25	Africa-focused; would be a summation of co-benefits from IDA and IBRD portfolio
WBG	[...] in line with these new climate financing commitments and future direction of our Africa Business Plan[b] more than half of the US$22.5 billion financing will be devoted to supporting adaptation and resilience in Africa. This will amount to about US$12 billion to US$12.5 billion over five years from 2021–25.	FY21–25	Africa focused; would be a summation of adaptation co-benefits from IDA and IBRD portfolio
IBRD	Increasing the climate co-benefit target of 28 percent by FY20 to an average of at least 30 percent over FY20–23, with this ambition maintained or increasing to FY30.[c]	FY20–23, and through 2030	Bankwide target, no formal Africa target

Note: IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; WBG = World Bank Group.
*IDA website, https://*ida.worldbank.org. WBG's ACBP website, https://www.worldbank.org/en/programs/africa-climate-business-planc. Report to Governors at 2019 Spring Meetings, https://www.devcommittee.org/sites/dc/files/download/Documents/2019-04/DC2019-0003-PIBRDIFC%20capital%20package%204-13.pdf

Under current commitments related to IDA19, Sub-Saharan Africa could deliver at least US$15.9 billion in climate finance from FY21–23; with IBRD financing at 30 percent co-benefits adding to this total.[57] These represent minimum amounts. Leveraging finance from other sources—bilateral and multilateral sources, dedicated climate finance sources, and the private sector—is not included in these estimations. For the Climate Plan to raise its level of ambition, IDA and IBRD resources will continue to be critical, but will not be sufficient, and may be further challenged in the face of the COVID-19 response. There is a need to step up resource mobilization by partnering with other key players, including client countries.

A delivery of 30 percent of climate co-benefits would achieve all of the preceding climate finance commitments for the Africa region, and help deliver its contribution to the Bankwide target. The pathways to each of the commitments have the following nuances:

IDA commitment of at least 30 percent co-benefits from FY21–23. For IDA19 to deliver a Bankwide target of 30 percent co-benefits, the Africa region as recipient of the major share of these resources (US$53 of the US$83 billion) will need to deliver co-benefit close to this upper level. This would translate to a total of US$15.9 billion of climate finance (or US$5.3 billion prorated annually).

Bankwide target of an average of 30 percent co-benefits (FY20–23). The target for climate co-benefits under the previous ACBP were set at an average of 22 percent. However, the Africa

57 This analysis may be altered in view of the COVID-19 response, which will influence the entire composition of the portfolio.

region delivered 25 percent, 27 percent, and 28 percent, respectively during FY17, FY18, and FY19. With the larger share of Africa's resources from IDA requiring 30 percent of co-benefits, the Africa region should be able to deliver on the average of 30 percent across its Portfolio.

Africa region to mobilize US$22.5 billion over FY21–25. With the target of co-benefits set at 30 percent for IDA and IBRD, the Africa region should be able to mobilize this level of financing for climate action. Delivering on the call that at least half of the resources go toward adaptation and resilience will require Portfolio tracking.

Climate co-benefits are an important means to deliver climate mainstreaming, but limitations in the current methodology should not undermine broader mainstreaming efforts that can drive systemic change. The co-benefit methodology has limitations, including the exclusion of systemic policy and enabling changes for transformation at scale. It is important for the program and investments to drive these broader shifts as identified in the priority areas under this Plan. This Climate Plan will provide the platform to address these gaps and opportunities on the co-benefit methodology, working closely with the Climate Group and the GPs.

