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THE WEATHER OUTLOOK FOR THE "LONG RAINS" (MARCH-APRIL-MAY) 2021 SEASON & REVIEW OF THE WEATHER DURING THE OCTOBER-DECEMBER 2020 "SHORT RAINS" SEASON.

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1 HIGHLIGHTS

1.1 Outlook for March-April-May 2021

Enhanced rainfall is expected over the Highlands West of the Rift Valley, the Lake Victoria Basin, parts of the Highlands East of the Rift Valley (including Nairobi County), the Northwest, Southern Rift Valley and Central Rift Valley. Near average rainfall is expected over the Southeastern Lowlands, parts of the Northeast and the Coastal Strip. Several places over Northeastern are likely to experience below average rainfall.

1.2 Review of the Rainfall Conditions in October-November-December 2020

The October to December 2020 analysis indicates that depressed rainfall occurred over several parts of the country as predicted. The highest seasonal total rainfall amount was 760.3mm (151.8% of LTM), recorded at Kisii Meteorological Station. Other stations that recorded significant amounts of rainfall were Meru 633.5mm (91.4%), Kisumu 602.0mm (183.2%), Embu 599.1mm (120.9%), Kericho 415.9mm (94.8%), Kakamega 416.9mm (104.9), Voi 373.5mm, (129.1%), Thika 360.4mm (98.4%), Marsabit 347.6mm (126.4%) and Nyeri 316.4mm (98.5%). The rest of the stations recorded between 100-300mm except Wajir, Lodwar, Garissa, Lamu and Mandera that recorded below 100mm. The rainfall distribution was poor throughout the country.

2 FORECAST FOR MARCH-APRIL-MAY (MAM) 2021 "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 > 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.

