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**THE WEATHER OUTLOOK FOR THE “LONG RAINS” (MARCH-APRIL-
MAY) 2022 SEASON & REVIEW OF THE WEATHER DURING THE
OCTOBER-DECEMBER 2021 “SHORT RAINS” SEASON.**

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1 HIGHLIGHTS

1.1 Outlook for March-April-May 2022

Enhanced rainfall is expected over the Highlands West of the Rift Valley, the Lake Victoria Basin, Central and South Rift Valley, the North-west, the Highlands East of the Rift Valley (including Nairobi County) and the Southeastern lowlands. Near average rainfall is expected over the North-eastern and the Coastal regions.

1.2 Review of the Performance of the October-November-December 2021 Rainfall Season

The analysis of the October to December 2021 rainfall season indicates that several parts of the Country received below average rainfall (< less than 75% of their Long-Term Mean). The start of the seasonal rains (onset), delayed over most parts of the country apart from a few areas over the Highlands West of the Rift Valley, the Lake Victoria Basin, Central and South Rift Valley. The distribution of the short rains was uneven spatially across the country and the

temporal distribution was poor. The season was characterized by pro-longed dry spells during the first half and isolated heavy storms during the second half of the season.

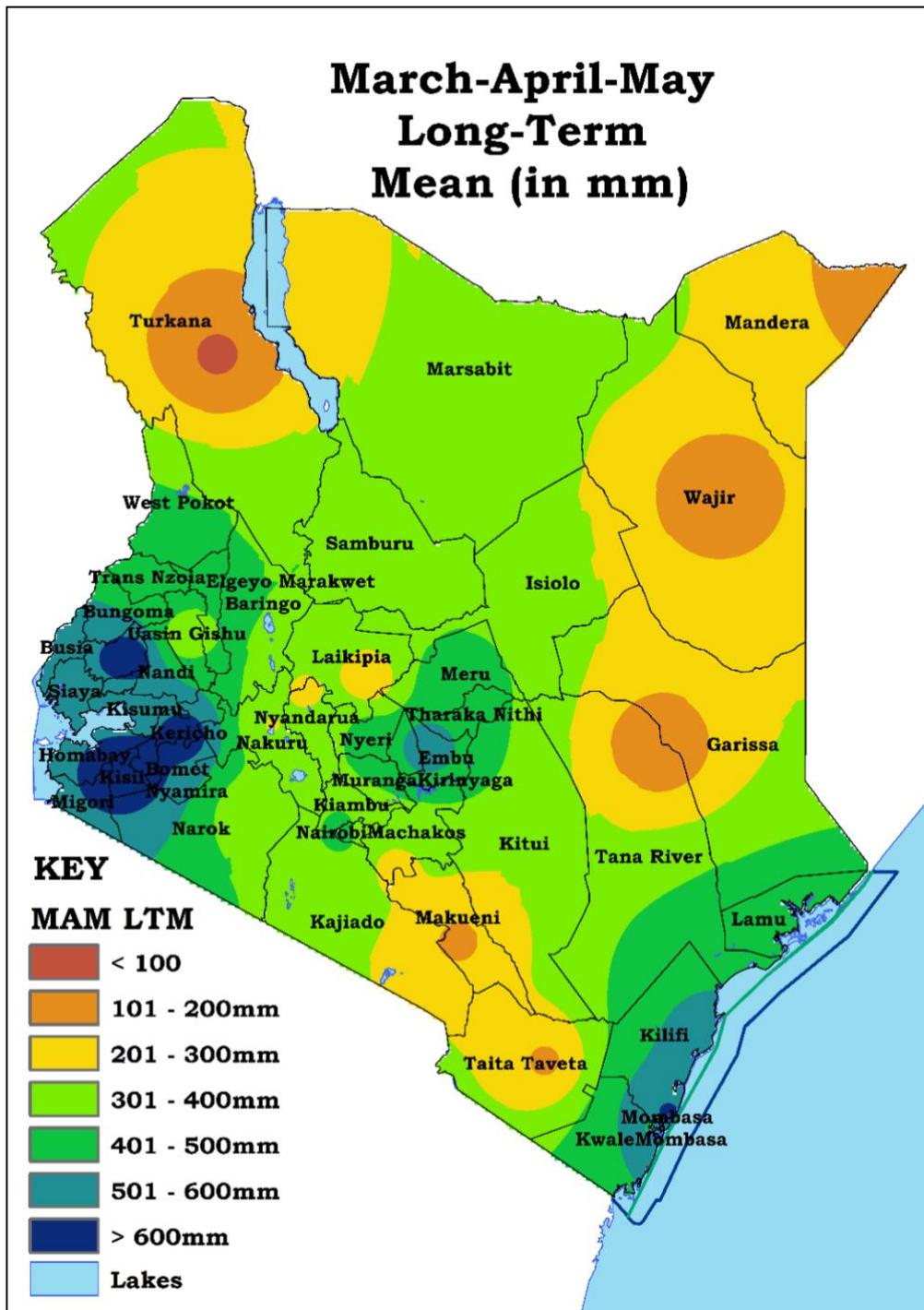


Figure 1: March-April-May Seasonal Rainfall Long-Term Mean (1981 - 2010)