Co-benefit capture can be enhanced through more systematic attention to the issue from early stages of project and program design. Capacity enhancements will address the missed opportunities and prevalence of low capture of co-benefits. Additional awareness raising, training, and dedicated clinics as offered by the Climate Change Group together with the Region will ensure better capture of co-benefits. An appreciation by task teams of the linkages of the different climate commitments (e.g., requirement for screening for climate and disaster risks) with downstream requirement for co-benefit assessment can lead to increased co-benefits and better outcomes all around. Knowledge products like the climate resilience attributes can further support teams to capture resilience more systematically.[58]

Meeting climate commitments during the COVID-19 response may pose a challenge but greening the financial stimulus package could support short-term interventions and the transition to low carbon, climate-resilient pathways for the most optimal long-term outcomes. Green economic opportunities, such as nature-based infrastructure, could be mobilized through community engagement and are less capital-intensive. Green for work programs in remote and rural areas could support landscape restoration to enhance productivity and food security. In addition, net oil exporting countries that face increased liquidity issues, lost tax in revenues, n opportunities (e.g., reducing exposure to air pollution, removal of fuel subsidies) that deliver local benefits as part of new fiscal stimulus packages, while helping countries shift toward low carbon pathways as part of integrated response strategies (Strand and Toman 2010).

10.4.2 Other Financing

Mobilizing funding from various climate finance instruments is key. Africa's low carbon, resilient future requires dedicated investments to strengthen the region's capital base, technologies, and human capacities. Climate financing instruments include the GCF, GEF, AF, SCCF, LDCF, and CIFs, although the overall scale of uptake in Sub-Saharan Africa has been inadequate. Climate financing remains below the region's demand, even as the needs increase with escalating climate impacts and other shocks, such as pandemics and disease outbreaks.

Public finance alone cannot meet the financing gap. Concessional financing will bring additional resources, innovation, and scale-up to climate action. The CIF concessional financing has helped address the challenges in markets and unlock demand by providing

58 See Knowledge Product P170863 on Enhancing Climate Resilience through Resilience Attributes–Integrating into Project Design.

Box 10.2

Promoting, leveraging, and harnessing financing innovations

Maximizing Finance for Development (MFD). The significant financing gap begs the need for continued emphasis to pioneer and innovate on financing to unleash private-public solutions. To counter this gap, the World Bank Group is exploring MFD, which seeks to leverage the private sector, while optimizing the use of scarce public resources. The Nachtigal Hydropower Project in Cameroon demonstrates the principles for maximizing finance: it is not only crowding in private capital and reducing public debt but is also lowering the overall costs of service for electricity and enabling the country to meet its ambitious targets by meeting its energy demand through renewable sources. The MFD applied to large-scale investments holds promise for learning and replication in Africa.

Sovereign instruments. These are gaining prominence to support climate resilience and broader development agendas.

- **Sovereign bonds.** The Seychelles has launched the world's first sovereign blue bond: a pioneering financial instrument that combines public-private financing to support the transition to sustainable fisheries and safeguarding the oceans to develop a blue economy.
- **Sovereign risk financing.** The Kenya Cat-DDO provides rapid access to funds in the event of disaster and supports key reforms to strengthen the country's ability to manage disaster and climate risks proactively.

Remittances. Remittances in Sub-Saharan Africa reached US$46 billion in 2018 (up almost 10 percent from 2017), supported by strong economic conditions in high-income economies. Nigeria (US$24.3 billion) was the largest remittance recipient, followed by Ghana (US$3.8 billion) and Kenya (US$2.7 million). As percentage of GDP, Comoros (19.1 per cent), the Gambia (15.1 per cent) and Lesotho (14.7 per cent) stand out (World Bank Group 2019). The direct benefits of remittances, which often spike at the time environmental- and climate-induced events (floods, droughts) coupled with the trickle-down and multiplier impact of these remittances, yield local benefits. However, these benefits may exclude the poorest individuals, who could be entrapped and without the means for mobility to harness remittances (Rigaud and others 2018).

targeted, concessional capital to de-risk investments and attract solar investment in Sub-Saharan Africa and elsewhere. These lessons can be extended to other sectors (BNEF 2019). Mobilizing the private sector and innovations in financing must be used to leverage financing. Some approaches are gaining momentum and can support climate-resilient mitigation and broader development agendas (box 10.2). The Bank must use its convening power, expertise, and innovation to mobilize resources and partners through this Plan.

