EASTERN AFRICA
Climate Seasonal Outlook
October – December 2024
Released 25th September

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HIGHLIGHTS

June to September (JJAS) Review:

- Lake Victoria levels were the highest ever recorded in May 2024. As this water flowed into the White Nile it has led to significant flooding in the Sudd, where permanent land loss may occur this year.
- El Niño Southern Oscillation (ENSO) conditions returned to neutral in May/June. However, heavy rains were seen across the northern half of the Greater Horn of Africa (GHA), causing severe floods especially in Sudan and Ethiopia.

October to December (OND) Outlook:

- With La Niña conditions likely to emerge (81% chance), less than usual rainfall is predicted for the coastal and south-eastern half of the GHA, increasing drought risk in Somalia, eastern Ethiopia, Kenya and Tanzania. Above average rainfall is likely in south-western parts of the GHA; in Uganda, Rwanda, Burundi and South Sudan.
- Hotter than average temperatures are expected across the region over OND.

JUNE TO SEPTEMBER (JJAS) CLIMATE REVIEW

- **Above-average rainfall** was seen in Sudan, Ethiopia and Uganda. Heavy rains also caused significant floods in early 2024 and effects extended into JJAS. Lake Victoria reached unprecedented levels in late May, partly due to lingering impacts of a combination of El Niño and a +'ve Indian Ocean Dipole seen in late 2023/early 2024. Significant flooding led to devastation and many casualties across the region. In fact, since La Niña conditions did not yet develop as was predicted back in May, there was less rain than expected over JJAS, especially in South Sudan and Eastern Ethiopia.

- **Flooding**: In Ethiopia and Somalia, thousands were displaced as the Baro, Gilo and Shabelle rivers overflowed and severe floods in the Sudd wetlands has begun. Preceding years of La Niña-related drought as well as longer term deforestation has both amplified the risk of flood damages and of zoonotic outbreaks.

- **Hotter than average temperatures** were seen in JJAS, particularly impacting Somalia and Sudan. In 2024, global temperatures soared, especially affecting those in vulnerable circumstances e.g. displaced children [UNICEF]. Although the JJAS heat was not as severe as the heatwave that scorched East Africa over MAM [NASA], dozens died attempting to cross the Sudanese border to Egypt in June [ReliefWeb].

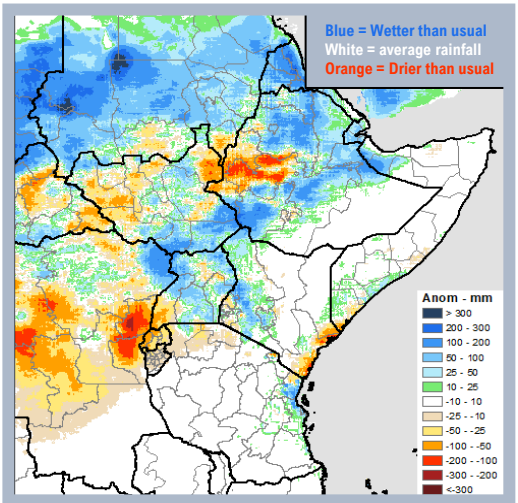

Fig 1. June-September Rainfall Anomaly, by Pentad (5-day period) over the Greater Horn of Africa [CHIRPS data].

TIMELINE OF FLOODS AND HEALTH IMPACTS

Whilst many acute flood impacts have already been felt, stagnant waters continue to increase the risk of many health issues. We recommend this review of flood forecast-based early action and opportunities by Nauman et al (Table 4) for response planning and lead time of actions.

Immediate risks:
Trauma, drowning, hypothermia, electrocution, CO poisoning.

[Sources: Brown et al, Paterson et al, Senkwe et al, Martinez et al, Ochoa et al, Benanisio et al, Onafruo et al, Yang et al, McCreesh et al, Holt et al, Okoka et al]

Short term (0-7 days) Water-borne infections, snakebites and animal attacks: Floods can quickly cause aspiration pneumonias, cutaneous bacterial infections, cholera and hep A/E. Animal attacks and snakebites rise as human-animal interactions go up. Diarrhoeal disease outbreaks can be viral (e.g. rotavirus), bacterial (e.g. E. coli, salmonella, yersinia) and protozoan (e.g. giardia).