2 FORECAST FOR MARCH-APRIL-MAY (MAM) 2022 “LONG-RAINS” SEASON

2.1 Climatology

The March to May period is the major rainfall season over most of Kenya and much of equatorial Eastern Africa. **Figure 1** depicts the mean (average) March-April-May seasonal rainfall in Kenya. The highest seasonal rainfall amounts (greater than 300mm) are normally recorded over the Lake Victoria Basin, the Highlands West of the Rift Valley, the Central and South Rift Valley, the Highlands East of the Rift Valley (including Nairobi County) and the Coastal Strip.

2.2 Rainfall Outlook for March-April-May (MAM) 2022 “Long-Rains” Season

The forecast for March-April-May (MAM) 2022 “Long-Rains” Season is based on the prevailing and the expected evolution of Sea Surface Temperature Anomalies (SSTAs) over the Pacific, Indian and Atlantic Oceans as well as the Synoptic, Mesoscale and local factors that affect the climate of Kenya. These factors were assessed using various tools including ocean-atmosphere models, statistical models, satellite derived information and expert interpretation. The global drivers considered included the Neutral Indian Ocean Dipole (IOD), negative El Nino Southern Oscillation (ENSO), Quasi Biennial Oscillation (QBO) and Madden-Julian Oscillation (MJO).

The forecast as shown in **Figure 2a** indicates that the Lake Victoria Basin, the Highlands East of the Rift Valley (including Nairobi County), the Highlands West of the Rift Valley, the Northwest, the Southern Rift Valley the Central Rift Valley and the Southeastern lowlands are likely to experience enhanced rainfall. However, near average rainfall is expected over Northeastern and the Coastal regions.

The peak of the rains is expected to be in the month of April for most regions except over the Coastal Strip where the peak is expected during the month of May.