Building critical capacities, guidelines, and protocols is critical if Sub-Saharan Africa is to leverage financing innovations that can ramp up climate action. Sustainable bonds, specifically green bonds, offer an opportunity to fund a portfolio of sustainable investments, and Africa is starting from a very low base of such bond issuances (the lowest region in the world). DRF is crucial for addressing the financial impacts and economic losses caused by natural disasters and support to countries to increase their financial resilience. The World Bank's Treasury Disaster Risk Insurance Platform helps clients overcome barriers by providing advisory and execution services for transferring risk to insurance and capital markets commodity hedging, and a capacity building program in Africa.[59]

59 See the World Bank website, "IBRD Financial Products: Disaster Risk Management," https://treasury.worldbank.org/en/about/unit/treasury/ibrd-financial-products/disaster-risk-management.

10.5 Tracking and Monitoring Results for Climate Action

This Climate Plan will contribute to the delivery of corporate and IDA commitments over the next two cycles of IDA funding. By embedding climate action through the Strategic Directions and Special Areas of Emphasis, the Climate Plan will support the region's portfolio to deliver the Bank's Corporate FY25 Climate Actions and Targets, the Adaptation and Resilience Action Plan for FY21–25, and IDA19 commitments, while being fully aligned with the Africa regional strategy (to 2023). A summary of the key climate actions that the Climate Plan will deliver are presented in table 10.7.

Protocols for collecting data (including frequency of data collection and reporting format) and a system to track and monitor the progress and impact of the Climate Plan will be put in place. Monitoring of the delivery of the targets and indicators will be done by GPs for their respective portfolio and through the CMUs for the country engagement instruments (SCDs, CPFs).

10.6 Moving Forward

The World Bank will implement this Climate Plan over the next six years (2021–26) by leveraging IDA and IBRD financing while remaining flexible to ensure a strong delivery on climate agenda. The GPs, CMUs, and the Africa region will work alongside WGB partners—IFC and MIGA—to ensure complementarity and greater impact. The Climate Plan will be dynamic as it responds to the next IDA (IDA20) cycle, and other emerging regional and corporate priorities that are critical to the climate agenda. Responsiveness to the COVID-19 recovery will demand flexibility, and the Climate Plan will seek to maximize synergies for low carbon and climate resilience to ensure that Sub-Saharan Africa addresses not just the current unprecedented crises but also gets ahead on the impending climate crises, in which the window of opportunity for climate action is rapidly narrowing.

The climate agenda—grounded in Africa's core development priorities—is large. As the World Bank rolls out this Plan with our client countries, we will reach out and work with development partners, civil society, the private sector, and other key players to leverage financing and ramped up action at scale across Sub-Saharan Africa to ensure that the benefits of concerted climate and development action make a positive difference to each last beneficiary in the region.

