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Introduction

This climate change profile is designed to help integrate climate actions into development activities. It complements the publication 'Climate-smart = Future-Proof! – Guidelines for Integrating climate-smart actions into development policies and activities' and provides answers to some of the questions that are raised in the step-by-step approach in these guidelines.

The current and expected effects of climate change differ locally, nationally and regionally. The impacts of climate change effects on livelihoods, food and water security, ecosystems, infrastructure etc. differ per country and region as well as community and individual, with gender a particularly important vulnerability factor. This profile aims to give insight in the climate change effects and impacts in South Sudan, with particular attention for food security and water. It also sheds light on the policies, priorities and commitments of the government in responding to climate change and important climate-relevant activities that are being implemented, including activities being internationally financed.

Summary

South Sudan is a landlocked country located in the east-central region of Africa with an estimated population of 12.2 million. Nearly 87% of the South Sudanese population depends on agriculture, livestock, and forestry, yet these sectors contribute very little to the national economy. Food imports support most of the urban population. South Sudan is experiencing substantially warmer and drier weather, and the combination of these effects leads to increasing evapotranspiration and more droughts. Since 1980, decreasing rainfall has been accompanied by rapid increases in temperature on the order of more than 1°C. This warming, which is two and a half times greater than the global warming, is making 'normal' years effectively drier. Rapid population growth and the expansion of farming and pastoralism under a more variable climate regime could dramatically increase the number of at-risk people in Sudan over the next 20 years. Climate change will aggravate South Sudan's fragile situation and may contribute to existing tensions and conflict.

Overall ranking

As one of the world's newest countries with little historical and current national data, South Sudan is not included in the rankings for international reports and assessments, such as the widely used ND-GAIN index¹. Information for South Sudan, for example, is included in the Sudan in the ND-GAIN index (2016), in which Sudan was ranked 176th out of 181 countries. Sudan (including South Sudan) is the 7th most vulnerable and is the 14th least ready country, meaning that it is extremely vulnerable to, yet unready to combat climate change effects. The Verisk Maplecroft Climate Change Vulnerability Index does, however, include South Sudan in its evaluation of the vulnerability of human populations to climate change over the next 30 years. The Vulnerability Index considers the risk of exposure to climate change and the resources of the country to cope with extreme weather events. Out of 186 countries, South Sudan ranked 3rd ².

Biophysical vulnerability³

Current climate. Historically, the prevalent **rainfall** pattern shows lowest precipitation in the north-east and highest in the south-west of the country, culminating in the Greenbelt along the border with the Central African Republic, the Democratic Republic of Congo, and Uganda. However, currently there is considerable variation in rainfall from year to year and from location to location within the same year, due to bimodal and unimodal rainfall regimes. The bimodal areas cover much of Greater Equatoria (Western, Central and Eastern Equatoria), while the rest of the country has a unimodal regime. Consequently, agricultural performance varies markedly depending primarily on latitude, with the possibility of two and even three harvests per annum from the same plots in the Greenbelt in Greater Equatoria, and a single harvest in the unimodal areas further north.

South Sudan receives most of its rain in the 'long-rain' season between June and September, during which relatively heavy and steady rains are usually common.

¹ GAIN index summarizes a country's vulnerability to climate change and other global challenges in combination with readiness to improve resilience. <http://index.gain.org>

² <https://maplecroft.com/portfolio/new-analysis/2014/10/29/climate-change-and-lack-food-security-multiply-risks-conflict-and-civil-unrest-32-countries-maplecroft/>

³ This section draws heavily on: USGS, Famine Early Warning Systems Network- Informing Climate Change Adaptation Series, FEWS NET (2011): *A Climate Trend Analysis of Sudan* <http://pubs.usgs.gov/fs/2011/3072/pdf/F52011-3072.pdf> UNEP Global Environmental Alert Service (2011): *Food Security in the Horn of Africa: The implications of a Drier, Hotter and More Crowded Future* http://na.unep.net/geas/getUNEPPageWithArticleID-Script.php?article_id=72. FAO (2014): *Special Report of FAO/WFP Crop and Food Security Assessment Mission to South Sudan* <http://www.fao.org/docrep/019/i3652e/i3652e.pdf>

In most years, rainfall totals of more than 500 mm provide enough water across parts of South Sudan for farming and livestock. Average annual **temperatures** are between 18 °C and 30 °C, with the coldest temperatures in elevated areas.

South Sudan experiences both widespread and localized **droughts** and **floods** caused by above or below normal rainfall across the country or in a certain region. Flash floods often occur when the Nile River and its tributaries overflow during the months of August and September.

Current trends. According to the climate analysis of the Famine Early Warning Network (FEWS NET)⁴, much of South Sudan has experienced a 10-20% decrease in long **rains** since the mid-1970s. The region that received 500 mm or more of rain has contracted, increasingly exposing populations in Upper Nile, Jonglei and Eastern Equatoria to rainfall deficits. In the Upper Nile, the shift was from approximately 11 degrees to 10 degrees north (see [Map 1](#)). A westward retraction is occurring in Jonglei and East Equatoria, with the 500-mm contour shifting from approximately 33 degrees to 32 degrees east. Due to the reduced rainfall trend between the 1960s and late 2011, the area receiving adequate rainfall to support agro-pastoralist livelihoods (500 mm) has been reduced by 18%. In addition to the 30 years trend of declining precipitation, there is evidence that variability in the amount and timing of rainfall will be increasing from year to year. Smoothed time series (see [Map 2](#)) of 1960-2009 rainfall, extracted from the extended Darfur region in Sudan and South Sudan, show that 1960-2009 rainfall has been, on average, about 20% lower than rainfall between 1960 and 1989.