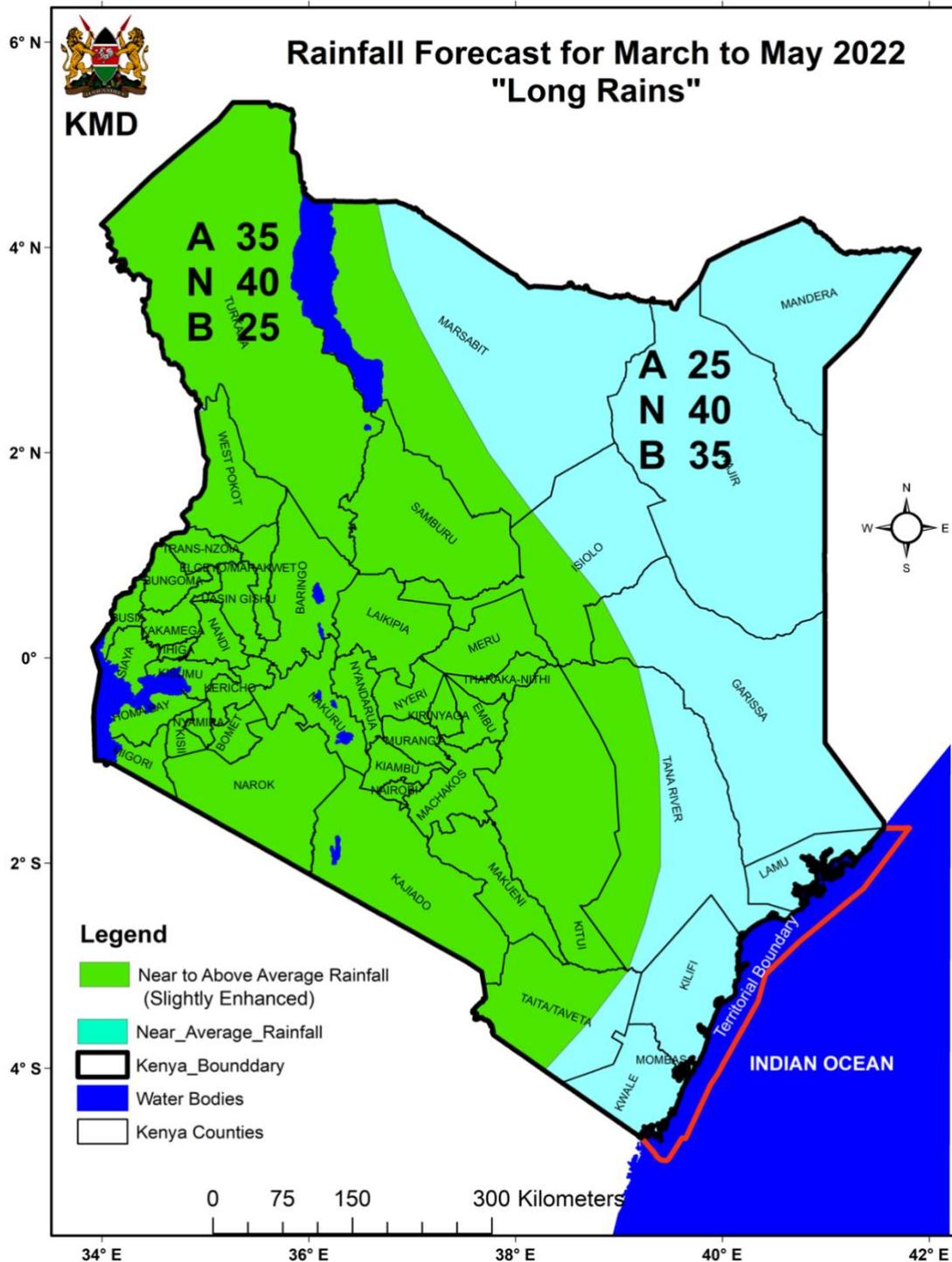


Figure 2a: March-April-May 2022 Rainfall Outlook

2.3 Specific Outlook for March to May 2022 “Long-Rains” Season

The specific outlook for March to May 2022 “Long-Rains” Season is as follows:

- 2.3.1 The Lake Victoria Basin, the Highlands West of the Rift Valley and the Central and South Rift Valley (Siaya, Kisumu, Homa Bay, Migori, Kisii, Nyamira, Trans Nzoia, Baringo, Uasin Gishu, Elgeyo-Marakwet, Nandi, West Pokot, Laikipia, Nakuru, Narok, Kericho, Bomet, Kakamega, Vihiga, Bungoma and Busia):** The expected rainfall is likely to be near to above the long-term average amounts (above normal) for the season.
- 2.3.2 The Northwestern Counties: Turkana, Samburu, Western parts of Marsabit:** The expected rainfall is likely to be near to above the long-term average amounts for the season.
- 2.3.3 The Highlands East of the Rift Valley (including Nairobi County) (Nyandarua, Nyeri, Kirinyaga, Murang'a, Kiambu, Embu, Meru, Tharaka Nithi, and Nairobi):** The expected rainfall is likely to be near to slightly above the long-term average amounts for the season.
- 2.3.4 The Northeast (Wajir, Garissa, Mandera, Eastern Marsabit and parts Isiolo):** counties are likely to experience rainfall amount that is likely to be near the long-term average for the season
- 2.3.5 The Southeastern Lowlands: (Kajiado, Kitui, Makueni, Machakos, parts of Tana River and Taita Taveta):** The expected rainfall is likely to be near to slightly above the long-term average amounts for the season.
- 2.3.6 The Coastal Strip: (Mombasa, parts of Tana River, Kilifi, Lamu and Kwale counties)** are expected to receive rainfall that is likely to be near the long-term average amounts (normal) for the season.

2.4 Onset, Cessation and Distribution of Rainfall.

2.4.1 Distribution

The predicted onsets, cessations and distribution of rainfall were derived from statistical analysis of past years which showed similar characteristics to the current year and are as indicated in **Table 1**. The analogue years chosen are 2008, 2012 and 2021. The season is expected to experience a normal onset with fair distribution over the areas expected to receive near to above average rainfall and poor distribution in the ASAL region.

2.4.2 Onset and Cessation Dates

The expected onset and cessation dates for the various counties are as indicated in **Table 1** below.

Table 1: Onset and cessation dates				
	Region	Onset Dates	Cessation Dates	Distribution
1	Southern parts of the Rift Valley and Counties in the Lake Victoria Basin (Siaya, Kisumu, Homa Bay, Migori, Kisii, Nyamira, Narok, Bomet, Kericho, and parts of Kajiado);	Rainfall is expected to continue from February 2022	Rainfall will continue into June 2022	Good
2	Counties in Highlands West of the Rift Valley (Trans Nzoia, Baringo, Uasin Gishu, Elgeyo-Marakwet, West Pokot, Nandi, Laikipia, Kakamega, Vihiga, Bungoma and Busia)	Rainfall is expected in the 2 nd to 3 rd week of March 2022	Rainfall will continue into June 2022	Good
3	Highlands East of the Rift Valley including Nairobi County (Nyeri, Kirinyaga, Murang'a, Embu, Meru, Kiambu, Nyandarua and Nairobi)	Rainfall is expected in the 3 rd to 4 th week of March 2022	3 rd to 4 th week of May 2022	Good
3	Central Rift Valley (Nakuru, Laikipia)	Rainfall is expected in the 3 rd to 4 th week of March 2022	Rainfall will continue into June 2022	Good
4	Southeastern Lowlands (Kajiado, Kitui, Makueni, Machakos, Taita Taveta, parts of Tana River)	Rainfall is expected in the 3 rd to 4 th week of March 2022	2 nd to 3 rd week of May 2022.	Good
5	Coastal region (Lamu, Mombasa, Kwale, parts of Tana River and Kilifi)	Rainfall is expected from the 4 th week of March to the 1 st week of April 2022	Continues into June 2022	Poor
6	The Northwest (Turkana, Samburu)	Rainfall is expected from the 4 th week of March to the 1 st week of April 2022	3 rd to 4 th week of May 2022	Poor
7	The Northeast (Wajir, Isiolo, Garissa, Mandera, Marsabit)	Rainfall is expected in the 4 th week of March to the 1 st week of April 2022	3 rd to 4 th week of May 2022	Poor

2.5 Temperature Forecast

Above average temperatures are expected over most parts of the country except the Lake Victoria Basin, Highlands West of the Rift Valley, South Rift Valley and extreme north-western parts of the country where near average temperatures are expected as shown in the **figure 2b** below.