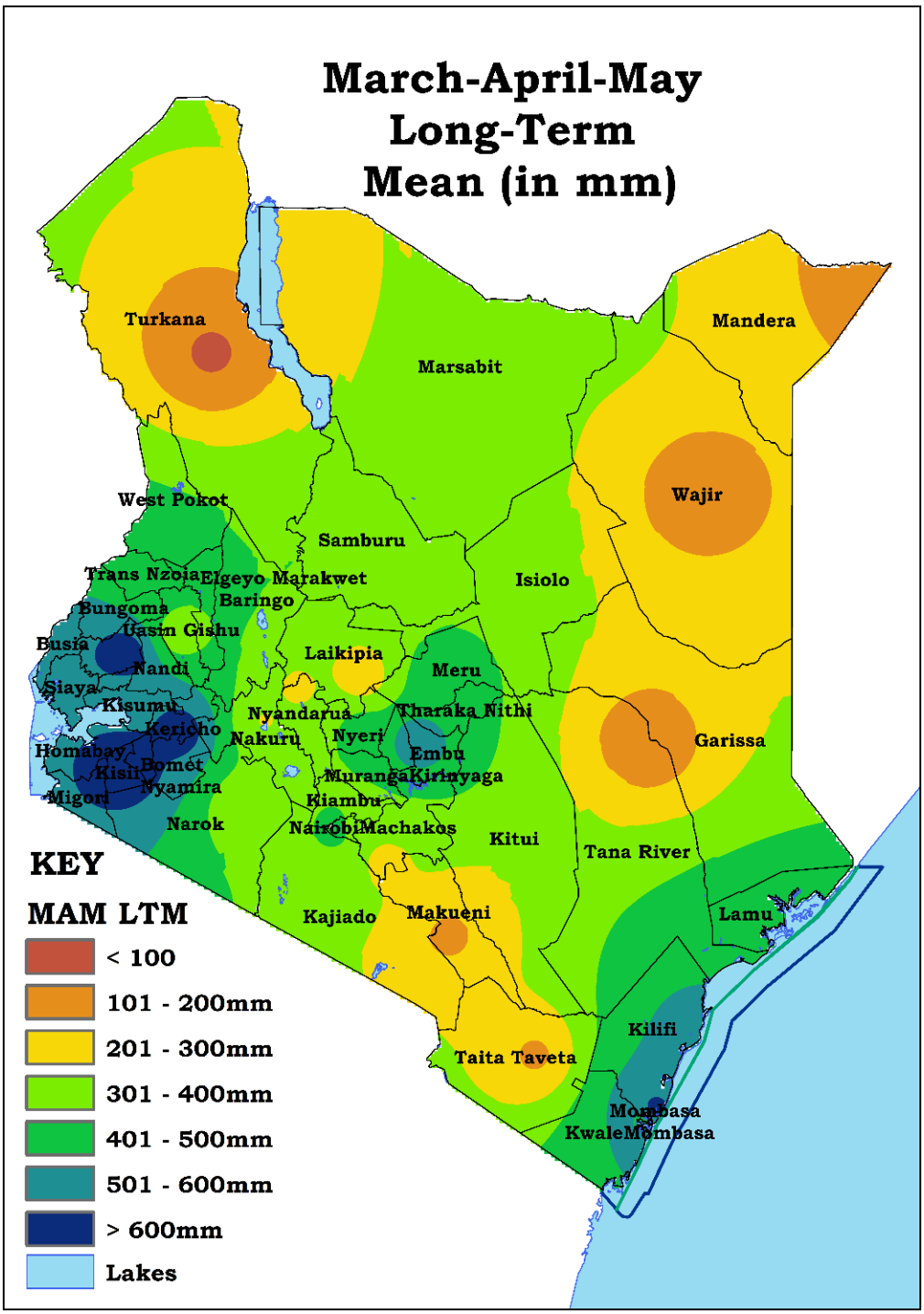

Figure 1: March-April-May Seasonal Rainfall Long-Term Mean (1981 - 2010)

2.2 Outlook for MAM

The forecast for March-April-May (MAM) 2021 "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. In particular, the Indian Ocean Dipole (IOD) - a key synoptic factor influencing rainfall over Eastern Africa that is currently neutral, was considered. Other global drivers such as the Madden-Julian Oscillation (MJO)- a major fluctuation in tropical weather on weekly to monthly timescales, were also considered.

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

The temporal rainfall distribution is expected to be poor especially over the Eastern and 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.

