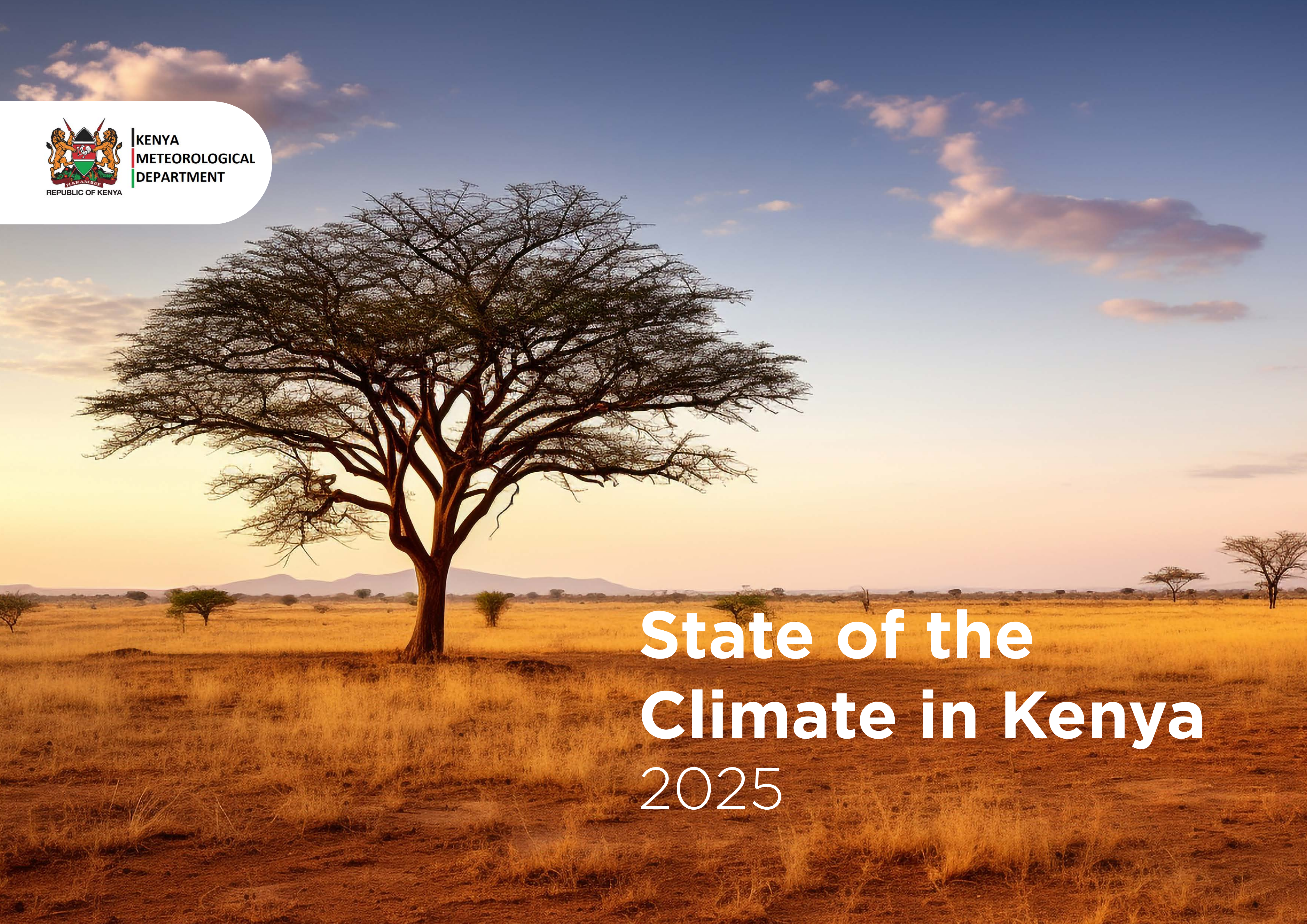
REPUBLIC OF KENYA

KENYA
METEOROLOGICAL
DEPARTMENT



State of the Climate in Kenya

2025

State of the Climate in Kenya 2025

This State of the Climate Report Kenya 2025 like its predecessors, provides a snapshot of the state of the climate in Kenya during the year 2025. It examines key weather events during the year, puts them in the context of 1990-2020 climatology and highlights its impacts on key socioeconomic sectors in Kenya.

This complete report can be found at www.meteo.go.ke

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Contents

Figures & Tables

Key Messages

Kenya is warming
Kenya's average temperatures have risen by about 0.88°C since 1960, with warming accelerating in recent decades and increasing the likelihood of heat extremes.

Rainfall patterns are becoming more unpredictable
Rainfall in 2025 showed large regional differences and uneven distribution, highlighting growing variability that complicates planning for agriculture and water resources.

Extreme weather is becoming more frequent and disruptive
Heatwaves, floods, strong winds, and localized cold conditions were observed in 2025, reflecting increasing climate volatility across the country.

Climate impacts are already affecting livelihoods
Extreme weather events led to flood displacement, infrastructure damage, disease outbreaks, and agricultural losses, affecting communities and economic sectors.

Climate information is a critical national asset
Investments in climate services, early warning systems, and impact-based forecasting are helping protect lives, guide decision-making, and support climate-resilient development.

Protecting ecosystems strengthens climate resilience
Safeguarding Kenya's critical ecosystems and water towers is essential for maintaining water resources, regulating climate, and supporting national development.

Climate finance unlocks action
Enhancing access to climate finance in Kenya nationally and beyond will better support in building Kenya's resilience against climate shocks.

Chapter 1: Introduction

1.1 Purpose and Scope of the Report

Climate is more than weather—it is the foundation upon which Kenya's economy, environment, and social well-being are built. In a nation where sectors such as agriculture, water, energy, health, and tourism are profoundly sensitive to climatic shifts, timely, accurate, and accessible climate information is not merely useful; it is essential for planning, resilience, and sustainable development. The Kenya Meteorological Department (KMD), in fulfilment of its mandate is pleased to present the State of the Climate 2025 Report. This report is the 7th installment in a demonstrated dedication to providing users with timely relevant information for informed evidence-based action and resilience building. This annual publication provides a comprehensive, authoritative, and evidence-based analysis of Kenya's climate for the year 2025. It synthesizes vast amounts of observational data, scientific analysis, and sectoral impact assessments to document climatic trends, significant extreme events, and their cascading effects across the nation.

This report serves as a critical national climate diagnostic tool, translating complex data into actionable intelligence. It is designed to bridge the gap between climate science and practical decision-making for a wide range of users:

- For Policymakers and Government Planners: The report provides the empirical basis for robust climate policy formulation, national adaptation planning, and disaster risk reduction strategies. It helps in evaluating the effectiveness of existing interventions and in targeting resources toward the most vulnerable regions and populations, guided in part by gender-disaggregated data where available.
- For County Governments and Devolved Units: It offers localized climate summaries and trends that are vital for county-integrated development planning, early warning systems, and community-based adaptation projects, supporting the transition toward climate-resilient counties.
- For Sectoral Ministries (Agriculture, Water, Health, Energy, etc.): The report details climate impacts on specific sectors, enabling ministries to assess annual climate-related losses, plan sector-specific adaptation measures, and mainstream climate risk management into their core strategies and budgets.
- For Development Partners and NGOs: It provides a shared, credible evidence base to inform project design, monitor climate-related vulnerabilities, and ensure that investments in resilience-building are data-driven and aligned with Kenya's identified climate priorities.
- For Researchers and Academia: The report is a foundational reference, offering a curated dataset and analysis that can spur further scientific inquiry, validate models, and identify emerging research gaps in Kenya's climate science landscape.
- For the Private Sector: Businesses in agriculture, insurance, manufacturing, and tourism can leverage the insights on climate variability and extremes to manage supply chain risks, develop climate-smart products, and make informed long-term investment decisions.
- For Media and the Public: It acts as a trusted source of climate information, enhancing public understanding of climate change dynamics in Kenya and fostering a national conversation on climate action and environmental stewardship.

By consolidating knowledge from KMD's monitoring networks and through valued collaborations with partner ministries, departments and agencies, this report underscores our collective commitment to building a climate-informed nation. It is our firm belief that by understanding our past and present climate, we are better equipped to anticipate the future, mitigate risks, and seize opportunities—paving the way for a more resilient and prosperous Kenya for all.

Data sources and methodologies

Station data is relied upon for analysis of the weather and climate and is supplemented by gridded data. Sectoral impacts are derived from the various National Ministries, Departments and Agencies through designated focal points.

1.2 Global Climate Context in 2025

The past 11 years, 2015 to 2025, were individually the eleven warmest years in the 176-year observational record, with the past three years being the three warmest years on record (Figure 1 a). The mean near-surface temperature in January-August 2025 was 1.42 °C ± 0.12 °C above the pre-industrial average. Carbon dioxide (CO_2) is the primary driver of global warming and ocean acidification. It accounts for roughly 66% of the total warming effect from human-emitted greenhouse gases—more than double the contribution of all other greenhouse gases combined. Since 1800, atmospheric CO_2 concentrations have increased by over 50%, reaching a record 422.03 parts per million in 2025 and even higher in 2025 (Figure 1b). This rise is overwhelmingly driven by human activities, including the extraction and combustion of fossil fuels (such as coal, oil, and natural gas), cement manufacturing, biomass burning, and agricultural practices.

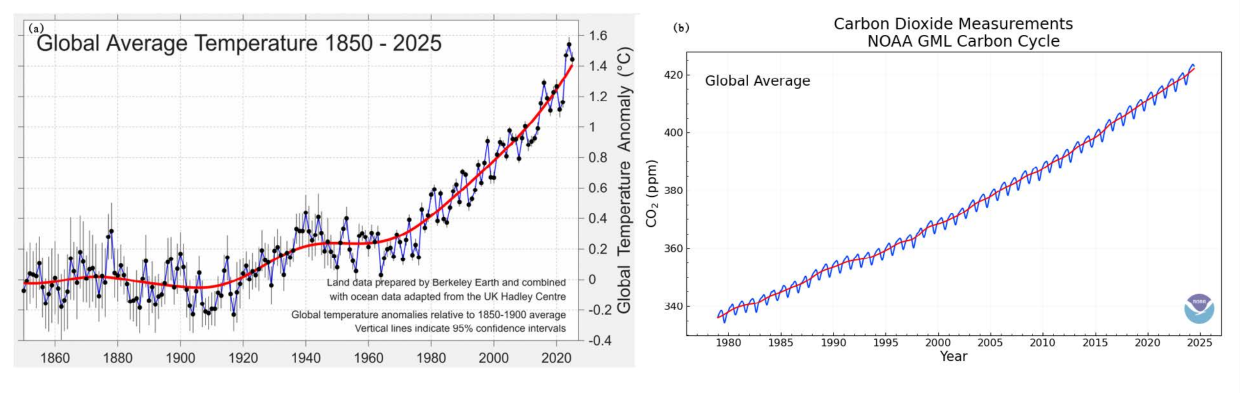

Figure 1. *(a) Global temperature trends from 1850 - 2025 and (b) greenhouse gas concentrations from 1980-2025. Source [NOAA, 2025]*

1.3 Regional Climate Context (Africa and East Africa)

The regional variation and fluctuation of the climate system often produces large socio-economic impacts across sectors and affects the environment and natural systems. In 2025, across Africa, the annual mean surface temperature averaged over land areas ranked between the 3rd and 7th highest on record. The mean value for 2025 was 0.51°C relative to the 1991-2020 average (0.31-0.60°C depending on the data set used). Relative to a 1961-1990 baseline, the mean value for 2025 was 1.21°C (1.06-1.32°C depending on the data set used). In 2025, above average annual precipitation was experienced in many parts of Africa especially around the southwest Indian Islands of Madagascar and La Reunion, and Mozambique Channel, but also significant precipitation was received in the Congo Basin, and Ethiopian Highlands. Besides the Sahara, below average annual precipitation amounts were recorded around the Horn of Africa, and Western Cape. Western Africa and the Sahel region rely on the seasonal monsoon rains. While the onset of the monsoon rains was normal, the total amounts were below normal along the coast of the Gulf of Guinea and the adjoining Atlantic Ocean.

Around the Greater Horn of Africa, significant drought returned in 2025, with the short rains (October-December) season particularly dry, associated with the negative phase of the Indian Ocean Dipole, following below average rainfall in the first half of 2025. Particularly dry conditions affected central and eastern Kenya and the southern half of Somalia, with poor crop and pasture conditions. Large-scale population displacement was reported in Somalia. The majority of East Africa received less than normal rainfall.

Above normal annual precipitation totals were recorded in the majority of Southern Africa.
In Northern Africa, annual precipitation totals along the coast to the Mediterranean Sea were below normal. Above normal precipitation totals were recorded in some locations in the Atlas Mountains. It was the first year in some locations in northwestern Africa with above average precipitation amounts after several years, which were drier than normal. But the drought didn't ease in all locations of the drought affected regions. Southern Africa is prone to tropical cyclones emanating from the southwest Indian Ocean. In the early part of 2025 tropical cyclones and flooding affected various parts of southern Africa. Mozambique was hit by Cyclone Dikeledi in January and Jude in March, adding to the effects from the impact of Chido in December 2024, with Dikeledi also affecting Madagascar, while moisture from Jude also contributed to flooding in Malawi and Namibia. More than 1 million people were affected by Jude in Mozambique, resulting in some deaths.

Chapter 2: Observed Climate Conditions in Kenya

This section describes observed climatic changes in the year 2025 with respect to the climatological period 1991-2020. We present observed behavior and changes in annual, monthly and seasonal rainfall and temperatures.

2.1 Temperature

Annual Temperature Anomalies

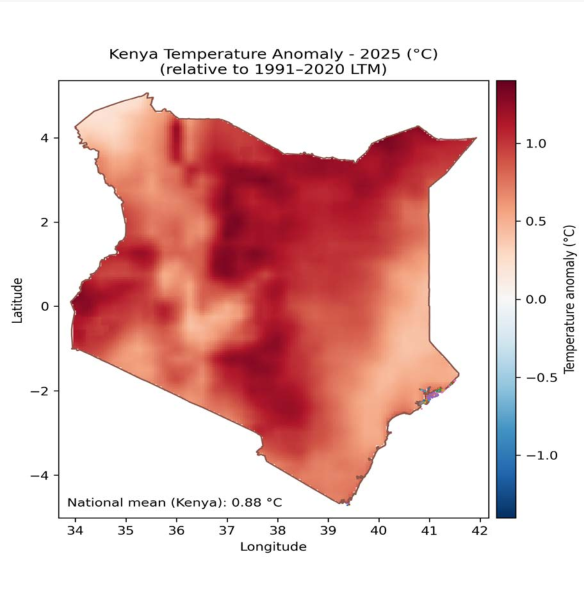

Figure 2. *Temperature anomalies for Kenya in the year 2025*

The country experienced widespread positive temperature anomalies relative to the 1991-2020 mean temperature indicating that 2025 was warmer across the country (Figure 2). Stronger warming signals are visible over parts of central, northern, and eastern Kenya. No large-scale negative anomaly regions are evident. The national area-weighted mean anomaly for 2025 is +0.88 ^{o}C. Even though 2025 temperatures were warmer than the long-term mean, it was the 7th warmest year out of 36-years (since 1991-2025) and cooler than the warmest year (2024) by ~0.30 ^{o}C (Figure 3). The warmest year on record is 2024. Kenya's annual temperature has shown a consistent warming trend over the period 1991–2025. The warming rate is estimated to be +0.22 ^{o}C/decade. The most pronounced warming occurs after the year 2005 with several years exceeding +0.1 ^{o}C.

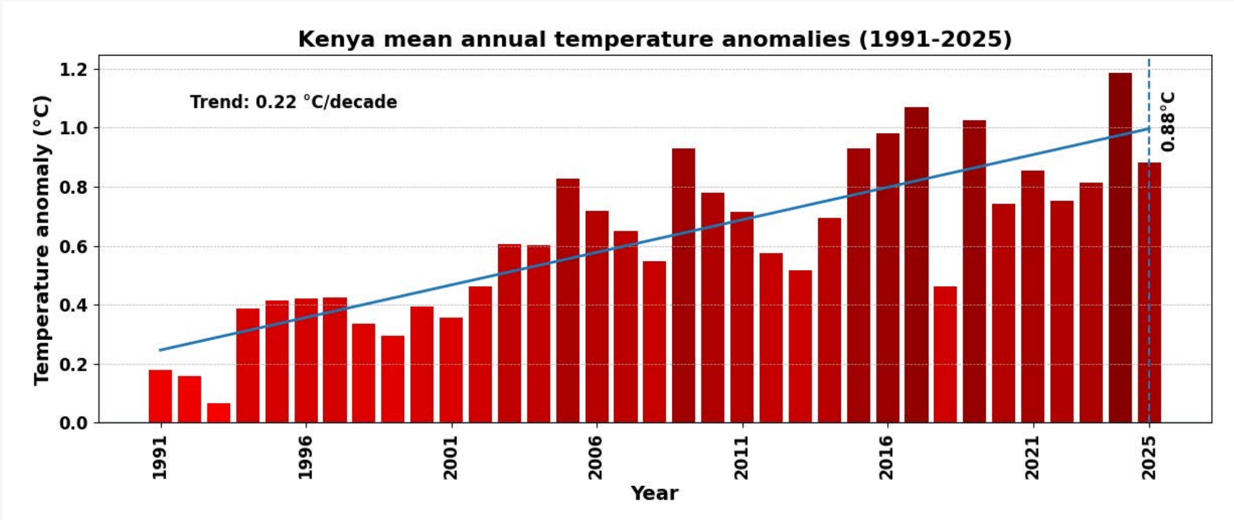

Figure 3. *Temperature Anomaly time series and trends for Kenya since 1991*

Monthly Temperature Anomalies

There was a mildly above-normal start to the year with slightly warm anomalies of 0-1 ^{o}C across much of the country in January (Figure 4). Pre-MAM heat conditions intensified in February with anomalies exceeding +1.5^{o}C particularly in western Kenya. Southern and coastal regions were moderately warm. At the start of MAM, (in March) warming showed a spatial variability with slight cooling in northwestern and northern Kenya while central and eastern regions experienced near-normal to mildly warm temperatures. In April, the peak MAM season rains, near-normal to slightly cool anomalies dominated the country.

