Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized



EASTERN AND
SOUTHERN AFRICA

SOUTH SUDAN

World Bank Group

COUNTRY CLIMATE AND DEVELOPMENT REPORT

January 2026

© 2026 The World Bank Group
1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

This work is a product of the staff of the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), the International Finance Corporation (IFC), and the Multilateral Investment Guarantee Agency (MIGA), collectively known as The World Bank, with external contributors.

The World Bank Group does not guarantee the accuracy, reliability or completeness of the content included in this work, or the conclusions or judgments described herein, and accepts no responsibility or liability for any omissions or errors (including, without limitation, typographical errors and technical errors) in the content whatsoever or for reliance thereon. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of any of the organizations of The World Bank Group concerning the legal status of any territory or the endorsement or acceptance of such boundaries. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of IBRD/IDA, IFC and MIGA, their respective Boards of Executive Directors, and the governments they represent.

The contents of this work are intended for general informational purposes only and are not intended to constitute legal, securities, or investment advice, an opinion regarding the appropriateness of any investment, or a solicitation of any type. Some of the organizations of The World Bank or their affiliates may have an investment in, provide other advice or services to, or otherwise have a financial interest in, certain of the companies and parties named herein.

Nothing herein shall constitute or be construed or considered to be a limitation upon or waiver of the privileges and immunities of any of IBRD/IDA, IFC and MIGA, all of which are specifically reserved.

Rights and Permissions
The material in this work is subject to copyright. Because the World Bank Group encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given and all further permissions that may be required for such use (as noted herein) are acquired. The World Bank Group does not warrant that the content contained in this work will not infringe on the rights of third parties and accepts no responsibility or liability in this regard. All queries on rights and licenses should be addressed to World Bank Publications, The World Bank, 1818 H Street NW, Washington, DC 20433, USA; e-mail: pubrights@worldbank.org.



EASTERN AND
SOUTHERN AFRICA

SOUTH SUDAN

World Bank Group

COUNTRY CLIMATE AND DEVELOPMENT REPORT 2026

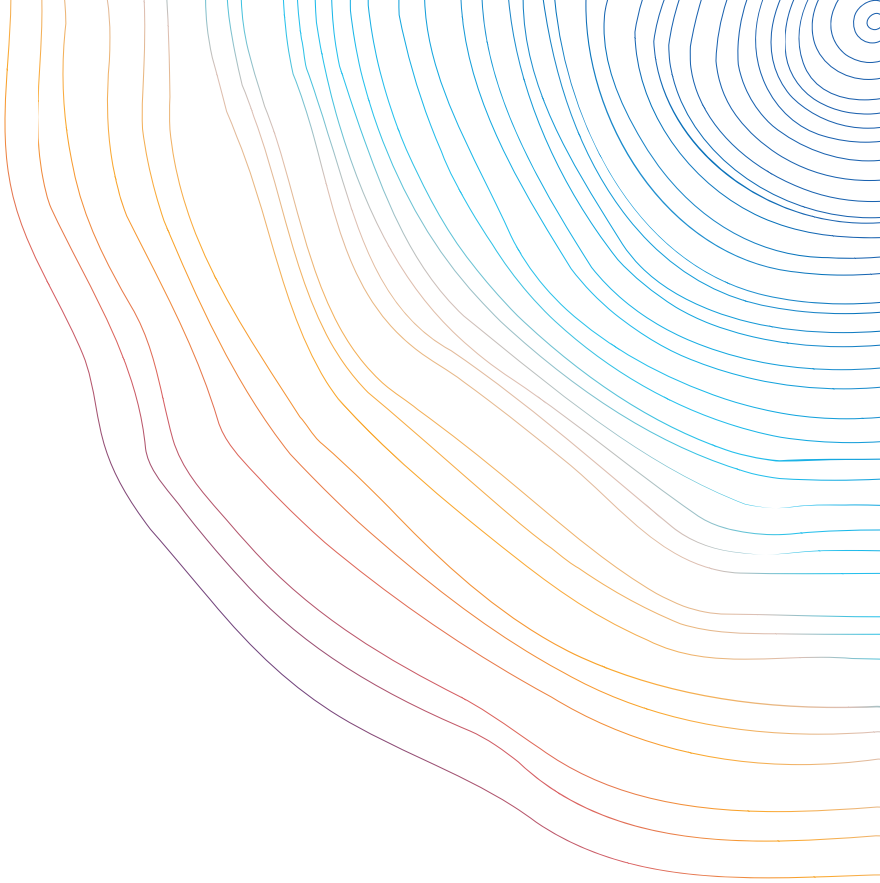


Table of contents

Ackowledgments ..... **vii**
Acronyms ..... **viii**
Executive summary ..... **x**
Development x
Vulnerability, conflict, and fragility xii
Climate-informed macroeconomic modeling xiv
Main areas of action xvi
1. Development priorities and climate risks and opportunities **2**
1.1. Development priorities and objectives 2
1.2. Climate change and vulnerability 7
1.3. Impact on the most vulnerable populations 12
1.4. Climate change and development opportunities 15
2. Climate commitments, policies, and institutional capacity **18**
2.1. Governance framework for climate policy and finance 18
2.2. Integrating climate and DRM into PFM systems 23
2.3. Sources of climate finance 25
3. Multisectoral policy packages for resilient and low-carbon development **30**
3.1. Integrating flood risk management in the development process 30
3.2. Sustainable rural livelihood development and resilience 36
3.3. Sources of climate finance 41
4. Macroeconomic measures and financing options for a resilient and low-carbon economy **48**
4.1. Future impact of climate change on the economy and poverty: a modeling approach 48
4.2. Poverty impact analysis 55
4.3. Mobilizing additional financing for climate action 56
5. Prioritizing climate action **58**
5.1. Crosscutting measures 58
5.2. Enhancing flood and drought management 61
5.3. Adopting climate-resilient farming and livestock practices and valuing renewable natural resources 63
5.4. Improving energy access 64
References **66**
Appendix A. Prioritized recommendations **72**
Appendix B. Poverty and inequality impacts **84**

List of figures, tables, and boxes

List of figures

Figure ES1. Evolution of the Sudd extent, in km2, 2000-2040s	xiii
Figure ES2. Impacts of climate change on GDP, under two climate scenarios, by impact pathway (2050)	xv
Figure 1.1. GDP growth, 2019-2025	3
Figure 1.2. Current account balance and oil exports revenues, 2019–24	4
Figure 1.3. Overall inflation and food inflation, 2022—24	5
Figure 1.4. Crop prices, 2022—24	5
Figure 1.5. Food insecurity, 2010–21	6
Figure 1.6. Food insecurity, by state, 2022	6
Figure 1.7. Observed annual average mean surface air temperature in South Sudan, 1901–2023	8
Figure 1.8 Average temperature annual trends per decade, 1950–2020	9
Figure 1.9. Annual precipitation	9
Figure 1.10. National flood extent map for 1-in-20-and 1-in-100-year flood events, 2022	9
Figure 1.11. Annual precipitation, 1960–2100	9
Figure 1.12. Mean temperature, 1995–2100	10
Figure 1.13. Number of tropical nights in South Sudan and neighboring countries under an SSP3-7.0 scenario, 2060–79	10
Figure 1.14. Poverty rates, by county, 2021	13
Figure 1.15. Urban and rural poverty rates, 2016/2017 and 2022	13
Figure 1.16. Internal displacement, by cause, 2012–24	14
Figure 2.1. Climate change governance structure	21
Figure 2.2. Estimates of government effectiveness in selected African countries, 2011–21	22
Figure 2.3. Net ODA received, 2011–23	25
Figure 2.4. Climate financing trends, 2011–22	26
Figure 3.1. Maximum flooded areas extent, 2017–22	31
Figure 3.2. Social sustainability index, by region	31
Figure 3.3. Flood exposure of cropland and grassland, 2017–22	31
Figure 3.4. Flood exposure of transport infrastructure, 2017–22	31
Figure 3.5. Annual maximum flood extent in the Sudd, 2000–40s	32
Figure 3.6. Bias correction of modeled Sudd areas, 2000–40s	33
Figure 3.7. Projected changes in areas of the Sudd that are permanently inundated at least half the year, 2040s	33
Figure 3.8. Oil fields exposed to projected Sudd-related floods, 2050	33
Figure 3.9. Agricultural drought exposure assessment, 2001–22	35
Figure 3.10. Agroclimatic zones in South Sudan	36
Figure 3.11. Labor productivity shocks in the agriculture sector under the BAU with continuing fragility scenario, 2031–50	39
Figure 3.12. Average electricity tariff in selected Sub-Saharan African countries, December 2020	43
Figure 3.13. Projected impacts of flooding on planned transmission grid infrastructure by the 2040s under two climate scenarios	44

Figure 3.14. Hydropower generation and production shocks at the planned Shukoli hydropower plant 45
Figure 3.15. Least-cost electrification modeling results, 2025 and 2030 46
Figure 3.16. Challenges and recommendations for developing the offgrid and mini-grid market 46
Figure 4.1. Impacts of climate change on GDP, 2050 52
Figure 4.2. Projected real GDP per capita under the pessimistic (dry/hot) climate under all the development scenarios, 2050 54
Figure 4.3. Impacts of climate change on GDP, 2050, including fisheries in the Sudd channel 54
Figure 4.4. Poverty impact under the BAU with continuing fragility scenario, 2020–50 55
Figure 4.5. Poverty impact under the growth and stability scenario, 2020–50 55

List of tables

Table ES1: Change in mean climate conditions by 2041-2050 by climate scenarios xv
Table ES2. Summary recommendations xviii
Table 1.1. Key economic indicators 2023–27 4
Table 2.1. Climate-related policies, laws, and plans in South Sudan 18
Table 2.2. Main government bodies for climate action 19
Table 3.1. Population displaced by new inundations by the 2040s, due to permanent flooding in the Sudd 33
Table 3.2. Mean annual rainfed crop production shocks under the BAU with continuing fragility scenario, 2041–50 39
Table 3.3. Mean annual rainfed crop production shock under two development scenarios, 2041–50 39
Table 3.4. Livestock production shock by product due to climate stress under two development scenarios, 2041–50 40
Table 4.1. Impact channels examined in this CCDR 49
Table 4.2. Deep dive: flooding in the Sudd 49
Table 4.3. Adaptation interventions selected for this CCDR 51
Table B.1. Poverty impact under the BAU with continuing fragility scenario 84
Table B.2. Poverty impact under the BAU with disrupted oil exports scenario 84
Table B.3. Poverty impact under the growth and stability scenario 84
Table B.4. Poverty rate under the climate-smart development scenario 84
Table B.5. Gini coefficient across development scenarios and climate conditions 85

List of boxes

Box 1.1. Climate scenarios used in this Country Climate and Development Report (CCDR) 10

Acknowledgments

The South Sudan Country Climate and Development Report (CCDR) was prepared by a multisectoral World Bank Group team led by Stephen Ling, Kamer Karakurum Ozdemir, Fang Guo, and Michael Vaislic, with support from Florent McIsaac and Dalia Elfatih Zein, and under the supervision of Paul Jonathan Martin, Marco Hernandez, and Noreen Beg.

Core team members included Antonio Rodriguez Serrano, Edoardo Borgomeo, Danielle Monsef Abboud, Jeren Kabayeva, Juvenal Nzambimana, Ana Cristina Canales Gomez, Sheu Salau, Nada Farid, Jessica Charles Wade, Zewditu Banteyehun Haile, David Santos Ruano, Andrea Sissa Velandia, Tigran Parvanyan, Abalo Irene Jerry Fabiano, Tom Carlowitz, Bernard Aritua, Getachew Yilma Debela, Franck Adoho, Mariko Yamamoto, Charity Nyombe Gabriel Modi, Ray Salvatore Jennings, Rory Morrison, Lukas Loeschner, Droma Bank Dominic Kat, Uloaku Oyewole, Alejandro Espinosa-Wang, John Deng Aleer Goch, Jennifer Gui, Tapfuma Jongwe, Amr Elshalakani, Makda Getachew, Martin Lokanc, Yesmeana N. Butler, and Grace Tabu Felix. Brent Boehlert, Ken Strzepek, Diego Castillo, Kim Smet and Charles Fant from Industrial Economics, Inc (IEc) contributed to the CCDR's analysis.

The team thanks Charles Undeland, Firas Raad, Anna Wellenstein, Maiko Miyake, Kate Wallace, Conor Healy, and Cheick-Oumar Sylla for their guidance and support during the process. The team also thanks Kevin Carey, Dena Ringold, Sebastian-A Molineus, Raffaello Cervigni, Eileen Burke, Berengere Prince, Stephane Hallegatte, Craig Meisner, Luis Diego Herrera, and Fabiano de Andrade Correa for their review and technical guidance. The team would also like to thank NBS:Invest for its support in finalizing the CCDR.

We are also grateful to all the different government ministries, departments, and agencies in South Sudan, and representatives from academia, civil society, the private sector, and development partners for their feedback and inputs.

Acronyms

BAU	business-as-usual (scenarios)
BBJL	Boma Badingilo Jonglei Landscape
CBNRM	community-based natural resource management
CBT	climate budget tagging
CCDR	Country Climate and Development Report
CCWG	Climate Change Working Group
DRM	disaster risk management
FCV	fragile, conflict-affected, and vulnerable
GBV	gender-based violence
GCF	Green Climate Fund
GCM	General Circulation Model
GDP	gross domestic product
GHG	greenhouse gas
IDP	internally displaced people
km2	square kilometers
LGB	Local Government Board
MAFS	Ministry of Agriculture and Food Security
MoED	Ministry of Energy and Dams
MoEF	Ministry of Environment and Forestry
MoFP	Ministry of Finance and Planning
MoHADM	Ministry of Humanitarian Affairs and Disaster Management
MoLF	Ministry of Livestock and Fisheries
MoP	Ministry of Petroleum
MoWCT	Ministry of Wildlife Conservation and Tourism
MoWRI	Ministry of Water Resources and Irrigatio
MW	megawatts
NAC	National Audit Chamber
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NDS	National Development Strategy
NGO	nongovernmental organization
NTFPs	non-timber forest products
O&M	operations and maintenance
ODA	official development assistance
PFM	public financial management
PIM	public investment management
PPP	public-private partnership
PV	photovoltaic
R-ARCSS	Revitalized Agreement on the Resolution of the Conflict in South Sudan
RCP	Representative Concentration Pathways
R-NDS	Revised National Development Strategy
SSEC	South Sudan Electricity Corporation
SSP	Shared Socioeconomic Pathway
tCO2e	tons of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

All $ amounts are US dollars

Executive summary

Executive summary

Key messages:

South Sudan has fallen into a vicious cycle of fragility, conflict, and climate vulnerability, with climate change acting as a threat multiplier, exacerbating displacement, food insecurity, social dislocation, resource conflict, and grievance.

Already one of the fastest-warming countries, 80 percent of South Sudan's population depends on climate-vulnerable livelihoods. More than half of the population is chronically food insecure, due to a combination of conflict and climate factors.

The devastating floods of recent years are likely to become the new normal, and will be joined by increasing climate stress on labor productivity, agrifood systems, and human health.

This Country Climate and Development Report (CCDR) identifies priority investments to strengthen resilience in flood risk management, resilient rural livelihoods, sustainable natural resource use, and sustainable energy access.

These require substantial fiscal resources, but the public finance system is under severe strain, and external support is set to decline sharply. Domestic revenue mobilization—particularly more targeted and effective use of existing government revenues and more efficient, transparent spending—is therefore essential to promote adaptation. Core governance reforms also need to support private sector development and climate action.

Inclusive and sustainable growth is indispensable for the country to achieve longer-term climate resilience. South Sudan has considerable economic growth potential, mainly in the agricultural and natural resources sectors. Its economy will remain climate sensitive, but improved security, robust and inclusive short-to-medium-term growth and diversification in the longer term will provide resources to mitigate the largest impacts and improve coping abilities at household level.

Development

The world's youngest state, South Sudan is a vulnerable post-conflict country with a very fragile political context. Following decades of conflict, it gained independence in 2011, but tensions between political elites and tribal groupings led to civil war in 2013, resulting in 400,000 deaths and over 4 million displaced. The Revitalized Agreement on the Resolution of the Conflict in South Sudan (R-ARCSS) was signed in 2018 to end hostilities and prepare for national elections, but progress towards greater peace and security and providing a sustainable political settlement envisioned in the agreement has been limited. Widespread violence persists at subnational levels, often related to ethnic division and contested natural resources. Although always subject to climate extremes, South Sudan has been affected by unprecedented levels of flooding since 2019, which has displaced more people internally than conflict. Within this context, the establishment of key institutions has been delayed, and governance is generally weak. Very little of the substantial foreign assistance received flows through the government.

Despite the country's significant agricultural potential, the predominantly rural population is extremely poor and food insecure. At less than 20 people per square kilometer (km2), population density is very low. Although the country is largely suitable for agriculture, only 5 percent of the land is used for cropping, and nearly 20 percent of basic cereal consumption has to be met through imports. Acute malnutrition is well above World Health Organization (WHO) emergency thresholds, with more than half the population (7.7 million people) experiencing acute food insecurity (WHO 2025). This exacerbates grave health risks of acute malnutrition for 2.3 million children (UN 2025; WFP 2025). The percentage living below the poverty line is increasing and was estimated to have reached 92 percent in 2024 (World Bank 2025e), and 93 percent of the population experiences deprivation in education, access to services, asset ownership, and quality housing. At 0.31, South Sudan's Human Capital Index is one of the world's lowest (World Bank 2024a).

The formal economy is dominated by oil production and exports, but oil wealth has not translated into broad-based development, and recent shocks to the sector have produced an accelerating crisis. The oil sector contributes about 50–60 percent of gross domestic product (GDP), 85–90 percent of government revenues, and 99 percent of exports, but the use of oil revenues is opaque, and public service delivery is limited and mostly dependent on international donors. After the end of the civil war, oil production and GDP growth rebounded, but since 2020, devastating floods have impacted both oil production and subsistence livelihoods. Compounded by COVID19, the war in Ukraine, and more recently, conflict in Sudan, they have driven four years of economic contraction. The closure of the main oil export pipeline in February 2024, after fighting in Sudan prevented repairs, drove a GDP contraction of 7.2 percent in FY24, and triggered a severe fiscal and inflation crisis. In FY25, the economy is projected to further contract by over 30 percent.

Although it has to navigate one of the world's most challenging business environments, the country's nascent private sector could be a driving force for diversified and resilient growth. Fragile security; supply chain disruptions; rent-seeking behavior (including numerous checkpoints across the limited transport network); inadequate infrastructure and access to energy, clean water, and finance; weak regulatory frameworks; and very low human capital are all deterrents for private economic activities and investment. The South Sudanese youth also often rely on informal sectors, exacerbating socioeconomic and security fragility. Yet given the opportunity, the private sector has proved itself inventive and resilient, and can be effective in substituting the lack of government-run services. Fostering a conducive business environment is imperative to support the development of natural resource-based industries, critical service provision, job creation, and growth and diversification of the tax base.

South Sudan's natural resource wealth could support much-needed economic diversification and rural livelihoods. As well as oil, South Sudan may also have considerable mineral deposits, although the only mining activity is currently informal and unregulated gold production, largely outside of the formal economy. With its low population density and vast and varied natural habitats—including one of the world's largest seasonal wetlands (the Sudd) and the eastern plains of the Boma-Badingilo-Jonglei Landscape (BBJL), which are home to the world's largest animal migration—renewable natural resources also provide largely untapped opportunities for an extremely productive and diverse rural economy. Most of the country has fertile soils and adequate rainfall for highly productive agriculture. Livestock is the largest source of rural livelihoods, with herds totaling around three times the human population, but productivity is extremely low. Fisheries centered around the Sudd and other seasonal wetlands of the vast Nile floodplain provide livelihoods for around one-sixth of the population and much of the country's protein supply. Reducing post-harvest losses and developing export value chains offers large potential for expanding fisheries livelihoods and revenues, particularly during the production boom of high-flood years. The country's savanna and closed forests are more intact than in neighboring countries, and could produce over $1 billion per annum in sustainable revenue from non-timber forest products (NTFPs). In the longer term, restoring the previously extensive teak plantation industry could support a major export industry, and the vast and varied natural habitats could support world-class nature-based tourism attractions, beginning with the BBJL and its 6 million head of migratory antelope.

Capitalizing on the country's potential for diversification will require significant improvements in governance. Security and rule of law—including secure land tenure and relief from informal taxation at checkpoints—could be primary drivers of increased investment and production, particularly in resource-rich rural areas, where local conflict remains common. Macrofiscal stability, access to credit and foreign exchange, and robust regulatory frameworks would be key for enabling the growth of formal enterprises. Public investment and an adequate legal framework for private investment in year-round transport systems, energy access, sustainable management of common property resources, and human capital development are also necessary for long-term growth.

Government development priorities focus around consolidating peace, stabilizing the economy, and fostering sustainable development. The Revised National Development Strategy 2021–24 aims to consolidate peace, stabilize the economy and return to sustainable development, by achieving five core objectives. These are: establishing and/or strengthening institutions for transparent, accountable and inclusive governance; building critical infrastructure for sustainable development, including roads, energy, public buildings and broadband capability; increasing support to the social sector for human capital development and protecting the vulnerable population to leave no one behind; and mainstreaming gender in all development policies and programs and empowering women and youth as drivers of growth and nation building. The strategy is designed to support the country's vision toward freedom, equality, justice, peace, and prosperity for all.

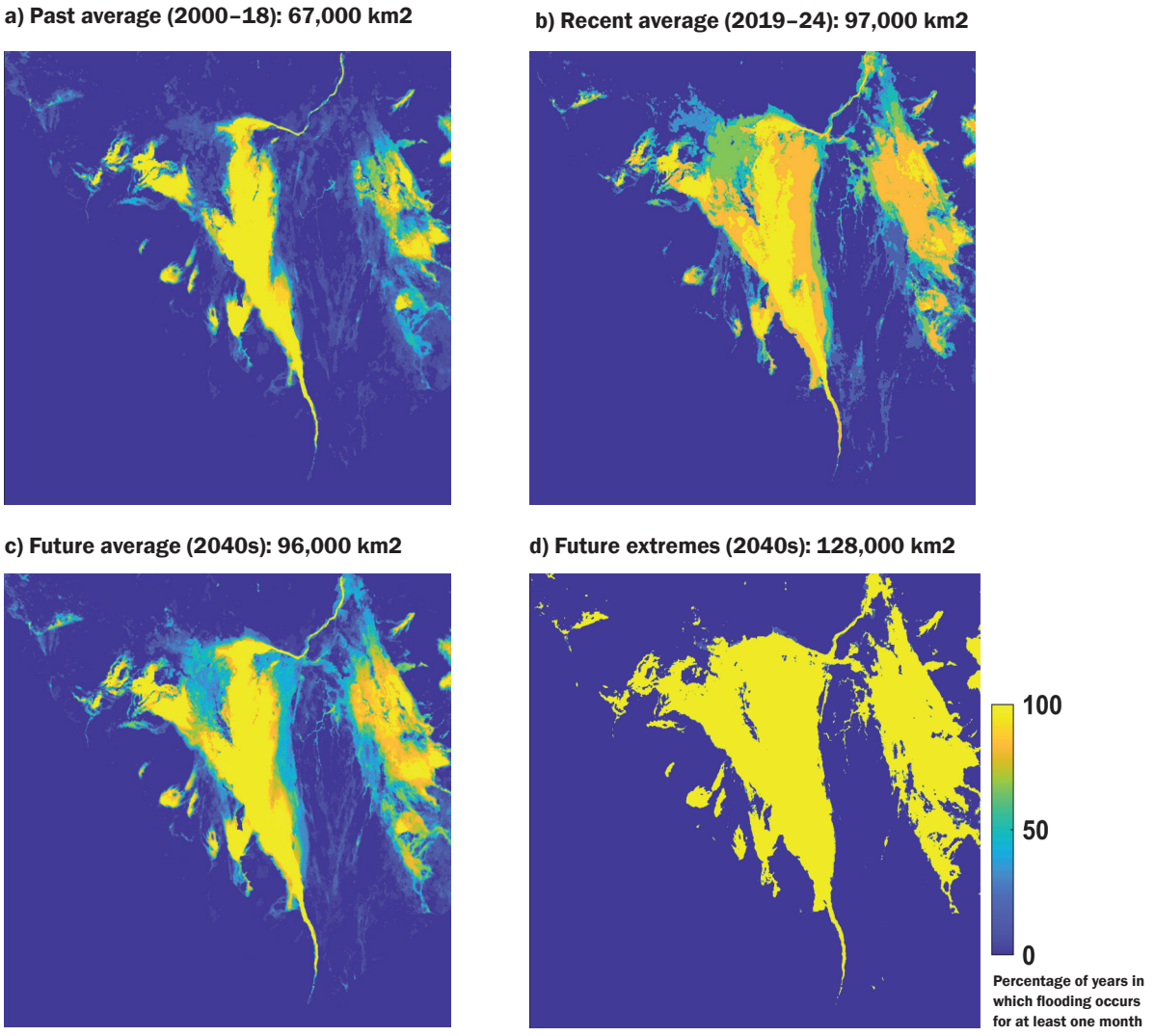
National climate policies are broadly ambitious, but implementing frameworks are weak. The Transitional Constitution commits to sustainable development and environmental protection for current and future generations. The Second Nationally Determined Contribution (NDC) (2021) focuses on low-emissions development across a range of sectors, while acknowledging the importance of disaster risk management (DRM) and improving health services to tackle additional climate stresses. The National Adaptation Plan (NAP) (2021) aims to reduce vulnerability and integrate adaptation into development plans, particularly in relation to natural resources, agrifood systems and community resilience. But many of the environmental laws envisaged in the National Environment Policy (2015–25) remain in draft form, with no detailed implementing regulations or legal enforcement mechanisms. Human and financial capacity to implement laws—let alone undertake the extensive investment programs envisaged under the NDC and NAP—is virtually nonexistent. The Ministry of Environment and Forestry (MoEF), Ministry of Water Resources and Irrigation (MoWRI), and Ministry of Humanitarian Affairs and Disaster Management (MoHADM) are the primary government bodies responsible for climate change and water-related DRM; but they have limited staff and ability to convene or coordinate other agencies. There is no monitoring tool to track concrete action toward the general policy objectives, and specific government goals, indicators, and timelines are lacking.

Vulnerability, conflict, and fragility

Lying just south of the Sahel, with around half its territory within the floodplains of the White Nile and its tributaries, and centered around one of the planet's largest seasonal wetlands, South Sudan is highly exposed to climate change. The Sudd's annual flood pulse lends exceptional productivity to fisheries and agropastoral systems. It is also critical to regional climate, with evaporation from the Sudd estimated to contribute a large share of the rainfall over the Ethiopian highlands (Ashkriz 2015; Viste and Sorteberg 2011). But South Sudan has been among the world's most rapidly warming locations over the past 30 years, and mean annual temperature is projected to increase around 1°C from 2024 values by 2050, and 3°C by 2100, under a Shared Socioeconomic Pathway (SSP) 3-7.0 scenario.[1] Projections of annual rainfall patterns remain uncertain, but are expected to show a moderate increase, with greater variability.

[1] SSPs explore socioeconomic developments, examining whether emissions reductions will be achieved, based on factors such as policy choices, technological advancements, and societal trends. Projections in this report use the CMIP6 suite of climate models, examining SSPs described in the IPCC Sixth Assessment Report. See box 1.1. in the main report for more information.

Figure ES1. Evolution of the Sudd extent, in km2, 2000-2040s



Source: IEc 2025b

Extreme flooding is the new normal and will continue to have devastating impacts. South Sudan ranks seventh for population exposed to fluvial floods, just behind Bangladesh and Myanmar. Since 2019, the extent of annual flooding around the Sudd has increased dramatically, driven mainly by higher outflows from Lake Victoria and the Albertine Great Lakes. At their peak, flood waters have covered up to a quarter of the country. A new flood model developed for this CCDR indicates that these larger annual floods are likely to become the new normal within less than two decades, with greater extremes likely also in store (figure ES1). Flooding has a hugely disruptive impact on rural livelihoods (agriculture and livestock production), combining with inflation to drive an increasingly severe food security crisis (more than half the population were at least moderately food insecure in 2022). It also cuts communities off from essential services such as health and market access over extended periods, and has a significant impact on oil production.

A wider range of climate impacts are likely to become more prominent, affecting agricultural and labor productivity, and human health. As 95 percent of agricultural production is rainfed, rainfall unpredictability and variability is expected to impact productivity and farmers' livelihoods. Sorghum, the country's most important crop, is particularly vulnerable, with rises in temperature projected to cause an 8.1 percent loss in yields by 2050 in a hotter climate scenario. Aggregate climate shocks to livestock revenues are estimated at -9.6 percent under the same conditions. The increasing frequency of heatwaves, particularly during March–May, poses a risk to public health and labor productivity. In

February 2025, schools were closed in the capital, Juba, for two weeks due to students collapsing from heat exhaustion. It has also been estimated that by 2041–50 in a dry/hot climate under the business-as-usual (BAU) with continuing fragility development scenario, the incidence of heat-related deaths and disease would rise by 90 percent from 13.8 and 9,058 per 100,000 people, respectively. Health impacts are notably anticipated from vectorborne diseases, with the increase in gastroenteric disease alone projected to reduce effective labor supply by 1 percent by 2050 in a hotter climate. By 2100, labor supply shocks due to rises in deaths and disease incidences could reach -6.1 percent in a dry/hot climate under the BAU with continuing fragility scenario (IEc 2025c).

With around 80 percent dependence on climate-sensitive sectors, particularly livestock and subsistence farming, alongside structural inequalities, social vulnerability to climate impacts is extremely high. Pastoralism is a predominantly male livelihood, but women are heavily involved in subsistence farming, and female-headed households are already poorer, leaving them more exposed to climate impacts. And as men migrate in search of alternative livelihoods, women are left to manage households under extreme economic stress, further increasing their vulnerability. In a national context of extremely high gender-based violence (GBV) and extremely low social inclusion scores, women in both female-headed households and displacement camps are exposed to increased risks of exploitation, GBV, and harmful household coping strategies such as child marriage.

South Sudan has fallen into a vicious cycle of fragility and climate vulnerability, with climate change acting as a threat multiplier. Climate impacts greatly exacerbate two existing crises in South Sudan, amplifying social fragility. Since 2020, they have replaced conflict as the largest driver of internal displacement. Climate also multiplies nutrition risks, through direct impacts on agricultural production, by cutting communities off from markets and health services, and by exacerbating disease transmission, particularly gastrointestinal illness, which directly increases wasting risks. Impacts disproportionately affect lower-income and rural communities, exacerbating grievance and political divides, and deepening dependency on informal coping mechanisms, including participation in illicit economies and armed groups. Displacement and livelihood impacts intensify resource competition, which in the face of weak governance, elite manipulation, and a lack of effective conflict resolution mechanisms, is becoming increasingly militarized. Flood- and drought-induced movement brings pastoralists into increasing conflict with agrarian communities; disruption of grazing routes increases conflict between competing pastoralist tribes (for example, due to cattle-raiding); and long-term displacement due to permanent flooding concentrates people in overcrowded and unsanitary camps, generating grievances among internally displaced people over inadequate support and diversion of humanitarian aid by local government or armed groups, and increasing resource competition and conflict with local residents. Armed groups, including local militias and cattle raiders, exploit climate-induced migration and resource scarcity to expand their influence, leading to cycles of retaliatory attacks and further displacement. In turn, conflict increases vulnerability to climate change, by forcing relocation to vulnerable areas. For example, many seek refuge in vast floodplains and wetlands because the “walls of water” make them less accessible to armed groups, but these marginal areas are also more vulnerable to climate impacts.

Climate-informed macroeconomic modeling

A variety of climate impacts were modeled and combined within a macroeconomic model to assess the overall impacts on growth in the South Sudanese economy. This was run across four development scenarios:

- **BAU with continuing fragility,** reflecting South Sudan’s limited recent growth trajectory, which remains heavily reliant on oil revenues in the absence of meaningful structural reforms and economic diversification

- **BAU with disrupted oil exports,** reflecting a deepening economic crisis marked by collapsing oil revenues, which would severely constrain public service delivery, infrastructure maintenance, and broader growth enhancing public investments

- **Growth and stability,** which assumes the implementation of structural reforms—including prudent monetary and fiscal policies to curb inflation—which improves revenue management and diversification, the effective implementation of the R-ARCSS, and growing foreign direct investment

- **Climate-smart development,** which includes targeted climate resilience investments on top of the growth and stability scenario.

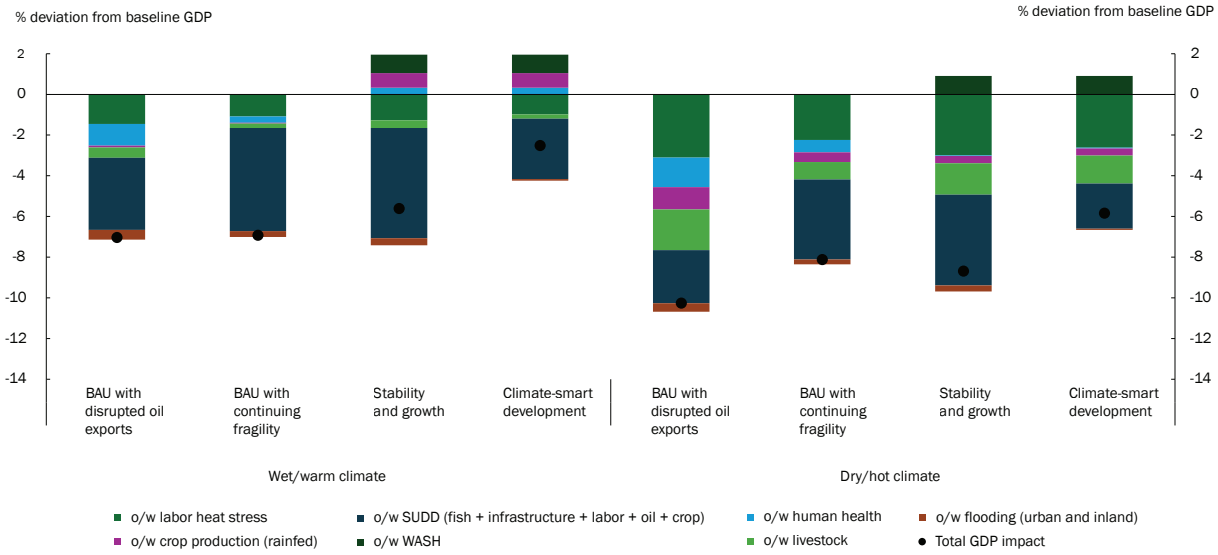
These growth scenarios were run across two climate scenarios, reflecting dry/hot and wet/warm outcomes, as summarized in table ES1.

Table ES1: Change in mean climate conditions by 2041-2050 by climate scenarios

Climate scenario	Mean temperature	Annual precipitation
Dry/hot (pessimistic)	+1.35°C	+0.8%
Wet/warm (optimistic)	+0.71°C	+11.8%

Source: IEc 2025a

Figure ES2. Impacts of climate change on GDP, under two climate scenarios, by impact pathway (2050)



Source: World Bank staff calculations

Even partial adaptation measures can be highly cost-effective, and a combination of robust development and targeted resilience investments significantly reduces the relative impacts of climate change. Additional targeted resilience investments included in the climate-smart development scenario reduced GDP losses by more than 2 percent compared to the growth and stability scenario, under both climate scenarios, despite only partial solutions being available for the largest climate impacts. The scale of flooding in the Sudd cannot be readily controlled, leaving adaptation to flooding as a key response. Heat stress impacts on labor productivity will also remain a significant constraint on the economy until the level of development allows for the widespread mechanization of agriculture and availability of reliable cooling in indoor workspaces.

Poverty impact analysis shows that South Sudan's future poverty levels hinge critically on its policy choices. Without reforms, poverty remains extremely high, and will be further worsened by climate stress and in the event of oil disruptions. But implementing structural reforms—in the form of prudent fiscal and monetary policies, improved oil revenue management, diversification, and climate-smart investments—could drive a profound turnaround, reducing poverty to single-digit levels by 2050 even under challenging climate conditions.

Main areas of action

The fragility of South Sudan to the recent combination of severe climate and fiscal shocks highlights its vulnerability to incremental impacts and the urgency of building climate and economic resilience. In the face on ongoing climate change and extremely high levels of poverty and food insecurity, anticipated increases in the severity and breadth of climate impacts are likely to be devastating for many households, and present a real risk of triggering cascading economic and social impacts that destabilize the country's fragile security, with potential consequences far beyond those captured in the macroeconomic models developed for this report. Resilience depends on improving the management of public finances to facilitate targeted climate adaptation measures as well as robust, sustainable economic diversification in the medium to long term. Restoring peace, improving security and providing a political settlement and inclusive governance, as envisioned in the R-ARCSS, is critical for bringing South Sudan onto a sustainable growth path and longer-term stability. While this will take time, targeted policy interventions can help the country progress toward climate resilience and broader development in the interim.

Improved public financial management (PFM) is central to delivering basic public services and help build people's resilience to climate-related shocks. The World Bank Public Finance Review calls for a sequenced reform agenda focused on transparency, efficiency, and revenue mobilization (World Bank 2026). Immediate, no-cost measures include strengthening fiscal transparency and PFM controls, particularly in oil revenue reporting and budget execution. Short-term priorities involve phasing out monetary financing of deficits, unifying official and parallel exchange rates, and accounting for all public debt and arrears. Medium-term actions include introducing a functioning government securities market, implementing a credible interest-rate-based monetary framework, and establishing a transparent public-private partnership framework to attract private investment in irrigation, energy, and transport infrastructure. Together, these reforms aim to stabilize public finances, improve spending efficiency, and unlock resources for adaptation investments.

