



THE SUDD INSTITUTE

ENVISIONING A PEACEFUL, JUST AND PROSPEROUS SOUTH SUDAN

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Weekly Review

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South Sudan's devastating floods: why they happen and why they need a coherent national policy

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Summary

This year's flood is one of the worst in South Sudan's history. It has affected about one million people from 142,783 households in 8 of the former 10 states, compared to only 344,618 people in 2013. People lost homes, livelihoods, and shelter and got exposed to deadly diseases. Schools, roads, health centers and other useful forms of infrastructure have been destroyed.

This year's flood emanated from an Indian Ocean climate event known as the Indian Ocean Dipole, which caused an increase of temperatures of Western India Ocean by 2 degrees Celsius. While the Indian Ocean Dipole is part of a regular climate variability, its effects have been worsened by global warming, a greenhouse gas induced situation that leads to temperature increase. Because of global warming, the climate is changing. Floods are becoming more frequent and severer than before. Therefore, South Sudan needs a coherent national adaptation and mitigation policy to protect lives, property and infrastructure against climate disasters.

1 Introduction

South Sudan has been hit hard this year by the heaviest floods in six years. A flood of almost similar proportion occurred in 2013, just few months before the civil war erupted in December 2013. While this year's flood is the worst, there has been flood every year in several locations in the country since 2005. Floods are increasing in frequency and in magnitude due to global warming. About a million people are affected, according to the UNOCHA. President Salva Kiir Mayardit declared a state of emergency in most of the country's counties at the end of October 2019. This is a double tragedy for those who are already affected by the 6-year-old conflict. For example, UNOCHA reports that over "60 percent of the flood-affected counties, are currently classified as facing extreme levels of acute malnutrition."

This colossal tragedy needs immediate intervention by the government in collaboration with humanitarian aid groups working in the country. The international aid organizations and the

government of South Sudan have been focusing on humanitarian needs of the people affected by the conflict since 2013, sometimes leaving climate disasters like this with no adequate policy attention and no resources. While doing research in former Northern Bhar al Ghazal and Warrap States in 2016, flood victims told us that they were not receiving the same attention that victims of conflict are receiving from the international and national organizations. They cited the fact that climate events are seen as temporary where the victims are supposed to return to their areas of origin few days or weeks after the disaster. However, climate events have increased in frequency and magnitude and are no longer happening once after a considerable interval as they used to be. In addition, floods do not just displace people temporarily, they also destroy food and property and so even if floods subside, there is nothing to return to in many cases.

Using flood incidents data and climate change evidence, we argue that climate induced disasters like floods and droughts are increasing and should no longer be treated as temporary events as they are now happening almost every year, resulting in destruction of lives, property and infrastructure in many parts of the country. Floods, instead, should be viewed as posing perpetual threats to lives, property and infrastructure. There is, therefore, a need for a coherent vision and policy to mitigate their impacts. This review provides an update on flood-induced impacts, discusses its causes, and concludes with policy pointers.

2 What is the level of impact?

Based on the UNOCHA data that we have reviewed, about one million people from about 142,783 households have been affected in 8 of the former 10 states of South Sudan (See table 1). This flood is the worst, affecting more locations and greater number of people, and has lasted longer than usual. For example, the 2013 flood affected 344,618 people, compared to about 1 million people in 2019. In addition, this year's flood started in several places in May and lasted into November. For example, former Northern Bhar el Ghazal and Jonglei States started to get flooded in May. More bouts of floods started in June in many places across the country's flood plains and have continued until November 2019.

Many people have lost homes, food, and shelter and have gotten exposed to fatal diseases. Schools, roads, health centers and other useful forms of infrastructure have been destroyed. Loss of crops and livestock is catastrophic. For example, based on recent FAO assessment, the flooding has damaged 74,157 Ha out of 480,120 Ha of cultivated land, leading to a loss of 72,611 tons of cereals. The same assessment has revealed a possible loss of about 3 million livestock.¹

¹ See FAO's report on impacts of floods on crop production and livestock published on November 13, 2019

Table 1: Summary of 2019 flood impacts by regions (former ten states)

