



REPUBLIC OF KENYA

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**CLIMATE OUTLOOK FOR OCTOBER-DECEMBER 2023 SHORT-RAINS SEASON
AND REVIEW OF MARCH – MAY and JUNE-SEPTEMBER SEASONS**

Ref No: KMD/FCST/5-2023/SO/03

Issue Date: 30/08/2023

1. HIGHLIGHTS

1.1. Forecast for the October-November- December 2023 “Short Rains” Season

The Climate Outlook for the October-November-December (OND) 2023 “Short Rains” season indicates that the whole country is likely to experience enhanced rainfall with higher probabilities over the eastern zone. This will be driven by warmer than average Sea Surface Temperatures (SSTs) over the central and eastern equatorial Pacific Ocean, indicating the presence of El Niño conditions. According to most of the global climate models, El Niño conditions are likely to persist throughout the OND season.

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 favorable for enhanced rainfall over most of East Africa. Throughout the season, it is likely that most areas will have a relatively fair to good distribution of rainfall in both time and space. Occasional storms are likely to occur over several parts of the country during the season. The Standardized Precipitation Index (SPI) analysis of observed and predicted precipitation for the season indicates near to moderately wet conditions over most parts of the country. The temperature forecast suggests that for the larger part of the country, the season is likely to be warmer than average, except in isolated areas over the northeastern zone where temperatures are expected to be lower than average.

1.2. September 2023 Weather Outlook

On average, several parts of the country will experience generally sunny and dry weather conditions during the month of September. However, the Lake Victoria Basin, the Highlands West of the Rift Valley, the Central Rift Valley, and parts of the Southern Rift Valley are expected to experience occasional rainfall that is likely to be below average. Counties in the Highlands East of the Rift Valley, and Nairobi are likely to experience occasional rainfall during the month as well as occasional early morning cloudy conditions at the beginning of the month. Sunny and dry conditions are likely to prevail over the Northeastern, Southeastern, Coastal strip and Northwestern during the month; however, occasional rainfall is likely in the fourth week of September in the Coastal region, parts of the northeastern and southeastern lowlands.

1.3. Review of the March-April-May 2023 Rainfall Season

Most regions enjoyed near to above average rainfall, with the exception of Voi in Taita Taveta County, where below-average rainfall was recorded. The temporal and spatial distribution of rainfall was generally favorable, particularly in March and April. However, May witnessed drier conditions across much of the country, except for the Highlands West of the Rift Valley, Central and Southern Rift Valley, and the Coastal region, which experienced significant rainfall. Notably, the early onset of rainfall in some areas was influenced by the effects of Cyclone "Freddy" and the Madden-Julian Oscillation (MJO), leading to increased moisture influx into the country.

1.4. Review of the Rainfall in June-July-August 2023

During the JJA season, parts of the country experienced dry weather, while others, including the Lake Victoria Basin, the Central and South Rift Valley, and the Coastal region, received significant rainfall. However, the western regions faced uneven rainfall distribution and prolonged dry spells. Kitale recorded the highest rainfall, but places like Lodwar, Mandera, and Makindu received no rain. Overall, temperatures were higher than average in most areas during JJA.

2. FORECAST FOR OCTOBER-NOVEMBER-DECEMBER 2023 SEASON

2.1. Rainfall Forecast

The “Short Rains” October-November-December (OND) season constitutes an important rainfall season in Kenya, particularly in the Central and Eastern regions of the country as shown in **Figure 1a**.

During OND 2023, it is expected that most parts of the country will experience enhanced (above average) rainfall that will be well distributed in both time and space. The forecast indicates a high probability that some counties in the Northeastern region are likely to experience above-average rainfall as shown in **Figure 1b**. This will be driven by warmer than average SSTs over the Central and Eastern Equatorial Pacific Ocean, suggesting the presence of El Niño conditions. According to most of the global climate models, El Niño conditions are likely to persist throughout the OND season.

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 favorable for enhanced rainfall over most of East Africa. Throughout the season, it is anticipated that most areas will have a relatively fair to good distribution of rainfall in both time and space. Occasional storms are likely to occur over several parts of the country during the season.

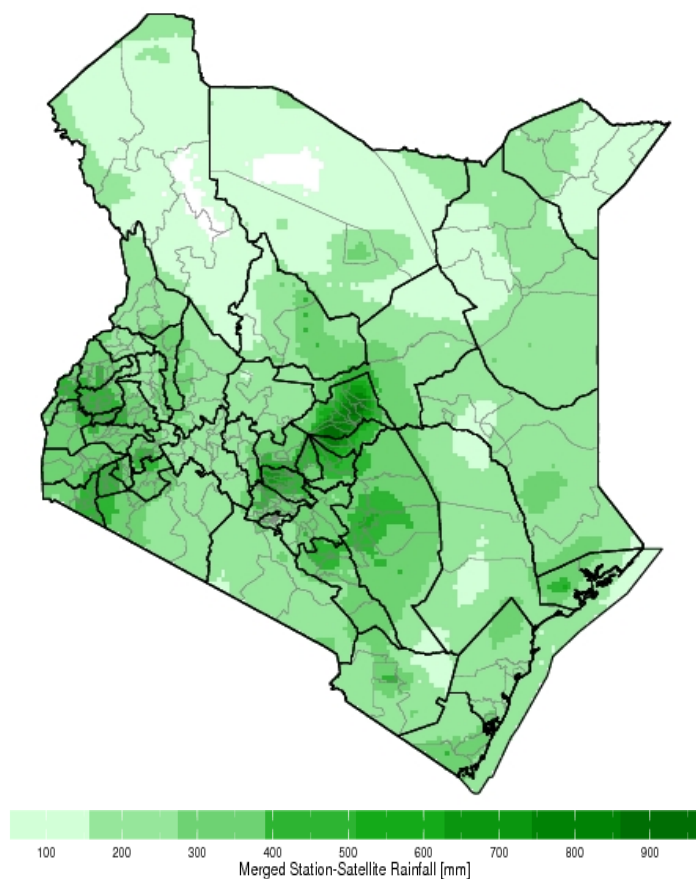
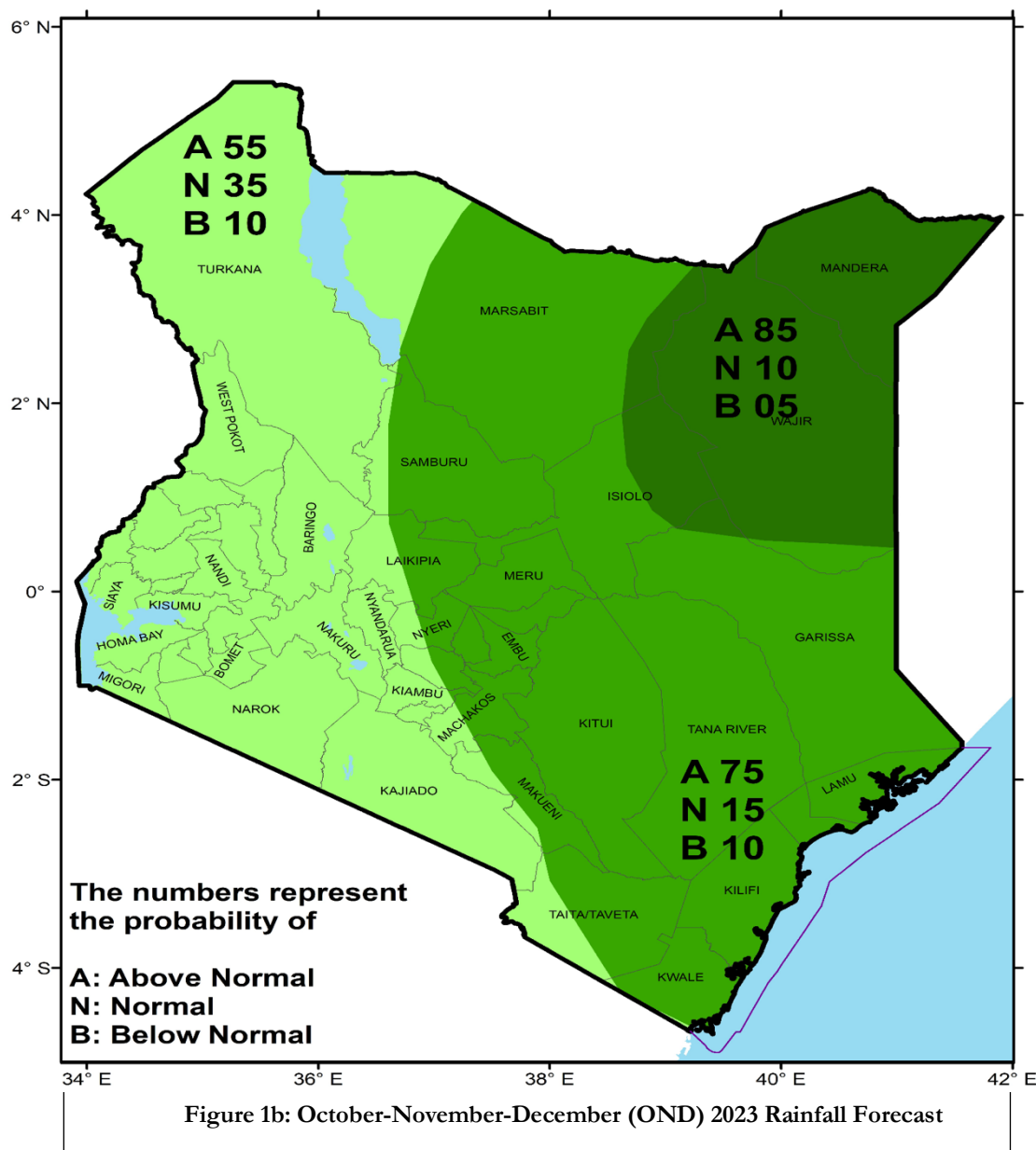


