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THE FORECAST FOR NOVEMBER AND THE REVIEW FOR OCTOBER 2023

1. HIGHLIGHTS

1.1. The Forecast for November 2023

The October-November-December (OND) "short-rains" season typically peaks in November. According to the November forecast, it is likely that rainfall will be above average over most parts of the country, with increased probabilities in parts of the Northeast and the Central Highlands. This will be driven by the present El Nino conditions and the positive Indian Ocean Dipole (IOD), typically associated with above-average rainfall over Kenya during the month. Isolated episodes of storms are likely to be experienced in several parts of the country during the month.

1.2. The Outlook for November 2023-January 2024

The outlook for the next three months indicates that most parts of the country will experience above-average rainfall. This will be driven by the current El Nino conditions and the positive Indian Ocean Dipole (IOD), which are typically associated with above-average rainfall over Kenya during the short rains season. In some parts of the country, the rains will continue into January 2024. Rainfall cessation is likely to occur in several parts of the country in January as well. Temperature is expected to be warmer than average in several parts of the country, except in the Northeast and parts of the Coast (Tana River), where temperatures are expected to be cooler than the average cumulatively.

1.3. The Rainfall Review for October 2023

Several parts of the country experienced wet weather conditions during the month of October. The start of the seasonal rains (onset) was realized from the third to fourth week of October over several parts of the country except over the western sector Lake Victoria Basin and parts of Central and South Rift Valley where rainfall continued from September. The Coastal region received rainfall during the first week of October as had been predicted followed by a dry spell. The month was characterized by heavy storms that led to floods especially along the Coastal strip, parts of the Central highlands and South Eastern lowlands as well as several parts of Northwest and North eastern Kenya. This was driven by warmer than average Sea Surface Temperatures (SSTs) over the central and eastern equatorial Pacific Ocean, indicating the presence of El Niño conditions that's usually associated with above average rainfall over East

Africa. Additionally, the warmer than average SSTs in the western equatorial Indian Ocean (adjacent to the East African coastline), coupled with cooler than average SSTs over the eastern equatorial Indian Ocean (adjacent to Australia) constitutes a positive Indian Ocean Dipole (IOD) that is also favorable for enhanced rainfall over most of East Africa during the short rains season.

2. THE FORECAST FOR NOVEMBER 2023

This climate outlook is based on models that have been developed based on the expected evolution of global Sea Surface Temperatures (SSTs). The forecast indicates that the whole country is likely to experience above average (enhanced rainfall) with elevated probabilities in parts of the Northeast and the Central Highlands. This enhanced rainfall will be as a result of ***El Nino conditions and a positive Indian Ocean Dipole (IOD)***. El Nino conditions are currently present in the Pacific Ocean while the IOD is positive in Indian ocean, hence the expected enhanced rainfall in November. Whenever both of these phenomena are simultaneously active, the East African region typically experiences a period of above-average rainfall during the October to December rainy season. However, it's important to note that the actual rainfall amounts can vary from year to year, depending on the strength of the El Nino event.

2.1 Rainfall Forecast for November 2023

The Lake Victoria Basin, Highlands West of the Rift Valley, Central and South Rift Valley, Highlands East of the Rift Valley, South-Eastern Lowlands, Northwestern, Northeastern, and the Coastal Strip, as illustrated in **Figure 1**, are expected to receive above-average rainfall, according to the forecast. Moreover, parts of the Northeast and the Central Highlands have increased probabilities of above-average rainfall. Nonetheless, it's important to note that isolated episodes of heavy rainfall may still occur in various parts of the country during the month.