Region	Counties/locations	Summary of impacts	# of people affected
ABY	Agook town, Abuthok, Athoney	Impacts on crops, bridges, schools, farms, health facilities, houses, grinding mills, and livestock death	272,500
CES	Lado, Dolo, Luri, Lirya, Lobonok, Gondokoro, Lokiliri, and Mangalla	Crops (unknown number)	52,288
EES	Tirangore, Mura-Hatiha, Hafurere, Lafon, Kapoeta, Budi Torit East County, Laudo -Bur Payam, Magwi	Roads, bridges, displacement of people	8,000
JGL	Uror, Nyirol, Yuai, Partet, Pieri, Moto, Lankien, Karam, Pathai, Duk Payuel, Pajut, Duk Padiet, Panyagor, Wangulei, Maar, Paliau, Mabior, Jalle, Baidit, Makuach, Anyidi, Duk Pangak, Duk Panyang, and Bor Town, Lekuangulei, Gumruk, Pibor Town, Pibor North, Pibor South, Pochala, Ajuara, Otallo, Obwodi, Okadi, Dholam (Pochala South), Akobo East, Bilkeny, Dengjok, Nyandit, Gakdong, Walgak, Dior, Kakuny, Buong, YIdit, Pabong, Pamai, Ulit, Pakam, Rialjak, Kuerdiek, Yuai, Wikon, Pulcho, Patet, Pading, Pulturuk, Wunbil, Rim, Payang, Wechdeng, Nyambar, and Padiel	Airstrips destruction, warehouse destruction, roads impassability, crops destruction, diseases, insecurity, people's displacement, exposure to poisonous snakes, schools and health facilities destruction, destruction of grazing areas, death of livestock, blockage to humanitarian aid supplies, poor hygiene conditions, reduced access to medical facilities, and limited access to clean water,	448,731

LKS	Rumbek North, Meen, Aloor	Crops destruction, roads inaccessibility, people's displacement, diseases outbreak	34,270
NBG	Aweil Town, Barmayen, Nyamlell, Gok Machar	Destruction of houses, livelihood, roads and displacement	56,102
UNS	Maban, Longchuk, Ulang, Maiwut, and Nasir	limited humanitarian access, displacement of people, livestock drowning, inadequate pasture, limited access to clean water, destruction of schools and health facilities,	263, 311
UTY	Mayom, Abiemnhom, Mayendit South, and Mayendit North	Limited humanitarian access, displacement of people, destruction of farms, houses and schools and inaccessible roads	40,430
WRP	Gokrial West, Gokrial East, Tonj, and Twic	Destruction of houses, crops destruction, snake bites, livestock diseases, drowning of children, poor hygiene and sanitation, lack of drugs, diseases outbreak	72,732
Total people affected			1, 003, 364

Source: Compiled from UN OCHA flood impact review matrix, 2019

This year's flood has also affected Ethiopia, Kenya, Somalia, and Sudan, even though South Sudan has gotten the severest impact (see table 2).

Table 2: Comparison of 2019 flood impact on people in Eastern Africa

Country	number of people affected
Ethiopia	570,000
Kenya	101,000
Somalia	581,000
South Sudan	1, 003, 364
Sudan	364,000

Source: Compiled from UNOCHA data

Without immediate action, people will suffer from hunger both in the short and long terms. While most flood affected areas had a presence of humanitarian response in place before the flood, many places did not have any presence of humanitarian response. Therefore, it will take time to make emergency response to rescue lives as the roads and airstrips have been submerged under water, making it difficult to deliver emergency food aid and other services to meet crisis needs. Flood induced diseases have increased, yet medical supply has been cut due to roads impassibility, as well as destruction of health facilities.

The long-term consequences will be severe if no immediate coordinated action is taken. For example, hunger will persist beyond the receding of the flood water up to the next possible harvest season, depending on a host of factors. In the areas affected by the flood, about 3 million people were already in dire need of humanitarian assistance while about 7 million people across the whole country were in grim need before the flood hit, making this a double tragedy.² The government and the humanitarian agencies need to collaborate in mobilization and delivery of emergency services to the affected people, as well as putting down medium to long term measures to address these catastrophic floods.

3 What are the causes of these floods?

The flood of this year has been caused by the record breaking temperature increase of 2 degree Celsius in the Western Indian Ocean due to a phenomenon called Indian Ocean

² See UNOCHA's press release of October 25, 2019, https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/20191025_press_release_south_sudan_floods.pdf

Dipole (IOD).³ While IOD is part of a normal climate variability that can cause either a flood or a drought, this rise in temperature is attributed to global warming. The increase in temperatures in the Western Indian Ocean led to high evaporation of the ocean water, resulting in heavy down pour of rains that have led to floods in South Sudan, Sudan, Ethiopia, Somalia, and Kenya.⁴

The IOD causes warmer sea surface temperatures in the Western Indian Ocean and cooler sea temperatures in the Eastern Indian Ocean and vice versa.^{5 6} Changes in temperatures of the Indian Ocean cause extreme weather conditions in Eastern Africa and in Australia. When the Western Indian Ocean gets warmer temperatures, the Eastern Indian Ocean gets cooler temperatures. Warming of the sea-surface of the Western Indian Ocean leads to evaporation that brings rainfalls to East Africa. The intensity of such warming, as it happened this year, causes severe floods through rainfalls in East Africa. The cooling of the Eastern Indian Ocean leads to less evaporation that causes dry wind which leads to drought in Australia.