Medium term (1-4 weeks) Atypical, Rodent-borne infections: Atypical cutaneous infections (e.g. mycobacterial, fungal) can occur next. Rodents, snakes and many other animals are forced out of flooded burrows to search for dryer and higher grounds, leading to more interactions with humans, this increases leptospirosis infection risk.

Longer term (+4 weeks) Vector-borne infections: Heavy rains bring cause hatching of *Aedes* eggs which can lay dormant in dry soil for ~8 months, and carry arboviruses e.g. dengue, yellow fever, zika and rift valley fever (RVF). Stagnant floodwater pools allow breeding of *Anopheles*, increasing risk of malaria and lymphatic filariasis. Floodwaters also increases exposure to chronic health risks such as schistosomiasis.

Continuous: Floods heavily impact **Non-communicable diseases.** This can be **direct**, e.g. stress/exertion precipitating asthma/COPD exacerbations, heart attacks or aggravating mental health conditions or **indirect** via delays to diagnosis, treatment and management of all conditions. This increases all-cause mortality, which peaks about day 15-35 after acute flooding. **Cardiovascular and respiratory mortality** risk peaks around day 20-25, and 25-35 respectively (data not specific to East Africa). Health impacts of flooding can **disproportionately affect women**, who often shoulder the burden of certain labour activities and Gender-based violence and exploitation can increase following floods. Exposure to **environmental contaminants** like heavy metals and toxic industrial waste can increase, especially in areas of oil exploration. These pollutants damage the environment, and are linked with cancers, female infertility, miscarriages, birth defects, eye infections, blindness and skin problems and communities near to oil fields most affected. Permanent land loss can also occur, exacerbating displacement issues and raising the risk of conflict.

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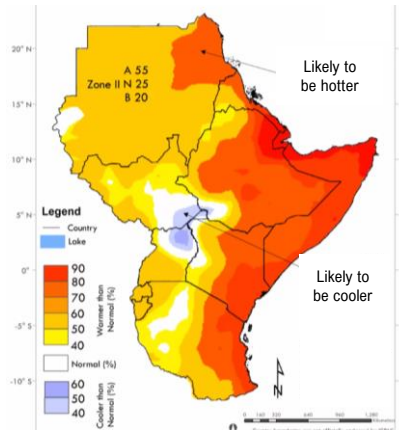
OCTOBER TO DECEMBER (OND) CLIMATE OUTLOOK

(A) Probabilistic Temperature Forecast



(B) Probabilistic Rainfall Forecast

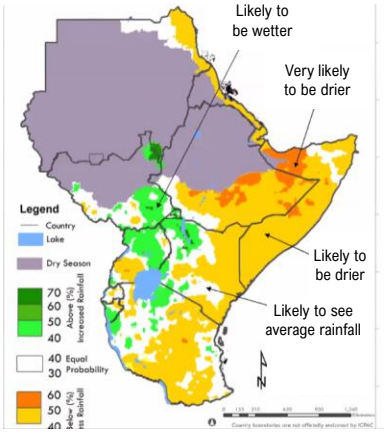


Fig 2. ICPAC Forecast for OND for the Greater Horn of Africa (GHA).

- **Above average temperatures** are predicted across the region (**Fig 2A,** ICPAC). Although OND is not the hottest period of the year, temperatures are very likely to be hotter than usual in coastal northern Sudan, Eritrea, eastern Ethiopia, Somalia and coastal regions in Kenya and Tanzania.

- **Drier than normal** conditions are likely across the east of the GHA; for Somalia, Eritrea, eastern Kenya, central Tanzania, coastal Sudan and southern Ethiopia (**Fig 2B,** ICPAC). OND is usually an important rainfall season here (contributing ~70% of total annual rainfall for Kenya and Somalia), but **this OND may see -10 to -50mm less rain than usual** [CS3].

- If ENSO conditions do shift towards **La Niña** (81% likelihood by OND), then this can further exacerbate dry conditions for the eastern GHA over the coming months and into mid-2025. The IOD is predicted to remain neutral until Spring 2025.