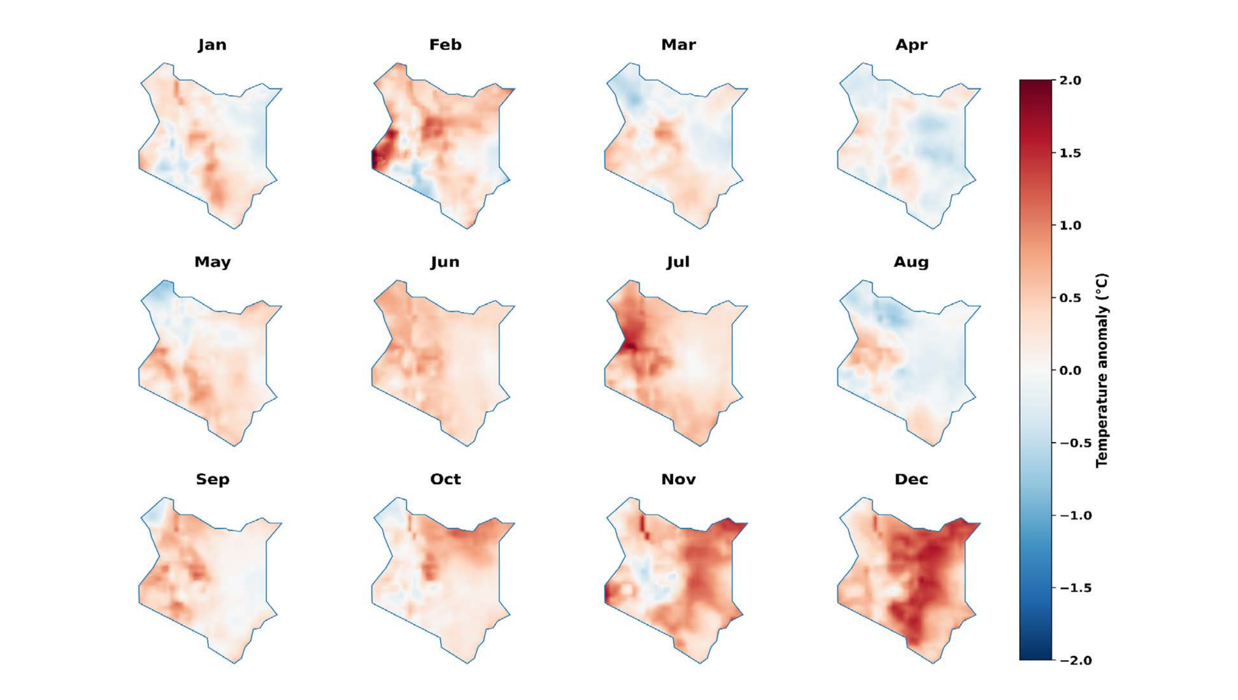

Figure 4. *Monthly temperature anomalies, for the year 2025 relative to 1991-2020.*

Cooling conditions could have resulted from moderation by cloud cover and rainfall. There was gradual warming towards the end of MAM (in may) in much of the country, western was specifically warmer than normal. In the climatologically cooler season of June-July-August (JJA), warming was above the baseline in most of the country. June and July experienced fairly uniform warming anomalies of between +0.5 to > +1.5 ^{0}C, likely impacting agriculture and increased water demand. August anomalies were variable with slight cooling in northern and western regions, and neutral conditions in central and eastern.

The rest of the year starting from September had widespread warming. Western and northern regions were particularly warmer than normal in September. Strong and persistent warming experienced from October to December (anomalies +1 to +1.5 ^{0}C) in most of the country. December 2025 was the warmest month; eastern and southern Kenya were particularly hotter.

2.2 Rainfall

In 2025, rainfall distribution in space and time was generally poor throughout the year. Figure 5a shows annual and seasonal rainfall anomalies in 2025. The western and central highlands experienced above-normal rainfall, while most other regions saw drier-than-average conditions. The analysis of extreme rainfall indices—cumulative 5-day rainfall (Rx5day) in particular—provides insight into short-duration and multi-day extreme rainfall events (Figure 8). The dark red line illustrates the temporal evolution of this index in 2025, while the orange lines represent trends from 1991 to 2025. Notably, high rainfall was observed in the last week of March and last week of April while the period between the last week of May to the third week of October remained particularly dry (Figure 8), explained by the widespread poor distribution reported across the country.

Late November exhibited a brief spike with the rest of the year remaining dry. Analysis of monthly station data (Figure 6 & 7) shows March and April recorded the highest both in space and time with much recording near to below average rainfall, particularly in arid, semi-arid and coastal regions. Early-season rainfall was followed by extended dry spells, while in some western and central areas, heavy rainfall events were concentrated within short periods. MAM season began earlier than expected in several regions, with onset occurring in mid-March across most parts of the country, though Mandera experienced a delayed onset in April. Cessation of the MAM 2025 rains was earlier than normal across some parts of northeastern and southeastern Kenya, with rainfall ending from the second week of May.

Near to above-average rainfall was recorded in most areas, with the highest totals being recorded in the central and western highlands and over the Lake Victoria Basin. Prolonged dry conditions were observed in the Coastal region and parts of Northern Kenya particularly in March and the second half of May. In central regions, including Nairobi and its environs, occasional rainfall persisted into early June. For the months of June-July-August, the Western and Coastal parts of the country and a few areas over the Central highlands including Nairobi County received near to above average rainfall. The rest of the country, including the Southeast, Northeast and some parts of the central highlands, experienced mainly dry weather conditions with occasional light rainfall. The months of Sep, Oct, Nov and Dec saw a poor distribution in space and time. October and December were characterized by long dry spells and uneven rainfall, significantly reducing effective moisture availability. November showed relatively improved rainfall distribution over western Kenya, parts of the Rift Valley and the highlands, but distribution remained poor over northern Kenya and parts of the south-eastern lowlands.

During the OND season, rainfall performance was largely near average to below average across most parts of the country, with very limited areas recording relatively enhanced seasonal totals (Figure 5b). Spatially, suppressed rainfall dominated the north-eastern region, north-western areas, the coastal strip, most stations in the south-eastern lowlands, and several stations over the Highlands East of the Rift Valley including Nairobi County, as well as parts of the Central Rift Valley.

The season was characterized by prolonged dry spells and isolated storms. The Western sector of the country, Nairobi and a few areas over the Southeast (Makindu) and Northeast (Garissa) received near average rainfall. The rest of the stations recorded depressed rainfall with Msabaha (coast), Wajir (Northeast), Marsabit (Northeast), Lamu (coast) and Mandera (Northeast) receiving less than 30% of their OND LTM. Kitui (southeast) is the only station that received above average rainfall at 133.6%. The eastern sector of the country including the Coast experienced a false onset during the fourth week of October that was followed by prolonged dry spells in November while onset over the Northern sector was not realized as had been predicted. The highest amount of rainfall: 643.1mm was recorded in Nyaroya station in Migori County over the Lake Victoria Basin while Mandera in the Northeast received the least amount of rainfall (7.6mm)

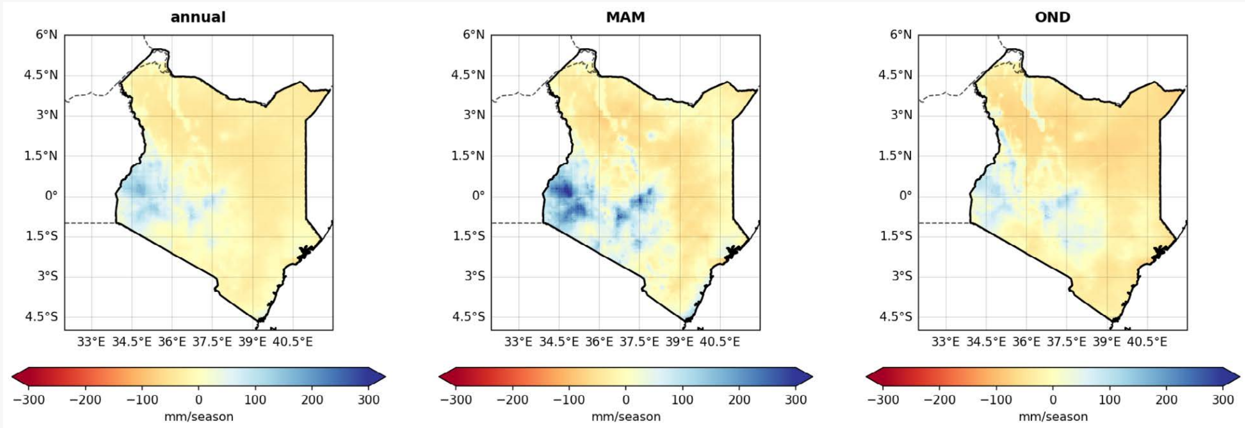

Figure 5. *Annual and Seasonal rainfall anomalies in 2025*

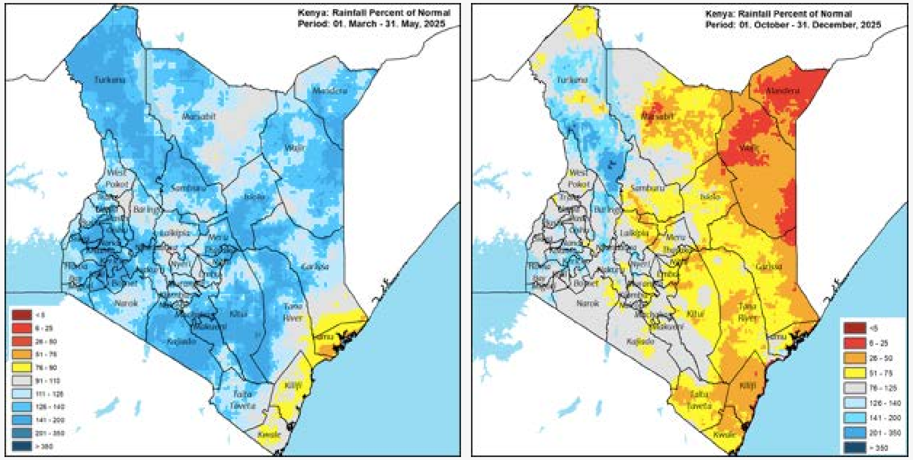

Figure 6. *March-May and October -December Seasonal rainfall percent of Normal in 2025*

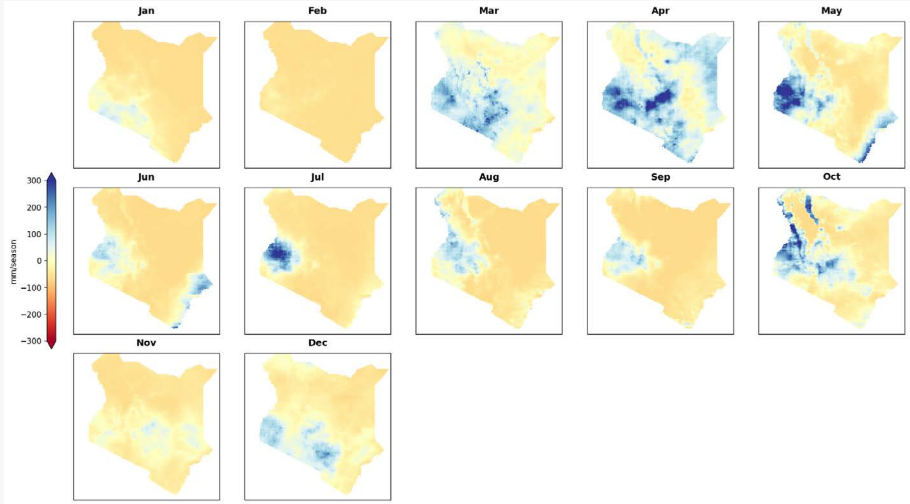

Figure 8. *Spatial evolution of total monthly rainfall anomalies in 2025*

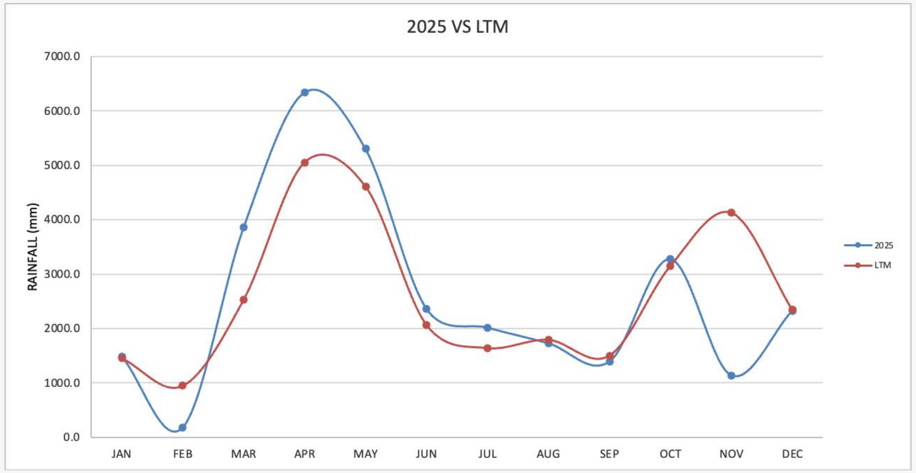

Figure 7. *Temporal evolution of total mean monthly rainfall in all years (red line; LTM) compared to total mean monthly rainfall in 2025 (blue line; 2025).*

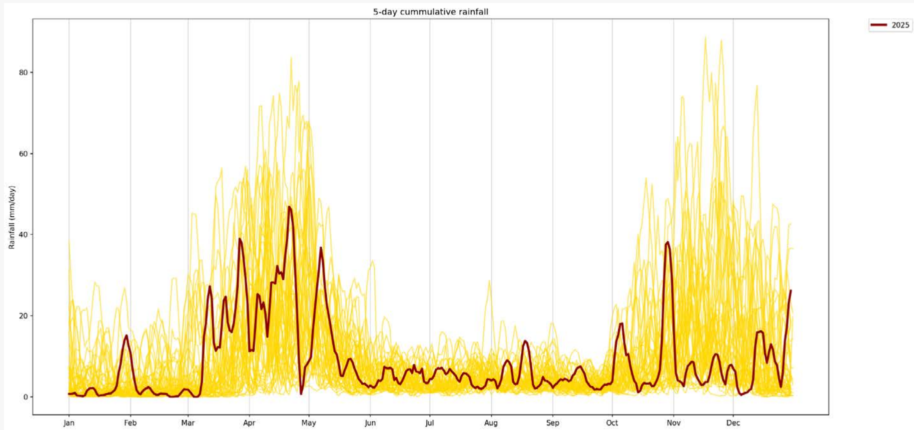

Figure 9. *Temporal evolution of cumulative 5-day rainfall in all years from 1991-2025. The dark red line shows RX5day in 2025.*

Box 1 : Explainer

Have you heard of the ‘East African Climate Paradox’?

The ‘East African climate paradox’ first explained by Rowell et al., 2015 is a phenomena where an increased frequency of droughts and a general drying trend has been observed since early 1990s (e.g., Funk et al., 2008; Liebmann et al., 2014; Maidment et al., 2015; Nicholson, 2016a; Ongoma & Chen, 2016) while global climate model projections show increases in rainfall (Meehl et al., 2007; Otieno & Anyah, 2012;) over East Africa. Few hypotheses have been presented to explain this paradox. Giannini et al., (2018), argued that confidence and reliance in projections of future increase in rainfall in East Africa is limited due to substantial biases in simulations of the regional climate, and discrepancy in the modelled versus observed tropical Pacific and Indian SST trends. They pointed out the role and effect of the complex East African topography in advection of moisture from the Indian Ocean and Congo Basin, and the current cooling of the tropical eastern Pacific is due to internal variability alone or partly attributable to evolving La Niña-like conditions due to increasing GHGs in the atmosphere. Tierney et al., (2015) demonstrated how simulated El-Niño-like shifts tend to unrealistically increase annual rainfall through the effects of overestimated short rains. Many models overestimate OND rainfall while underestimating the MAM rains (Tierney et al., 2015; Wainwright et al., 2019). According to Batté & Déqué, (2011), the paradox could be explained by a limited understanding of the complexity of the interactions between local, regional, and large-scale processes in the tropics making model simulations less robust compared to other regions.

Recent recovery in MAM rains (from late 2010s) appears to challenge this paradox (Kimutai et al., 2024; Matthews et al., 2019; Pinto et al., 2023). It has become more and more likely that the “paradox” arises from models’ systematic biases in simulating the complex interaction of local convection, regional circulation, and remote teleconnections that drive East African rainfall (Funk et al., 2023). Kimutai et al., (2024) suggests that the paradox may reflect complex multi-decadal variability rather than a simple model–observation contradiction that could potentially be further evaluated through a more comprehensive examination of regional precipitation patterns, including their fluctuations, long-term trends, and underlying drivers.

2.3 Marine and Coastal Climate

2.3.1 Winds, Waves and Monsoon Systems

(a) Waves

During 2025, wave conditions exhibited a clear seasonal cycle linked to the regional monsoon system. During December–February (DJF) and March–May (MAM), wave heights were generally moderate, with waves predominantly propagating from the northeast to east, reflecting the influence of the Northeast Monsoon and the inter-monsoon transition. The June–August (JJA) season showed the highest significant wave heights across the offshore domain, accompanied by a consistent southerly to southeasterly wave propagation associated with the Southeast Monsoon, indicating enhanced wind forcing and increased ocean energy.

In October–December (OND), wave heights decreased again and wave directions gradually shift, marking the transition back toward Northeast Monsoon conditions. **Figure 9** illustrates the seasonal distribution of mean significant wave height and dominant wave propagation direction over the western Indian Ocean adjacent to the East African coastline during 2025. Overall, the figure highlights the strong seasonal variability of the marine wave climate in the region, with implications for coastal processes, marine operations, and maritime safety

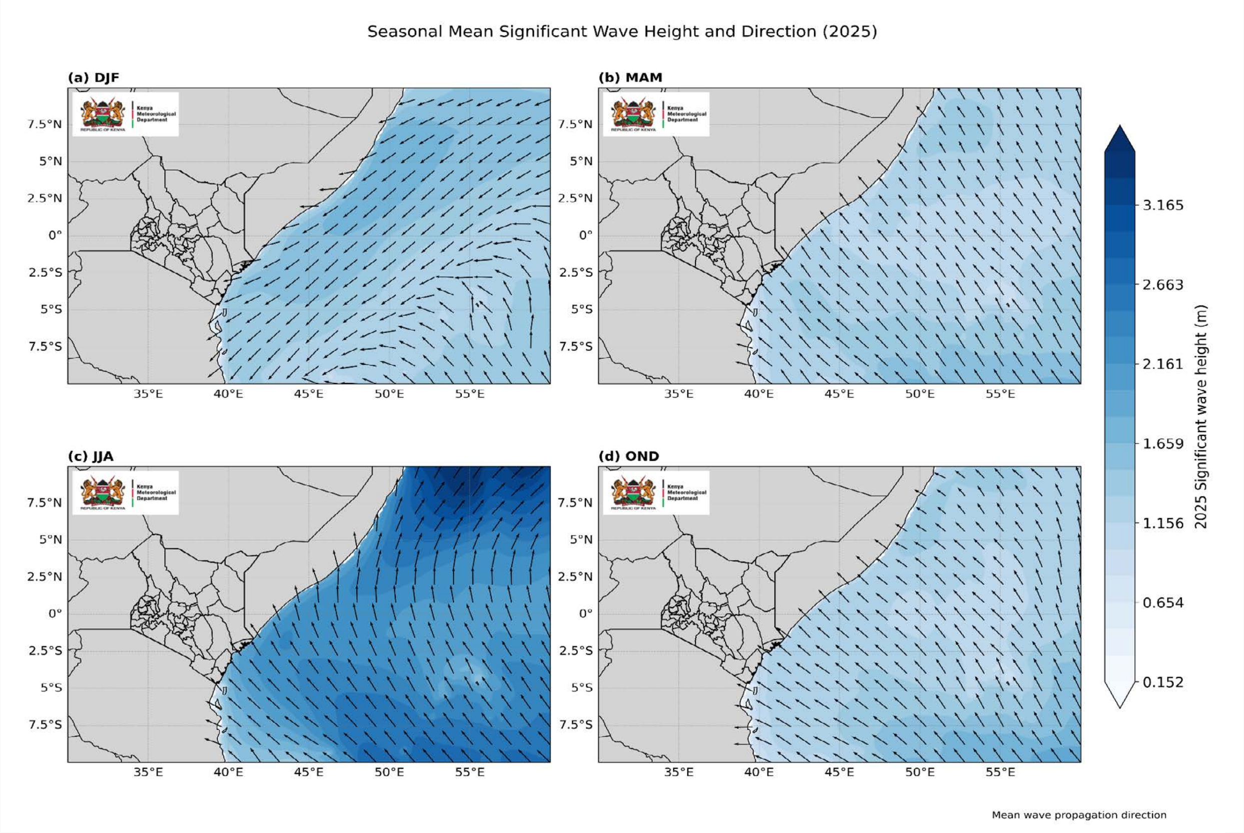

Figure 10. *Seasonal mean significant wave height and direction (2025)*

Figure 10. Seasonal mean significant wave height (shaded, m) and mean wave propagation direction (black arrows) over the western Indian Ocean along the East African coast for 2025. Panels show (a) December–February (DJF), (b) March–May (MAM), (c) June–August (JJA), and (d) October–December (OND). The strongest wave heights and more persistent southerly to southeasterly wave directions occur during JJA, while relatively calmer conditions dominate during DJF, MAM, and OND

(b) Winds

During December–February (DJF), winds were predominantly from the northeast, associated with the Northeast Monsoon, with generally moderate wind speeds over the offshore areas and weaker winds over land. In March–May (MAM), wind speeds reduced and directions became more variable, reflecting the inter-monsoon transition period characterized by weaker pressure gradients and less persistent flow. The June–August (JJA) season exhibited the strongest and most spatially extensive winds, dominated by southeasterly to southerly flow linked to the Southeast Monsoon. Enhanced wind speeds during this period extended across the open ocean and along the coastline, indicating increased atmospheric forcing and a higher potential for rough marine conditions. In October–December (OND), wind speeds gradually weakened and wind directions shifted as the system transitioned back toward Northeast Monsoon conditions.