Figure 1a: OND Rainfall Climatology



specific outlook for October-November-December (OND) is as follows:

2.1.1 The Lake Victoria Basin, Highlands West of the Rift Valley and Central and South Rift Valley: (Siaya, Kisumu, Homa Bay, Migori, Kisii, Nyamira, Baringo, Uasin Gishu, West Pokot, Elgeyo Marakwet, Nandi, Kericho, Bungoma, Kakamega, Busia, Trans Nzoia, Vihiga, Laikipia (Laikipia West), Nakuru and Narok): In these counties, rainfall is expected to continue throughout the season. The expected rainfall is likely to be above the long-term average amounts for the season (enhanced rainfall). The peak of the season is expected in November. The expected rainfall is likely to be poorly distributed in October, and well distributed in November and December.

2.1.2 Northwestern Counties (Turkana and Samburu) are likely to experience occasional rainfall during the season. The expected rainfall amount is likely to be above the long-term average for the season (enhanced rainfall). The expected rainfall is likely to be poorly distributed in October, and well distributed in November and December.

2.1.3 Highlands East of the Rift Valley Counties (including Nairobi area): (Nyandarua, Nyeri, Kirinyaga, Murang'a, Kiambu, Meru, Embu, Tharaka Nithi, Nairobi and the Eastern parts of Laikipia): These counties are likely to experience rainfall throughout the season. Rainfall amounts are expected to be above the season's long-term average. The rainfall is expected to be well distributed in time and space.

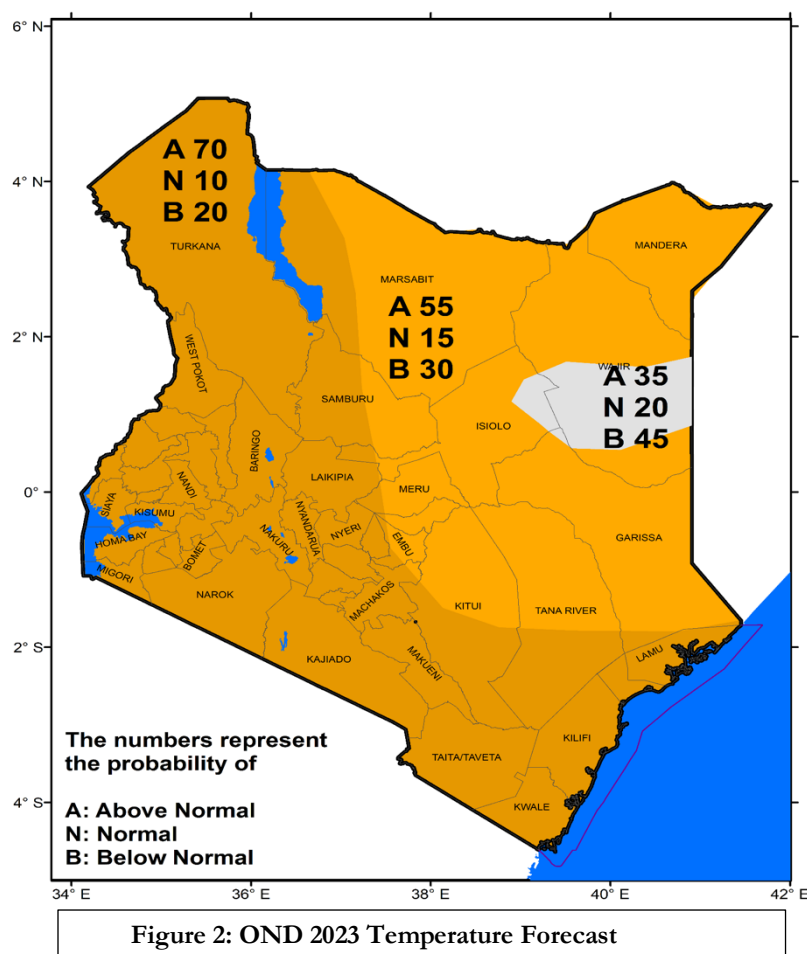
2.1.4 South-eastern Lowlands Counties (Kitui, Makueni, Machakos, Taita Taveta and Kajiado): These counties are expected to experience rainfall during the season. The expected rainfall amount is likely to be above the long-term average for the season. The rainfall is likely to be well distributed in both time and space.

2.1.5 Northeastern Counties (Mandera, Marsabit, Wajir, Garissa, and Isiolo): These areas are expected to experience occasional rainfall during the season. The expected rainfall amount is likely to be above the long-term average for the season, and it is likely to be well distributed in both time and space. Parts of the Northeast (Wajir and Mandera) are likely to experience highly enhanced rainfall (above the long-term average).

2.1.6 The Coastal Counties (Mombasa, Tana River, Kilifi, Lamu and Kwale): The expected rainfall in these counties is likely to be above the long-term average amounts for the season. It is likely to be well distributed in both time and space.