Over the past 30 years, South Sudan has been among the most rapidly warming locations on the globe, with **temperatures** increasing as much as 0.53 °C per decade⁵. Temperatures have increased by more than 1 °C across large parts of South Sudan. [Map 1](#) (right panel) shows warming in Sudan and South Sudan as successive southward advances of the average temperatures. The spatial pattern of warming corresponds (broadly) with the areas associated with reduced precipitation. South Sudan and western Sudan are becoming drier and hotter.

Climate change. Actual rainfall records of East Africa since the 1970s indicate that **precipitation** has declined, and analysis of data suggests continued declines in the future⁶. If present rainfall trends continue, by 2025 the drying impacts which are currently experienced in Upper Nile, Jonglei and Eastern Equatoria will likely reach into West and North Bahr al-Ghazal, Warrap, Unity, Al Buhairat (Lakes) and Central

Equatoria. **Temperature** impacts will be amplifying the effects of drought: observed warming of more than 1°C is equivalent to another 10-20% reduction in rainfall through increased evaporation⁷.

Climate change will affect **water availability** in the country. Most of South Sudan is covered by the Bahr el Ghazal, Nile and Sobat River catchments that join at their confluents near Malakal to form the White Nile. In contrast to the Nile, the Sobat River and the Bahr el Ghazal river catchments have a strong seasonal character. Research on the Equatorial lakes and Bahr El Ghazal sub-basins suggest that an increase of 2°C in temperature might cause the natural flow to fall to 50% of the current average in these two sub-basins. The rising temperatures and uncertain rainfall could also impact on the Sudd, which is not only an important source of fish and products, but also a wetland of global biodiversity importance.

The transition to an even warmer climate has strong **food security** implications, reducing crop harvests and pasture availability, and it can amplify the impact of droughts. The shrinking of the area receiving more than 500 mm of rainfall will leave a large number of people exposed to increased food insecurity, and will strongly impact crop production in the south-eastern part of the country.

| 4 |

Socio-economic vulnerability

Key facts⁸:

GDP (PPP) per capita (2016) ⁹ :	no data provided, decline from 2015 of USD 1,850
Population (2017) ¹⁰ :	12,575,714
Projected population (2050) ¹¹ :	25,366,000
Population density per km ² (2015) ¹² :	20.85
Human Development Index (2016) ¹³ :	181 out of 188 countries
Corruption Perceptions Index (2016) ¹⁴ :	171 of 176 countries

⁷ <https://pubs.usgs.gov/fs/2011/3072/pdf/FS2011-3072.pdf>

⁸ As a new country, disaggregated statistics (from the Sudan) are unavailable for some variables.

⁹ World Bank Data – GDP per capita, PPP (2015): <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>

¹⁰ World Population Review (2017): *South Sudan*, <http://worldpopulationreview.com/countries/south-sudan-population/>

¹¹ UNDESA (2017): *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables*. Working Paper No. ESA/P/WP/248. https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf

¹² World Population Review (2017). <http://worldpopulationreview.com/countries/south-sudan-population>

¹³ UNDP (2017): *Human Development Report 2016: Human Development for Everyone*. Table 1. <http://hdr.undp.org/en/content/human-development-index-hdi>

¹⁴ Transparency International (2017). *Corruption Perceptions Index*. https://www.transparency.org/whatwedo/publication/corruption_perceptions_index_2016

⁴ <https://pubs.usgs.gov/fs/2011/3072/pdf/FS2011-3072.pdf>

⁵ Climate Service Center Germany (2015). *Climate-fact-sheet-South-Sudan*, updated version 2015. http://www.climate-service-center.de/products_and_publications/fact_sheets/climate_fact_sheets/index.php.en

⁶ <https://pubs.usgs.gov/fs/2011/3072/pdf/FS2011-3072.pdf>

Gender Inequality Index (2016) ¹⁵ :	no ranking provided.
Adult literacy (2015) ¹⁶ :	27% (male 40%; female 16%)

The civil war and on-going political and economic instability has resulted as of January 2017 in an estimated 2.4 million South Sudanese taking refuge in neighboring countries and another 1.9 million remaining internally displaced^{17 18}. After nearly four years of civil conflict, the South Sudan population continues to face a food security crisis. By the end of the 2017 lean season in September (the period of the year when food is most scarce) approximately 56% of the population was facing life-threatening hunger and in need of humanitarian assistance, making 2017 the most food-insecure year in South Sudan's history¹⁹. Food security is expected to deteriorate through March, with an estimate 5.1 million people (nearly half of the population) facing Crisis (IPC3) or worse levels of acute food insecurity²⁰.