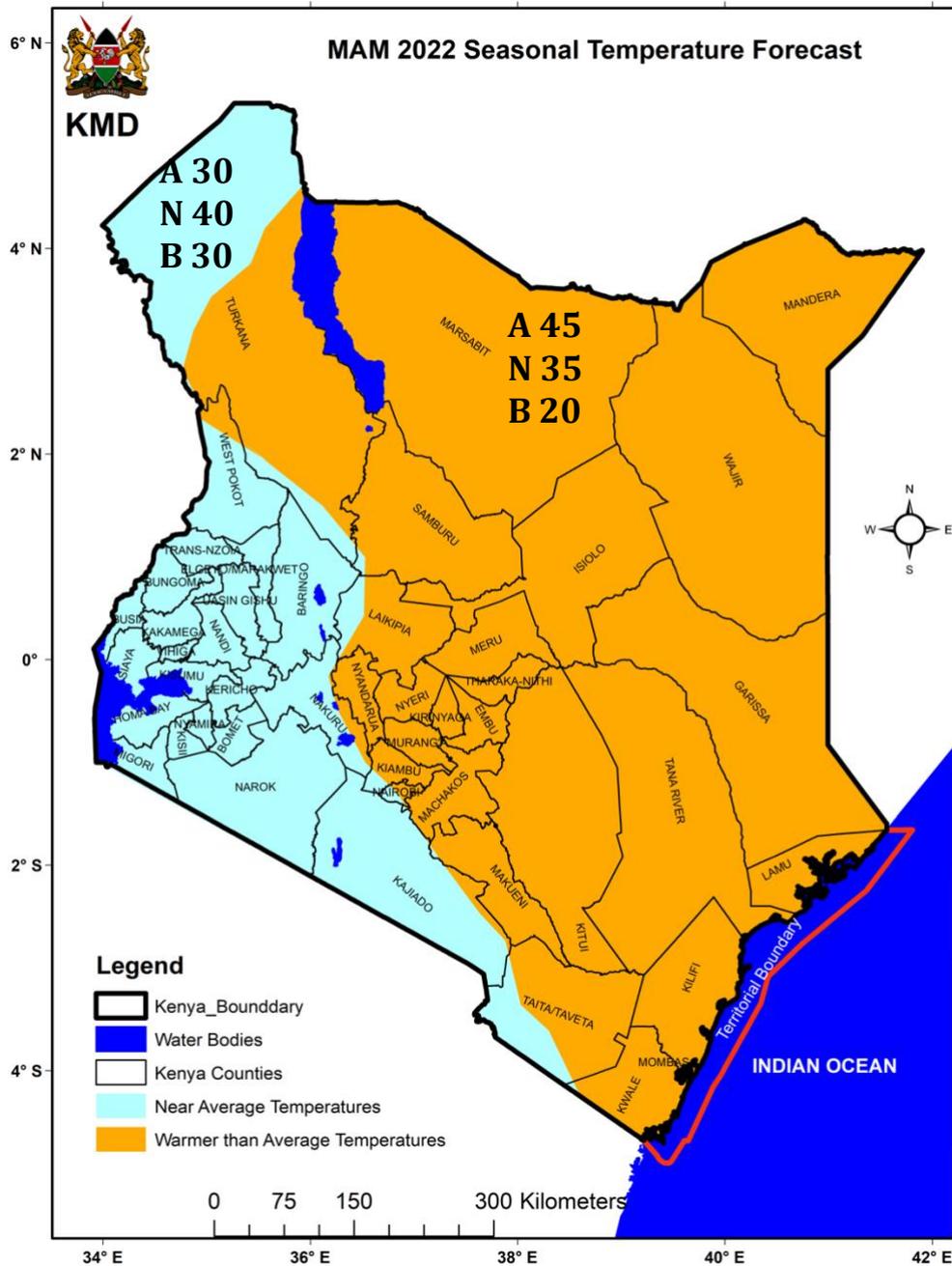


Figure 2b: MAM 2022 Temperature Forecast

2.6 Potential impacts

2.6.1 Agriculture, Food Security and Livestock Sectors

The enhanced rainfall is expected to be conducive for agricultural practices. Thus, the farming communities in the agricultural counties of the **Lake Victoria Basin, Highlands West and East of the Rift Valley, the South and Central Rift Valley, South eastern lowlands** are advised to take advantage of the expected rains and maximize on crop yield through appropriate farming and land-use management practices. Farmers are advised to liaise with the Ministry of Agriculture and agricultural extension officers for further advice. Due to the prolonged drought that is being experienced in the ASAL region which has led to land degradation the expected rainfall will lead to further soil erosion. The public is advised to put in place soil conservation measures.