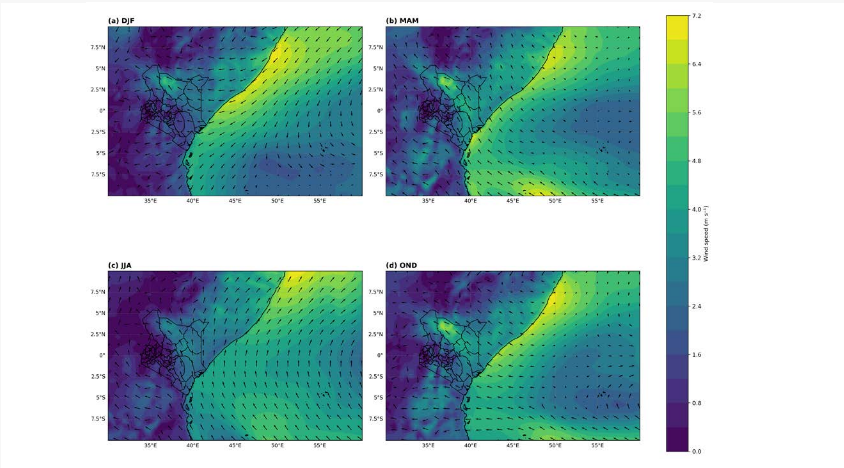

Figure 11. *2025-10m Seasonal Wind Spread and Direction*

Figure 11. shows the seasonal distribution of mean 10-m wind speed and prevailing wind direction over the western Indian Ocean and the East African coastal region during 2025, highlighting the strong influence of the regional monsoon system. Overall, the figure underscores pronounced seasonal variability in near-surface wind conditions across the region. These seasonal wind patterns play a critical role in driving ocean waves, surface currents, coastal upwelling, and marine weather conditions, with important implications for maritime transport, fisheries, offshore operations, and coastal management.

Figure 11. Seasonal mean 10-m wind speed (shaded, m s^{-1}) and wind direction (black arrows) over the western Indian Ocean and the East African coastal region for 2025. Panels show (a) December–February (DJF), (b) March–May (MAM), (c) June–August (JJA), and (d) October–December (OND). Stronger and more persistent southerly to southeasterly winds dominate during JJA, while weaker and more variable wind conditions prevail during DJF, MAM, and OND.

2.3.2 Sea surface temperatures
(a) Annual Mean Conditions

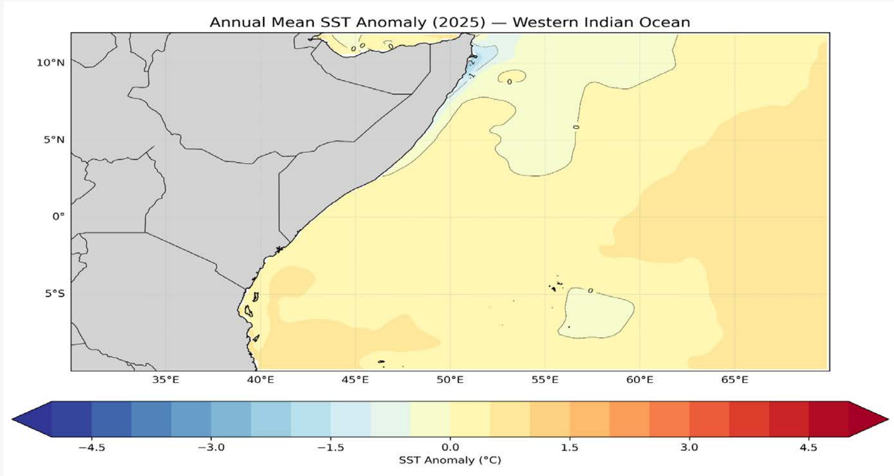

Figure 12. *Annual Mean SST Anomaly (2025)- Western Indian Ocean*

Figure 12. Annual mean sea surface temperature (SST) anomaly (°C) over the Western Indian Ocean for 2025, relative to the reference climatology. Shading shows SST anomalies, with positive (negative) values indicating warmer-than-average (cooler-than-average) conditions. Coastlines, national boundaries, and latitude–longitude gridlines are shown for reference.

(b) Seasonal Evolution

The annual mean sea surface temperature (SST) anomaly over the Western Indian Ocean in 2025 indicates widespread positive anomalies, reflecting generally above-average ocean surface temperatures across much of the region. Anomalies of approximately +0.5 to +2.0 °C dominated the basin, with the largest positive departures from the climatological mean occurring in offshore areas toward the central and eastern parts of the domain.

In contrast, near-coastal regions along the Horn of Africa exhibit locally reduced or near-neutral anomalies, consistent with the influence of seasonally enhanced upwelling and ocean–atmosphere coupling. Despite these localized features, the spatially averaged signal indicates a net warming of the Western Indian Ocean during 2025.

The seasonal evolution of SST anomalies highlights a strong modulation by the regional monsoon system. During December–February (DJF), SST anomalies are generally weakly positive and spatially homogeneous, with limited evidence of coastal cooling. In March–May (MAM), positive anomalies intensify and expand offshore, consistent with enhanced surface warming during the boreal spring transition season.In June–August (JJA), a marked cooling signal emerged along the Somali coast, with negative SST anomalies locally exceeding –2 °C. This pattern reflects the impact of the Southwest Monsoon, which drives strong coastal upwelling and increased vertical mixing. Offshore regions during JJA remain characterized by positive anomalies, indicating a pronounced coastal–offshore gradient in SST.

During October–December (OND), SST anomalies return to predominantly positive values across the basin as monsoon winds weaken and coastal upwelling diminishes. The resulting pattern is more spatially uniform, resembling conditions observed during DJF but with slightly enhanced warming in some offshore areas.

Overall, the 2025 annual mean warming of the Western Indian Ocean arose from persistent positive SST anomalies during DJF, MAM, and OND (figure 13), which outweighed the seasonally confined cooling associated with JJA upwelling. These results underscore the critical role of monsoon-driven processes in regulating regional SST variability, while also indicating an elevated background ocean temperature state. Such conditions may have implications for regional climate variability, marine ecosystems, and air–sea interactions, and warrant continued monitoring within the context of ongoing climate change.

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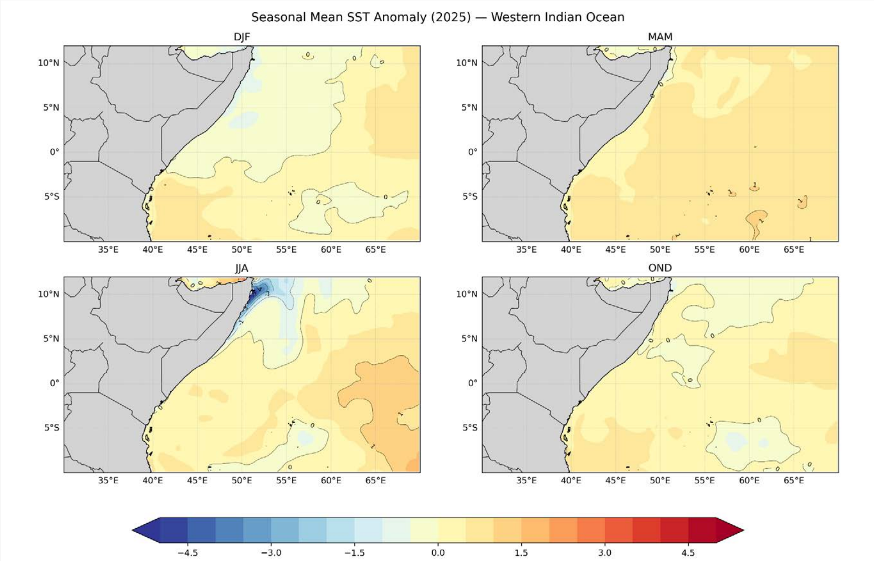


Figure 13. *Seasonal Mean SST Anomaly (2025)- Western Indian Ocean*

Figure 13. Seasonal mean sea surface temperature (SST) anomalies (°C) over the Western Indian Ocean for 2025 for (a) December–February (DJF), (b) March–May (MAM), (c) June–August (JJA), and (d) October–December (OND). Shading represents SST anomalies relative to the climatological mean. The seasonal evolution highlights basin-wide warming during DJF, MAM, and OND, and pronounced coastal cooling along the Somali coast during JJA associated with Southwest Monsoon upwelling.

2.3.3 Sea Level and Tidal Heights

Figure 14 presents quality-controlled tide-gauge observations from the Mombasa station, showing daily extremes in sea level expressed relative to the Mean Higher High Water (MHHW) tidal datum. The record is derived from hourly measurements covering 1986–2025, with climatological averages calculated over the 1986–2001 reference period.

The shaded envelopes illustrate the historical variability in daily tidal extremes. The outer, lighter band represents the full range between record low and record high daily water levels observed over the entire period of record. The inner, darker band shows the climatological mean range between average daily low and average daily high water levels for the reference epoch, while the thin bounding lines indicate the corresponding long-term average values. Superimposed black markers and lines depict the observed daily maximum (high water) levels for 2025, allowing direct comparison between recent conditions, long-term averages, and historical extremes.

Clear semi-monthly (spring–neap) and seasonal tidal cycles are evident, reflecting dominant astronomical forcing at Mombasa. Periods when the 2025 daily high waters approach or exceed the climatological upper envelope indicate times of elevated coastal water levels, which are particularly relevant for coastal management and operations.

From an impacts perspective, elevated daily high water levels have direct implications for marine and coastal activities. For port and shipping operations at the Port of Mombasa, higher water levels can temporarily improve navigational clearance for deep-draft vessels but may also increase operational risks when combined with waves, currents, or storm surges. For small-scale fisheries and artisanal marine transport, increased tidal ranges and higher high waters can affect access to landing sites, timing of departures and returns, and the safety of nearshore operations.

In coastal and marine ecosystems, periods of higher high water enhance tidal inundation of intertidal zones, mangroves, and seagrass beds, influencing sediment transport, nutrient exchange, and habitat availability for juvenile fish and invertebrates. Conversely, more frequent or prolonged exceedance of typical high-water levels can contribute to shoreline erosion, damage to coastal infrastructure, and flooding of low-lying areas, with cascading impacts on tourism, aquaculture facilities, and coastal communities.

2.4 Extreme Weather and Climate Events

Kenya’s 2025 station observations highlight 4 severe-weather-relevant signals: extreme heat in January–February, cold extremes in June–August, intense daily rainfall events in March–May and October–December and isolated strong winds events especially in the Coastal regions. These extremes are operationally important because they align with elevated risk of heat illness and water stress, cold stress in highland areas, and flooding, infrastructure disruption, and

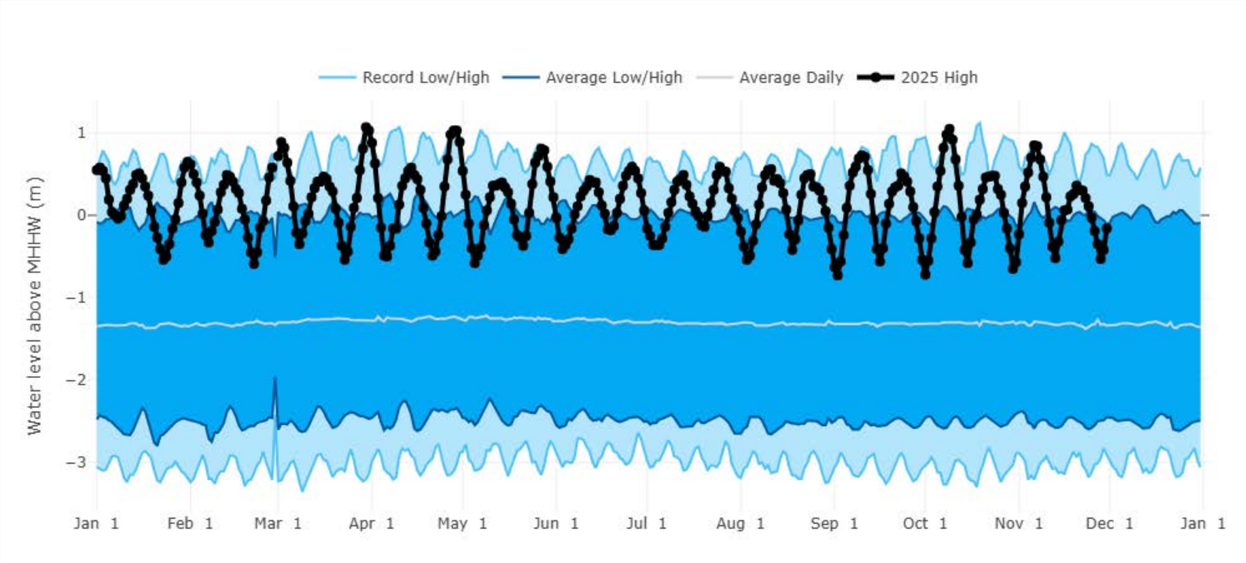


Figure 14. *Daily tidal water-level extremes at Mombasa, Kenya, relative to Mean Higher High Water (MHHW).*

The figure shows record and climatological (1986–2001) daily low and high water levels (shaded bands and lines), with black markers indicating the observed daily high water levels for 2025. The seasonal and fortnightly tidal variability is evident, along with how recent extremes compare to long-term averages and historical records.

WASH-related impacts during heavy rainfall episodes.

Observed Temperature Extremes (TEMP)

Month (2025)	Extreme Type	Station	County/ Area	Value (°C)	Date (Day)
January	Highest maximum temperature	Lodwar	Turkana	39.8	28th
February	Highest maximum temperature	Wajir	Wajir	41.1	20th

Table 1: *Highest Temperatures (Jan–Feb 2025)*

Month (2025)	Extreme Type	Station	County/ Area	Value (°C)	Date (Day)
June	Lowest minimum temperature	Nyahururu	Laikipia/ Nyandarua region	5.3	1st
July	Lowest minimum temperature	Nyahururu	Laikipia/ Nyandarua region	4.0	31st
August	Lowest minimum temperature	Nyahururu	Laikipia/ Nyandarua region	4.9	26th

Table 2: *Lowest Temperatures (Jun–Aug 2025)*

Month (2025)	Extreme Type	Station	County	Rainfall (mm)	Date (Day)
March	Highest daily rainfall	Kabete	Kiambu	98.0	9th
April	Highest daily rainfall	Thika	Kiambu	127.3	9th

Month (2025)	Extreme Type	Station	County	Rainfall (mm)	Date (Day)
May	Highest daily rainfall	Kakamega	Kakamega	85.0	30th
October	Highest daily rainfall	Kisii	Kisii	60.7	6th
November	Highest daily rainfall	Garissa	Garissa	64.4	8th
December	Highest daily rainfall	Kitui	Kitui	126.1	20th

Table 3: *Observed Rainfall Extremes (RAIN)*

Severe Weather Impacts

- On 26th March heavy rainfall in Kilifi, Magarini led to flash floods 36 households displaced, total number of people affected 237 (137 children, 80 women & 20 men) 4th April Magarini heavy rainfall. Heavy rainfall in Kibwezi led to drowning of a small boy 6th April

Figure 15. *Two drown while crossing River Muangini in Makueni. PHOTO/Citizen Tv*

- **Droughts:** The depressed OND 2025 rainfall season led to deterioration from normal to alert drought phase. In October, (7) counties including Mandera, Wajir, Garissa, Tana River, Kilifi, Kwale and Kajiado deteriorated to the Alert phase. In November, Mandera, deteriorated to the Alarm drought Phase. Thirteen (13) ASAL counties were classified under the Normal drought phase, while nine (9) counties including Wajir, Garissa, Tana River, Kilifi, Kwale, Isiolo, Kajiado, Marsabit and Kitui continued to deteriorate to the Alert phase. In the month of December, one county, Mandera, remained at Alarm drought Phase. Thirteen ASAL counties - Samburu, Taita Taveta, Tharaka Nithi, Laikipia, Kitui, Baringo, Makueni, Narok, Nyeri, Embu, Meru, Lamu and West Pokot were classified under the Normal drought phase while nine (9) counties (Turkana, Wajir, Garissa, Tana River, Kilifi, Kwale, Isiolo, Kajiado and Marsabit) deteriorated to the Alert phase.
- **Storms and other hazards:** Hailstorms were reported in Nandi county in January 2025 (29th) One drowning incident in Kilifi county from highwaves (27th feb). High waves from strong winds reported in Kilifi on 14th March, two boats capsized
- **Strong winds** were reported in mid January in Kilifi county with impacts being recorded including damaged homes. Makueni county reported strong winds on 1st March resulting in destroyed houses and displaced residents. 11th March strong winds in Mwingi, school classroom roof destroyed. 24th March Acacia tree uprooted by strong winds following heavy rain. Another strong winds incident was reported in June in Kilifi with damaged homes once again reported. Chapter Three: Climate Drivers and Large-Scale Influences

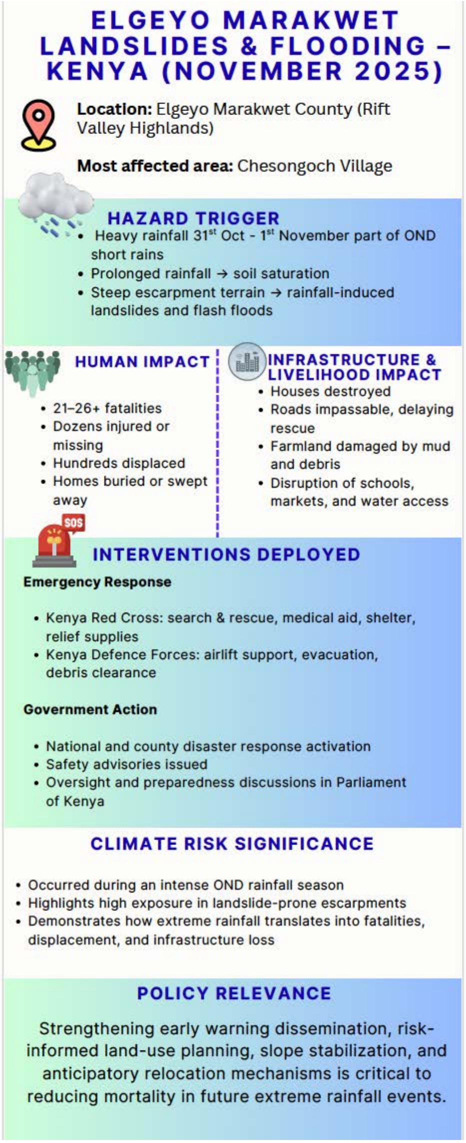


Figure 16. *Case study; Elgeyo Marakwet Flooding*

2.5 Global Atmosphere Watch (GAW)

The Nairobi GAW station is responsible for ozone measurements at different levels, that is:

- Total Column Ozone (TCO)
- Surface Ozone
- Ozone profiling (Ozone Vertical Cross-section)

Total Column Ozone (TCO)

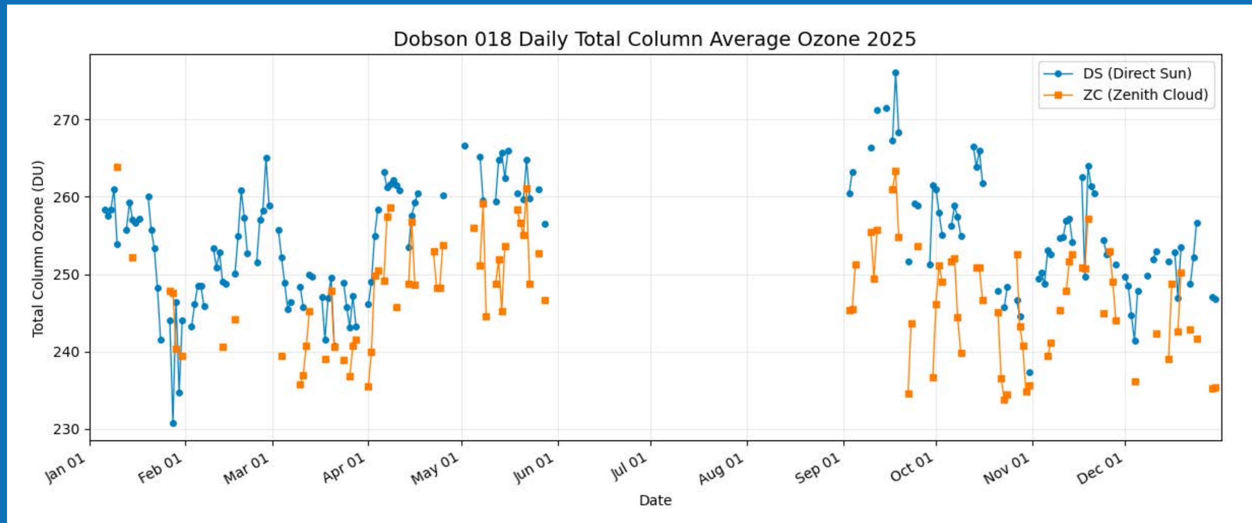


Figure 17. *TCO data analysis for D018 for 2025.*

* several instruments underwent calibrations in Spain in June-July 2025 hence the data gap.

Figure 17. TCO data analysis for D018 for 2025. The readings indicate that the range of daily total column ozone across 2025 was 230–270 DU with short-term fluctuations and a clear seasonal pattern. May–June shows the highest ozone values. September–October shows the lowest ozone values. January–March and July–August show moderate values between the peak and trough. Seasonal shifts in the ITCZ and regional pressure systems move winds and convection north–south across East Africa; that mass movement alters ozone transport and explains the May–June peak and the later decline.

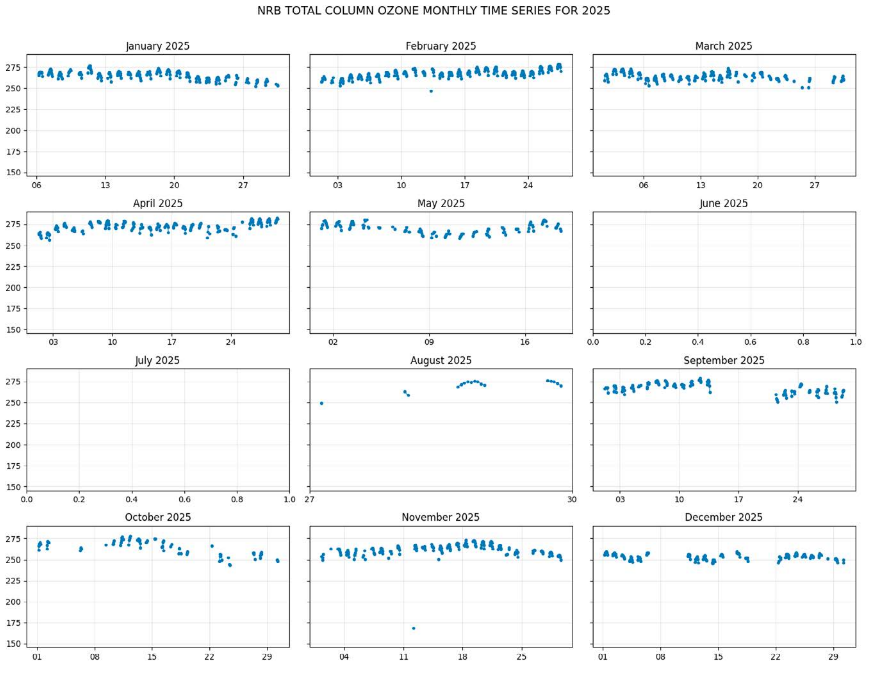
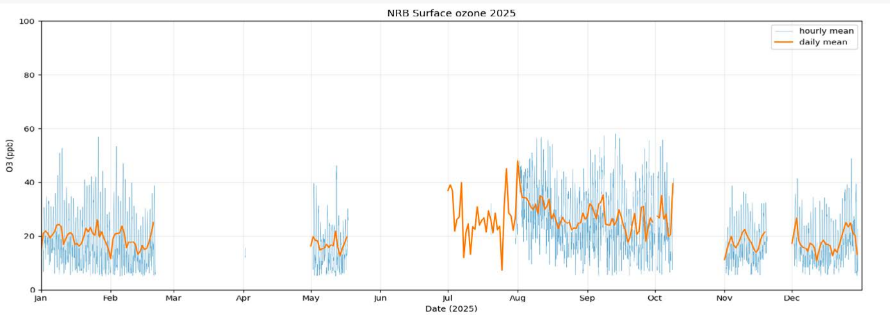


Figure 18. *TCO monthly data analysis for B071 for 2025.*

SURFACE OZONE MEASUREMENTS FOR NAIROBI & MT. KENYA GAW STATIONS 2025

Surface ozone is measured using a thermo 49i & 49c Ozone Analyzers.



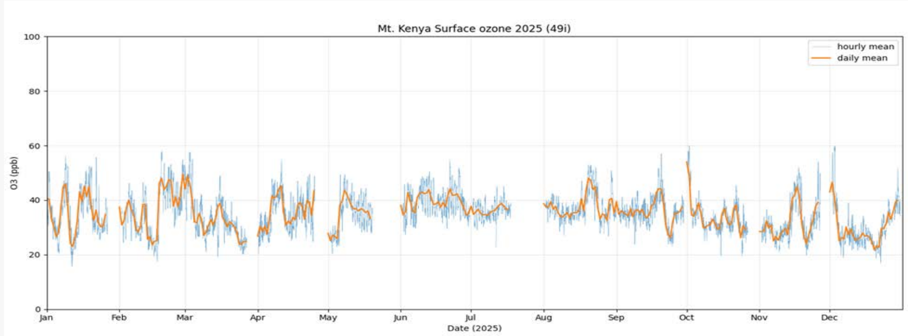


Figure 19: *Surface Ozone analysis for 2025 for Nairobi & Mt. Kenya*

The Nairobi station reported higher and more variable surface ozone in 2025, consistent with local emissions and photochemical production. The Mt Kenya station recorded lower, steadier ozone, reflecting reduced local precursor emissions and more regional/background conditions. However, these two stations clearly show strong diurnal & Seasonal patterns:

Surface Ozone Diurnal Cycle

Nairobi station shows a clear morning minimum surface Ozone concentration before sunrise and pronounced afternoon peaks consistent with strong photochemical production and boundary-layer mixing. In Mt. Kenya station, morning minima are present but afternoon peaks are weaker and less sharp, indicating reduced local photochemical production. Nairobi's larger hourly swings reflect local emissions (VOC/NOx) and urban mixing; Mt Kenya reflects background/regional ozone with weaker diurnal buildup.

Surface Ozone Seasonal patterns

January, February, July, August, September show the largest daily means and strongest afternoon peaks at NRB station; MKN also shows elevated values in these months but at lower magnitudes. May, October, November, December show reduced daily means and lower afternoon peaks at both sites but more pronounced at MKN station. March and September show the most variable conditions at NRB station; Mt Kenya shows variability too but with smaller amplitude.

Particulate Matter

***Figure 20** (a) & (b). Particulate matter analysis*

Nairobi station showed consistently higher PM1, PM2.5, PM4, PM10 and CN across 2025 with pronounced peaks in August, September and December. Mt. Kenya station on the other hand is much lower and shows only modest seasonal rises, indicating NRB is dominated by local/urban sources while Mt. Kenya reflects background/regional aerosol. PM1, PM2.5, PM4 & PM10 increase in absolute value at both sites, but the urban increment (Nairobi Station) is largest for PM2.5–PM10, consistent with combustion and coarse dust contributions in the city. Nairobi station shows high short-term variability (frequent spikes) while Mt. Kenya station is smoother with fewer spikes.

Seasonal and temporal behavior

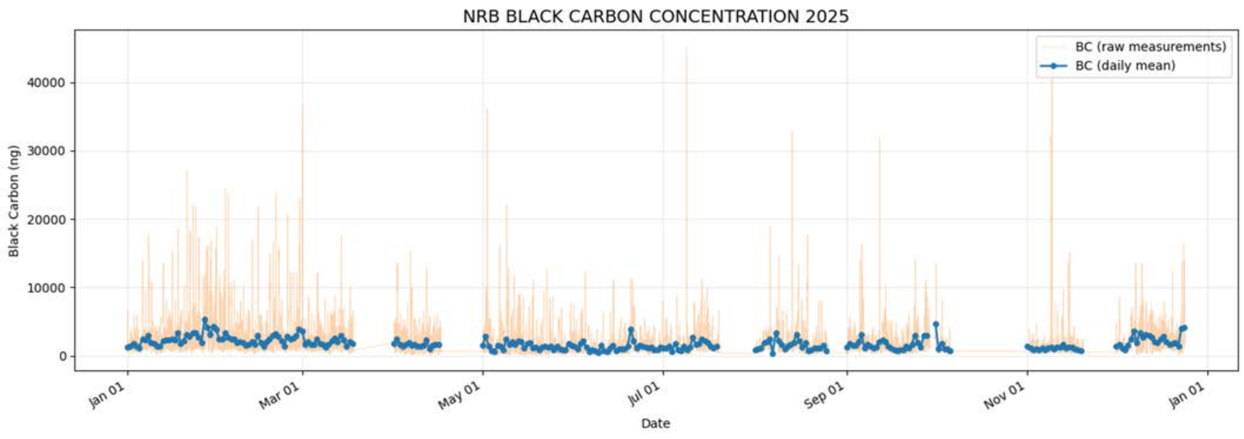
Both stations had elevated values in August & September, but peaks at Nairobi were much larger. This suggests a seasonal event (e.g., regional biomass burning, long-range dust transport, or meteorological stagnation) that amplifies urban concentrations. A secondary increase in December at Nairobi (and smaller at Mt. Kenya) likely reflects local emissions & seasonal activities (traffic, waste burning, domestic heating/cooking). April shows lower baseline concentrations before the mid-year increases.

Size-fraction Insights of Each Pollutant

- PM1 is elevated at Nairobi relative to Mt. Kenya which indicates fresh combustion/traffic and secondary aerosol formation in the urban plume.
- PM2.5 largest urban increment and strongest correlation with CN spikes in NRB station typically marks for combustion and fine secondary particles.
- PM4 & PM10 shows larger absolute increases during spikes at NRB, pointing to coarse contributions (road dust, construction, resuspension) superimposed on fine aerosol.
- PMtotal mirrors the combined behavior at both stations; It tracks both fine and coarse events, producing the highest peaks.
- CN (particle count) responds rapidly to short events; CN spikes coincide with PM1/PM2.5 rises at NRB, confirming particle number increases are driven by fine mode emissions (combustion, fresh aerosol).

Likely Sources and Processes

- Nairobi: Traffic emissions, diesel combustion, waste burning, construction/resuspension, and local secondary aerosol formation; episodic regional smoke/dust amplifies concentrations.
- Mt. Kenya: Background continental aerosol, long-range transport, and natural sources (biogenic, aged regional aerosol); much less



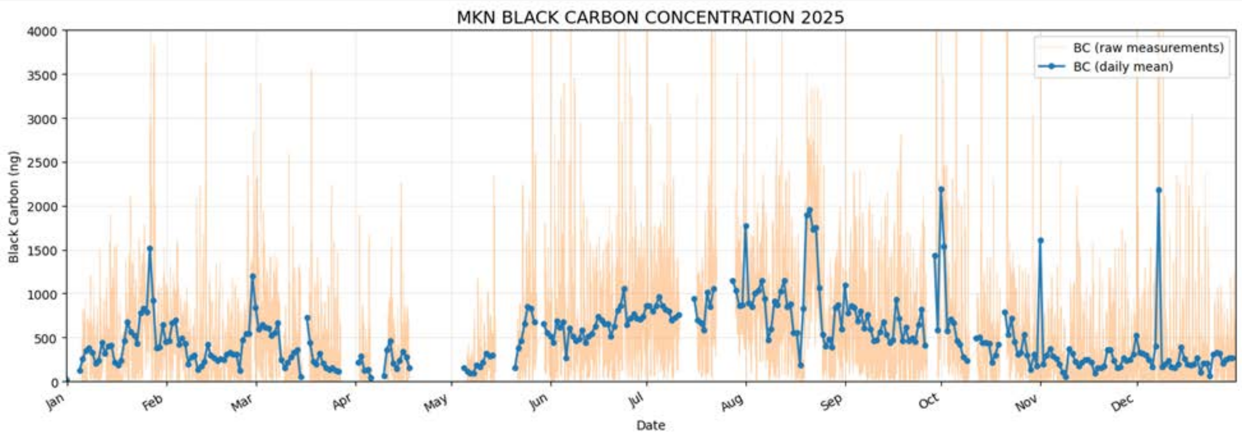


Figure 21. *(a) Black carbon concentrations in Nairobi & (b) Mt. Kenya*

The higher baseline and frequent spikes at Nairobi are consistent with persistent local emissions (traffic, domestic burning, industry). Mt Kenya's low baseline with occasional peaks suggests a background site that only intermittently receives polluted air masses (regional transport, biomass burning episodes, or long-range plumes). Urban residents in Nairobi are exposed to higher and more variable BC concentrations compared with the remote Mt Kenya site. Both stations show a clear diurnal & seasonal pattern:

Black Carbon Concentration Diurnal Cycle

Raw BC in both Nairobi & Mt. Kenya shows sharp spikes superimposed on a steadier daily mean, but Nairobi's spikes are far more frequent and larger in magnitude. The majority of spikes occur during daytime hours at both sites, producing a clear day–night contrast; this contrast is much stronger at Nairobi. Nairobi's daytime spikes reflect local daytime emission sources (traffic peaks, cooking, small industry, resuspension) and stronger mixing that brings intermittent plumes to the sampler. Nighttime concentrations are generally lower and more stable at both sites, indicating reduced local emission activity and/or more stable boundary-layer conditions after sunset.

Black Carbon Concentration Seasonal patterns

May, September, October & December had the largest raw spikes and raised daily means at both stations, but absolute levels were much higher in Nairobi. The coincidence of high months at both stations points to regional drivers e.g. seasonal biomass/agricultural burning or meteorological patterns favoring accumulation/transport. Nairobi's much larger absolute increases during high months indicate local urban emissions superimposed on the regional signal. June, August & November show suppressed daily means and far fewer large spikes at both stations; Mt Kenya's seasonal minima are closer to zero relative to Nairobi. Low months reflect reduced emissions and/or meteorological conditions that enhance dispersion. January & April show moderate BC levels; Nairobi still shows higher variability and means than Mt Kenya.

2.6 Status of air quality in Kenya: The case of Nairobi city

Air quality and climate are closely interconnected, as the chemical species that degrade air quality are often co-emitted with greenhouse gases. Thus, changes in one inevitably cause changes in the other (WMO, 2022).1 Climate change and air pollution are significant environmental and development challenges in Kenya, posing potential risks to human, animal and ecosystem health, while impacting development. Air pollution can be detrimental in urban areas, where large numbers of people are continuously exposed to emissions. In Nairobi, air pollution is a significant environmental and public health concern, with rapid urbanization, increasing vehicular emissions, industrial activities, and waste burning contributing to deteriorating air quality.

This sub section provides an analysis of the status of air pollution in Nairobi city focusing on fine particulate matter (PM2.5), commonly referred to as aerosols, that have a diameter of 2.5 micrometers or smaller, and are often made up of smoke, soot, liquid or solid particles in aerosol, or biological matter like mold, bacteria, and pollen. PM2.5 can penetrate deep into the lungs and enter the bloodstream, leading to severe health effects such as respiratory diseases, cardiovascular conditions, and premature deaths. Monitoring results are from 11 sites in Nairobi city, located across diverse environments, including residential zones, health facilities and playground, airports, and industrial areas. The analysis assesses annual averages of PM2.5 concentrations for 2024 and 2025, enabling a comparison of pollution levels between years and across sites and identifying spatial patterns of exposure in the city.

1 WMO (2022). Annual Air Quality and Climate Bulletin:

The results are evaluated against the Kenya's national annual air quality standards of 35 µg/m³ and the World Organization (WHO) Air quality Guidelines. Overall, the monitoring results show persistent moderate to high PM2.5 concentration levels across several urban locations, particularly in densely populated residential environments. While all the 11 sites remain below the Kenya regulatory limit, all the 11 sites exceeded Air Quality Guidelines of annual average of 5 ug/m3 in 2025, indicating continued public health risk due to exposure.