2.2. Temperature Forecast for October-December Season

The temperature forecast indicates that for the larger part of the country, the season is likely to be warmer than average, except in isolated areas over the northeastern where temperatures are expected to be lower than average for the season, as shown in **Figure 2**.



3. Expected distribution of the OND Rainfall, Onset and Cessation Dates

3.1 Distribution of the OND Rainfall

The predicted onsets, cessations and distribution of rainfall were derived from 3 Global Circulation Model (GCM) runs as well as statistical analyses of past years which showed similar characteristics to the current year and are as indicated in Table 1. The analogue (similar) years chosen are **2006 and 1997**. The expected OND 2023 rainfall is likely to be well distributed. However, in some few areas (Turkana and parts of Samburu county in the Northwest), the expected rainfall is likely to be poorly to fairly distributed in both time and space. Several parts of the country are likely to experience rainfall into January 2024.

3.2 Onset and Cessation Dates

The forecast indicates that several parts of the country are likely to have an early onset and a late cessation. This might be especially pronounced in the Eastern Sector. Several parts of the Highlands West of the Rift Valley, the Lake Victoria Basin, the Central, and parts of South Rift Valley will continue experiencing occasional rainfall in September. The expected onset and cessation dates for the Counties are as indicated in **Table 1**.

Table 1: Expected Onset and Cessation of the OND 2023 Rains

	Region	Expected Onset	Expected Cessation	Distribution
1	Northwest (Turkana, Samburu)	Third to fourth week of October	Fourth week of December	Fair
2	Northeast (Marsabit, Mandera, Wajir, Isiolo, Garissa, Parts of Tana River)	Fourth week of September to 1st week of October	Rainfall is likely to continue in January 2024	Good especially in October & November
3	HW/LB (Siaya, Kisumu, Homa Bay, Migori, Kisii, Nyamira, parts of Baringo, Uasin Gishu, West Pokot, Elgeyo Marakwet, Nandi, parts of Bomet, Kericho, Bungoma, Kakamega, Busia, Trans Nzoia, West Pokot, Vihiga)	Rainfall to continue from September	Rainfall is likely to continue in January 2024	Poor in September and October, good in November and December
4	Central and Southern Rift Valley (Nakuru, Narok, Laikipia, parts of Bomet and Baringo)	Second to third week of October (Occasional rainfall expected in September)	Rainfall is likely to continue in January 2024	Good
5	Highlands East of the Rift Valley including Nairobi (Nyandarua, Nyeri, Kirinyaga, Murang'a, Kiambu, Meru, Embu, Tharaka Nithi and Nairobi)	First to second week of October	Rainfall is likely to continue in January 2024	Good
7	Southeast (Kitui, Makeni, Machakos, Taita Taveta, and Kajiado)	Second to third week of October with a likelihood of a dry spell after the onset (Parts of Taita Taveta may experience rains in September)	Rainfall is likely to continue in January 2024	Good
8	Coast (Mombasa, Coastal parts of Tana River, Kilifi, Lamu and Kwale)	Fourth week of September to first week of October	Rainfall is likely to continue in January 2024	Good

4. Standardized Precipitation Index (SPI) forecast

In order to contextualize the impact of the expected enhanced rainfall, the rainfall forecast has been expressed as standard deviations from the mean using the standard precipitation index (SPI). A probabilistic forecast of SPI can provide advance warning by indicating the chance of the various parts of the country either sliding into the alert or the alarm worsening phases of the national drought early warning system. The national drought early warning system uses $SPI < -0.09$ and $SPI < -0.98$ thresholds for the alert and alarm worsening phases respectively. The forecast probabilities for the two scenarios are shown in **Figures 3a and 3b**. The counties that are still recovering from the drought are marked by circles. Taita Taveta County, which is still in the alert phase of the drought, is marked by an **x**.

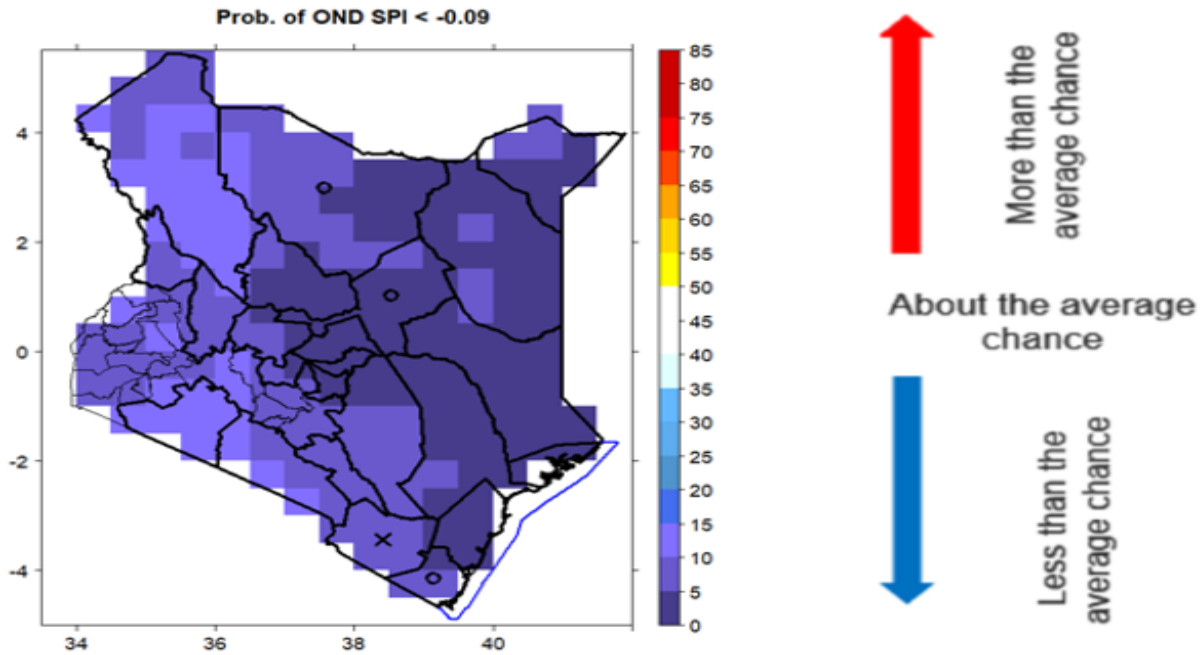


Figure 3a: Forecast probability of the likelihood of the country getting into the alert phase.