Global warming causes climate change. Climate⁷ change is defined as “a change of climate attributed directly or indirectly to human activity that alters the composition of the global atmosphere in addition to natural climate variability observed over comparable time periods”(UNFCCC, 1992). These changes involve decrease and increase in rainfall patterns that result in an increase in either the frequency and magnitude of flood or drought beyond a normal climate variability. Climate change is caused by greenhouse gases emitted from the burning of fossil fuels, deforestation, volcanic eruptions and respiration (NASA, 2016, IPCC, 2013, UNFCCC, 1992). Combustion of fossil fuels emits carbon dioxide and other greenhouse gases into the atmosphere while the deforestation reduces the capacity of the earth to absorb the increasing greenhouse gases (NASA, 2016). The accumulated gases cause the earth’s warming which leads to a change in global weather systems.

³ See Indian Ocean Dipole spells flood danger for East Africa

<https://www.thenewhumanitarian.org/news/2019/10/22/Indian-Ocean-Dipole-flood-danger-East-Africa>

⁴See Global heating supercharging Indian Ocean climate system. <https://www.theguardian.com/global-development/2019/nov/19/global-heating-supercharging-indian-ocean-dipole-climate-system>

⁵ See Black, E. (2005). The relationship between Indian Ocean sea-surface temperature and East African rainfall. *Phil. Trans. R. Soc. A* (2005) 363, 43–47 doi:10.1098/rsta.2004.1474. <https://royalsocietypublishing.org/doi/pdf/10.1098/rsta.2004.1474>

⁶ See Marchant, Mumbi, C., Behera, S. and Yamagata, T. (2006). The Indian Ocean dipole – the unsung driver of climatic variability in East Africa. *African Journal of Ecology*. <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2028.2006.00707.x>

⁷ Climate is “the ‘average weather’ over a period of time ranging from months to thousands or millions of years” (IPCC, 2007).

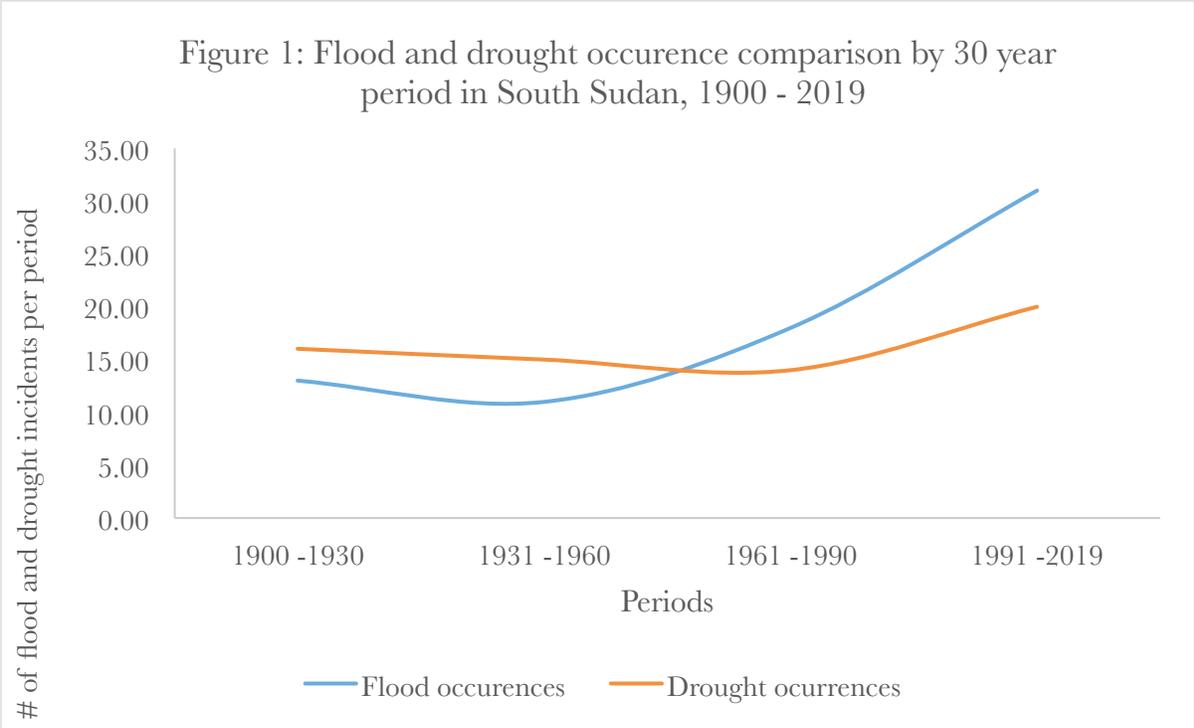
This year, carbon dioxide concentration has reached 412 parts per million (PPM) from 403.28 PPM in 2016 (NASA, 2019).⁸ Carbon dioxide and other greenhouse gases trap the heat of the sun and cause a greenhouse-like effect, leading to the warming of the earth's surface. The warming of the earth's surface affects weather system in a variety of ways, including a rise in sea-surface temperatures, which lead to change in precipitation. A rise in sea surface temperature, as it has been the case in the Indian Ocean this year, results in severe floods in low lying areas (Quan and Dyer, 2008).