- **Wetter than normal** conditions are expected for the central western half of the GHA, namely Rwanda, northern Uganda, Southern South Sudan and north-western Kenya.

- **Early/normal onset of the short rains** is likely in southwest Ethiopia, southern South Sudan, Uganda, western Kenya, Burundi, Rwanda, and central/west Tanzania. **Delayed onset** is more likely in south Somalia, south-eastern Tanzania as well as central/west and north-east South Sudan and central/east Kenya. **The end of the wet season in South Sudan is likely to occur at early/normal times.**

OND EXPECTED HEALTH, NUTRITION AND PEST OUTLOOK

Stagnant floodwater affects health in many ways (see timeline page 1), but **cholera** and **malaria** are two of the most important regionally. Given ongoing global cholera outbreaks and vaccine shortages, above average risk may continue into OND, especially in parts of Ethiopia, Sudan, Rwanda, Uganda and South Sudan [Perez-Saez et al]. Cholera cases are reducing in East Africa and have been less in 2024 than 2023 [WHO]. Malaria vaccination efforts (R21 and RTS,S) are ongoing in Kenya, South Sudan and Uganda [WHO]. *Recommendations: Flood responses, WASH, Vaccination, Malaria prevention, collaborate with VSF for active cattle RVF surveillance.*

Above-average temperatures put vulnerable groups (e.g. elderly, children, pregnant/lactating women, those with pre-existing conditions) at risk of heat stress, dehydration and death. Although OND is not the main heat-risk season for the GHA, this can mean communities are less well prepared for out-of-season heatwaves. High temperatures not only worsen outcomes for hospital inpatients (e.g. in VHF outbreaks [Peters et al]) but can also affect disease vector distribution [Blanford et al] and increase the risk of antimicrobial resistance [McIver et al]. *Recommendations: See weekly ICPAC heat forecasts, ensure supply cold-chain.*

Drought and drier conditions over OND across eastern GHA is likely. This can lead to crops dying, grasslands drying up and increase the risk of livestock deaths/ disease and subsequent, malnutrition and famine. This is made worse when combined with the above average temperatures predicted. This is important as **meningitis season begins** around December for areas in the 'Meningitis Belt'. *Recommendations: monitor FEWSNET drought predictions and Meningitis/dust bulletin alerts.*

La Niña generally brings drier conditions for the eastern half of the GHA, whilst it can bring increased rainfall to Sudan, northern South Sudan and north-western Ethiopia; however, these effects are mostly felt over JJAS not the OND season [FEWSNET]. Higher rainfall in the Sahel may be associated with a reduced risk of meningitis outbreaks in the 'meningitis belt' areas (mainly Sudan) [Oluwole et al]. *Recommendations: monitor ENSO forecast.*

M-Pox: Although the DRC accounts for 96% of all cases and 97% of all deaths reported in 2024, there's been 696 cases in Burundi, 22 in Uganda, 6 in Rwanda 5 and in Kenya as of late Sept. There is ongoing risk of spread to other East African countries [OCHA, WHO]. The currently circulating clade 1b variant is more contagious and severe than clade 2b and especially affects children <15.

Food insecurity is particularly dire in Sudan, South Sudan and northern Ethiopia, with widespread IPC 3-4 (crisis to emergency) levels and famine confirmed in Zamzam, and likely in Al Fasher, Sudan. FEWSNET estimates that there are ~50M people in need of humanitarian food assistance across the GHA as of September, but this is projected to improve slightly over OND. *Recommendations: monitor FEWSNET prediction updates.*

Pests: Locust activity is forecasted to be calm for the region with scattered and low numbers of adults in Sudan and Yemen [FAO]. Other important cereal pests include Lepidopteran Stem Borers, Busseola fusca and Chilo partellus, which have caused up to $450M losses to farmers in East Africa. Fall Armyworm, which invaded the African continent in 2016 has continued to spread across east Africa [Conversation]. *Recommendations: monitor FAO monthly locust bulletins.*