TABLE 10.7 Delivering World Bank climate commitments in Sub-Saharan Africa

Business element	Action area to support IDA-19 and Corporate climate actions and targets45	Timing
	World Bank instruments for delivery on climate action	
Country engagement (SCDs, CPFs)	▶ **At least three SCDs and three CPFs per FY**, based on CMU demand, undertake robust upstream analytics to provide evidence base for prioritization of climate-smart policy action and investments in the pipeline of CPFs, facilitated through ▷ Development of SCD template for enhanced integration of climate considerations ▷ Upstream engagement with CPF teams to translate evidence into advice to nurture climate-smart CPFs	FY21–23
Focus on NDCs	▶ **At least 10 strategic NDC engagements** to inform increased ambition on low carbon climate resilience, with a focus on: ▷ Institutional strengthening and technical assistance programs in client countries, including with ministries of finance ▷ Macro- or sector-based work, as requested by client countries, including long-term strategies	FY21–23
Leveraging the Portfolio	▶ **IPFs, DPFs, PforRs, and other instruments mapped to the five Strategic Directions for integration of climate risks** and contribution to climate co-benefits (*see item on climate co-benefits*)	FY21–26
	▶ **Develop a set of climate-informed policy reforms for each Strategic Direction and the macro context** to support agreed commitments under IDA-19 and Corporate targets.	FY21-23
	▶ **Leverage near- to mid-term COVID-19 responses through DPOs with synergies to support climate policy** for secure and climate-smart economic recovery.	FY21–23
Flagship analytics and showcase projects	▶ **At least two ASAs per Strategic Direction** that: ▷ Mobilize robust approaches to assess current and future climate risks, including through credible climate information and appropriate modelling tools ▷ Enhance specialized knowledge and skill sets of Bank/client teams ▷ Exemplify integrative showcase projects that address climate risks through effective solutions and policy reforms	FY21–23
	Financing climate action	
Climate co-benefits	▶ **Sub-Saharan share of** climate co-benefits to total commitment at least 30% ▷ Under current IDA-19 commitments, this will deliver at least US$15.9 billion ▷ **Financing from IBRD** ▶ Which together, will count toward the US$22.5 billion commitment for climate action in Sub-Saharan Africa under the One Planet Summit commitment ▶ Of which at least 50% is for adaptation	 FY21–23 FY21–25 FY21–25 FY21–25

45 COVID-19 response and recovery may have an impact on the final targets that may be delivered under this Climate Business Plan.

Business element	Action area to support IDA-19 and Corporate climate actions and targets45 World Bank instruments for delivery on climate action	Timing
Tracking and monitoring targets for climate action		
Co-benefit delivery by Global Practices	▶ **30% of climate co-benefits** at the Sub-Saharan Africa portfolio level Tracked by Global Practices and Climate Change Group	FY21–23
Delivery of IDA and Corporate commitments	**The five Strategic Directions and the two Special Areas of Emphasis will support delivery of the following agreed IDA-19 (FY21–23) and Corporate commitments (FY21–25) through the portfolio** (*no new targets*)	
	Strategic Directions	
	▶ **Climate Shocks and Risk Governance** ▷ 150 million people have access to impact-based forecasting and warnings in at least six countries ▷ Timely and reliable forecasts and warnings are available at the national, regional, and local levels and efficiently reach end users. ▷ Weather, climate, and hydrological services for key sectors are developed and delivered and trigger coordinated decisions and actions ▷ Improved delivery systems for cash transfers and other social protection programs ▷ Increased resilience among poor households across Sub-Saharan Africa ▷ Strengthened financing for disaster risk management and climate change adaptation ▷ Partnerships on hydromet with global/regional centers of excellence, academia, private sector and CSOs are scaled up ▷ Improved identification of the most vulnerable populations	FY21–23; FY24–26
	▶ **Food Security and a Resilient Rural Economy** ▷ 28 million farmers have adopted CSA practices ▷ Countries with improved pastoral systems (target: 15 countries) ▷ Number of farmers with access to improved agricultural services (integrated weather and market information, financial services—including savings, credit, payment, insurance) ▷ Countries with new climate-smart policies and programs implemented for food and nutrition security (target: 20 countries)	FY21–23; FY24–26
	▶ **Ecosystem Stability and Water Security** ▷ Integrated landscape management approach for avoiding deforestation and promoting landscape restoration or sustainable forest management in up to 20 countries and covering up to 60 million ha (*Africa regional target*) ▷ Support at least 10 river basins with climate-informed management plans or improved river basin management governance ▷ Support at least 10 countries to enhance management of landscapes, seascapes and watersheds	FY21–23; FY24–26
Delivery of IDA and Corporate commitments	▶ **Low Carbon and Resilient Energy** ▷ Provide direct, indirect and enabling policy support for generation, integration, and for enabling infrastructure for at least 3.5 GW of renewable energy. ▷ Support countries to strengthen energy sector planning and execution in linkage with NDCs (target: 25 countries)	FY21–23; FY24–26