The expected enhanced rainfall in these counties, coupled with high temperatures, may lead to emergence of pests and diseases. Relevant authorities are therefore advised to stock enough herbicides and pesticides and to enhance disease surveillance, control and prevention.

The near average rainfall expected over the Arid and Semi-Arid Lands (ASALs) of the **Northeastern** and **Coastal** regions may regenerate pasture and browse as the season progresses but recovery from the current drought may take time. Thus, the current shortage of food, water and pasture for both humans, livestock and wildlife is likely to persist for some time. The National and County governments as well as humanitarian organizations are therefore advised to continue with measures that are already being implemented to avert loss of lives, livelihoods and livestock.

2.6.2 Disaster Management Sector

In the **Arid and Semi-Arid Lands (ASALs) of North-eastern and Coastal regions** drought related impacts such as water scarcity and lack of pasture for domestic use, livestock and wildlife are likely to continue especially at the beginning of the season. This may lead to human-wildlife and inter-community conflicts over the limited resources. Contingency plans and strategies should therefore be put in place to avert such incidences.

In the **Lake Victoria Basin and the Highlands West of the Rift Valley** lightning strikes are highly probable, especially in Kisii, Kisumu, Nandi, Bungoma (Mt. Elgon areas) and Kakamega Counties.

Cases of flooding in flood-prone areas such as Budalangi and Nyando as well as along rivers over the **South-eastern lowlands, Tana- River and Garissa Counties** are likely due to the enhanced rainfall expected upstream.

The high water level in Lake Victoria and the Rift Valley lakes is likely to be maintained or rise further.

Landslides or mudslides are likely on the hilly areas of **Highlands West of the Rift Valley** as well as parts of the **Highlands east of the Rift Valley**. The floods or landslides may lead to displacement of people and wildlife with possible loss of lives, livelihoods and destruction of property.

The Ministry of Interior and Coordination of National Government, county governments and humanitarian institutions are therefore advised to put in place measures to avert possible negative impacts that may arise including loss of lives, livelihoods and property. County Governments are also advised to clear drainages in good time to avert artificial flooding of the urban areas. The public is advised not to drive or walk through flooded rivers or moving waters.

2.6.3 Transport and Public Safety Sectors

Flash floods are very likely to occur in the **Lake Victoria Basin, the Highlands West of the Rift Valley, the Central and South Rift Valley and parts of the Highlands East of the Rift Valley (including Nairobi County)** due to the expected rainfall in these areas. This may lead to structural damage to roads, bridges and sub-standard infrastructure which may in turn lead to transport challenges, damage to property and loss of lives.

Slippery roads and poor visibility during rainstorms may also pose a danger to motorists and pedestrians, especially along the Kikuyu-Kinungi stretch on the Nakuru-Nairobi Highway and the public should therefore take utmost care during the rainy period to minimize accidents that could result from such weather conditions.

2.6.4 Water and energy Sector

Water resources are expected to be replenished over most of the **Lake Victoria Basin, the Highlands West and East of the Rift Valley, Central and South Rift Valley as well as over the South-eastern lowlands** due to the expected enhanced rainfall. This is expected to improve domestic water supply and enhance ground water supply.

The major river catchment areas for the country's hydroelectric power generating dams are forecasted to receive near-average rainfall. This means that surface water run-offs may register maintained inflows into rivers Sondu Miriu, Turkwell, Tana and Athi. There is however a risk of flooding downstream of the Tana and Athi Rivers. Thus, flood risk awareness should be carried out to the communities expected to be affected.

Efficient water management should be carried out to ensure enough water resources for the animal and human population needs in the Southeastern Lowlands, the Northeast, the Northwest and the Coastal Strip. Rainwater harvesting should be encouraged to boost water availability for households.

2.6.5 Health Sector

Vector-borne diseases such as malaria are likely to emerge over the **Lake Victoria Basin, Northeast, Northwest and the Coastal areas** especially in areas with poor drainage as these may harbor pools of stagnant water which create conducive breeding areas for mosquitoes. In areas expected to receive near to above average rainfall, water borne diseases such as cholera, diarrhea and typhoid may emerge as a result of flooding and subsequent contamination of water. Cases of dengue and chikungunya fevers may also increase over the Coastal region. Scarcity of food over the ASAL regions of Northeast may lead to malnutrition related diseases.

Rapid risk assessment should therefore be carried out to identify high risk areas. Health authorities should preposition and redistribute medical supplies and insect treated nets in the affected areas. Food security assessment should be carried out in the ASAL areas to identify the most vulnerable communities and provide them with water, food and/or food supplements. Public health

education on disease prevention as well as Water Sanitation and Hygiene (WASH)) should be carried out.