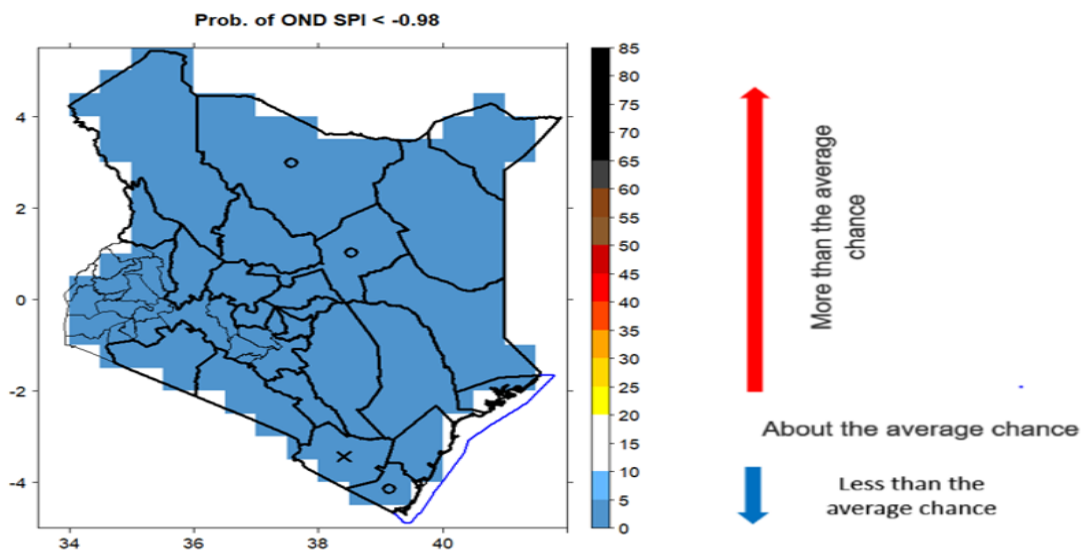


Figure 3b: Forecast probability of the likelihood of the country getting into the alarm-worsening phase

The average chance of SPI<-0.09 is 46%. The probabilities are way below 15% over much of the country and less than 5% over the eastern sector. This forecast shows that there is a very limited chance of the country sliding into the alert phase.

The average chance of SPI<-0.98 is 16%. The forecast probabilities are less than 5% over the entire country. This indicates that there is hardly any chance that the country could experience a severe drought.

These forecasts show that the country is likely to recover from the effects of the previous drought.

5. POTENTIAL IMPACTS OF THE OND 2023 RAINS

The forecasted enhanced October to December rainfall is likely to have impacts on various sectors.

5.1. Agriculture, Food Security and Livestock Development Sectors

Positive Impacts

- Enhanced agricultural production which will increase accessibility to food, lower the prices of food commodities and improve nutrition
- Pasture rejuvenation will increase the productivity of livestock
- Enhanced rainfall will improve water for irrigation

Negative impacts

- Water logging, soil erosion and nutrient leaching may lead to land degradation
- Crops and livestock pests and diseases are likely to increase due to high humidity coupled with warmer than average temperatures
- Excess moisture may lead to pre and post harvesting losses and contamination
- Increased weed proliferation which may increase the cost of farm management
- Damage to agricultural infrastructure and roads. This may impede farm operations and development

Advisories

- Encourage farmers to expand crop and pasture production
- Implement effective marketing strategies to ensure value addition of surplus feeds and fodder; food conservation and market access
- Promote good agricultural practices such as soil and water conservation as well as sustainable land management
- Promotion of essential infrastructure for both pre and post-harvest processes, including efficient drying, cooling, and storage facilities to reduce losses and contamination
- Prevention and control of diseases and pests for both crops and livestock through vaccination and vector control

5.2. Disaster Management Sector

Positive Impacts

- Recovery from previous drought effects
- Reduction in resource-based conflicts
- Less stress on the major economic resources

Negative impacts

- Floods and flash floods are likely over several parts of the country especially over the Coast, Southeastern lowlands, Lake Victoria Basin, parts of the Central and South Rift Valley, Northeast and Northwestern parts of the country and urban centers with poor drainage systems. This could lead to destruction of property, loss of lives and displacement of people
- Landslides and mudslides are likely over some parts of the Highlands West and East of the Rift Valley, Central and South Rift Valley and the Southeastern lowlands

- Lightning strikes are highly probable over the western parts of the country especially in Kisii, Kisumu, Nandi, Kakamega and Bungoma (Mt. Elgon areas) counties.
- Heavy rainfall could lead to rising water levels in rivers, lakes and dams as well as lake back flows
- There may be emergence of desert locusts over some parts of the country
- Infrastructural damage to key installations
- Disruption of social economic activities such as education, agriculture and supply chain

Advisories:

- The public is advised not to drive or walk through flooded waters or cross flooded rivers to avoid loss of lives.
- Dissemination of timely early warning information through radio, newspapers, TV, and social media, with a focus on inclusivity for all demographics, including women, the elderly, and people living with disabilities.
- Implement measures in advance to address flood-related issues, such as repositioning of food and non-food items and resource mobilization

5.3. Health Sector

Positive Impacts

- The enhanced rainfall is likely to improve food availability which will in turn reduce nutrition related diseases

Negative Impacts

- Waterborne diseases, such as cholera, are likely to increase as a result of contamination of drinking water sources by floods
- There may be an increase in vector-borne diseases such as malaria, Rift Valley fever and dengue fever as stagnant water from floods is expected to provide breeding grounds for disease carrying insects such as mosquitos
- Respiratory illnesses such as asthma may increase as a result of prolonged periods of cold weather especially in flooded houses
- Mental health issues may arise in flood prone areas as a result of displacement and loss/destruction of property
- Overcrowding in flood rescue centers could increase the spread of infectious diseases
- Floods might destroy infrastructure such as roads, bridges and health facilities making it difficult to access health care especially among the most vulnerable in the community

Advisories

- Provide water treatment chemicals to communities that draw water from open water sources and promote education on Water and Sanitation Hygiene (WASH) practices
- Enhance disease surveillance and early detection systems for diseases
- Distribute insect treated mosquito nets to high risk areas
- Establish mental health support systems for communities affected by floods

5.4. Transport and Public Safety Sector

The expected occasional flash floods may lead to destruction of transport systems, in parts of the Highlands West of the Rift Valley, the Lake Victoria Basin, South Rift Valley, Tana River Basin, Northeastern and parts of Southeastern lowlands. There may also be an increase in road, marine and aviation accidents due to poor visibility.

5.5. Water and Energy Sectors

The anticipated enhanced rainfall during OND 2023 in Kenya has implications for both the water and energy sectors.

5.5.1 Water Sector:

In the water sector, the implications and proposed key response measures are as follows:

Positive Impacts:

- Increased surface and underground water resources
- Availability of water for domestic and livestock use
- Reduction of pollution loads through washouts

Negative Impacts:

- Increased siltation and sedimentation in some rivers and dams
- Pollution and contamination of surface and groundwater
- Destruction of wetlands and swamps
- Breakage of small earth dams and pans
- Floods including river channel overflows, urban and flash floods

Advisory

- Encourage rain water harvesting and storage to boost water availability
- Desilting of dams
- Monitoring and improving waste water and solid waste management
- Separating storm water and wastewater channels
- Distribution of water treatment chemicals
- Improve and adequately disseminate flood early warning systems
- Need for transboundary collaboration among riparian counties to prevent potential flood disasters
- Constant monitoring of water levels and efficient floodplain management

5.5.2 Energy Sector:

Positive impacts

- Increased inflows into the hydropower reservoirs. This will enhance hydropower generation and reduce the use of thermal power plants
- Increased groundwater recharge for geothermal power production
- Increased feedstock availability for biogas production
- Increased availability of biomass for domestic use

Negative impacts

- Possible overflow of dams to downstream settlements could result in loss of lives and livelihoods as well as displacement of people and destruction of property
- Disruption in power supply may lead to social and economic losses
- Less use of solar power due to decreased irradiance

Advisories

- Careful monitoring and management of water levels in the dams
- Disseminating early warning to people living downstream to move to safer grounds
- Improve power transmission and distribution infrastructure