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Key for Calendar Bars

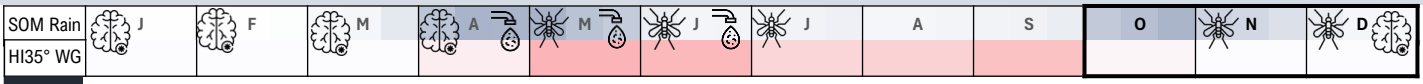
10	45	70
1	4	8

Blue bars represent national average (1994-2013) rainfall, from 0-70mm per dekad (10 days) [WFP]. Red bars represent local (statewide) average number of days per month above Heat Index >35°C ranging from 1 to >8 [CKP]. We chose states with nearby MSF projects at high risk of heat-related morbidity (WG=Woqooyi Galbeed, Somalia. Kh=Khartoum, Sudan. Un=Union, S. Sudan. Af=Afar, Ethiopia. Ga=Garissa, Kenya). N.b. Many countries have highly variable local rainfall and heat index patterns for different geographical regions. For more precise heat and humidity related historical data we would recommend reviewing [ERA5].

The mosquito symbol represents historical monthly malaria peaks [data from PMI, Noor et al, MSF and Elagali et al]. N.b. Malaria is endemic and outbreaks can occur outside of these periods, especially following atypical rainfall and temperature patterns impacting vectors, and migration affecting community immunity.

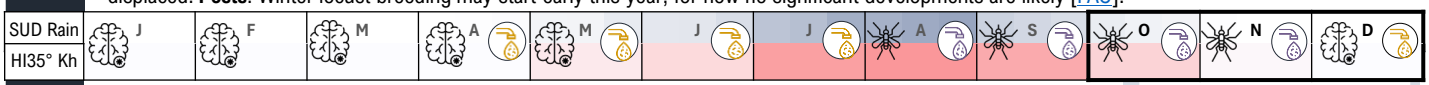
The tap with contaminated water symbol to the left signifies periods when cholera outbreak risk is historically highest [data from Perez-Saez et al]. This could potentially (with caution!) also be used as a proxy for the risk of other waterborne diseases, but many other environmental and social factors alter outbreak risk.

The meningitis symbol represents months where historical meningitis outbreak risk is high [from EMDAT and peer-reviewed literature]. This peaks in the dry season across the meningitis belt as 'Harmattan winds' bring Saharan dust, which damages the mucosal barrier and inhibits immune defences, facilitating bacterial invasion – but outbreaks can occur year-round. Check ACMAD for meningitis/dust storm warnings and forecasts but these are infrequently updated [methods here - Dione et al].



Somalia

Climate: Heavy rainfall experienced from April-June (*Gu* rains) displaced tens of thousands from their homes through floods and damage to infrastructure and properties and impacts lasted into JJAS [ReliefWeb]. OND marks the shorter and weaker rainy season (*Deyr*) of Somalia [WFP]. Predicted seasonal forecasts for this *Deyr* show a high likelihood of drier than usual conditions across Somalia, especially in Woqooyi Galbeed, Juba and Awdal. There is usually a total of <300mm rainfall over OND, however this season may see -10 to -50mm below average, (-100mm below around Juba districts) [CS3], increasing the risk of drought [ICPAC]. **Health:** Even with minimal rainfall, a continued downflow from Ethiopian highlands has led to an increase in water levels as well as riverbank flooding in some areas over JJAS, which can subsequently increase the risk of a malaria outbreaks. Areas affected include Belet Weyne, Bulo Burte, Jalalaqsi, Jowhar, Lower Shabelle Balcad districts. An outbreak of pneumonia occurred among children due to the cooler weather at night in the coastal areas [FAO-SWALIM]. AWD/Cholera outbreaks due to water scarcity and poor hygienic conditions in most parts of Somalia, along with a shortage of water sources in dry regions could lead to communal conflict over water source scarcity in remote nomadic areas. **Nutrition**: With the floodings witnessed during early *Gu* season, and below average rainfall both over the last few months and projected for OND, national crop harvest (maize, rice, sorghum) is expected to suffer. This will impact food accessibility and prices across the country particularly in areas that haven't recovered from the 2020-23 drought [FEWSNET]. Malnutrition is highly likely over OND, especially for the 3.8M people internally displaced. **Pests**: Winter locust breeding may start early this year, for now no significant developments are likely [FAO].