2.6.6 Environment Sector

An increase of water and forage for wildlife is expected in areas forecasted to receive near to above average rainfall. This is expected to reduce wildlife migration and consequently minimize human-wildlife conflicts in these areas. The rainfall is expected to reduce the chance of forest fires as well as increase natural regeneration of forests. However, soil erosion and land degradation are expected especially over the high ground areas. Thus, soil conservation measures should be put in place to minimize environmental degradation due to soil erosion.

The Ministry of Environment and Forestry should encourage residents to continue planting trees including indigenous and fruit trees in order to increase tree and forest cover and conserve the environment. The March-April-May season, being the major rainfall season in Kenya, will provide enough moisture to sustain tree growth in the areas expected to receive enhanced rainfall.

3 WEATHER REVIEW

3.1 Review October-November-December (OND) 2021 “Short Rains” Season

The “Short Rains” October to December (OND) season constitutes an important rainfall season in Kenya and more so in the Highlands East of the Rift Valley and Southeastern Lowlands. The Climate Outlook for the October-November-December (OND) 2021 “Short Rains” season indicated that much of the country was likely to experience below average rainfall. The distribution, both in time and space, was also expected to be poor.

The October to December 2021 analysis indicates that depressed rainfall was recorded over several parts of the country. The start of the seasonal rains (onset) delayed over most parts of the country apart from a few areas over the Highlands West of the Rift Valley, the Lake Victoria Basin, Central and South Rift Valley where rainfall continued from September 2021 as had been

predicted. The rainfall distribution in time and space was poor throughout the country.

The poor rainfall performance in the country was due to the La Nina conditions linked to cooler than average Sea Surface Temperatures (SSTs) in the central and eastern Equatorial Pacific Ocean and warmer than average Sea Surface Temperatures (SSTs) in the Western Equatorial Pacific Ocean. The Indian Ocean dipole (IOD) remained negative in October and neutral in November and December.

The seasonal rainfall analysis shows that depressed rainfall was received in North-western, North-eastern, parts of South-eastern lowlands (Machakos), parts of Nairobi, parts of the Coastal strip and parts of the Western sector of the country. Laikipia Meteorological station is the only station that recorded above normal rainfall at 125.6%. Thika, Malindi, Meru, Makindu Kisumu, Embu, Msabaha, Nyahururu, Dagoretti, Eastleigh, Kitale, Nyeri, Voi, Kericho and Mombasa recorded near average rainfall at 117.2%, 109.2%, 104.7%, 103.6%, 97.6%, 95.7%, 94.7%, 87.1%, 82.3%, 81.9%, 80.2%, 78.8%, 78.4%, and 76.1% respectively. All the other stations recorded less than 75% of their OND LTMs.

The highest seasonal total rainfall amount of 725.9mm was recorded at Meru Meteorological station. Other stations that recorded significant amounts of rainfall are Embu (474.2mm), Thika (429.2mm), Kisii (358.7mm), Kericho (333.9mm), Makindu (329.5mm) and Kisumu (320.7mm). The other stations recorded between 100-260mm except Narok, Lamu, Mandera, and Lodwar that reported 97.1mm, 95.9mm, 83.5mm and 1.0mm respectively.

Figure 4a shows the OND 2021 rainfall performance (%) while **Figure 4b** shows total rainfall amount recorded in OND 2021 (**Blue bars**) in comparison with the OND LTMs (**Red bars**).