Transparent and effective use of existing public resources is crucial amid declining international aid. The approximate cost of priority measures identified in this report is around $14 billion (roughly 1.7 percent of the estimated GDP for the 2025-2050 period under the climate-smart development scenario), on top of investment costs several times that amount to support broader sustainable development. Dedicated international climate funds, which have provided South Sudan with only a few tens of millions of dollars in recent years, cover no more than a small fraction of these costs and are unlikely to significantly expand their financing capacity in the foreseeable future. Official development assistance is also projected to fall by more than half in 2025 compared to the 2019–24 average, with United States aid dropping by 80 percent and European Union support by 20 percent—together accounting for three-quarters of all aid. In light of shrinking external support, maximizing synergies between humanitarian aid and resilience, accelerating domestic revenue mobilization, and improving the efficiency of resource allocation and public spending represent the most practical path to preserving essential services and safeguarding the population's well-being, while paving the way for stronger climate adaptation.

Getting the fundamentals of development right is indispensable to the transition toward resilient growth. While South Sudan can take multiple steps to enhance resilience at the grassroots—including by building participatory resilience assessment into aid programs—without inclusive and sustainable growth tied to improving governance and security, their impact will be limited. As described in table ES2, this will require robust macrofiscal policies, transparent (and ultimately climate-informed) PFM systems, and reliable policy frameworks across key sectors, including environmental and social risk management systems for public and private investment that incorporate holistic disaster, climate, and conflict risk assessment and management requirements. Enhancing resilience will also mean building government capacity to both better coordinate, monitor, and evaluate action across a manageable set of key climate priorities, and assume increasing responsibility for implementing public investment and service provision, ensuring greater efficiency and sustainability. It will also require greater engagement and facilitation of the private sector, particularly in key climate-related sectors. A platform for expanding investment to attenuate the most severe climate impacts and provide a basis for resilient diversification and growth should particularly target action in three areas: flood management, sustainable natural resource use, and resilient green power.

Flood risk management is critical to addressing the most acute climate impacts and living with the new normal of expanded flood risk. The primary flood risk management approach for the foreseeable future is likely to revolve around improving local capacity to live with flooding by strengthening early warning and response systems, increasing small-scale flood protection infrastructure (such as polders around settlements and oil infrastructure), building resilient transport systems, such as river transport and raising critical road sections on embankments, and developing flood-resilient livelihoods, including the sustainable exploitation of growing fisheries potentials. Significant emphasis must be placed on community preparedness, response, and adaptation, embracing flood-resilient livelihood options such as recession agriculture, improving the mobility of people and livestock in the context of significant security and infrastructure constraints, and strengthening adaptive safety nets. Although various additional measures can be explored—including strengthening data-sharing and regional collaboration on managing upstream releases and developing multipurpose water storage projects within South Sudan—the complexity of transboundary water management and the scale and nature of the hydrological threats, including flow volumes and the vast flatness of the floodplain, mean that these will likely remain both highly challenging and partial solutions. In particular, any proposals to significantly alter flows within the Sudd will need to be evaluated extremely carefully and inclusively, given its critical importance for local livelihoods, regional climate, and downstream hydrology. The country's central region will remain vital for rural livelihoods and as an economic corridor. While future investments in major linear infrastructure and urban growth will need to integrate flood risk, wholesale retreat from the Nile floodplain is unrealistic.

To manage the direct climate threats to agrifood systems, livelihood development, and diversification more generally, South Sudan must open up its vast renewable natural resources in a sustainable fashion. This means addressing a complex mix of technical, infrastructure and security challenges that affect the country's major livelihood systems—livestock, agriculture, and fisheries—differently. On-the-ground initiatives to promote improved agricultural and livestock practices, and investments in small-scale water storage can help achieve this. But building more systemic solutions will require larger-scale investment and governance reforms to develop resilient rural access and value chain infrastructure, and a stronger enabling environment for agribusiness and export, alongside strengthening land tenure rights to protect communities from dispossession and incentivize investment. Establishing robust community-based natural resource management (CBNRM) systems at all stages would provide a basis for the sustainable exploitation of fisheries, NTFPs, wildlife, and rangelands, and to promote rural security by building institutions and capacity for resolving resource conflict, including disputes between pastoralist and agriculturalist groups.

Finally, providing resilient and green power supply is vital for climate adaptation. As well as enabling indoor cooling to mitigate heat stress impacts on labor productivity and communications for emergency warnings and response, it would allow resilient diversification and long-term growth by supporting reliable health and education services to build human capital and enabling the expansion of business and livelihood opportunities. This will require enabling largely private sector investment in off-grid and mini-grid renewable energy solutions (starting with electrifying health facilities and schools), as well as exploring options for development of domestic hydropower and regional power trade infrastructure.

Table ES2. Summary recommendations

Priority area and policy recommendations	Lead agency	Timeframe	Benefit		
			Ad	Mit	Dev
Crosscutting					
Broad fiscal and governance reform supporting transparent PFM and public sector management	Whole-of-government	Immediate-ongoing	H	M	H
Strengthen climate coordination and oversight capacity within the Climate Change Working Group, Ministry of Finance and Planning (MoFP) and MoEF	MoFP, MoEF	Immediate	H	M	L
Enhance regulatory frameworks for environmental and social risk management of public and private investments, including disaster, climate, and conflict risk assessment	MoEF	Immediate	H	L	M
Enhance climate finance and efficiency by: agreeing a set of core priorities and measurable results indicators with development partners; developing government implementation capacity; and promoting community-led resilience planning and action	Whole-of-government	Immediate-ongoing	H	M	H
Enhance public-private dialogue for climate action, and regulatory frameworks to support private investment in key areas, including climate-smart agriculture, green energy and resilient infrastructure	MoFP	Immediate	H	M	H
Flood risk management					
Improve flood monitoring, early warning systems and response preparedness	MoWRI, MoHADM	Immediate	H	L	M
Rehabilitate dikes and construct new embankments to protect key locations and transport links	MoWRI, MoHADM	Immediate	H	L	H
Promote flood-resilient livelihoods, including critical services and development of adaptive safety nets	Ministry of Agriculture and Food Security (MAFS), Ministry of Livestock and Fisheries (MoLF), MoWRI	Immediate-ongoing	H	L	H
Explore options to expand flood retention and storage capacity	Ministry of Electricity and Dams (MoED), MoWRI, MAFS	Needs study	H	L	H
Rural livelihoods					
Expand small-scale storage for drought resilience	MoWRI, MAFS, MoLF	Immediate	H	L	H
Support higher productivity and climate-smart agriculture and livestock practices	MAFS, MoLF	Immediate-ongoing	H	M	H
Establish CBNRM models, supported by strengthened local institutions and land tenure reform	MoEF, MoLF, Ministry of Wildlife Conservation and Tourism	Immediate-ongoing	H	H	H
Invest in fisheries management and export value chains to sustainably exploit additional fish production in high-flood years	MoLF	Immediate-ongoing	H	L	H
Sustainable energy access					
Support energy access for public institutions and rural households through off-grid solar	MoED	Immediate-ongoing	M	H	H
Develop flood resilient mini-grids for urban power supply through private investment facilitated by a clear legal framework	MoED	Immediate-ongoing	M	M	H
Explore potentials for hydropower development	MoED. MoWRI	Needs study	M	H	H
Develop interconnector infrastructure to support regional power trade	MoED	Needs study	M	M	H

Notes: In the timeline column, immediate indicates no-regret actions that can largely be accomplished within a few years; immediate-ongoing indicates no-regret actions that involve longer-term transitions; and needs study indicates that feasibility analysis is required. In the Benefits column, Ad = adaptation; Mi = mitigation; Dev = development; H = high; M = medium; and L = low. See appendix A of the main report for more detailed recommendations.

1. Development priorities and climate risks and opportunities

1. Development priorities and climate risks and opportunities

South Sudan faces a dual challenge of economic fragility and climate vulnerability, both of which threaten its long-term development prospects. As one of the world's most oil-dependent economies, the country's fiscal and macroeconomic stability is highly sensitive to fluctuations in global oil prices, domestic production constraints, and ongoing internal and regional conflicts. At the same time, the increasing frequency and severity of climate-related shocks—such as floods, droughts, and extreme weather events—pose significant risks to livelihoods, infrastructure, and food security, disproportionately affecting the most vulnerable populations.

1.1. Development priorities and objectives

1.1.1. Political context

South Sudan is a vulnerable post-conflict country with an extremely fragile political context. Following a brutal secession war, it gained independence in 2011. But subsequent tensions within the political elite and rival militias led to civil war in 2013, resulting in 400,000 deaths and over 4 million displaced, and costing $80 billion. The Revitalized Agreement on the Resolution of the Conflict in South Sudan (R-ARCSS) was signed in 2018 to end hostilities and prepare for national elections, but its implementation has been slow. The Government of National Unity has been in office since the R-ARCSS was signed, but elections planned for December 2024 were postponed amid signs that the status quo could break down. Governance and institutional development remain weak, the establishment of key institutions and registration of the main political parties have been delayed (IMF 2024a), violence persists at subnational levels, and divisions deepen.

1.1.2. Growth and poverty over the past decade

South Sudan is endowed with a rich tapestry of ecosystems encompassing vast wetlands, floodplain grasslands, savannas, and montane forests. The landlocked country lies just south of the Sahel and spans a climate gradient from tropical savanna with forested uplands in the south and southwest to a hot, semiarid Sahelian savanna in the north (UNDP 2021). Almost all its land area (97.5 percent) falls within the White Nile Basin (South Sudan comprises 20 percent of the entire Nile Basin), around half within the Nile floodplain with the vast Sudd wetland at its heart. The Sudd is the world's second largest seasonal wetland, expanding from around 26,500 square kilometers (km2) up to 77,600 km2 over 2000–22, depending on the size of the annual (October through February) flood pulse. Around 80 percent of the population (9.6 million people) is rural; but at less than 20 people per km2, population density is extremely low for a country largely suitable for agriculture, and only 5 percent of the land is used for cropping (World Bank 2025f). Most of the land area is covered by natural and semi-natural habitats, and South Sudan benefits from a high per capita natural resource abundance. Despite its large agriculture potential, food needs exceed domestic cereal production by nearly 20 percent.

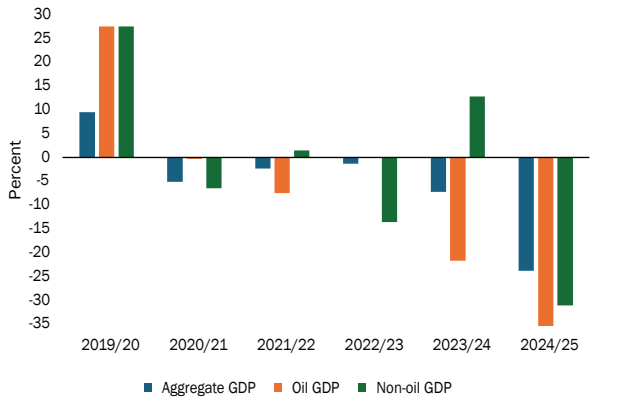
The economy is heavily reliant on a narrow base of economic activities, with oil and agriculture serving as the primary pillars of national output and livelihoods. The oil sector is the dominant driver of economic activity, contributing approximately 50–60 percent of gross domestic product (GDP), 99 percent of foreign exchange earnings, the vast majority of export revenues, and 85–90 percent of total government revenues (World Bank 2025e). Agriculture also plays a critical role in the country's economic and social fabric, serving as the main source of livelihood for most of the population. But since independence, South Sudan's development trajectory has been marked by a stark imbalance between its substantial oil resources and persistent gaps in institutional capacity and human capital. While the country's weak and volatile development performance has been partly driven by external shocks—such as floods and, most recently, the conflict in Sudan—it is primarily the result of entrenched governance failures, elite capture, and the inability to translate oil wealth into productive investments. Chronic underinvestment in human and physical capital, combined with the misallocation of public resources,

has critically undermined progress, with spending skewed toward public administration, defense, and rule of law at the expense of health and education.

Following years of crisis, South Sudan's economy showed signs of recovery after 2018. Soon after independence, the country faced a series of overlapping crises that escalated into a large-scale conflict, claiming hundreds of thousands of lives and triggering massive population displacement, alongside a severe macroeconomic crisis. After years of conflict, the economy began to show signs of recovery, supported by the signing of the 2018 peace agreement and progress in the oil and agriculture sectors. Oil production increased once the fields damaged during the conflict had been rehabilitated, while regional trade rebounded strongly in FY18 and FY19. In the agriculture sector, improved security conditions enabled some displaced farming households to return and re-engage in farming activities, leading to an expansion in cropped land. As a result, real GDP growth recovered to 3.2 percent in FY18/19 and rose further to 9.5 percent in FY 19/20.

But these gains proved to be short-lived, and despite its wealth of natural resources, substantial oil revenues, and considerable agricultural potential, economic outcomes have significantly deteriorated over the past few years. The economy has contracted for four consecutive years and is projected to decline for a fifth year in FY25, with real GDP estimated to fall by 23.8 percent (figure 1.1). Already weakened by years of severe flooding, the spillover effects of Russia's invasion of Ukraine, and the impacts of COVID-19, the outbreak of conflict in Sudan in April 2023 delivered another major blow to the South Sudanese economy, severely disrupting the flow of goods and services—including oil exports, which account for almost all of country's exports—triggering a massive influx of refugees and returnees, and exacerbating economic challenges. The rupture of the main Dar Blend pipeline in February 2024, caused South Sudan's oil production to plunge to below 50,000 barrels per day, down from approximately 150,000 previously. Oil production and exports through the Dar Petroleum Operating Company's main pipeline resumed in April 2025, but intermittent disruptions continued throughout the year, causing oil production to decline further.

Figure 1.1. GDP growth, 2019-2025



Source: World Bank staff calculations, based on National Bureau of Statistics and Ministry of Petroleum data

The major oil production shock caused a sharp deterioration of the macroeconomic situation, depressing economic activity and exports, and exerting pressure on the balance of payments. Oil export revenues declined by around two-thirds in FY25, with annual government oil revenues averaging $1.4 billion between FY19 and FY24, down from much higher levels in the early 2010s. Given the dominant role of oil, which accounts for around 60 percent of GDP, this shock contributed to an estimated 23.8 percent GDP contraction in FY25 (table 1.1). The country also remains heavily dependent on imports to meet domestic demand for staple food, fuel, medicine, and intermediate and capital goods, with imports of goods and services amounting to nearly 60 percent of GDP. The conflict in Sudan has further disrupted crossborder trade routes, forcing a shift to more expensive alternatives through East African countries. The influx of refugees and returnees has also sharply increased food demand. These

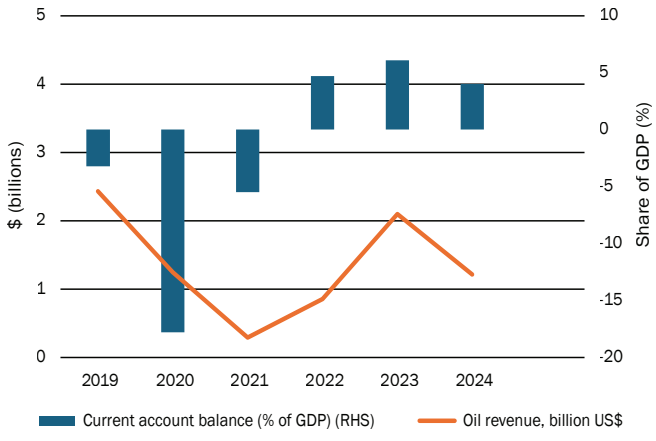
challenges were exacerbated in the third quarter of 2024, when reduced maize and sorghum production in key regional exporters led to a sharp decline in shipments, further constraining food availability in South Sudan. As a result, the country's balance of payments is pressured: its current account balance declined by more than 2 percentage points in FY23 and FY24 and recorded a deficit of approximately 3.5 percent of GDP in 2025. External buffers remain low and inadequate, limiting the country's ability to further absorb external shocks (figure 1.2).

Table 1.1. Key economic indicators 2023–27

Annual percent change unless indicated otherwise						
	2022	2023	2024	2025e	2026f	2027f
Real GDP growth, at constant market prices	-2.3	-1.3	-7.2	-23.8	48.8	0.8
Agriculture	-1.8	-1.7	8.0	0.5	1.0	2.0
Industry	-4.8	-4.3	-11.6	-34.0	81.8	0.3
Services	1.7	3.6	2.3	-2.9	1.1	2.0
Inflation (Consumer Price Index)	22	18.0	35.0	182.6	20.8	6.7
Current account balance (% of GDP)	4.7	6.1	4.0	-3.5	1.0	1.4
Net foreign direct investment inflow (% of GDP)	1	0.6	1.7	1.7	1.7	2.7
Fiscal balance (% of GDP)	-5.9	3.3	-4.9	-1.3	-3.2	-3.7
Revenues (% of GDP)	28.8	32,7	28.3	23.6	24.1	24.8
Debt (% of GDP)	56.9	39.5	44.4	41.3	28.0	24.0
Primary balance (% of GDP)	-3.8	3.7	-4.9	0.3	-2.1	-2.8

Source: World Bank estimates and Government of South Sudan
Note: Projections for 2026 and 2027 assume a rapid rebound from the recent pipeline closure; e = estimate; f = forecast.

Figure 1.2. Current account balance and oil exports revenues, 2019–24



Source: World Bank staff calculations, based on International Monetary Fund and Ministry of Petroleum data

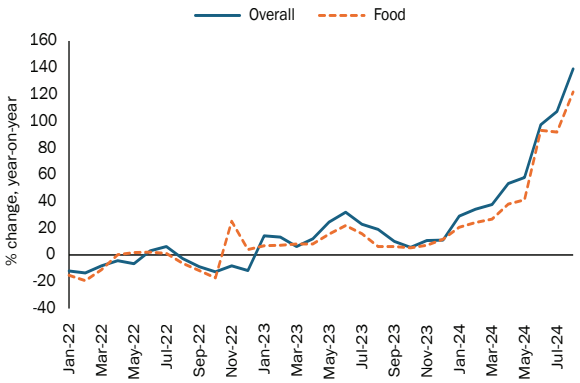
Underlying these macroeconomic challenges are deep-seated weaknesses in fiscal and monetary policy frameworks. South Sudan's fiscal policy is highly procyclical, volatile, and ad hoc, driven by oil revenue swings and political priorities rather than development needs. The lack of fiscal buffers, prevalence of off-budget operations, and failure to implement the Public Financial Management (PFM) Reform Strategy have left the economy vulnerable to shocks. Deficit monetization and fiscal

dominance have rendered monetary policy ineffective, fueling hyperinflation and currency depreciation. The absence of credible budget planning and the dominance of elite interests in public spending have further undermined macroeconomic stability.

Persistent high inflation and price volatility have been compounded by the oil sector shock, engendering a cost-of-living crisis. Inflation has been on a steady upward trajectory since November 2023 and accelerated sharply after the oil shock. Inflationary pressures, driven by fiscal mismanagement, monetization of fiscal deficits, and heightened exchange rate volatility linked to oil price fluctuations, have been further amplified by supply constraints and higher transportation costs following more than 200 percent fuel price increases in 2024.

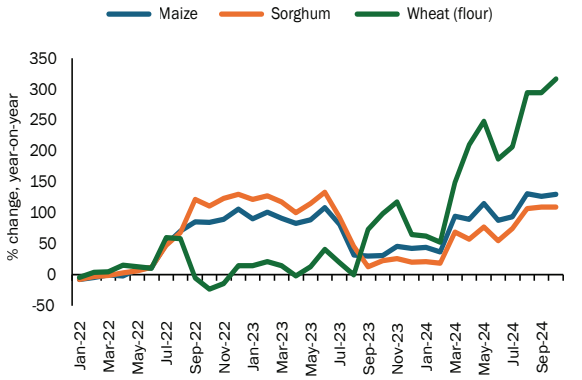
The high pass-through of South Sudanese pound depreciation—particularly to food prices—has also been a key driver of the sharp rise in inflation. In the second half of 2024, consumer price inflation reached exceptionally high levels, primarily driven by rapid increases in food inflation (figures 1.3 and 1.4). According to the Central Bureau of Statistics, consumer price inflation reached over 180 percent in mid-2025, significantly eroding household purchasing power.

Figure 1.3. Overall inflation and food inflation, 2022—24



Source: World Bank staff calculations, based on National Bureau of Statistics data

Figure 1.4. Crop prices, 2022—24



Source: World Bank staff calculations, based on World Food Programme statistics

South Sudan's heavy reliance on oil revenues significantly impacts its fiscal sustainability. The country's fiscal balance went from 3.3 percent of GDP in FY23 to -4.9 percent of GDP in FY24 following the oil sector shock, while its public debt increased from 39.5 to 44.0 percent of GDP over the same period (table 1.1). Beyond this shock, a lack of transparency and accountability in the governance of the oil sector and reports of corruption and revenue misuse—via nontransparent oil advances, oil-backed loans, off-budget transactions, and so on—severely undermine the country's fiscal sustainability, PFM, and budget integrity, and have led to a loss of credibility in the international community.

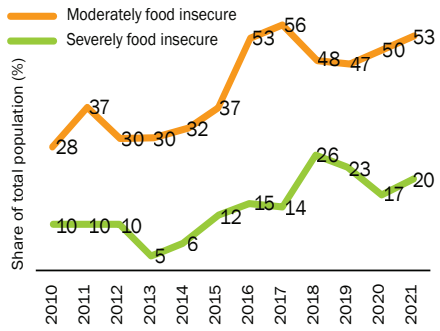
Oil wealth has not translated into broad-based development, and widespread poverty has affected almost every South Sudanese since independence, exacerbated by the recent oil shock and floods. National poverty rates have increased from 69 percent in 2016 to 76 percent in 2022, and an estimated 92 percent in 2024 (World Bank 2025e). Per capita GDP growth averaged -5.5 percent between 2016 and 2022, reducing household incomes and economic opportunities, while average consumer prices were 60 times higher in 2022 than 2016. With public service delivery extremely limited and mostly dependent on international donors, 93 percent of the population experiences multiple forms of deprivation—in education, access to services, asset ownership, and/or quality housing—and limited access to education and health services significantly hampers human capital development. The country's Human Capital Index score (0.31) is one of the world's lowest (World Bank 2024a).

The agrifood sector plays a key role, but low productivity leads to food insecurity. As the most important source of livelihoods to the majority of South Sudanese, the sector accounts for 36 percent of non-oil GDP and employs about half of the population. But productivity is among the world's lowest, with an agricultural land productivity of $67 per hectare compared to $103 in the majority of Sub-Saharan African fragile, conflict-affected, and vulnerable (FCV) countries. This exacerbates food insecurity, as less than half of rural households produce enough food to cover their needs and only about 4 in 10 rural households acquire essential food items, such as milk and dairy products, cereals, roots, tubers, and legumes, from the market (World Bank 2025c).

Compounded by inflation, fragility, and recurrent flooding, food insecurity impacts 78 percent of the population (9 million people). In 2022, more than half (53 percent) the population fell into the moderate food insecurity category, signifying a notable food consumption gap or ability to meet minimal food needs only through irreversible coping strategies, such as selling productive assets or seeds intended for planting. This is a 25 percent increase from 2010. Another 20 percent (a 10 percent increase from 2010) were facing extreme food insecurity, reflecting either an extreme food consumption gap or a severe loss of livelihood assets, such as through the sale of homes or land (figure 1.5).

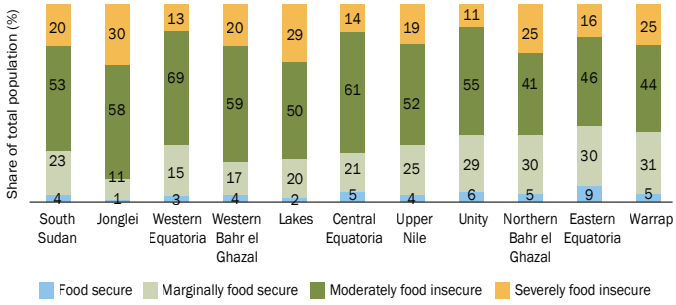
High food prices—coupled with supply disruptions due to flooding, purchasing power losses, elevated border fees, reduced production in neighboring countries, increased transport costs, and unofficial taxation at multiple checkpoints along trade routes—are among the main factors that have affected food security (World Bank 2024a). States impacted by frequent climate-related shocks and a high number of returnees/refugees experienced a high incidence of food insecurity. The incidence of moderate and severe food insecurity in 2022 was most pronounced in Jonglei, at 88 percent, closely followed by Western Equatoria, at 82 percent (figure 1.6). This represents a 22 and 23 percent increase, respectively, compared to 2020.

Figure 1.5. Food insecurity, 2010–21



Source: World Bank 2024a

Figure 1.6. Food insecurity, by state, 2022



Source: World Bank 2024a

1.1.3. Development priorities

Consolidating peace, stabilizing the economy, and fostering sustainable development is at the core of the government's development priorities. Following the elaboration of the National Development Strategy (NDS) 2018–21 and the 2018 R-ARCSS, the government revised its NDS. The Revised National Development Strategy (R-NDS) aims to consolidate peace, stabilize the economy and return to sustainable development, through four core objectives: establishing and/or strengthening institutions for transparent, accountable, and inclusive governance; building critical infrastructure for sustainable development, including roads, energy, public buildings, and broadband capability; increasing support to the social sector for human capital development and protecting the vulnerable population, to leave no one behind; and mainstreaming gender in all development policies and programs and empower women and youth as drivers of growth and nation building. The approach to fulfill these objectives is driven by the following principles: government leadership; partnership and coordination; considering the triple nexus of interconnectedness of the peace, development and humanitarian challenges, and the need for an equally integrated response; inclusion and spatial representation; youth-centeredness and the importance of empowerment; a focus on investment in value chain development; and results orientation.

Harnessing South Sudan's natural resources could create new opportunities for private sector participation in the country's economic diversification and sustainable development efforts. The country's rich biodiversity presents several investment opportunities in wildlife and forest products, such as: ecotourism development, leveraging numerous national parks and reserves; wildlife breeding programs for legally traded species; and employment opportunities for refugees and internally displaced people (IDPs) in harvesting and processing non-timber forest products (NTFPs). Agriculture holds significant promise for boosting food security, generating employment, and driving inclusive economic growth through crop production and agroprocessing. In the livestock industry, direct benefits can be gained through milk, meat, and skin products, while indirect benefits include using livestock as credit, collateral, and self-insurance. The expansion of women's involvement in commercializing animal-derived products presents additional opportunities, along with the development of veterinary services and responsible investments toward establishing robust livestock supply chains aligned with the International Finance Corporation's Sustainable Livestock Principles. There are also investment opportunities in expanding small-scale and redistributed renewable energy systems, solar home systems, clean cooking stove development and distribution, rural electrification through mini-grids and standalone solar systems, and off-grid solar systems for essential facilities (World Bank 2025a).

The private sector, still nascent, faces one of the world's most challenging business environments. The country's investment environment is burdened by policy challenges, such as economic distortions, fragile security, supply chain disruptions,[2] iincreased checkpoints, rent-seeking behavior, and weak institutional and regulatory frameworks, as well as physical challenges, such as inadequate infrastructure, and limited access to inputs in the energy, finance, and water sectors (World Bank 2025e). The low level of foreign direct investment attracted by the country suggests a significant investment competitiveness challenge.

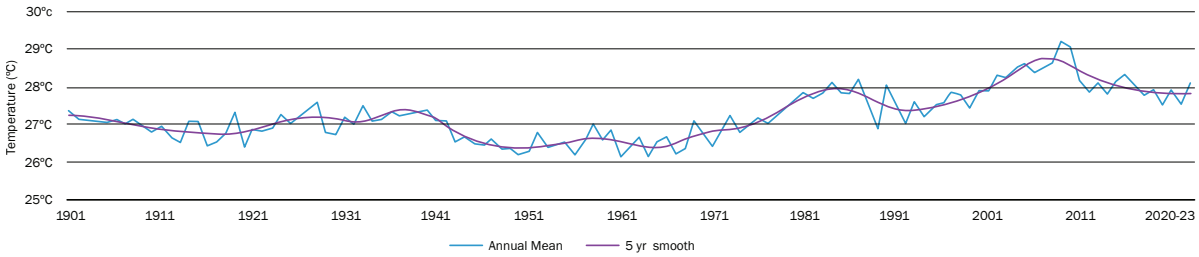
As South Sudan grapples with limited fiscal space and high risk of debt distress, fostering a conducive business environment for private sector investment becomes an imperative. Such support could catalyze economic growth, create jobs, promote sustainable peace, generate tax revenues, and deliver much-needed basic goods and services, contributing to the country's sustainable development and creating jobs (World Bank 2025a).

1.2. Climate change and vulnerability

South Sudan has experienced substantially warmer and drier weather since the 1950s. The country's average temperature rose by 1.9 °C over 70 years, from 26.2 °C in 1950 to 28.1 °C in 2020 (**figure 1.7**). Its average warming rate per decade has also significantly increased over the same period, from a 0.37 °C increase per decade over 1951–2020 to 0.53 °C over 1991–2020 (**figure 1.8**). South Sudan has been among the world's most rapidly warming locations over the past 30 years, especially its central and southern regions (Government of South Sudan 2018). The increasing frequency of heatwaves, particularly during March–May, combined with extreme temperatures, pose a risk to public health, agriculture, and water supply systems. In February 2025, schools were closed in the capital, Juba, for two weeks due to students collapsing from heat exhaustion.

[2] Supply constraints have been further exacerbated by importers' protests against revised customs valuations following the FY25 Finance Act and applying the daily prevailing exchange rate instead of the previous fixed SSP 300 per $1 of imports.

Figure 1.7. Observed annual average mean surface air temperature in South Sudan, 1901–2023

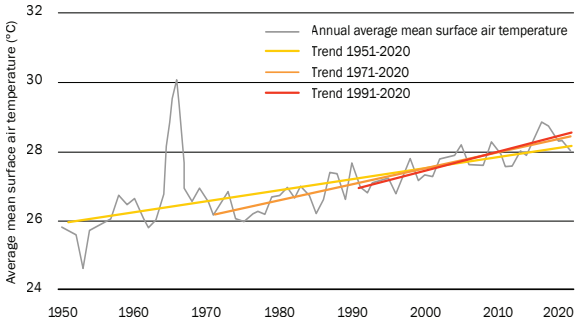


Source: World Bank Climate Change Knowledge Portal 2025

South Sudan is particularly vulnerable to fluvial (river) floods and droughts, ranking second in vulnerability to natural hazards (European Commission 2023), and in the top five most vulnerable countries to climate change (UNEP 2023). One in two South Sudanese (about 5.4 million people) live in areas that are exposed to flood hazards (World Bank 2023e). The country has experienced particularly devastating annual floods since 2019, described as the worst since the 1960s (IMF 2023). Sudd-related floods alone covered 97,000 km2, on average, over the 2019–24 period, or 15 percent of South Sudan's territory.[3] Under a 1-in-20-year flood event, all states apart from Western Bahr el Ghazal and Western Equatoria would face flooding with depths of at least 0.15 meters, and most areas around the Sudd and Machar wetlands and large parts of Unity, Warrap, and Jonglei states would be submerged under a meter of floodwater (figure 1.10). Since mid-2019, prolonged heavy rains have triggered widespread flooding, damaging farmlands, disrupting key transport routes, reducing domestic food supplies, and straining distribution channels. In 2019 alone, an estimated 74,000 hectares of cultivated land were damaged, resulting in a loss of more than 70,000 metric tons of cereals (Eckstein, Künzel and Schäfer 2021). A flood event in 2021 impacted nine states out of ten and caused irreparable damage to more than 100,000 buildings, severely affecting about 1.24 million people (about 11 percent of the population), moderately affecting 1.33 million people, and causing more than $670 million in total direct economic damage. Flooding also contributed to a 7.4 percent contraction in oil production (World Bank 2025e). Floods in 2024 affected over 1.4 million people in 44 counties (OCHA 2024b). These floods are directly linked to rainfall patterns in the African Great Lakes region, where the White Nile originates, and in the Ethiopian Highlands. Climate change and variability exacerbates flooding in South Sudan. During an El Niño event, expected rainfall increases over most of the Lake Victoria catchment area by about 15–25 percent, and while long-term rainfall trends in East Africa are highly uncertain, there is a strong chance that increases in sea surface temperature in the Indian Ocean will increase rainfall in South Sudan and upstream areas in Ethiopia and in the African Great Lakes region (World Bank 2023e).

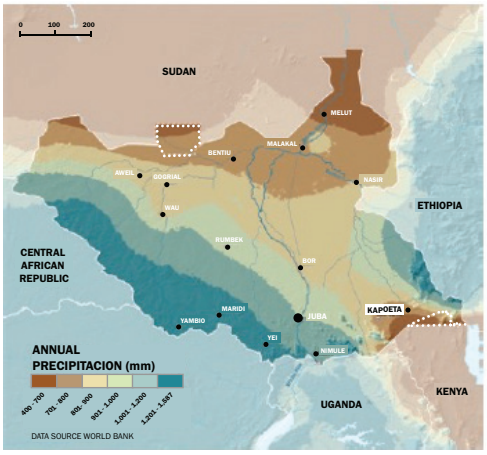
[3] IEc estimates.

Figure 1.8 Average temperature annual trends per decade, 1950–2020



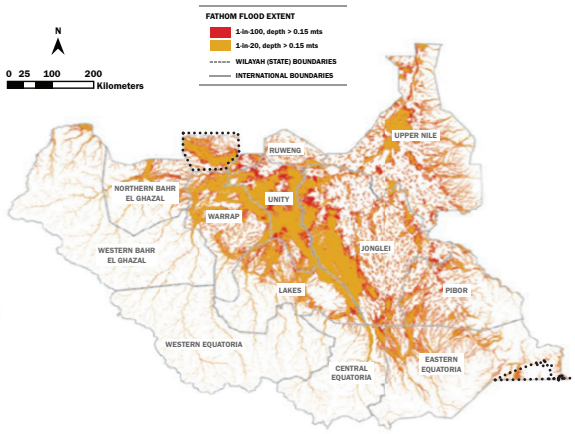
Source: World Bank Climate Change Knowledge Portal 2025

Figure 1.9. Annual precipitation



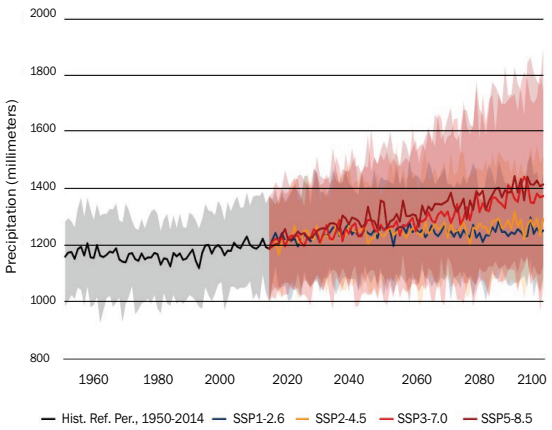
Source: World Bank 2025f, based on Terra Climatology lab data

Figure 1.10. National flood extent map for 1-in-20- and 1-in-100-year flood events, 2022



Source: World Bank 2023e

Figure 1.11. Annual precipitation, 1960–2100

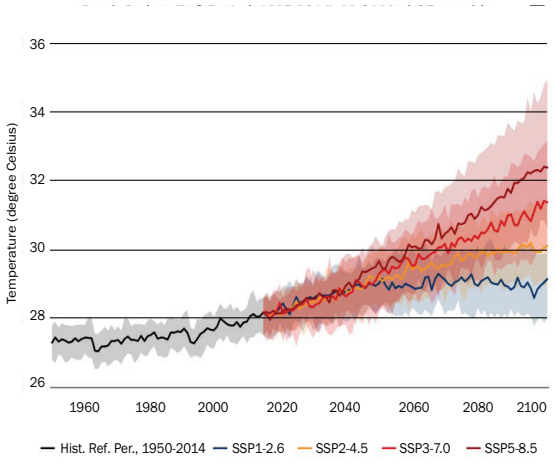


Source: World Bank Climate Change Knowledge Portal 2025

South Sudan has also witnessed high rainfall variability, bringing higher drought frequency and intensity. Since the mid-1970, the long rains have decreased by 10–20 percent across much of the country, with southern and central regions most affected (figure 1.9). Summer rainfall notably declined by 15–20 percent across parts of western South Sudan between the mid-1970s and late-2000s. Seasonal rainfall patterns are also shifting, with the rainy season now starting a month later than it used to (Government of South Sudan 2021a). Notable droughts occurred in the 1990s, 2000s, and 2010s,[4] further affecting and displacing the poor and most vulnerable in rural areas, where agriculture is the primary livelihood (World Bank 2025b; Government of South Sudan 2018). Since 2009, droughts have occurred every five years (2009, 2016, 2021), with the 2021 drought alone impacting 7.7 million people, contributing to severe food shortages and water scarcity. Even less widespread droughts, such the one in 2016 that affected fewer people (3.6 million), had catastrophic consequences, including famine, particularly in conflict-affected areas where response capacity was limited.

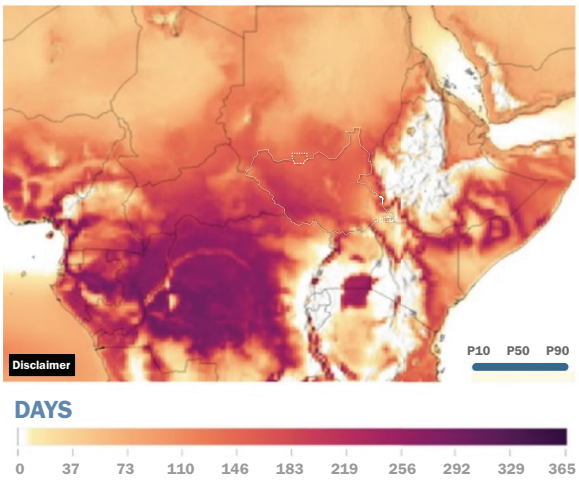
[4] Droughts notably occurred in 1990, 1997, 1998, 2000, 2008–2009, 2010–2011, 2014, and 2016.