Monitoring Site	PM2.5 Mean 2024	PM2.5 Mean 2025	Change (µg/m³)	Change (%)	WHO AQG Exceedance Factor (2025)	Kenya Standard Compliance
Dandora Phase 4	28.1	30.5	+2.4	+8.5%	6.1 ×	Within standard
ICRAF Gigiri Campus	13.8	13.4	-0.4	-2.9%	2.7 ×	Within standard
Jomo Kenyatta International Airport (JKIA)	13.6	14.2	+0.6	+4.4%	2.8 ×	Within standard
KMD HQ Dagoretti	14.0	13.4	-0.6	-4.3%	2.7 ×	Within standard
Kangemi Health Center	22.0	21.2	-0.8	-3.6%	4.2 ×	Within standard
Kariobangi Health Center	28.6	29.2	+0.6	+2.1%	5.8 ×	Within standard
Moi Air Base Eastleigh	19.4	19.2	-0.2	-1.0%	3.8 ×	Within standard
Nyayo Estate Gate B	29.2	24.3	-4.9	-16.8%	4.9 ×	Within standard
Nyayo Estate Gate D	20.4	18.7	-1.7	-8.3%	3.7 ×	Within standard
Nyerere Road	22.7	20.5	-2.2	-9.7%	4.1 ×	Within standard
Wilson Airport	15.8	14.9	-0.9	-5.7%	3.0 ×	Within standard

The monitoring sites at Dandora Phase 4 recorded the highest level of PM2.5 pollution levels in 2025 (30.5 ug/m3), followed by Kariobangi Health Center along Thika Road and Nyayo Estate Gate B that recorded 29.2 ug/m3, and 24.3 ug/m3 respectively. ICRAF Gigiri Campus recorded the lowest PM2.5. pollution levels of 13.4 ug/m3. None of sites exceeded Kenya's annual regulatory limit of 35 µg/m³

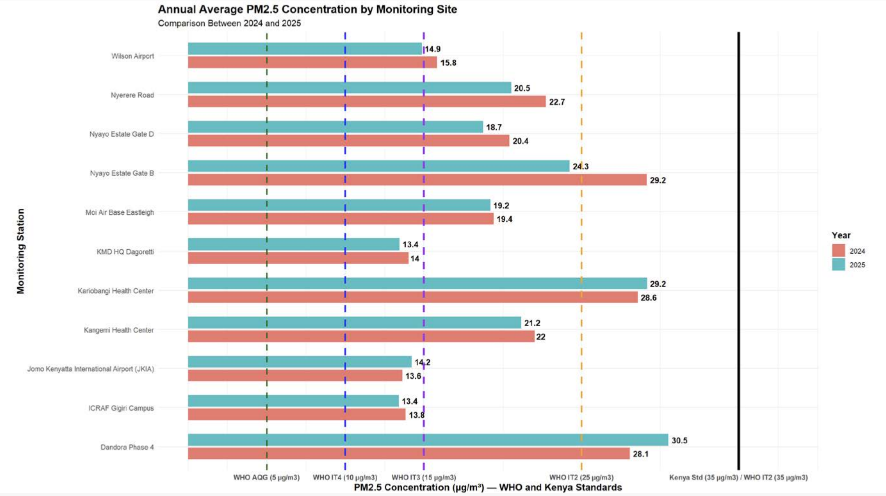


Figure 22. *Mean PM 2.5 records across the 11 monitoring sites compared to the Kenyan National Guidelines and WHO Standards for annual average*

Policy Implications and Recommendations

The analysis of annual PM2.5 concentrations across the Nairobi monitoring network indicates that while most monitoring sites remain within the Kenyan national air quality standard of 35 μg/m³, the persistent exceedance of the World Health Organization (WHO) Air Quality Guideline of 5 μg/m³ across all monitoring locations indicates that urban populations remain exposed to levels of particulate pollution associated with adverse health impacts. This underscores the need for strengthened national air quality management strategies, including enhanced emissions control measures targeting key pollution sources such as road transport, residential combustion, and waste burning. Aligning national policies with WHO interim targets could provide a progressive pathway toward improved air quality and reduced public health risks.

High pollution exposure in densely populated residential areas

The highest PM2.5 concentrations were recorded at monitoring sites located in densely populated residential neighborhoods, including Dandora Phase 4, Kariobangi Health Center, and Nyayo Estate Gate B. These areas are likely influenced by a combination of traffic emissions, informal waste burning, small-scale industrial activities, and household fuel combustion. Targeted interventions in these neighborhoods—such as improved waste management systems, cleaner household energy solutions, and better traffic management—could reduce local pollution exposure.

Expanding monitoring coverage and data-driven decision making

The current monitoring network provides valuable insights into spatial variations in pollution across Nairobi. It highlights the need for an expanded monitoring network to fill in existing data gaps. The PM2.5 air pollution data presented in this report did not include analysis of the influence of meteorological parameters such as wind (direction and speed), temperature, humidity, and atmospheric pressure on pollutant dispersion and accumulation. The integration of meteorological parameters with air quality data in future can enable more accurate forecasting thereby enhancing possibility for predictive models to generate evidence for improved decisions and interventions for air quality management in Kenya.

Chapter 3: Drivers

The Madden Julian Oscillation (MJO) and tropical cyclones drove intra-seasonal variability throughout the year even in months/seasons that are climatologically dry. The known drivers for OND and especially the negative IOD had the greatest influence on the OND 2025 seasonal outlook closely followed by weak La Nina conditions.

3.1 Intertropical Convergence Zone (ITCZ)

In 2025, the Intertropical Convergence Zone ITCZ's position and shifts played a critical role in determining rainfall patterns across Kenya and East Africa. Its northward movement during March to May long rains, resulted in substantial rainfall, particularly in the highlands, western regions, and the Lake Victoria basin. As the ITCZ shifted further north from June to September, Kenya typically experienced drier conditions. The ITCZ's southward return around October to December triggered the short rainy season. However, stronger than usual pressures over the North (Arabian high pressure cell) kept the ITCZ further south depriving most areas of the East African region of rainfall especially in November.

3.2 Ocean–Atmosphere Teleconnections

El Nino Southern Oscillation (ENSO)

The cold phase of ENSO, La Nina, was a driver in the October- November- December (OND) 2025 season. Weak La Nina conditions were established during the September-October-November (SON) season and were persistent during the OND season and contributed to depressed rainfall over the eastern and parts of Central sectors of the country.

Indian Ocean Dipole (IOD)[2]

The IOD was the major driver for the OND 2025 season. IOD values started dropping towards the negative phase on 27th July. The IOD values kept on dropping and a negative IOD event was declared in early September. The 2025 IOD event was the strongest ever on record since observations started in 2008, reaching its peak of -1.61 °C the week ending 26th October 2025.

Madden Julianne Oscillation (MJO)

The Madden-Julian Oscillation (MJO) was an active and influential intra seasonal driver throughout 2025, with specific strong signals recorded in January, March, August, and October. Its activity was linked to several extreme weather events including heavy off-season rainfall in January. Some stations over the Lake Victoria Basin, western highlands, Nairobi, and isolated areas over the eastern sector recorded heavy rainfall above 50mm in 24 hours in January when the MJO was in phase 2 and 3 from 12th to 25th. The MJO was responsible for an earlier than expected long rains onset over several parts of the country. It was in phases 2 to 3 with a high to moderate amplitude from the 7th to 17th of March occasionally sliding to phase 1 and back to phase 2. Some stations in Nairobi and its environments, central and parts of the Southeast recorded high amounts of rainfall during this period.

2 Discussed extensively in The State of the Climate in Kenya Report of 2024 available on www.meteo.go.ke

In August, MJO was in phases 2 and 3 from 11th to 25th and led to above average rainfall of more than 200% of the August Long Term Mean (LTM) in Nairobi stations yet August is climatologically cool and cloudy with light rains over Nairobi and Central. In October the MJO was in phases 2 and 3 from 16th to 22nd October with a high amplitude and moved to phase 4 from 25th to 30th. Very intense storms were recorded during this period over the central, eastern and parts of the Coast. Majajani station in Kilifi recorded 120.2 mm in 24 hours on 28th while Kawala also in Kilifi and Mbooni in Makueni recorded 88.6mm and 73.0mm on the same day. Matasangoni in Kilifi recorded 101 mm on 29th October while Vigurungani in Kwale and Kaguru in Meru recorded 76.4 and 73.3mm respectively. The MJO phase in October led to a false onset over the Southeastern region which was followed by a prolonged dry spell.

Tropical Cyclones/Storms

Although Kenya lies outside the primary cyclone track zone, tropical cyclones forming in the South-West Indian Ocean exert significant indirect impacts on the country's atmospheric circulation, rainfall distribution, and coastal weather conditions. The 2024-2025 cyclone period over Southwestern Indian Ocean began on 15th November 2024 and ended on 30th April 2025. Two cyclones affected rainfall in Kenya during this period, Dikeledi and Jude. Dikeledi was experienced from 6th to 17th January 2025 and coupled with a favourable MJO phase immediately after led to enhanced rainfall over some parts of Central, eastern and Lake Victoria region.

Kangaita tea research recorded 43.1mm in 24 hours on 10th while Kangaita tea farm recorded 42.9 mm on 11th January. Jude was experienced from 6th to 16th March and its effect was enhanced by a favourable phase of MJO from 7th to 17th March and together contributed to the earlier than expected onset over several parts of the country. The 2025-2026 cyclone period over Southwestern Indian Ocean began on 15th November 2025 and is expected to end on 30th April 2026. During this period, tropical storm Chenge which occurred from 17th to 26th October coupled with a favourable MJO phase from 16th to 22nd October was responsible for the enhanced rainfall over parts of the Central including Nairobi, Western, Lake Victoria Basin and eastern sectors of the country.

Chapter 4: Socio-Economic Impacts

4.1 Early Warning and Disaster Risk Reduction

During the year 2025, a total of 12 advisories/warnings were issued covering heavy rainfall, strong winds, and high waves, collectively demonstrating KMDs commitment to improving access to early warning information to reduce detrimental impacts and support resilience building.

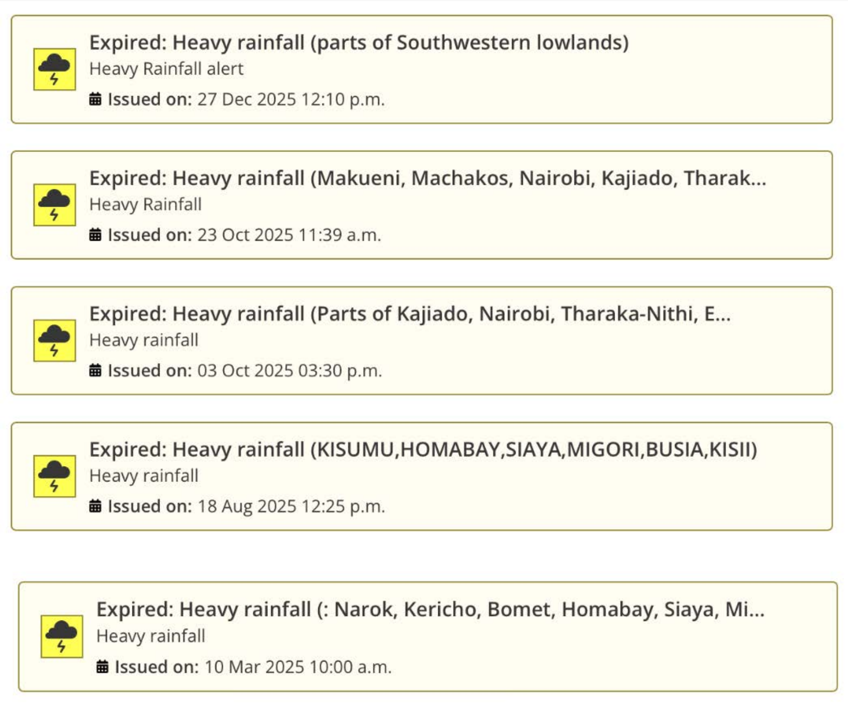


Figure 23. *Heavy rainfall advisories issued throughout 2025*

5 heavy rainfall advisories were issued (figure 24) . One during the long-rains seasons in March for parts of Western Kenya, 1 during the June to August season for the same regions and 3 associated with the short rains, for parts of central highlands & southwestern lowlands.

Likewise, 5 advisories for strong winds were issued through the year (figure 25)

Figure 24. *strong winds advisories issued during 2025*

2 Advisories for large waves were issued corresponding in most cases to the strong winds advisories in May (moderate severity) and June (Severe) (figure 26)

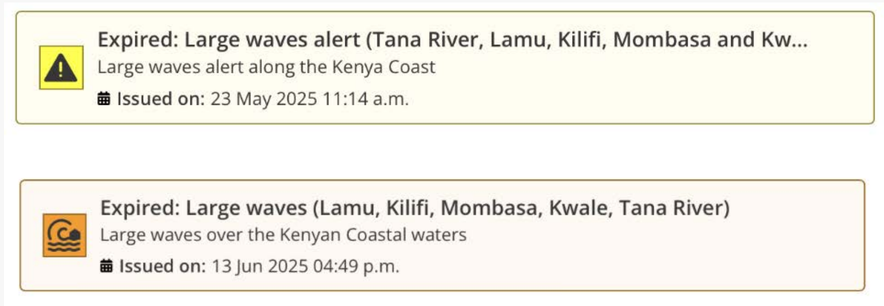


Figure 25. *Large waves advisories issued in 2025*

4.2 Agriculture and Food Security

Crop and livestock performance

During the March-April-May (MAM) 2025 Long Rains season, rainfall was generally near to above average across most of Kenya, except the Coast, but poor spatial and temporal distribution, irregular patterns, and dry spells reduced its effectiveness for agricultural productivity, leading to below-average crop production in marginal agricultural areas.

National maize production was estimated at 4 million tonnes, 10% above the five-year average, driven by favorable conditions in high and medium rainfall zones like the Rift Valley, Western, and Central Kenya, while beans production was 60% above the long-term average (LTA). However, in arid and semi-arid lands (ASALs), yields were 21-35% below LTA for maize and beans due to shifts to drought-tolerant crops, fall armyworm (FAW) infestations, high input costs, uncertified seeds, and early cessation. Irrigated crops saw a 10% increase in acreage, with sorghum up 49% in production, but tomatoes declined 39% from pests like Tuta absoluta and water limitations. Flooded lowlands lost significant acreage of beans and vegetables. Household maize stocks were 37% below average, lasting 1-3 months in pastoral and coastal areas versus the normal 4-5 months, increasing market dependence and vulnerability to price shocks. Smallholder farmers in ASAL counties were most affected.

The performance of the October-November-December (OND) 2025 season led to widespread crop failures. Maize production in marginal areas was 20-30% below LTA, with total failures in coastal counties like Kilifi and Lamu, and northeastern areas like Mandera and Wajir receiving <25% of normal rainfall. Pulses like green grams and cowpeas also suffered, though some clusters saw shifts to these crops. FAW infestations reduced yields by 30-50% in affected zones. Household food stocks declined sharply in drought-hit counties, forcing early market reliance amid rising prices. With respect to temperature, warmer-than-average conditions prevailed throughout 2025, reducing soil moisture retention and causing heat stress on crops and livestock, lowering milk yields and fertility rates. For livestock during the Long Rains, pasture and browse were good to fair, projected to last 3 months, with milk production at 3-4L/day and consumption at 1.5-2L/day, supported by rangeland recharge, though invasive species covered 103,000 ha in Marsabit and 10,000 ha in Turkana, limiting access. During the Short Rains, drought reduced pasture regeneration in northern Kenya, increasing trekking distances, weakening animals, and causing malnutrition in cattle and goats, leading to higher mortality rates. Reported outbreaks of livestock diseases such as Rift Valley Fever after floods, foot and mouth disease, lumpy skin disease, contagious caprine pleuropneumonia (CCPP), and peste des petits ruminants (PPR) were prevalent. Economic Impact: During the Long Rains, livestock prices were above long-term average (LTA) in most areas due to good body conditions (e.g., +65% in Laikipia), with favorable terms of trade (ToT) allowing 124 kg maize per goat in Laikipia vs. LTA 80 kg. In the Short Rains, prices fell in drought-affected counties like Mandera due to distress sales and poor conditions, with pastoralist households facing reduced income and food access. Maize prices were above LTA (KES 56-80/kg), driven by low production and high demand.

Food security outcomes (IPC analysis)

Following the poor performance of the short rains in 2024 Kenya's food security situation rapidly deteriorated[3]. By February 2025 conditions had worsened in Taita Taveta, Garissa, Wajir, Kitui, and Makueni, with Garissa and Wajir declining to IPC AMN Phase 4 (Critical). Several counties, including Turkana, Mandera, Samburu, Baringo (Tiaty), and Marsabit (North Horr and Laisamis), remain in Phase 4, indicating persistent critical levels of acute malnutrition (Figure 27)

3 State of the Climate Kenya 2024

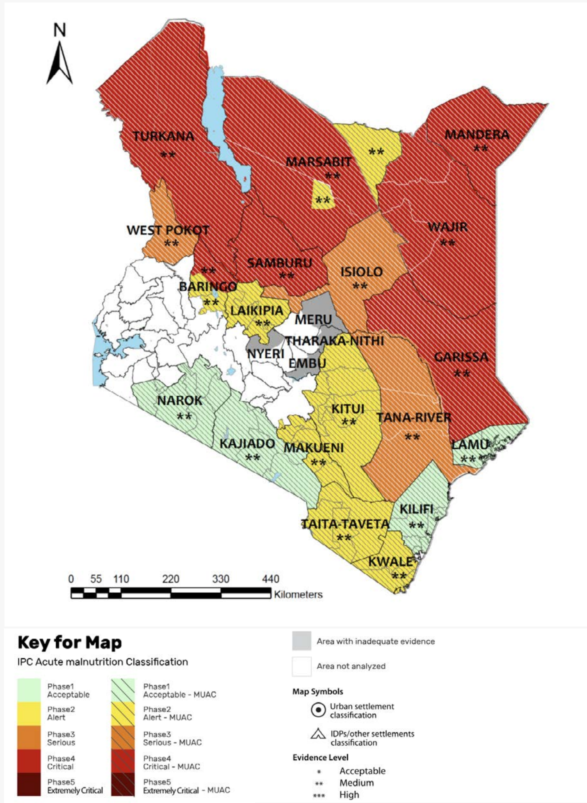


Figure 26. *IPC status by February 2025 Source: ReliefWeb*

Between July and September, around 1.8 million people faced high levels of acute food insecurity (IPC Phase 3 or above). Of these, 179,000 people were in IPC Phase 4 (Emergency), while the rest were in IPC Phase 3 (Crisis). This period coincided with the lean season, when household food stocks are typically depleted.

By September 2025 four counties, namely Baringo, Mandera, Marsabit, and Turkana were in critical to emergency IPC phases (figure 28)

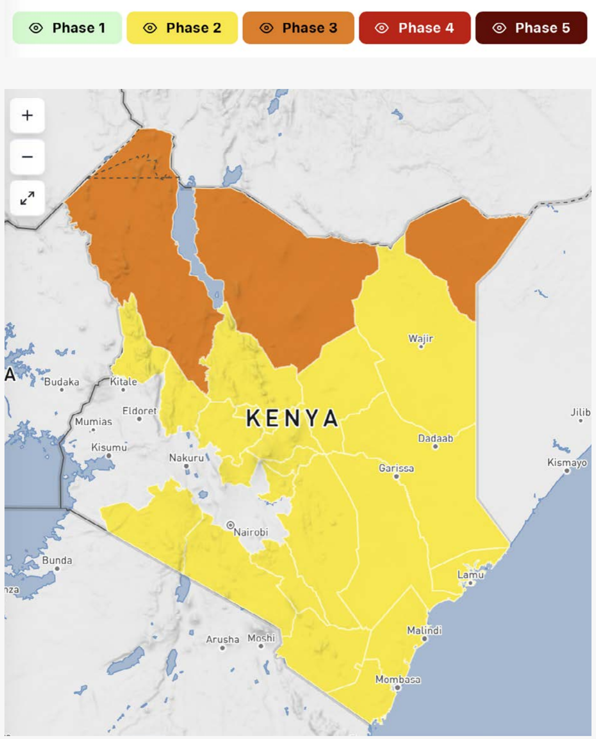


Figure 27. *IPC status by September 2025 Source: ReliefWeb*

Between October and December a combination of the poor short rains and higher than average temperatures, dryness worsened, leading to vegetation loss, water shortages, and poor crop development. This drove widespread IPC Phase 3 (Crisis) conditions across pastoral and marginal agricultural zones.