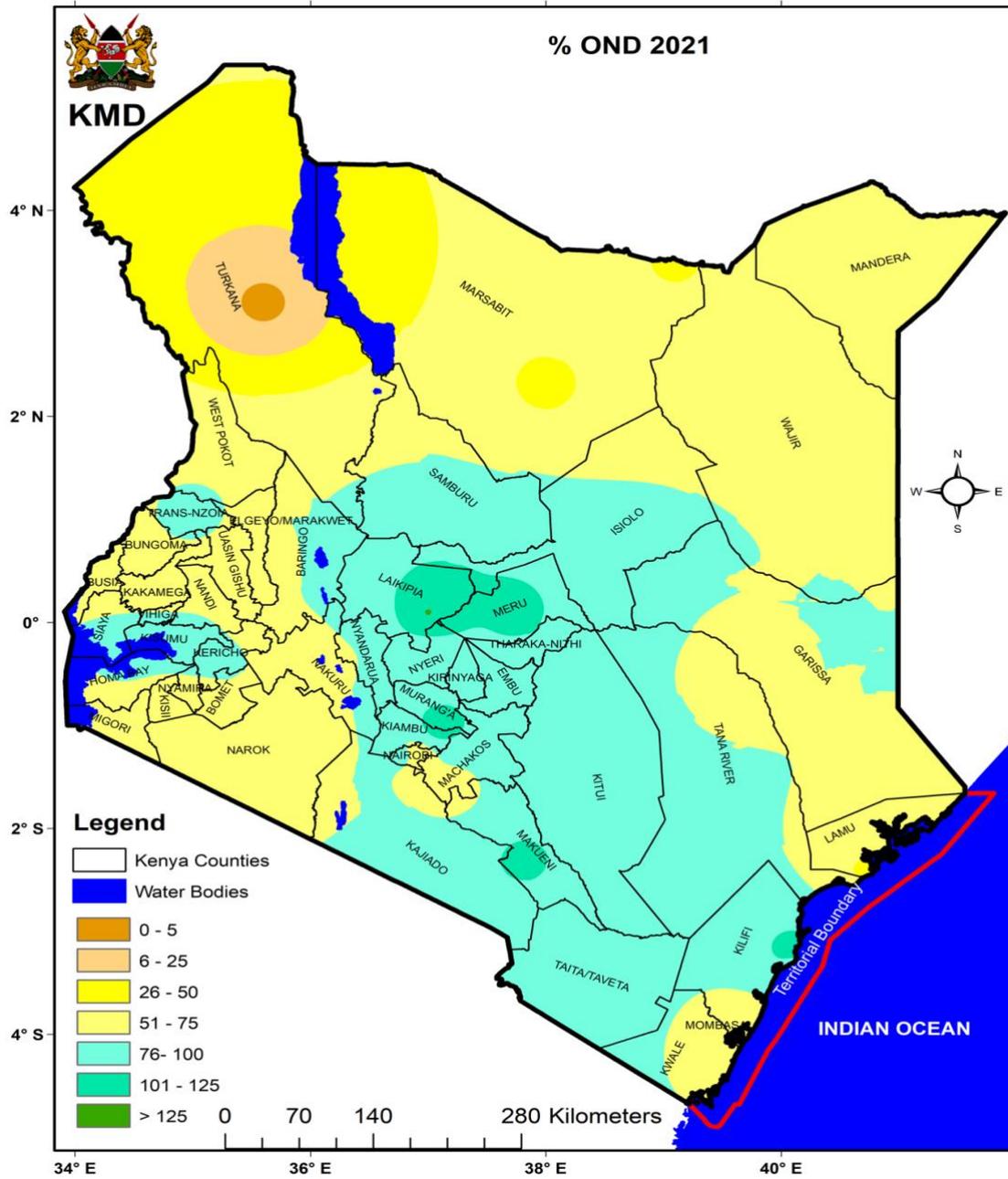
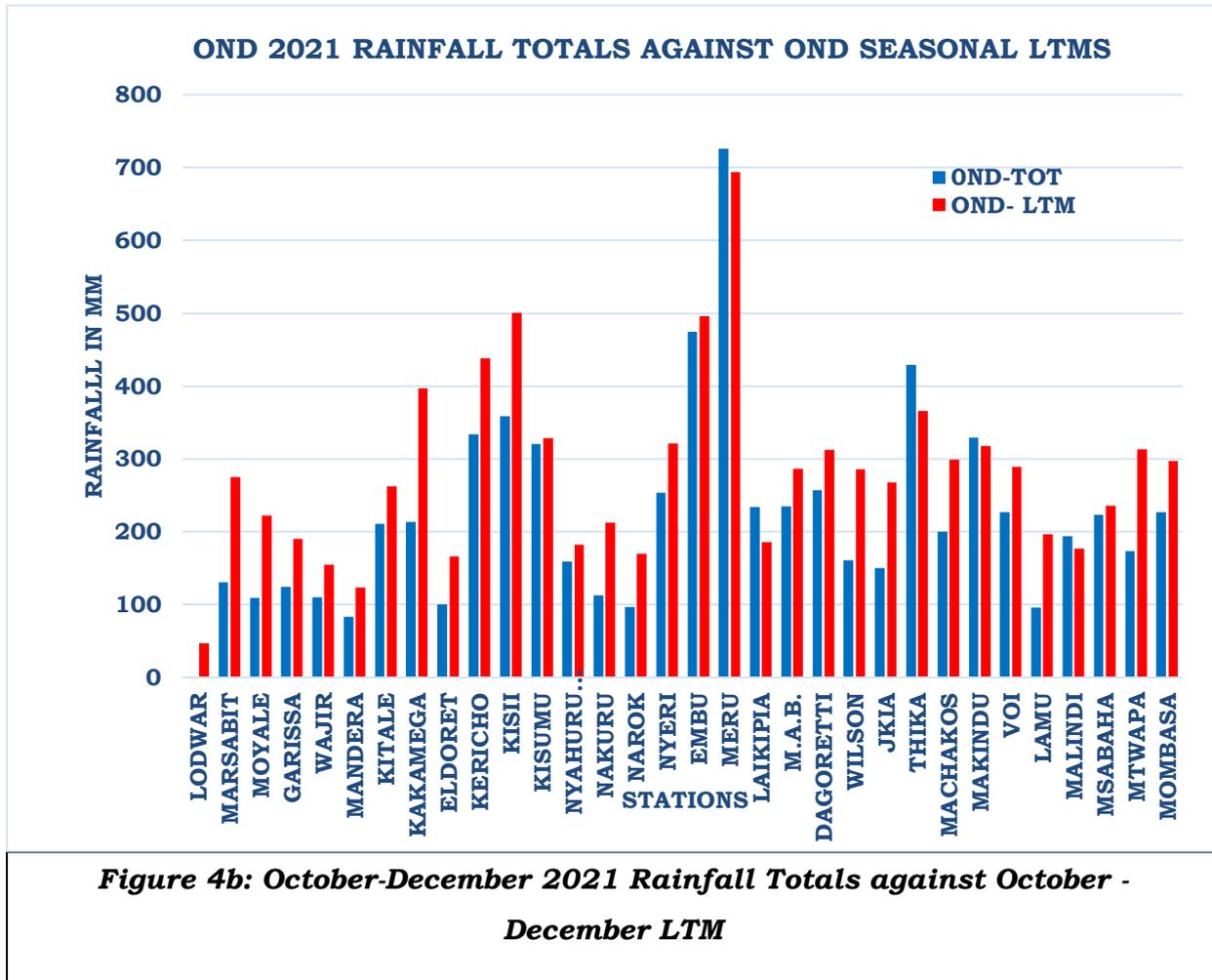