Empirical evidence suggests the frequency and severity of floods and droughts have increased as a result of global warming.⁹ For example, “heavy rainfalls associated with tropical cyclones are likely to increase with continued warming¹⁰” (IPCC, 2012). How is global warming exacerbating the normal climate variability? Global warming is the increase in temperatures due to increase in the emissions of greenhouse gases such as carbon dioxide and other gases mostly from fossil fuels. Global warming increases temperatures in places that have normally been warmer, exacerbating the warming effects of weather phenomena like the Indian Ocean Dipole and el Niño Southern Oscillation. Therefore, due to global warming, extreme weather events are likely to be common, which calls for a coherent policy for adaptation and mitigation.

⁸ See carbon dioxide latest measurement as of October 2019 based on NASA <https://climate.nasa.gov/vital-signs/carbon-dioxide/>

⁹ See US National Academy of Sciences and the Royal Society, 2014

¹⁰ IPCC, 2012: Summary for Policymakers. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 1-19.



In South Sudan, incidents of floods are increasing. Our analysis of incidents of floods and droughts documented in the media and other sources since 1900 reveals that the last 30 years have seen the highest number of floods compared to previous periods (See figure 1). In addition, floods have happened in South Sudan every year since 2005, depending on the location. Between 1991 and 2019, there have been 31 incidents of floods compared to 13 incidents between 1900 and 1930, 11 incidents between 1931 and 1960, and 18 incidents between 1961 and 1990, respectively. This shows the climate is changing. It also demonstrates that these disasters have become regular threats to human lives, property and infrastructure, requiring coherent adaptation and mitigation policy measures.

4 Conclusion and recommendations

Floods and droughts have increased in frequency and magnitude in South Sudan due to global warming. This means floods like the one that has just devastated the country will be more frequent and catastrophic. This calls for a coherent national policy on how to adapt and mitigate flood and drought impacts. Therefore, we suggest the following:

1. Immediate concerted, coordinated effort by the government in collaboration with humanitarian agencies to deliver emergency services to rescue lives in the affected areas.

2. Raising awareness among the population of the cycle of floods which are now almost happening every year so that the population can be well prepared against such disasters.
 3. Enactment of climate change legislation and establishment of a climate change authority equipped with technical, financial and political support to design and implement adaptation and mitigation measures against floods and other climate induced disasters.
 4. Establishment of emergency food silos to address emergency food needs.
 5. Construction of flood resistant infrastructure such as dykes, roads, houses, schools and health facilities as part of mitigation.
 6. Identification and use of seeds that can resist flood and drought conditions.
 7. Assessment and relocation of settlements away from flood prone areas.
 8. Provision of climate disaster early warning system and climate information services.
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The Sudd Institute is an independent research organization that conducts and facilitates policy relevant research and training to inform public policy and practice, to create opportunities for discussion and debate, and to improve analytical capacity in South Sudan. The Sudd Institute's intention is to significantly improve the quality, impact, and accountability of local, national, and international policy- and decision-making in South Sudan in order to promote a more peaceful, just and prosperous society.

About the Author

Nhial Tutmamer is the Director of Environmental and Natural Resources Program at The Sudd Institute and a sessional lecturer at the University of Juba. His research has focused on environmental protection, sustainable energy, natural resource management, climate change, and extractive industries transparency, accountability, local content and revenue sharing arrangements. A recipient of Weston Honors Citation Award (2006) conferred by the Canadian Merit Scholarship Foundation (CMSF), Nhial holds a B.A. in Environmental Studies and an MSc in Sustainable Energy Development from the Universities of Alberta and Calgary in Canada where he spent stints as an environmental consultant and research associate in environmental studies. Nhial is the co-founder of the NewSudanVision.com and has extensively commented and written on issues about South Sudan and Sudan.