4.3 Health

The March–May long rains season brought with it floods in some regions as seen in the preceding sections, at the same time the country experienced drought conditions especially in the vast arid and semi-arid lands (ASALs). These extremes intensified disease transmission, overwhelmed limited health infrastructure, and exacerbated acute food and water insecurity. Notable health impacts included outbreaks of cholera, visceral leishmaniasis, and other vector-borne and water-related diseases, compounded by disruptions in sanitation services and mobility of displaced populations. Humanitarian needs surged, with increased demand for emergency health services, nutrition support, and water, sanitation, and hygiene (WASH) interventions.

4.3.1 Cholera Outbreaks

Cholera outbreaks often follow flooding events, facilitated by compromised water quality and poor hygiene conditions. In late February 2025, the Ministry of Health officially declared cholera outbreaks in several counties including Nairobi, Kisumu, Migori and Kwale. By 22 May 2025, 256 suspected cholera cases and 13 deaths had been reported, with a case fatality rate (CFR) of 5.2 %, above the acceptable threshold for adequate clinical management — signaling delays in access to treatment and difficulties in containing the outbreak. Rapid response mechanisms were activated with support from the World Health Organization (WHO), focusing on case finding, contact tracing, and laboratory support[4]

4 https://www.afro.who.int/photo-story/kenya-steps-national-cholera-preparedness-and-response?utm_source=chatgpt.com

4.3.2 Visceral Leishmaniasis (Kala-azar)

Climate drivers such as prolonged heat and dry conditions in northern Kenya support sandfly populations that transmit Leishmania donovani. In the March–May 2025 season, outbreak investigations recorded elevated visceral leishmaniasis activity:

- Marsabit County recorded 267 suspected cases, 105 confirmed cases, and four deaths by late March.
- Wajir County experienced a significant disease burden, with 1,280 confirmed cases and 41 deaths by July[5].

These outbreaks disproportionately affected adult males — likely reflective of occupational and mobility patterns in pastoralist communities — and strained the already limited diagnostic and treatment capacity in remote health facilities.

4.3.3 Other Outbreak Signals

In addition to cholera and visceral leishmaniasis, weekly emergency health bulletins reported ongoing surveillance for MPox and preparedness activities for other high-impact pathogens such as filoviruses, reflecting the interconnected nature of climate, mobility, and infectious disease risk. (WHO I Regional Office for Africa)

Field epidemiology investigations also identified localized enteric disease clusters and waterborne illnesses in areas such as Kisii County in early 2025, underscoring the diversity of climate-sensitive disease threats[6].

5 https://knowledgeweb.ndma.go.ke/Content/LibraryDocuments/National_Long_Rains_Assessment_Report_202520250819170940.pdf?utm_source=chatgpt.com
6 https://www.feltp.or.ke/events.html?utm_source=chatgpt.com

4.3.4 Vector-Borne Disease Risks

Beyond confirmed outbreaks, climate change as evidenced by increasing temperatures, has broadened environmental suitability for vectors such as mosquitoes. Warmer temperatures and erratic rainfall extend malaria and arboviral transmission seasons into previously marginal zones, raising epidemic risk in highland, coastal, and transitional regions[7]. Mosquito-borne disease risks also rise in stagnant floodwater, creating ideal breeding habitats for vectors responsible for malaria, Rift Valley fever, and other arboviruses — though specific 2025 outbreak counts for these diseases were not published nationally, the epidemiological linkage is well-recognized[8].

4.3.5 Flood-Related Health Impacts

Human Displacement and Infrastructure Damage

The March–May long rains triggered severe flooding in multiple counties across Kenya. Heavy rains and flash floods displaced thousands of people, disrupted essential services, and damaged infrastructure. The European Union reported that heavy rains and severe floods displaced over 18,000 people across frontline counties (e.g., Taita-Taveta, Garissa, Turkana, Homa Bay) and destroyed homes, crops, and livelihoods[9].

7 https://www.sollaykenyanfoundation.org/the-impact-of-climate-change-on-kenyan-health-issues/?utm_source=chatgpt.com

8 https://www.trtafrika.com/english/article/18153464

9 https://www.eeas.europa.eu/delegations/kenya/european-union-supports-people-affected-devastating-floods-and-disease-outbreaks-kenya_en?s=352&utm_source=chatgpt.com

Health system strains:

- Disruption of health facility operations due to access barriers and damage to clinics.
- Breakdown of WASH systems, leading to contamination of community water sources and heightened diarrhoeal disease risk.
- Overcrowding in temporary shelters, which increased respiratory disease transmission risk.

4.3.6 Drought-Linked Health Impacts

Food Insecurity, Malnutrition and Secondary Health Stress

Drought diminished crop yields and pasture conditions, pushing food insecurity and malnutrition to crisis levels.

Acute malnutrition — especially among children and pregnant women

Increases susceptibility to infectious diseases and complicates disease recovery, placing additional burdens on health systems[10].

Livestock disease outbreaks were reported (e.g., foot and mouth, lumpy skin disease) linked to climate stress further undermining pastoralist livelihoods, with indirect consequences on household nutrition and economic resilience.

Health Systems Strain - The dual pressures of flood-driven outbreaks and drought-induced vulnerabilities strained public health systems. Remote health facilities faced access barriers, supply chain disruptions, and surges in demand for outbreak response and clinical care, often with limited surge capacity[11].

10 https://www.ifrc.org/press-release/kenya-ifrc-launches-chf-15-million-emergency-appeal-climate-extremes-push-millions?utm_source=chatgpt.com

11 https://globalhealthstudygroup.com/2025/08/26/climate-change-health-what-kenya-and-the-world-must-do-next/?utm_source=chatgpt.com

In 2025, climate-sensitive disease outbreaks and extreme weather events intersected to generate complex health challenges in Kenya. Cholera and visceral leishmaniasis were the most documented outbreak events tied to climate drivers, while broader vector-borne disease risks and enteric pathogen transmission remained elevated. Flooding amplified water contamination and displacement, while drought eroded water security and nutritional status — both weakening population resilience and burdening health systems.

Priority recommendations to build resilience going forward:

1. Strengthening disease surveillance and early warning systems that integrate climate forecasts with health data to anticipate and mitigate outbreaks.
2. Bolstering WASH infrastructure resilience in flood and drought-prone communities to reduce waterborne disease risk.
3. Expanding vector control and targeted malaria prevention campaigns in newly at-risk areas.
4. Enhancing emergency preparedness capacity, ensuring health facilities can maintain services during climate extremes.
5. Scaling nutrition and water security interventions in drought-affected regions to reduce compounding health vulnerabilities

4.4 Water Resources

The suppressed rainfall associated with the developing La-Nina conditions led to increased water scarcity in most parts of the Country. While parts of Tana, Athi and Ewaso Ng'iro North basins experienced drought, the Lake Victoria and Rift Valley basins received near-to-above-average rainfall in some periods, demonstrating high spatial variability in river flows. The MAM season saw erratic incidences of floods in certain areas in Lake Victoria and Rift Valley basins affecting livelihoods, infrastructure and social facilities. Water levels in all the major rivers across the Country remained normal with spikes to above Flood Alert thresholds during this period. Most dams in the Country experienced natural overflow and maximum capacity. The Seven-folks dam comprising Masinga, Kamburu, Kiambere, Gitaru and Kindaruma operated at full capacity prompting advisory to downstream communities to remain vigilant of impending floods due to high volumes released.

The JJAS period witnessed decreased flows across all basins in the Country. However, the effects of the MAM floods were evident in many low-lying areas. Parts of Lake Victoria shoreline areas including the river mouths of Nzoia, Nyando, Sondu and Kuja-Migori remained inundated due to sustained high lake levels. The OND period witnessed a rise in river flows although flooding levels were not reached. Incidents of flash floods and riverine flooding were however recorded in Lower and Upper Nzoia, shoreline areas of Lake Victoria and upper Tana and Athi.

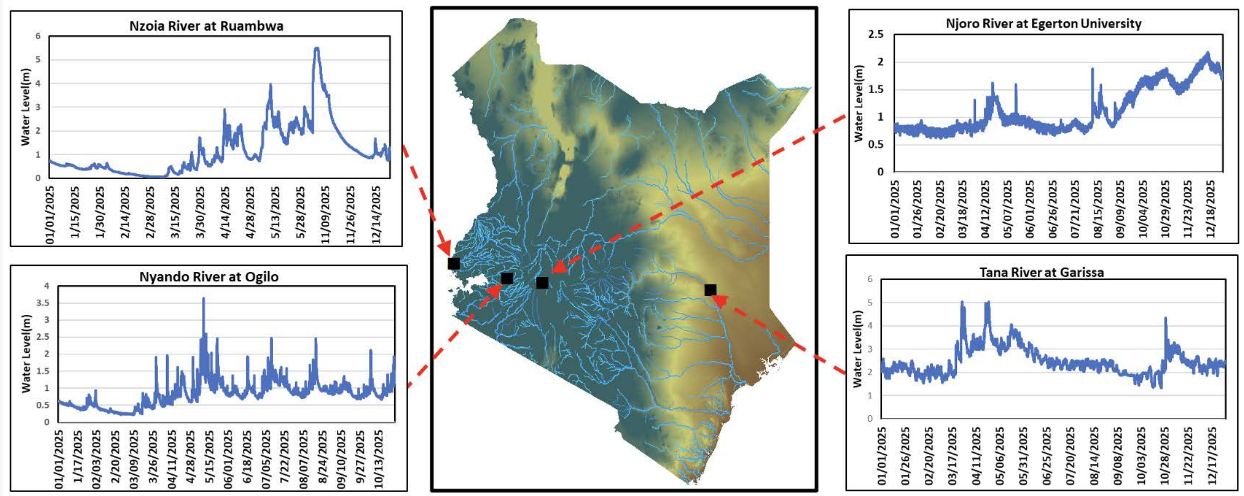


Figure 28: *Review of the Nyando, Nzoia, Njoro and Tana River Flows in 2025*

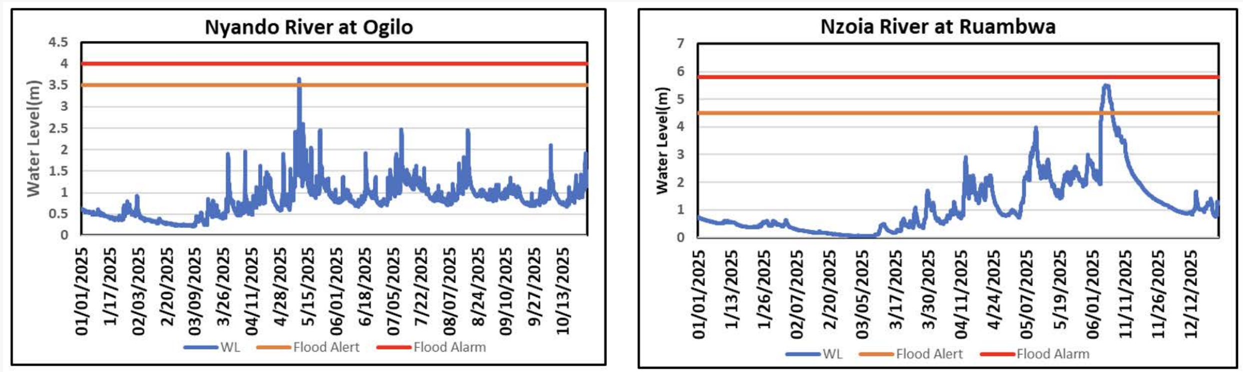


Figure 29: *Hydrographs of the Nyando and Nzoia River levels in 2025 showing flood thresholds*

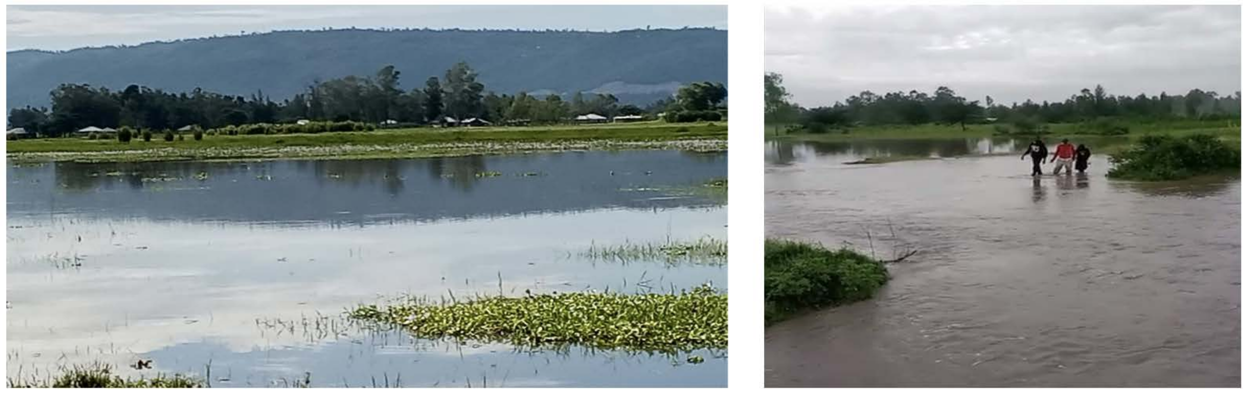


Figure 30. *Osodo Village in Lower Sondu (left) and Luanda River near Kisumu City (right) during the MAM 2025 season*

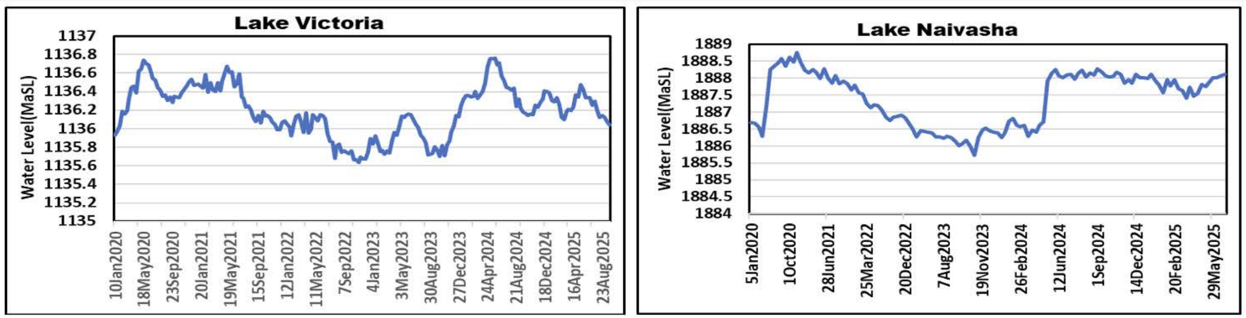


Figure 31: *Water level variation in Lakes Victoria and Naivasha*

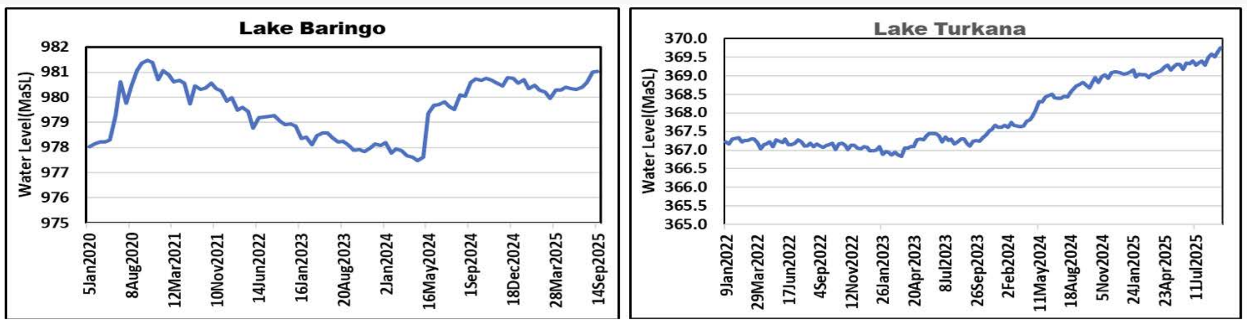


Figure 32: *Water level variation in Lakes Baringo and Turkana*

4.5 Transportation and Infrastructure

Road Infrastructure Damage and Traffic Disruptions were reported associated with various heavy rainfall events. While the October-November-December (OND) 2025 season was expected to be below average in many areas, brief, intense, and isolated storms caused significant flash floods. Specific Disruptions recorded included:

- Nairobi Express Way & CBD: Flooding was reported in early October, severely disrupting transport in the central business district.
- Chepsonoi-Kipsugur-Kisia-Ivihiga-Kambiri road: Stranded commuters after the Sokobora bridge submerged, October 27th.
- Garissa-Bangale road: Disrupted in late October due to Tana River catchment flooding.
- Kikima-Machakos highway: Floods from the overflowing River Ikiwe disrupted travel.

Chapter 5: Climate Outlook and Projections for 2026

5.1 ENSO Outlook

The El Niño–Southern Oscillation (ENSO) is a major driver of seasonal climate variability across many parts of the world, including Kenya. ENSO phases strongly influence rainfall distribution, with negative ENSO conditions (La Niña) often associated with below-average rainfall over parts of the country, while positive ENSO conditions (El Niño) are commonly linked to enhanced rainfall. These variations frequently carry significant socio-economic and environmental implications.

Historical Characteristics of ENSO

Historically, El Niño and La Niña events tend to develop during the April–June period. They typically reach their peak intensity between October and February and usually persist for about 9–12 months, although in some cases they can last up to two years. ENSO events generally recur every 2 to 7 years.

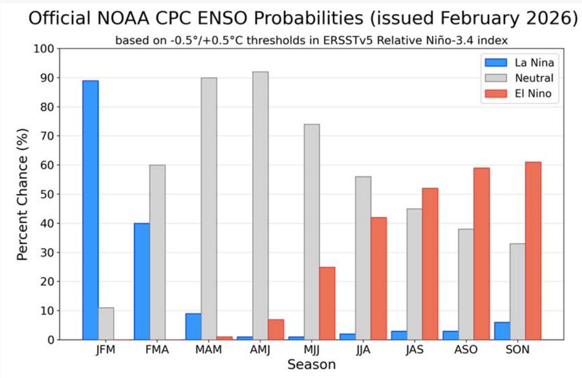
ENSO Forecast and Model Guidance

The CCSR/IRI ENSO prediction plume indicates a high likelihood of ENSO-neutral conditions during February–April 2026. Multi-model guidance from both statistical and dynamical models shows a very high probability (96%) of ENSO-neutral conditions during this period. ENSO-neutral conditions are expected to remain dominant through March–May and April–June 2026.

As the year progresses, the probability of El Niño development gradually increases, rising from 9% in March–May to 35% by April–June 2026. El Niño becomes the leading category from May–July and is projected to remain so through the boreal summer and fall (June–December 2026), with probabilities ranging between 58% and 61%. However, forecasts at these longer lead times remain highly uncertain due to the spring predictability barrier.

Probabilistic ENSO Outlook

Based on the multi-model mean (statistical and dynamical models), and considering forecast skill by start time and lead time, the probabilities (%) of ENSO states over the next nine overlapping seasons are as follows:



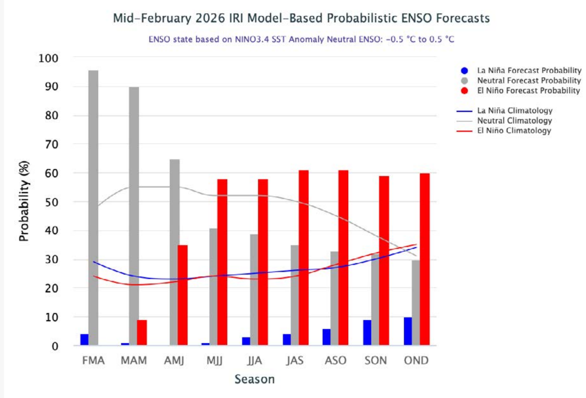


Figure 33. *ENSO outlook for 2026*

Overall, La Niña conditions are present at the start of the period, characterized by below-average SSTs in the east-central equatorial Pacific and atmospheric patterns consistent with La Niña. A transition to ENSO-neutral conditions is expected during February–April 2026 (60% chance), with neutral conditions likely persisting through the Northern Hemisphere summer (56% chance for June–August 2026). Below-average SST anomalies in the central and eastern Pacific are expected to weaken as the current weak La Niña dissipates, signaling a shift toward ENSO-neutral conditions. However, persistently above-average SSTs in the western Pacific are likely to maintain a pronounced east–west temperature gradient. This gradient may continue to support residual La Niña–like atmospheric responses during the season.