Figure 4a: October to December 2021 Rainfall Performance as a percentage (%) of OND LTM



3.1.1 Experienced Impacts during the October-November-December 2021 Season

3.1.1.1 Agriculture and Food Security

The dry weather conditions experienced during the season were favourable for crop harvesting especially over the Highlands West of the Rift Valley.

During the months of October and November, dry conditions over the ASAL areas led to diminished pasture and water for livestock and food for human consumption. Residents in these areas were faced with acute food shortage

and children were severely malnourished and had to rely on food supplements. Livestock deaths were reported in the ASAL areas of North-east, Southeastern lowlands and the Coastal regions. The body conditions of the remaining livestock in these areas were bad and this affected milk and meat production.

Agricultural production in the marginal areas of the South-eastern lowlands and the Coastal region were 70% below average. This further escalated the food security in these regions as food prices went up.

In December, conditions were favourable for agricultural production in the South-eastern lowlands and Highlands East of the Rift Valley as a result of the enhanced rainfall experienced in these regions. However, crops were destroyed in Taita Taveta County as river Lumi burst its banks on 2nd December following heavy rains that pounded the area.

3.1.1.2 Disaster Management

Thirty-two lives were lost on 4th December in Kitui County when a bus was swept away as the driver attempted to cross the swollen river Enziu.

A child was swept away in Kyandoo village also in Kitui on 14th December as he attempted to cross river Kanzili.

Flash floods also occurred in Kotulo in El Wak, Garissa and Makueni which led to marooning of families.

On 13th December, three children were swept away while attempting to swim in the swollen river Mwache in Dundaloma village in Kwale County.

A landslide occurred in Mwangia village in Taita- Taveta County on 8th December and destroyed property.

Crops and cattle were swept away in Taita Taveta County following heavy rains that pounded the area on 26th November.

A man was struck and killed by lightning in Bungoma County on 26th November 2021.

There was a case of human wildlife conflict in Samburu County in October where an elderly man was killed by a rogue elephant.

Heavy rainfall accompanied by strong winds destroyed farms, houses and school roofs in Kisii, Elgeyo Marakwet and TransNzoia counties in October 2021.

Drought was reported during the season in more than twenty Counties where over 2.5 million people were faced with acute food shortage.

3.1.1.3 Water Resources Management and Energy

The depressed rainfall received during most of the OND 2021 season led to reduced water resources especially in the months of October and November where residents and livestock were faced with acute water shortage. Water sources dried up in most ASAL regions and residents had to walk for long distances in search of water both for human and livestock consumption. However, the water situation improved over most of the ASAL areas in the eastern sector in December following the enhanced rainfall but the North-Western sector of the country was still faced with water stress.

3.1.1.4 Environment

Wildlife deaths were reported in Wajir and Garissa Counties as a result of lack of food and water in the conservancies and in the neighbouring areas. Decrease of forage and grass in rangelands and protected areas led to illegal chopping of tree branches which in turn led to destruction of trees.

Reduction of water and forage for livestock and wildlife led to migration of animals and this led to higher incidences of zoonotic diseases such as anthrax.

3.1.1.5 Transport and Public Safety

Transport was temporarily disrupted along the Njabini- Engineer and Pesi roads in Nyandarua County on 1st October following heavy rainfall that was accompanied by hailstones in the area. Traffic was also temporarily disrupted along Uhuru highway, Mombasa road and Waiyaki way in Nairobi following heavy rains that caused flooding on 27th and 28th November 2021.

NB: This outlook should be used together with the 24-hour, 5-day, 7-day, monthly forecasts, regular updates and advisories issued by this Department. Weekly County forecasts are available from County Meteorological Offices.

KEY OF SCIENTIFIC WORDS USED

Rainfall performance is generally categorized as follows:

- Below 75% of the LTM – Below Normal (Depressed) rainfall
- Between 75% and 125% of the LTM - Near normal rainfall
- Above 125% of the LTM – Above Normal (Enhanced) rainfall



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