Due to South Sudan's instability, poverty, low literacy rates and persistent food insecurity, the country and its people are very vulnerable to climate change. Through its heavy dependence on rain-fed agriculture, its livelihoods and food security are particularly vulnerable to the effects of climate change. South Sudan ranks as the most fragile state (1 out of 178 countries) in the Fragile States Index (2017)²¹. An estimated 50.6% of South Sudanese live below the poverty line. Women are particularly disadvantaged. Women are seen as inferior to men, and there are stark inequalities in access to education (as illustrated by the much lower literacy rates for women) and resources (e.g. women's rights to own property and inheritance are strongly limited by customary law).

The economy of South Sudan is characterized by a high dependency on oil, limited domestic production and a high reliance on imports. The non-oil economy is dominated by subsistence farming and livestock. During the same period that the previously described trends in temperature and rainfall have made rain-fed agriculture less secure, the population of South Sudan has roughly tripled. For the past five years, at least 10% of the population has been experiencing severe seasonal food insecurity every year.

Approximately 90% of South Sudanese households depend on crop farming, animal husbandry, fishing or forestry for their livelihoods. Livelihood strategies include a combination of cattle rearing, crop production, fishing, wild food collection and trade – with the combination determined by the agro-ecological conditions as well as culture and traditions of the communities in a given region. In the far south-east corner of South Sudan (see [Map 3](#)), arid conditions make cattle rearing the most viable livelihood option, and the majority of the people are pastoralists. The Greenbelt area is inhabited mostly by agriculturalists, whereas cattle rearing is rare due to the presence of the tsetse fly. Mountains and hills livelihood zones are home to both agriculturalists and agro-pastoralists. In difficult years they depend on cattle, trade, and root crops. In the Western flood plains, households supplement their agricultural products with fish and wild food. Eastern flood plains are similar to the Western flood plains with an added advantage of game hunting. In Iron Stone Plateau, people depend on crop production and trade in surplus production from the Greenbelt. People in the Nile and Sobat zone depend on wild foods and fish in addition to crops and livestock. For most households in South Sudan, cattle rearing is the preferred option as it is a basis for wealth and status. In contrast, although producing crops does play an important complementary role, it is considered an inferior activity.

Much of the country's agricultural production comes from small, rain-fed, hand cultivated plots. A significant portion is farmed by women-headed households belonging to larger (polygamous) family aggregations. Sorghum is the main crop (70% of area cultivated), followed by maize (27%, including double cropping in the Greenbelt). Other cereals (including bulrush, finger millet, and rice) make up the remaining 3%. Recent evidence suggests that climate change will result in reductions of yields of sorghum of 5-25% between 2000 and 2050²². However, even now most households do not produce enough to provide for year-round household consumption (i.e. until the next harvest) and depend on markets (for purchase/access). Some states are more dependent on market supplies than others. Jonglei and Unity, for example, show very high market dependency very soon after the harvest period, whereas in Upper Nile households are almost exclusively dependent on market supplies throughout the year. West Bahr el Ghazal households are also heavily dependent (up to 79%), while North Bahr el Ghazal and to a lesser degree Warrap state show seasonality in market supply. These are the most vulnerable states to price shocks during the lean season.

¹⁵ UNDP (2017): Human Development Report 2016. Table 5. <http://hdr.undp.org/en/content/human-development-index-hdi>

¹⁶ CIA (2015). The World Factbook – South Sudan. Available via <https://www.cia.gov/library/publications/the-world-factbook/geos/od.html>

¹⁷ <http://data.unhcr.org/SouthSudan/regional.php>

¹⁸ https://www.usaid.gov/sites/default/files/documents/1866/FFP_Fact_Sheet_South_Sudan.pdf

¹⁹ https://www.usaid.gov/sites/default/files/documents/1866/FFP_Fact_Sheet_South_Sudan.pdf

²⁰ Integrated Food Security Phase Classification: Level 3, Crisis; Level 4, Emergency; Level 5, Humanitarian Catastrophe/Famine.

²¹ Fragile States Index (2017) Available at <http://fundforpeace.org/fsi/>

²² IFPRI (2013). Sudan. Book Chapter in East African Agriculture and Climate Change: a comprehensive analysis. Also cited in USAID (2016) Climate Change Risk Profile: South Sudan.

Looking to the future climate in South Sudan, the country's inherent vulnerability will increase with the expected changes in rainfall and temperature. Agricultural production, livestock, and forest resources are expected to be impacted by higher temperatures, while both drought and flooding have negative implications for these activities (see [Map 4](#) for projected influences on sorghum yield). Some of the states that currently face high, persistent food insecurity will be experiencing rising temperatures and changes in rainfall patterns that will further impact crops and pasture.

Currently, the coping strategies of households are primarily to eat less preferred foods, eat fewer meals, and limit portion size. The coping strategies of the last resort are the sale or consumption of resources such as animals and seed stock. Climate change will exacerbate existing household vulnerability and may exceed the capacity of current coping strategies. Of special concern are states such as North Bahr el Ghazal, Warrap, Unity, Upper Nile and Jonglei that currently have limited coping strategies. These states will be experiencing changes in precipitation and temperature that are likely to result in decreased crop yields. Especially children are affected: inside South Sudan, an estimated 27.6% of the children under 5 years are underweight²³. In addition, it is likely that climate change will affect investments in transport infrastructure that facilitate trade, potentially disrupting markets and trade on which South Sudanese households are highly dependent.