Business element	Action area to support IDA-19 and Corporate climate actions and targets45	Timing
	World Bank instruments for delivery on climate action	
Delivery of IDA and Corporate commitments	▶ **Resilient Cities and Green Mobility** ▷ Cities ▶ Integrated planning: multisectoral climate-smart urban and transport plans prepared with up-to-date data for at least five African cities ▶ 30 cities with integrated, city-based resilience approach ▶ Target of US$2 billion in investment financing for urban resilience-building activities ▷ Green mobility ▶ Support 5 new BRTs in fast-growing African cities (making at least 50% of jobs accessible within an hour of commute) ▶ Secure maintenance to make 100,000 km of climate-resilient African roads	FY21–23; FY24–26
	Special Areas of Emphasis	
	▶ **Macroeconomic planning and policy** ▷ Increase engagement with ministries of finance and planning and other stakeholders on NDCs ▷ Promote concrete and systematic policy actions (IDA19) ▷ Analytics to inform policy action and design of prior actions in DPFs	FY21–23; FY24–26
	▶ **Green and Resilient Infrastructure** Supports targets of Strategic Directions above, including ▷ **Energy** ▶ renewable energy. ▶ battery storage. ▶ renewable energy generation capacity ▷ **Urban** ▶ low carbon and compact urban planning ▶ integrated, city-based resilience approach ▷ **Water** ▶ climate-informed management plans	FY21–23; FY24–26

Note: ASA = Advisory Services and Analytics; BRT = bus rapid transit; CMU = Country Management Unit; CPF = Country Partnership Framework; CSA = climate-smart agriculture; CSO = civil society organization; DPF = development policy financing; DPO = Development Policy Operation; IDA = International Development Association; IPF = Investment Project Financing; NDC = Nationally Determined Contribution; PforR = Program for Results; SCD = Strategic Country Diagnostics.

Annex 10.1

Title and scope of flagship analytics

1. Southern Africa Drought Resilience Program

Objective

A technical assistance program to strengthen drought resilience in the southern Africa region, targeting member states, river basin organizations, and regional entities (e.g., South African Development Community) through ongoing and new pipeline projects.

Strategic Direction

Ecosystem Stability and Water Security

Value proposition

This knowledge-driven technical assistance will build synergies and learning from international experiences to scale-up tools and innovations to design an impactful program that informs drought resilience building in a strategic manner to active investment project financing (IPFs) and pipeline IPFs. With a focus on (i) monitoring and forecasting; (ii) vulnerability and risk assessment and drought preparedness; and (iii) mitigation and response planning and management, the technical assistance will drive an integrated approach for positive and systemic impact on the southern African economies in which drought contributes to livelihood vulnerability and ecosystem degradation, which has economic impacts through multiple sectors (water, energy, agriculture). The development and application of tested innovative tools to integrate climate projections in the Drought Monitoring and Early Warning Systems include, for example, planning infrastructure to alleviate current and future drought impacts using frameworks that account for climate uncertainties (e.g., Decision Making under Uncertainty Framework) and linking these with targeting and delivery mechanisms (including a focus on adaptive social protection mechanisms). This process is transformational and key to achieving impact, especially in long-developing crises such as drought.

Countries

Active IPFs: Botswana (P160911, US$145.5 million) and Eswatini (P166697, US$45 million); pipeline IPFs (such as Zambia (P172140, US$30million) and Angola (P172948)

Global Practice (GP) engagement

Water; Urban, Disaster Risk Management Resilience and Land; Agriculture; Environment and Natural Resources; Finance, Competitiveness, and Innovation; Poverty and Equity; and Climate Change (Global Theme)

Status

US$2 million to be processed from the Cooperation of International Waters in Africa (CIWA) to scale up the approach implemented through different Bank products across GPs; dialogue ongoing with GPs

Annex 10.1 *(Cont)*

Title and scope of flagship analytics

2. *Resilient Food System for West Africa*—Regional Flagship Initiatives (P172941) (US$1 million)

Objective

To support Economic Commission for West African States (ECOWAS) and Comité permanent inter-État de lutte contre la sécheresse au Sahe (Permanent Interstate Committee for Drought Control in the Sahel, CILSS) in identifying and designing regional flagship initiatives that draw on existing strategies with the potential to increase the resilience of food systems and strengthen regional food security management in West Africa.