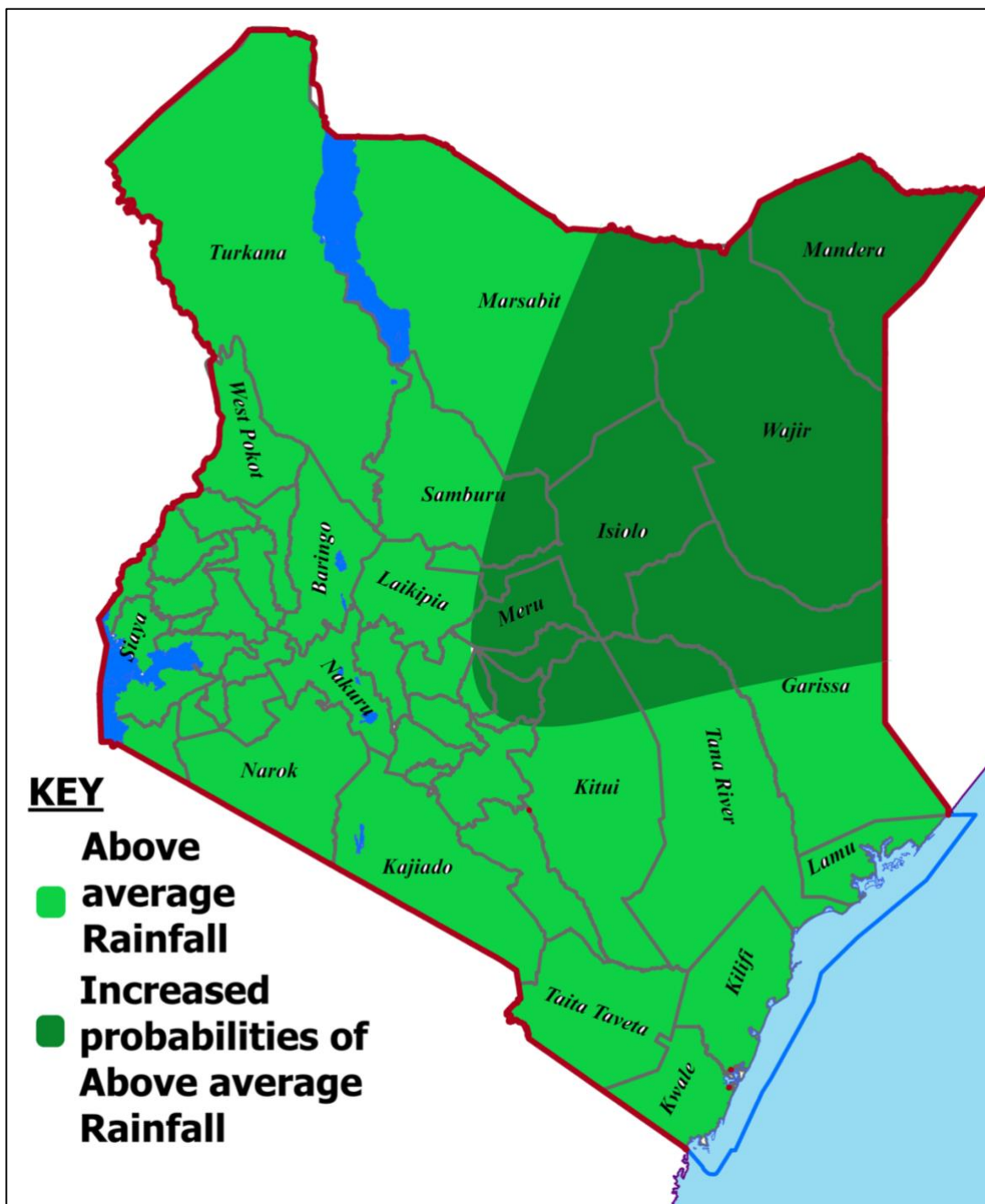


Figure 1: Rainfall Forecast for November 2023

2.2 The specific outlook for individual areas is as follows:

2.2.1 The Lake Victoria Basin, Highlands West of the Rift Valley and Central and South Rift Valley (Siaya, Kisumu, Homabay, Migori, Kisii, Nyamira, Trans Nzoia, West Pokot, Baringo, Uasin Gishu, Elgeyo-Marakwet, Nandi, Laikipia, Nakuru, Narok, Kericho, Bomet, Kakamega, Vihiga, Bungoma and Busia): Significant amounts of rainfall are expected throughout the month, which are likely to be higher than the long-term average received during the same period. During this time, heavy storms are expected to become more frequent, especially during the afternoons and evenings.

- 2.2.2 North-western Region (Turkana and Samburu):** Occasional rainfall is forecasted for November 2023, with the expected rainfall amounts likely surpassing the long-term November average. During this month, there is a possibility of heavy rains accompanied by strong winds exceeding 25 knots.
- 2.2.3 Highlands East of the Rift Valley and Central Kenya (Nairobi, Nyandarua, Nyeri, Kirinyaga, Murang'a, Kiambu, Meru, Embu, and Tharaka):** Morning rains and afternoon/evening showers are expected over several places in the month of November 2023. The expected total amounts are likely to be above the long-term average for November. Occasional episodes of heavy rainfall accompanied by strong winds may occur during the period.
- 2.2.4 North-eastern Region (Marsabit, Mandera, Wajir, Garissa and Isiolo):** Rainfall is expected during the month of November 2023. The expected total amounts are likely to be above the long-term average for November. Occasional episodes of heavy rainfall accompanied by strong winds may occur during the period.
- 2.2.5 South-eastern Lowlands (Kajiado, Kitui, Makueni, Machakos and Taita Taveta):** Rainfall is expected during the month of November 2023. The expected total amounts are likely to be above the long-term average for November. Occasional episodes of heavy rainfall accompanied by strong winds may occur during the period.
- 2.2.6 The Coastal Strip (Mombasa, Tana River, Kilifi, Lamu and Kwale):** The Coastal strip is expected to continue receiving significant rainfall throughout the month of November 2023. The expected total amounts are likely to be above the long-term average for November. Occasional heavy rains are likely to continue being experienced during the forecasted period.