To increase adaptive capacity and resilience to the increasingly frequent droughts and higher temperatures, improved water and agricultural management practices could contribute to off-setting climate induced changes. Adaptation strategies that focus on raising yields in wetter areas may be a more viable option than extending agriculture into more marginal areas. However, rapid population growth may make it difficult to slow the process of agricultural expansion.

There is concern that the impact of climate change may further exacerbate South Sudan's existing instability - nationally, regionally, and locally. If, as likely to occur, climate change results in longer dry seasons and an increased prevalence of drought, it may exacerbate the factors that drive conflicts over access to resources. For example, the heightened competition for increasingly scarce pasture and water can lead to further conflict among pastoralists. One of the current adaptive practices of pastoralists is to start moving from high to lower ground in search of pasture, but if this quest will begin earlier in the year due to climate change effects (e.g. one to two months earlier than usual) it may lead to more conflicts as others act

likewise. Actions that contribute to the resilience of one group may undermine the resilience of another. In 2014 this concern was expressed by South Sudan's Minister of Environment Deng Hoc Yai who proclaimed that climate change is "exacerbating the civil war in South Sudan, and the environmental damage caused by global warming increased the suffering that war already caused in the strife-ridden country, worsening food shortages and building pressure on urban areas"²⁴.

National government strategies and policies²⁵

The South Sudan National Environmental Policy (2015-2025) was endorsed by Parliament in April 2016. In general, the National Environmental Policy calls for the development of a national strategy for climate change adaptation and mitigation; the formulation of a climate change policy for South Sudan; and support to efforts to reduce community vulnerability to climate variability and change²⁶. South Sudan has not yet developed its climate change policy and strategies; however, adaptation strategies or plans have been incorporated in its development plans. Some of these adaptation strategies are in the process of being implemented. Priority sectors for adaptation strategies include agriculture and forestry, livestock, health, water and (cross-cutting) disaster risk management. Energy policies, including on the petroleum and electricity sectors, do not have direct measures to address climate change (e.g. reducing greenhouse gas emissions), although environmental and social impact assessment and environmental baseline assessment are required before the development of each energy project.

South Sudan ratified the UN Convention on Biological Diversity (CBD) and as noted above is currently working on a National Biodiversity Strategy and Action Plan (NBSAP)²⁷. South Sudan also ratified the Convention to Combat Desertification (CCD) but has not yet elaborated on a National Plan of Action to Combat Desertification. South Sudan furthermore ratified the Framework Convention on Climate Change (UNFCCC) and drafted a National Adaptation Plan of Action (NAPA), but it was not submitted to the UNFCCC. South Sudan received support from GEF, which finances

²³ CIA (2015). The World Factbook – South Sudan. Available via <https://www.cia.gov/library/publications/the-world-factbook/geos/od.html>

²⁴ Responding to Climate Change (RTCC) (2014): *South Sudan*, <http://www.rtcc.org/2014/05/30/climate-impacts-fuelling-south-sudan-war-says-minister/>

²⁵ This section draws heavily on Tiitmamer, N., The SUDD Institute (2015): *Assessment of Policy and Institutional Responses to Climate Change and Environmental Disaster Risks in South Sudan* <http://suddinstitute.org/assets/Publications/climate-change-Tiitmamer.pdf>

²⁶ FAO (2013): *Workshop on sustainable ecosystem management for adaptation to climate change and improved livelihoods in the Nile Basin*, <http://www.fao.org/forestry/39595-0d29aa96b994d11cc6fd6a7b8f68cd2f2.pdf>

²⁷ <http://www.unep.org/disastersandconflicts/CountryOperations/SouthSudan/News/NBSAPworkshop/tabid/1061054/Default.aspx>

implementation of, and development of action plans for the three conventions (CBD, CCD, UNFCCC). South Sudan signed the Paris Agreement on climate change in April 2016 but to date has not ratified the agreement (see under Intended Nationally Determined Contributions below).

Prior to the civil war South Sudan was working on its National Biodiversity Strategy and Action Plan (NBSAP), National Adaptation Plan (NAP), and Initial National Communication (INC) needed to fulfill its commitments and obligations under the UNFCCC, but these documents were not submitted²⁸. To date National Appropriate Mitigation Actions (NAMAs) have not been developed and submitted to the UNFCCC.

South Sudan is a partner country to Reducing Emissions from Deforestation and Forests Degradation (REDD), which works to enable countries that preserve forests to assess forests and estimate forest-based carbon which can potentially be marketed for carbon-offsets. A REDD+ Country Needs Assessment (2017)²⁹ found that while some progress had been made in the design of institutions, legislative and policy instruments and capacity building, there are still important areas to be addressed before South Sudan could move forward with the REDD+ process. These include the passing of legislative instruments such as the Forest Policy and Forest Bill and the Environment Policy and Bill and significant investment in both human resources and technical capacity in order to design and operate a national forest monitoring system, including an MRV system, as envisaged in REDD+ national programmes. However, the financial capacity to implement these measures is largely absent, representing a key area where support is needed. The Ministry of Environment has established a climate change unit, but it is not operational due to the lack of financial and human resources.