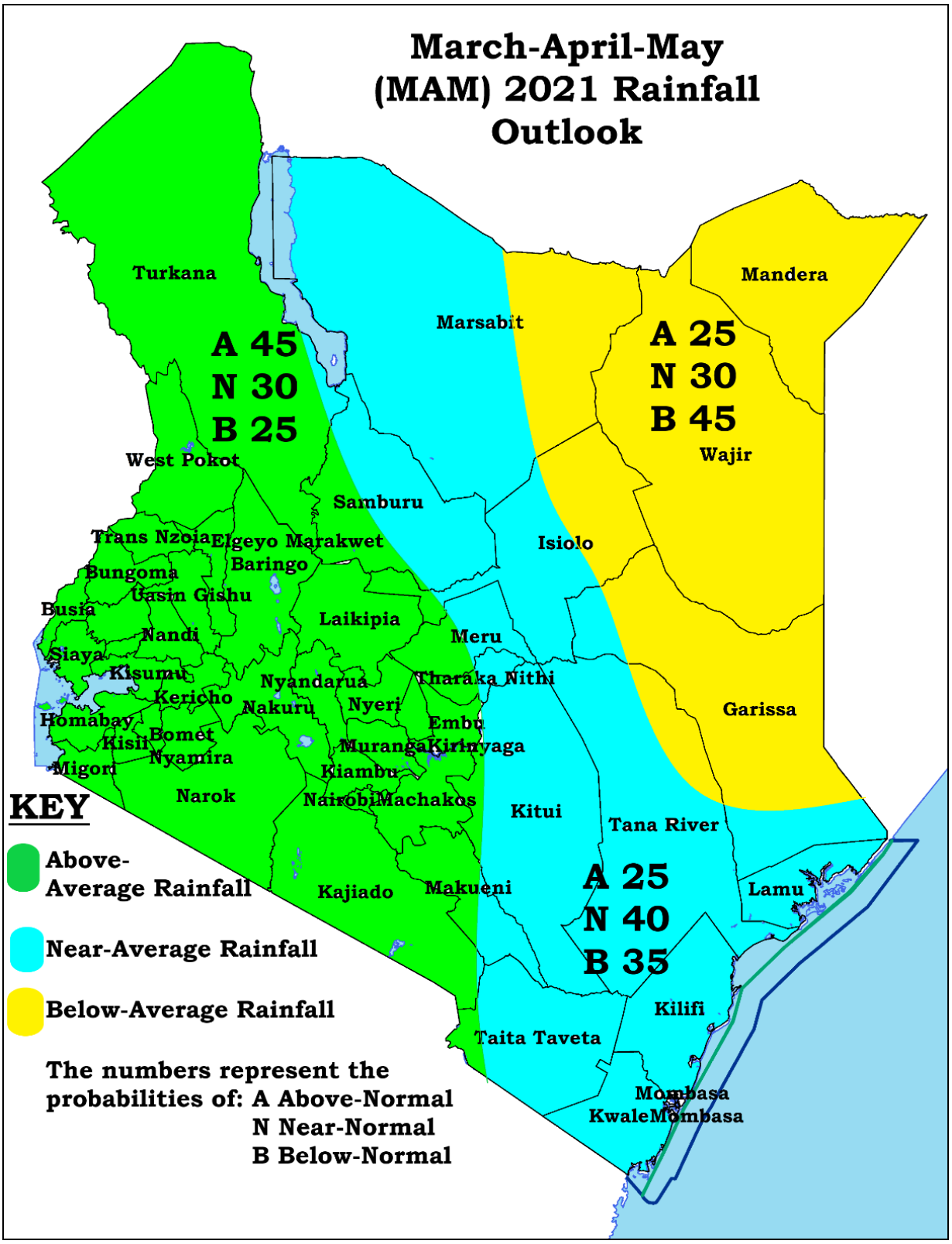

Figure 2: March-April-May 2021 Rainfall Outlook

2.3 Specific Outlook for March to May 2021 "Long-Rains" Season

The specific outlook for March to May 2021 "Long-Rains" Season **(Figure 2)** 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 higher than the long-term average amounts (above normal) for the season.

2.3.2 The Northwester Counties:

Turkana, and the western parts of Samburu: The expected rainfall is likely to be higher than the long-term average amounts (above normal) for the season.

Eastern parts of Samburu are expected to experience near-average rainfall.

2.3.3 The Highlands East of the Rift Valley (including Nairobi County) (Nyandarua, Nyeri, Kirinyaga, Murang'a, Kiambu, Embu, Eastern parts of Meru and Tharaka Nithi, and Nairobi): The expected rainfall is likely to be near to above the long-term average amounts for the season. **The western parts of Meru and Tharaka Nithi** are expected to experience near average rainfall

2.3.4 The Northeast (Wajir, Garissa, Mandera, Marsabit and Isiolo):

The Western parts of Marsabit and Isiolo counties are likely to experience near average rainfall.

The Eastern parts of Marsabit and Isiolo, Garissa, Mandera, The rainfall amount is likely to be below the long-term average for the season

2.3.5 T

The Southeastern Lowlands:

(Kajiado, Kitui, Southern Makueni, Machakos and Taita Taveta): The expected rainfall is likely to be near to below the long-term average amounts (normal) for the season.

Kajiado, Northern parts of Makueni, southwestern parts of Taita Taveta county (bordering Mt. Kilimanjaro) are however likely to receive above-average rainfall.

The Coastal Strip:

Mombasa, parts of Tana River, Kilifi, Lamu and Kwale counties are expected to receive rainfall that is likely to be near to below the long-term average amounts (normal) for the season.

Parts of Tana River County bordering Garissa county are expected to receive depressed rainfall.

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 1996 and 2008.

2.4.2 Onset and Cessation Dates

The expected onset and cessation dates for the various counties are as indicated in ***Table 1*** and in ***Figures 3a*** and ***3b*** below:

Table 1: Onset and cessation dates

	Region	**Onset Dates**	**Cessation Dates**
1	Counties in the Lake Victoria Basin, Highlands West of the Rift Valley (Siaya, Kisumu, Homa Bay, Migori, Kisii, Nyamira, Trans Nzoia, Baringo, Uasin Gishu, Elgeyo-Marakwet, West Pokot, Nandi, Laikipia, Kakamega, Vihiga, Bungoma and Busia)	Rainfall is expected in the 2nd to 3rd week of March 2021	Rainfall will continue into June 2021
2	Southern parts of the Rift Valley (parts of Narok, Bomet, Kericho);	Rainfall is expected in the 2nd to 3rd week of March 2021	3rd to 4th week of May 2021
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 3rd to 4th week of March 2021	3rd to 4th week of May 2021
3	Central Rift Valley (Nakuru, Laikipia)	Rainfall is expected in the 3rd to 4th week of March 2021	Rainfall will continue into June 2021

4	Southeastern Lowlands (Kajiado, Kitui, Makueni, Machakos, Taita Taveta, parts of Tana River)	Rainfall is expected in the 3rd to 4th week of March 2021	2nd to 3rd week of May 2021.
5	Coastal region (Lamu, Mombasa, Kwale, parts of Tana River and Kilifi)	Rainfall is expected in the 4th week of March to 1st week of April 2021	Continues into June 2021
6	The Northwest (Turkana, NW Samburu)	Rainfall is expected in the 4th week of March to 1st week of April 2021	3rd to 4th week of May 2021
7	The Northeast (Wajir, Isiolo, Garissa, Mandera, Marsabit)	Rainfall is expected in the 4th week of March to 1st week of April 2021	3rd to 4th week of May 2021