5.6 Environment and Natural Resources

Positive impacts

- Enhanced rainfall will provide sufficient soil moisture for widespread afforestation and reforestation by all citizens and partners to increase the country's tree and forest cover
- Availability of pasture and browse will reduce grazing in the forests
- The above average rainfall is expected to significantly reduce forest fire risks
- Increased forest biodiversity
- Enhanced carbon sequestration
- Enhanced business opportunities for establishment of tree nurseries to raise stock for tree growing
- Increased job creation through tree growing

Negative Impacts

- Increased incidences of landslides and mudslides may lead to land degradation
- Increased wind snap and wind throws are likely to damage trees and forests
- Damage of tree seeds and seedlings
- Siltation and sedimentation of mangrove degraded areas
- Increased forest harvesting costs
- Prevalence of moisture related pests and diseases
- Spread of invasive alien species (IAS)

Advisories

- Enhance awareness on tree growing
- Promote good agricultural practices such as soil conservation measures
- Select diverse tree species and proper planting sites
- Increase reforestation efforts for regeneration and biodiversity
- Engage communities in education for sustainable practices
- Establish early warning systems for environmental challenges
- Monitor and report on forest health
- Build capacity through training programs

6. REVIEW OF THE WEATHER DURING MARCH-MAY (LONG-RAINS) 2023 AND JUNE-JULY-AUGUST JJA 2023 SEASONS

6.1. March-May (Long-Rains) 2023

An assessment of the rainfall recorded from 1st March to 31st May 2023 indicates that most parts of the country recorded near to above average rainfall except Voi which recorded below average rainfall. The distribution both in time and space was good over several parts of the country especially in March and April. The first half of March was characterized by dry spells over most parts of the country except over a few areas in the southwestern and Lake Victoria Basin where rainfall was experienced. The second half of the month was characterized by heavy rainfall over most parts of the country except a few areas over southeastern lowlands (Taita Taveta county) and the coastal region where rainfall was experienced towards the end of the month. Most parts of the country experienced rainfall in April except over Northwest and parts of Highlands West of the Rift Valley (Trans Nzoia and West Pokot) which remained dry for most of the month with occasional rainfall at the beginning and towards the end of the month. May was relatively dry over several parts of the country except over the Highlands West of the Rift Valley, Lake Victoria Basin, Central and South Rift Valley and the Coastal region where near to below average rainfall was recorded and over Moyale in the Northeast where above average rainfall was recorded.

The start of the season (onset) over several parts of the country was realized during the third to fourth week of March as had been predicted except over Taita Taveta and Kwale counties where

onset was between the first and second week of April. The onset over the Southwestern and Lake Victoria Basin (Kericho, Kisii and Kisumu counties) and a few areas over northeast (Moyale and Wajir), was realized earlier than expected. The highest seasonal rainfall total of 1014.5mm was recorded in Kisii Meteorological station while the lowest amount of 70.3mm was recorded in Voi Meteorological station. The season was characterized with severe storms over several parts of the country especially in March and April. Notably, the early onset of rainfall in some areas was influenced by the effects of Cyclone "Freddy" and the Madden-Julian Oscillation (MJO), leading to increased moisture influx into the country.

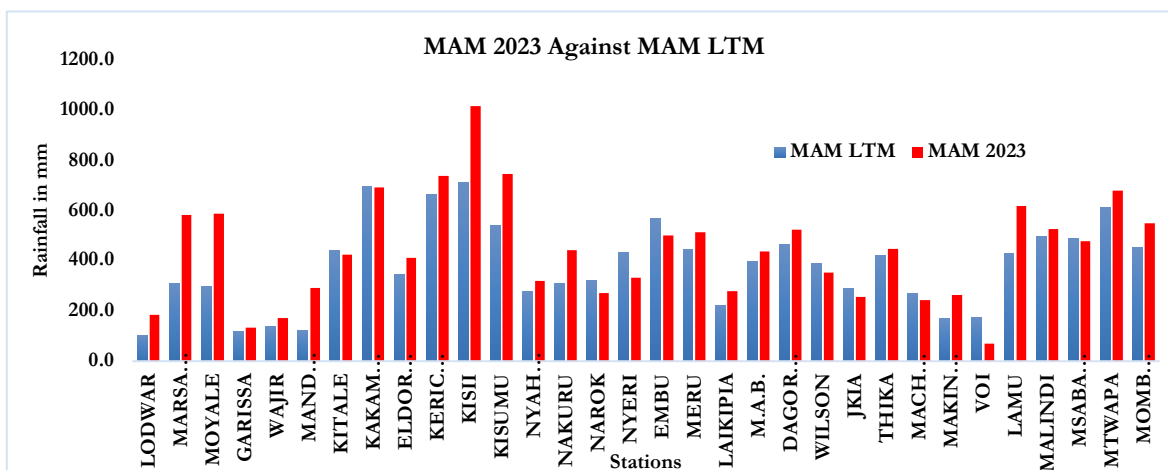


Figure 4a: MAM 2023 Rainfall Totals Compared to MAM Seasonal LTM.

Figure 4a shows the amount of rainfall recorded during the MAM 2023 season (Blue bars) up to 31st May 2023 as compared to the MAM seasonal LTMs (Red bars). Figure 4b shows the MAM 2023 seasonal rainfall performance as a percentage of the LTMs.