Figure 1.12. Mean temperature, 1995–2100



Source: World Bank Climate Change Knowledge Portal 2025

Figure 1.13. Number of tropical nights in South Sudan and neighboring countries under an SSP3-7.0 scenario, 2060–79



Source: World Bank Climate Change Knowledge Portal 2025
Note: Tropical night refers to a minimum nighttime temperature of 23°C.

Box 1.1. Climate scenarios used in this Country Climate and Development Report (CCDR)

Climate scenarios incorporate different combinations of Shared Socioeconomic Pathways (SSPs) and Representative Concentration Pathways (RCPs). RCPs outline trajectories for greenhouse gas (GHG) concentrations, determining the potential level of global warming by the end of the century. In contrast, SSPs explore varying socioeconomic developments, examining whether emissions reductions will be achieved or not, based on factors such as policy choices, technological advancements, and societal trends. Projections in this CCDR use the CMIP6 suite of climate models, examining SSPs described in the IPCC Sixth Assessment Report.

Following World Bank guidance titled *Global Scenarios for CCDR Analyses*, two combined climate scenarios were selected for analysis in this CCDR to estimate the impact channels used in the macroeconomic model (chapter 4). These scenarios were chosen primarily to enable comparisons across emissions trajectories, referred to as *mitigation scenarios*. The guidance outlines two specific mitigation scenarios:

- **Pessimistic case: Ensemble average of SSP3-7.0 General Circulation Models (GCMs)**, which projects global warming of approximately 4 °C by 2100, driven by weak climate policy and reduced carbon sequestration by natural systems.
- **Optimistic case: Ensemble average of SSP2-4.5 GCMs**, which reflects a global mitigation scenario that is consistent with current climate commitments and 2030 targets as of November 2021.

To reflect a wide spectrum of climate conditions, ten GCMs were selected, reflecting projected climate change from the baseline (1995–2020) during the period between 2031 and 2050. These include:

- **Dry/hot scenarios:** Five scenarios around the 10th percentile of mean precipitation changes (i.e., dry) and the 90th percentile in mean temperature changes (i.e., hot), across SSP2-4.5 and SSP3-7.0 GCMs. Final channel results also include the average climate impact of the five dry/hot GCMs selected.
- **Wet/warm scenarios:** Five scenarios around the 90th percentile of mean precipitation changes (i.e., wet) and the 10th percentile in mean temperature changes (i.e., warm), across SSP2-4.5 and SSP3-7.0 GCMs. Final channel results also include the average climate impact of the five wet/warm GCMs selected.

Combining the emissions and precipitation scenarios result in the two ensemble climate scenarios used in the macromodeling:

- **Climate scenario 1: Dry/pessimistic ensemble scenario**, which reflects extreme dry conditions and is aligned with the most pessimistic climate outlook.
- **Climate scenario 2: Wet/optimistic ensemble scenario**, which represents extreme wet conditions and is aligned with the least pessimistic (or more optimistic) climate outlook.

South Sudan's climate is expected to become warmer in the medium and long term. Mean annual temperature, under an SSP3-7.0 scenario and at the 50th percentile, is projected to increase by 1.07 °C by 2050 and by 3.05 °C by 2100 from 2024 values (**figure 1.12**). Hot nights are also projected to significantly rise by 2080—particularly in the west, south, and southwest—under an SSP3-7.0 scenario (**figure 1.13**). Higher, more prolonged nighttime temperature creates relentless heat with no ability for livestock, environment, or humans without access to active cooling to recover from intense daytime temperatures. Projections of annual rainfall patterns remain uncertain in all scenarios, with a slight increase in mean precipitation likely. Under an SSP3-7.0 or high GHG emissions scenario and at the 50th percentile, annual precipitation is expected to rise by 42.71 millimeters by 2050 and by 164.02 millimeters by 2100 from 2024 values (**figure 1.11**). This increase is expected to be mirrored in the Great Lakes and drive a significant increase in flooding.

South Sudan's acute vulnerability to climate change stems not only from its environmental exposure but also from deep-rooted structural and institutional weaknesses that undermine its capacity to adapt and respond. The country's limited road networks, weak drainage systems, and underdeveloped water, health, and education infrastructure severely constrain its ability to prepare for, respond to, and recover from climate shocks. Political fragmentation and weak institutional capacity undermine the country's coordinated disaster response efforts and long-term planning, as well as its ability to influence Nile Basin governance frameworks to enable more equitable and climate-informed regulation of upstream flood inflows. Ongoing conflicts both within the country and along its borders also displace communities, disrupt livelihoods, and weaken local resilience. High poverty rates reduce household capacity to adapt to climate-related disruptions, such as floods and droughts, by limiting access to basic resources, diversified incomes, and coping mechanisms. Together, these challenges have created a fragile context in which even moderate climate shocks can trigger large-scale humanitarian and economic crises, increasing the range of chronic impacts the populations face in the future.

1.2.1. Impact on agriculture and livestock

Climate change is likely to significantly affect agricultural productivity. As 95 percent of agricultural production is rainfed, rainfall unpredictability and variability is expected to impact agriculture productivity and farmers' livelihoods. Almost 70 percent of grain and cereal production variability in the country is due to variable rainfall. Late or early onset and erratic rains and long dry spells are particularly associated with delayed planting, soil degradation, and a shorter growing season, leading to crop failures (Government of South Sudan 2018) and reduced yields. Sorghum—which accounts for 70 percent of the country's cultivated area—is particularly vulnerable and rises in temperature may cause an 8.1 percent loss of its yields by 2050 in a dry/hot climate and under business-as-usual (BAU) development scenarios. Cassava and sesame, the country's highest-value rainfed crops, are also expected to face significant heat effects, with yields dropping by 19.8 and 21 percent, respectively, by 2050 in a dry/hot climate under the BAU with continuing fragility scenario. In total, rainfed crop production shocks by 2100 are estimated to reach -16 and -38 percent in a wet/warm and dry/hot climate, respectively, under the BAU with continuing fragility scenario (IEc 2025h). Increased flooding around the Sudd is also estimated to lead to a 2.1–8.7 percent reduction in crop production by the 2040s.[5]

Climate change also threatens livestock populations and pastoralist livelihoods. South Sudan has one of Africa's largest livestock populations, particularly in comparison to the human population. The loss of pasturelands and reduced access to water resources exacerbated by climate change threatens livestock and the pastoralist communities that rely on them. The baseline conditions for animal husbandry create a development deficit that also contributes to climate vulnerabilities. Livestock in South Sudan is characterized by low calving percentages (30 percent), and annual death rates of 15–40 and 5–10 percent for young and adult stock, respectively (Government of South Sudan 2021a). Livestock will likely be further stressed—especially during critical reproductive and developmental lifecycle phases—by the increased temperatures and changing precipitation patterns brought about by climate change through the increased potential for pest and disease outbreaks, crop failure or reduced water resources, and the loss or destruction of agriculture habitats and grazing areas. Aggregate climate shocks to livestock revenues have notably been estimated to be -9.6 percent and -24 percent in a dry/hot climate and under the BAU with continuing fragility scenario by 2050 and 2100, respectively (IEc 2025g).

[5] IEc calculations and projections.

1.2.2. Impact on health

A variety of climate change impacts on health are expected in South Sudan. Rising temperatures are expected to contribute to deaths from cardiovascular and respiratory disease, with the elderly most affected. Due to their reliance on agriculture and pastoralism, the South Sudanese are also particularly exposed to dehydration and heat exhaustion, which will have major impacts on labor productivity. It is estimated that by 2041–50 under a dry/hot climate, heat-related deaths and disease incidences would increase by 90 percent, reducing effective labor supply by around 6.6 percent. Other climate-related diseases and longer transmission seasons for malaria and other vectorborne diseases would produce an additional labor supply shock of around -1.4 percent. Floods also increase the risks of being affected by waterborne diseases such as dysentery and typhoid, and disrupt access to health facilities. These impacts fall disproportionately on the elderly, women—particularly expectant mothers left without critical prenatal and postnatal care (UNFPA 2023; Pappas, Kovats and Ranganathan 2024)—and children. Changes in climate can also cause mental health issues, particularly among the young, those dependent on agriculture, and IDPs (Government of South Sudan 2021a).

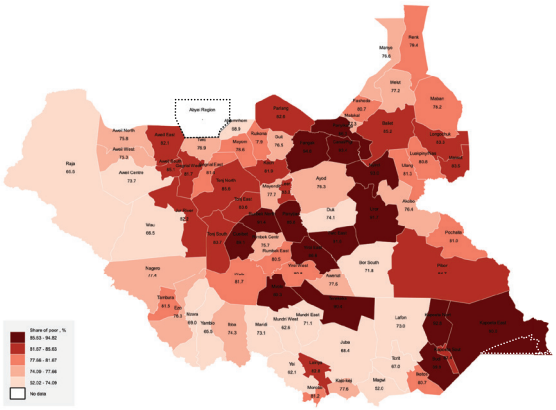
1.2.3. Impact on transport/infrastructure

The lack of climate-resilient infrastructure exacerbates vulnerability and limits adaptation options. The country is not equipped with reliable road, rail, air, or water transport infrastructure, and 98 percent of its roads are unsealed. Decades of underinvestment, combined with the destruction caused by war, have left the country with minimal capacity to manage climate shocks. Its infrastructure is vulnerable to damage and destruction caused by heavy precipitation, landslides, and flooding, flood-prone areas lack adequate drainage systems, and drought-affected regions suffer from poor water storage and irrigation facilities. Increased flooding in the Sudd and surrounding areas is expected to roughly double impacts on infrastructure and oil production by mid-century. Even in other areas, increased fluvial flooding is expected to produce a 25 percent increase in infrastructure damage by 2050 under SSP3-7.0 and BAU development scenarios (IEc 2025e), and a 64 percent increase by 2080. Socioeconomic impacts of vulnerable infrastructure go well beyond physical damage, as communities are often left without access to markets and critical health and education services for extended periods, especially within the Nile floodplain.

1.3. Impact on the most vulnerable populations

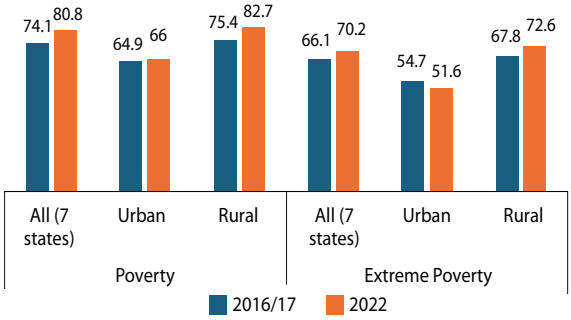
South Sudan's fragility and climate change are deeply interconnected, exacerbating vulnerabilities and compounding conflict risks. Decades of civil war, political instability, and economic collapse have led to a fragile social fabric and continue to affect households. Climate-related shocks, such as floods, droughts, and shifts in seasonal rainfall patterns, further stress already precarious livelihoods, increasing the likelihood of displacement, the prioritization of low-risk, low-return activities, resource competition, and violence. Between 2016 and 2022, poverty rates increased notably in rural areas from 75 to 83 percent, and remained steady around 65 percent in urban areas. More than 40 percent of the country's poor population is concentrated in just three states: Jonglei, Northern Bahr el Ghazal, and Warrap (figure 1.14). Extreme poverty—defined as the rate of households whose total expenditures do not cover basic food needs—also rose from 66 to 70 percent between 2016 and 2022 (World Bank 2025e; figure 1.15).

Figure 1.14. Poverty rates, by county, 2021



Source: World Bank staff estimates, based on the 2022 Household Budget Survey and 2016/2017 High-Frequency Survey

Figure 1.15. Urban and rural poverty rates, 2016/2017 and 2022



Source: World Bank staff calculations, based on the 2022 Household Budget Survey and 2021Food Security and Nutrition Monitoring Survey

South Sudan's economy and livelihoods remain highly sensitive to climate variability, and women are disproportionately vulnerable. Around 80 percent of the population depends on climate-sensitive sectors, including subsistence farming—which women rely on heavily—and livestock herding. Environmental disruptions significantly limit access to essential services, such as education and health care, disproportionately burdening women who commonly shoulder household and caregiving responsibilities (IOM 2024), while the destruction of local markets and loss of arable land curtail women's access to income-generating activities, reinforcing cycles of poverty and dependency (Global Women's Institute and the International Rescue Committee 2017). Economic hardships resulting from climate shocks have also led to a rise in early and forced marriages, as families use marriage as a coping mechanism to alleviate financial burdens (Umar and Kiden 2024). At 84 percent, female illiteracy is significantly higher than the national adult average of 73 percent (SIDA 2024). Up to 65 percent of women also have experienced gender-based violence (GBV) (UNICEF 2019), and in conflict-affected areas, armed groups and community militias often use it as a weapon of war (Chavy 2017; MSF 2018; World Bank 2018). As a result, South Sudan's social inclusion score of 15.7 is markedly lower than neighboring Uganda (59.3), Kenya (62.9), and Ethiopia (51.5)[6] It also lags its neighbors for process legitimacy—which reflects governance, civic freedoms, and rule of law—scoring 10.5 compared to Uganda (37.9), Kenya (45.2), Ethiopia (37.3), and Somalia (10.99).[7]

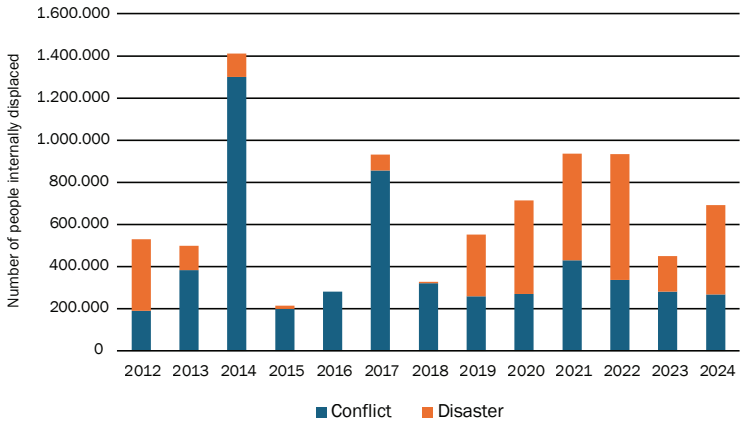
Displacement caused by climate shocks is reshaping demographic patterns, intensifying intercommunal conflicts, and burdening the most vulnerable. Extreme weather events such as floods have been the largest source of displacement over the past six years (**figure 1.16**), particularly in Jonglei, Unity, and Upper Nile states (Eberle and Boswell 2022; Stephens and Levi 2024). Unity and Upper Nile states alone host approximately 85 percent of South Sudan's refugee population, primarily from Sudan (UNHCR 2024). As men migrate in search of alternative livelihoods, women are left to manage households under extreme economic stress, further increasing their vulnerability to GBV, poverty, and exploitative labor conditions (UNICEF 2021), while women and girls in displacement camps face increased exposure to sexual violence, exploitation, and trafficking (UN Women 2023; World Bank 2023a). Mass movements also often result in competition over scarce resources, such as arable land and water, contributing to clashes between farmers and pastoralists, and between pastoralist groups seeking new grazing routes (Muorwel, Pospisil and Monoja 2023). As the area receiving adequate rainfall to support agriculture reduces, farmers are also expanding into areas previously used as seasonal pasture to cope

6 *Inclusion* is defined in this report as a practice where everyone has access to basic services, markets, and political, social, and cultural spaces to participate in society with dignity. Calculations are based on: share of households with access to a basic water source, share of households with access to basic sanitation facilities, share of population who owns a bank account, and percentage of population who uses the internet at least one time. Scores are World Bank staff based on data from the World Bank's Country Policy and Insitutional Assessment Social Inclusion Score.

7 *Process legitimacy* is the extent to which a community or society accepts who has authority, what goals they pursue, and how policies and programs are implemented. The assessment took into consideration the accessibility and affordability of civil courts, the state of civic freedoms in a country, the perceptions of the quality of public services, and the rule of law. Scores are World Bank staff based on the 2024 Civicus Global Alliance database (https://monitor.civicus.org/data/).

with declining yields and soil quality. A prolonged dry season will result in additional conflicts and impact the livelihoods of many livestock-dependent households, whose resilience is already weak as they have limited livelihood diversity and are often prone to livestock diseases and cattle raiding (Government of South Sudan 2018).

Figure 1.16. Internal displacement, by cause, 2012–24



Source: Internal Displacement Monitoring Centre 2025

Climate-induced economic instability is worsening existing inequalities and fueling grievances. The economic disruptions caused by climate change disproportionately impact lower-income and rural communities, exacerbating social and political divides. Inflation driven by food shortages and loss of livestock has deepened dependency on informal coping mechanisms, including participation in illicit economies and armed group activities (World Bank 2024a). The economic decline has also forced many young people into urban centers, where unemployment and a lack of opportunities can increase their vulnerability (Morrison-Métois 2017).

The militarization of resource competition is deepening conflict dynamics. As natural resources such as water and arable land become scarcer, increased competition over them generates disputes, which in turn are increasingly being settled through violent means rather than traditional mediation mechanisms. In some states, local militias, cattle raiders, and other armed groups exploit climate-induced migration and resource scarcity to expand their influence, leading to cycles of retaliatory attacks and further displacement (UNMISS–OHCHR 2021). The erosion of traditional conflict resolution systems has left communities more vulnerable to escalating violence.

Climate change exacerbates pre-existing FCV dynamics in South Sudan through three main pathways: flood- and drought-induced pastoralist migration to agrarian lands; conflict and climate-induced disruptions to grazing routes and interethnic violence; and livelihood losses for host communities due to permanent inundation. First, repeated flooding in Jonglei and Upper Nile displaces pastoralist communities into Equatoria's farmlands, where competition over resources escalates tensions and fuels intercommunal violence (Eberle and Boswell 2022; Muorwel, Pospisil and Monoja 2023). In particular, pasture loss in Jonglei has forced Dinka Bor herders from Bor South, Twic East, and Duk counties to migrate to Magwi and Torit counties in Eastern Equatoria (OCHA 2020). The pattern is similar with droughts, as water scarcity and pasture depletion drive armed pastoralist groups into new territories, increasing conflicts over water and grazing land, particularly in Warrap and Eastern Equatoria (OCHA–UNHCR 2016; IPC 2024). Displaced populations often settle in unsanitary, rapidly-expanding IDP camps or urban peripheries, placing additional pressure on limited resources (Morrison-Métois 2017). Second, the combination of climate stress, armed violence, and political fragility continues to drive cycles of forced migration and conflict. Insecurity and changing climate patterns disrupt traditional grazing routes, leading to increased cattle raiding and interethnic conflict among pastoralist groups (Da Costa 2023; REACH-Impact 2022). This is exemplified in the Greater Pibor Administrative Area, where political shifts

after the 2018 R-ARCSS peace agreement reignited interethnic conflicts between the Murle and the Lou Nuer, exacerbated by a high vulnerability to droughts and floods in the area. And third, the prolonged inundation of large areas in Unity State forces long-term displacement, erodes local economies, and intensifies competition for resources (Danish Refugee Council 2024; Tiitmamer 2022), erasing traditional livelihoods and forcing thousands away from farming into protracted displacement and cash-based survival strategies. Since 2019, persistent flooding has cut off entire counties, preventing communities from returning home. With farmland and grazing areas submerged, many displaced populations have little choice but to remain in Bentiu, where conditions are worsening (ACAPS 2022). Strained resources due to overcrowding, combined with the diversion and exploitation of humanitarian aid by local government representatives and impunity for armed groups exacerbate FCV issues and further destabilize the state (Craze and Markó 2022).

Conflict also tends to increase vulnerability to climate change, driving a vicious cycle of fragility, conflict, and climate vulnerability. Violence and insecurity often prompt South Sudanese to relocate to vulnerable areas or deters them from moving to safer regions. Many seek refuge in vast floodplains and wetlands that are less accessible to armed groups and are generally less valuable for agriculture and livestock grazing. While representing a defensive barrier against conflicts, these "walls of water" can also threaten the population as floodwaters rise. Overall, climate shocks directly impact livelihoods and food security, leading to displacement, rural-urban migration, and resource competition. Weak governance, elite manipulation, and the lack of effective conflict resolution mechanisms transform these resource conflicts into violent clashes. This violence further destabilizes the country, hindering recovery from climate shocks and creating a continuous cycle of fragility, conflict, and displacement.

1.4. Climate change and development opportunities

South Sudan's economic diversification is imperative due to its heavy reliance on oil production, which poses significant risks from oil price volatility, the potential depletion of oil reserves, and political risks. Oil prices are currently high, but the trend toward decarbonization is accelerating globally, with implications for medium- and long-term oil demand. The pace of this global decline in oil demand—and prices—may be gradual, as countries electrify their transportation sectors and switch power generation to renewable energy over time, but it can also be sudden, as in the case of technological breakthroughs that quickly lead to substitution away from oil. Climate concerns have already affected investment decisions by global oil companies, which have started to diversify their portfolios and invest in renewables. They are also committing to reduce the carbon footprint of their production, so to stay competitive, South Sudan will need to reduce upstream emissions in its oil sector. Although the sector will provide revenues for the country's green transition, the government will also have to consider the need for economic diversification into the agriculture and manufacturing sectors, policy reform, and the legacy of volatile political landscape, conflict, and governance issues.

South Sudan stands at a critical juncture, with promising opportunities to build a more diversified, resilient, and inclusive economy. Its vast natural resources—which include fertile land, abundant water, and renewable energy potential—provide a strong foundation for economic transformation. Diversifying beyond oil—by revitalizing agriculture and investing in sustainable natural resource management and clean energy development—can reduce fragility, build long-term resilience, and generate inclusive growth and employment. But with many of its growth potentials in climate-dependent sectors and its central transport and economic corridor lying within the Nile Floodplain, climate challenges remain.

South Sudan's future development pathway will need to be both resilient and sustainable. Its total contribution to global warming remains negligible, at about 0.12 percent of global GHG emissions, due to low consumption. Per capita GHG emissions are just 533,000 tons of carbon dioxide equivalent (tCO2e) and anthropogenic methane emissions, largely driven by agricultural emissions, account for over half the country's total GHG emissions (World Bank 2024c). Methane emissions from livestock and the oil and gas sector may therefore provide significant opportunities to reduce emissions. Growth and export performance remains dependent on oil, leaving it highly exposed in the mid-term to global measures designed to transition away from fossil fuels associated with a permanent decline in the

global demand for fossil fuels. Most of the population relies on climate-affected rural livelihoods, and economic diversification potential largely depends on developing more climate-resilient infrastructure, particularly transport. Given the scope of the projected climate change impacts on the country's key economic sectors and population in the longer term, following a greener and more resilient growth pathway in the medium and long term would allow South Sudan to use its climate mitigation potential to leverage carbon finance in support of resilient growth and diversification. International initiatives such as the Global Methane Pledge[8] and the World Bank's Global Methane Reduction Platform for Development may also offer opportunities to manage and monetize methane emissions reduction in the livestock sector, which could help promoting inclusive, stable, and sustainable economic growth, while alleviating poverty, supporting the country's aim to transition from a Least Developed Country to a low-carbon, middle-income country by 2030 (Government of South Sudan 2021c).

[8] The Global Methane Pledge unites 159 participating countries and the European Commission in pursuit of a goal to cut methane emissions 30% below 2020 levels by 2030. Quantifying and verifying methane reductions using robust measurement, reporting, and verification systems could help South Sudan access climate finance.

2. Climate commitments, policies, and institutional capacity

2. Climate commitments, policies, and institutional capacity

2.1. Governance framework for climate policy and finance

Although South Sudan does not have a climate change law, its constitution promotes sustainable development and environmental conservation, and it has a set of climate change policies, programs, and plans. The 2011 Transitional Constitution commits all government levels to ensuring sustainable development and environmental protection for current and future generations and guarantees the right to a clean and healthy environment and the contribution to its protection. The country has also developed policy frameworks supporting economic development while integrating sustainable development objectives and addressing international commitments (table 2.1). Its **National Environment Policy (2015–25)** provides a foundation for climate action, emphasizing the need for comprehensive laws regulating natural resource management, pollution control, and disaster risk reduction. The **2021 National Adaptation Plan for Climate Change (NAP)** aims to reduce vulnerability to climate impacts and integrate adaptation into national policies and development plans, seeking to promote agroforestry and sustainable agriculture, conserve wetlands and water resources, strengthen food security measures, build capacity for climate resilience at the community level, strengthen governance and institutions for climate adaptation, establish reforestation programs, and develop sustainable management of forest resources. Finally, its **2021 Second Nationally Determined Contribution (NDC)** aligns with the Paris Agreement objectives, has an overarching goal of transitioning to a low-carbon economy by 2030, and sets out an emissions reduction pathway for ten mitigation sectors[9] to reduce an estimated 109.87 million tCO2e and sequester 45.06 million tCO2e by 2030 (Government of South Sudan 2021c).

Table 2.1. Climate-related policies, laws, and plans in South Sudan

Policy/law/plan name	Year	Description
South Sudan Second NDC, 2022–30	2021	Updates the first NDC to include the country's changing climate and its development considerations
First National Adaptation Plan for Climate Change (2021)	2021	Guides climate change adaptation efforts over five years Follows United Nations Framework Convention on Climate Change (UNFCCC) guidelines to reduce vulnerability to climate impacts and integrate adaptation into national policies and development plans A coordinated approach to help the country manage climate challenges
Initial National Communication to the UNFCCC	2018	Reflects South Sudan's commitment to tackling global warming and reducing GHG emissions Identifies gaps and constraints in the country's climate response, and calls for establishing systems and frameworks to ensure effective coordination of adaptation measures and compliance with international climate policies
National Adaptation Program of Action	2018	Outlines priority adaptation projects, focusing on five key areas: environment, water resources, agriculture, disaster risk reduction, and policy/institutional frameworks
National Environment Policy 2015–25	2015	Primary framework for implementing climate actions, focusing on the sustainable use of natural resources and environmental conservation Aims to raise public awareness, establish regulations, and integrate environmental concerns into developmental policies.
Intended NDC to the UNFCCC	2015	Aligns with South Sudan's Vision 2040 and Development Plan, aiming for environmentally sustainable economic growth Outlines actions in sectors like energy, land use, agriculture, and infrastructure to tackle climate change and support vulnerable communities' adaptation efforts
Environmental Protection Policy	2013	Provides guidance on addressing climate change through a national strategy, climate policy, and adaptation and mitigation mechanisms Promotes laws to preserve ecological functions, protect forests, conserve biodiversity, water, and soil in fragile ecosystems Encourages sustainable forest management for income generation and livelihood improvement

[9] Agriculture, livestock, and fisheries; infrastructure (construction and buildings); forestry; electricity; waste; tourism and recreation; mining and quarrying; transport; industry; and petroleum, chemical and non-metallic products.

Policy/law/plan name	Year	Description
Environmental Protection Bill	2013	Establishes a legal framework for addressing environmental issues in South Sudan Empowers the Ministry of Environment and Forestry (MoEF) to lead the implementation of policies related to climate change, biodiversity, pollution, and land use monitoring Aims to protect natural resources by assessing the impact of land use on their quality and quantity
National Biodiversity Strategy and Action Plan 2018–27	2018	Highlights climate change as a key threat to biodiversity, addressing potential impacts from altered rainfall, river flows, and increased risks of fires, droughts, and floods

Sources: Government of South Sudan 2021a, 2021c
Note: Other relevant policies related to climate response include the National Policy on Food Security, the Comprehensive Agricultural Master Plan 2015–40, the Irrigation Development Master Plan 2015–40, the National Electricity Policy, the Fisheries Policy, the Water Bill, the Forest Policy, the National Petroleum Policy, and the Petroleum Act, 2012.

Most of the climate policies developed before 2018 focus strongly on natural resource conservation, particularly forests and biodiversity, rather than adopting a comprehensive approach, making execution difficult. Nationally driven climate policies overlook the country's vulnerability to climate disasters, and with many environmental policies still in draft form, and lacking legal enforcement mechanisms, effective execution of these policies is a challenge. Where policies do exist, weak governance, political interference, and a lack of financial resources hinder enforcement. There is no monitoring tool to track implementation and accountability. And while key policies such as the National Adaptation Program of Action, the National Environment Policy 2015–25, and the NDCs outline plans for mitigation and adaptation, it is unclear whether government entities have taken actionable steps, such as setting specific government goals, indicators and timelines, to achieve concrete results.

The MoEF is the primary government body responsible for climate change issues (UNESCO 2023). Serving as the national focal point for climate change, it is responsible for implementing strategies and measures to address climate impacts (Government of South Sudan 2018). Its directorates manage forest resources and climate programs, and ensure compliance with environmental laws. Although the MoEF leads climate efforts, implementation requires coordination across government agencies, nongovernmental organizations (NGOs), civil society, donors, and local communities. The government aims to mainstream climate adaptation planning across different ministries.

The Ministry of Humanitarian Affairs and Disaster Management (MoHADM) is the main authority responsible for disaster and risk management. It is responsible for disaster risk management (DRM) and has a mission to formulate policies and coordinate disaster response efforts to protect vulnerable populations. Its general objective is to develop and disseminate early warning advisories to communities at risk of climate-related shocks via three priority actions: understanding underlying climate-related risks; strengthening institutional capacities for early warning and disaster preparedness; and establishing a national early warning coordination unit.

Table 2.2. Main government bodies for climate action

Name	Role in climate action
Ministry of Environment and Forestry (MoEF)	Leads the formulation and implementation of environmental, forestry, and biodiversity policies Serves as the national focal point for climate change and technical focal point for international environmental treaties Develops frameworks (e.g. Environment Policy Framework, Environmental Bill) to regulate natural resource exploitation and promote sustainable development Its directorates manage climate programs, forest resources, and ensure compliance with environmental laws
Ministry of Agriculture and Food Security (MAFS)	Aims to boost agricultural productivity to enhance food security, drive economic growth, and promote sustainable development Focuses on increasing agricultural efficiency, supporting rural communities, and leveraging genetic resources for resilience against climate change Develops and implements forestry policies within the agricultural sector

Name	Role in climate action
Ministry of Water Resources and Irrigation (MoWRI)	Oversees the management of water resources, including rivers, watersheds, and water supply Adheres to principles of common ownership, economic and social value, and integrated planning with stakeholder participation The 2007 Water Policy, the 2013 Water Bill, and the 2011 Water, Sanitation, and Hygiene Sector Strategic Framework guide equitable and sustainable water allocation and address social and environmental impacts
Ministry of Energy and Dams (MoED)	Responsible for developing and regulating the electricity sector, overseeing generation, distribution, transmission, and irrigation-related dams Manages both renewable and nonrenewable energy sources Developed an energy policy, though the Energy Act is still awaiting parliamentary approval The South Sudan Electricity Corporation (SSEC) implements the ministry's policies to ensure electricity is available, accessible, and affordable
Ministry of Livestock and Fisheries (MoLF)	Develops policies for livestock and fisheries, including regulations on disease control and food safety Addresses challenges from climate change, overgrazing, and droughts that impact pastoralist communities and rangelands
Ministry of Wildlife Conservation and Tourism (MoWCT)	Oversees the protection and management of national parks and game reserves through the South Sudan Wildlife Service Responsible for conserving biological diversity and natural and cultural resources in protected areas Ensures wildlife and protected areas are managed effectively under the Transitional Constitution, with all resources remaining government property for the people
Ministry of Humanitarian Affairs and Disaster Management (MoHADM)	Develops policy and decision-making on disaster risk reduction at national level Undertakes climate change vulnerability assessments Responds to climatic disasters such as flooding, in collaboration with international organizations and state governments Developing a national Disaster Management Policy and implementation plan
Ministry of Finance and Planning (MoFP)	Develops finance policies, PFM, tax and revenue collection, procurement and legislation Allocates financial resources to government agencies, enabling them to implement sectoral plans and policies
Ministry of Petroleum	Creates legislation and regulations for the oil and gas sector Oversees the supply of petroleum products for power generation Manages oil exploration, primarily in Jonglei, Lakes, and Upper Nile, areas rich in natural resources The Petroleum Bill guides the sector and mitigate environmental impacts from exploration activities

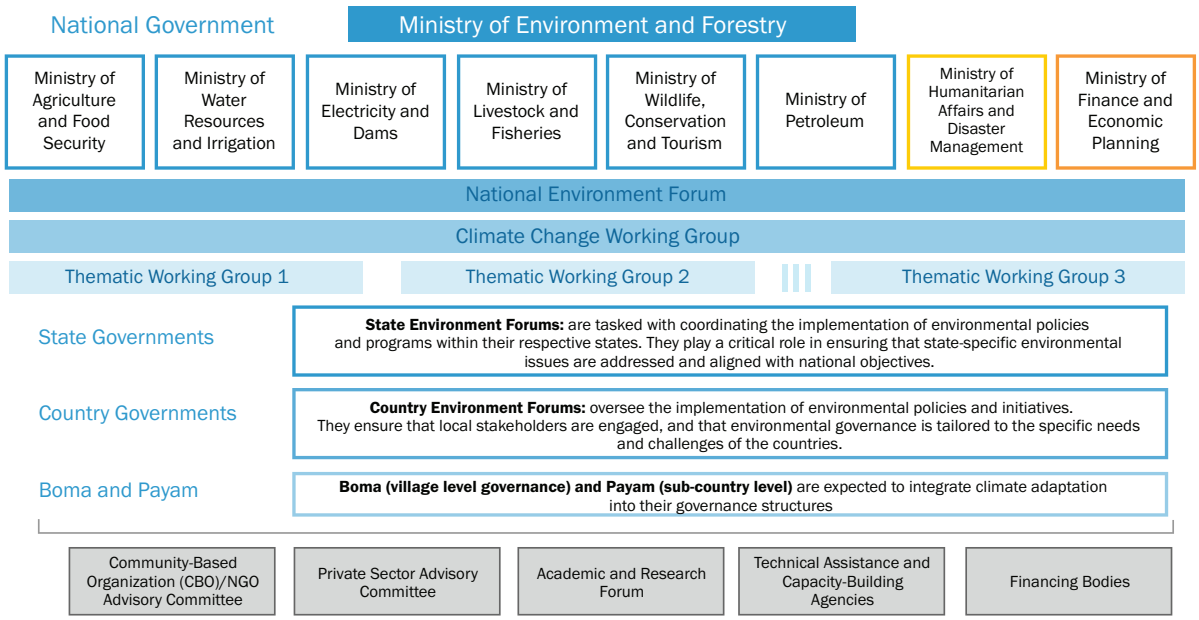
Sources: Government of South Sudan 2018, 2021a, 2021c

The National Environment Policy 2015–25 describes coordination mechanisms to enhance intergovernmental cooperation for climate change at national and subnational levels. South Sudan's governance structure (figure 2.1) is characterized by five levels: the national government, ten states, and three administrative areas: local/county, *boma* (village), and *payam* (subcounty). Each level has distinct roles and responsibilities in managing and protecting ecosystems, biodiversity, and forestry. The Climate Change Working Group (CCWG) and thematic working groups facilitate horizontal coordination across government ministries and stakeholders, while a decentralized governance model ensures vertical coordination across national, state, county, *payam*, and *boma* levels. The policy envisages that the Climate Change Finance Interministerial Steering Committee manage climate financing, particularly Green Climate Fund (GCF) funds. Nongovernmental engagement includes advisory committees for community-based organizations, NGOs, private sector, and academic institutions to ensure broad participation.

The coordination mechanisms intend to ensure effective implementation and collaboration between stakeholders across different government levels and sectors. Responsible for overseeing policy implementation across the country, the **National Environment Forum** analyzes and debates the results of annual and quarterly reports from state-level forums, facilitating a coordinated approach to environmental governance at national level. Tasked with coordinating the implementation of environmental policies and programs within their respective states, the **state environment forums** play a crucial role in ensuring state-specific environmental issues are addressed and aligned with national objectives. Overseeing the implementation of environmental policies and initiatives, **county environment forums** ensure local stakeholders are engaged and environmental governance is tailored to specific

county needs and challenges. The policy also emphasizes the importance of **coordinating, cooperating, and collaborating with local stakeholders**, from development partners to NGOs and community-based organizations, to address environmental matters effectively at the grassroots level. Finally, it encourages **cross-sectoral collaboration** to ensure environmental considerations are integrated into various development plans and initiatives, thus addressing environmental issues holistically and promoting sustainable development practices across all sectors.

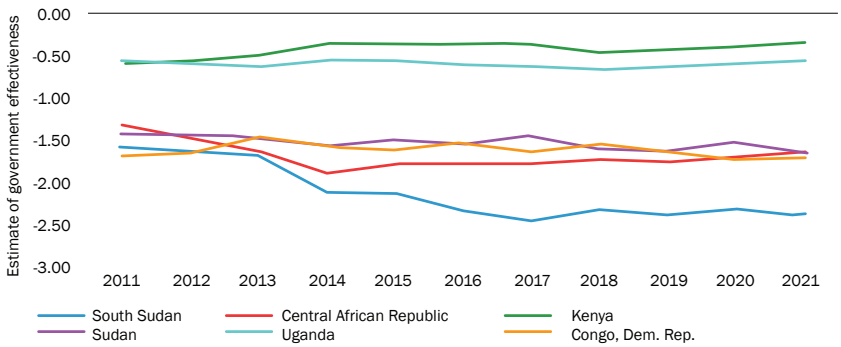
Figure 2.1. Climate change governance structure



Source: World Bank staff elaboration, based on Government of South Sudan 2018, 2021c, 2021a

However, a lack of institutional and financial capacity seriously constrains the implementation of climate policies and plans. Government effectiveness has been in sharply decline over the past decade, and the country's government effectiveness score (-2.38) was the region's lowest in 2021 (figure 2.2). Common challenges ministries face in designing and implementing climate policies include inadequate legal frameworks, a lack of office infrastructure, and limited technical capacity for integrated resource management. Ongoing conflict and insecurity further curbs the MoEF's ability to organize inclusive and participatory processes for climate action planning, creating obstacles to mainstreaming climate considerations into government policies, plans, and programs. Coordinating climate change actions across different national agencies is challenging, as the lack of a robust national early warning and early action coordination mechanism hinders effective multisectoral and multihazard responses to extreme events. These challenges are compounded by a lack of data, low staffing levels, and inadequate attention to disaster risk communication across various tiers of governance. The lack of clarity around state and local government roles also limits local administrative capacity and weakens government structures, while poor coordination between central and state governments creates challenges in resource allocation and accountability. The private sector is hindered by inadequate infrastructure, skills shortages, limited capacity to develop bankable climate finance proposals, and restricted access to capital. Public understanding of climate change is also low, largely due to an absence of locally relevant information and a lack of vulnerability assessments to guide adaptation planning.