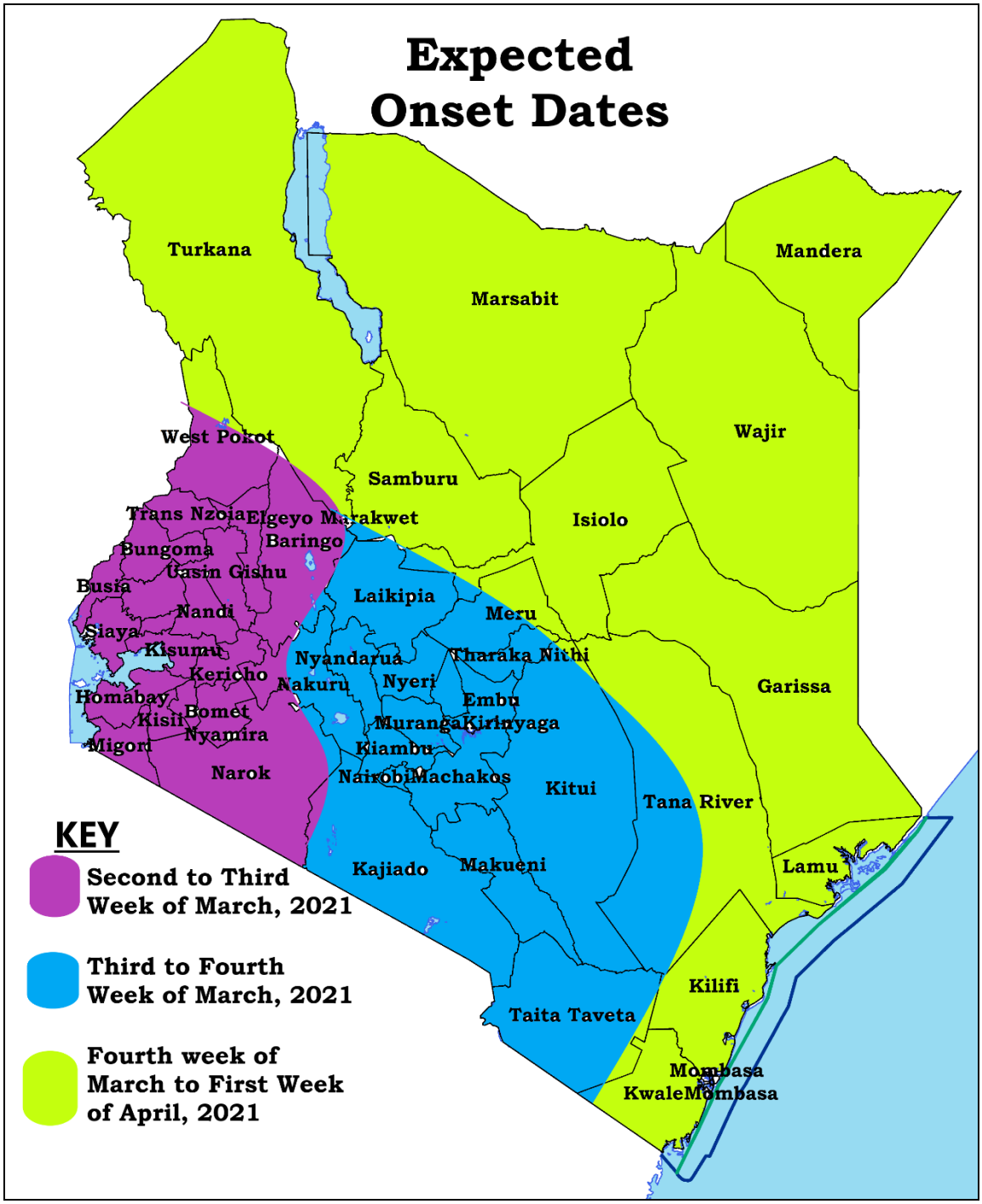

Figure 3a: Expected Onset Dates

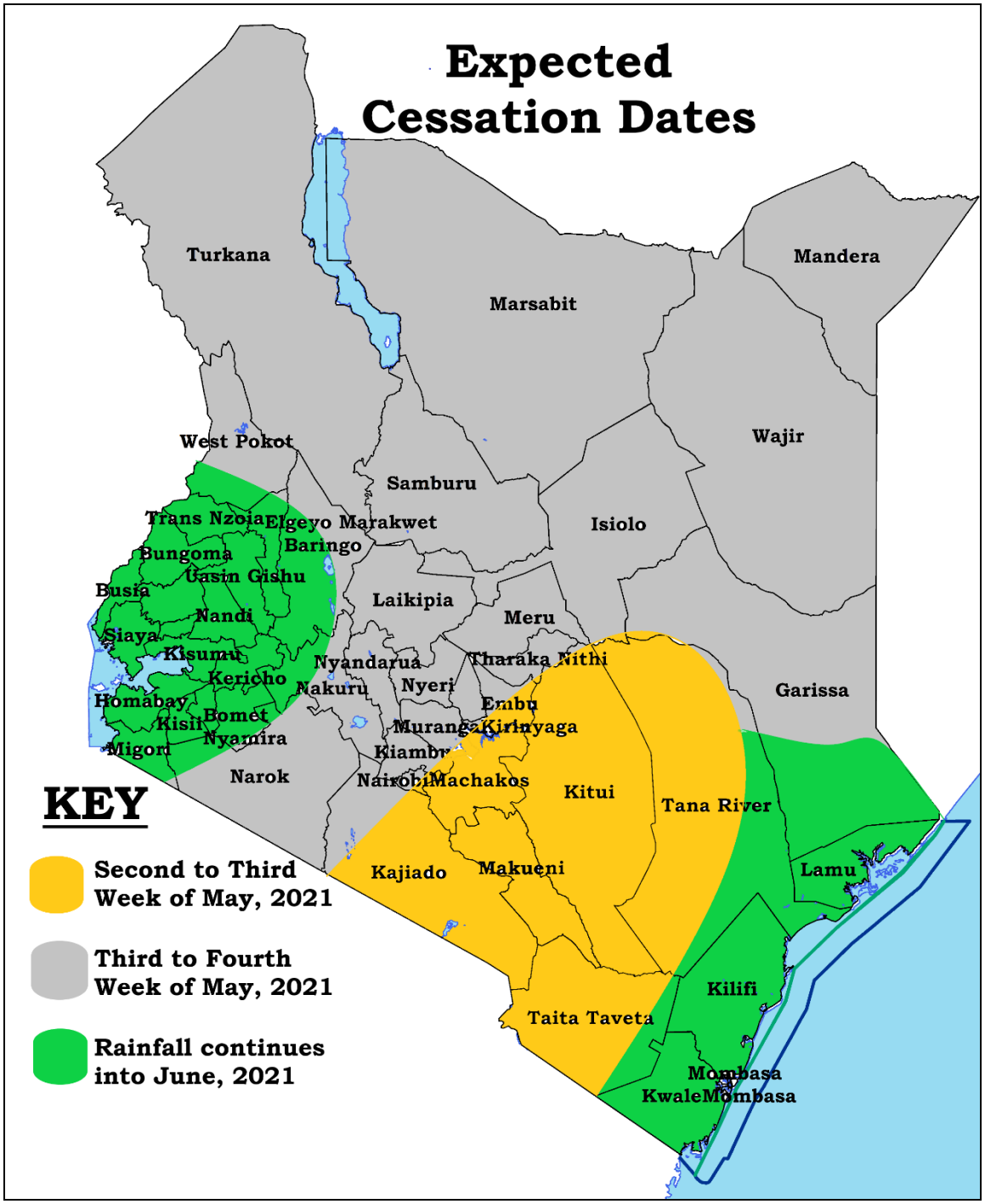

Figure 3b: Expected Cessation Dates

2.5 Potential impacts

2.5.1 Agriculture, Food Security and Livestock Sectors

In the agricultural counties of the **Lake Victoria Basin, Highlands West of the Rift Valley, the South and the Central Rift Valley**, where enhanced rainfall is expected, the farming communities are advised to take advantage of the expected rains and maximize on crop yield through appropriate farming and land-use management procedures. Farmers are advised to liaise with the State Department of Agriculture for advise on the appropriate time to plant, appropriate seeds, time to plant etc.,

In areas where the rainfall is expected to be depressed, farmers are advised to liaise with the State Department of Agriculture to get advice on appropriate crops that are drought resistant in order to maximize on the anticipated poor rainfall performance.

The poor (depressed) rainfall performance expected in some of the Arid and Semi-Arid Lands (ASALs) is likely to impact negatively on the availability of foliage, water and pasture in the pastoral areas of **Northeastern, Northwestern and Southeastern Kenya**. This is expected to have an adverse impact on the livestock sector and therefore farmers are advised to identify supplementary feeds or practice destocking. Locust invasion is also likely to thrive in these areas and therefore lead to destruction of plants.

To ensure food security, farmers are advised to plant early maturing and drought resistant crops in marginal areas. The Ministry of Interior and Coordination of National Government and humanitarian institutions are therefore advised to put in place measures to avert food shortage in these areas.