Strategic Direction

Food Security and a Resilient Rural Economy

Value proposition

It has three pillars: (i) strategy and partnerships: for the provision of advisory services to ECOWAS and CILSS on the agenda of food security under climate change and blueprint for regional flagship initiative; (ii) evidence, analytics, and delivery mechanisms: (co)develop technical, policy, and strategy notes to build the evidence base and close knowledge gaps (review functioning and option [regional agricultural and food security crisis management; and incentives for resilience—realigning public support for resilience at regional and national levels]), collaboratively with technical partners, and led by WBG; (iii) leaning and capacity building: continuous and needs-based convening of topical communities of practice, organization, of south-south and north-south exchanges.

This technical assistance will allow ***scale up transformative action*** through the first proposed investment: Resilient Food System for Africa (RFSA) Program (P172769) in response to the Africa Food Security Leadership Dialogue (AFSLD) on Food Security under Climate Change in Africa summit in Kigali.

Countries

Regional (West Africa)

GP engagement

Agriculture; Environment and Natural Resources; Social Development; Urban, Disaster Risk Management Resilience and Land; Water; and Climate Change (Global Theme)

Status

Project Concept Note review was held in (January 2020); completion June 2021

Annex 10.1 *(Cont)*

Title and scope of flagship analytics

3. Sahel-Adaptive Social Protection Program

Objective

To support countries in the Sahel in strengthening their adaptive social protection (ASP) systems to help poor and vulnerable households build resilience to climate change before, during, and after the occurrence of climate shocks such as drought and floods.

Strategic Direction

Climate Shocks and Risk Governance

Value proposition

The Sahel Adaptive Social Protection Program (SASPP) aims to support the Sahel government to increase systemic capacities by building and strengthening ASP systems, including climate change consideration in the design and delivery of social safety nets, and reflecting this in NDCs. The second phase (2020–25) will scale up the reach of its activities and ensure expedited delivery systems so households do not resort to negative coping mechanisms and fall further into poverty. This includes climate-adaptive interventions through shock responsive cash transfers and cash transfers with productive inclusion measures; and expanding the reach of the unified social registries that focus on poverty households to include climate-vulnerable households or regions. Informed by robust analytics and lessons, the SASPP will leapfrog and transform its early warning systems on potential shocks by strengthening the use of climate early warning systems with satellite data and information for analytical and modeling work to use as triggers for ASP instruments, and risk financing strategies as part of the readiness to shock response by governments for early action.

GP engagement

Social Protection; Social Development; Urban, Disaster Risk Management Resilience and Land; Finance, Competitiveness, and Innovation; and Poverty and Equity

Countries

Sahel (Burkina Faso, Chad, Mauritania, Mali, Niger, Senegal)

Status

SASPP: starting phase 2 (2020–25) (US$56 million, replenishment ongoing), having successfully completed Phase 1 (US$72 million), which laid the foundations of ASPs and piloting innovative ASP instruments to build climate change resilience and robust analytics.

Annex 10.1 *(Cont)*

Title and scope of flagship analytics

4. Strengthening Resilience in the Horn of Africa (P172358) (US$1.7 million)

Objective

To strengthen the foundations for regional approaches to resilience building in the Horn of Africa through improving the knowledge base and institutional capacity related to climate shocks, and the scoping of potential investments in the region.