Figure 2.2. Estimates of government effectiveness in selected African countries, 2011–21



Source: World Bank Worldwide Governance Indicators data 2023

Land tenure insecurity is a critical barrier to a successful climate response in South Sudan, given the nature of the impacts on and resilience needs in rural livelihoods. Formal land security measures outlined in the Land Act of 2009—such as land surveys, demarcation, registration, and titling—have been largely unenforced. This creates tenure insecurity, particularly in rural areas, where land conflicts frequently arise due to overlapping communal claims and climate-induced displacement. Without legal recognition and protection of land rights, individuals and communities are at risk of displacement, especially in the wake of climate disasters such as floods and droughts. Climate-displaced persons also receive less priority in land allocation than those displaced by conflict, further complicating resilience-building efforts (BRACED 2018). The lack of secure land tenure also discourages investment in more sustainable forms of agriculture and land management, which typically require higher inputs (particularly of labor) in return for higher sustained production.

South Sudan's institutional framework for climate-responsive land management lacks coordination and suffers from weak governance and policy fragmentation. The MoEF, MAFS, and South Sudan Land Commission are among many ministries that oversee land-related policies, and inadequate communication and coordination lead to inefficiencies in land management and climate adaptation efforts (MAFS 2020). The absence of a comprehensive land use framework with integrated climate resilience strategies, alongside a lack of environmental data and land-use planning, further exacerbates land degradation and resource mismanagement, while corruption and nepotism within land administration institutions undermine the equitable allocation of land and limit efforts to implement sustainable land management practices. Limited consultation processes also constrain informed decision-making, with marginalized groups often excluded from climate adaptation decisions, particularly in remote rural areas, deepening social inequalities and reinforcing grievances that can fuel instability (Watson 2021; Tiitmamer 2022; Da Costa 2013).

The following recommendations can help South Sudan create a more integrated and efficient approach to climate action and elaborate ambitious, actionable, and sustainable climate policies.

1. **Strengthen, clarify, and communicate the role and progress of the CCWG to government agencies and the public.** As the CCWG should ensure transparent reporting on the progress of major climate policies, raising awareness of its work and fostering inclusiveness will enhance trust and participation from stakeholders at all levels. Formalizing and building the capacity of thematic working groups would also improve coordination among sectors and institutions addressing climate change. By aligning efforts across ministries, development partners, and local actors, the government can optimize resources and foster integrated approaches to climate action, ensuring tangible progress in adaptation and mitigation efforts.

2. **Create local awareness of climate change for systemic action.** Given the population's dependence on agriculture, forestry, and fisheries for their livelihoods, raising local awareness may lead to more effective adaptation strategies and community-driven solutions. Local awareness can also help

address climate-related challenges such as drying seasonal streams, increased deforestation, and resource-based conflicts between pastoralists and farmers (UNDP 2017). Developing ecosystem-based adaptation projects to enhance local participation can also support the functioning of the environment forums proposed in the National Environmental Policy.

3. **Improve the leadership of the MoEF.** This requires enhancing institutional capacity, strengthening coordination mechanisms, and ensuring the ministry's active involvement in climate policy formulation and implementation. Investing in building the MoEF's technical and managerial capacity, particularly within its Climate Change Unit, and fostering stronger coordination with other relevant ministries, such as finance, agriculture, and energy can help achieve this. A National climate change council, modeled on the Kenyan and Nigerian councils, could notably strengthen climate governance structure in South Sudan.

2.2. Integrating climate and DRM into PFM systems

The country's PFM system is extremely weak, characterized by a lack of transparency and accountability. Corruption, poor institutional capacity, and limited reporting on public investment projects feed opacity and non-accountability of the PFM system. Despite constitutional provisions mandating PFM accountability and technical support from international partners, the National Audit Chamber (NAC)—South Sudan's supreme audit institution—faces severe operational constraints such as resource shortages and political interference, and has not published any audited financial statements since 2011. A large portion of government spending, particularly on the oil-for-infrastructure scheme, remains opaque, with weak oversight in project approvals, procurement, and expenditure reporting. Oil revenues could contribute significantly to meeting the country's interlinked climate and development needs. At the same time, weak tax administration and a narrow tax base mean that non-oil revenue is also severely underused, contributing only 5.8 percent of GDP in 2023. Legislative oversight is similarly weak, with South Sudan scoring only 28/100 in the Open Budget 2023 Survey for legislative oversight functions, reflecting limited parliamentary scrutiny of budget execution. Debt management is also weak, with non-concessional borrowing practices and insufficient coordination between the MoFP and Bank of South Sudan.

Operating under the 2011 PFM and Accountability Act, the PFM system has, however, undergone reforms since 2024 to improve fiscal transparency, expenditure control, and debt management. The government has also taken steps to publish quarterly budget execution reports, enhance the accountability of oil revenues, and integrate financial controls through the Treasury Single Account. Efforts to improve transparency also include donor-supported initiatives such as technical assistance from the International Monetary Fund and World Bank. But while these programs have introduced reforms such as the Integrated Financial Management Information System, their effectiveness is constrained by weak governance structures and political will.

South Sudan's prioritization of climate action in budget allocation processes is extremely limited. Despite the MoFP's crucial role in allocating funds to ministries, departments, and agencies to address disasters and its position on the Climate Change Finance Interministerial Steering Committee, there is no independent policy or framework expressly addressing climate change financing. The MoFP lacks institutional perspective on the need for climate-related resource allocation, and focuses on short-term priorities such as safety and social protection. The budget allocation for the MoHADM in FY25 represents only 0.04 percent of the total national budget, while the MoEF, tasked with leading the country's climate response, is among the least-funded ministries, departments, and agencies, accounting for only 0.05 percent of the total national budget. This inadequate funding severely impedes the MoEF's ability to fulfill its mandate under the Environmental Policy 2015–25, NAP, and NDCs and reflects the broader issue of limited financial support for climate action, preventing it—and its Climate Change Unit in particular, from effectively implementing adaptation and mitigation strategies, raising awareness about climate needs, and ensuring cross-sectoral coordination to address the country's climate vulnerabilities[10].

[10] MoFP, annual budget books

The MoFP relies on development partners and coordination with other ministries to fund and manage climate change activities. It has no specific environmental unit; rather, assigned officials collaborate with the MoHADM and other sectors to manage climate-related activities. Most climate change initiatives are funded by development partners and the humanitarian sector, underscoring the country's heavy reliance on donor support and the urgent need for local resource mobilization and sustainable financing mechanisms. For FY25, the MoFP has allocated SSP 173 billion to the social humanitarian affairs sector to address floods, droughts, and conflict-related displacement. But despite this allocation, its role in direct climate change mitigation and adaptation efforts remains limited.

The implementation of climate action policies is also hindered by systemic challenges. While South Sudan has climate action policies to guide environmental projects, implementation remains a major concern. Delays in disbursing allocated funds to the MoHADM, weak monitoring and evaluation mechanisms, and the absence of targeted budgeting significantly undermine the effectiveness of these policies, highlighting the need for stronger governance and resource allocation systems to support climate resilience.

South Sudan is taking steps to address the lack of a policy framework for climate financing. The Regional Climate Resilience Program intends to formulate a climate financing policy developed through stakeholder consultations involving the MoFP, MoEF, and MoWRI. The program aims to conduct feasibility studies and establish a robust policy by 2028, marking a crucial step toward institutionalizing climate finance in South Sudan.

To reduce its dependence on volatile and non-transparent oil revenues, South Sudan needs to strengthen its domestic climate financing and diversify its revenue streams. The following recommendations can help it implement broad-based development, structural PFM reforms, and targeted climate-focused measures.

1. **Enhance PFM transparency for existing revenues.** Publishing PFM and fiscal reports, strengthening the role of parliamentary scrutiny, and increasing civil society knowledge for reviewing and analyzing PFM reports can help promote transparency and accountability around public resource management. To complement these measures, the NAC must play a stronger role in auditing climate-related public expenditure to improve reporting on climate finance allocations. Independent climate expenditure audits ensure accountability in public finance for adaptation (OECD 2024). Providing resources and technical training to effectively audit climate-related expenditures would strengthen the NAC's mandate. Along the same line, oil-backed loans have financed large-scale infrastructure but often operate outside formal budget processes. The 2024 PFM and Accountability Act introduced parliamentary oversight, which could be enforced through rigorous project appraisal and transparent loan terms (IMF 2024b). Embedding "green PFM" principles (IMF 2021) can include publishing loan documentation and prioritizing financing for projects that contribute to resilience, such as climate-proofed roads or flood defenses. Fostering public participation in the budget cycle through open budget hearings or civil society organization collaboration with local governments also ensures accountability and helps align spending with community-level priorities.

2. **Align budget formulation and execution with climate priorities.** Strategic planning for climate finance requires climate adaptation measures to be incorporated into national budgeting and macrofiscal projections. To enhance South Sudan's budget formulation process, the MoFP could explicitly integrate climate risks into macrofiscal projections and revenue forecasts and introduce a green budgeting framework that includes climate-focused spending ceilings within its sectoral plans. This could imply: incorporating climate adaptation and mitigation targets; integrating climate change programs into the Medium-Term Expenditure Framework; building sector working groups' capacity to use climate data and cost-benefit analysis tools (NDC Partnership 2024); and developing a firm calendar that fosters stakeholder participation and ensures timely finalization (AFD 2022). Embedding climate-responsive PFM practices in budget execution through climate budget tagging within the Integrated Financial Management Information System or including contingency funds for climate shocks could also be key for tracking how funds are spent against green priorities (IMF 2021).

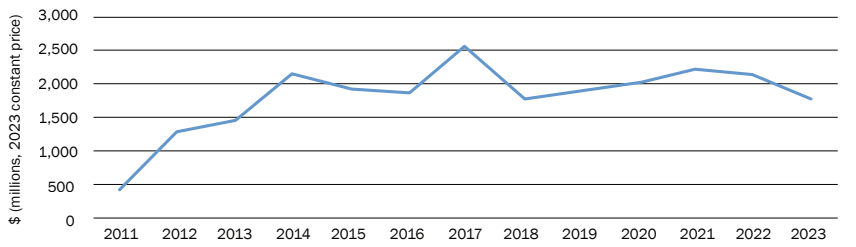
3. **Pursue green and resilient public procurement/public investment management (PIM).** South Sudan has established a PIM department within the MoFP and, while this is a positive step toward structured investment planning, enhancing the department's capacity to conduct climate-resilient investment appraisals is vital. This could include: requiring systematic climate risk and vulnerability assessments for all major public investments (OECD 2024); climate-responsive cost-benefit analysis training for the PIM department; and using donor-supported technical assistance to ensure enhanced monitoring and evaluation by tracking project outcomes more rigorously and promoting data-sharing between line ministries (NDC Partnership 2024).

Adapting available tools on green budgeting and climate-responsive PFM can significantly enhance South Sudan's capacity to tackle economic instability and climate vulnerability. Embedding climate priorities in budget preparation, investment management, and transparency mechanisms can help the country channel scarce resources toward long-term resilience and improve the likelihood of attracting more external funding. But success depends on three factors. First, **political commitment**—which can be demonstrated through the credible enforcement of the amended PFM and Accountability Act (2024) and Public Procurement and Disposal of Assets Act (2018), alongside consistent legislative support—is vital for effective reform (IMF 2024b). The second is **institutional capacity**. Building up specialized units within the NAC, the PIM Department, and procurement committees would help ensure climate objectives are not sidelined by competing priorities (OECD 2024; IMF 2021). Finally, **stakeholder engagement** is essential, as collaboration between government agencies, donors, and civil society fosters transparency and robust public investment in climate adaptation (NDC Partnership 2024).

2.3. Sources of climate finance

Since gaining independence in 2011, South Sudan has received substantial official development assistance (ODA) (figure 2.3). The United States has been the largest donor ($622 million in 2018–19), followed by the United Kingdom ($234 million), Germany ($140 million), and UNICEF ($108 million). In 2019, 55 percent of ODA was humanitarian aid, serving immediate lifesaving needs. But the Organisation for Economic Cooperation and Development projects a 9–17 percent decline in ODA in 2025, with the outlook beyond that year remaining uncertain. This projected reduction is driven by announced cuts from four major ODA providers—the United States, United Kingdon, France, and Germany—whose assistance is heavily concentrated in a limited number of countries, including South Sudan, making it particularly vulnerable to these funding contractions (OECD 2025). Since the reduction in ODA will have a significant macroeconomic impact on South Sudan, the country must identify ways to reduce this vulnerability as traditional sources of financing will be insufficient.

Figure 2.3. Net ODA received, 2011–23

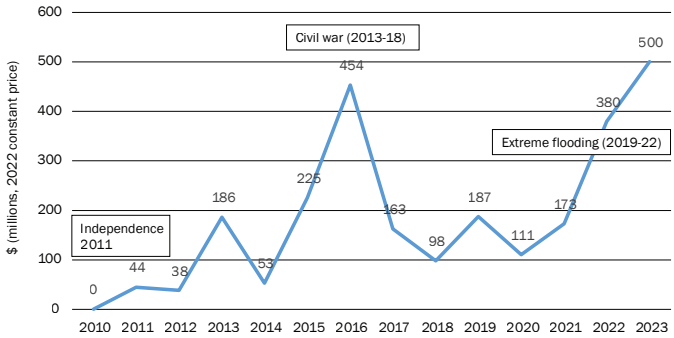


Source: World Bank 2025h

Climate-related ODA has shown an upward trend over the past decade but remains characterized by significant volatility and is far below South Sudan's actual needs (figure 2.4). ODA for climate-related activities increased sharply from just $43 million in 2011, shortly after the country's independence, to $364 million in 2022, in response to the unprecedented flooding and extreme weather events during that period. Only a very small proportion of this climate-responsive ODA has come from dedicated global climate funds. The Global Environment Facility offered a grant of $20 million in 2023 to finance climate adaptation implemented by the Food and Agricultural Organization of the United Nations and

the International Fund for Agricultural Development with a focus on agriculture, disaster risk reduction, water resources, policy, and institutional frameworks between 2024 and 2030. Additionally, South Sudan has received GCF readiness support to enhance its capacity to access climate finance. This includes strengthening the institutional capacities of the MoEF as the national designated authority to effectively engage with the GCF and develop a country program (GCF 2018).

Figure 2.4. Climate financing trends, 2011–22



Source: SPARC 2025

Although global delivery of concessional climate finance has increased in recent years, it remains insufficient to meet global climate goals (Naran, Zhang and Gupta 2024). Between 2019 and 2022, international concessional climate finance grew by 50 percent, reaching $81 billion in 2022, with Sub-Saharan Africa receiving the largest share (30 percent), followed by South Asia and Latin America (16 percent each). But concessional climate finance remains significantly lower than global fossil fuel subsidies, which reached $1.3 trillion in 2022. The main sources of concessional climate finance include bilateral development finance institutions (33 percent), multilateral development banks (30 percent), and direct government contributions (26 percent). Multilateral climate funds contributed only 5 percent. Concessional loans mainly target climate mitigation projects while grants tend to focus on adaptation and resilience efforts.

In addition to broadening the overall tax base, South Sudan could significantly increase domestic resource mobilization for climate adaptation through climate-focused fiscal instruments. There are several ways of taxing the high-emitting oil and gas sectors to support adaptation priorities. One is the gradual implementation of carbon pricing, introduce a modest carbon tax on oil and gas production, and increasing it gradually over time. It could also introduce a differentiated tax structure that varies based on the carbon intensity of operations. Another is to earmark existing revenues, allocating a portion of current oil and gas revenues to climate initiatives and adaptation projects without introducing new taxes. The government could also consider eliminating fossil fuel subsidies, introducing a temporary windfall tax on oil companies during periods of high oil prices, improving efficiency and transparency in the oil sector, and issuing sovereign green bonds, backed by oil revenues, to finance climate projects.

There is significant potential for private sector involvement in South Sudan's economic transformation, particularly through climate-related investments and sustainable natural resource exploitation. The private sector could play a crucial role in supporting the climate mitigation and adaptation agenda in key areas. Public-private partnerships (PPPs) provide a key entry point for procuring climate-resilient infrastructure projects by establishing incentive structures that allow for resilient and adaptive assets or services, enabling effective risk allocation between public and private partners, and stimulating innovation in resilient design standards and nature-based solutions (World Bank 2022). Large-scale projects requiring substantial capital and technical expertise—such as developing climate-resilient water systems or expanding clean energy access—may also benefit from PPP involvement (IADB 2020). The private sector could also invest in agriculture by developing and providing training in climate-resilient farming techniques, such as timely planting, crop spacing, mulching, mixed cropping, and irrigation methods. Training programs in food-insecure communities can enhance gender-responsive food production, market-based distribution, and household nutrition. There are also opportunities for private

sector actors to improve financial inclusion of vulnerable groups by expanding mobile money channels for cash assistance distribution, developing financial services to support income-generating activities, creating insurance services adapted to vulnerable populations' needs, and supporting village savings and loans associations. There are also opportunities in sustainable biomass energy production using wood, agricultural residues, and organic waste, and developing renewable energy infrastructure to reduce rural-urban disparities (World Bank 2025a).

But several barriers hinder private sector contributions to climate finance and green growth. These include inadequate infrastructure, skills gaps, capacity shortages to develop bankable climate finance proposals, limited access to capital, and high lending rates (averaging 12 percent in 2022). South Sudan's banking system is underdeveloped, constrained by deep-rooted structural and operational weaknesses. The financial sector is small and bank dominated, with total banking assets amounting to approximately 32 percent of GDP. Over two-thirds of commercial bank income is derived from foreign exchange transactions, leaving banks highly exposed to external shocks. Given the central role of oil in generating foreign exchange, the sharp decline in oil exports in 2024 severely impacted bank revenues and increased financial stability risks, which were further compounded by the undercapitalization of several banks and persistent sector vulnerabilities. Financial inclusion and small and medium enterprise access to credit in South Sudan are among the lowest in Sub-Saharan Africa, and limited financial intermediation poses a major constraint to private sector development and economic diversification (World Bank 2024b).

The investment climate is severely constrained by South Sudan's dire macroeconomic conditions and structural bottlenecks. Recent deterioration in economic activity, coupled with the rapid depreciation of the exchange rate and soaring inflation, has significantly undermined investor confidence and private sector recovery efforts that had begun in FY22 and FY23. While domestic credit to the nongovernmental sector rose modestly to an estimated 3.4 percent of GDP in FY24—up from 2.4 percent the year before—access to finance remains limited. Despite a reduction in violent conflict, ongoing supply chain disruptions, the proliferation of checkpoints, and multiple layers of taxation continue to weigh on business activity (World Bank 2025e).

Developing a clear and transparent strategy for using limited concessional resources to leverage private capital would help build investor confidence and mobilize sustainable financing at scale. The following strategies can help facilitate private sector involvement and create an enabling environment for climate-related investments.

1. **Develop robust policy and regulatory frameworks.** This includes establishing clear climate targets, implementing carbon pricing mechanisms, and creating incentives for green investment. For example, developing policies that encourage renewable energy adoption or sustainable agriculture practices, streamlining bureaucratic processes, and improving transparency can make it easier for private companies to engage in climate projects. The government could also focus on building institutional capacity to design and manage climate-related initiatives, including PPPs.

2. **Mitigate project risks and build resilience.** Developing strong relationships with local authorities and stakeholders, implementing transparent and ethical business practices, and managing fragility risks through stakeholder engagement and security risk management are essential. To ensure appropriate integrity due diligence levels, developing comprehensive and participatory due diligence processes and adhering to high ethical standards in partner relationships is also vital. A thorough analysis of conflict dynamics and contextual risks, notably by considering local and external conflict factors, implementing feedback mechanisms for stakeholder engagement, and developing environmental, social, and governance principles would also be needed. The financial management capacity could focus on improving working capital management practices, enhancing management information systems, and ensuring compliance with international financial reporting standards. Natural disaster management could be improved by developing emergency response and business continuity plans, implementing remote sensing technology for disaster monitoring, establishing collaboration with local communities and institutions, and developing community-

based early warning systems. Implementing inclusive grievance mechanisms, creating income-generating activities training programs, and integrating gender-sensitive approaches in climate resilience initiatives would help develop culturally appropriate engagement mechanisms for women. Finally, to tackle forced displacement, private sector investment strategies could integrate and create employment opportunities for IDPs and refugees in their corporate value chains.

3. **Address infrastructure and skills gaps.** Investing in critical infrastructure such as climate-resilient road network improvements would help enhance connectivity between urban and rural areas and develop export-oriented transportation infrastructure, while supporting education and training programs would help develop the necessary skills for implementing climate-resilient projects.

4. **Improve access to finance.** South Sudan's private sector currently faces limited access to capital and high lending rates. In the long term, the government could work with international financial institutions to develop innovative financing mechanisms, such as blended finance or green bonds, to de-risk investments and make climate projects more attractive to private investors—given the complexity of these measures and the lack of conditions in South Sudan, these measures cannot be considered for the short or medium term. Regional and international carbon markets also offer opportunities for private sector participation by providing economic incentives through emissions trading, initially at project level, especially in agriculture, land and waste management, and renewable energy. Strengthening the rule of law, modernizing market access policies, streamlining investment procedures, building robust legal frameworks that align with international standards, revising restrictions on foreign participation, establishing clear mechanisms for investor grievances, and developing stronger linkages between foreign investors and local suppliers would also help create a more transparent, predictable, and efficient investment climate and attract foreign direct investment flows (World Bank 2025e).

3. Multisectoral policy packages for resilient and low-carbon development

3. Multisectoral policy packages for resilient and low-carbon development

3.1. Integrating flood risk management in the development process

South Sudan is one of the world's most exposed countries to fluvial floods, due to a combination of climate, hydrological, and institutional risk factors. It ranks seventh for share of total country population exposed to fluvial floods, just behind Bangladesh and Myanmar, which are well-known flood risk hotspots (WRI 2019). Dominating in the central and eastern parts of the country, where the largest rivers are located, fluvial floods are directly linked to rainfall patterns in the African Great Lakes region, where the White Nile originates, and in the Ethiopian Highlands. As a result of the country's flat landscape and impermeable clay and silt soils, floodwaters persist for long periods, receding mainly through evaporation, which helps maintain rainfall over Ethiopian highlands (Mohamed et al. 2005). Approximately 3.5 million poor South Sudanese,[11] or 21 percent of the population, are exposed to 1-in-100-year flood events (World Bank 2023e).

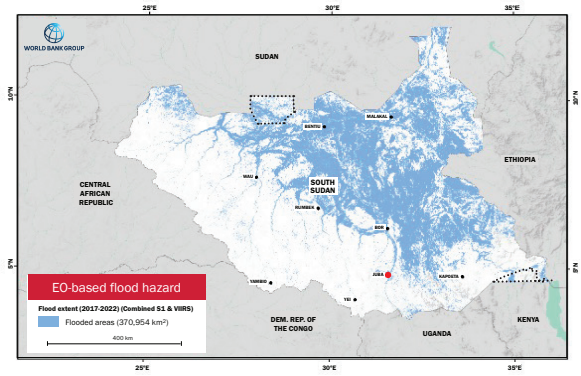
Two factors may explain this exposure. First, institutional fragility and insecurity have led to protracted displacement cycles, increasing the population's exposure and vulnerability floods. While fleeing violence and conflict, many South Sudanese take refuge in vast floodplains and wetlands that act as a defensive barrier against armed conflict. But these same "walls of water" place populations at higher risk of recurrent displacement and death due to floods, highlighting the complexity of the factors driving vulnerability.

Rapid urbanization is also changing the pattern of flood exposure. South Sudan is a predominately rural country, where only around 21 percent of the population lives in cities and towns. But the number of urban dwellers is growing rapidly (at around 4 percent per year), driven by migration and forced displacement. Settlements are expanding in a mostly haphazard manner, encroaching into flood hazard areas. While some rapidly growing urban areas (such as Abyei, Bentiu, and Aweil) are highly exposed to fluvial flooding, pluvial flooding from heavy rainfall is becoming an increasing challenge in Juba and other growing centers characterized by limited drainage, an increase in impervious surfaces, and a loss of wetlands and other green areas (World Bank 2025i).

Floods greatly impact South Sudan's economic development. More than two-thirds of the country's area faced flooding during 2017–22, with central and northeastern areas—where social vulnerability is highest—most affected (figures 3.1–3.4). Flooding around the Sudd due to the annual Nile flood pulse increased dramatically in 2019 and has remained at elevated levels ever since. The socioeconomic consequences of floods are far-reaching. Nearly half (45 percent) of South Sudan's cropland is exposed to floods—mostly in Greater Upper Nile, Northern Equatoria, and Eastern Bahr el-Ghazal (figure 3.3)—and 43 percent of its pastures (16,430 km2) are also exposed. In 2021, floods destroyed over 37,000 tons of crops and killed nearly 800,000 livestock (FAO 2021). Such exposure contributes to malnutrition and health risks for women and children, who are forced into areas with poor access to basic services, as floods exacerbate the condition of poorly maintained transport networks, often cutting off communities from access to food and health. The vast majority (98 percent) of the country's roads are unpaved and impassable for more than half the year (World Bank 2025d). At least 26 percent of its 38,217-kilometer road network is at risk, potentially disrupting connectivity and mobility (figure 3.4). Its health facilities are also exposed, with 58 submerged and another 90 inaccessible due to flooded roads in 2024. In October 2024 alone, these direct and indirect impacts affected an estimated 890,000 people (WHO 2024). About half of the country's airport infrastructure is also exposed to floods, and the oil industry is highly vulnerable. Recent floods impacted oil facilities in Upper Nile and Unity (PAX and University of Utrecht 2023), directly affecting oil production and increasing risks to public health, livestock, and ecosystems. Many schools have been rendered unusable, at reduced capacity, or difficult to access due to floods, disproportionately affecting girls, as families prioritize boys' education. Long-term impacts of disrupted education for girls include increased risk of early pregnancy, domestic violence, and sustained economic dependency among young women.

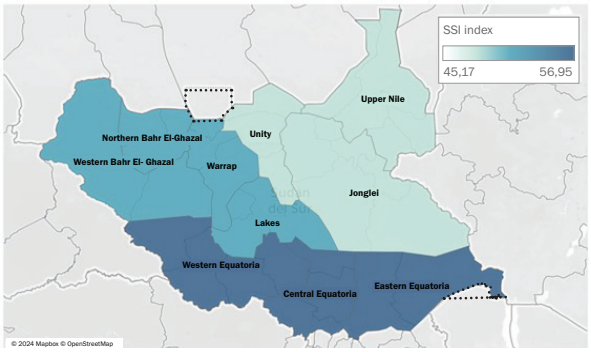
[11] The poverty level is defined at $1.90 a day.

Figure 3.1. Maximum flooded areas extent, 2017–22



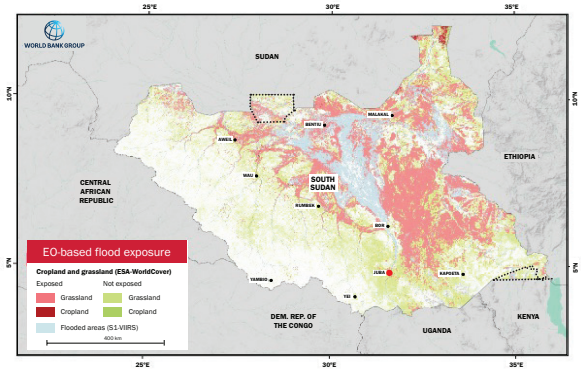
Source: World Bank staff estimates and design, based on Earth Observation data

Figure 3.2. Social sustainability index, by region



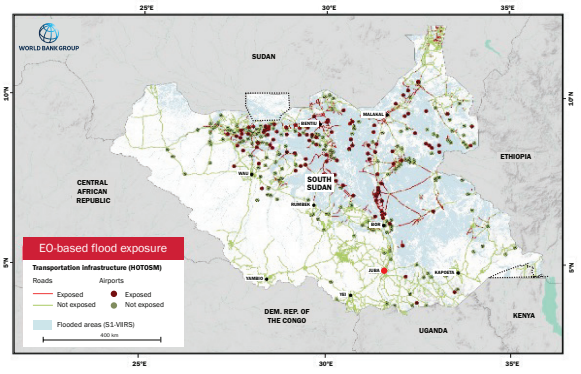
Source: World Bank staff estimates

Figure 3.3. Flood exposure of cropland and grassland, 2017–22



Source: World Bank staff assessment and design, based on Earth Observation data

Figure 3.4. Flood exposure of transport infrastructure, 2017–22



Source: World Bank staff assessment and design, based on Earth Observation data

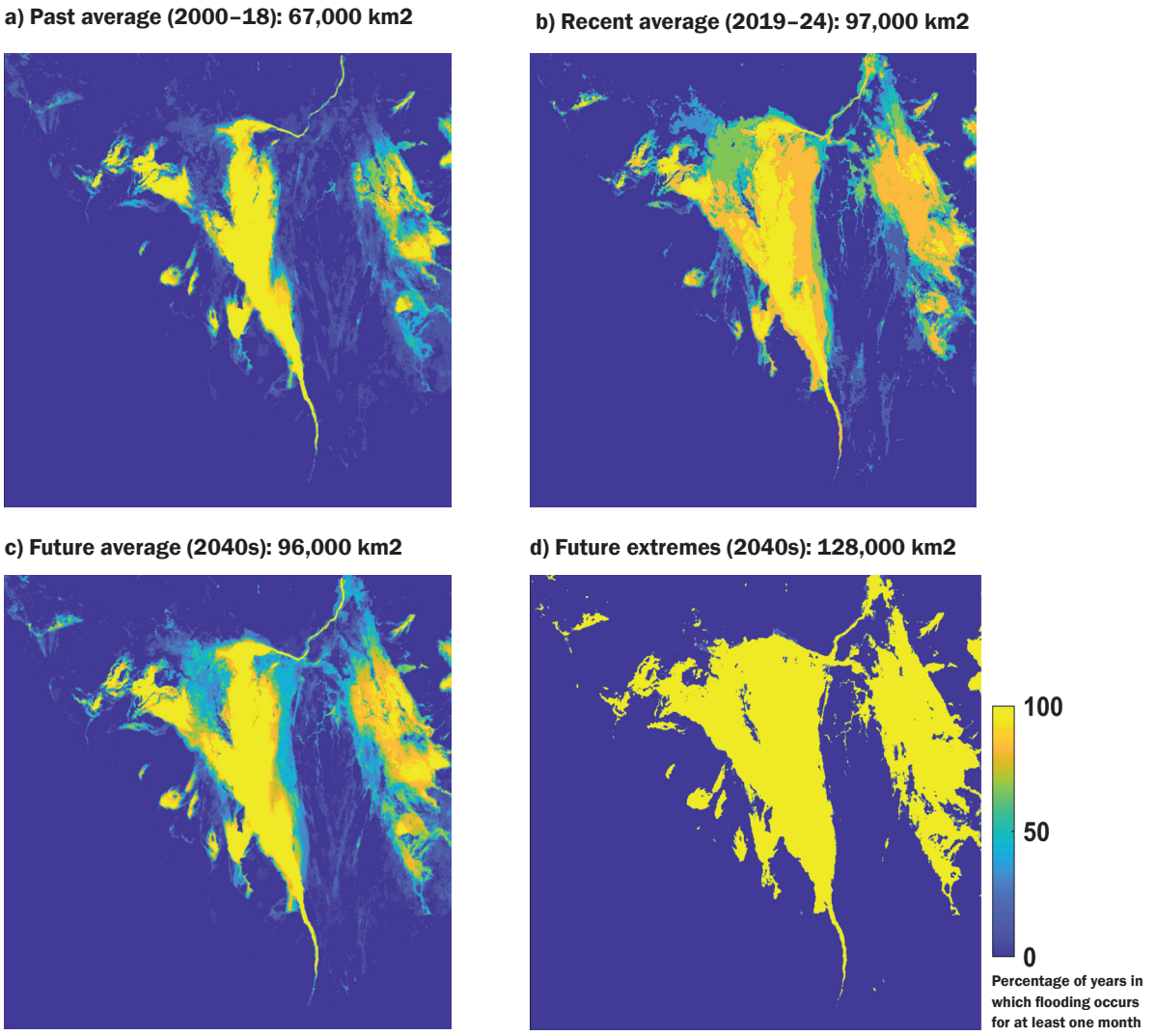
Floods are a major driver of displacement and subnational conflict. They are the second-most frequent reason for displacement mentioned by IDPs, after conflict (IOM 2024). In 2024, floods displaced at least 270,000 people, with Unity and Northern Bahr-el-Ghazal most affected (OCHA 2024a). Flooding also deepens the vulnerability of women and girls and increases their exposure to GBV. Areas close to the Sudd that experience high variation in land cover—from standing water during times of floods to grasslands when the waters recede—experience frequent conflicts (Sosnowski et al. 2016), particularly at the boundary between Unity and Warrap states, often as a result of pastoralist migration into agrarian farmlands. Between 2019 and 2022 alone, record floods submerged traditional grazing lands in Jonglei, Unity, and Upper Nile, forcing displaced pastoralists to seek alternative pasture in Equatoria. Traditional mediation structures largely fail to address emerging disputes, as pastoralists encroach on agrarian land without agreements or compensation frameworks. With little state protection, farming communities have periodically mobilized youth militias, further escalating violence (with pastoralists often receiving similar support from political and military elites). Regardless of flood subsidence, few herders return to their home areas in Jonglei, Twic East, and Duk as the land remains unproductive and insecurity persists; instead, armed pastoralists migrate further south into southern Equatoria.

South Sudan is projected to face even greater risk of flooding and related impacts. The proportion of the population exposed to flooding excluding the Sudd area is projected to increase by 2.6 percent and 9.6 percent by 2050 in the event of a 50- and 100-year flood, respectively, under SSP3-7.0 and BAU development scenarios, compared to less than 1 percent in the historical reference period (IEc 2025e). Even larger impacts are expected around the Sudd, where flooding is expected to be the new normal by

mid-century (figure 3.5). The area flooded under a 10-year event is projected to be around 30,000 km2 larger (figure 3.6), and there is a 50 percent chance the area of permanent inundation will be at least 2,000 km2 larger and a 10 percent chance of it being 16,000 km2 larger (figure 3.7). Although this could lead to substantial increases in fish production, other socioeconomic impacts are predominantly negative. By mid-century, under BAU development and wetter climate scenarios, these could include:

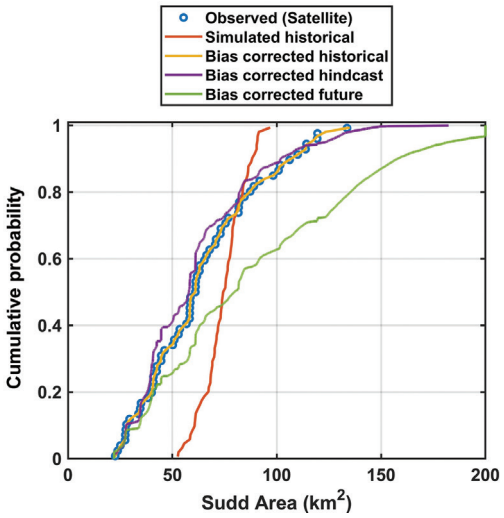
- Doubling the exposure of oil fields compared to the historical reference period (-8.5 percent vs. -4 percent) (figure 3.8)
- Almost twice the number of residential and non-residential buildings affected, and an additional 30 percent of critical health facilities directly impacted by a 20-year flood
- Increasing the area of crop and grazing land affected by flooding from 13.5 to 18.4 and 33.2 percent, respectively
- Larger areas being permanently inundated, leading to a 50 percent chance of at least 1.4 percent of the national population being displaced, and a 10 percent chance of at least 5.5 percent being displaced (table 3.1).