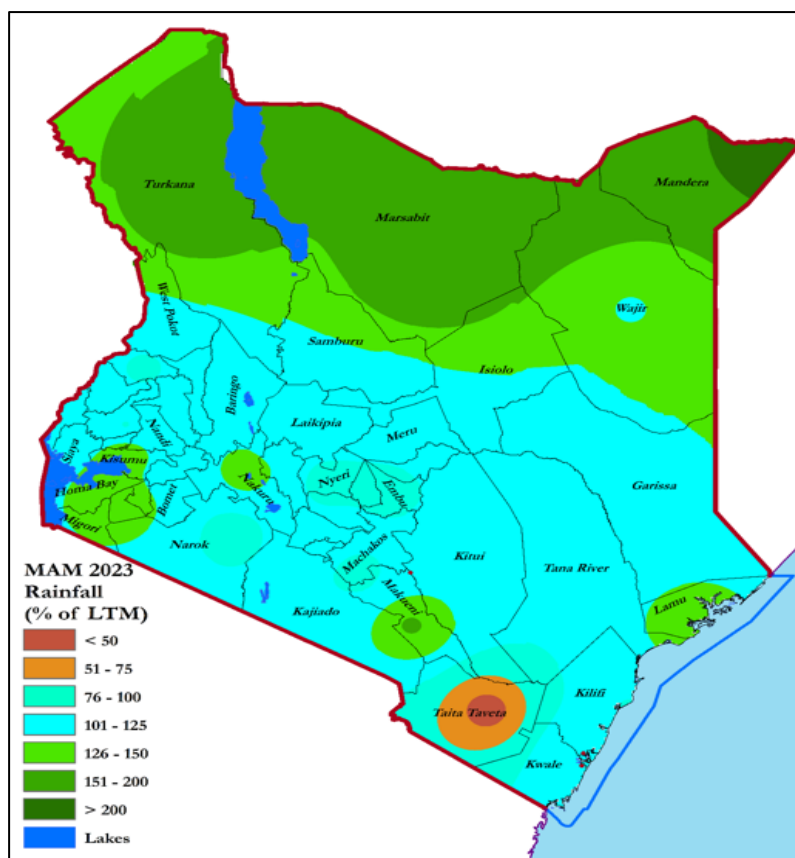


Figure 4b: MAM 2023 Rainfall Performance as a Percentage (%) of MAM LTM

6.2. JUNE-JULY-AUGUST JJA 2023

6.2.1. June-July-August JJA 2023 Rainfall Review

Several parts of the country experienced dry weather conditions. However, the Highlands West of the Rift Valley, the Lake Victoria Basin, the Central and South Rift Valley, the Coastal region and a few areas over the Highlands East of the Rift Valley, Southeast and Northeast experienced rainfall during the season. An analysis of the seasonal rainfall up to 24th August indicates that most stations over the western sector of the country experienced below average rainfall except Kitale and Eldoret where near average rainfall was experienced. Most stations over the Coastal region experienced near average rainfall while Meru, Voi, Garissa and Mtwapa experienced above average rainfall. The Northwest, most of the Northeast and Southeastern lowlands remained generally dry. Occasional cool and cloudy conditions with light rains were experienced over the Highlands East of the Rift Valley including Nairobi County and parts of Southeastern lowlands. The high-altitude areas of Marsabit County were characterized by occasional foggy conditions in the morning.

The rainfall distribution in both time and space over the western sector was generally poor with prolonged dry spells especially over the Lake Victoria Basin, Central Rift Valley and parts of the South Rift Valley. The highest seasonal rainfall total of 387.7 mm (92.1% of JJA LTM) was recorded in Kitale Meteorological station followed by Kakamega station with 375.9mm (70.3%). Other stations that recorded significant amounts of rainfall include Eldoret (338.4mm), Kisii (329.8mm), Kericho (309.5mm), Mtwapa (273.4mm), Lamu (242mm), Msabaha (222.6mm), Nyahururu (221mm) and Malindi (218.2mm). All the other stations recorded less than 200 mm of rainfall with Lodwar, Mandera and Makindu recording no rainfall at all throughout the season.

Figures 5a and 5b show the JJA 2023 Rainfall Totals (in blue bars) as compared to JJA LTMs (in red bars). **Figure 5c** shows the JJA 2023 Percent of Normal.