Strategic Direction

Environmental Stability and Water Security, Food Security and a Resilient Rural Economy, Climate Shocks and Risk Governance

Value proposition

This programmatic Advisory Service and Analytic (ASA) consists of three pillars. Strengthening information for resilience will undertake evidence-based joint planning on strengthening information, particularly climate information as it relates to natural resources and key livelihood groups (particularly pastoralists). Building on case studies (including a focus on the ongoing locust outbreak), systematic stakeholder engagement mapping, and development scenarios, the flagship will identify capacity needs and a plan to improve capacity more ***systemically*** to strengthen institutions and organizations for resilience at multiple levels, and on formal and informal social and governance institutions. The third pillar will convene the countries to strengthen the knowledge base for ***scale up and transformation*** through regional resilience investments and agree on a package of policy, financing, and coordination measures to deepen regional integration around resilience, on the basis of the robust analytics, systematic engagement, and roadmaps.

Countries

Horn of Africa (Djibouti, Eritrea, Ethiopia, Somalia, and Kenya)

GP engagement

Water; Agriculture; Environment and Natural Resources; Social Development; and Urban, Disaster Risk Management Resilience and Land

Status

Concept Note meeting in May 2020. Key products to be completed by July 2021.

Annex 10.1 *(Cont)*

Title and scope of flagship analytics

3. Drought and Flood Policies

Objective

To provide a general policy framework to help countries reduce their hydroclimatic risks by identifying gaps, constraints, and opportunities for strengthening flood and drought management systems.

Strategic Direction

Ecosystem Stability and Water Security and Climate Shocks and Risk Governance

Value proposition

Although floods and droughts are at opposite ends of the climate spectrum, the Study will generate the following insights by analyzing these issues together: (i) the hydroclimatic risk analytical framework put forward in the ASA applies to both floods and droughts; (ii) the same entities are often attempting to manage both flood and drought risk management—one year it may be a flood and the next year a drought; (iii) many actions simultaneously help to both lower flood and drought risks, such as healthy watersheds, multipurpose water resource infrastructure, and hydromet systems; and (iv) both flood and drought management require a systems approach. The Study will promote a better shared understanding of hydro-climatic risk management and help to guide analysis of programs and projects. Internally, it is expected to inform future DPOs that seek to reduce drought and flood risks through policy reforms.

Countries

Global

GP engagement

Water; and Urban, Disaster Risk Management Resilience and Land (lead GPs), with Agriculture and Environment and Natural Resources

Status

Study expected to be published in November 2020 and will include a showcase of its application in two countries (one is Tanzania).

Annex 10.2
Scope of showcase projects informed by robust analytics

Resilient Food System for West Africa
Food Security under Climate Change Project (P172769) (US$850 million)

Objective
To increase the resilience of West Africa's food system to climate change and strengthen regional food security management systems.

Strategic Direction
Food Security and a Resilient Rural Economy

Value proposition
The continentwide Food Security under Climate Change Program (FSCCP) has West Africa as the first mover region through the proposed Resilient Food System for West Africa program, led by the mandated regional bodies Economic Community of West African States (ECOWAS) and the Permanent Interstate Committee for drought control in the Sahel (CILSS). It is informed by the Regional Flagship Initiative (box 10.1). The project will address issues of fragmented market input through developing regional food value chains and integrating regional food market (by harmonizing national policies and regulations); scaling up regional linkages among national entities for research and innovation (e.g., for drought-tolerant varieties), building on the success of the West African Agriculture Productivity Program. It will leapfrog regional early warning and climate advisory capabilities by tapping into recent advances in geospatial data-processing to transform the capabilities of the Regional Center of Agro-meteorology (Agrhymet, a branch of CILSS). Projects include using digitally enabled regional agricultural observatory for enhanced crisis preparedness; training and acquisition of digital solutions; and unlocking access to rural finance at scale through MFD in collaboration with the International Finance Corporation (IFC). The project will seek to build systemic resilience by enhancing regional and national institutional and regulatory capacity for food security and food crisis readiness; tapping into and developing new agriculture and food risk financing instruments (emergency funds, insurance, derivatives, contingency loans) and cross-border counter-cyclical farmer support measures.