Figure 3.5. Annual maximum flood extent in the Sudd, 2000–40s



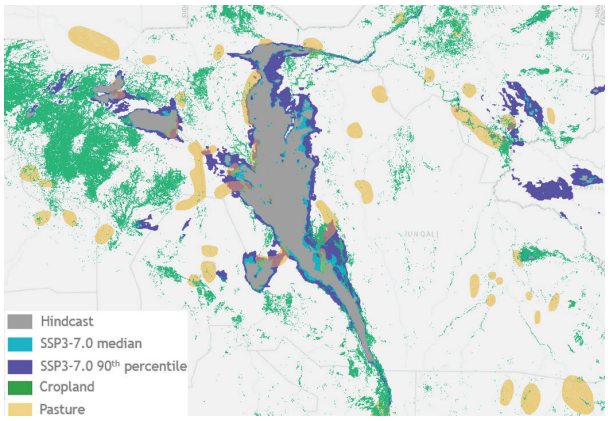
Source: IEc 2025b

Figure 3.6. Bias correction of modeled Sudd areas, 2000–40s



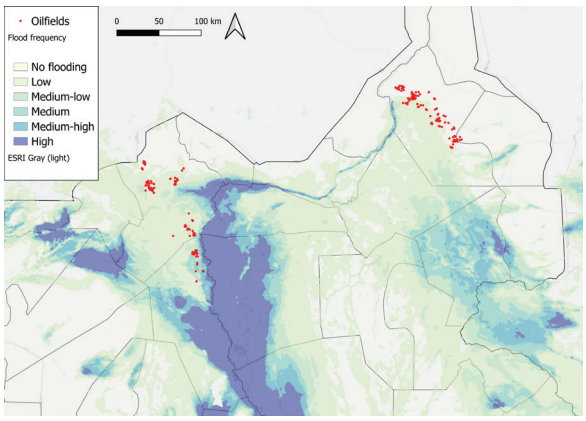
Source: IEc 2025b

Figure 3.7. Projected changes in areas of the Sudd that are permanently inundated at least half the year, 2040s



Source: IEc 2025b

Figure 3.8. Oil fields exposed to projected Sudd-related floods, 2050



Source: IEc 2025b

Table 3.1. Population displaced by new inundations by the 2040s, due to permanent flooding in the Sudd

People displaced (% of national population)			
Percentile	**Historical**	**SSP2-4.5, 2040s**	**SSP3-7.0, 2040s**
Median	**0.0%**	**0.9%**	**1.4%**
75th	1.4%	4.2%	4.6%
90th	4.2%	5.2%	5.5%

Source: IEc 2025b

Although mobility is a key coping strategy, it comes with considerable costs to displaced communities and risks exacerbating conflict and must therefore be managed carefully. In response to changing patterns of flooding, communities frequently move livestock and pastoral grazing routes and migrate to local centers where there is some protection from floodwaters and they can access critical services and aid. As the areas that are subject to frequent or permanent flooding expand, such movements may become permanent, either to local displacement centers or to other parts of the country offering greater perceived opportunities. Such moves come at considerable cost, through loss of lands and community networks. Large-scale movements also exacerbate conflict dynamics through a variety of pathways. It is therefore important to manage mobility carefully, equipping communities with knowledge to ensure they make informed choices and the skills they need to adapt livelihoods to changing circumstances—whether in situ or in new locations—and mitigating conflict risk. For flood-vulnerable communities, this involves community-based participatory flood risk assessment to understand coping mechanisms and social vulnerabilities, and how these are likely to be impacted by future flood patterns. This should be followed by tailored livelihood support linked to flood risk and supported by early warning systems tailored to provide actionable messages. For displaced communities, links to critical social services should be re-established, with support and development investments taking an area-based approach that includes both displaced and host communities and incorporates conflict-sensitive approaches, including identifying and responding to potential conflict triggers.

Combined with the unique environmental characteristics of the Sudd wetlands, the scale and hydrology of flooding in South Sudan make conventional engineering solutions extremely challenging. The Nile flood pulse is largely shaped by upstream hydrology and water storage infrastructure outside of South Sudan's control. In the flat topography of the vast Sudd wetlands, water spreads slowly and stagnates, creating extensive swamp conditions with no natural drainage. Large-scale engineering interventions face severe limitations due to the region's geomorphology and the ever-increasing unpredictability of rainfall patterns driven by climate change. The immense importance of the Sudd for local livelihoods, global biodiversity, and regional climate regulation means that any major flood management works in South Sudan would require extensive ground-breaking analysis and a comprehensive feasibility assessment that considers local and downstream risks in the watershed and airshed. There have been efforts to advance cooperative transboundary water management and development within the Nile Basin over recent decades. A basin-level approach to flood management that integrates hydrological data sharing, early warning systems, and joint infrastructure planning is in South Sudan's interest.

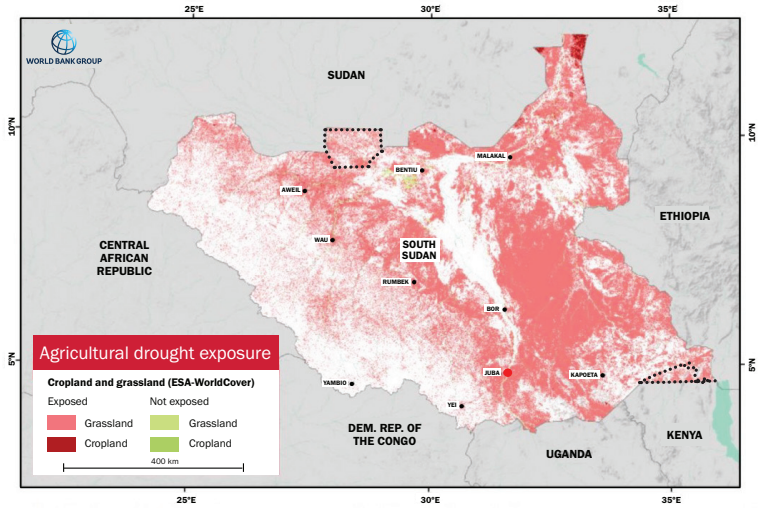
South Sudan's flood crisis demands a transformative adaptation shift that embraces flooded landscapes and reinvents livelihoods and basic services around them with a focus on community-based measures. Building resilience in flood-affected regions requires moving beyond attempts to control water, toward adapting to its presence. Flood-resilient and flood-based livelihoods and basic services are essential for reducing long-term vulnerability and displacement. Agriculture can adapt through facilitating flood-recession farming, which takes advantage of fertile soils left behind as waters recede, and the introduction of rice and other flood-tolerant crops that can withstand longer periods of inundation. Fisheries, already a critical livelihood in the Sudd, could be strengthened through improved resource co-management practices, investment in preservation and cold chain facilities, and development of local and export market access. Pastoral livelihoods also require support, particularly in mapping and protecting livestock corridors and identifying elevated refuges for dry season grazing. Basic service systems, including water and sanitation, can adopt flood-resilient infrastructure designs and community-based service delivery models that continue functioning even when access is cut off and land is submerged. Together, these strategies reframe recurrent floods from being solely a hazard to also serving as a productive ecological process, contributing to income stabilization, enhanced food security, reduced disease risks, and lower population displacement by enabling households to remain safely in place during and after flood events, strengthening community resilience to hydroclimatic extremes.

South Sudan's hydrological variability also implies a vulnerability to droughts. Drought risks are predominantly moderate across the country, with the southern and eastern borders displaying high drought hazard levels. The city of Malakal and its surroundings are most affected, experiencing a "very high" meteorological drought hazard over the studied period. In these areas, droughts led to poor crop growth or crop failure and reduced yields, as most recently observed in 2017, when failed rains led to an almost 10 percent reduction in aggregate food production (World Bank 2017).

Changing precipitation patterns associated with climate change have already affected surface water resources in South Sudan. Over the past two decades, water flow in perennial rivers along the border with Central African Republic—such as the Kiir, Lol, Jur, Gal, and Peyia rivers—has become seasonal. Climate change is expected to further affect water availability throughout the country in multiple ways. They include: droughts leading to a volume reduction of the water table, drier seasonal rivers, and a drop in wetland size; lower rainfall and inflows, leading to water stagnating into ponds due to prolonged dry seasons; and decreased water flows resulting in increased sedimentation of watercourses and more congested irrigation channels. A diminution of surface water levels and quality would heavily impact the 33 percent of the population that relies on surface water for domestic use, while decreased recharge rates would affect the 60 percent of the population that relies on wells and boreholes to access water (Government of South Sudan 2018). Finally, 30 years of low rainfall and periodic severe drought have notably led to disputes over water resources, domestically and with neighboring countries, with water rights contested between South Sudan and Sudan.

South Sudan's agricultural systems are extremely vulnerable to drought. As illustrated in figure 3.9, 97 percent of cropland and 99 percent of grasslands are exposed to agricultural drought conditions, indicating that both crop and livestock production are at risk during drought events. This near-complete exposure of cropland, grasslands, and pastures underscores the potentially severe implications for food security and rural livelihoods, as drought conditions simultaneously threaten staple crop yields and grazing resources essential for livestock.

Figure 3.9. Agricultural drought exposure assessment, 2001–22



Source: World Bank staff assessment and design, based on Earth Observation data

Drought-induced migration places pressure on host communities, leading to resource competition and intercommunal conflict. During prolonged dry periods, crops fail, livestock suffers malnutrition, and food insecurity rises. To prevent large-scale herd losses, pastoralists move toward perceived safer areas, often inhabited by neighboring ethnic groups. When migration occurs without prior coordination, tensions can escalate into violent clashes. In addition, weak governance structures prevent community leaders from negotiating migration terms, exacerbating disputes over access to land and water.

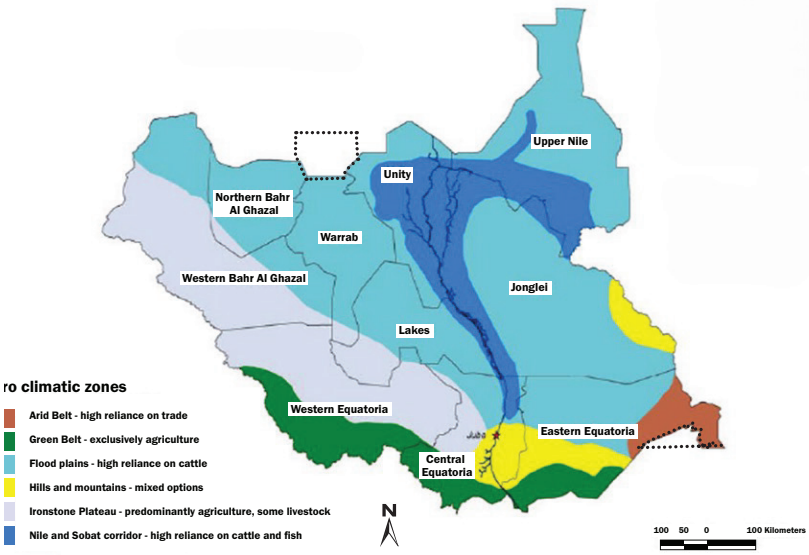
Successive droughts or erratic climate events increase the likelihood of long-term displacement, permanently altering migration patterns. Water sources and grazing areas cannot recover if hit by consecutive years of drought and flash floods, worsening food insecurity and intensifying resource competition. Frequent climate shocks leave little time for communities to rebuild lost livelihoods or repair strained relationships, increasing the risk of entrenched conflict and forced migration. Since cattle remain central to both Toposa and Dinka cultural identity, permanent migration is more likely than livelihood shifts.

An efficient response to climate change in South Sudan would require a change in the flood and drought risk management paradigm. Humanitarian and contingency responses are essential for addressing urgent challenges and meeting immediate needs. But they are not suited for providing long-term and cost-effective solutions to persistent hydroclimatological risks. Instead, a gradual transition toward a long-term, government-led, climate-resilient, conflict-sensitive development approach to water resource management is needed. Climate resilience, conflict sensitivity, and pre-existing socioeconomic vulnerabilities need to be embedded in all water-related interventions, to ensure that flood and drought risk management interventions strengthen community resilience and do not inadvertently lead to further violence or exacerbate socioeconomic fragilities.

3.2. Sustainable rural livelihood development and resilience

South Sudan is potentially one of Africa's richest agricultural areas. Located in the White Nile valley, it has very fertile soil, a variety of agroclimatic zones (figure 3.10), and plentiful rain and surface water, creating ideal conditions for a vast diversity of agricultural products. South Sudan has around five times as much agricultural land per capita than Kenya, Uganda, or Ethiopia, but only around 800,000–1.3 million hectares (1–2 percent of total land area) is cultivated. Rural households depend heavily (88 percent) on agrifood systems for their livelihoods, compared to about half of urban households. Agrifood systems could also have a tremendous job multiplier effect beyond primary production, and could benefit from the emergence of medium-sized professional farmers, as seen in other Sub-Saharan African countries, such as Kenya, Ghana, Tanzania, and Zambia, where dynamic and commercially oriented medium-scale (5–100 hectares) farms now amount to roughly 20, 32, 39, and 50 percent of total farmland, respectively, and have the potential to drive productivity growth and jobs generation.

Figure 3.10. Agroclimatic zones in South Sudan



Source: USAID 2019

Numbering around three times the human population, livestock is a key socioeconomic asset. Livestock rearing alone provides 60 percent of the population with livelihoods. Socioculturally, it is the basis for familial and extended social networks, wealth, status, and is used as payment for bride wealth, 'blood money', and other customary fines. Economically, it is used for barter and sale, to supplement household income to meet household needs. It is also an essential source of protein (via milk, ghee, meat, blood, and eggs), provides manure to enrich the soil, and improves rangeland biodiversity through seasonal grazing. Improving livestock value chains in areas with more abundant pasture and water resources, enhancing rural infrastructure, improving the indigenous stock, addressing governance issues, and investing in quality breeds and human resources could boost productivity and favor the sector's sustainable development.

With an estimated 300,000 fishers in the country,[12] more than one in six South Sudanese rely on fishing for their livelihoods. South Sudan has one of the world's most productive freshwater fisheries, driven by the highly variable annual flood dynamics. In low-flood years, potential yield is likely to reach over 400,000 tons, but in recent high-flood years, the potential production may have been several times higher, greatly exceeding the estimated current catch of around 300,000 tons. The catch may be worth around $450 million at local market prices. Fisheries also make a significant contribution to overall nutrition, representing 20 percent of average total protein and 46 percent of average animal protein consumption. It is also a vital coping livelihood strategy for communities impacted by flooding. The sector contributes 15–20 percent of government revenue at state level. The 18 percent general sales tax levied at the Nimule border post implies that the post alone may generate several million dollars in federal government revenue.[13]

Forests and wildlife are also critical for the rural population's livelihoods and the country's economy. South Sudan has vast natural assets, including one of the world's largest seasonal wetlands, the Sudd, and the world's largest animal migration (6 million head of antelope) across the eastern plains of the largely unspoilt Boma-Badingilo-Jonglei Landscape (BBJL). Wood products, such as poles and fuelwood, and NTFPs such as honey, bamboo, shea, and gum arabic[14] are important sources of cash income for rural households. NTFPs provide a sustainable source of protein and vitamins in local diets, especially during times of food insecurity, and wood-based fuels provide around 96 percent of household energy used for cooking. The ecosystem services of the Sudd alone, on which agropastoral livelihoods depend, are estimated at around $2.3 billion per year, while restoring teak plantations could generate close to $1 million per year and 150 jobs per 1,000 hectares on average, with hundreds of thousands or millions of hectares potentially available for expanding production. Close to one-third of the country has potential for community forest management, which could generate over $1 billion per annum in sustainable revenue from NTFPs. In the longer term, the country's vast and varied natural habitats could support world-class nature-based tourism attractions. With improved security and restoration of the populations of sedentary species, such as elephants, giraffes, buffalo, zebra, hartebeest, and roan, the BBJL could support one of the planet's pre-eminent wildlife tourism experiences (World Bank 2025f).

But without effective management, the country cannot realize its vast natural resource potential. Although many of its natural resources are underused nationally, local overexploitation and degradation is common in accessible areas. Around urban centers and along road corridors, forests are being rapidly cleared, particularly for unregulated charcoal production. Over recent decades, wildlife populations have declined by at least 90 percent in most areas, and the country's once extensive teak plantations have been felled. Policy frameworks have been developed but often remain in draft form and are rarely implemented. For example, the Forest Policy (2015) has not been approved by the legislature, and remains largely unimplemented, while the Forest Bill (2023) requires further clarification of mandates across central and local government, as well as more specificity on the regulation of private plantation development and the legal definitions and framework for community forest management. The country has also developed agrifood sector policies such as the Agricultural Sector Policy Framework, the Policy Framework and Strategic Plan 2012–16 for livestock and fisheries, the Agriculture Mechanization Policy, the National Cooperative Development Policy 2012–17, the Food Security Policy, the Soil Health Policy, or the Rural Finance Policy, many of which acknowledge a variety of climate risks and issues. But largely prepared before 2013, they are mostly obsolete. The MAFS, which manages these policies, also has a different mandate from the former Ministry of Agriculture, Forestry, Cooperatives and Rural Development, which designed them. Many policies remain at draft status, and lack concrete implementation strategies, budgets, and monitoring systems. Some of the set objectives—such as the target of becoming food self-sufficient by 2017—are also unrealistic. Finally, the central government neither disseminated nor consulted these policies at state and county levels, but expects subnational governments to implement them as a part of decentralization efforts.

12 Assuming that the average household size in South Sudan is 6-7 persons.
13 Also assuming that the average household size in is 6–7 persons.
14 *Shea (Vitellaria paradoxa ssp nilotica)* production potential is estimated at 500,000 tons per year, with about 30,000 tons consumed domestically. Average annual exports of 100,000 tons could generate an average of $460–720 million per year; the three key *gum arabic* production states have about 4,596,000 hectares of gum acacia resources, with an estimated annual gum production potential of 25,700 tons and potential export value of around $150 million; *honey* production potential is 100,000 tons and 5,000 tons of beeswax per year, which would be worth around $550 million; and *bamboo* annual production potential could be $452,000.

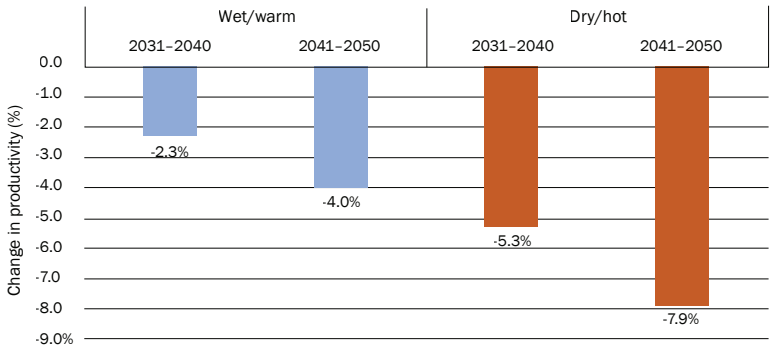
Rural livelihoods and associated value chains are highly constrained by the lack of ancillary services—such as roads and transportation—and an unstable macroeconomic environment. A set of parallel investments in information systems, infrastructure, and cold chains, paired with effective and sustainable risk and natural resource management, could provide the enabling environment needed to unlock the sector's potential. The livestock sector, for example, faces unstable services, weak infrastructure, and conflicts—between herders, or between sedentary farmers and pastoralists—over grazing and water rights and its potential is limited by disease outbreaks, drought insecurity, and a lack of organization between herders due to inadequate capacity, resources, and data. In the fisheries sector, 70 percent of the catch potential value of $450 million is lost through post-harvest physical and quality loss, and an inability to transport fresh fish to market. Over 80 percent of the fish sold is processed to facilitate preservation and transport, leading to a 40 percent loss of value in fresh weight equivalent terms. Around one-sixth of the catch is exported, particularly to the Democratic Republic of Congo, where prices are roughly double those in South Sudanese markets. But foreign traders dominate these exports, capturing most of the value added in more lucrative regional markets.

Rural production is significantly impacted by ongoing insecurity. Agricultural output is typically inversely correlated with insecurity in South Sudan, as predominantly rural conflict pushes farmers away from their lands and the deprivations of armed groups. Insecurity and cattle raiding also constrain the movement of pastoralists, their ability to optimally adjust to changing climatic conditions through managing patterns of grazing and destocking, and therefore the productivity of the livestock sector. In turn, drought and flood shocks force herders into contested secondary zones, increasing conflict both between pastoralist groups and between pastoralists and sedentary communities. Extended periods of armed conflict and widespread lawlessness in rural areas have been major drivers of the loss of wildlife and the commercial extirpation of the previously valuable teak plantation sector. Informal taxation at frequent checkpoints, set up by state and non-state armed actors along roads, hampers timely market access and therefore the value of perishable products such as fish, and insecure land and resource tenure rights create severe risk of land grabs and dispossession of resources, even as improvements in security may increase access to remote areas.

Climate change is projected to exacerbate and add to these challenges. This will affect ecosystems, reduce productivity, crop yields, and livestock production, and impact the livelihoods of most of the population in multiple ways.

The agriculture/livestock sector is expected to be particularly affected. It is projected to suffer from a labor productivity shock of -7.9 percent due to heat stress, relative to the 1995–2020 historical reference period, during 2041–50 in a dry/hot climate and under the BAU with continuing fragility scenario (**figure 3.11**). This shock is greatest in central and western states (the Lakes and Jonglei provinces), where it will reach between approximately -10 and -11 percent (IEc 2025f). It is mitigated (-4.6 percent) in a dry/hot climate under growth and stability and climate-smart development scenarios. Projected shocks are expected to be less severe in a wet/warm climate under all development scenarios. Significant production declines due to heat and water unavailability for the two crops that account for 61 percent of rainfed crop revenues—cassava and sesame, at -20.1 and -21 percent, respectively— and vegetables (at -27 percent) are expected by 2050 in a dry/hot climate and under the BAU with continuing fragility scenario. These declines are projected to be dampened (to -8.9 percent for cassava, -11.8 percent for sesame, and -17 percent for vegetables) under a dry/hot climate and climate-smart development scenario. Warmer conditions in a wet/warm climate and under the BAU with continuing fragility scenario are also projected to lead to production declines due to heat and water unavailability for most crops by 2050. But these are less severe, with four crops (millet, maize, beans and sorghum) expected to see production increases. All the crops considered (cassava, sesame, sorghum, groundnut, maize, vegetables, millet, beans and rice) are projected to witness a production increase under a climate-smart development scenario. In total, rainfed crop production shocks by 2050 are estimated to reach -2.6 and -14.3 percent in wet/warm and dry/hot climates, respectively, and under the BAU with continuing fragility scenario, while they reach +6.8 percent and -5 percent under the wet/warm and dry/hot climate, respectively, and climate-smart development scenario (**tables 3.2** and **3.3**; IEc 2025h). By 2100, rainfed crop production shocks worsen, and are projected to reach -16 and -38 percent in a wet/warm and dry/hot climate, respectively, and under the BAU with continuing fragility scenario.

Figure 3.11. Labor productivity shocks in the agriculture sector under the BAU with continuing fragility scenario, 2031–50



Source: IEc 2025f

Table 3.2. Mean annual rainfed crop production shocks under the BAU with continuing fragility scenario, 2041–50

Crop	Shock from heat effects		Shock from water availability		Total shock	
	Wet/warm	Dry/hot	Wet/warm	Dry/hot	Wet/warm	Dry/hot
Cassava	-10.8%	-19.8%	4.9%	-0.4%	-6.4%	-20.1%
Sesame	-10.5%	-21.0%	4.7%	0.1%	-6.3%	-21.0%
Sorghum	-3.6%	-8.1%	5.3%	1.6%	1.5%	-6.5%
Groundnut	-3.6%	-7.6%	3.7%	1.2%	0.0%	-6.5%
Maize	-2.7%	-6.1%	10.2%	2.9%	7.2%	-3.4%
Vegetables	-12.7%	-27.7%	5.7%	1.0%	-7.7%	-27.0%
Millet	-0.5%	-1.2%	15.6%	-2.5%	15.0%	-3.7%
Beans	-2.8%	-6.3%	7.7%	1.7%	4.6%	-4.7%
Rice	-1.6%	-2.5%	1.3%	0.1%	-0.4%	-2.3%
Total	**-7.4%**	**-14.6%**	**5.1%**	**0.4%**	**-2.6%**	**-14.3%**

Source: IEc 2025h

Table 3.3. Mean annual rainfed crop production shock under two development scenarios, 2041–50

Crop	BAU with continuing fragility		Climate-smart development	
	Wet/warm	Dry/hot	Wet/warm	Dry/hot
Cassava	-6.4%	-20.1%	5.9%	-8.9%
Sesame	-6.3%	-21.0%	3.0%	-11.8%
Sorghum	1.5%	-6.5%	10.5%	3.1%
Groundnut	0.0%	-6.5%	5.6%	-0.3%
Maize	7.2%	-3.4%	19.0%	8.2%
Vegetables	-7.7%	-27.0%	3.6%	-17.0%
Millet	15.0%	-3.7%	24.9%	6.2%
Beans	4.6%	-4.7%	15.0%	5.8%
Rice	-0.4%	-2.3%	8.6%	6.8%
Total	**-2.6%**	**-14.3%**	**6.8%**	**-5.0%**

Source: IEc 2025h

Livestock production will likely suffer from climate stress. Cattle milk, which represents 46 percent of livestock product revenue, is projected to be South Sudan's most vulnerable livestock product to heat stress due to climate change by 2050 under both a dry/hot climate (production shock of -17 and -14.2 percent under the BAU with continuing fragility and climate-smart development scenarios, respectively) and a wet/warm climate (production shock of -8.7 and -6.2 percent under the BAU with continuing fragility and climate-smart development scenarios, respectively). By 2100, impacts of heat stress on milk products are projected to be noticeably more severe, with shocks reaching -26 and -41 percent in a wet/warm and dry/hot climate, respectively, under the BAU with continuing fragility scenario. Impacts on meat are expected to be less severe and more varied. Under dry/hot conditions, declines in meat products are expected mostly in central South Sudan by 2050. These range from -3.6 and -0.7 percent for cattle to -3.8 and -0.8 percent for goats, and -4.1 and -0.9 percent for sheep under the BAU with continuing fragility and climate-smart development scenarios, respectively. Conversely, a wet/warm future is anticipated to improve feed availability for livestock, potentially resulting in production gains. As milk products represent the majority of livestock revenues, the overall shock to livestock production by 2050 is expected to be negative in both a dry/hot climate (-9.6 and -7.2 percent under the BAU with continuing fragility and climate-smart development scenarios, respectively) and a wet/warm climate (-2.6 percent and -0.5 percent under the BAU and climate-smart development scenarios, respectively) (table 3.4). This shock to livestock production is expected to worsen under a BAU with continuing fragility development scenario by 2100 under both the dry/hot (-24 percent) and wet/warm (-12 percent) climates (IEc 2025g).

Table 3.4. Livestock production shock by product due to climate stress under two development scenarios, 2041–50

Product	BAU with continuing fragility		Climate-smart development	
	Wet/warm	Dry/hot	Wet/warm	Dry/hot
Livestock shocks from heat effects				
Cattle milk	-8.7%	-17.0%	-6.2%	-14.2%
Goat milk	-1.0%	-2.2%	-1.0%	-2.2%
Sheep milk	-1.9%	-3.9%	1.9%	-3.9%
Livestock shocks from feed availability				
Cattle milk	4.2%	-3.6%	6.8%	-0.7%
Goat milk	4.8%	-3.8%	7.4%	-0.8%
Sheep milk	5.1%	-4.1%	7.9%	-0.9%

Source: IEc 2025g

Climate change is also expected to significantly impact South Sudan's fisheries. Increasing water temperatures could impact biodiversity and productivity, but the increase in the size of the annual flood pulse is likely to produce a significant increase in the overall biological productivity of South Sudan's fisheries. Whether or not the country can capitalize on this will depend on progress in fisheries resource management and market development.

Climate change impacts on the agrifood sector and rural livelihoods are best addressed through a comprehensive strategy to tackle severe food insecurity and rural poverty in the country through natural resource management and by increasing sustainable and resilient production. While climate change will have significant impacts without adaptation, potential within the agrifood sector will remain much larger than current production levels, particularly if the country can establish key resilience measures. Boosting local food production by expanding agriculture, improving agricultural techniques, and developing infrastructure will be critical, while improving resilient road networks and transportation systems will enhance market access and lower food costs. Ensuring safety to enable the free movement of people and goods is also vital. Climate-resilient farming practices and effective water management would lessen the effects of floods and drought and mitigate climate shocks. Addressing land tenure issues—particularly by strengthening formal tenure for local communities and implementing conflict resolution systems—is crucial for agricultural development. The livestock sector also offers opportunities for enhancing food security and farm incomes, despite facing significant challenges,[15] but government,

[15] The livestock sector is currently being supported by the World Bank South Sudan Resilient Livestock Sector Project.

development partners, NGOs, and local communities will need to work together to establish a sustainable and inclusive food security plan, which could be integrated with other initiatives like the Comprehensive Agriculture Master Plan to ensure cohesive and efficient execution.

Managing the impacts of climate change on fisheries, forests, and wildlife will require the implementation of robust, adaptive, ecosystems-based management. This should include developing fish production and marketing systems that can respond to varying levels of annual flooding and system productivity, developing a representative protected area system, enhancing value chains, and developing community-based natural resource management (CBNRM) systems. It should also promote climate-smart fisheries infrastructure, such as landing and fluvial transport systems that can cope with varying water levels, flood-resilient road systems, and cold chains based on low-carbon energy sources. To develop markets and value chains, South Sudan will need to improve the environment for private sector development, enhance women's access to financial institutions, improve regulatory certainty, basic security, and the rule of law, and remove informal taxation. CBNRM and monitoring systems will be key to underpinning natural resource resilience and productivity, building on many regional models for local fisheries management, community-based forestry, and community conservancies for rangeland and wildlife management. CBNRM will also help reduce and mitigate conflict in rural areas, improving both overall productivity and adaptability to climate impacts. Since one of the main constraints for comprehensive sectoral development is security, addressing natural resource constraints and other drivers of tension could foster a virtuous cycle of enhanced productivity, sustainable natural resource use, and resilient livelihoods.

Significant carbon finance opportunities may be available. Although South Sudan does not have a system in place to measure and monetize carbon sequestration in its natural habitats, it has significant potential to do so. General land use modeling suggests that 1.4 billion tCO2e could be sequestered by improving patterns of land use without any change in overall rural production (World Bank 2023c). Between 2001 and 2023, forests in South Sudan represented a net carbon sink of -36.9 million tCO2e per year, which could be worth around $250 million per year on voluntary markets. Should the country follow a similar forest loss pathway to its neighbors, projected GHG emissions due could reach a range between 22 and 29.5 million tCO2e per year. Flood reduction measures could also produce major methane emission reductions, although the dynamics of emissions from South Sudan's wetlands are not fully understood.

3.3. Improving low-carbon energy access to support economic diversification and growth

South Sudan has one of the world's lowest electricity access rates, significantly hindering its development. While 46 percent of Sub-Saharan Africa's population has access to electricity, South Sudan's access rate is estimated at only 5.3 percent (World Bank 2025g); only 1.8 percent of South Sudanese are connected to the grid, and 3.5 percent rely on off-grid technologies. The country currently has a total installed power capacity of approximately 129 megawatts (MW), mostly in Juba and mainly from thermal sources, with one recently commissioned solar photovoltaic (PV) plant. Other generation plants in smaller cities are non-operational due to inadequate maintenance and civil war-related destruction. South Sudan lacks a transmission network, and its power system consists of isolated distribution grids. The low access to reliable electricity outside of the capital constrains basic health, education, and local government services. While some large-scale institutions, such as state-level hospitals, rely on diesel generators, the tariffs often remain prohibitive due to transportation costs and associated fees levied at various checkpoints across the country. Displaced populations, particularly women and girls, face acute energy access challenges, which can lead to malnutrition, low economic activity, increased household burdens, and increased risk of GBV.

Climate change sharpens the urgent need to expand electricity access to support essential adaptation efforts and build resilience for millions of South Sudanese. The country's power sector is key to improving household resilience through economic diversification (Gorgulu et al. 2023), as it provides opportunities for alternative income sources beyond traditional agriculture and pastoralism.

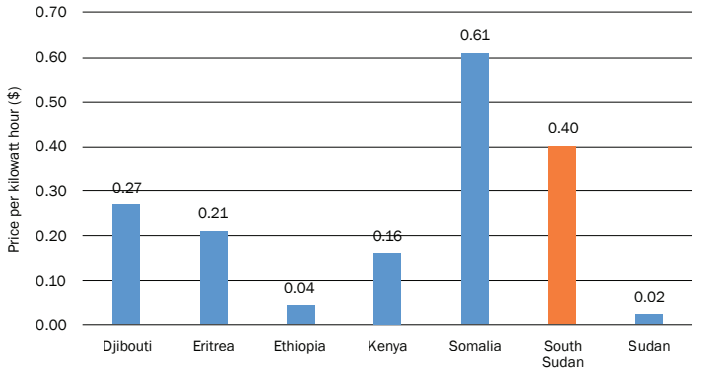
Access to electricity improves uptake of modern agricultural techniques and supports small-scale industries. This diversification is essential for enhancing household resilience against climate-induced shocks and fostering sustainable growth. Electricity access also improves educational outcomes by providing better learning environments, which in turn builds human capital and supports long-term development goals. Increased access to electricity would reduce woodfuel use, with significant benefits to public health (due to a decrease in indoor air pollution) and reducing deforestation. Solar energy reduces GHG emissions and enhances energy security, while hydropower dams can contribute to flood control and resilience.

In addition to being a cornerstone of sustainable development and economic diversification in general, improving energy access would directly counter several key climate impacts in health care, workplaces, education, agriculture and food security, and emergency response. Most health and educational institutions outside of Juba are deprived of electricity. And even higher-tier service institutions with diesel generators only have limited electricity due to the high cost of transporting fuel to rural areas. As well as limiting public health institutions' capacity to operate basic medical equipment and store vital medicines such as vaccines at adequate temperatures, this impedes the provision of emergency response during climate-related disasters and disease outbreaks. The electrification of and investment needs for health institutions in South Sudan is estimated at around $17 million (World Bank 2023d). Rising temperatures due to climate change also pose significant health risks, and access to air conditioning, cooling centers, and shaded areas in workplaces and educational facilities can help mitigate heat stress effects. Implementing these services requires a robust and reliable electricity supply, supported by investments in sustainable energy infrastructure. With around 80 percent of the population relying on agriculture as their main source of income, electricity-powered irrigation systems would enable farmers to sustain crop production amid unpredictable climatic change and strengthen resilience. And with an increasing frequency of drought and extreme heat, electricity access is vital for food storage and transport, especially for highly perishable products such as fish and dairy. Finally, reliable electricity is essential for powering coordination and communication networks, data centers, early warning systems, and other critical infrastructure and effectively responding to extreme climate events and disasters. Increased investment in sustainable energy infrastructure is crucial for realizing the full potential of digital services and building a more resilient and prosperous South Sudan.

The private sector has played a vital role in improving electricity services in Juba, but power supply remains limited and expensive. The Juba Electricity Distribution Company, a joint venture between the SSEC and Ezra Group, an Eritrean construction company, operates under a tailored, non-competitive arrangement. This unique framework, which saw the government cede significant tariff-setting authority, has prompted calls for greater transparency regarding procurement and governance. Under the agreement, tariffs reached a high of around $0.40 per kilowatt hour, reportedly the second highest in the world (after Somalia). Grid access remains limited, largely due to the high cost of service. The Juba Electricity Distribution Company reports serving approximately 48,000 customers. Despite a 13 percent tariff reduction announced in April 2025, the cost remains a significant burden relative to regional peers (Sudans Post 2025; figure 3.12), especially given the depreciation of the South Sudanese pound. Overall demand on the Juba grid has been growing, highlighted by a significant peak demand spike in early 2025 driven by intense heatwaves. This surge in consumption, which has at times exceeded available generation capacity, underscores a widening gap between the city's growing energy needs and the current infrastructure's ability to provide an affordable, reliable supply.

Investment in rural areas and secondary cities remains critically low. With no clear mandate on electrification outside of the capital, investment in downstream electrification planning is extremely limited, particularly in rural areas. But the 2013 South Sudan Electricity Policy emphasizes their importance, and the Government of Egypt is supporting the rehabilitation of thermal generation units in Rumbek and Yambio with isolated grid systems. Although these distribution networks remain dysfunctional, their potential rehabilitation presents an opportunity to enhance electrification. Public and private entities have collaborated to rehabilitate generation and distribution assets in Aweil, Wau, Yambio, Malakal, and other state capitals. But without public subsidies, electricity tariffs are expected to be unaffordable for most customers.

Figure 3.12. Average electricity tariff in selected Sub-Saharan African countries, December 2020



Source: World Bank, forthcoming a; South Sudan Electricity Sector Diagnostic (Draft), World Bank, 2022

A lack of planning, governance, and project implementation capacity keeps South Sudan's electricity sector trapped in underinvestment and sluggish growth. The country's weak power sector policy framework has led to conflicting institutional mandates and inadequate sector development. Sector planning is done on an ad hoc basis, making it vulnerable to short-termism and stakeholder capture. The MoED is the apex policy-making institution and regulator, although few regulations are formally in place. The SSEC—the main national power utility mandated with expanding and operating generation and distribution assets before the conflict—has seen its role diminish following asset decommissioning and privatization of the Juba power system. It also lacks financial autonomy and capacity, making it difficult to maintain assets and retain staff. Both the MoED and SSEC lack the capacity to implement projects effectively, with issues such as inadequate reactive compensation for the Nesitu solar plant operating at 25 percent of its capacity highlighting the challenges of integrating new projects into existing systems. The lack of clear planning and regulation tends to hamper growth and inhibit further investment from both the private sector and development partners. Hydropower development remains at the feasibility stage, but one additional solar PV plant is under construction, and the country imports a limited amount of electricity from Sudan via a 32 MW, 220 kilovolt interconnector in Upper Nile State (World Bank forthcoming). A 300-kilometer interconnector with Uganda has recently been approved and received funding.