Sudan

Climate: Amidst the ongoing war, the JJAS season has been characterized by heavy rains in Sudan, the wettest rainy season on the 40-year record, affecting close to 500K people and damaging infrastructure like the Arba'at Dam [OCHA]. The conflict has led to 8M internally displaced and >2M have fled; the majority to South Sudan (800K) and Chad (600K). IDP populations have been severely affected by flooding in both countries [UNHCR]. Predictions for OND show drier than usual weather, with little to no rainfall expected this season [ICPAC]. **Health**: With the heavy rain and floods of the previous season, stagnating flood water will exacerbate cholera, dengue and malaria outbreaks into the OND season [OCHA]. Meningitis cases are increasing and may continue to go up especially in the meningitis belt area as the dry season begins [Al Jazeera]. WHO declared a cholera outbreak is ongoing in Kassala and several other states [WHO]. **Nutrition**: Hunger, famine and subsequent mortality was high over JJAS due to conflict and the peak lean season. Conditions may improve a little over OND in some areas like North and West Kordofan, but food insecurity is still likely to be at crisis/emergency levels across most of the country with ongoing displacement from flooding and war. 25.6M people face acute hunger, and confirmed famine (the first globally since 2017) is ongoing in Zamzam camp near Al Fasher as the RSF siege continues [FEWSNET]. **Pests**: Immature adult locusts were seen in September, and a second generation could start in mid-October whilst some may move to the Red Sea coast [FAO].

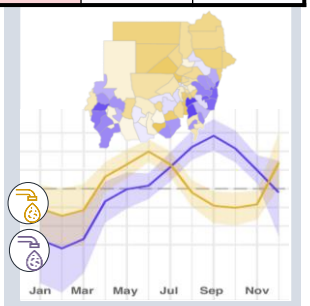


Fig 4. Sudan historical cholera outbreak Risk

South Sudan

Climate: Heavy rains over JJAS around Lake Victoria combined with high-rates of controlled water releases from Dams, have significantly raised White Nile levels, causing downstream floods affecting about 750K people across South Sudan so far. Less rain than was predicted back in May actually fell over the JJAS season within South Sudan, but MSF projects around the Sudd such as Leer, Old Fangak and Ulang have been badly flooded, and water levels often peak around OND. Floods are now projected to be similar this year in extent to the catastrophic 2022 floods, and have devastated homes, destroyed crops, disrupted education and health services, and restricted access to essential facilities. Wetter than normal conditions are expected for the southern half of the country in OND, especially Pibor. Ongoing flooding is likely to worsen still as it take ~3 months for water to reach the Sudd from Lake Victoria. The dry season should start early/as normal [OCHA, ICPAC]. **Health**: Reports indicate rising malaria cases, anthrax, measles, visceral leishmaniasis, diarrhoea, yellow fever and Hep E over JJAS which may extend into OND [WHO, OCHA, ICPAC]. There is increasing contamination of flood water with toxic by-products from oil exploration and drilling in many states [Sudd Institute]. Meningitis risk increases from Dec. **Nutrition**: JJAS rainfall was good for crops but flooding overall negatively affected food production. IPC level 4/5 food insecurity is likely, due to flooding, conflict, limited resources and refugee influx from Sudan [FEWSNET]. **Pests**: In Greater Kapoeta, a bird invasion has caused crop losses and forced many farmers to harvest sorghum prematurely to avoid further losses [FEWSNET].

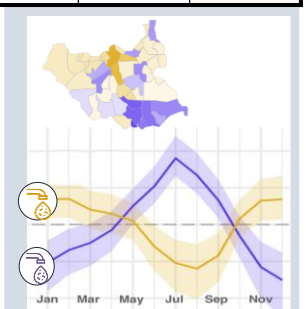
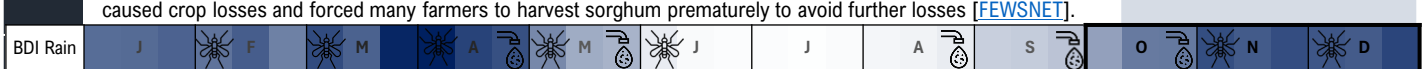