2.3 Potential Impacts of the November Outlook

The following are the likely impacts during the month of November 2023:

2.3.1 Agriculture and Food Security

The anticipated rainfall in Kenya is expected to have diverse impacts on agriculture. For farmers in the high-potential regions, encompassing the Highlands West and East of the Rift Valley, the Lake Victoria Basin, Central and South Rift Valley, as well as the Southeastern lowlands, this rainfall provides favorable conditions for crop cultivation. It is an opportunity to expand their agricultural endeavors, increase crop yields, and ensure food security.

Conversely, in the arid and semi-arid (ASAL) areas of the Northern, Southeastern, and Coastal regions, the same rainfall is anticipated to rejuvenate pasturelands. This is particularly beneficial for livestock farmers, as it ensures the availability of nutritious forage for their animals.

For those in the midst of harvesting, the impact of increased rainfall can be mixed. It can extend the growing period and enhance yields for certain crops but may also pose challenges during the harvest, potentially leading to crop damage.

2.3.2 Disaster Management

There is a significant risk of isolated storms developing, and this weather pattern may lead to various forms of flooding. Areas prone to flooding include flood plains and locations with inadequate drainage systems, especially in urban settings. Riverbanks are also susceptible to overflow, and flash floods can occur, primarily in regions with low-lying terrain such as Northeastern and Northwestern areas, the Southeastern lowlands, the Coastal region, Lake Victoria Basin, and segments of the Central and South Rift Valley.

To safeguard lives and property, it is of utmost importance that the general public exercises caution during these weather conditions. It is strongly advised to refrain from venturing on foot or by vehicle through flooded areas. Additionally, attempting to cross swollen rivers should be avoided at all costs to prevent any loss of life.

Additionally, there is a probability of lightning strikes happening over the Lake Victoria Basin, South Rift Valley and Western parts of the country, notably in areas like Kisumu, Narok, Kisii, Nandi, Kakamega, West Pokot and Bungoma (specifically, Mt. Elgon areas). The public is cautioned against seeking shelter under trees or near metallic structures, particularly during rainy conditions.

Landslides and mudslides are likely over parts of the Highlands East and West of the Rift Valley, Central and South Rift Valley as well as parts of Southeastern lowlands.

2.3.3 Water Resources Management and Energy

The rains expected in October will boost water availability. The public is encouraged to adopt rainwater harvesting and storage practices.

The increased inflow into hydropower reservoirs is expected to boost hydropower generation and contribute to groundwater recharge for geothermal power production. However, it's important to note that this heightened rainfall, along with accompanying winds, may lead to disruptions in power supply, potentially resulting in social and economic losses and damage to transmission infrastructure.

2.3.4 Environment

The expected enhanced rainfall can significantly support widespread afforestation and reforestation initiatives. It remains imperative for relevant authorities to proactively raise awareness about the value of tree cultivation, and the public is strongly encouraged to actively participate in tree planting campaigns to expand the nation's forest cover.

However, it's essential to remain vigilant regarding the potential consequences of enhanced rainfall. While this increased precipitation is a valuable resource for sustainable forestry practices, it may also introduce the risk of land degradation, particularly in the form of soil erosion and landslides. To effectively address these challenges and ensure the long-term success of afforestation and reforestation efforts, the implementation of restoration measures becomes increasingly critical.

2.3.5 Health

The increased rainfall is expected to have a positive impact on food availability, which, in turn, should help decrease nutrition-related diseases. However, there is a potential risk of higher instances of waterborne and vector-borne diseases due to water source contamination

resulting from flooding and the presence of stagnant water, which can serve as breeding grounds for disease-carrying insects like mosquitoes.

2.3.6 Transport and Public Safety Sector

Anticipated intermittent flash floods could result in the disruption of transportation infrastructure, particularly in regions including the Highlands West of the Rift Valley, the Lake Victoria Basin, South Rift Valley, Tana River Basin, Northeastern, and sections of the Southeastern lowlands. Additionally, reduced visibility caused by the weather conditions may lead to a rise in road, marine, and aviation accidents. Motorists are advised to take caution while driving in rainy conditions to minimize road accidents.