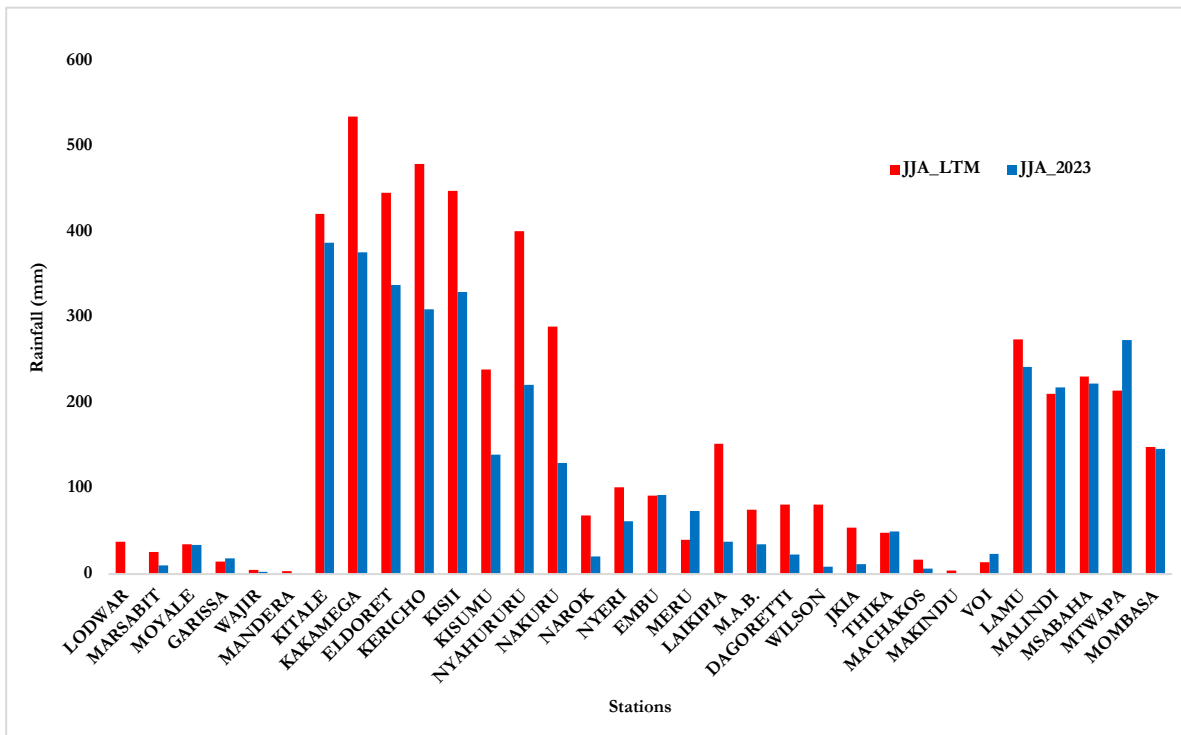


Figure 5a: JJA 2023 Rainfall Totals against JJA LTM

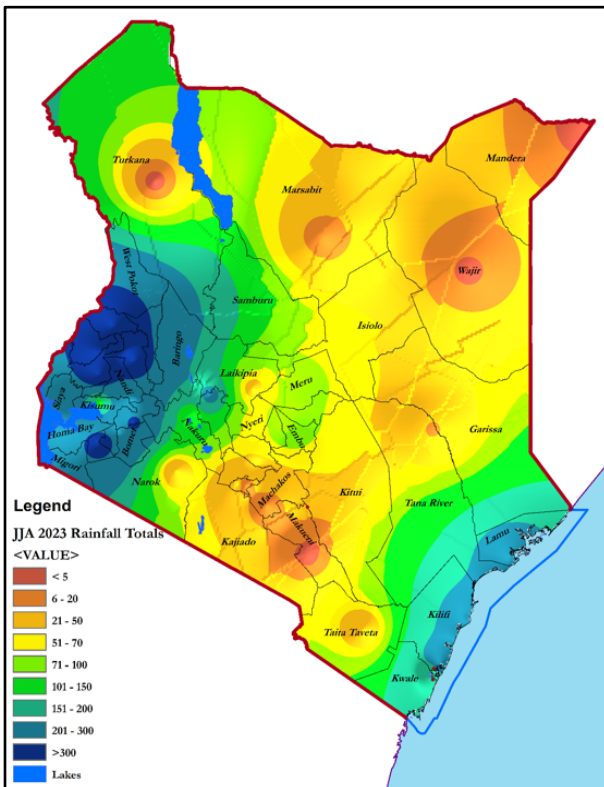


Figure 5b: JJA 2023 Rainfall Totals

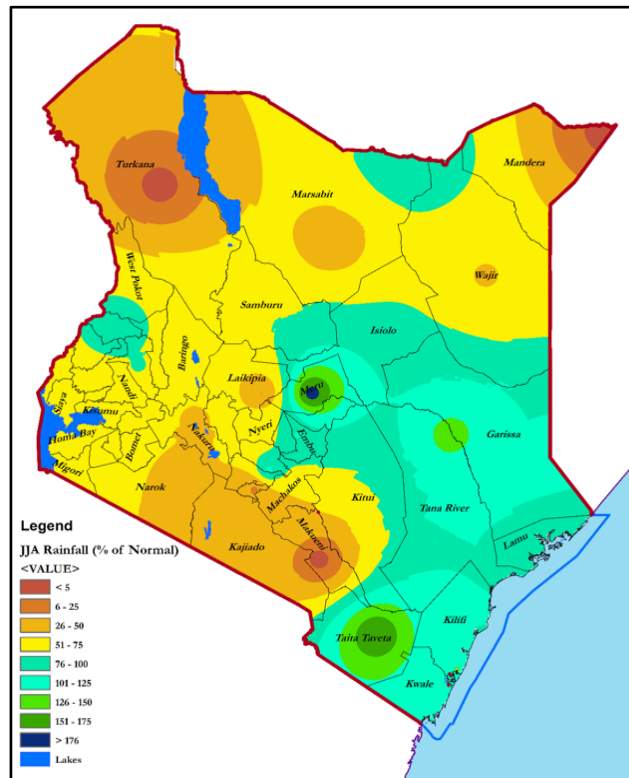


Figure 5c: JJA 2023 Percent of Normal

6.2.2. June-July-August JJA 2023 Temperature Review

Analysis of the JJA 2023 mean temperatures indicates that temperatures were generally warmer than average over the whole country. However, the daytime (maximum) temperatures in the Central highlands, Nairobi area and isolated areas over the Southeastern lowlands (Ngong) occasionally fell below 18°C. **Figure 6a** shows the JJA 2023 mean temperature anomalies while **figure 6b** shows the JJA 2023 mean temperatures against JJA LTMs.

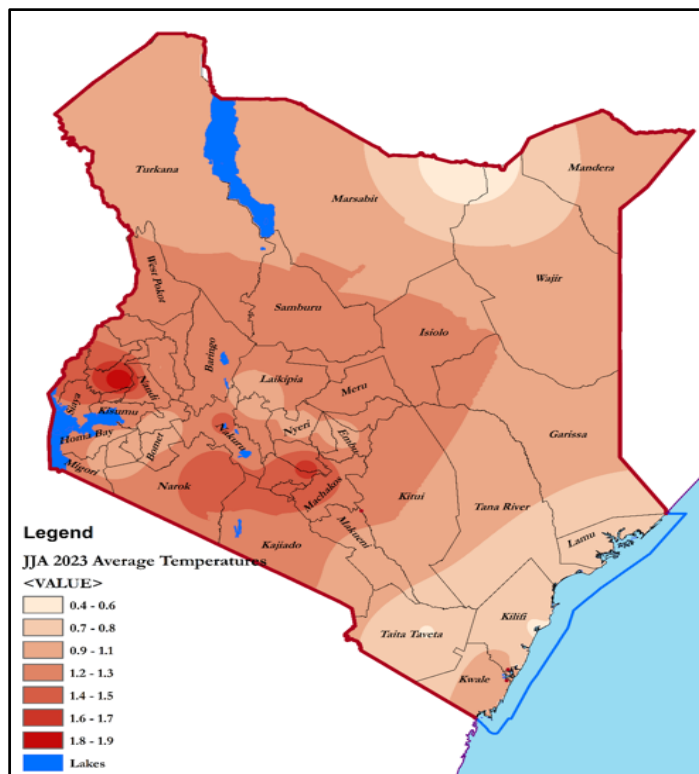


Figure 6a: JJA 2023 Mean Temperature Anomalies

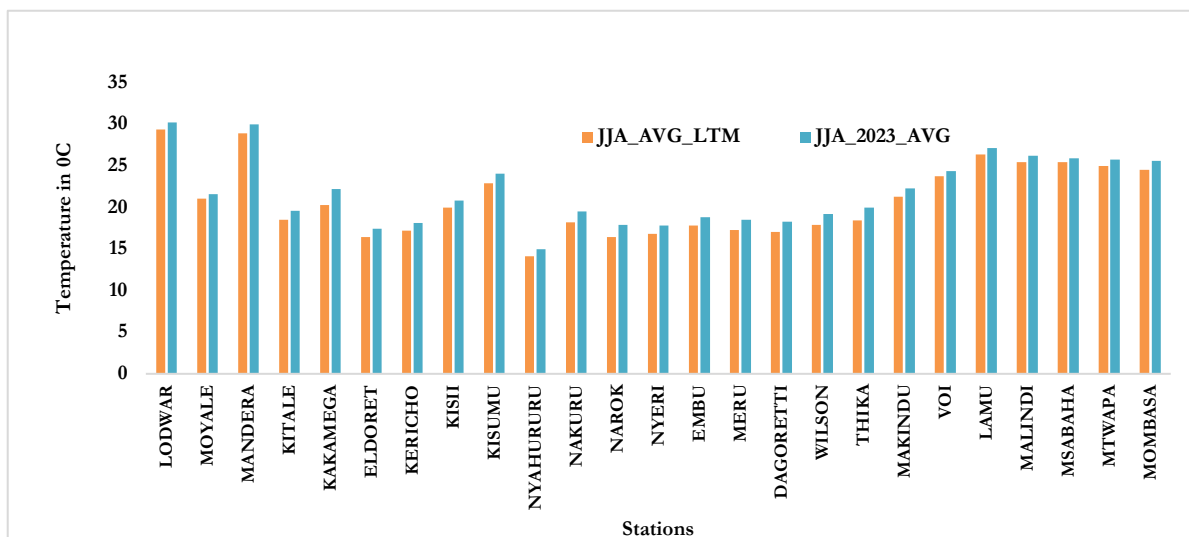


Figure 6b: June- August 2023 Average Temperatures against June-July LTM

6.3 EXPERIENCED IMPACTS OF MAM and JJA 2023

6.3.1 Agriculture and Food Security Sector

The rainfall experienced during the MAM season was conducive for agricultural practices over the high potential areas of the Highlands East and West of the Rift Valley, Lake Victoria Basin, Central and South Rift Valley as well as Southeastern lowlands. Pasture also improved over most parts of the country. However, the severe storms experienced during the season had negative impacts including the following:

- Livestock deaths in Marsabit, Mandera, Isiolo, Wajir, Narok Kisumu, Siaya and Mombasa counties
- Rice fields destruction in the Ahero irrigation scheme after river Nyando broke its banks following heavy rains experienced during the fourth week of April
- Approximately 100 tea bushes were destroyed by a landslide in Wanjerere sub location, Murang'a county after heavy rains were experienced during the fourth week of April
- 83 acres of maize and green grams were destroyed by floods in Maziwa sub-location, Garsen division Tana River County following heavy rains experienced during the fourth week of April
- Several hectares of crops were destroyed by hail storms in Kapskwony (Bungoma), Soko Mjinga (Kiambu) and Kericho on diverse dates in May
- Several hectares of farmland were destroyed in Siaya county after Lake Kanyaboli broke its dyke following heavy rains that were experienced in the catchment areas of River Yala which feeds the lake during the first half of May.

During the JJA season, the following impacts were noted:

- **Improved Crop Harvests:** Early crop harvests slightly improved household food security, especially in regions with bimodal rainfall patterns.
- **Favorable Harvesting Conditions:** Depressed rainfall over the western sector of the country favored harvesting, but led to higher food prices.
- **Healthy Livestock:** Animals were in good body condition due to the availability of pasture and feed from crop residues and the positive performance of the MAM rainfall, but there were cases of animal diseases.
- **High Food Prices:** Prices of most food staples remained high compared to the Long-Term Average, causing economic challenges.