Intended Nationally Determined Contributions (INDC)

South Sudan submitted its Intended Nationally Determined Contributions (INDC) in September 2015³⁰ but has not submitted its First NDC to the UNFCCC. Taking into consideration the 50 years of conflict that destroyed the little infrastructure and governance structure that existed prior to the conflict, in its INDC South Sudan presents itself

as being highly vulnerable to the negative effects of climate change, mainly due to the dependence of its population on climate-sensitive natural resources for their livelihoods, limited institutional and technical capacity, appropriate technologies and financial resources to support the implementation of for climate adaptation interventions. The INDC notes that in South Sudan climate change is already occurring – particularly unpredictable rain patterns, recurrent droughts, flash flooding and excessive heat that result in food insecurity and famine. Implementation costs of adaptation and mitigation actions up to 2030, is estimated at over **USD 50 billion** and is conditional upon international support.

Mitigation. South Sudan is working to employ clean technologies to realize low-carbon, climate-resilient development. Current GHG-emission estimates are not available; in its INDC the country commits to undertake a national GHG-inventory to allow assessment for mitigation potential and to quantify emission reductions. South Sudan prioritizes three sectors for low carbon development and puts forward several options per sector:

- Energy generation and energy use:
 - increase the use of clean and carbon-neutral energy;
 - construct hydro-electricity at the Fulla rapids;
 - increase solar and wind energy;
 - increase efficiency for biomass use in the informal sector (fuel wood and charcoal);
 - increase electricity use in the formal sector.
- Reforestation and deforestation:
 - declare 20% of the country's natural forest as reserve forests to protect it from deforestation;
 - reforestation and afforestation efforts: planting of 20 million trees over the next 10 years.
- Transport:
 - establish emission standards for vehicles;
 - establish exhaust test centres, repair/improve vehicles that score above allowable emission levels;
 - restrict importing vehicles that do not meet allowable emission levels.

Adaptation. A sectoral approach was adopted for the INDC with priority actions based on observed adverse effects of climate change on the sectors:

- **Agriculture and livestock:** building upon traditional knowledge and supporting community based adaptation to improve climate resilience in agriculture (climate smart agriculture, livestock improvement, enhancing productivity of fishery sector and soil erosion control); promoting the harvesting and retention of water for different uses through community based watershed management.
- **Health:** conduct comprehensive vulnerability assessments to inform actions on improving early warning systems for climate related disease outbreaks (e.g. malaria) and establishing contingency plans for climate-resilient health systems, building public hospitals.

²⁸ <http://www.unep.org/disastersandconflicts/CountryOperations/southsudan/EnvironmentalGovernance/tabid/105737/default.aspx> Accessed on Sept 20, 2016

²⁹ South Sudan REDD+ Country Needs Assessment (2017) <http://www.unredd.net/documents/global-programme-191/country-needs-assessment-2611/africa-2/south-sudan/16050-south-sudan-redd-country-needs-assessment.html>

³⁰ UNFCCC (2015). <http://newsroom.unfccc.int/unfccc-newsroom/south-sudan-submits-its-climate-action-plan-ahead-of-2015-paris-agreement/>

- **Adapting vulnerable communities to climate change:** among the actions to achieve this are improving access to water, enhancing food security through the introduction of climate-smart agriculture and irrigation, inclusive participation in national and subnational climate change planning, gender inclusive adaptation interventions, hydro-meteorological monitoring network, increasing investments in disaster mechanisms, and creating buffer zones and relocating vulnerable communities from flood-prone areas.
- **Forests, biodiversity and ecosystems,** among actions for this sector are:
 - promoting agro-forestry practices;
 - afforestation of degraded landscape (e.g. planting 20 million trees over a ten-year period);
 - reducing deforestation by establishing forest reserves, conservancies and protected areas;
 - enforcing environmental regulations;
 - establishing water points for wildlife;
 - and increasing awareness of local communities on climate change and environmental protection.
- **Infrastructure:** improving waste water treatment; incorporating of adaptation criteria into development plans and ensuring that land-use plans and building codes reflect the expected impacts of climate change.
- **Institutional and policy actions:** capacity building and mainstreaming climate change concerns into all sectors; providing decision makers with relevant data and information to develop early warning systems and inform appropriate responses to climatic events.

Capacity building and transfer of technology. Areas identified which would benefit mitigation and adaptation include renewable energy technologies, climate information systems, water technologies (e.g. waters savings, recycling, harvesting and irrigation), methods and tools to assess climate impacts, vulnerability and adaptation, and transportation technologies that are climate resilient.

Climate finance

No figures are available on the total contribution of the South Sudanese government to climate change related actions. South Sudan joined the GEF in April 2013 and was to engage in working on GEF enabling activities (to fully qualify for funding from GEF), including a NAPA, National Biodiversity Strategy and Action Plan (NBSAP) and country self-assessment. In total, it was allocated USD 3,700,000 for climate change projects, USD 2,220,000 for biodiversity, and USD 1,000,000 for land degradation (management).³¹ However, being a fragile state with on-going conflict has hindered South Sudan in receiving potential climate finance and implementing climate projects.