The increase in frequency and intensity of extreme climate events is already affecting South Sudan's energy sector, which is burdened by limited power generation potential. The country's power infrastructure is highly vulnerable to climate-related shocks such as floods and heatwaves, and outside of Juba, much of the existing infrastructure is damaged, non-operational, or poorly maintained. Isolated grids outside Juba have been out of service for years because of poor network conditions. Diesel-based off-grid generation is particularly prone to supply chain disruptions, as flooded roads and destroyed bridges frequently disrupt fuel deliveries, increase fuel costs, and reduce power availability (Paul 2023; Ruiz and Guevara 2020). For instance, heavy flooding led to the submerging of 15 main roads in 2024, including those linking to Juba.[16]

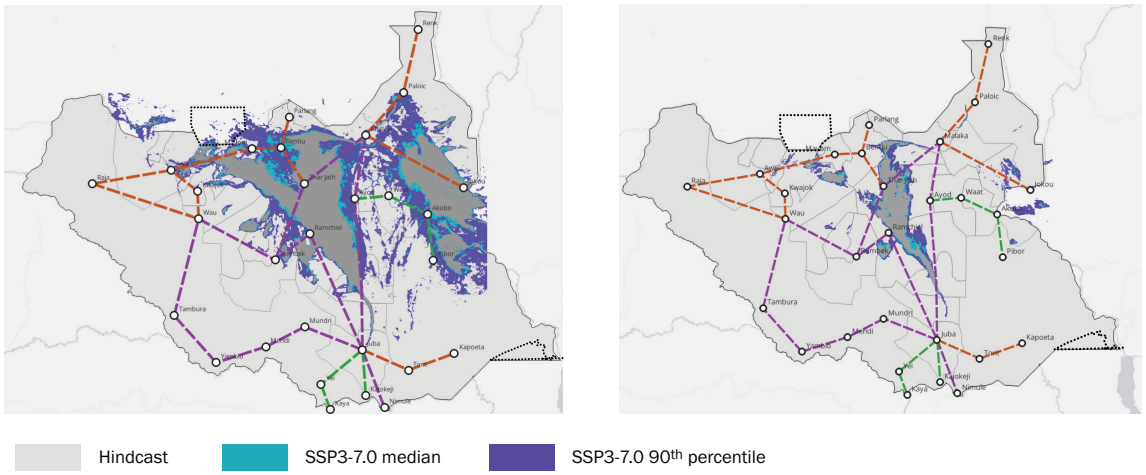
With additional climate change, South Sudan's planned transmission grid infrastructure is projected to face a 35-42 percent increased flooding risk. The planned transmission network (SSEC 2021) will likely be at risk of increased flooding (**figure 3.13**), with the length of transmission lines expected to be flooded increasing by 35 and 42 percent in a wet/warm and dry/hot climate, respectively, by the 2040s compared to the historic baseline.[17] Future transmission lines in high-risk areas, including planned infrastructure such as the Uganda–South Sudan interconnector, should consider flood risk throughout construction and maintenance. For example, critical substations can be elevated or built with flood barriers and drainage systems, and transmission grid towers can be placed on more flood-proof structures, such as a single raft of concrete foundations.

[16] South Sudan: Public Health Situation Analysis, Reliefweb, November 2024 (https://reliefweb.int/report/south-sudan/south-sudan-public-health-situation-analysis-phsa-21-november-2024.)
[17] Under historic conditions, about 12 percent of the total network would be flooded, on average, each year.

Figure 3.13. Projected impacts of flooding on planned transmission grid infrastructure by the 2040s under two climate scenarios

a) Annual maximum flooded area

b) Permanently flooded area (for six months or more in a year)



Hindcast | SSP3-7.0 median | SSP3-7.0 90th percentile

c) Annual expected transmission lines flooded compared to historical baseline (1995-2020)

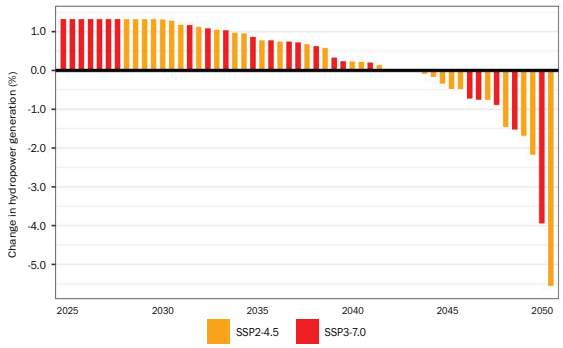
Recurrence interval	Historical	Future lines flooded (km)		Future lines flooded (% change relative to historical)	
	Lines flooded (km)	SSP2-4.5, 2040s	SSP3-7.0, 2040s	SSP2-4.5, 2040s	SSP3-7.0, 2040s
Expected value	591	799	837	35.2%	41.6%

Source: IEc 2025a; SSEC 2021

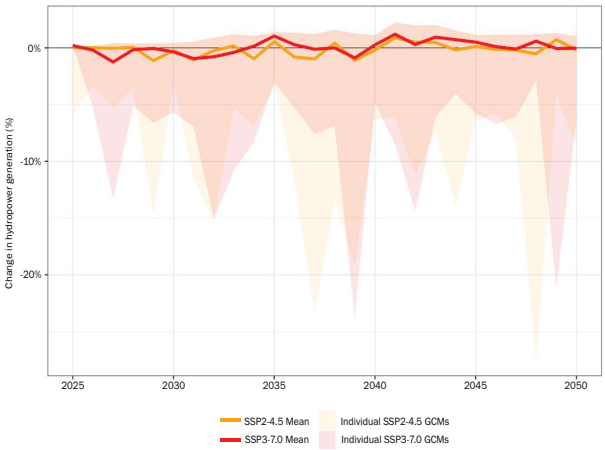
South Sudan's potential future hydropower projects are expected to experience increased generation variability as a result of climate change, underscoring the need for climate-resilient design. The country has significant hydropower potential and could meet much of its baseload energy needs at substantially cheaper cost and much lower carbon intensity than current generation. Prioritizing hydropower development, the R-NDS 2021–24 has a target to add 1,080 MW of hydro generation capacity by 2024. The country has identified six high-potential hydropower sites that could add up to more than 2,600 MW, the most advanced of which is the 42 MW Fula Rapids hydropower plant and associated 170-kilometer Juba evacuation line, which has been in planning since independence. Feasibility studies were completed for Fula rapids, Grand Fula (890–1,080 MW), Bedden (540–780 MW), Lakki (410 MW), and Shukoli (235 MW) (World Bank forthcoming). Modeling results indicate that water inflows of the White Nile are projected to increase by 90 percent of 55 future climate scenarios assessed (IEc 2025a). This would result in modest gains in South Sudan's average decadal hydropower generation potential by the 2040s, ranging from 1–1.5 percent across most scenarios, as illustrated in figure 3.14a for one of the sites. But increased interannual variability of water inflows is also predicted, resulting in a higher probability of years with significant hydropower production shocks larger than 20 percent (figure 3.14b). The country's planned hydropower projects should therefore incorporate design features that enhance resilience, integrating both adequate reservoir storage capacity and optimally sized turbine systems to enable the effective use of increased runoff and mitigate production risks in low-inflow years.

Figure 3.14. Hydropower generation and production shocks at the planned Shukoli hydropower plant

a) Change in average annual hydropower generation, 2041–50



b) Hydropower production shocks, 2025–50

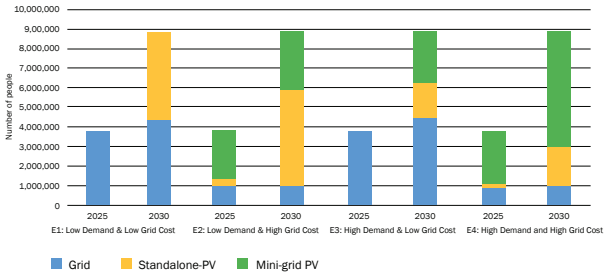


Source: IEc 2025d

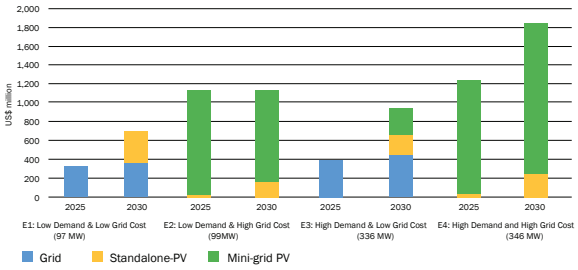
Accelerating the deployment of distributed renewable energy solutions is imperative to support the resilience of critical facilities and communities. Given the limitations of South Sudan's power sector and the urgency to provide energy access for adaptation, distributed energy solutions emerge as high-priority short- and medium-term interventions. Distributed off-grid systems provide a bottom-up solution for building resilience to exogenous shocks. While many South Sudanese households have turned to off-grid solutions (World Bank 2023d)—mainly diesel generators in urban areas—solar-based solutions are a faster, more resilient, and more affordable option to address the energy access gap, given the high capital costs of generators, high fuel prices, and the increasing risk of climate shocks disrupting fuel transport. With estimated sales of around 55,000 solar lighting products in 2021 (World Bank 2023b), the continued growth of this nascent market shows potential, and removing high import duties and providing incentives would help support it. Electrification planning also shows that stand-alone solar home systems and solar PV mini grids are priority least-cost solutions under multiple scenarios (Sherpa, Ivanescu and Yi 2023). Even in scenarios with the highest levels of new access coming from the grid, around 25 percent of households will need to be connected by off-grid solutions in 2030. To achieve a 50 percent electrification rate by 2030 in a low-demand, low grid cost scenario, solar home systems would account for 26 percent of electrification (~ $139 million investment costs) and grid for 25 percent (~ $361 million investment costs). In a low-demand, high grid cost scenario, solar home systems would account for 29 percent (~ $163 million investment costs), mini-grid for 18 percent (~ 973 million investment costs) and grid, 5 percent, with no additional investment costs (figure 3.15).

Figure 3.15. Least-cost electrification modeling results, 2025 and 2030

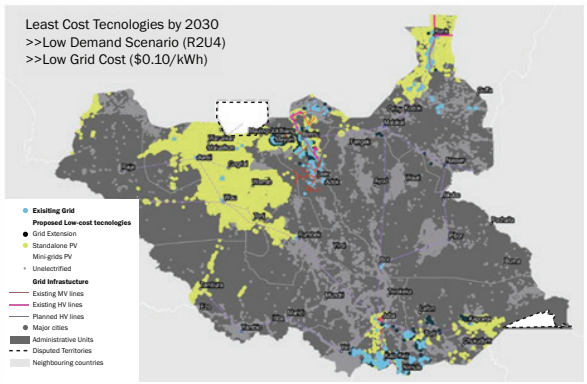
a) Target electrification rate, by technology type



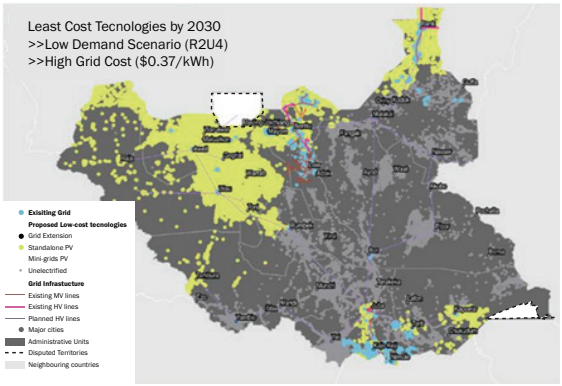
b) Estimated cumulative investment costs



c) Least Cost Technologies by 2030 - Low Demand Low Grid Cost Scenario

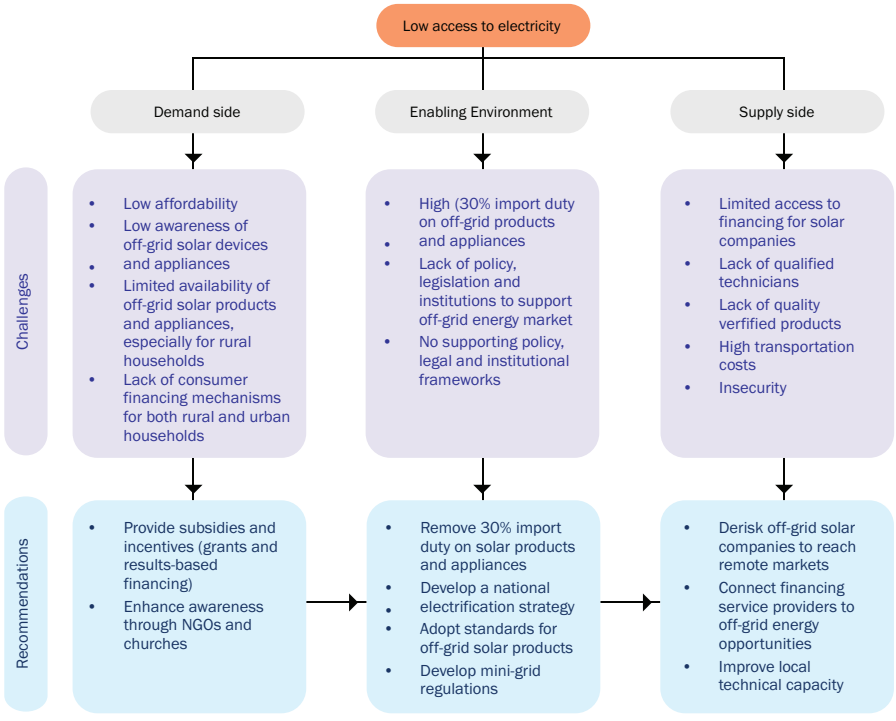


d) Least Cost Technologies by 2030 - Low Demand High Grid Cost Scenario



Source: Sherpa, Ivanescu and Yi 2023

Figure 3.16. Challenges and recommendations for developing the off-grid and mini-grid market



Source: World Bank 2023d

4. Macroeconomic measures and financing options for a resilient and low-carbon economy

4. Macroeconomic measures and financing options for a resilient and low-carbon economy

South Sudan faces a twin challenge of economic fragility and climate vulnerability that threatens its long-term development prospects. Fourteen years after independence, it remains trapped in a cycle of humanitarian and macroeconomic crises, with near-universal poverty, declining per capita GDP, and minimal infrastructure. As one of the world's most oil-dependent economies, its fiscal and macroeconomic stability is highly sensitive to global oil price fluctuations, domestic production constraints, and persistent internal and regional conflicts. Most critically, entrenched corruption and weak state capacity underpin the country's economic and social decline, manifesting most visibly in the chronic mismanagement of public finances. At the same time, the increasing frequency and severity of floods and other climate-related shocks pose escalating risks to livelihoods, infrastructure, and food security, disproportionately affecting the most vulnerable. Together, these structural and environmental issues create a precarious context that demands urgent governance reforms, macrofiscal stabilization, and targeted investments in adaptation to move the country on a sustainable growth trajectory.

To better understand these intertwined risks and identify potential pathways for resilient growth, this chapter outlines set of four development scenarios that illustrate how South Sudan's economy might evolve under different policy and institutional settings. These scenarios—BAU with disrupted oil exports, BAU with continuing fragility, growth and stability, and climate-smart development—are analytical tools designed to assess the implications of alternative reform and investment choices for the country's long-term development trajectory. The analysis also integrates climate scenarios as key inputs to these development pathways. Climate scenarios provide physical and environmental context, capturing variations in temperature, rainfall, and extreme events, within which the development outcomes unfold. By combining the two, the modeling framework allows us to examine how climate change may amplify or mitigate the impacts of policy choices and structural reforms, and to assess the potential benefits of climate-smart strategies that promote adaptation and resilience. The chapter also examines the distributional effects of climate change, discusses relevant social protection measures, and explores financing options and strategies for mobilizing climate-related resources in South Sudan.

4.1. Future impact of climate change on the economy and poverty: a modeling approach

As part of the CCDR's analytical framework, a representative set of climate scenarios was selected (box 1.1). Climate variables associated with these climate scenarios were derived for 25-year period from 2025 to 2050 (the period covered in this CCDR), relative to a climate baseline from 1995 to 2020 to serve as input to biophysical models that convert changes in climate variables into shocks through impact channels identified for the country and examined to address the potential economic and development challenges posed by climate change (table 4.1).[18]

[18] The shocks for the water, sanitation, and hygiene and clean cooking channels do not consider climate change directly but evaluate the labor supply impacts of enhanced investments. Hence, the shocks differ by development scenario, but not by climate scenario.

Table 4.1. Impact channels examined in this CCDR

Impact channel	How climate change translates into damages
Water and agriculture	
Crop production	Shock to rainfed crop revenues through changes in yields from water availability and heat stress
Livestock production	Shock to livestock yields from heat stress and changes in feed availability from grazing pastures
Human capital	
Labor heat stress	Shock to labor productivity from heat stress to both indoor and outdoor workers
Human health	Shock to labor supply from changes in incidence and mortality of vectorborne, waterborne, and temperature-related diseases
Water, sanitation, and hygiene	Shock to labor supply from changes in diarrheal incidence and mortality
Clean cooking	Shock to labor supply from indoor air pollution, including the effect of changes in cooking services
Infrastructure	
Inland and urban flooding	Shocks to capital from changes in pluvial and fluvial depth and extent

These grid- or basin-level biophysical shocks were subsequently aggregated to national and/or sectoral scales to serve as inputs into the country-specific macroeconomic model.[19] In addition to these nationally focused impact channels, a dedicated deep-dive analysis was conducted on flooding in the Sudd (table 4.2). Changes in flooding were translated into macroeconomic impacts through several Sudd-focused impact channels.

Table 4.2. Deep dive: flooding in the Sudd

Deep dive	How climate change translates into damages
Sudd flooding	Shocks to oil production, fish catch potential, building damage, labor productivity, and crop production from changes in the flood extent of the Sudd

The modeling framework relies on a broad set of assumptions to assess potential challenges and trade-offs; as such, results should be interpreted with caution and are not intended to be definitive. The analysis is subject to limitations, such as the exclusion of several impact channels and transmission pathways, as the model captures only those deemed most relevant and feasible in the context of South Sudan. In addition, climate adaptation is modelled only partially, reflecting the current state of best-available modelling approaches as well as data constraints: as a result, the analysis does not fully capture the scale and effectiveness of adaptation measures across sectors. Additionally, data limitations - both in terms of time series and thematic coverage - constrain the model's analytical reach on the production side and limit its econometric potential. Consequently, the estimated GDP impacts are not fully comprehensive and are likely to understate the total economic effects. In addition, the macroeconomic modeling horizon also ends in 2050 and does not account for potential amplifying risks in the region, including instability and conflict in neighboring countries, which could trigger large-scale displacement and inward migration into South Sudan. The analysis also excludes the risks of ecosystem collapse and the acceleration of climate-induced outmigration. The likelihood of these risks materializing is considerable, particularly beyond 2050 if global emissions do not decline rapidly. If realized, these factors would substantially amplify economic losses beyond those estimated in this analysis.

[19] For the water, agriculture, and human capital sectors, both wet/warm and dry/hot climate scenarios were derived from the available climate futures. For infrastructure, ensemble statistics were reported for the SSP2-4.5 and SSP3-7.0 pathways. To assess national hydropower and flooding impacts in the Sudd, a total of 55 individual SSP2-4.5 and SSP3-7.0 GCMs were evaluated.

4.1.1. Development scenarios

The modeling presents four growth scenarios, each based on distinct assumptions about South Sudan's development trajectory. Scenarios (a) and (b) represent BAU scenarios, which assume the absence of any major improvement in macroeconomic and structural policy implementation. Both assume continuing fragility and persistent structural vulnerabilities—including a heavy dependence on oil revenues—and therefore represent a state of high instability and vulnerability to external shocks. Scenario (b) differs from scenario (a) by assuming recurrent oil sector disruptions such as those experienced in 2013/14 and 2024/25. Scenarios (c) and (d) illustrate endogenous policy pathways, where the government's reform, investment choices, and climate-smart development play a central role in shaping outcomes.

a) BAU with continuing fragility: This scenario reflects South Sudan's historical growth trajectory, which remains heavily reliant on oil revenues in the absence of economic diversification. Persistent capacity constraints and limited fiscal space restrict investments in oil production, infrastructure maintenance, and broader growth-enhancing public investments, worsening the fiscal crisis. Although the flow of oil through the main export pipeline transporting Dar blend oil to Port Sudan resumed in early 2025 after a year-long closure, oil production levels are unlikely to return to the peak levels of 2010–11. Without meaningful structural reforms and given the sluggish implementation of the R-ARCSS, climate impacts worsen sectoral development outcomes, constrain productivity, and limit growth prospects.

b) BAU with increased fragility due to oil sector disruptions (BAU with disrupted oil exports): This scenario assumes a deepening economic crisis driven by collapsing oil revenues—South Sudan's main source of foreign exchange and fiscal income—resulting from various factors, including regionally driven conflict- related disruptions and a long-term decline in oil prices. Such disruptions would severely constrain public service delivery, delay the remuneration of public sector wages and pensions—a recurring issue in the country—and heighten sociopolitical tensions. As revenues fall and fiscal space tightens, competition over scarce resources may fuel rent-seeking behavior, diverting funds away from essential public services and development priorities. Collectively, these disruptions would exacerbate challenges and deepen the country's structural vulnerabilities.

c) Structural reforms promoting growth and stability (Growth and stability): This scenario assumes the implementation of structural reforms, including prudent monetary and fiscal policies to curb inflation, improved oil revenue management, enhanced spending efficiency, and increased mobilization of non-oil revenue. Effective implementation of the R-ARCSS is expected to strengthen investor confidence, attract foreign direct investment, and place the economy on a sustainable growth trajectory. These structural reforms significantly improve outcomes and help reduce the vulnerability of the economy.

d) Climate-smart development: This scenario builds on the structural reforms outlined in scenario (c) and integrates the goals of the R-NDS with a strong focus on climate-smart development. It prioritizes reducing climate vulnerability; strengthening policies, institutions, and resources for climate action; and improving disaster risk prevention and response, particularly in vulnerable communities. The scenario also emphasizes scaling up investments in proactive climate adaptation measures. While climate-smart development significantly enhances resilience and long-term stability, it requires substantial investment and sustained external support.

To evaluate the potential effects of climate change on South Sudan's economy, development scenarios were combined with climate scenarios for 2020–25 to estimate the corresponding GDP losses. Adaptation interventions for four impact channels, (table 4.3) were also modeled to assess benefits—in terms of reduced annual shocks—and costs in terms of annual capital expenditure and operating expenses. Crop production and clean cooking adaptation interventions have been excluded because their costs outweigh the benefits.

Table 4.3. Adaptation interventions selected for this CCDR

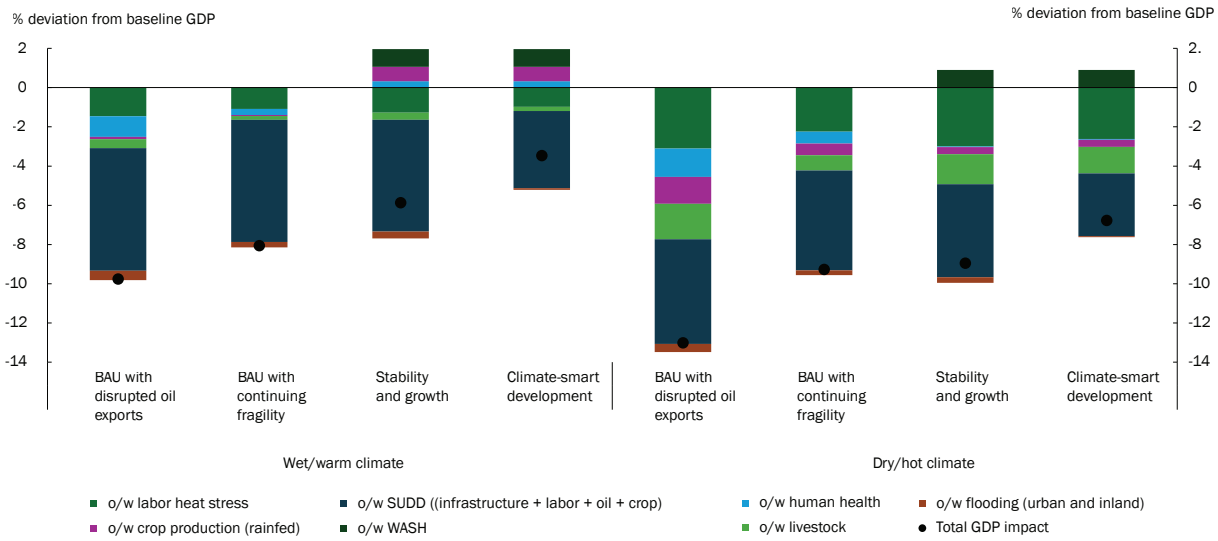
Impact channel	Description of adaptation intervention	Adaptation costs
Labor heat stress	Investment in cooling technologies for indoor industry and services workers, increasing from zero at present to 20% coverage by 2050 Mechanization increases in the agriculture sector, benefiting workers by reducing their share of labor in the most vulnerable outdoor occupations exposed to heat[20]	Undiscounted costs are estimated to reach approximately $12.9 million in total Increased annual energy consumption is estimated at 13.4 gigawatt hours in 2041–50 The costs of increases in mechanization are not considered due to insufficient data
Livestock	Supplemental feed purchase is assumed to reverse pasture deficits for up to 40% of grazing animals based on the dry/hot mean climate scenario	Combining the two interventions, average annual costs between 2041-2050 are $7.2 million. Total costs between 2025-2050 are expected to reach $121.4 million, of which around 52 percent are from imported feed
Inland and urban flooding	New infrastructure is built outside of the historical 20-year floodplain[21] Buildings representing 0.03% of total expected damage by 2050 are floodproofed up to the first meter of the structure Both measures start in 2025 and grow linearly through 2050	Only building floodproofing considers investment costs, while building away from floodplains is assumed to have zero incremental costs Total undiscounted costs for 2025–50 are expected to reach around 1.01% of national capital[22] During 2041-2050, annual average costs will reach 0.01 percent.
Sudd flooding	**Oil production:** Investments to protect 30% of the most vulnerable oil wells with permanent flood barriers to protect the well and 100-meter perimeter, as well as raising platforms and wellheads **Fish production:** Investments to double the production capacity (to 960,000 tons/year) of the fishing sector by 2050 **Infrastructure:** Protective barriers are assumed to be built to protect about 0.5% of the national building stock, prioritizing structures with the highest benefit-cost ratios[23]	Costs are estimated to reach $26.1 million per year, on average, between 2041 and 2050, mostly for the flood barrier Annual average costs of investments are estimated at around $3.8 million Costs are estimated to average approximately 0.0127% of capital annually by the 2040s

[20] Benefits only consider the reduction in heat stress, not the productivity gains from mechanization investments.
[21] The rate of new infrastructure constructed is assumed to follow the population growth rate of urban areas, as reported by the UN World Urbanization Prospects 2018.
[22] Capital stock data for South Sudan are not available; adaptation costs are presented as a fraction of national capital.
[23] Shocks for macroeconomic modeling for infrastructure include building damage, labor productivity shocks from commercial building downtime, and transport infrastructure interruptions.

4.1.2. Results

The macromodeling results show that climate change poses significant risks to South Sudan's economy, particularly in the absence of adaptation measures, with GDP projected to decline by 2050 due to climate shocks. Figure 4.1 shows the impacts of climate change on South Sudan's GDP by 2050 under the four development scenarios.[24] The key patterns are highlighted here.

Figure 4.1. Impacts of climate change on GDP, 2050



Source: World Bank staff calculations

In the absence of adaptation and mitigation measures, climate change is projected to have a significant adverse impact on GDP. In an optimistic (wet/warm) climate, GDP is projected to decline by 9.7 percent under the BAU with disrupted oil exports scenario, 8.1 percent under the BAU with continuing fragility scenario, and 5.9 percent under the growth and stability scenario by 2050. In a pessimistic (dry/hot) climate, GDP is expected to fall by 13, 9.3, and 8.9 percent under the BAU with disrupted oil exports, BAU with continuing fragility, and growth and stability scenarios, respectively.

In the absence of broad-based development, differences in real GDP losses across scenarios imply large and cumulative economic losses for South Sudan. Under both BAU scenarios, higher GDP losses reflect a reduced economic base and limited fiscal capacity, significantly constraining the government's ability to respond to climate shocks. These GDP losses would directly weaken household incomes, reduce productive activity, and increase reliance on humanitarian assistance, particularly among rural and displaced populations already exposed to floods and droughts.

Over time, foregone growth risks entrenching a weak development path, where repeated climate shocks erode livelihoods, human capital, and social cohesion. This underscores that broad-based development is crucial, not only for limiting GDP losses, but also for protecting well-being and strengthening climate resilience.

[24] As already noted, this macromodeling section should be interpreted with an understanding that all models are subject to limitations arising from their inputs and the assumptions that underpin them. While the model seeks to capture the primary channels through which climate change affects the economy, numerous other potential impact pathways exist; therefore, the estimated GDP impacts are not comprehensive.

The Sudd impact channel emerges as the most significant across all development scenarios and climate conditions. It exerts the largest negative effect, with estimated annual GDP losses ranging from 4.7 to 5.3 percent in a dry/hot climate and from 5.7 to 6.2 percent in a wet/warm climate. This pronounced impact reflects the vast size (57,000 km2) and importance of these wetlands. Given its scale and the critical role the Sudd plays in the national economy and ecosystem, designing and implementing targeted measures to mitigate the adverse effects of climate shocks on the region is vital.[25]

Labor heat stress is identified as the second-most impactful channel across all development scenarios, through reduction in labor productivity. Annual GDP losses attributable to heat stress are projected to range from 1.1 to 1.5 percent in a wet/warm climate, and from 2.2 to 3.1 percent in a dry/hot climate by 2050. Given that agriculture—the main source of livelihood for nearly 80 percent of households in South Sudan (World Bank 2025e)—is heavily reliant on outdoor activities, the population is expected to be significantly affected by rising temperatures and increasing heat exposure.

Estimated economic losses through the livestock impact channel are projected to reach 0.5 percent of GDP in a wet/warm climate and 1.8 percent in a dry/hot climate by 2050 across the different development scenarios. Historically, climate shocks have disrupted critical seasonal livestock migration routes, resulting in irregular movements that have weakened disease control (World Bank 2023f). As the livestock sector is a cornerstone of food security and a key source of household income and investment, climate-induced shocks are expected to significantly reduce production and productivity, increasing food insecurity and rural vulnerability.

The benefits (in terms of reduced GDP losses) across impact channels are significantly improved as a result of adaptation interventions, as demonstrated in the climate-smart development scenario. The modeling results indicate that implementing climate adaptation measures in the selected impact channels could reduce annual GDP losses to 3.5 and 6.8 percent of GDP in a wet/warm and hot/dry climate, respectively. This represents a substantial improvement compared to the 9.7 and 13 percent annual GDP losses projected under the wet/warm and dry/hot BAU scenarios without such interventions.

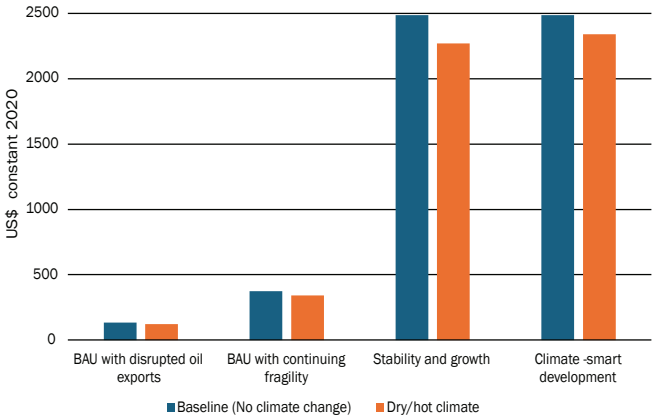
The analysis underscores the importance of targeted adaptation measures in strengthening resilience to climate-related shocks. For example, building protective barriers around oil wells and key national infrastructure helps safeguard these assets from flooding. Under the BAU with continuing fragility scenario in a wet/warm climate, flooding in the Sudd region is projected to reduce GDP by 6.2 percent, compared to 3.9 percent under the climate-smart development scenario, demonstrating the benefits of adaptation investments. Likewise, labor heat stress adaptation measures—such as increasing agricultural mechanization and investing in cooling technologies for indoor industry and service workers—reduce reliance on outdoor labor and mitigate heat-induced productivity losses. Under the BAU with disrupted oil exports scenario in a dry/hot climate, heat-related impacts are estimated to lower GDP by 3.1 percent, falling to 2.6 percent under the climate-smart scenario.

Although adaptation interventions are crucial for mitigating the economic losses from climate change in South Sudan, they have their limits. While the country urgently needs to scale up efforts in key sectors such as agriculture, water management, and infrastructure, some adaptation measures—such as rainfed crop measures and clean cooking technologies—carry high costs that may exceed their economic benefits. In these cases, full adaptation may prove inefficient. This highlights the need to prioritize interventions with the highest net benefits, while also considering South Sudan's extreme vulnerability and constrained fiscal space.

[25] A key difference between the two BAU scenarios—with disrupted oil exports and continuing fragility—for the Sudd impact channel lies in the relative importance of oil in total output. In the BAU with continuing fragility scenario, oil accounts for a larger share of output, making the economy more vulnerable to oil-related shocks compared to the BAI with disrupted oil exports scenario, where oil production is significantly reduced. As oil's share in the economy declines over time in the BAU with continuing fragility scenario, the output losses associated with the Sudd gradually converge toward those observed in the BAU with disrupted oil exports scenario.

Figure 4.2 shows the projected real GDP per capita in a dry/hot climate under all the development scenarios. Despite adaptation efforts, climate-related shocks will continue to impose damage, as complete adaptation is neither feasible nor realistic. This highlights the importance of sustained and robust economic growth to counterbalance climate-induced damages and support the per capita income growth required in South Sudan.

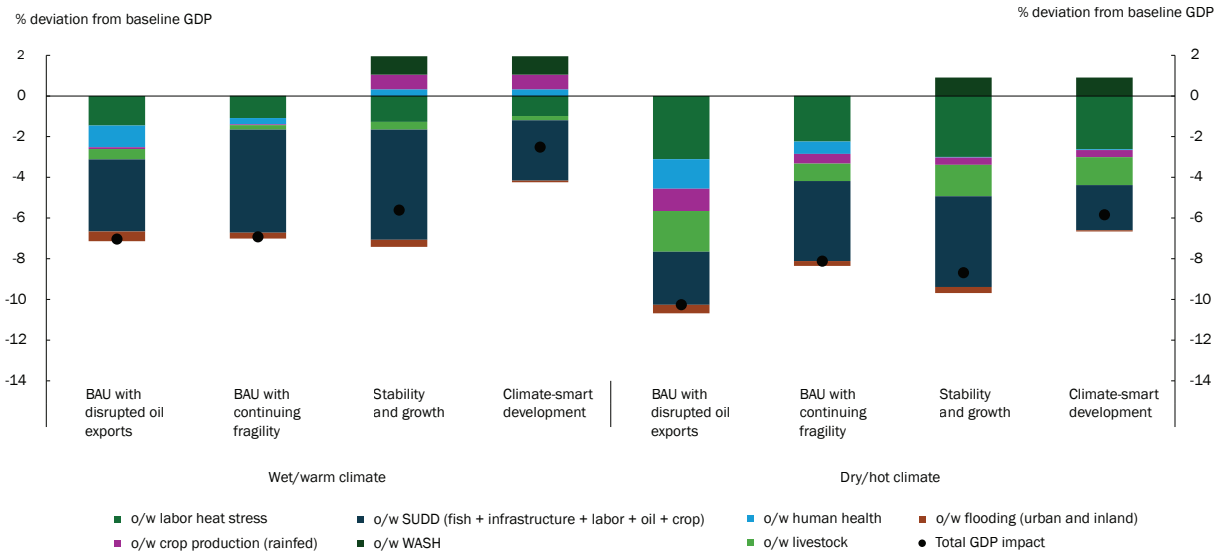
Figure 4.2. Projected real GDP per capita under the pessimistic (dry/hot) climate under all the development scenarios, 2050



Source: World Bank staff calculations

Figure 4.3 illustrates the enhancement in GDP projections resulting from the inclusion of fisheries in the modeling framework. Incorporating fishery catch potential could raise GDP by approximately 0.3–2.3 percent, with the largest gains occurring in the BAU with disrupted oil exports and climate-smart development scenarios, which unlock the sector's development potential.

Figure 4.3. Impacts of climate change on GDP, 2050, including fisheries in the Sudd channel



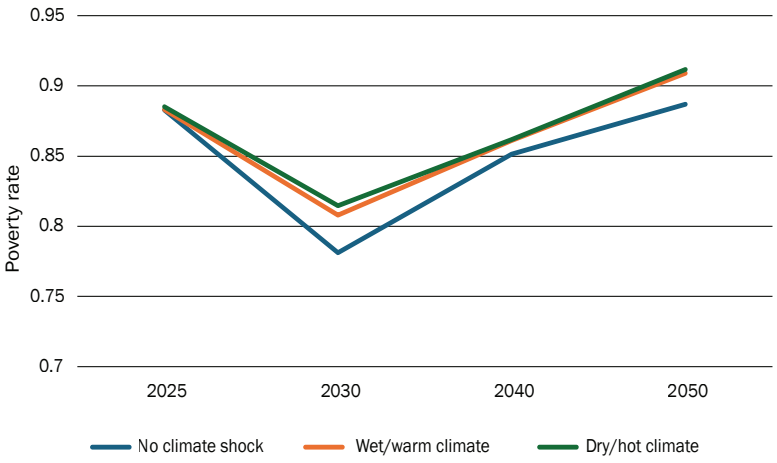
Source: World Bank staff calculations

Although currently underdeveloped, the fisheries sector represents an important source of food, income, and employment. Investments to double the fish production under different climate conditions, along with targeted investments in sustainable aquaculture, could help offset some of the economic losses experienced through other impact channels. These results highlight the sector's potential to enhance economic resilience, improve food security, and support inclusive growth.