- **Agrifood System Stress:** The agrifood systems faced high pressure due to the cumulative impacts of consecutive droughts and floods.
- **Crop Failure:** Early cessation of rains in the ASAL region led to wilting and crop failure in some areas, particularly for late-maturing crops.
- **Fall Armyworm Outbreaks:** Sporadic outbreaks of fall armyworms were reported in areas that received below-average rainfall, posing a threat to crops.

6.3.2 Disaster Management Sector

- **Severe Storms and Flooding:** Occasional severe storms caused widespread flooding, leading to 66 deaths, injuries, and displacements across multiple counties during both seasons.
- **Landslides and Mudslides:** Incidents of landslides and mudslides affected Nakuru, Meru, and other counties, resulting in fatalities and property damage.
- **Petroleum Tanker Incidents:** Two petroleum tankers were washed away by floods, causing fatalities and environmental risks in Narok and Tana River counties during both seasons.
- **Lightning Strikes:** Lightning strikes led to casualties in Suba, Homa Bay County, and Meru County during both seasons.
- **Road Traffic Accidents:** Poor visibility due to adverse weather conditions contributed to an increase in road traffic accidents during both the MAM and JJA seasons.
- **Structural Collapses:** Kiambu and Kajiado counties experienced structural collapses, causing injuries during both seasons.
- **Mine Collapse:** A mine collapse in Siaya County resulted in fatalities and injuries during the MAM season.

Additional Impacts in JJA Season:

- **Persistent Drought Conditions:** Kitui and Taita Taveta counties faced drought conditions, remaining in the alert drought phase in June and July.
- **Strong Winds:** Strong winds exceeding 25 knots damaged houses in Isiolo County and affected the coast, northeast, and parts of the southeastern lowlands during the JJA season.

6.3.3 Health Sector

- **Malaria Outbreaks:** Malaria outbreaks were reported in Bomet, Turkana, and Marsabit Counties during both the MAM and JJA seasons.
- **Vector-Borne Diseases:** There was a decrease in the prevalence of vector-borne diseases across most parts of the country during both seasons. However, in some areas, there were increased cases of respiratory diseases, especially in regions experiencing cold weather conditions like the Central and Western highlands. These respiratory diseases were more prevalent during the JJA season.
- **Cholera Outbreaks:** Cholera outbreaks were reported in various parts of the country during both seasons, including Nairobi, Homa Bay, Busia, Mandera, Wajir, Garissa, Samburu, Kajiado, and Machakos.

6.3.4 Transport and Public Safety

- **Transport Disruption:** The heavy rainfall during the MAM season led to significant transportation disruptions in various parts of the country, including Narok, West Pokot, Nairobi, Kitui, Makueni, Mombasa, Garissa, Wajir, Kisumu, and Kisii. These disruptions occurred on diverse dates during the season.
- **Road and Bridge Damage:** In Narok and Kisii counties, the heavy rainfall resulted in the destruction of roads, exacerbating transportation challenges. Furthermore, a bridge along the Garbatula-Danyere road in Garissa County was destroyed by floods, posing significant challenges to transportation and public safety.
- **Fog Reports:** During the JJA season, fog was reported along several transportation routes, including the Nairobi Nakuru highway, multiple counties in the Highlands East of the Rift

Valley, and a few counties in the Northeast. Fortunately, these foggy conditions did not have a significant impact on transportation or public safety during this season.

6.3.5 Water Resources Management and Energy Sectors

MAM Season Impacts:

- **Positive Impacts:**
 - **Enhanced Rainfall Benefits:** Adequate rainfall during this season had several positive outcomes.
 - **Improved Water Availability:** Most water sources were recharged, benefiting domestic, livestock, and irrigation purposes.
 - **Pollution Reduction:** Rainfall helped reduce pollution levels through the washout effect.
 - **Aquifer Recharge:** Adequate rainfall supported aquifer recharge.
 - **Hydropower Production:** Adequate water supply enabled effective hydropower production in dams like Sondu Miriu, Turkwell, and Seven Forks.
 - **Small Hydropower Expansion:** Increased water resources facilitated the establishment of more small hydropower plants in rural areas.
 - **Biomass Growth:** Adequate rainfall supported vegetation regeneration, increasing biomass availability.
 - **Soil Moisture for Tree Planting:** There was sufficient soil moisture for tree planting initiatives around hydropower production catchment areas.
- **Negative Impacts:**
 - **Contaminated Water Sources:** In some areas like Rongo, Kisumu County, heavy rains led to the contamination of water sources.
 - **Reduced Solar Energy Output:** Extended cloud cover during the rainy season resulted in decreased solar energy production.
 - **Power Infrastructure Damage:** Power distribution infrastructure was damaged, causing power outages.
 - **Rural Challenges:** Impassable rural roads hindered responses to power failures and connection issues.

JJA Season Impacts:

- **Positive Impacts:**
 - **Efficient Hydropower Operation:** The Sondu Miriu hydropower plant operated at full capacity due to near-normal inflows, contributing to stable energy generation.
 - **Recharged Water Sources:** Surface water and groundwater sources in the coastal region were recharged due to increased rainfall.
- **Negative Impacts:**
 - **Reduced Hydropower Output:** Many hydropower reservoirs across the country experienced reduced water levels, affecting hydropower production, particularly in the Tana cascade.

6.3.6 Environment and Forestry

MAM Season Impacts:

- **Positive Impacts:**
 - **High Tree Survival Rate:** Adequate rainfall contributed to a high survival rate among trees.
 - **Reduced Fire Risk:** The season experienced fewer forest fire occurrences, reducing fire risks.
 - **Increased Forest Biodiversity:** Adequate rainfall enhanced forest biodiversity.

- Enhanced Ecosystem Services: Improved environmental conditions led to enhanced ecosystem services.
- Enhanced Carbon Sequestration: Adequate rainfall supported increased carbon sequestration.
- **Negative Impacts:**
 - Environmental Degradation: Some regions, including West Pokot, Elgeyo Marakwet, Narok, Nakuru, and Kajiado counties, experienced mudslides, land degradation, soil erosion, and vegetation loss.
 - Mangrove Siltation: Mangrove growing areas reported siltation.

JJA Season Impacts:

- **Positive Impacts:**
 - Reforestation Initiatives: The Ministry of Environment Climate Change and Forestry initiated tree planting projects in Elgeyo Marakwet County and various regions across the country.
 - High Tree Survival Rate Continued: Adequate rainfall contributed to a continued high tree survival rate.
- **Negative Impacts:**
 - Human-Wildlife Conflicts: Escalated human-wildlife conflicts occurred in Kilifi County due to elephants encroaching on farms and destroying crops.
 - Habitat Degradation: Arid conditions in ASAL areas led to reduced water and forage resources for wildlife, resulting in habitat degradation, wildlife migrations, and increased conflicts between humans and wildlife.
 - Increased Fire Incidents: The number of fire incidents surged in Tsavo West and Chyulu conservation areas, indicating heightened environmental stress during the season.
 - Strong Winds: Strong winds affected air security patrols within protected areas along the Coast, Northeast, and southeastern lowlands, posing challenges in safeguarding wildlife and ecosystems

NB: This outlook should be used together with the 24-hour, 5-day, 7day, 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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