³¹ GEF: Country profile South Sudan. <https://www.thegef.org/gef/south-sudan>

Climate change projects

Relatively little information is available on climate change actions underway in South Sudan by donors, although South Sudan is involved in a handful of regional projects. As stated above, conflicts are likely to influence the progress since priority is often given to immediate conflict resolution, and because it is more difficult (for international organizations) to work in conflict areas.

UNEP has provided critical policy guidance to the government of South Sudan and key ministries on new environmental policies and regulations and on compliance with multilateral environmental agreements (MEAs)³². Future UNEP projects in South Sudan were to focus on among others wildlife conservation, integrated water resources management (IWRM) and wetlands management, forest resource management, and urban waste management – all considered vital areas for climate change adaptation and mitigation. There are several GEF projects that have been approved, but not implemented³³. For 2017 there are no international or multilateral climate related funded projects being implemented in the South Sudan included in the Climate Fund Update³⁴.

| 8 |

Climate contribution of the Netherlands

The Netherlands supports climate-relevant projects in South Sudan through a variety of channels and in cooperation with range of actors in the fields of water and food security. Projects focus on:

- **Sustainable and equitable access to water.** Developing systems which focus on sustainable and equitable access to water for people, agriculture and livestock through construction of (deeper) boreholes, rain water harvesting structures and the restoring of the natural drainage systems to adapt to prolonged dry spells and decreasing rainfall; enlarging water storage capacity.
- **Operationalizing an IWRM approach** to water resources management with focus on social, economic and ecological aspects, enabling the building of resilience against climate change shocks.
- **Developing IWRM capacity** at all levels to support and boost equitable and sustainable use of the available resources, targeting the most vulnerable groups for decision making.
- **Introducing diversified cropping and farming systems,** horticulture and access to (better quality) seeds of drought resistant varieties and species to reduce the climate change impact on agriculture production.

³² UNEP (2015): *Disasters and Conflicts, South Sudan*. <http://www.unep.org/disastersandconflicts/CountryOperations/southsudan/FutureProjects/tabid/105738/Default.aspx>

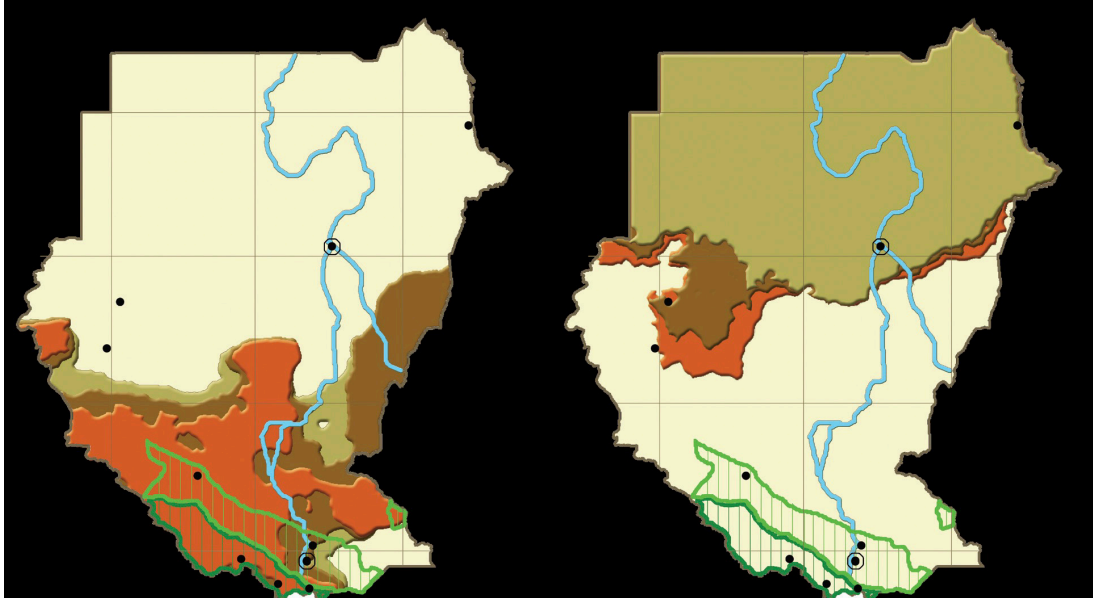
³³ https://www.thegef.org/projects?fjl=field_country:148

³⁴ *Climate Funds Update* (2017): <http://www.climatefundsupdate.org/data>

- **Developing value chains and marketing** of agricultural, livestock and fishery products to stimulate economic development, build resilience and enhance possibilities to adapt to climate change.
- **Developing the seeds sector**, resulting in increases in agricultural productivity through access to improved inputs and better farming practices. This includes seeds that will be adapted to current and future weather patterns (early maturing, disease resistant, drought tolerant and adapted to local agro-ecological zone), contributing to climate resilience;
- **Enhancing** food security of local communities.
- **Rehabilitating feeder roads** to increase access to markets for (farming) communities, stimulate agricultural production and improve services to communities, as well to reduce disaster risks by enabling access by emergency services.