Countries
Burkina Faso, Chad, The Gambia, Ghana, Liberia, Mali, Niger, Sierra Leone, Togo

GP engagement
Agriculture; Environment and Natural Resources, Water

Status
Concept note review meeting in April 2020; project is expected to go to board approval in Q4 of FY21

Annex 10.2 *(Cont)*

Scope of showcase projects informed by robust analytics

Expansion of the West Africa Coastal Areas (WACA) Program

Objective

To strengthen the resilience of targeted communities and areas in coastal Africa by reducing exposure of households to coastal erosion, flooding, pollution, and sea level rise, and by regional integration among institutions and countries.

Strategic Direction

Climate Shocks and Risk Governance

Value proposition

Exemplary scale-up of the successful first phase WACA program to all Atlantic-facing coastal countries. Build off robust analytics on climate risks and economic analysis to scale up Multi-Sector Investment Plans, which take an integrative approach to longer-term development solutions, transitioning from emergency assistance for transformative impact. Designed with engineering and nature-based solutions, the program will support the preservation and rehabilitation of natural coastal resources, minimize impacts of displacement (e.g., Saint-Louis, Senegal), and ensuring access to sanitation and transport infrastructure. It focuses on human capital and expertise through building African Centers of Excellence. Innovations through the finance marketplace to pitch projects to financiers and extending partnerships of regional organizations with regional climate groups is pioneering. Systemic change and long-term consideration are addressed through integrating budget planning for maintenance and future adaptation into investment planning to ensure long-term relevance and sustainability of current and upcoming infrastructure investments.

Countries

At present, 17 West Africa countries are engaged; six of which have existing WBG financing and three are proposed to pipeline.

GP engagement

Environment and Natural Resources; Social Development; Urban, Disaster Risk Management Resilience and Land; Transport; Social Protection; Education; Climate Change (Global Theme); Water; and Finance, Competitiveness, and Innovation

Status

A scale-up platform is active and offers services in expertise, finance, and dialogue (US$8 billion) (P166218, P162337).

Annex 10.2 *(Cont)*

Scope of showcase projects informed by robust analytics

Nature-Based Solutions in the Sahel:

Addressing Linkages between Climate-Environment and Human Development

Objectives

To promote the inclusive and sustainable use and management of natural resources, centered on people's social, economic, and environmental welfare and resilience; scaling up and leveraging sectoral interventions, so that the whole is greater than the sum of individual interventions in terms of ecological, social, and economic gains. To ensure the integrity, restoration, and sustainable management of landscapes across the region.

Strategic Direction

Ecosystem Stability and Water Security

Value proposition

The program would promote sustainable land management in degraded lands to help bring them back to productivity, hence improving livelihoods and reducing poverty. It would support the World Bank Africa Strategy pillar on "building resilience to fragility and climate change" by building on the experience of the World Bank-financed Sahel and West Africa Program (SAWAP). The program could potentially be part of a larger continentwide landscape resilience initiative. Regionally, the program would use the Bank's convening power to increase visibility of the Sahel region through existing platforms (e.g. Sahel Alliance, Climate Commission for the Sahel, TerrAfrica, Africa100), which could eventually help build a continent-based harmonized monitoring system for land degradation. Nationally, projects would contribute to national strategies and mainstreaming activities as part of countries' land-use plans to ensure sustainability and systematic impact. There is a wealth of local knowledge in these countries to address degraded lands, but this remains fragmented in the face of the climate crisis, leading to degradation, poverty, and social displacement. Coalescing these known practices, scaling them up, and providing incentives to communities and policy makers to improve the health of land will pay dividends to the health of ecosystems, society and economies.

GP engagement

Environment and Natural Resources (lead) with Agriculture and Water

Countries

Burkina Faso, Chad, Mali, Mauritania, and Niger, also partners in the Sahel Alliance (G5 countries)

Status

Prepipeline

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A young Africa boy holds his hands under a water tap; water insecurity is a growing challenge due to climate change. *Riccardo Mayer / Shutterstock*

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1818 H Street NW
Washington, D.C. 20433