Fig 5. South Sudan historical cholera outbreak risk



Burundi

Climate: Burundi has experienced the impacts of heavy rains earlier in the year with subsequent floodings and displacement. These heavy rains raised water levels in Lake Tanganyika, affecting populations living along its shores. Wetter than normal conditions are likely for OND over southern Burundi with a high likelihood of exceeding 300mm, increasing risk of further floods [ICPAC, Africanews]. **Health**: The country also is being affected by Mpox (>696 cases so far) [UNICEF]. There are many other ongoing outbreaks (polio, cholera, malaria) and the risk of Ebola and measles are high [Reliefweb]. Malaria cases usually rise over OND. **Nutrition**: The lean season runs over OND, but predicted wetter conditions for OND may improve soil moisture and crop production. The early cessation of rains by mid-December may minimise post-harvest losses. **Pests**: Mealybug control is ongoing.

PROTOTYPE - Please share feedback here

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Ethiopia

Climate: The *Kiremt* season, typically spanning from JJAS saw heavy rains which have been beneficial for *Meher* crop production and improved water and pasture availability. Conversely, many areas saw overflow of rivers, flash flooding and landslides, leading to displacements, deaths and damages to crops, properties and public infrastructure. Drier-than-normal conditions are now projected for OND with reduced *Deyr/Hegaya* seasonal rains in the lowlands of Somali, Oromia and Southern Ethiopia regions. This increased risk of drought, shortages of grazing and water resources may affect 7.8M people [OCHA, ICPAC]. **Health**: With the intense rains seen in JJAS, an extension of flood related health concerns such as cholera, leishmaniasis, malaria, dengue and respiratory infections may extend into the OND season [OCHA]. Ongoing cholera outbreaks have been severe, and whilst cholera outbreak risk historically peaks around September in the northern half of the country and reduces over OND, outbreaks are more likely in areas experiencing drier conditions due to water shortages. The west of the country is part of the 'Meningitis belt', and here outbreak risk usually peaks around December with the high-risk season from November-June, however in Gondar and Awassa outbreak peak may be in the rainy season around June [Meshesha et al, Simegn et al and Ahmed et al]. Dengue cases can increase over the dry season when water is stored near houses, allowing *Aedes* breeding. **Nutrition**: While malnutrition concerns persist nationally, levels of acute malnutrition are expected to have peaked in August/September around the lean season and then should decline with the *meher* green harvest in OND, when floodwaters subside, food consumption improves, and disease incidence declines [FEWSNET]. Enhanced livestock disease surveillance is recommended [ICPAC]. **Pests**: Over August, no locusts were seen in Ethiopia and no significant developments are forecasted for the coming months [FAO].

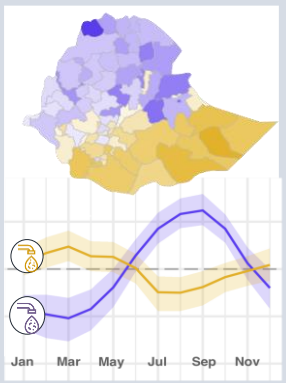


Fig 6. Ethiopia historical cholera outbreak Risk

Kenya

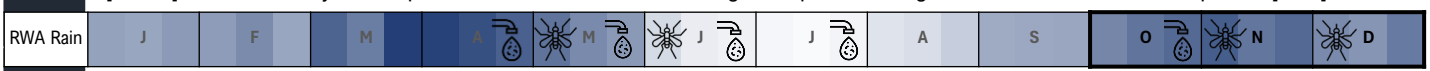
Climate: Since the onset of heavy MAM rains, Kenya has experienced intense rainfall affecting various regions, including the coastal area, central regions including Nairobi, the Western Highlands, Rift Valley, Lake Victoria Basin, South-eastern lowlands and North-eastern regions; resulting to displacement, submerging arable land, affecting businesses. While drier than usual conditions are expected in central and eastern parts of the country during the OND season, wetter than usual conditions are expected in western and northwestern Kenya [Kenya Red Cross, ICPAC]. ranging from -45–75% of the average in northeastern Kenya, and -75-90% of the average in south/coastal areas. Hotter than average temperatures are predicted across the region. **Health**: ICPAC warns of increased incidence of vector-borne diseases, especially in counties in the southern, western, and central regions of the country, and increased incidence of waterborne diseases such as dysenteries and watery diarrhoea over the OND period. **Nutrition**: ICPAC warn of crop damages due to floods, mudslides, and livestock deaths, along with the outbreak of waterborne diseases, internal parasites, and transboundary animal diseases (TADs), RVF and anthrax. OND marks the main harvest of corn, wheat, barley sorghum oats etc. Across pastoral areas, widespread Stressed (IPC Phase 2) outcomes are expected to persist through OND. Vegetation conditions continue to improve and currently are average, but declining each season [FEWSNET]. There is concern about livestock migration-related conflicts due to inadequate pasture in both areas of little rain and flood-affected areas. **Pests**: Localized outbreaks of Fall Armyworm affected coastal southeastern areas recently [FAO].