Maps

Map 1 Climate change in Sudan

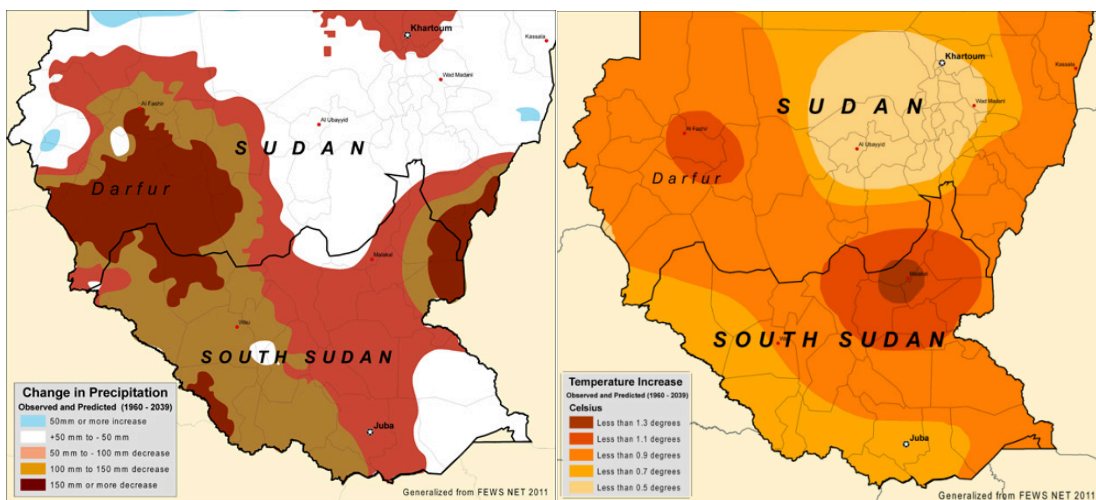


Left: Average location of the 500-millimeter rainfall isohyets for the years 1960–1989 (light brown), 1990–2009 (dark brown), and 2010–2039 (predicted, orange). The green polygons in the foreground show the main crop surplus region (the Greenbelt livelihood zone) and the agro-pastoral Ironstone Plateau and Hills and Mountains livelihood zones.