3. RAINFALL OUTLOOK FOR NOVEMBER 2023 – JANUARY 2024

The outlook for the next three months indicates that the whole country is likely to experience above average (enhanced) rainfall. The Highlands West of the Rift Valley, the Lake Victoria Basin, Central and South Rift Valley as well as Southeastern lowlands are expected to experience rainfall throughout the three months. The Highlands East of the Rift Valley and the Northeastern regions are expected to receive rainfall in November, December and during the first half of January as well as towards the end of January. The Coastal region is expected to receive rainfall in November, December and most of January. The Northwestern region is likely to receive rainfall in November and December and remain generally dry in January though a few days may experience rainfall. The enhanced rainfall and the lengthened season into January will be as a result of the present El Nino conditions as well as the positive Indian Ocean Dipole (IOD).

Temperature is expected to be warmer than usual during the forecast period over most parts of the country except over Wajir, Garissa, Tana River, Isiolo and the western parts of Marsabit where cooler than average temperatures are expected and most of Mandera where normal temperatures are expected.

4. REVIEW FOR OCTOBER 2023

4.1 Rainfall Review for October 2023

The month of October marks the onset of the October-November-December (OND) short-rains season in Kenya. The start of the seasonal rains (onset) was realized during the third to fourth week of October over several parts of the country except over the Highlands West of the Rift Valley, Lake Victoria Basin and parts of Central and South Rift Valley where rainfall continued from September. However, over some parts of Central, Nairobi and Southeastern lowlands, the onset during the third week of October was followed by a dry spell. The Coastal region received substantial amounts of rainfall during the first week of October as had been predicted but this was followed by a prolonged dry spell. Some areas in Garissa, Makueni and Machakos counties have not yet realized their onset despite receiving occasional rainfall during the month.

The month was characterized by dry weather conditions during the first half of the month over most parts of the country except over the western sector including the Lake Victoria Basin and the Coast where rainfall was received. The rainfall spread to other parts of the country during the second half. Near to above average rainfall was received over several parts of the country except Wilson Airport, Nyeri, Makindu, Msabaha, Nyahururu and Machakos that recorded below average rainfall. As at 30th October, the highest monthly rainfall of 389.8mm was recorded in Meru station followed by Marsabit with 355.8mm. Kakamega, Embu and Kericho recorded 301.8mm, 224.8mm and 214.3mm respectively. Other stations that recorded above 200mm

are shown in **Table 1**. All the other stations recorded less than 200mm of rainfall with Makindu and Machakos recording the least amount of 14.7mm and 8.9mm respectively as depicted in **Figures 2a, 2b and 2c**.

Severe storms were reported over the Coastal region, Northeast and parts of the Highlands East of the Rift Valley and Southeastern lowlands during the month. For Instance, on 3rd October Faza Secondary in Lamu recorded 219.8mm in 24 hours. On the same day, NYS Witu, NYS Mpeketoni and Lamu Meteorological station all in Lamu county recorded 130.7mm, 115.8mm and 101.7 mm respectively while Kipini Police station recorded 120.0mm. Kitui Meteorological station recorded 83.4mm on 16th October while Gatare forest station in Muranga received 90.0mm on 17th October. On 18th October Meru Meteorological station recorded 102.4mm while Mutulu in Kitui, Castle forest station, Marsabit Meteorological station, Kyome in Kitui and Mugae school in Meru recorded 97.0mm, 91,8mm, 83.7mm, 77.2mm and 72.4mm respectively. Uwanja wa ndege in Kwale county received 65.4mm on 19th October while Kangaita Tea farm in Kirinyaga and Bute Police station in Wajir received 64.5mm and 55.3mm respectively. On 25th October, Tseikuru in Kitui recorded 105.4mm while Kianamu in Embu, Kasafari also in Embu, Meru Meteorological station, Gitii-Ngura in Embu and lower Chure in Meru recorded 82.8mm, 80.0mm, 71.8mm, 65.7mm and 65.6mm respectively. Lower Chure recorded 71.8mm on 29th October while Gitoro KWS in Meru recorded 58.0mm. Nkondi MRG in Tharaka Nithi recorded 104.7mm on 30th October while Nkondi Primary also in Tharaka Nithi, Gatare Forest in Muranga and Tharaka University recorded 96.0mm, 70.0mm and 66.0mm respectively.