2.5.2 Disaster Management Sector

In the **Arid and Semi-Arid Lands (ASALs)** where near-average rainfall is expected, water scarcity and lack of pasture for domestic use and livestock are likely to be exacerbated due to the dry conditions experienced in the months of January and February 2021. Human-wildlife and inter-community conflicts over the limited resources are likely to escalate, in these areas. 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** where above-average rainfall is expected, 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 are likely. Landslides/mudslides are likely on the hilly areas of western Kenya as well as parts of the **highlands east of the Rift Valley**. The Rift Valley lakes, which are already filled up, are expected to maintain high levels and may lead to displacement of people and/or 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 city estates.

2.5.3 Transport and Public Safety

Flash floods are very likely to occur in the **Lake Victoria Basin, the Highlands West of the Rift Valley, the Central Rift Valley and the Highlands East of the Rift Valley (including Nairobi County)** due to the expected rainfall in these areas. This may lead to transport challenges

especially in areas where the roads become impassable when it rains. 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. Urban flooding is also very likely. Motorists should, therefore, take utmost care during the rainy period to minimize accidents that would result from such weather conditions.

2.5.4 Water and energy Sector

Water resources are expected to be replenished over most of the **Lake Victoria Basin, the Highlands West of the Rift Valley and the Central Rift Valley** due to the expected enhanced rainfall. 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 risk of flooding downstream of Tana and Athi Rivers.

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 and the Coastal Strip. Rainwater harvesting should be encouraged to boost water availability for households.

2.5.5 Health Sector

Vector-borne diseases such as malaria are likely to emerge over the **Lake Victoria Basin and the coastal areas** especially in areas with poor drainage as these may harbor pools of stagnant water which become conducive breeding areas for disease causing pathogens such as mosquitoes. In areas expected to receive enhanced rainfall, water borne diseases such as cholera and typhoid may emerge as a result of flooding and subsequent contamination of water.

Scarcity of water in areas expected to receive below normal rainfall (parts of northeast) may lead to water related diseases such as typhoid, scabies and trachoma. Respiratory allergies such as bronchial asthma may also emerge over the northeast due to dust.

Malnutrition is also likely in the northeastern parts of the country.

The provision of safe water, sanitation and waste management and hygienic conditions is essential for preventing and for protecting human health during all infectious disease outbreaks, including of coronavirus disease 2019 (COVID-19). Given the depressed rainfall likely in the ASALs, health authorities should therefore ensure contingency plans and strategies are put in place for provision of water in communities, homes, schools, marketplaces, and healthcare facilities which will help prevent human-to-human transmission of pathogens including SARS-CoV-2, the virus that causes COVID-19.

Health authorities should therefore, equip hospitals with necessary drugs to be able to deal with such situations as they arise. Distribution of insect treated nets should also be carried out to prevent Malaria. Public health

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

2.5.6 Environment

The Ministry of Environment and Forestry should encourage residents to put in place soil conservation measures to minimize environmental degradation due to soil erosion. Institutions and individuals should also be encouraged to continue planting trees including indigenous and fruit trees in order to increase 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) 2020 "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) 2020 "Short Rains" season indicated that much of the country was likely to experience near to below average rainfall. The distribution, both in time and space, was also expected to be poor.

The October to December 2020 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 the Highlands West of the Rift Valley, the Northwest and the Lake Victoria Basin where rainfall continued from September 2020 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) largely remained neutral during the season.

The seasonal rainfall analysis shows that depressed rainfall was recorded in the Northeast, the Southeastern Lowlands, parts of the Highlands West of the Rift Valley (including Nairobi County) as well as the Coastal Strip. Several stations recorded below 100% of their OND LTM. Kisumu Meteorological Station recorded 183.2% of its seasonal LTM of 328.5mm. Other stations that recorded more than 125% of their LTMs include Lodwar (173%), Kisii (151.8%), Voi (129.1%) and Marsabit (126.4%).

The highest seasonal total rainfall amount of 760.3mm was recorded at Kisii Meteorological Station. Other stations that recorded significant amounts of rainfall are Meru (633.5mm), Kisumu (602.0mm), Embu (599.1mm), Kericho (415.9mm), Kakamega (416.9mm), Voi (373.5mm), Thika (360.4mm), Marsabit (347.6mm) and Nyeri (316.4mm). The other stations recorded

between 100-300mm except Wajir, Lodwar, Garissa, Lamu and Mandera which recorded below 100mm.

Figure 4a shows the OND 2020 rainfall performance (%) while **Figure 4b shows** total rainfall amount recorded in OND 2020 (**Blue bars**) in comparison with the OND LTMs (**Red bars**).