4.2. Poverty impact analysis

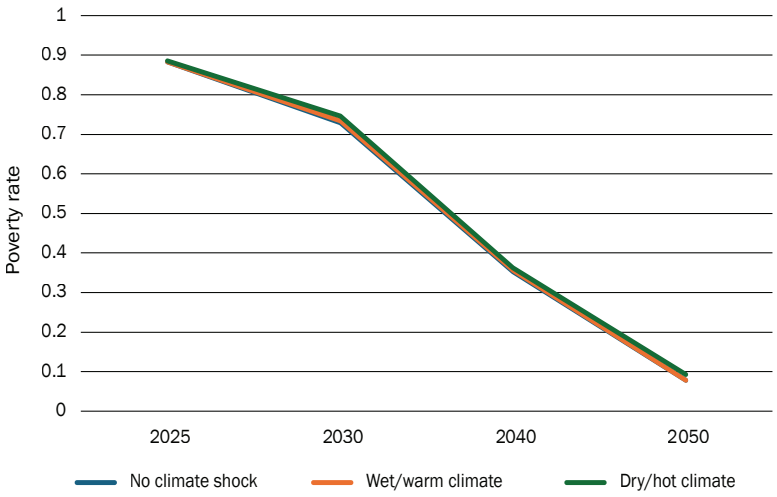
Poverty impact analysis reveals the primacy of the country's development policy choices and trajectory in shaping poverty trends, although climate shocks have a significant poverty impact, and development trajectory also affects climate sensitivity.[26] Under the BAU with continuing fragility scenario, poverty rates initially fall as there is some recovery from the recent crisis, but then rise again after 2030, surpassing current levels by mid-century, and with climate impacts causing a jump of several percent in addition to already very high rates (figure 4.4). When oil sector disruptions continue, poverty climbs continuously and is near-universal by 2050. In stark contrast, the implementation of structural reforms produces a significantly faster decrease in poverty to 2030, which further accelerates thereafter, leaving single-digit poverty rates by 2050 (figure 4.5). Although climate impacts still increase rates by a couple of percent, this differential is much more modest in relation to the size of the absolute fall. The results for the climate-smart development scenario are similar, with an even faster reduction in poverty.

Figure 4.4. Poverty impact under the BAU with continuing fragility scenario, 2020–50



Source: World Bank staff calculations

Figure 4.5. Poverty impact under the growth and stability scenario, 2020–50



Source: World Bank staff calculations

[26] The poverty analysis is based on the projections that include the fisheries sector.

Changes in poverty rates and economic growth do not significantly alter the overall distribution of income. Across all scenarios and climate conditions, inequality remains relatively stable over time, with only modest fluctuations (Gini coefficient remains in the range 0.406–0.438: see table B.5). Structural reforms (prudent fiscal and monetary policies, improved oil revenue management, diversification efforts) and climate-smart development are effective in reducing poverty, but South Sudan may also need additional targeted policies to address income inequality.

4.3. Mobilizing additional financing for climate action

Given the recent decline in ODA and its impact on South Sudan, available resources are far from sufficient to meet the country's substantial development and climate-resilient investment needs. Funding for climate-related activities in South Sudan has primarily come from foreign direct investment, remittances, and ODA, Among these, ODA, largely directed toward humanitarian assistance, has been the most significant, averaging about $1.5 billion per year (ADB 2024).

Against this financing backdrop, the limited set of climate adaptation investments modeled under the climate-smart development scenario would cost at least $5 billion by 2050. The table of recommended adaptation measures in appendix A would cost around $14 billion (roughly 1.7 percent of the estimated GDP for the 2025-2050 period under the climate-smart development scenario). But these targeted resilience investments would be on top of much larger amounts needed to support robust and sustainable economic growth more broadly. Given the recent decline in ODA, existing financing levels are likely to fall short of meeting South Sudan's substantial development and climate resilient needs, underscoring the urgency of mobilizing additional and more diversified sources of long-term financing.

South Sudan's fiscal space is extremely limited, constrained by volatile oil revenues and a narrow non-oil tax base. The government's ability to mobilize domestic resources is hampered by weak institutional capacity and pervasive corruption, and as a result, non-oil revenues average less than 4 percent of GDP. That is among the lowest globally. With public spending heavily reliant on oil receipts, fiscal policy remains highly procyclical and lacks strategic direction, leaving little room to respond to climate shocks or invest in development priorities. The government's inability to access external financing, coupled with recurrent deficit monetization and the crowding out of private sector credit, further constrains fiscal flexibility. Consequently, persistent fiscal imbalances, rising debt vulnerabilities, and severe financing constraints limit the country's capacity to invest in human capital, infrastructure, and climate resilience.

To reduce its reliance on external aid and ensure sustainable financing for climate action, South Sudan needs to enhance and strengthen domestic resources. Given its constrained fiscal space and limited capacity to finance climate investments or its broader investment needs, there is an urgent need to improve oil revenue management and fiscal transparency. Efforts to enhance domestic revenue mobilization and broaden the non-oil tax base by improving institutional capacity and addressing structural barriers (for example, by aligning the customs valuation exchange rate with the official exchange rate), would help increase the country's critically low levels of non-oil revenues (World Bank 2026).

In parallel, strategic prioritization of expenditures is crucial to ensure scarce public resources are directed toward high-impact, cost-effective climate investments—particularly in agriculture, water management, and resilient infrastructure. This requires integrating climate priorities into national and sectoral budgets, adopting results-based allocation frameworks, and strengthening the appraisal and monitoring of public investment projects.

South Sudan's economy holds significant latent potential for private sector development and investment-led transformation. Although the private sector remains small and largely underdeveloped, this very nascency presents a unique opportunity to cultivate a new generation of private sector-driven growth and innovation. The absence of entrenched market players and limited competition across most non-oil sectors creates space for early investors to capture market share, establish integrated operations, and set new benchmarks for quality, efficiency, and sustainability.

5. Prioritizing climate action

5. Prioritizing climate action

Development and climate resilience are inextricably linked in South Sudan. The country faces serious fragility, conflict, fiscal, and development challenges that it must tackle to successfully adapt to climate change. The challenge is therefore broad and complex; but it is not insurmountable, particularly because there are many synergies between governance, development, and resilience that can help reverse the pernicious cycle of climate vulnerability and social fragility into a positive cycle of resilient investment and robust growth. Broad-based development that improves human capital and access to services will itself support macroeconomic and household resilience, and many crucial adaptation measures—to manage flood impacts, adopt climate-smart agriculture and livestock practices, and build CBNRM institutions—will themselves help mitigate sources of social fragility and instability.

South Sudan needs a wide array of investments and policy packages to build resilience, but, recognizing its fiscal constraints and low institutional capacities, it also needs to prioritize measures. Chapters 2–4 identify a range of issues and interventions that would help it meet its development goals in a changing climate. Policies aimed at better adapting to climate change—mostly through crosscutting governance measures, enhancing flood management, adopting climate-resilient farming and livestock practices, valuing renewable natural resources, and improving energy access—are among the main stepping stones for tackling climate change challenges. These are summarized here and detailed in appendix A.

In the longer term, South Sudan needs to ensure that its climate mitigation and adaptation efforts prioritize social inclusivity and effective institutions. Resilience investments must therefore be targeted and tailored to the unique vulnerabilities of excluded groups. Pro-poor investments in agriculture, access to water, sanitation, and electricity, housing, and transport may all need to be adjusted to ensure that they can be accessed by women, conflict-affected communities, and marginalized groups. Inclusion can also be achieved by prioritizing the provision of resources, capacity-building, and direct funding opportunities to local communities for effective climate action. Effective local institutions are central to a country's ability to respond to the impacts of climate change.

5.1. Crosscutting measures

5.1.1. Adopting a comprehensive approach to address climate-driven fragility

South Sudan needs to adopt a comprehensive, integrated approach to break the cycle of climate-driven fragility. The country's FCV-climate nexus requires a holistic response that combines governance reforms, economic development, infrastructure investment, and regional cooperation. By addressing the root causes of vulnerability and integrating climate adaptation into broader peacebuilding efforts, South Sudan can move toward greater resilience and stability in the face of climate change. Integrating climate adaptation into national governance is vital for long-term stability and must be approached with a conflict-sensitive lens. Strengthening institutional capacity to manage climate risks, improving accountability in climate finance, and ensuring the equitable distribution of adaptation resources are key measures to mitigate climate impacts. Enhancing local governance structures to incorporate climate-sensitive planning and decision-making—by building climate adaptation into ongoing local government capacity-building programs—may help prevent exclusion and grievances that contribute to instability. Developing robust early warning mechanisms that integrate climate data with conflict monitoring could also enable more effective responses to emerging crises. Climate adaptation programs must be designed with a conflict-sensitive approach, to ensure interventions do not inadvertently exacerbate social tensions or deepen inequalities. Regional cooperation and transboundary resource management also need to be prioritized. South Sudan's climate challenges are inherently linked to broader regional dynamics, requiring crossborder cooperation on water resource management, refugee protection, and sustainable land use policies. Strengthening regional frameworks for climate adaptation and conflict prevention can help address shared vulnerabilities and promote stability across borders.

5.1.2. Improving public financial and macroeconomic management

Strengthening South Sudan's public financial management is essential for delivering basic services and building resilience to climate shocks. The World Bank Public Finance Review calls for a sequenced reform agenda focused on transparency, efficiency, and revenue mobilization, starting with nocost measures to improve fiscal transparency—especially in oil revenue reporting, budget execution, and debt recording. Short-term priorities include phasing out monetary financing of deficits, unifying official and parallel exchange rates, and accounting for all public debt and arrears. Medium-term actions include introducing a functioning government securities market, implementing a credible interest-rate-based monetary framework, Together, these reforms aim to stabilize public finances, improve spending efficiency, and unlock resources for adaptation investments. As the official development assistance is expected to fall by more than half in 2025 relative to the 2019–24 average, the most practical path is to align humanitarian and resilience efforts; accelerate domestic revenue mobilization; and improve the efficiency of resource allocation and public spending to protect essential services and public well-being, while laying the grounds for stronger climate adaptation.

5.1.3. Refining the institutional framework

Several recommendations strengthen the existing framework for climate policy and finance, elaborate a more integrated and effective approach to climate action, and establish ambitious, actionable, and sustainable climate policies by 2030. They include:

- **Enhancing the role and visibility of the CCWG by clearly defining its responsibilities and progress to government agencies and the public:** The CCWG should ensure transparent reporting on the advancement of major climate policies. Raising awareness of its activities and promoting inclusiveness will build trust and encourage participation from stakeholders at all levels. Strengthening coordination and interministerial dialogue will also support more integrated climate and development planning processes. By aligning efforts across ministries, development partners, and local actors, the government may optimize resources and promote integrated approaches to climate action, ensuring significant progress in adaptation and mitigation efforts. Ultimately, a high-level policy and oversight body similar to neighboring countries' national climate change councils could significantly reinforce climate governance leadership.

- **Raising local awareness of climate change for systemic action:** Since many South Sudanese rely on agriculture, forestry, and fisheries for their livelihoods, increasing local awareness can lead to more effective adaptation strategies and community-driven solutions and help tackle climate-related challenges such as drying seasonal streams, increased deforestation, and resource-based pastoralist–farmer conflicts. Enhancing local participation—for example, through ecosystem-based adaptation projects—may also support the functioning of environment forums proposed in the national environmental policy.

- **Strengthening the leadership of the MoEF and MoFEP by enhancing institutional capacity, improving coordination mechanisms, and ensuring active involvement in climate policy formulation and implementation:** Investing in building technical and managerial capacity, particularly within the MoEF's Climate Change Unit, is a key strategy, while strengthening coordination between the MoEF, MoFP, and other ministries is essential for effective climate action.

Several factors may impede the implementation of these measures. They include: persistent conflict and insecurity; limited technical, managerial, and financial capacity within ministries and agencies; the absence of updated or clear laws, mandates, and procedures for climate governance; weak coordination mechanisms between ministries, agencies, and other stakeholders; low public awareness and limited involvement of civil society, local communities, and the private sector in climate policy processes; insufficient climate, environmental, and socioeconomic data to inform decision-making and monitor progress; and mismanagement or diversion of resources.

5.1.4. Mainstreaming climate and DRM in investment planning

Both structural reforms and targeted climate-focused measures are required to mainstream climate and DRM in investment planning. They include:

- **Aligning budget formulation with climate priorities:** Explicitly integrating climate risks into macrofiscal projections and revenue forecasts would enhance South Sudan's budget formulation process. To do this, the MoFP can introduce a green budgeting framework that includes climate-focused spending ceilings within sectoral plans. This could include: setting climate-focused ceilings; integrating climate change programs into the Medium-Term Expenditure Framework; strengthen sector working groups; and establishing an early and inclusive budget calendar that fosters stakeholder participation and ensures timely finalization.

- **Embedding climate-responsive PFM practices in budget execution:** This can be done via climate budget tagging and contingency funds for climate shocks.

- **Strengthening PIM:** Investing in systematic feasibility assessments, institutional capacity building, and enhanced monitoring and evaluation would enhance the government's capacity to conduct climate-resilient investment appraisals.

- **Enhancing climate finance accountability:** Providing resources and technical training to audit climate-related expenditures effectively would strengthen the NAC's mandate. Publishing loan documentation and aligning these with climate investments would help embed "green PFM" principles. Prioritizing oil-backed financing for projects that contribute to resilience—such as climate-proofing roads or flood defenses—over politically driven initiatives is also vital.

- **Enhancing legislative and civil society engagement by fostering public participation in the budget cycle:** Potential measures include open budget hearings and publishing user-friendly summaries of climate-relevant expenditures and expected results for citizens.

5.1.5. Attracting the private sector

Establishing transparent regulations, streamlining investment processes, and targeting fiscal incentives at climate-smart technologies would help attract private investment into South Sudan's climate-resilient agriculture, renewable energy, and infrastructure sectors. In particular, the government is encouraged to:

- Introduce policies, laws, and institutions that reduce investor perceptions of risk and make business environments more competitive

- Revise the sectors restricted to foreign participation via a "negative list" approach, eliminate minimum domestic capital requirements, and remove the screening process while adopting more objective criteria to improve decisions transparency

- Strengthen the investment legal framework by adding features to complete rules on expropriation, transfer of profits, and dispute settlement, and promote consistency and non-discretionary behavior/measures

- Establish an investor grievance mechanism that goes beyond simply addressing investment authority decisions to cover the actions of all government agencies

- Ensure all incentives and linkage programs follow good international practice that maximizes the effectiveness of foreign direct investment in the local economy

- Negotiate and conclude bilateral investment treaties with main trade and investment partners, and review the domestic legal regime on investment to make it consistent with the international investment regime.

5.2. Enhancing flood and drought management

To ensure an efficient response to climate change, South Sudan needs to change its approach to flood and drought risk management. A transition toward a long-term, government-led, climate-resilient development approach to water resource management, grounded in conflict sensitivity and inclusion, is required. This analysis identifies six key areas to promote a long-term, integrated approach to managing floods and droughts: hydrometeorological monitoring and forecasting, climate-resilient livelihoods, DRM capacity, social protection and services, spatial development and planning, and gray and green flood management infrastructure.

5.2.1. Hydrometeorological monitoring and forecasting

A lack of weather records, insufficient investment, and limited technical capacity mean that the climate monitoring system across Central and Eastern Africa, including South Sudan, is significantly underdeveloped. Although South Sudan has made efforts to establish climate databases, projections, and early warning systems, these systems are still in development and face significant challenges. Political instability and economic crises have led to the collapse of much of the meteorological infrastructure, making climate studies difficult. While several institutions—including the South Sudan Meteorology Department, Famine Early Warning Systems Network, United Nations, Intergovernmental Authority on Development Climate Prediction & Applications Centre, and some NGOs—generate climate-related information, these data are not systematically integrated into local decision-making. As a result, the availability and quality of historical climate data in South Sudan are poor, inconsistent, and largely uncoordinated. A twin track approach building on and scaling up ongoing efforts would continue to leverage and adopt innovative early warning technologies, such as satellite-based remote sensing and hydrological models, to strengthen hydrometeorological forecasting and real-time monitoring. In parallel, it would expand, integrate, and sustain the on-the-ground observational hydrometric network, integrate climate security analysis, and be directly accessible to at-risk communities. These efforts need to build on community-based lessons on awareness and preparedness to ensure information is readily available to communities and allows them to anticipate natural hazards. For efficient early warning systems, investments are required to upgrade hydrometric stations, train personnel, strengthen state capacity, and establish a national communication system to ensure alerts reach all affected communities. Strengthening transboundary water management and cooperation with riparian countries, including more streamlined information-sharing with upstream riparian countries and coordinated infrastructure management at critical upstream locations, such as the Elegu-Nimule border post with Uganda and water releases from Lake Albert and Lake Victoria is also needed.

5.2.2. Climate-resilient livelihoods

Communities struggle to anticipate climate-related shocks, rendering them unable to make productive decisions to foster adaptation. Improved information could facilitate the expansion of recession agriculture and use of flood-tolerant crops, such as rice. A lack of foresight and access to marketing systems means herders are generally unable to destock ahead of climate-related crises, while limited access to healthy animals after a climate shock prevents them from restocking once the crisis is over. This increases pastoralists' and herders' economic vulnerability, reduces their resilience, and increases their recovery time. Expanding access to cattle markets would improve resilience and offer economic opportunities, particularly for women and youth, who are disproportionately vulnerable to climate shocks and already face limited livelihoods. Without alternatives, young men—unable to afford marriage obligations—are susceptible to elite-driven militia recruitment to protect elite-owned herds, perpetuating a cycle of scarcity and conflict. Enabling cattle sales as a sustainable income source can reduce this vulnerability and stabilize communities. Making climate risk and early warning systems accessible to farmers and livestock herders would enable them to make informed decisions early in the season and well ahead of climate shocks, reducing their vulnerability, increasing food system resilience, and enhancing livelihoods. This would reduce forced migration and the subsequent encroachment of agriculture land by herders, reducing competition over natural resources, which results in conflict. Embedding such community-centric participatory climate risk assessment approaches in donor-funded

programs can enhance local adaptation and is particularly relevant in the absence of intergovernmental fiscal transfers and low own-source revenue. Targeted small-scale engineering measures, such as maintaining or expanding polders, providing flood-resilient roads, or improving river transport would also greatly enhance livelihoods by protecting and ensuring access to critical local infrastructure.

5.2.3. DRM capacity

South Sudan's DRM and emergency response, and capacity to design, implement, and coordinate effective social protection programs are also constrained by political instability, limited funding, and weak governance structures. Flood and drought risk management requires strengthening institutional frameworks at multiple levels. Operationalizing the county and payam DRM committees as defined in the National DRM Policy (2021) and capacitating community dike committees through training and equipment provision would help establish local-level institutions for improved flood emergency preparedness and response. Communities could also collaborate with the government, humanitarian, and development actors to provide lessons learned, delineate flood- and drought-prone areas, and identify safe grounds.

5.2.4. Social protection and services

At household level, the ability to adequately prepare for and respond to climate shocks is influenced by access to resources and social support, and household assets are crucial for escaping poverty. Targeted social protection mechanisms and systems—such as cash transfers, food assistance, index-based insurance, and livelihood support—provide critical safety nets that help households maintain access to food and livelihoods. Social protection interventions to date have been almost entirely funded by donors and are often fragmented and unpredictable, therefore lacking both efficiency and sustainability. There is a clear need to improve mechanisms to develop robust national social protection frameworks with data-driven, climate-adaptative targeting. Continuity of critical local services can be enhanced through climate-resilient schools and health centers, which integrate flood-proofing measures, such as elevating rooms; improving drainage; applying climate-resilient construction standards; installing flood-resistant water, sanitation, and hygiene facilities; risk-informed siting; and heat-resilience and cooling solutions such as climate-responsive building orientation, improved ventilation, reflective roofing, insulation, shading, and tree cover.

5.2.5. Spatial development planning and zoning

Rapid urbanization and the displacement of flood- and conflict-affected communities requires targeted strategies to reduce exposure and vulnerability to flooding. Investing in urban drainage and preserving wetlands and riparian zones by preventing encroachments into these areas can help prevent the emergence of future risks (World Bank 2025i). Zoning and building control can significantly reduce flood exposure by restricting the use of flood-exposed lands, particularly when combined with awareness-raising and other instruments to ensure communities are on board. At national level, enhanced coordination across sectors and levels and improved legal frameworks for floodplain management could support a transition toward sustainable flood and drought risk management. This includes signing land and DRM policies into law, engaging the Parliamentary Committee on Land and the Ministry of Land, Housing and Urban Development to include land and water clauses linked to flood risk mitigation, and building flood and drought risk management capacity in land-governing institutions.

5.2.6. Gray and green flood management infrastructure

Given South Sudan's extensive natural capital in the form of wetlands and water-related ecosystems, interventions to reduce flood hazards could start by leveraging nature-based solutions. Investments might include wetland conservation and management, and the creation of riparian buffers to enhance these ecosystems' flood-retention ability. Reforestation may be useful around urban areas that are subject to flash flooding, but at landscape level, South Sudan's natural habitats are in good condition. Investments in gray infrastructure and river engineering works should be guided by comprehensive feasibility assessments and integrated planning frameworks that explicitly consider upstream

hydrological dynamics, regional governance frameworks, and the transboundary nature of the Nile Basin and assess their potential impact on social and conflict dynamics. Where feasible, it is advisable to complement or maintain these investments with nature-based solutions. They should also aim to capture the multipurpose benefits of water engineering works to support adaptation to both droughts and floods—for example, river engineering might help reduce flood hazards while also facilitating the use of inland waterways for safe, low-carbon transport, while building water storage facilities to reduce fluvial flood hazards can also expand access to clean energy and water availability in times of drought. Investments to consider include rehabilitating the Jonglei embankment; conservation and management of water-related ecosystems between Nimule and Juba to help reduce flood peaks generated from upstream releases; multipurpose dam options; and rehabilitating and building small-scale water storage solutions to enhance the resilience of rural livelihoods to droughts.

5.3. Adopting climate-resilient farming and livestock practices and valuing renewable natural resources

5.3.1. Adopting a resilient agriculture with supporting services and infrastructure

With the threat climate change presents to agricultural productivity and food security, adopting climate-resilient farming and livestock practices is vital. Climate-resilient farming and livestock practices—such as conservation agriculture (sustainable fodder production, stable access to rangeland and water resources for livestock systems, and so on), integrated crop-livestock systems, improved grazing management, and sustainable natural resource management—can enhance soil health, improve water retention, maintain livestock health and productivity, and increase biodiversity, thereby boosting climate resilience. Important climate-smart agriculture techniques for South Sudan include improving rainwater management with tied ridges, mulching, conservation tillage, small scale solar powered irrigation and water harvesting structures to stabilize agricultural production, strengthening seed systems, particularly for heat and drought tolerant sorghum, cassava, sesame, and short cycle legumes, improved planting calendars, intercropping, and soil health practices such as residue retention and agroforestry.

Widening access to high-quality extension services and climate-resilient seeds and livestock breeds is key to enhancing agricultural resilience in South Sudan. This transition must be supported by stronger extension services, community based seed banks, accessible inputs, and the translation of climate early warning information into actionable advisories for farmers. Post harvest resilience will be equally crucial, including hermetic storage, raised granaries, and flood resilient aggregation centers. Risk management tools, such as index insurance and adaptive safety nets, can reduce negative coping strategies, while targeting women who are disproportionately vulnerable through tailored training, labor saving technologies, and safer access to energy will strengthen both equity and resilience. By prioritizing knowledge transfer and capacity building, South Sudan can empower its agricultural communities to embrace climate-resilient practices, ultimately fostering a more robust and sustainable agricultural sector and safeguarding livelihoods.

The country's heavy reliance on rainfed agriculture and vulnerability to climate-induced water stress means that enhancing agricultural resilience to drought by improving water retention/storage infrastructure is particularly important. Expanding irrigation systems and large water harvesting structures in dry areas of the southeast may optimize water use and reduce wastage, ensuring stored water is used effectively to support crop growth. This approach mitigates the risk of crop failures while also stabilizing food security and livelihoods.

5.3.2. Promoting sustainable natural resource management and resilient ecosystems

Enhancing sustainable production and value generation from renewable natural resources by 2040 is also crucial for the country's economic development. Establishing CBNRM across the forestry, fisheries, and wildlife sectors can play a significant role in achieving this goal. CBNRM empowers local communities to manage and benefit from their natural resources, fostering a sense of ownership and responsibility. By integrating CBNRM into these sectors, South Sudan may improve the handling,

processing, and marketing of natural resources, increasing their value. This approach supports sustainable practices and enhances local community livelihoods by creating jobs and generating income. Improved value chain handling may also bring about more efficient resource use, reducing waste, and maximizing economic returns.

Expanding the country's capacity to rapidly scale up fisheries production during high-flood years would contribute to food security and economic resilience in the face of climate change. Floods represent abundant opportunities for fisheries, but these can be lost without adequate infrastructure and resources. Investing in additional gear and landing capacity can help people capitalize on these high-flood periods, increasing fish harvests and improving economic outcomes, while developing multipurpose cold storage facilities that can switch between storing animal and fish products would reduce post-harvest losses and help maintain product quality.

5.4. Improving energy access

5.4.1. Clean energy for public services

Improving clean energy access for public institutions by 2030—which would cost $56.5 million—is key for South Sudan to deliver critical health and education services. Deploying solar-based off-grid solutions could provide reliable, sustainable energy to remote institutions currently underserved by the national grid. Solar energy systems, coupled with battery storage, offer a viable alternative to diesel generators, which are costly and environmentally harmful. Prioritizing solar electrification for public institutions could reduce operational costs and minimize reliance on fossil fuels, while incorporating advanced resilience and operations and maintenance measures would maximize their benefits. Ensuring the sustainability of these solar-based off-grid systems requires regular maintenance and technical support, which can be facilitated through training programs for local staff and community members. This engagement fosters a sense of ownership and responsibility, reducing risks of theft and vandalism. By integrating these measures, South Sudan could build a robust infrastructure that supports the long-term functionality of solar energy systems, improving the resilience of public institutions against power outages and climate-related disruptions.

5.4.2. Clean energy for households

Providing clean energy access to South Sudanese households and farmers by 2030—at a cost of $79.8 million—would improve living standards and boost agricultural productivity. Targeted market development for off-grid solar solutions can increase their availability and affordability for households and smallholder farmers, providing immediate access to reliable electricity. This would enhance household welfare by providing lighting, powering appliances, and enabling communication, and support agricultural activities through solar-powered irrigation and refrigeration systems. Supporting South Sudanese businesses that are active in off-grid solar distribution and incentivizing increased market entry from established actors would help expand clean energy access. Awarding results-based financing schemes or grants to commercially viable off-grid solar companies on a competitive basis would encourage innovation and growth in the sector and foster a competitive market environment, attracting international actors and leveraging their expertise to enhance the local off-grid solar sector. As well as supporting the development of a sustainable energy market, this approach promotes jobs creation and stimulates economic growth. Establishing quality standards and regulatory frameworks would ensure the reliability and safety of solar products, further boosting consumer confidence and adoption.

References

References

ACAPS. 2022. South Sudan: *Briefing Note*.

ADB. 2023. *South Sudan Economic Outlook*. African Development Bank.

ADB. 2024. *Country Focus Report 2024: Driving South Sudan's Transformation and the Reform of Global Financial Architecture. African Development Bank.*

AFD. 2022. *The Green Budgeting Transition*.

Ashkriz, E. 2015. *Regional Sources of Precipitation in the Ethiopian Highlands*.

BRACED. 2018. *Building Climate Resilience in Fragile Contexts: Key Findings of BRACED Research in South Sudan*.

Chavy, A. 2017. *Weaponizing Gender Violence in Sudan*.

Craze, J and Markó F. 2022. "Death by Peace: How South Sudan's Peace Agreement Ate the Grassroots." African Arguments, January 6. https://africanarguments.org/2022/01/death-by-peace-how-south-sudans-peace-agreement-ate-the-grassroots/.

Da Costa, D. 2013. We Are One, *But We Are Different: Murle Identity and Local Peacebuilding in Jonglei State, South Sudan*. Norwegian Peacebuilding Resource Centre.

Da Costa, D. 2023. "Navigating the Complex Webs of Murle Authority in Pibor: Conflict Sensitivity Considerations for Aid Actors." Conflict Sensitivity Resource Facility blog, June 27.

Danish Refugee Council. 2024. *Floating Gardens: Flood Adaptive Agriculture in Unity State*. https://drc.ngo/resources/documents/floating-gardens-flood-adaptive-agriculture-in-unity-state/.

Eberle, U and Boswell, A. 2022. *Floods, Displacement and Violence in South Sudan*. International Crisis Group.

Eckstein, D, Künzel, V and Schäfer, L. 2021. *Global Climate Risk Index 2021: Who Suffers Most from Extreme*

European Commission. 2023. *Inform Risk Profile* - South Sudan.

FAO. 2021. *Flood Impact Report - South Sudan*. Food and Agriculture Organization of the United Nations.

GCF. 2018. NDA Strengthening and Country Programming Support for South Sudan through UNEP. Green Climate Fund.https://www.greenclimate.fund/document/nda-strengthening-and-country-programming-support-south-sudan-through-unep.

Gebrechorkos, S H, Taye, M T, Birhanu, B, Solomon, D and Demissie, T. 2023. "Future Changes in Climate and Hydroclimate Extremes in East Africa." *Earth's Future* 11(2). https://doi.org/10.1029/2022EF003011.

Global Women's Institute and the International Rescue Committee. 2017. *No Safe Place: A Lifetime of Violence for Conflict-affected Women and Girls in South Sudan*.

Gorgulu, N, Foster, V, Jain, D, Straub, Sand Vagliasindi, M. 2023. *The Impact of Infrastructure on Development Outcomes: A Meta-Analysis*. Washington DC: World Bank. http://hdl.handle.net/10986/39534.

Government of South Sudan. 2018. *Initial National Communication to the United Nations Framework Convention on Climate Change*.

Government of South Sudan. 2021a. *First National Adaptation Plan for Climate Change – Republic of South Sudan*.

Government of South Sudan. 2021c. *South Sudan's Second Nationally Determined Contribution*.

IADB. 2020. *Climate-Resilient Public-Private Partnerships: A Toolkit for Decision Makers*. Inter-American Development Bank.

IEc. 2025a. Estimating the Economic Impacts of Climate Change in South Sudan.

IEc. 2025b. "South Sudan CCDR – Deep Dive: Sudd Flooding" (Draft). In IEc. 2025a. *Estimating the Economic Impacts of Climate Change in South Sudan.*

IEc. 2025c. "South Sudan CCDR – Human Health Channel Memo" (Draft). In IEc. 2025a. *Estimating the Economic Impacts of Climate Change in South Sudan.*

IEc. 2025d. "South Sudan CCDR – Hydropower Generation" (Draft). In IEc. 2025a. *Estimating the Economic Impacts of Climate Change in South Sudan.*

IEc. 2025e. "South Sudan CCDR – Inland and Urban Flooding Channel Memo" (Draft). In IEc. 2025a. *Estimating the Economic Impacts of Climate Change in South Sudan.*

IEc. 2025f. "South Sudan CCDR – Labor Heat Stress Channel Memo" (Draft). In IEc. 2025a. *Estimating the Economic Impacts of Climate Change in South Sudan.*

IEc. 2025g. "South Sudan CCDR – Livestock Channel Memo" (Draft). In IEc. 2025a. *Estimating the Economic Impacts of Climate Change in South Sudan.*

IEc. 2025h. "South Sudan CCDR – Rainfed Crop Production Channel Memo" (Draft). In IEc. 2025a. *Estimating the Economic Impacts of Climate Change in South Sudan.*

IMF. 2021. *Climate-Sensitive Management of Public Finances — "Green PFM"*.

IMF, 2023. *South Sudan - IMF Country Report*.

IMF. 2024a. *IMF Country Report No. 24/327 – Republic of South Sudan*.

IMF. 2024b. Republic of South Sudan: 2023 *Article IV Consultation, and First and Second Reviews under the Staff-Monitored Program with Board Involvement-Press Release; Staff Report; and Statement by the Executive Director for Republic of South Sudan*. https://doi.org/10.5089/9798400279096.002.

Internal Displacement Monitoring Centre. 2025. *South Sudan Country Profile*.

IOM. 2024. *DTM South Sudan - Baseline Assessment Round 15*. International Organization for Migration.

IPC. 2024. *IPC South Sudan Acute Food Insecurity and Malnutrition Report (September 2024 – July 2025)*. Integrated Food Security Phase Classification.

MAFS. 2020. *Land Degradation Neutrality Target Setting Final Report*. Directorate for Agricultural Research, South Sudan's Ministry of Agriculture and Food Security.

Mohamed, Y A, van den Hurk, B J J M, Savenije, H H G and Bastiaanssen, W G M. 2005. "Impact of the Sudd Wetland on the Nile Hydroclimatology." *Water Resources Research* 41(8). https://doi.org/10.1029/2004WR003792.

Morrison-Métois, S. 2017. *Responding to Refugee Crises: Lessons from Evaluations in South Sudan as a Country of Origin*. OECD. https://www.oecd.org/en/publications/responding-to-refugee-crises_3b2fd4cc-en.html.

MSF. 2018. "125 Women and Girls Seek Emergency Assistance in Bentiu After Horrific Sexual Violence." Médecins Sans Frontières press release, November 30. https://www.msf.org/125-women-and-girls-seek-emergency-assistance-bentiu-after-horrific-sexual-violence-south-sudan.

Muorwel, J, Pospisil, J and Monoja, V. 2023. *Caught between Crisis: Flood-Induced Migration of Dinka Bor Cattle Herders into the Equatoria Region*. FES: Friedrich-Ebert-Stiftung. https://library.fes.de/pdf-files/bueros/suedsudan/20819.pdf.

Naran, B, Zhang, T and Gupta, I. 2024. *Understanding Global Concessional Climate Finance*. CPI.

NDC Partnership. 2024. *Green Climate Fund & NDC Partnership*.

OCHA. 2020. *South Sudan: Flooding Snapshot (as of September 3, 2020).*

OCHA. 2024a. *South Sudan: Floods Snapshot (as of October 18, 2024).*

OCHA. 2024b. *South Sudan Floods Snapshot (as of November 29, 2024).*

OCHA–UNHCR. 2016. *South Sudanese Influx into East Darfur Fact Sheet Issue 4.*

OECD. 2024. *Climate Adaptation Investment Framework*. https://www.oecd.org/en/publications/climate-adaptation-investment-framework_8686fc27-en.html.

OECD. 2025. *Cuts in Official Development Assistance: OECD Projections for 2025 and the Near Term*. OECD Policy Briefs, No. 26, OECD Publishing, Paris, https://doi.org/10.1787/8c530629-en.

Pappas A, Kovats S and Ranganathan M. 2024. *Extreme Weather Events and Maternal Health in Low-income and Middle-income Countries: A Scoping Review*.

Paul, G. 2023. *Road Maintenance Challenges: The Greatest Obstacle to Sustainable Development in South Sudan*.

PAX and University of Utrecht. 2023. *Toxic Floods? Climate, Natural Hazards and Risks to South Sudan's Oil Infrastructure*. https://paxforpeace.nl/wp-content/uploads/sites/2/import/2023-05/PAX_Toxic%20Floods.pdf.

REACH-Impact. 2022. *Greater Kapoeta Climate Impact & Displacement Profile, Eastern Equatoria State, South Sudan*. March 2022. https://repository.impact-initiatives.org/document/impact/deb791be/Kapoeta_Climate_Assessment_Report_Final.pdf.

Ruiz, A and Guevara, J. 2020. "Sustainable Decision-making in Road Development: Analysis of Road Preservation Policies." *Sustainability* 12(3): 872. https://doi.org/10.3390/su12030872.

Sherpa, S, Ivanescu, C and Yi, X. 2023. *High-Level Least-Cost Electrification Prospectus: For Achieving 50 Percent Electrification Access Target By 2030*. Washington DC: World Bank. http://documents.worldbank.org/curated/en/099062423121020382.

SIDA. 2024. *Multidimensional Poverty Analysis: South Sudan 2023–2024*. Swedish International Development Cooperation Agency.

Sosnowski, A, Ghoneim, E, Burke, J J, Hines, E and Halls, J. 2016. "Remote Regions, Remote Data: A Spatial Investigation of Precipitation, Dynamic Land Covers, and Conflict in the Sudd Wetland of South Sudan." *Applied Geography* 69: 51–64. https://doi.org/10.1016/j.apgeog.2016.02.007.

SPARC. 2025. *Trends in Access to Climate Finance in South Sudan*.

Stephens, L and Levi, J. 2024. "South Sudan Floods: The First Example of a Mass Population Permanently Displaced by Climate Change?" *The Conservation*, September 10.

Sudans Post. 2025. "JEDCO announces 13% Electricity Tarriff Reduction." April 8. https://www.sudanspost.com/jedco-announces-13-electricity-tariff-reduction/.

Tiitmamer, N. 2022, "To Dredge or Not to Dredge the White Nile's Tributaries: Is the Cart Before the Horse?" The Sudd Institute Weekly Review, June 15. https://suddinstitute.org/publications/show/62ac0191bac2f.

Umar, M. and Kiden, L. 2024. "Climate Change, Conflict and Gender Nexus: Evidence from Bor County South Sudan." *Management of Environmental Quality* 36(2): 491–509. https://doi.org/10.1108/MEQ-04-2024-0141.

UN. 2025. "Famine Stalks Two Counties in South Sudan as Fragile Peace is Threatened." United Nations News, June 12. https://news.un.org/en/story/2025/06/1164311.

UN Women. 2023. *Gender, Education, and Literacy in South Sudan*.

UNDP. 2017. "Confronting Climate Change in South Sudan." *Africa Renewal*: Economic Development, July 6. https://africarenewal.un.org/en/magazine/confronting-climate-change-south-sudan.

UNDP. 2021. *First National Adaptation Plan – Republic of South Sudan*.

UNDP. 2023. *Strengthening Agricultural Value Chain AfCFTA Linkages in South Sudan: Opportunities and Challenges*.https://www.undp.org/south-sudan/publications/strengthening-agricultural-value-chain-afcfta-linkages-south-sudan-opportunities-and-challenges.

UNEP. 2023. "South Sudan Adapts to Climate Change by Restoring Its Ecosystems." UN Environment Program press release, April 19. https://www.unep.org/gan/news/press-release/south-sudan-adapts-climate-change-restoring-its-ecosystems.

UNESCO. 2023. *Climate Change Communication and Education*.

UNFPA. 2023. "South Sudan Ranks Second in GBV Prevalence Rate in East Africa – A New Study Indicates." https://southsudan.unfpa.org/en/news/south-sudan-ranks-second-gbv-prevalence-rate-east-africa-%E2%80%93-new-study-indicates.