5.2 Indian Ocean Dipole Outlook

Positive IOD phases are typically associated with enhanced rainfall over East Africa, while negative phases often correspond to suppressed rainfall, particularly during the October–December season.

Current Oceanic Conditions

During recent months, the Indian Ocean exhibited mixed sea surface temperature (SST) anomalies. Persistent above-normal SSTs were observed in the eastern Indian Ocean, while the western basin remained closer to average. In the Atlantic basin, SST anomalies were slightly above average in the North Tropical Atlantic (NTA), near average in the South Tropical Atlantic (STA), and above normal across the extratropical North Atlantic.

As of 15 February 2026, the IOD index stood at +0.53 °C, marginally above the positive IOD threshold of +0.40 °C. However, IOD events do not typically develop or sustain during the December–April period. As such, these positive values are not expected to persist at magnitudes sufficient to constitute a fully developed IOD event.

Model Guidance and Near-Term Outlook

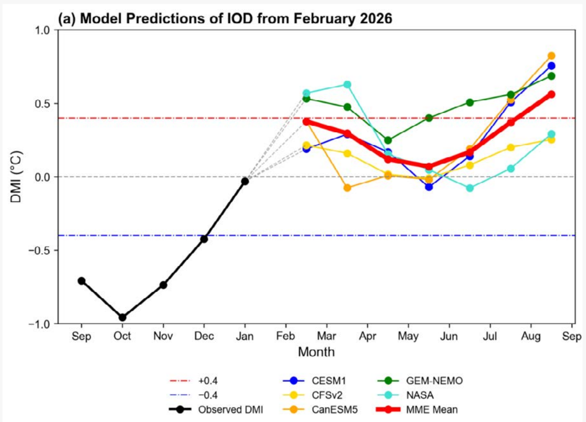
Both dynamical and statistical model guidance suggests that the IOD is expected to remain neutral into the Nothern Hemisphere spring. The North American Multi-Model Ensemble (NMME) ensemble mean forecast indicates continued neutral IOD conditions through the Northern Hemisphere spring of 2026.

Deterministic IOD Forecasts (NMME)

Deterministic forecasts derived from the NMME—including CESM1, CFSv2, CanESM5, GEM-NEMO, and NASA models—indicate a gradual weakening of the IOD signal. The observed DMI rose steadily from its negative-phase peak in October 2025, returning to neutral conditions by January 2026.

For March 2026, two models (NASA and GEM-NEMO) suggest DMI values slightly exceeding the +0.4 °C threshold, while the remaining models maintain neutral conditions. The equally weighted multi-model mean (MME), however, favors IOD-neutral conditions during this period. Beyond May 2026, most models indicate a gradual increase in DMI values, with the MME suggesting a potential transition toward positive IOD conditions by August 2026.

Probabilistic IOD Outlook



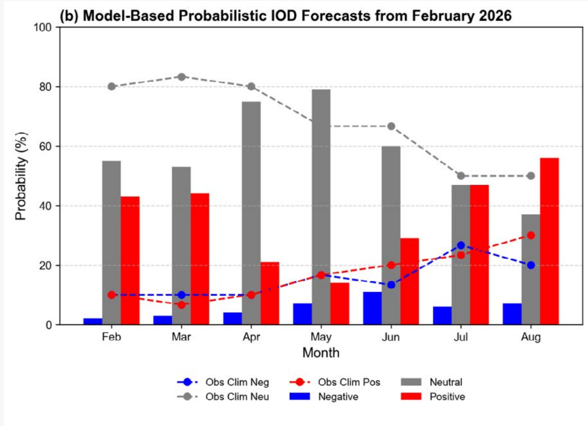


Figure 34. *IOD outlook for 2026*

Probabilistic forecasts generated by CCSR@ NASA-GISS/IRI using February 2026 initialization data indicate that IOD-neutral conditions remain the most likely outcome through February–June 2026. The probability of a positive IOD gradually increases during this period, while the likelihood of a negative IOD remains consistently low (below 10%). By July 2026, neutral and positive IOD phases are equally likely, each with a probability of approximately 47%. In August 2026, the probability of a positive IOD increases to 56%, while neutral conditions decline to about 37%.

Outlook for Oceanic Drivers

Overall, the IOD index is projected to weaken toward near-average conditions in the coming months. Concurrently, SSTs in the equatorial Atlantic—both in the northern and southern tropical regions—are expected to remain slightly above normal, maintaining the broader pattern of Atlantic warmth observed over recent seasons.

These evolving oceanic conditions suggest that IOD-neutral conditions will dominate in the near term, with a gradual emergence of positive IOD signals later in 2026. In summary, while positive IOD conditions emerge as an increasing possibility later in the year, neutral conditions remain the dominant and most likely state in the near to medium term.

5.3 Seasonal Rainfall and Temperature Projections

Short-term seasonal outlooks

March–April–May (MAM) 2026 - Rainfall Forecast

The climate outlook for the March–April–May (MAM) 2026 season indicates that near-average to above-average rainfall is expected over the Lake Victoria Basin, the Highlands West of the Rift Valley, the Highlands East of the Rift Valley (including Nairobi), the Rift Valley, and parts of North-western Kenya. Near- average to below-average rainfall is expected over the Southeastern Lowlands, Northeastern, and parts of Northwestern Kenya. Below-average rainfall is expected over the Coastal region. During the season, several areas are likely to experience a generally poor to fair temporal and spatial distribution of rainfall. Occasional heavy rainfall events are likely to occur in some parts of the country.

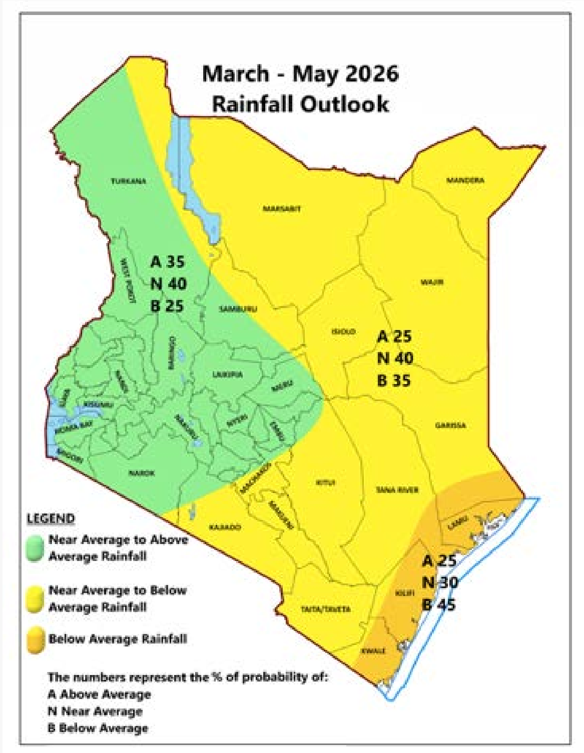


Figure 35. *MAM 2026 Rainfall Forecast*

March–April–May (MAM) 2026 - Temperature Forecast

The climate outlook for the March–April–May (MAM) 2026 season indicates that warmer than average temperatures are expected over the whole country, with increased probabilities over parts of the Lake Victoria Basin, the Coast, the South-eastern Lowlands and North-eastern Kenya as shown.

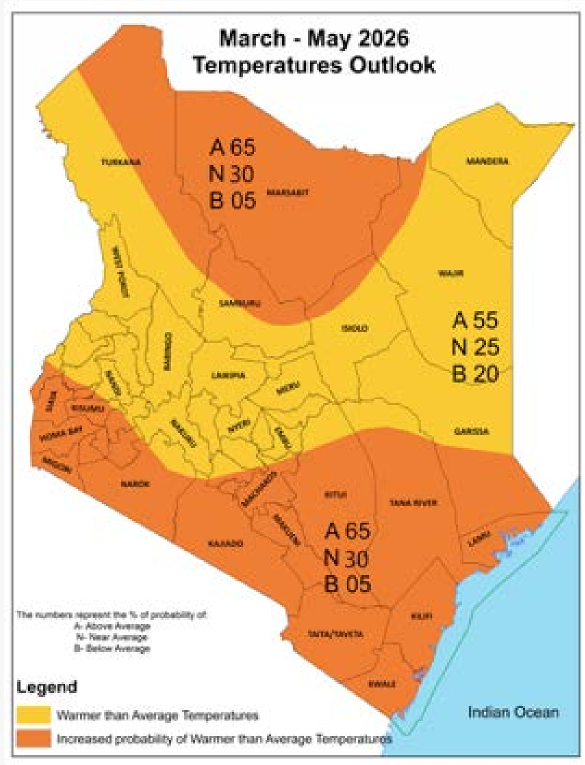


Figure 36: *MAM 2026 Temperature Forecast*

5.4 Socio-economic indicators

The March-April-May (MAM) 2026 "Long Rains" season is anticipated to bring varied socio-economic implications across Kenya, influenced by regional rainfall patterns and warmer-than-average temperatures. In areas expecting near- to above-average rainfall, such as the Lake Victoria Basin, Highlands West and East of the Rift Valley, and parts of the Rift Valley, agricultural productivity expect to see boosts through enhanced crop diversification, water harvesting, and fodder conservation, leading to improved food security, higher livestock production, and increased sales opportunities for seeds and agro-chemicals. However, these regions face risks of flooding, landslides, soil erosion, and pest outbreaks, potentially disrupting supply chains, causing infrastructure damage, and increasing production costs due to nutrient leaching and post-harvest losses.

The livestock sector may benefit from regenerated pastures and reduced conflicts but could suffer from disease outbreaks and milk gluts, while water resources might improve aquifer recharge and sanitation yet heighten flood-related contamination and utility disruptions. Energy production could gain from higher hydropower inflows, stabilizing supply and lowering electricity costs, though sedimentation and flood risks to dams pose challenges. Health outcomes may include reduced malnutrition but elevated threats from waterborne and vector-borne diseases like cholera and malaria, straining facilities, and access during floods.

Conversely, in regions projected for near- to below-average rainfall, including the Southeastern Lowlands, Northeastern Kenya, and the Coast, socio-economic pressures are likely to intensify, with declined crop yields, reduced incomes, and heightened food insecurity exacerbating malnutrition and poverty. Livestock challenges may involve poor pasture regeneration, increased trekking distances, resource-based conflicts, and depressed prices due to deteriorating animal conditions, while water scarcity could spark conflicts and limit irrigation, leading to low reservoir inflows.

The energy sector might experience reduced hydro contributions and higher cooling demands, necessitating shifts to geothermal and wind sources. Health risks could rise from waterborne diseases and heat stress, particularly affecting vulnerable groups like under-fives and pregnant women. Environmental impacts include heightened forest fire risks and biodiversity loss in drier areas, alongside potential deforestation from over-reliance on resources, while transport could face dust pollution and insecurity in conflict zones, though minimal disruptions favor infrastructure maintenance. Following the MAM season, the June-July-August (JJA) period typically represents Kenya's coolest and driest season climatologically, based on 1991-2020 averages. This cool, dry weather supports comfortable tourism and wildlife viewing, particularly in game reserves like the Maasai Mara during the Great Migration peak in July-August, but can strain water resources in pastoral areas, increasing reliance on boreholes and potentially heightening human-wildlife conflicts. Agriculture in rain-fed zones may face reduced productivity, emphasizing the need for drought-resistant crops and irrigation planning.

Towards the end of 2026, a likely El Niño signal is projected, with multi-model ensembles indicating a 58-61% probability of El Niño conditions dominating from June-December. However, ENSO forecasts issued during the spring (MAM) season should be treated with caution due to the "spring predictability barrier," which often leads to reduced forecast skill for the subsequent seasons. This could enhance rainfall during the October-November-December (OND) short rains, particularly in eastern and central Kenya, potentially alleviating dry season deficits but raising risks of flooding in vulnerable river basins. Socio-economic benefits might include boosted crop yields and hydropower generation, while challenges could involve increased vector-borne disease outbreaks and infrastructure strain, underscoring the importance of early warning systems and adaptive strategies. In wetter areas, focus on early warnings, infrastructure reinforcement like dikes and drainage systems, disease surveillance, and value addition for surpluses can minimize losses, while promoting integrated pest management and efficient water use supports resilience. In drier regions, drought-tolerant crops, water harvesting, conflict resolution, and livelihood diversification—such as through cash transfers and insurance—can bolster food security and reduce migration.

Across sectors, multisectoral coordination, community awareness, and resource mobilization involving government, NGOs, and private entities are crucial to harness positive opportunities and avert negative outcomes, ultimately fostering sustainable economic growth amid climatic variability. Recommended interventions from the Short Rains Assessment, totaling Kenyan Shillings (KES) 57.31 billion (United States Dollars [USD] 456.63 million) for February-July 2026, include safety nets for food assistance (KES 30.18 billion), livestock support (KES 3.43 billion), water infrastructure enhancements (KES 5.54 billion), health and nutrition programs (KES 9.98 billion), agricultural inputs and pest management (KES 2.59 billion), education initiatives like school meals and Water, Sanitation, and Hygiene (WASH) programs (KES

5.45 billion), child protection measures (KES 0.06 billion), peace-building efforts (KES 0.03 billion), and coordination logistics (KES 0.05 billion) to address immediate needs and build long-term resilience.

Projected Food Insecurity

April–June 2026: Outcomes are projected to remain strained, with Crisis (IPC Phase 3) persisting in most pastoral areas and Emergency (IPC Phase 4) in Mandera due to below-average pasture regeneration, low livestock productivity, and constrained household incomes amid elevated staple prices. In marginal agricultural areas, Stressed (IPC Phase 2) outcomes are expected in most regions, escalating to Crisis (IPC Phase 3) in counties like Kitui, Kilifi, Kwale, Lamu, Makueni, and Meru North, driven by poor crop production, high market reliance, and limited access to inputs.

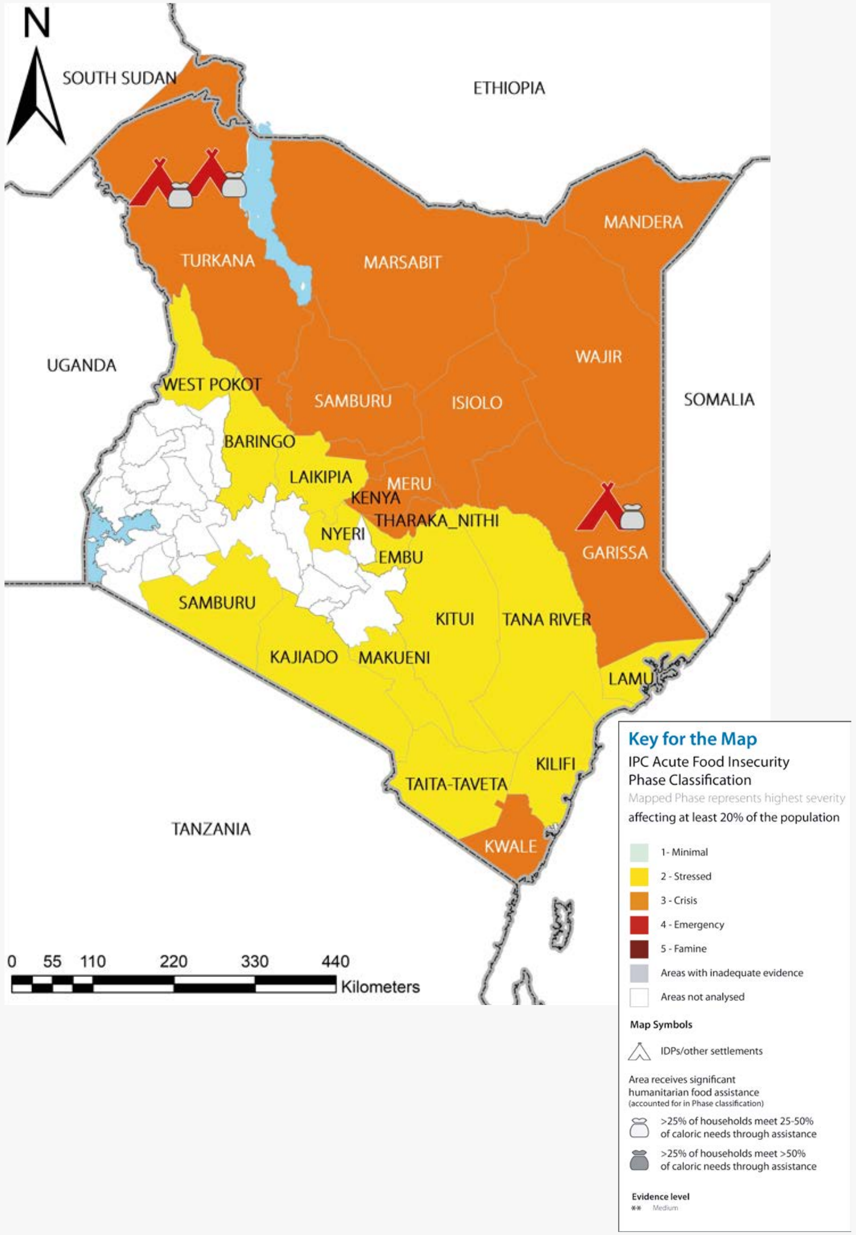


Figure 37: Current and Projected Food Security Phase Classification (from October–January 2026, April to June 2026). Source: NDMA

Chapter 6: Climate Services, Observations, and Capacity

6.1 State of Climate Services in Kenya

Early warning systems

In 2024 Kenya operationalized its National Framework for Climate Services which provides the framework for the provision of climate services. Under this framework priority sectoral focal points work with KMD to include impacts in the forecasts at seasonal timescale as well as document impacts of weather events throughout the seasons. This allows KMD to tailor make the forecasts to suit the needs of users.

KMD likewise works with various partners to develop impact-based forecasts for residents of informal settlements particularly those in Nairobi as a pilot to expand to other cities.

6.2 Climate Data and Information Systems

Climate Data

KMD's division on climate data mandate includes managing climate data from all meteorological observation platforms owned by KMD and other partners in weather observation. Once climate data is collected in the field, climate data is sent to headquarters where it is received through hand-written paper registers/forms/books, email, sms and internet. Automatic Weather Stations (AWSs) relay their data through telemetry using sim-cards via GSM or M2M network. The data undergoes initial quality control at the point of collection in the field.

Once the data in paper form is received at the headquarter, it is digitized into the computerised electronic database where it undergoes further quality checks before it is archived ready to be made available to users. The paper records are securely archived in climate-proof cabinets for preservation and storage.

Data availability and gaps

KMD data dates back to colonial times either as daily or monthly record. Where data gaps exist, use of proxy data from satellite and reanalysis is employed. The proxy data is bias corrected before it is made available for use. Some of the available data include parameters such as rainfall, temperature, windspeed and direction, relative humidity, pressure, evaporation, radiation, sunshine hours, visibility, pollution data (ozone, CO2, CO, Nox, aerosols). However, not all data is digitized therefore some data is still in paper records.