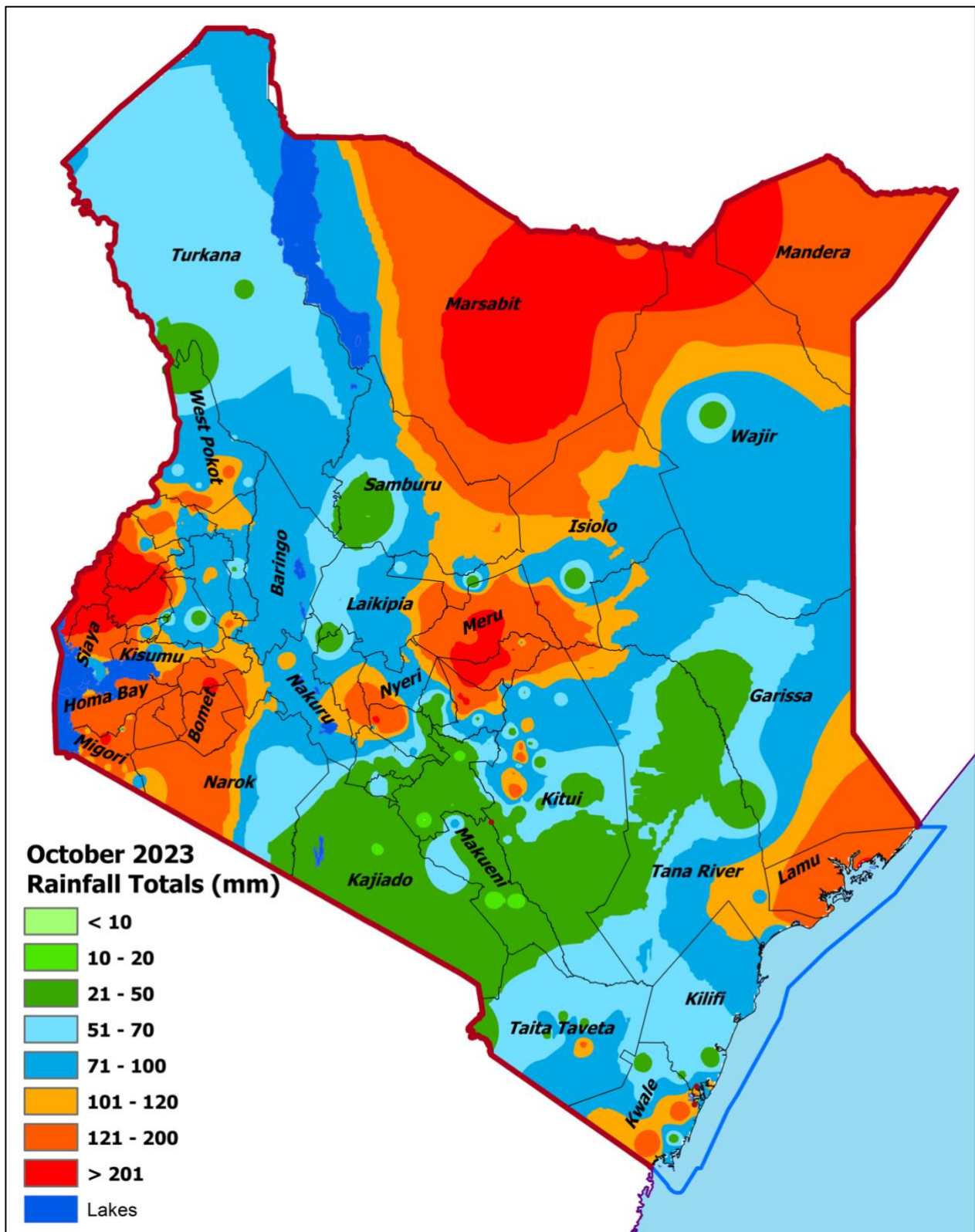


Figure 2a: October 2023 Rainfall Totals

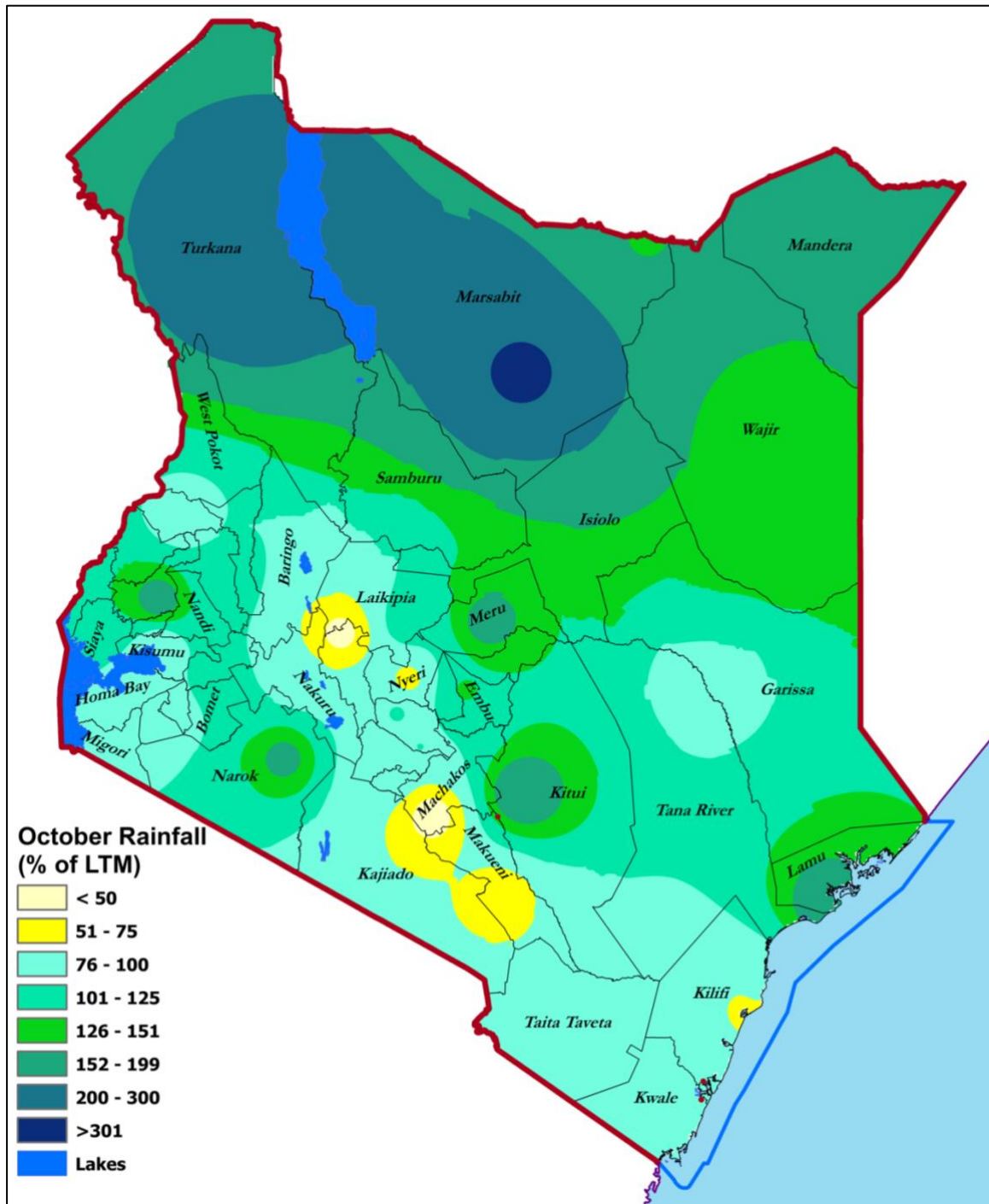


Figure 2b: October 2023 Rainfall as a percentage of October LTM

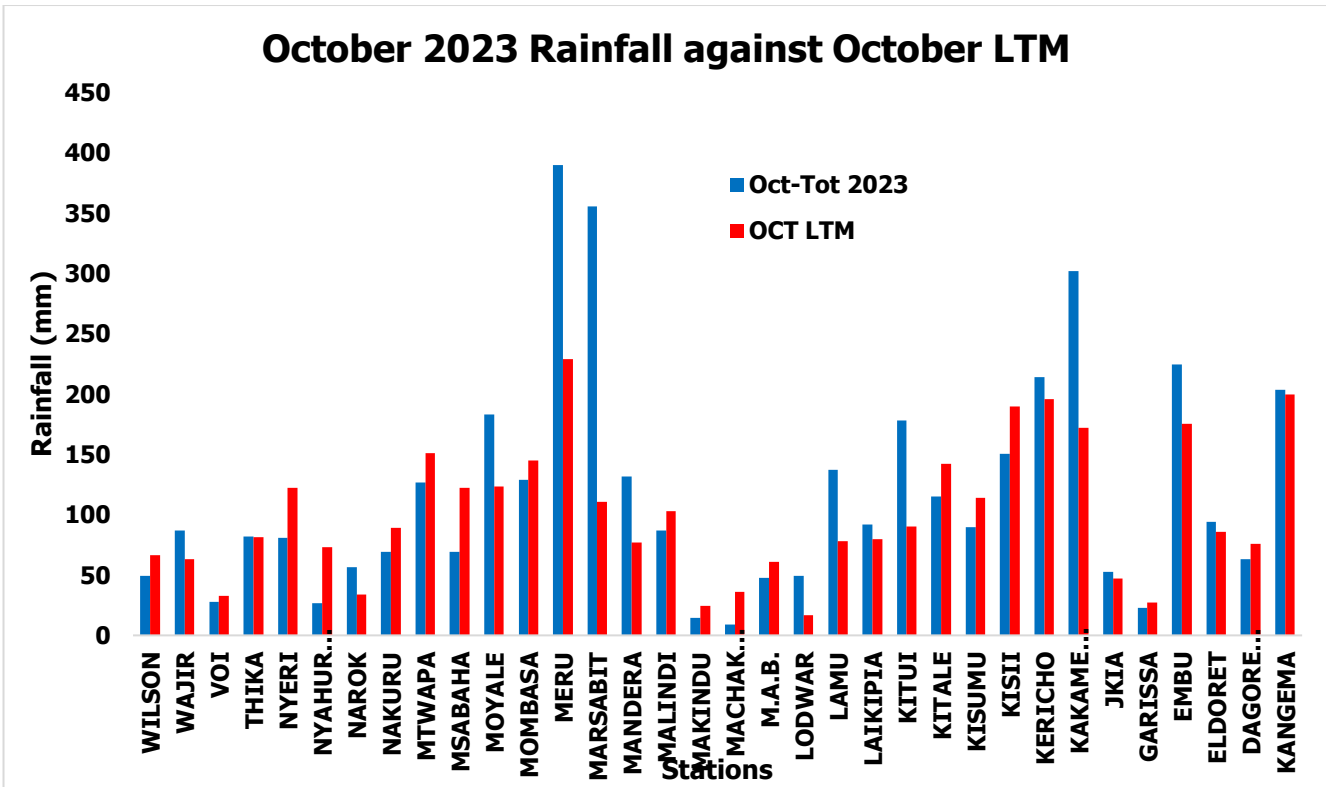


Figure 2c: October 2023 Rainfall Totals Against October LTMs

Table 1: Monthly rainfall reports from volunteer stations

Station	County	Amount In mm
Gurar Police station	Wajir	342.0
Bungoma Water Supply	Bungoma	342.0
Kitinda Secondary	Bungoma	327.4
Kanduyi Agricultural Office	Bungoma	323.2
Khalaba Ward	Bungoma	311.7
Nkondi Primary School	Tharaka Nithi	308.8
Nabichakha Secondary School	Bungoma	305.8
Mabanga ATC	Bungoma	286.6