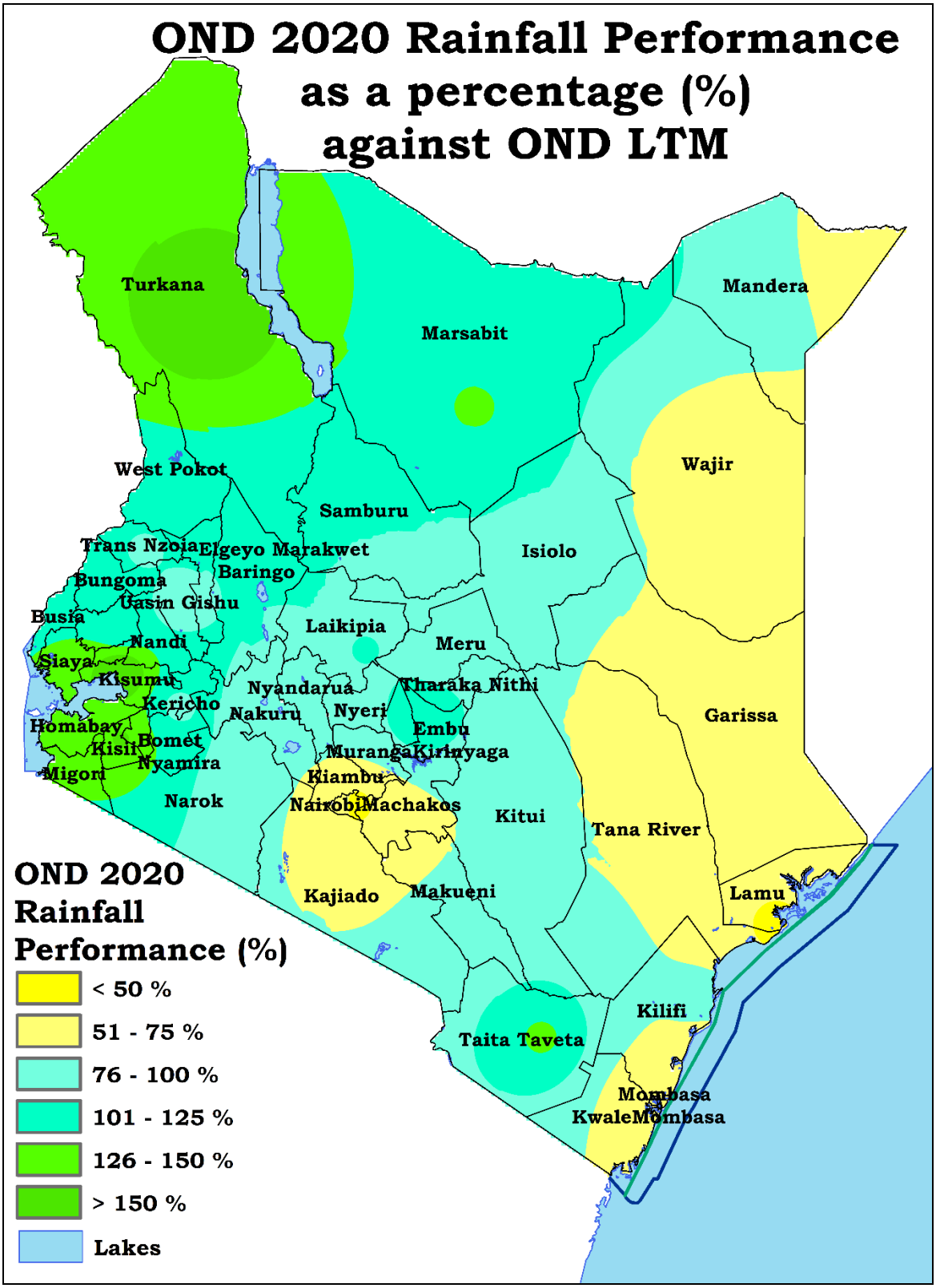

Figure 4a: October to December 2020-rainfall

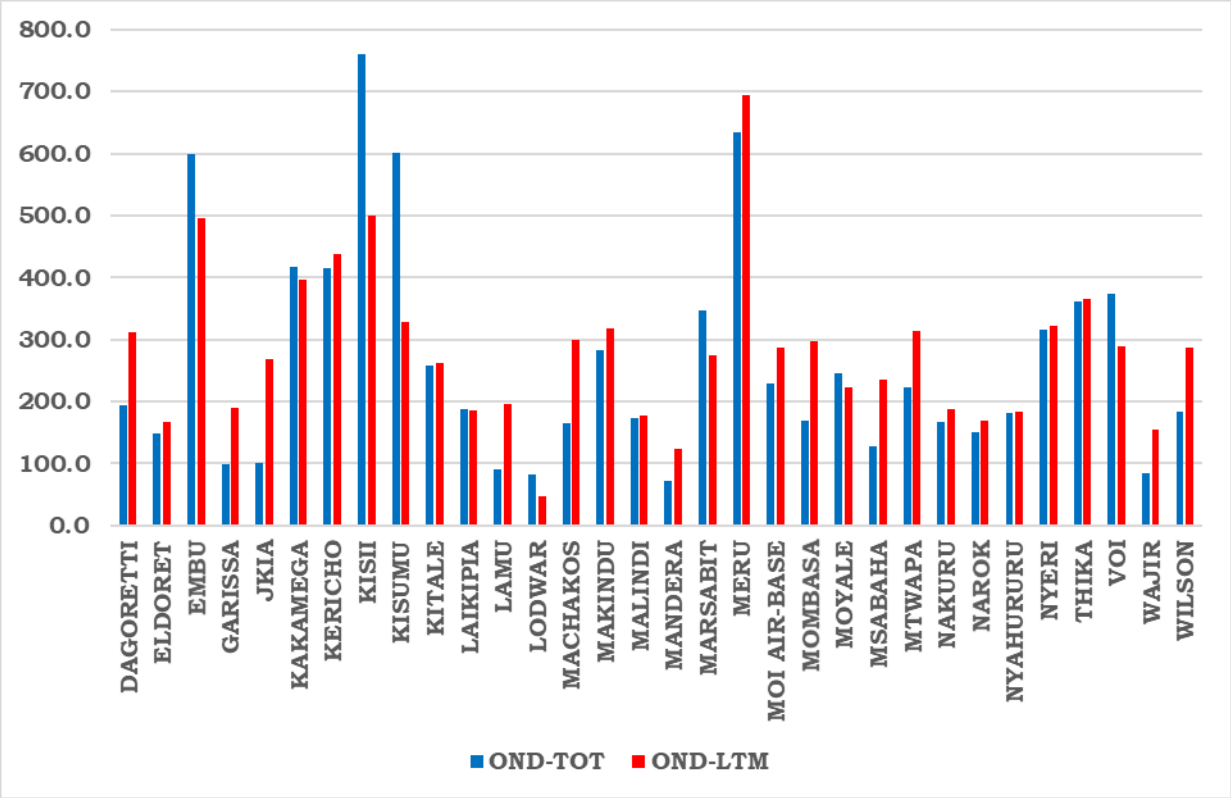

Figure 4b: October-December 2020 Rainfall Totals against October - December LTM

3.1.1 Experienced Impacts during the October-November-December 2020 Season

3.1.1.1 Agriculture and Food Security

In the pastoral areas of the Rift Valley, availability of pasture for livestock was maintained. The conditions were also favorable for agricultural crop production especially in the high potential areas. The continued rainfall however delayed harvesting and storage of cereals and grains in crop production areas. The Kenyan Ministry of Agriculture constituted a food security war room to check on food security in the country. Desert locusts destroyed crops and therefore led to reduced crop yield in the ASAL areas.

3.1.1.2 Disaster Management

Landslides were reported in West Pokot County that led to loss of lives and destruction of property. Several schools in Baringo County had been flooded due to the filling up and overflowing of Lake Baringo. Other lakes that overflowed include Naivasha, Nakuru, Turkana and Bogoria.

Huge hailstones were also reported in Laikipia and Kericho Counties. Desert locusts continued to thrive in some parts of the country. Towards the end of the month of November, locust swarms were reported in Taita

Taveta County. A second wave was also seen in Garissa County towards the end of December 2020.

Floods were reported in Meru and Isiolo Counties and led to the destruction of infrastructure and loss of lives. Flooding was also reported in urban areas (e.g. Kitale town in Trans Nzoia County) towards the end of the month of November 2020.

Strong winds of more than 25 knots (12.9 m/s) occurred in a number of counties in the Southeastern Lowlands (Makueni, Taita Taveta), the Northeast (Wajir, Marsabit), the Northwest (e.g. Turkana) as well as the Coastal Strip (Kwale). On 24th November, 2020 strong winds blew away roofs in Kalaani Primary School in Makueni County damaging the school buildings and leaving at least 50 learners to sleep on the floors of damaged classrooms.

3.1.1.3 Water Resources Management and Energy

The rainfall received in OND 2020 continued to maintain high levels of water in dams, rivers and lakes. Turkwel Dam achieved its highest water level for the first time since its construction. As at 31st of December, 2020, the dam level was at 1148.91 meters above sea level.

3.1.1.4 Environment

The Ministry of Environment and Forestry took advantage of the available rainfall to plant trees in various parts of the country.

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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