Data Access

To access KMD climate data, Kenya Meteorological Department has onboarded its services on the E-citizen portal. Requests for data and climate information can now be made through the E-citizen portal.

How to request for data

1. Open a web browser in your phone, tablet, laptop or desktop computer
2. Click on kmd.ecitizen.go.ke
3. On the top right side of the page sign in with your e-citizen account or register
4. Scroll down to Online Services
5. Under Data and Information Request, Click Apply Now
6. Fill the details of the data required and submit

KMD Maprooms

KMD Maprooms is a dedicated Climate Information Service (CIS) web portal available 24/7. The Maprooms use merged station and satellite data for rainfall on one hand, and station and reanalysis data on the other for other weather parameters to produce climate information ensuring spatial and temporal coverage across entire Kenya. The Maprooms aim to continuously enhance data availability, access and use on a daily to annual basis for a particular County, Sub-county, Ward or grid points as required. Maprooms users can;

1. Understand natural variability in temperature and rainfall over national, regional, County, Sub-county, Ward or grid points and assess the impacts on development outcomes.
2. Understand climate sensitivity to map populations and systems at risk of climate variability and change.
3. Improve the timing and scale of climate-sensitive interventions and design early-warning systems.

Maproom provides reliable and readily accessible climate data at high resolution to decision makers. It delivers robust climate data, targeted information products, enabling them to apply climate information to decision making with confidence.

6.3 Capacity Building and Partnerships

The Institute for Meteorological Training and Research (IMTR), designated as a WMO Regional Training Centre (RTC), continued to strengthen regional and national capacity in meteorology, climate services, and satellite meteorology throughout 2025. The Centre supported National Meteorological and Hydrological Services (NMHSs) across Africa through structured training programmes, technical workshops, and specialized satellite application courses.

During the reporting period 2025, IMTR conducted eleven (11) major training programmes delivered predominantly through face-to-face modalities, with one fully online regional course. A total of 243 participants were trained, comprising:

- 85 Kenyans (local) participants
- 158 international participants

International participants were drawn from the following countries: Angola, Botswana, Cabo Verde, Djibouti, Egypt, Eritrea, Eswatini, Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe.

Satellite Meteorology and Application Training

Satellite meteorology remained a core focus area in 2025, with approximately 304 hours dedicated to satellite-related instruction across multiple programmes.

Key activities included:

- EUMETSAT–IMTR Satellite Application Course (EISAC) – Online Edition (March–April 2025): 60 hours of instruction with 126 participants (8 local and 118 international) drawn from across the African region.
- EUMETSAT–IMTR Satellite Application Course (EISAC) – Face-to-Face Edition (May 2025, Kenya): 40 hours of training with 21 participants (1 local and 20 international) from Botswana, Zimbabwe, Uganda, Tanzania, Egypt, Lesotho, Liberia, Gambia, Sierra Leone, Nigeria, and Kenya.

PUMA/ClimSA Stations 2025 Capacity Development

With the upgrade of EUMETCast-Africa reception station in all NMHSs in Sub-Saharan Africa to ensure access and visualization of MTG products, IMTR supported the rollout and operationalization of the PUMA 2025 Programme in partnership with the African Union Commission (AUC) and EUMETSAT.

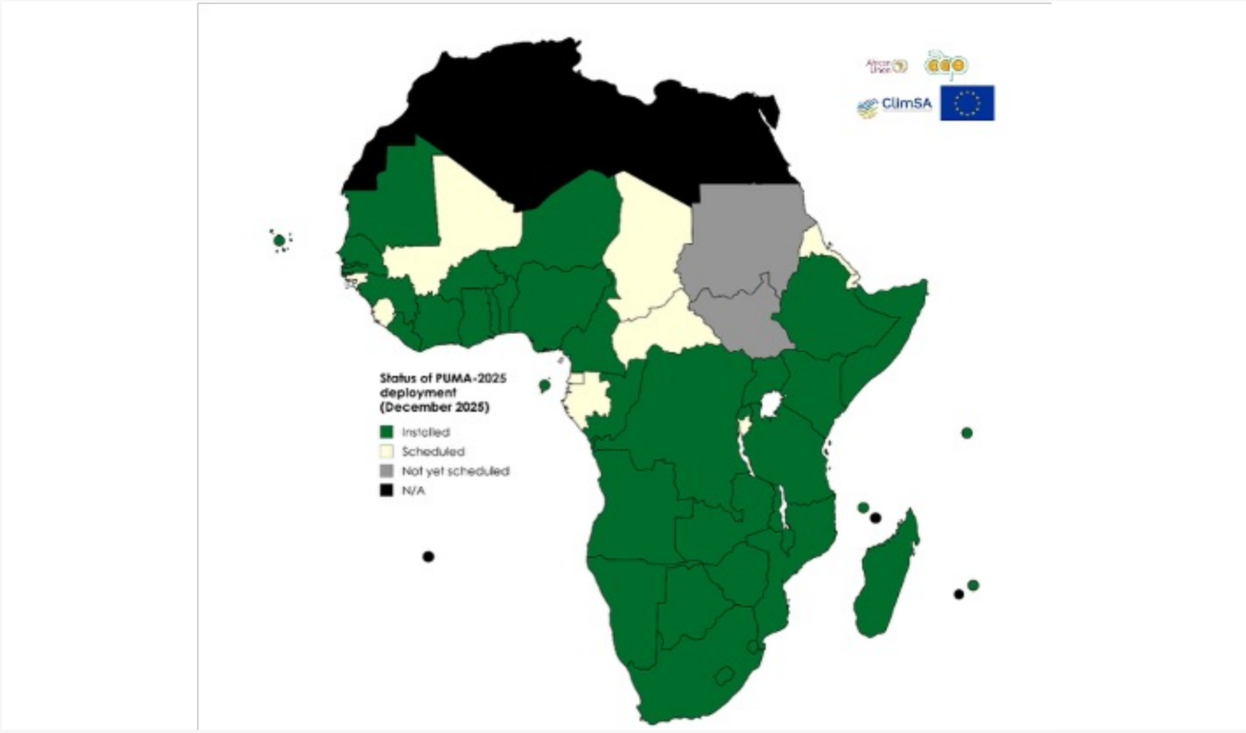


Figure 38. *Status of PUMA deployment across Africa*

The support included capacity development of Forecasters, Climate Scientists and IT/Technical experts as below:

- Use of PUMA 2025 Station for Weather Forecasting; August and October 2025: 80 hours combined, with 42 participants (3 local and 39 international) from Botswana, Kenya, Lesotho, Namibia, South Africa, Tanzania, Nigeria, Somalia, Mozambique, Angola, Gambia, Cabo Verde, Uganda, Malawi, Zambia, Seychelles, Ghana, South Sudan, Eswatini, and Sudan.
- Maintenance of PUMA 2025 Stations; September and November 2025: 40 participants (3 local and 37 international) from Gambia, Botswana, Lesotho, Namibia, South Africa, Tanzania, Eswatini, Nigeria, Somalia, Mozambique, Kenya, Uganda, Malawi, Zambia, Ghana, Cabo Verde, Seychelles, South Sudan, Mauritius, Rwanda, Zimbabwe, and Sudan.
- Use of ClimSA Stations for Climate; May 2025, conducted in collaboration with ICPAC, delivered 30 hours of climate-focused instruction to 15 participants (10 local and 5 international) from Kenya, Somalia, Sudan, Djibouti, and Eritrea.

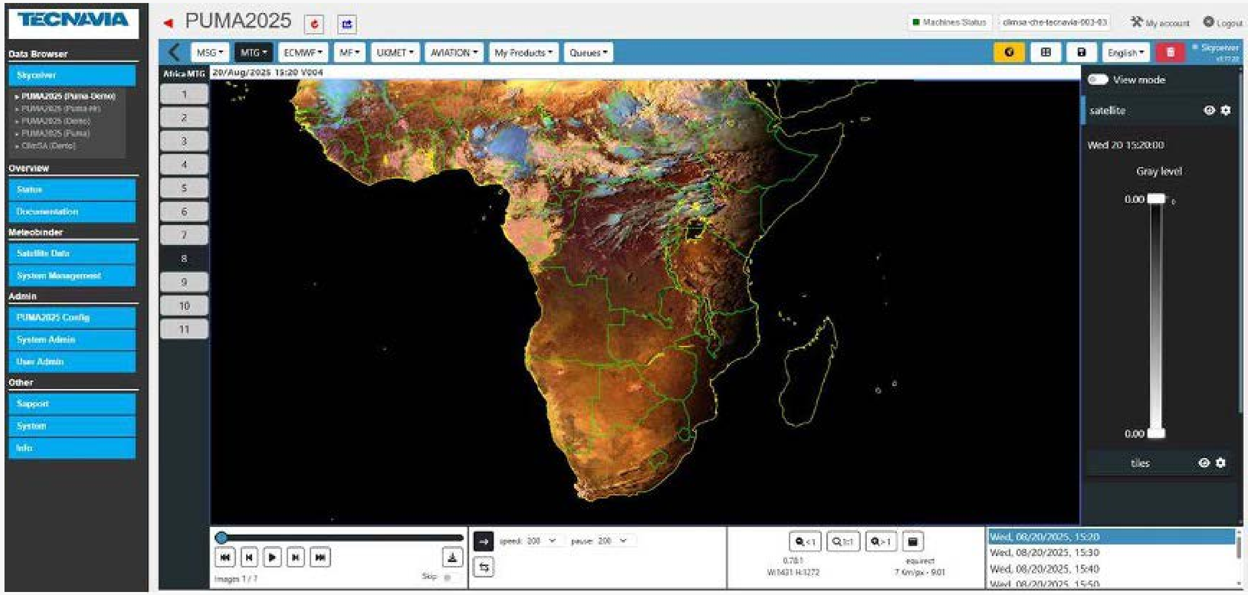


Figure 39: *PUMA/ClimSA 2025 user interface for Forecasters and Climate Scientists*

Forecasters' and Technicians' Training

With a mandate to provide professional and technical training for Meteorologists, Forecasters, and Meteorological Technicians in Kenya and across the African region. The Institute delivers competency-based training programmes designed to strengthen forecasting skills, enhance technical capacity in observation and instrumentation, and improve the application of satellite and climate information in operational meteorology. Through structured long-term courses and specialized short-term trainings, IMTR plays a critical role in building a skilled workforce capable of supporting effective weather forecasting, climate services delivery, and early warning systems. In 2025, these trainings were carried out:

- Operational Training Courses; 2024–2025 and 2025 cohorts; 46 Kenyan participants trained in the 6 months' training.
- Middle Meteorological Technicians Course; 2023–2025 cycle, 11 Kenyan participants were trained
- CREWS/SWFP Eastern Africa Training Desk; August 2025, provided focused training to 9 participants (3 local and 6 international) from Kenya, Somalia, Sudan, and Djibouti under the CREWS Project.

Strategic Impact and Outlook

IMTR's 2025 activities contributed directly to strengthening operational forecasting capacity, enhancing satellite data utilization for impact-based forecasting, supporting the implementation of modernized reception systems under PUMA 2025, and advancing regional collaboration and peer learning.

In 2026, IMTR aims to expand hybrid and online training modalities, increase participation from Least Developed Countries (LDCs), and further integrate satellite meteorology into climate services delivery frameworks.

6.4 Early Warning for All (EW4ALL)

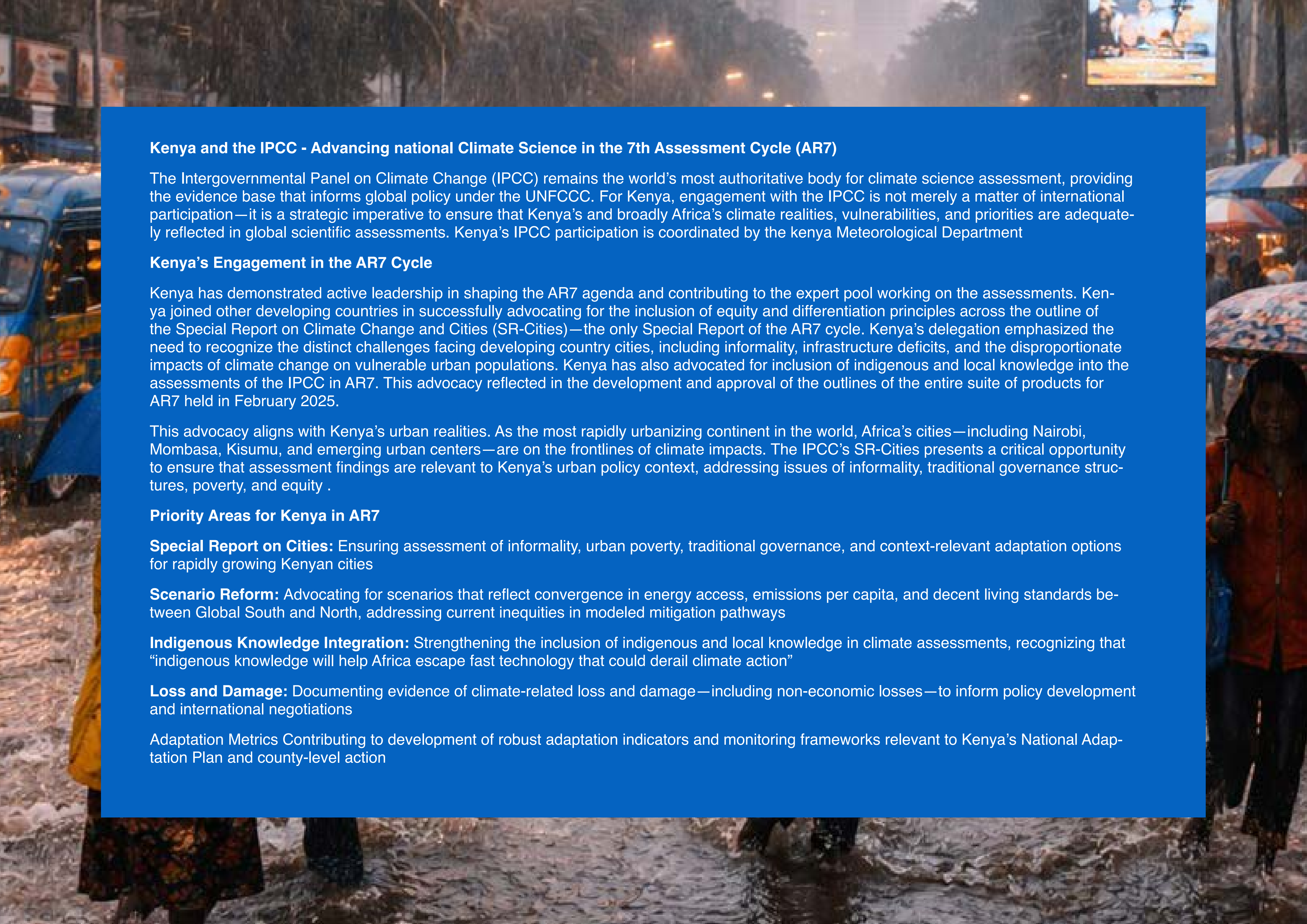
The global Early Warnings for All (EW4ALL) initiative, launched by the UN Secretary-General, aims to ensure that everyone on earth is protected by life-saving early warning systems by 2027. Kenya is among the initial priority countries for accelerated implementation. In May 2025, Kenya launched its National EW4ALL initiative representing a transformative shift toward proactive risk management, supporting policymakers in driving meaningful change that saves lives, safeguards development gains, and builds a climate-resilient Kenya (figure 41).

Figure 40. *Launch of EW4All*

The EW4All comprises the four foundational pillars of early warning systems and the coordination plan is outlined as follows:

- **Pillar 1:** Disaster risk knowledge led by (UNDRR, NDOC – Kenya) - systematically collect risk data and undertake risk assessments on hazards and vulnerabilities to improve risk understanding.
- **Pillar 2:** Observations and Forecasting led by KMD - develop hazard monitoring and early warning services.
- **Pillar 3:** Warning Dissemination and communication – led by International Telecommunication Union (ITU), Communication Authority of Kenya (CA) - communicate risk information so it reaches all those who need it and is understandable and usable.
- **Pillar 4:** Preparedness and response led by International Federation of Red Cross and Red Crescent Societies (IFRC) and the Kenya Red Cross Society (KRCS) - build national and community response capabilities.

The launch of the EW4All initiative in Kenya marks a significant step towards enhancing climate resilience and disaster risk preparedness. With support from government, private sector, and development partners, the initiative is poised to save lives and protect livelihoods through timely, accessible, and actionable warning systems tailored to local needs.



Kenya and the IPCC - Advancing national Climate Science in the 7th Assessment Cycle (AR7)

The Intergovernmental Panel on Climate Change (IPCC) remains the world's most authoritative body for climate science assessment, providing the evidence base that informs global policy under the UNFCCC. For Kenya, engagement with the IPCC is not merely a matter of international participation—it is a strategic imperative to ensure that Kenya's and broadly Africa's climate realities, vulnerabilities, and priorities are adequately reflected in global scientific assessments. Kenya's IPCC participation is coordinated by the kenya Meteorological Department

Kenya's Engagement in the AR7 Cycle

Kenya has demonstrated active leadership in shaping the AR7 agenda and contributing to the expert pool working on the assessments. Kenya joined other developing countries in successfully advocating for the inclusion of equity and differentiation principles across the outline of the Special Report on Climate Change and Cities (SR-Cities)—the only Special Report of the AR7 cycle. Kenya's delegation emphasized the need to recognize the distinct challenges facing developing country cities, including informality, infrastructure deficits, and the disproportionate impacts of climate change on vulnerable urban populations. Kenya has also advocated for inclusion of indigenous and local knowledge into the assessments of the IPCC in AR7. This advocacy reflected in the development and approval of the outlines of the entire suite of products for AR7 held in February 2025.

This advocacy aligns with Kenya's urban realities. As the most rapidly urbanizing continent in the world, Africa's cities—including Nairobi, Mombasa, Kisumu, and emerging urban centers—are on the frontlines of climate impacts. The IPCC's SR-Cities presents a critical opportunity to ensure that assessment findings are relevant to Kenya's urban policy context, addressing issues of informality, traditional governance structures, poverty, and equity .

Priority Areas for Kenya in AR7

Special Report on Cities: Ensuring assessment of informality, urban poverty, traditional governance, and context-relevant adaptation options for rapidly growing Kenyan cities

Scenario Reform: Advocating for scenarios that reflect convergence in energy access, emissions per capita, and decent living standards between Global South and North, addressing current inequities in modeled mitigation pathways

Indigenous Knowledge Integration: Strengthening the inclusion of indigenous and local knowledge in climate assessments, recognizing that "indigenous knowledge will help Africa escape fast technology that could derail climate action"

Loss and Damage: Documenting evidence of climate-related loss and damage—including non-economic losses—to inform policy development and international negotiations

Adaptation Metrics Contributing to development of robust adaptation indicators and monitoring frameworks relevant to Kenya's National Adaptation Plan and county-level action

Challenges and the Way Forward

Despite progress, challenges remain. African experts—including those from Kenya—face barriers to full participation in IPCC processes, including:

- Limited access to high-impact journals and scientific literature.
- Visa challenges affecting attendance at IPCC meetings .
- Underrepresentation in author teams relative to the continent's population and vulnerability.
- Balancing existing responsibilities and duties with the work of the IPCC

Kenya is leveraging crucial partnerships to actively work to address these gaps through capacity building, mentorship of early-career scientists, and coordinated African positioning in IPCC negotiations.

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