UNHCR. 2024. South Sudan Refugee Dashboard: 2024.

UNICEF. 2019. "Gender-Based Violence in South Sudan." Briefing note,

UNICEF. 2021. *The Situation of Children and Women in South Sudan: 2018 to 2020*.

UNMISS–OHCHR. 2021. "Armed Violence Involving Community-Based Militias in Greater Jonglei (January-August 2020)."

USAID. 2019. *South Sudan Climate Vulnerability Profile*.

Viste, E and Sorteberg, A. 2011. "Moisture Transport into the Ethiopian Highlands." *International Journal of Climatology* 333(1): 249–263. https://doi.org/10.1002/joc.3409.

Watson, D. 2021. *Surface Tension: Communal Violence and Elite Ambitions in South Sudan*. ACLED.

WFP. 2025. "Conflict, Displacement and Disease Drive Food Insecurity and Malnutrition to Alarming Levels in Parts of South Sudan." World Food Programme, June 12. https://www.wfp.org/news/conflict-displacement-and-disease-drive-food-insecurity-and-malnutrition-alarming-level-parts.

WHO. 2024. "Severe Flooding Compounds Health Crisis in South Sudan." World Health Organization.

WHO. 2025. "From Crisis Response to System Reform: Reframing Nutrition Action in South Sudan." World Health Organization Situation Report, July 14. https://reliefweb.int/report/south-sudan/crisis-response-system-reform-reframing-nutrition-action-south-sudan.

World Bank. 2017. *South Sudan Emergency Food and Nutrition Security Project. Project Appraisal Document*.

World Bank 2018. *Impact of Conflict on Adolescent Girls in South Sudan.*

World Bank. 2022. *Climate Toolkits for Infrastructure PPPs*.

World Bank. 2022. "South Sudan Electricity Sector Diagnostic" (Draft).

World Bank. 2023a. *Gender-Based Violence Prevention and Response in World Bank Operations: Taking Stock After a Decade of Engagement.*

World Bank. 2023b. South Sudan - Energy Sector Access and Institutional Strengthening Project (PAD).

World Bank. 2023c. *Nature's Frontiers: Achieving Sustainability, Efficiency, and Prosperity with Natural Capital*.

World Bank. 2023d. Pathways to Electricity Access Expansion in South Sudan: Off-grid and Mini-grid Market Assessment. ESMAP report. Washington DC: World Bank.

World Bank. 2023e. *Rising from the Depths - Water Security and Fragility in South Sudan*.

World Bank. 2023f. *South Sudan Resilience Livestock Sector Project: Project Information Document*.

World Bank. 2024a. *Poverty and Equity Assessment – Republic of South Sudan*.

World Bank. 2024b. *Strengthening South Sudan's Financial Sector*.

World Bank. 2024c. World Development Indicators.

World Bank. 2025a. "Boosting Green & Resilient Growth of South Sudan's Private Sector" Background Note (Draft).

World Bank. 2025b. "Climate Risk Profile for South Sudan" (Draft).

World Bank. 2025c. "Rural Livelihoods in South Sudan." Background Paper (Draft).

World Bank. 2025d. South Sudan Connectivity for Growth Project - Appraisal Project Information Document (PID).

World Bank. 2025e. South Sudan Economic Monitor – A Pathway to Overcome the Crisis.

World Bank. 2025f. South Sudan Natural Resources Review.

World Bank. 2025g. "South Sudan Off-grid and Mini-grid Market Assessment" (Draft).

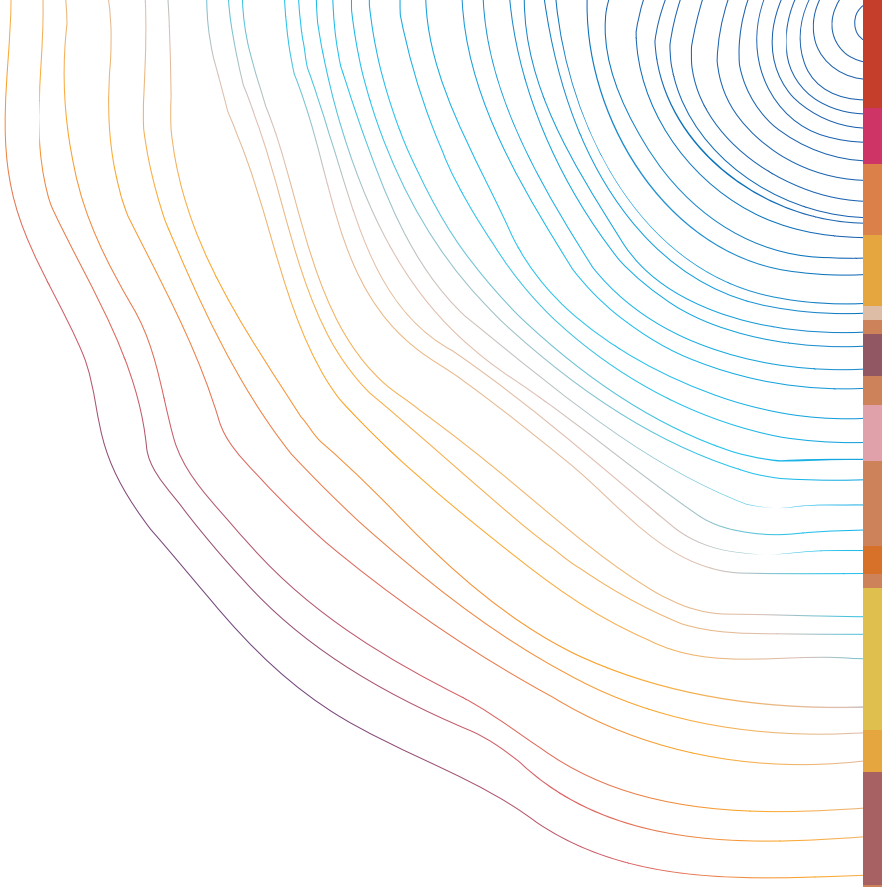
World Bank. 2025h. World Development Indicators.

World Bank. 2025i. *South Sudan: Assessing Urban Disaster Risks and Investment Options for Urban Disaster Risk Reduction*.

World Bank. Forthcoming. *South Sudan Electricity Sector Diagnostic*.

World Bank. 2026. "South Sudan Public Finance Review. *A Narrow Path to Recovery: The Key Role of Public Finances*" (Draft).

WRI 2019. Aqueduct 3.0: Updated Decision-Relevant Global Water Risk Indicators. World Resources Institute.



Appendices

Appendix A. Prioritized recommendations

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
PUBLIC FINANCE						
Objective: Improving public financial and macroeconomic management to create the fiscal space for delivering basic services and building resilience to climate shocks						
The World Bank Public Finance Review 2026 calls for a sequenced reform agenda focused on transparency, efficiency, and revenue mobilization, starting with no-cost measures to improve fiscal transparency *World Bank (2026) South Sudan Public Finance Review. A Narrow Path to Recovery: The Key Role of Public Finances*						
CLIMATE COMMITMENTS, POLICIES, AND INSTITUTIONAL CAPACITY						
Objective: Reinforcing the existing governance framework for climate policy and finance and fostering greater coordination among stakeholders to create a more integrated and efficient approach to climate action in the country						
Priority actions Strengthen, clarify, and communicate the role and progress of the Climate Change Working Group (CCWG) to government agencies and the public; consider a higher-level policy oversight body, such as a national climate council Work with the Local Government Board (LGB) to roll out training and facilitation programs that equip subnational governments in priority climate-vulnerable regions to design, finance, and implement locally led adaptation measures Improve the leadership of the MoEF by enhancing institutional capacity, strengthening coordination mechanisms, and ensuring active involvement in climate policy formulation and implementation (e.g. by investing in building the ministry's technical and managerial capacity, particularly within its Climate Change Unit) **Targets** Develop and disseminate clear terms of reference for the CCWG and publish and share at least two progress updates (e.g., newsletters or press releases) with all relevant government agencies and the public Building on the World Bank's Enhancing Community Resilience and Local Governance II model, partner with the LGB to co-design and roll out a climate adaptation training and facilitation plan, that equips county- and payam-level officials to integrate locally led adaptation measures into local plans and budgets, and positions the LGB as an ongoing hub for technical support and peer learning in South Sudan's most climate-vulnerable subnational governments Policy, technical, and managerial staff from MoEF and five line ministries complete accredited climate-training, with ≥ 40% women	President's Office Ministry of Finance and Planning (MoFP) Ministry of Environment and Forestry (MoEF)	$	**Technical assistance** for mandate definition, stakeholder mapping, and developing communication strategies and platforms for regular updates to government and the public **Support for engagement with subnational governments**, including knowledge sharing, facilitation, and training on adaptation measures (including ecosystem-based adaptation projects) with local stakeholders **Capacity building** for MoFP staff, establishing **coordination platforms**, and **technical advisory services** for policy development and implementation	2026 - 2030	Adaptation Mitigation	Persistent conflict or insecurity, disrupting policy implementation, stakeholder engagement, and investment flows Limited technical, managerial, and financial capacity within ministries and agencies hampering effective policy design, coordination, and execution Absence of updated or clear laws, mandates, and procedures for climate governance, creating confusion and reducing accountability Weak coordination mechanisms between ministries, agencies, and other stakeholders, leading to duplication, inefficiency, and policy gaps Low public awareness and limited involvement of civil society, local communities, and the private sector in climate policy processes Insufficient climate, environmental, and socioeconomic data to inform decision-making and monitor progress Risks of mismanagement or diversion of resources undermine trust and effectiveness of climate initiatives

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
CLIMATE COMMITMENTS, POLICIES, AND INSTITUTIONAL CAPACITY						
Objective: Mainstream climate and disaster risk management (DRM) considerations into the public financial management (PFM) system						
Priority actions Align budget formulation with climate priorities—e.g., by explicitly integrating climate risks into macrofiscal projections and revenue forecasts to enhance the budget formulation process, or introducing a green budgeting framework that sets climate-focused ceilings within sectoral plans, integrates climate change programs into the Medium-Term Expenditure Framework, strengthens sector working groups, and establishes an early and inclusive budget calendar that fosters stakeholder participation and ensures timely finalization Embed climate-responsive PFM practices in budget execution via climate budget tagging (CBT) and contingency funds for climate shocks Strengthen public investment management (PIM)—e.g., by enhancing capacity to conduct climate-resilient investment appraisals via systematic feasibility assessments, institutional capacity building; and enhanced monitoring and evaluation. Enhance climate finance accountability by: strengthening the National Audit Chamber's (NAC) mandate by providing resources and technical training to audit climate-related expenditures effectively; embedding "green PFM" principles such as publishing loan documentation and aligning with climate investments; and prioritizing oil-backed financing for projects that contribute to resilience (e.g., climate-proofed roads or flood defenses) rather than politically-driven initiatives Enhance legislative and civil society engagement by fostering public participation in the budget cycle through, e.g., open budget hearings, publishing user-friendly summaries of climate-relevant expenditures and expected results for citizens **Targets** Develop green budget tagging guidelines for the MoFP, and pilot the integration of at least one climate-related program into a medium-term fiscal instrument (e.g., the Medium-Term Expenditure Framework) in two key sectors (e.g., agriculture and water)	MoFP MoEF Ministry of Humanitarian Affairs and Disaster Management (MoHADM)	$	**Technical assistance and capacity building** for the MoFP to integrate climate risks into budget planning, establish green budgeting frameworks, and strengthen sector working groups **Support for designing and piloting CBT systems and contingency funding mechanisms**, including staff training and system upgrades **Institutional capacity building** for climate-resilient investment appraisal, including developing feasibility assessment tools and monitoring systems **Resources and technical training for the NAC** to audit climate expenditures and publish budget and loan documentation **Facilitation of open budget hearings, public consultations**, and **publishing user-friendly budget summaries** to increase transparency and participation	2027 - 2035	Adaptation Mitigation	Limited expertise and experience in climate finance, green budgeting, and DRM within the MoFP and other key institutions Absence of clear laws, guidelines, and mandates for integrating climate and DRM into PFM processes Insufficient or unreliable climate risk, fiscal, and investment data to inform budget formulation and execution Lack of dedicated funding for capacity building, system upgrades, and implementation of new PFM practices Institutional resistance to new processes, such as green budgeting or CBT, due to lack of incentives or understanding

High-Level Objectives and Recommended Priority Actions and Targets	Lead Agency	Estimated Costs	Type of Intervention	Prioritization	Policy Type	Prerequisites to investment / Implementation barriers
CLIMATE COMMITMENTS, POLICIES, AND INSTITUTIONAL CAPACITY						
Design and launch a basic CBT system and identify at least one contingency budget line for climate shocks in the national budget, training staff on its use Develop and pilot a simplified climate-resilient investment appraisal checklist, and train at least 10 PIM staff on its application for new public investment proposals Train at least 10 NAC staff on climate finance auditing, and publish one annual report summarizing climate-related expenditures and loan documentation for public access Hold at least one open budget hearing including climate-relevant spending and publish a user-friendly summary of climate-related budget allocations and expected results for citizen						
Objective: Optimize sources of climate finance						
Priority actions Adopt a multipronged approach to mobilize climate finance and in the longer-term focusing on economic diversification—e.g., (World Bank 2026) provides a comprehensive analysis of South Sudan's revenues and expenditures, and makes short- and medium-to-long-term policy recommendations for improving domestic revenue mobilization and using its considerable oil-based revenues more effectively; another option to explore is leveraging multilateral or bilateral funding via grants, non-concessional or concessional loans for climate adaptation, and establishing a natural capital accounting framework Improve the country's capacity to absorb and manage funding Facilitate private sector involvement and create an enabling environment for climate-related investments by: • Developing robust policy and regulatory frameworks—e.g., establishing clear climate targets, implementing carbon pricing mechanisms, and creating incentives for green investments such as green and resilient infrastructure (schools, dikes community centers, etc.), climate-smart farming, wetland restoration, solar mini-grids, clean cookstoves, etc—and building institutional capacity to design and manage climate-related initiatives, including public-private partnerships (PPPs)	MoFP MoEF	**$**	**Technical assistance** for establishing a natural capital accounting framework, tax policy reform (e.g., broadening tax base, VAT introduction), and mobilizing multilateral or bilateral climate finance through project preparation and proposal support **Capacity building for revenue authorities and ministries** to enhance non-oil revenue collection and manage climate-related taxes	In parallel with previous objective: 2027–40	Adaptation Mitigation	High inflation, exchange rate volatility, and fiscal deficits, discouraging both domestic and international investors Limited expertise in climate finance, natural capital accounting, tax reform, and innovative financial instruments (e.g., green bonds, blended finance) Absence or weakness of laws, regulations, and policies for climate finance, carbon markets, and private sector participation Insufficient domestic funding for initial investments in systems, capacity building, and infrastructure Weak tax administration, narrow tax base, and widespread exemptions, which hinder domestic revenue mobilization and reforms

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
CLIMATE COMMITMENTS, POLICIES, AND INSTITUTIONAL CAPACITY						
• Addressing infrastructure and skills gaps that constrain private sector participation, by investing in critical infrastructure and supporting education and training programs • Improving access to finance—e.g., by organizing a climate finance roundtable with key development partners to align development assistance with climate objectives and potentially access additional climate-specific funding; working with international financial institutions to develop innovative financing mechanisms, such as blended finance or green bonds, to de-risk investments and make climate projects more attractive to private investors; and exploring economic incentives for private sector involvement in emissions trading regional and international carbon markets, particularly in agriculture, land and waste management, and renewable energy **Targets** Develop and approve a roadmap for climate finance diversification and pilot at least one non-oil revenue enhancement measure (e.g., broaden sales tax base or streamline tax exemptions), with a report on potential climate-related revenue sources submitted to the MoFP Conduct at least one targeted training workshop on climate finance management and project implementation for key government staff, with at least 40% of the MoFP's sectoral planning and budget department staff completing the training Organize a national climate finance roundtable with at least 30 participants from government, private sector, and development partners, and draft a policy brief outlining initial steps for creating incentives for private climate investments (e.g., tax incentives, PPP guidelines, or green bond framework)			**Institutional strengthening and training for ministries and agencies** on climate finance management, fiduciary standards, and project implementation **Support** for robust monitoring and reporting systems **Policy advisory** for developing climate investment frameworks (e.g., carbon pricing, green bonds, PPP guidelines), regulatory reforms, and incentives for green investment **Support for infrastructure development, skills training, and convening climate finance roundtables** to connect government, private sector, and development partners			Perceived or actual corruption, which deter donors, investors, and private sector partners Challenges in tracking, absorbing, and managing climate finance, including the lack of transparent allocation and reporting systems Fragmented or poorly coordinated donor support, leading to duplication and inefficiency Difficulty meeting eligibility requirements for grants, loans, or participation in carbon markets due to weak governance or capacity Low awareness among government, private sector, and communities about climate finance opportunities and mechanisms

High-Level Objectives and Recommended Priority Actions and Targets	Lead Agency	Estimated Costs	Type of Intervention	Prioritization	Policy Type	Prerequisites to investment / Implementation barriers
CLIMATE COMMITMENTS, POLICIES, AND INSTITUTIONAL CAPACITY						
Objective: Attract private investment into South Sudan's climate-resilient agriculture, renewable energy, and infrastructure sectors by establishing transparent regulations, streamlined investment processes, and targeted fiscal incentives for climate-smart technologies						
Priority actions Introduce policies, laws, and institutions that reduce investor perceptions of risk and make business environments more competitive Revise the sectors restricted to foreign participation via a "negative list" approach, eliminating domestic minimum capital requirements and the screening process while adopting more objective criteria to make decisions more transparent Strengthen the investment legal framework by adding features to complete rules on expropriation, transfer of profits, and dispute settlement, promoting consistency and non-discretionary behavior or measures, establishing an investor grievance mechanism that goes beyond addressing Investment Authority decisions to actions of all government agencies Ensure all incentive programs follow good international practice to maximize effectiveness (e.g. investment incentives are linked to clearly defined policy objectives, instruments used to grant incentives are tailored based on policy objectives, fiscal costs and risks for the government are regularly assessed , monitoring and evaluation mechanisms are in place to verify whether benefits (i.e. policy objectives) are accomplished, investment incentive application and granting processes are simple and minimize discretion, and governments maintain a centralized and transparent database or inventory of all incentives by different agencies) Ensure all linkage programs follow good international practice to maximize the effectiveness of foreign direct investment in the local economy (e.g. improving local firm competitiveness as a key pre-condition for addressing any information gap, actively promoting local suppliers and helping to closing the information gap, investing in local supply development, and improving the local enabling environment) Negotiate and conclude bilateral investment treaties with main trade and investment partners Review the domestic legal investment regime to make it consistent with the international investment regime **Targets** At least two high-level regulations (laws) to establish a transparent and predictable investment climate	MoFP MoEF	$	Policy	2030	Mitigation Adaptation	Political stability: Achieve sustained ceasefire agreements and resolve intercommunal conflicts that prevent agricultural activities and infrastructure development Regulatory framework: Establish functioning investment authority with an active online platform and publish a clear negative list of restricted sectors Rule of law: Strengthen contract enforcement and property rights protection; reduce corruption levels from current ranking (178th out of 180 countries) Infrastructure: Develop basic transportation networks and reliable electricity supply to support private sector operations Currency convertibility: Resolve foreign exchange restrictions that prevent the conversion of local currency to US dollars Skilled workforce: Address the critical shortage of skilled and unskilled labor through vocational training programs Financial system: Expand banking services and mobile money infrastructure to rural areas where most climate investments are needed

High-Level Objectives and Recommended Priority Actions and Targets	Lead Agency	Estimated Costs	Type of Intervention	Prioritization	Policy Type	Prerequisites to investment / Implementation barriers
FLOOD RISK MANAGEMENT						
Objective: Enhance flood monitoring and risk awareness						
Priority actions Develop flood forecasting and monitoring infrastructure, and early warning systems in consultation with communities Strengthen institutional capacities for DRM, and emergency preparedness and response **Targets** Install hydromet and flood monitoring stations, and strengthen information systems Establish and train DRM committees in all flood-prone counties	Ministry of Water Resources and Irrigation (MoWRI) MoEF MoHADM	**$$**	Hydromet network and information systems development Committee formation and training at subnational (county, *payam*) levels	2030	Adaptation	Installing 1,000 hydromet and flood monitoring stations and strengthening information systems would benefit approximately 1.4 million people
Objective: Reduce flood exposure in most at-risk communities						
Priority action Rehabilitate emergency dikes (earthen dikes, compacted) **Target** Rehabilitate dikes to protect most at-risk communities	MoHADM MoWRI MoEF	**$$$**	Dike rehabilitation	2030	Adaptation	Rehabilitating 1,000 km of dikes will provide immediate flood protection for most at-risk communities in flood emergencies over 2–3 flood seasons
Objective: Enhance 'living with floods', flood-adapted livelihoods and flood resilience of at-risk communities, with strong participation of and leadership from vulnerable rural communities during design and implementation						
Priority action Implement integrated flood resilience measures, including dike construction, flood-resilient critical community infrastructure and services, local adaptation measures, risk-sensitive land use planning, and assess options for strengthening safety nets **Target** Reduce flood risk and enhance flood resilience for the most vulnerable people	MoWRI, MoEF MoHADM, LGB Ministry of Gender and Social Welfare Ministry of Land, Housing and Urban Development	**$$$$**	Construction of dikes, flood-resilient roads/ culverts, drainage, water, sanitation, and hygiene infrastructure, etc. Local adaptation measures (e.g., emergency centers on raised grounds etc.)	2050	Adaptation	Integrated measures increase the cost of emergency dike rehabilitation by a factor of 10 and would reduce flood risk and enhance flood resilience for around 1 million people

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
FLOOD RISK MANAGEMENT						
Objective: Enhance flood retention/storage capacity						
Priority Action Assess and pursue options for building multipurpose dams along Nile tributaries for flood control, hydropower, irrigation, and water supply development **Target** Expand flood storage capacity	MoWRI MoEF Ministry of Energy and Dams (MoED) Ministry of Agriculture and Food Security (MAFS)	**$$$**	Develop flood storage and hydropower capacity	2040	Mitigation Adaptation	Completion of feasibility studies and environmental and social impact evaluations for Kinyeti Multipurpose Water Resources Development Project and Limur/ Nyimur Multipurpose Water Resources Project
RURAL LIVELIHOODS						
Objective: Reduce drought risk in priority areas						
Priority Action Enhance water catchment and retention/storage infrastructure capacity **Target** Expand flood storage capacity	MoWRI MoEF MoHADM MAFS MoLF	**$$$**	Develop flood storage and enhance local climate conditions for climate adaptation Develop and adapt water infrastructure for multipurpose use to increase availability and access to drinking water for people and livestock, with emphasis on pastoralist routes	2040	Adaptation	Establishment of mechanisms that facilitate community ownership and management of water infrastructure, with capacity building for planning and managing water resource use for agriculture and livestock sectors Large infrastructure (e.g. water harvesting structures) require community maintenance (e.g. clearing sediments from waterways, terracing, planting grasses and trees on degraded land) Establishing community-based water users' associations, with diverse board membership to ensure representation of all levels of concerns, enhances sustainability

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
RURAL LIVELIHOODS						
Objective: Enhance agricultural resilience to drought						
Priority action Enhance water retention/storage infrastructure capacity **Target** Expand irrigation in dry areas in the southeast (Jebel Lado and Rejaf East)	MoEF MoHADM MAFS	**$$**	Irrigation expansion	2030	Adaptation	Establishment of mechanisms that facilitate community ownership and management of water and irrigation infrastructure, with capacity building for planning and managing water resource use for agriculture and livestock sectors Large infrastructure (e.g. water harvesting structures) require community maintenance (e.g. clearing sediments from waterways, terracing, planting grasses on degraded land) Establishing community-based water users' associations, with diverse board membership to ensure representation of all levels of concerns, enhances sustainability
Objective: Adopt climate-resilient farming and livestock practices and widen access to high-quality, climate-resilient seeds and livestock breeds						
Priority action Develop knowledge transfer and capacity-building models and enhance service delivery (including inputs) to increase farmers' adoption of climate-resilient practices and improved breeds and seeds **Target** Increase areas of landscape under sustainable management practices Increase number of farmers implementing climate-smart livestock and farming practices	MoEF MAFS MoLF	**$$**	Technical assistance, capacity building, service delivery, and knowledge transfer	2030	Adaptation	Delivering public services requires strengthening foundational institutional and capacity resources in the MoLF and MAFS Institutional alignment largely hinges on finalizing and enacting pending sectoral bills, which would facilitate implementation of sectoral policies and strategies Private sector delivery requires a functioning cost-recovery system Farmers, especially women, need improved access to financial services to access improved seeds and breeds

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
RURAL LIVELIHOODS						
Objective: Build a productive, resilient livestock economy through targeted adaptation measures and implement climate-smart agricultural practices						
Priority actions Foster the adoption and implementation of sustainable practices across the agriculture and livestock sectors. These include the adoption of conservation agriculture (e.g.., sustainable production of fodder, stable access to rangeland and water resources for livestock systems); Integrated agriculture/crop and livestock systems with adequate use of crop residues as feed, fodder conservation, and silage practices; and an overall sustainable natural resource management **Targets** Increasing investments in sustainable and competitive livestock systems, which are currently based on management of natural resources, mainly rangelands and water (e.g., soil management practices). Ensuring the resilience and productivity of crop systems—through improved soil health, climate-smart cropping practices, and strengthened seed systems— to sustain livelihoods and enhance the overall performance of integrated agriculture–livestock production systems.	MoEF MAFS MoLF	**$$**	Design, assess, pilot, and scale climate-smart and -resilient interventions Capacity building Service delivery Knowledge transfer	2030	Adaptation	The enabling environment for a competitive sector requires: a clear and transparent regulatory framework, which depends on the finalization and enactment of pending sectoral bills; the existence of a cost-recovery mechanism for delivering animal health services; and adequate connectivity infrastructure to enable domestic trade of foods between producing and demanding areas
Objective: Enhance sustainable production and value generation from renewable natural resources (forestry, fisheries, wildlife)						
Priority actions Establish community-based natural resource management (CBNRM) across the forestry, fisheries, and wildlife/tourism sectors Support improved value chain handling, processing, and marketing Significantly expand capacity to rapidly scale up fisheries production in high-flood years by investing in additional gear and landing capacity, and in multipurpose cold storage that can switch between animal and fish products **Targets** Robust CBNRM systems to cover major production areas (Sudd, the Boma Badingilo Jonglei Landscape (BBJL), major forest blocks) rolled out over the next two decades Significant improvements to value retention in main fisheries values chains Well-managed non-timber forest product export value chains and domestic bushmeat trade in BBJL Expanded tourism offerings and market size Fish catch expanded by around 50% in favorable years	MoEF MoLF Ministry of Trade and Industry Ministry of Transport	**$$$**	Policy and capacity development, with investments in establishing field CBNRM systems and value chain infrastructure	Gradual rollout, with most impacts realized in 2030–40	Increasing climate resilience, but not directly responding to climate change Adaptation	Absence of major conflict Significant improvements in security over time to realizing significant gains in the tourism sector Successful establishment of robust resource management systems and monitoring of fish stock levels and offtake capacities to increase fisheries production

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
ENERGY						
Objective: Improve clean energy access for public institutions						
Priority actions Deploy solar-based off-grid solutions for critical health and educational institutions using advanced resilience and operation and maintenance (O&M) measures **Targets** Reach all health care facilities and primary and secondary schools Sustainable O&M of installed equipment	MoED	**$$**	Investment	2030	Mitigation Adaptation	Extensive training and capacity building of field staff for installation and (advanced) O&M Improved site access (security, logistics) to remote areas Reduction of import duty and value-added tax on off-grid solar products Interventions ensure availability of long-term O&M financing and locally based technicians for uninterrupted daily O&M services
Objective: Develop clean energy access for households and farmers						
Priority actions Provide immediate access to electricity for households and smallholder farmers through targeted market development for off-grid solar solutions Support existing South Sudanese businesses already active in off-grid distribution and incentivize increased market entry from more established actors, potentially through results-based financing schemes or grants to be awarded to commercially viable off-grid solar companies on a competitive basis **Targets** 25% of all households have access to clean energy 10% of all farmers have access to clean energy	MoED	**Priority Action 1: $$$** Public investment including initial investments and ongoing	Investment	2030	Mitigation Adaptation	Enabling regulatory framework for the off-grid market, including the adoption of quality standards for products and applications to protect consumers from substandard products Effective design of results-based financing subsidy mechanism to account for severely constrained customer affordability and scarcity of viable financing alternatives Strengthening of local distribution networks Improved exchange rate and currency stability to foster an enabling market environment for off-grid companies

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
ENERGY						
Objective: Promote climate-resilient grids						
Priority action Priority action: Develop flood-resilient mini-grids for population centers in major load centers **Target** Nine major load centers (all major load centers except Juba and Yei)	MoED MoEF	**$$$**	Investment	2040–50	Mitigation Adaptation	Provision of a legal framework by the Government that facilitates private investment Guidance on licensing, permitting, tariff-setting and other foundational regulations to support the development of the mini-grid sector Completed flooding- and climate risk assessment of targeted mini-grid sites to incorporate resilience measures into design and O&M measures Climate resilience elements are proactively factored in, from planning to procurement
Objective: Explore options for development of climate-resilient hydropower plants projects						
Priority actions Continue to identify hydropower plants through updating feasibility studies Include potential climate effects (e.g., river flow variability and flooding risk of Nile) in planning and design **Target** Update around six feasibility studies, with a priority set for the Grand Fula Hydro Project (to be decided) *Note: Hydroelectric power could meet much of South Sudan's baseload energy needs at substantially cheaper cost and lower carbon-intensity than current generation*	MoED MoWRI MoEF	**$$**	Policy	2040–50	Mitigation Adaptation	Political willingness and institutional support from relevant ministries to access sites and key data and conduct required risk assessments Strong coordination mechanism between involved ministries Enabling geopolitical landscape

High-level objectives and recommended priority actions and targets	Lead agencies	Estimated costs	Intervention details	Prioritization	Policy type	Prerequisites to investment, assumptions, and implementation barriers
ENERGY						
Objective: Promote interconnection projects						
Priority action Develop selected high-potential planned regional interconnection projects coupled with required grid infrastructure **Target** Develop one priority interconnection project coupled with local grid investment *Note: As a landlocked country with little domestic oil refining and power generation capacity, South Sudan would benefit significantly from electricity trade with neighboring countries* *Interconnecting its network with regional grids can enhance climate resilience by ensuring a more stable, diversified, and affordable power supply, supporting essential services, and promoting sustainable economic growth*	MoED	**$$$**	Investment	2040–50	Mitigation Adaptation	Positive development of agreements and cooperation with relevant neighboring countries Completion of required technical feasibility studies (feasibility studies are completed for the Uganda and Ethiopia interconnectors and African Development Bank funding has been secured for the Uganda interconnector) Political stability and security around construction of interconnection lines
Objective: Elaborate a long-term, comprehensive, climate-resilient energy strategy						
Priority action Develop a long-term power sector strategy, emphasizing climate resilience **Target** One comprehensive strategy	MoED	**$**	Policy	2040-2050	Mitigation Adaptation	Sustained engagement, commitment and technical capacity of MoED and other relevant agencies

Note: $ = less than $10 million; $$ = $10–100 million; $$$: $100 million–1 billion; $$$$: over $1 billion.

Appendix B. Poverty and inequality impacts

Micro-simulation methodology for evaluating poverty impacts of various scenarios

Step 1: Estimation of sectorial real GDP. For each scenario, sector-specific and overall GDP values are projected from 2023 to 2050. The sectors include agriculture, non-oil industry, oil, and services.

Step 2: Identification of source of consumption (proxy for income). For each household, identify the sector (agriculture, industry/manufacture, services) in which the household head is employed. Note that there is no information available on the employment status of other household members. The entire household's consumption is attributed to the sector of employment of the household head. In cases where the household head is unemployed, the household's consumption is derived from unknown (non-labor) sources. All information was collected in 2022.

Step 3: Projection of household consumption. For years after 2022, we assume that households' employment and demographic composition remain unchanged from 2022. Households' consumption (used as a proxy for income) is assumed to grow at the same rate as the real GDP per capita[1] of the sector in which the household head is employed. For households with unemployed heads, the overall real GDP growth rate is used. For example, if the real GDP per capita in the agricultural sector grows by g percent between 2022 and 2023, the real consumption of households with heads employed in agriculture increases by g percent. Similarly, if the overall real GDP per capita grows by x percent, then the consumption of households with unemployed heads grows by x percent.

Step 4: Poverty analysis. In 2022, the national poverty line (combining food and non-food needs) was estimated at SSP 358,724. For any years after 2022, the household consumption estimated in 2022 prices (Step 2) is compared to the 2022 national poverty line to determine the household's poverty status.

[1] Assuming a 3% annual population growth rate, with all figures rebased to 2022.

Table B.1. Poverty impact under the BAU with continuing fragility scenario

	No climate shock	Optimistic (wet/warm) climate	Pessimistic (dry/hot) climate
2022	0.7588056	0.7588056	0.7588056
2025	0.8828145	0.8831574	0.8852834
2030	0.781122	0.8078521	0.8145245
2040	0.8513902	0.8612121	0.8616858
2050	0.8869908	0.9091234	0.9115620

Table B.2. Poverty impact under the BAU with disrupted oil exports scenario

	No climate shock	Optimistic (wet/warm) climate	Pessimistic (dry/hot) climate
2022	0.7588056	0.7588056	0.758806
2025	0.8828145	0.8831574	0.885283
2030	0.9058735	0.9084809	0.915005
2040	0.9645995	0.9723838	0.972788
2050	0.9867525	0.9882096	0.988920

Table B.3. Poverty impact under the growth and stability scenario

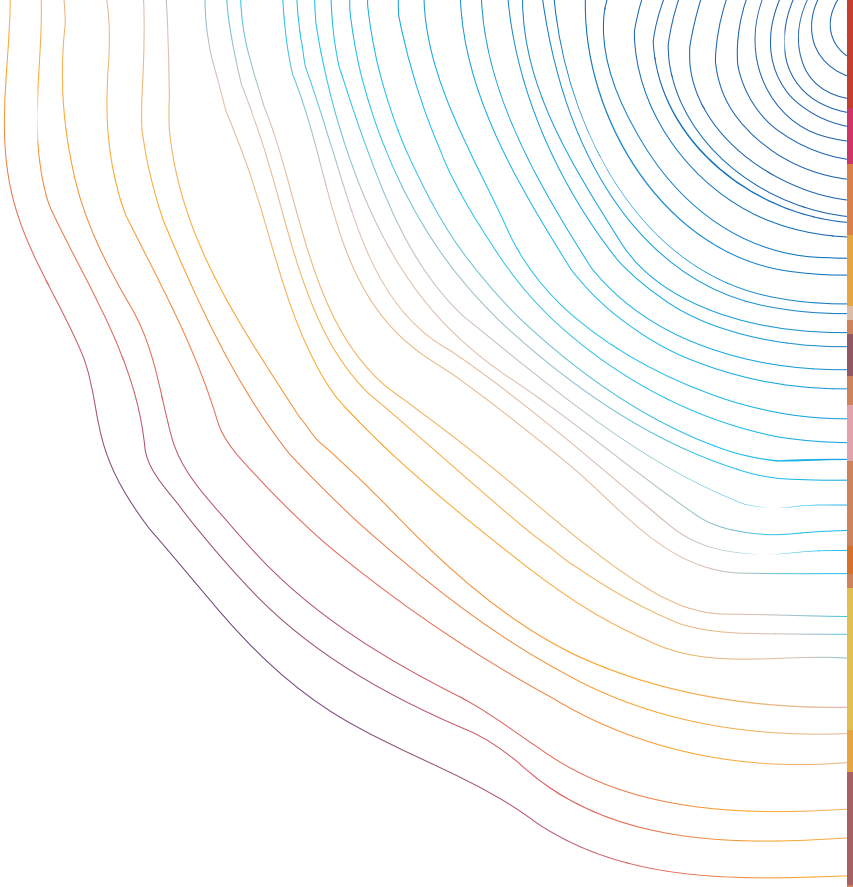
	No climate shock	Optimistic (wet/warm) climate	Pessimistic (dry/hot) climate
2022	0.7588056	0.7588056	0.758806
2025	0.8828145	0.8831574	0.885175
2030	0.7288956	0.7341479	0.745913
2040	0.3531559	0.3568778	0.361833
2050	0.0779283	0.0784231	0.093129

Table B.4. Poverty rate under the climate-smart development scenario

	No climate shock	Optimistic (wet/warm) climate	Pessimistic (dry/hot) climate
2022	0.7588056	0.7588056	0.758806
2025	0.8828145	0.8828063	0.885175
2030	0.7288956	0.7292895	0.739311
2040	0.3531559	0.3477132	0.356941
2050	0.0779283	0.0736834	0.082392

Table B.5. Gini coefficient across development scenarios and climate conditions

	No climate shock	Optimistic (wet/warm) climate condition	Pessimistic (dry/hot) climate condition
BAU with disrupted oil exports			
2022	0.406	0.406	0.406
2025	0.418	0.418	0.418
2030	0.413	0.412	0.412
2040	0.426	0.426	0.424
2050	0.433	0.438	0.435
BAU with continuing fragility			
2022	0.406	0.406	0.406
2025	0.418	0.418	0.418
2030	0.407	0.406	0.407
2040	0.408	0.406	0.407
2050	0.410	0.405	0.406
Growth and stability			
2022	0.406	0.406	0.406
2025	0.418	0.418	0.418
2030	0.409	0.408	0.409
2040	0.411	0.409	0.409
2050	0.415	0.414	0.413
Climate-smart development			
2022	0.406	0.406	0.406
2025	0.418	0.418	0.418
2030	0.409	0.407	0.408
2040	0.411	0.409	0.409
2050	0.415	0.415	0.413







WORLD BANK GROUP