Tanzania

Climate: Following the heavy rainfall and flooding witnessed during MAM season alongside cyclone Hidaya, and a subsequent dry season, OND in Tanzania is forecasted to be drier than usual in central and southern parts, with a likelihood of wetter than usual conditions in the northern parts [Africa news, ICPAC]. **Health**: Response to the cholera outbreak in Tanzania is ongoing, especially in the north, with noticeable efforts being made at national and subnational levels to control the flare-ups [WHO]. **Nutrition**: The lean season is usually from OND until the harvests from Jan-May, and considering this year will likely be drier than usual for many parts of the country, cases of acute malnutrition are more likely, especially in low-income households [McQuade et al]. **Pests**: Fall Armyworm and Quelea Quelea birds affected crop yields in last years OND rainy season [FAO].

Uganda

Climate: Scattered rains experienced during the months of June and July triggered flash floods and heavy storms. Forecasts for OND show wetter than normal conditions for northern and eastern parts of the country, with a likelihood of exceeding 300mm in the southern parts [ICPAC, IOM]. **Health**: Cases of cholera and measles have been reported in over 5 districts with several deaths involved. With the forecasted rainfall across the country, such cases are expected to increase, as well as Mpox and other zoonotic diseases [WHO]. Northern Uganda may see an increase in meningitis risk during the dry season from December-March, with the Hammartan winds bringing dust from the Sahel [Gonahasa et al] **Nutrition**: High levels of acute malnutrition is likely in the Karamoja sub-region, attributed to inadequate food consumption, disease, inadequate water and poor sanitation and female headed households associated with high workload and low economic power especially in rural areas [IPC]. Conditions around the rest of the country are likely to improve from IPC3 (Crisis) levels to IPC2 (Stressed) levels over OND [FEWSNET], with the harvest of soybean, sorghum, peanuts and rice [ACAPS]. **Pests**: Fall armyworm, aphids and banana rust have damaged crops, but no significant locust swarms are expected [FAO].



Rwanda

Climate: Dry weather conditions with little rainfall was witnessed between June and September for most parts of the country. OND forecast probabilities indicate wetter than normal conditions for Rwanda, with high probabilities of rainfall exceeding 300mm, and up to 700mm in some areas. Expected disruptions will be caused by floods and landslides [RMA, ICPAC]. There are over 130K forcibly displaced people in Rwanda, largely from DRC and Burundi [UNHCR]. **Health**: With the upcoming rainy season, malaria cases are expected to rise though the government has reduced the burden significantly over the years [WHO]. A handful of m-pox cases have been reported, and there is a risk of the outbreak spreading. Malaria cases are likely to rise over the OND period as the rains come. **Nutrition**: Malnutrition rates have been high over JJAS and may worsen over the lean season, which is from October until the beginning of the harvest of maize, sorghum and other crops in December/January [ACAPS]. **Pests**: Emergence of mealybugs and armyworm has continued to cause damage to crops.

DISCLAIMER: While climate forecasts can offer insights on health outcomes, many other drivers (e.g. conflict, displacement, migration, socio-economics, politics, immunity and vaccination) modulate disease transmission and should be considered possible. Furthermore, the impact of weather conditions may peak well after shifts in weather.

The Humanitarian Action for Climate and Environment is an MSF-Canada choice initiative established in 2020 **to support Climate Change Adaptation within the movement.**

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