Machwele Vocational Centre	Bungoma	278.6
Nyaroya	Migori	270.0
Bute Police Station	Wajir	267.7
Castle Forest Station	Kirinyaga	264.6
Gatare Forest Station	Muranga	263.4
Busia Ministry of Water Office	Busia	248.5
Kaanyanga Primary School	Tharaka Nithi	244.4
Mukakula Farm	Bungoma	241.3
Kibabii University	Bungoma	232.9
Faza Secondary School AWS	Lamu	231.8
Kianamu	Embu	223.1
Lower Chure Secondary School	Meru	222.7
Tharaka University	Tharaka Nithi	218.6
Materi Girls High School	Tharaka Nithi	215.9
Butere	Kakamega	209.8
Kangaita Forest Station	Kirinyaga	208.9
Matungu	Kakamega	205.5
Kanga AWS	Migori	204.7
Kinna	Isiolo	204.3
Kangema	Muranga	203.7
Kangaita Tea Farm	Kirinyaga	203.6

4.2 Experienced Impacts in October 2023

4.2.1 Agriculture and Food Security

In late October, Kenya experienced severe weather conditions, including heavy rains with strong winds that had adverse effects across various regions. In Teso South, farms were significantly damaged on the 24th of October. Lightning struck Tapach village, West Pokot, causing the loss of a few cows on the 22nd of October. Floods led to livestock casualties in several areas of the northern sector of the country, with Marsabit County witnessing livestock losses on the 25th of October. In Naremit village, Loima sub-county, Turkana, numerous goats were swept away by floods on the 28th of October.