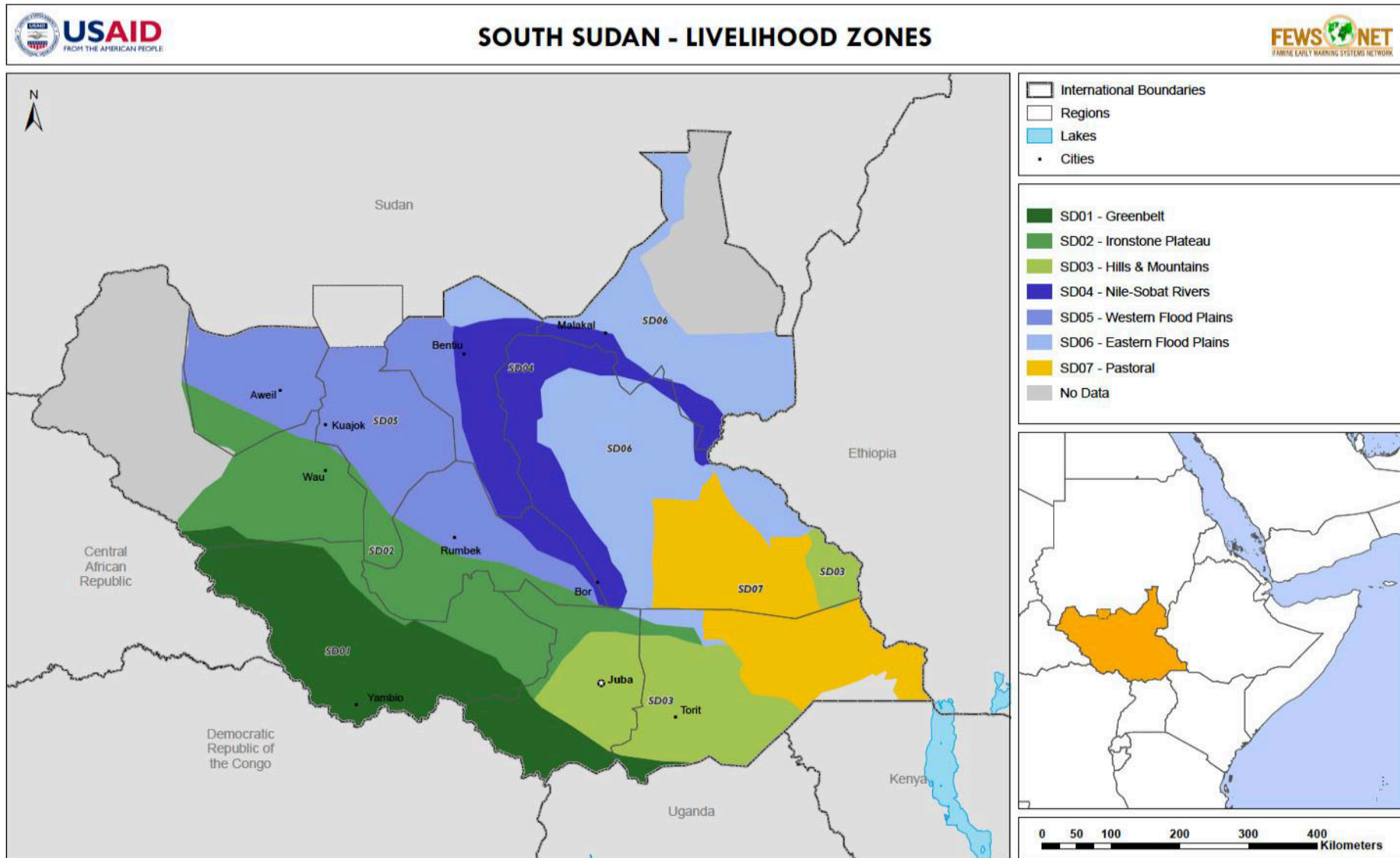
| 11 |

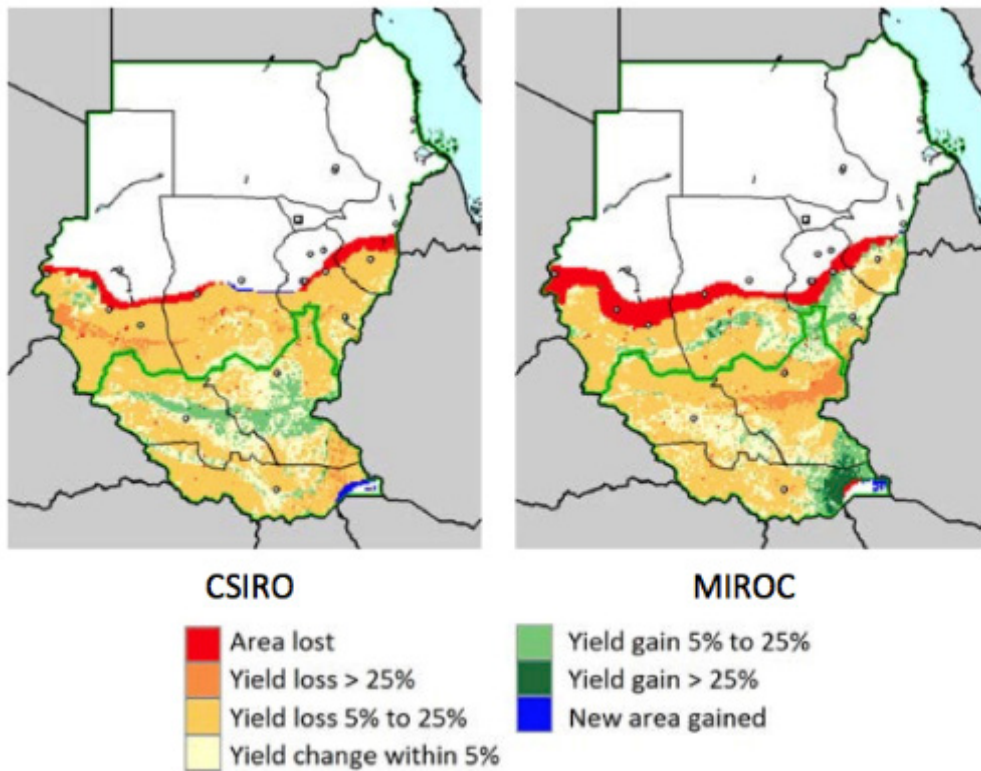
Right: Similar changes for the 30 degrees Celsius isotherm. Areas north of this line are very hot; this intense heat makes plant growth and pastoral livelihoods difficult.

Map 2 Changes in Precipitation and temperature increase: 1960-2039



Map 3 Livelihood zones of South Sudan



Map 4 Changes in yield with climate change: rain fed sorghum

Left: The CSIRO³⁵ model projects that annual rainfall will remain unchanged through 2050.

Right: The MIROC³⁶ model indicates that most of the southern part of Sudan will get wetter.

The maps depict the results of the Decision Support System for Agro technology Transfer (DSSAT) crop modelling software projections for rain fed sorghum, comparing crop yields for 2050 with climate change to yields with 2000 climate. The climate effects from both models result in a yield loss of 5–25 percent between 2000 and 2050 over most of the country's sorghum harvest area, and, in the marginal cultivated areas of the semi-dry zone, some loss of baseline area. These results would have serious implications for food security, as sorghum is the main staple cereal grain of the rural population. Those same climate models show some limited gain in baseline area that could potentially offset part of the yield loss in the rest of the cropped land.

Source: Taha, A.; T.S. Thomas; M. Waithaka (2012): *East African Agriculture and Climate Change: A Comprehensive Analysis – Sudan*, International Food Policy Research Institute (IFPRI), <http://www.ifpri.org/publication/east-african-agriculture-and-climate-change-sudan>

³⁵ Comprehensive climate system model developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) including atmosphere, land surface, ocean, and polar ice http://www.cawcr.gov.au/publications/technicalreports/CTR_021.pdf

³⁶ Model for Interdisciplinary Research on Climate (MIROC) is a coupled general circulation model and consists of five component models: atmosphere, land, river, sea ice, and ocean http://ccsr.aori.u-tokyo.ac.jp/~hasumi/miroc_description.pdf

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