4.2.2 Disaster Management

- A child drowned in a dam in Kako Waia, Mbooni, Makueni county following a heavy downpour that was experienced in the area on 15th October.
- Property was destroyed in Kitui County when a perimeter wall collapsed following heavy rains experienced in the area on 16th October.
- A school in Baringo county was ripped off following heavy rains that were accompanied by strong winds pounded the area on 16th October.
- Several houses were destroyed in Lokichogio Turkana county after heavy rains accompanied by strong winds were experienced in the area on 16th and 17th October.
- Three people in Olesinye village, Oldonyo Ngiro location, Narok county were injured after their house was struck by lightning on 17th October. The house was also destroyed.
- A woman was killed in Busia on 24th October after her house caved in as a result of heavy rains experienced in the area. On the same day, three other people were injured as they were hit by objects lifted by strong winds that accompanied the rains. Several families in Teso were also rendered homeless in Teso south due to the heavy rainfall.
- One person was killed by lightning in Kapchilla village west Pokot County on 22nd October while another one died in Bur Abor, Mandera county on 29th October during a heavy rainfall episode that was accompanied by thunderstorms.
- A child was swept away by flash floods on 25th October in Marsabit county when she attempted to cross the Isiolo Marsabit road which had been overrun by flood waters. On the same day, an elderly man in Liarapo village, Marsabit county was crushed to death after his house collapsed following heavy rains experienced in the county. Several families were also displaced after their houses were destroyed by floods.
- Washroom facilities collapsed in Nguthukii primary school, Meru County following heavy rains experienced on 24th and 25th October. The school was also closed temporarily as it was inaccessible due to floods.
- Several families were displaced in various parts of Mandera county after their houses were submerged by flood waters and household items washed away following heavy rains experienced in the area from 25th October. The areas affected were Mandera north, Hareri village and Dariqa sub location in Mandera east, Shimbir Fatuma in Mandera south and Lafey town. Toilets also collapsed in Shimbir Fatuma areas as a result of the heavy rainfall.
- Three classrooms, a dining hall and six toilets in Buna primary school, Wajir county were partially destroyed after heavy rains were experienced on 26th October. Several families were also displaced in Buna on the same day.
- Property was destroyed in Kangoi village of Abogeta location Imenti south sub county on 27th October after a landslide affected the village following heavy rains that were experienced in Meru from 25th October.
- Several houses were destroyed in Naremit village, Loima sub county in Turkana following heavy rains experienced in the area on 28th October.
- Three people lost their lives in different parts of Turkana county on 30th October after heavy rains pounded the area. A two year old child in Kalemunyang village was swept away by Kabulokor seasonal river while an elderly woman was swept away as she attempted to cross the swollen river Turkwel. A third person died in Katilu village after being swept by a stadium stream.

4.2.3 Water Resources Management and Energy

On the 16th of October, Baringo County faced a temporary disruption in its power supply due to the adverse weather conditions. Heavy rains accompanied by strong winds had a significant impact on the local power infrastructure, causing damage to vital power lines. As a result, the affected areas experienced an interruption in electricity services for a brief period. Additionally,

it's worth noting that the significant rains experienced in the month have led to increased water levels in rivers and some dams across several parts of the country, raising awareness about potential flooding and the need for water resource management.

4.2.4 Health

Temporary disruptions to healthcare services occurred at Miathane Level 4 Hospital due to flooding that affected the main road leading to the hospital. This flooding was a result of the heavy rainfall experienced in Meru on October 24th and 25th. The heavy downpours led to road inundation, creating access challenges for both healthcare staff and patients. Consequently, healthcare services were briefly affected during this period.

4.2.5 Transport

In late October, various regions of Kenya experienced adverse weather conditions that disrupted normal life and transportation. Kangirisae village in Turkana faced substantial road closures due to heavy rains on the 17th of October, causing inconvenience and difficulties for local residents and travelers. Similarly, on the 25th of October, heavy rainfall in Marsabit disrupted transportation along the Isiolo-Marsabit road, emphasizing the challenges brought about by extreme weather events. Mandera County encountered heavy rainfall on the 26th of October, leading to temporary disruptions in transportation along the Lafey-Elwak road, further underscoring the vulnerability of road infrastructure to intense weather conditions. These incidents highlight the need for preparedness and resilient infrastructure in the face of unpredictable weather patterns.

NB:

- ***El Niño and La Niña events (collectively referred to as the El Niño–Southern Oscillation or ENSO) are driven by the changes in sea surface temperatures (SST) over the equatorial Pacific Ocean. During El Niño, SSTs in the central and eastern Pacific Ocean become warmer than average, while La Niña is characterized by cooler than average SSTs in the same regions. El Niño is often associated with heavy rains and floods during the OND season especially in East Africa. El Nino is therefore not rainfall but a phenomenon that occurs in the Equatorial Pacific Ocean usually associated with enhanced rainfall over Kenya and East Africa.***
- ***A positive Indian Ocean Dipole (IOD) is characterized by warmer than average SSTs over the Western equatorial Indian Ocean adjacent to the East African Coast and cooler than average SSTs over the Eastern equatorial Indian Ocean south of Indonesia. The positive IOD often leads to enhanced/above average rainfall over Kenya and East Africa.***
- ***This outlook should be used together with the 24-hour, 5-day, 7-day, monthly, special forecasts and regular updates/advisories issued by this Department as well as Weekly and Monthly County forecasts developed and availed by County Meteorological Offices.***



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