Climate Centre

Kenya Red Cross

Country-level | Climate fact sheet

Kenya

The following climate factsheet summarizes available information on the climate of Kenya, climate change and impacts of these changes on humanitarian activities in country. Each of the factsheets were written as a compilation of information from peer-reviewed academic papers, government publications, and INGO documentation.

1. Climate Overview

Average annual temperature: With 24°C to more than 30°C in the coastal zones and north and 12°-18°C in the higher elevation areas (Figure 1a). Kenya experiences little seasonal temperature variation due to its geographical location.

Average annual rainfall: Less than 600 millimetres in north and east to over 2000 millimetres in the west. Highland areas receive approximately 1000 millimetres of rainfall each year (Figure 1b)

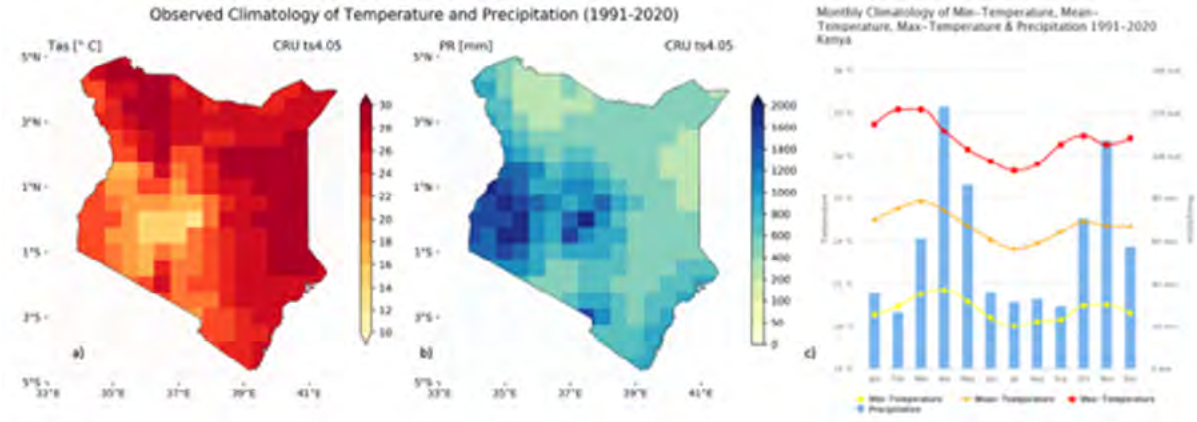

Figure 1: Observed Climatology of mean Temperature (a), annual mean total precipitation (b) and monthly climatology (c) over 1991-2020. (Adapted from World Bank, 2022).

2022

1.1 Short overview

Kenya's climate is tropical along the coast, semi-arid to arid in the east and north of country and temperate in the highlands and rift valley. The climate variations across the country are influenced by topography. Due to the influence of the Intertropical Convergence Zone (ITCZ) most of the country experiences a bimodal rainfall with long rains in March-May and short rains in October-December. The months of June to August are characterized by cooler temperatures while the highest temperatures are typically experienced during the month of February and March (Figure 1c).

Partly due to El Niño Southern Oscillation (ENSO), Kenya is prone to cyclical prolonged droughts associated with rainfall below average during La Niña episodes. Wetter than normal conditions in most parts of the country are usually observed during El Niño episodes. Indian Ocean Dipole (IOD) is also a driver of the rainfall variability over the region (Endris *et al.*, 2013).

The diverse and varied geography of Kenya means that it is exposed to a broad array of environmental hazards (hydrometeorological as well as geophysical) which are directly impacted and exacerbated by the impacts of climate change across the country. Ranked 27 out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022), Kenya is one of the higher hazard risk countries in the world.

Extreme Weather and Hazards

Kenya is at risk from an array of natural hazards, the most predominant hydrometeorological phenomena that impact the country and are impacted directly by the effects of climate change revolve around drought, flooding. In addition, Kenya's 1420 km of coastlines faces a threat from rising sea levels. Figure 1 shows the combined vulnerability of the country to the three hazards of flooding, droughts, and sea level rise. The World Bank (2021) estimates that 70% of the natural disasters occurring in Kenya can be attributable to extreme climatic events (World Bank, 2021). The interactions between the cycle of droughts and floods leads to loss of life as well as extensive socio-economic impacts on livelihoods and the economy at large.

Climate Change in Kenya

Historical climate change	Projected climate change
Temperature	
▪ The mean annual temperature over Colombia have increased at a rate of approximately 0.3°C/decade since 1961 to 2015 (Gutiérrez *et al.*, 2021) ▪ The frequency and intensity of hot extremes have increased and cold extremes have decreased (Seneviratne *et al.*, 2021)	▪ Mean temperature over the region are projected to rise until 2050 by at least 1.5°-2°C for a high greenhouse gas concentration scenario (SSP5-85) and 1°-1.5°C for low greenhouse gas concentration scenario (SSP2-4.5) (Gutiérrez *et al.*, 2021). ▪ Maximum and minimum temperature will increase, and heat waves will intensify in duration and peak temperatures for every increase in global warming levels above the pre-industrial values. In line with rising mean annual temperatures, the annual number of very hot days (days with daily maximum temperature above 35 °C is projected to rise and with high certainty (Gutiérrez *et al.*, 2021; Ranasinghe *et al.*, 2021; Seneviratne *et al.*, 2021)
Precipitation	
▪ Overall changes in mean rainfall is unclear for the country. However northern parts of the country have become wetter, while southern Kenya has become drier due to variability in 'short rains' (SNC, 2015)	▪ Mid-century estimates (2040-2060) of annual precipitation changes over Kenya under a low emission scenario (SSP2-4.5) and high emissions scenario (SSP5-8.5) is projected to increase around 10-15%, with enhanced interannual variability (Gutiérrez *et al.*, 2021) ▪ The frequency and intensity of heavy precipitation events are projected to increase with potential effects in flooding and soil erosion (Seneviratne *et al.*, 2021)

Legal and Policy Framework for DRR

- The Kenyan 2010 Constitution: underscores the importance of disaster management (articles 185 (2), 186 (1) and 187) and provides an avenue for disaster management legislation,
- Vision 2030 is the Climate Change Response Strategy of Kenya
- The National Disaster Risk Management Policy The country's National DRM Policy is aligned with the Sendai framework and focuses on resilience and a multi-hazard approach.
- National Climate Change Council: tasked with mainstreaming climate change and overseeing NCCAP.
- The National Drought Management Authority: Strives to end drought emergencies in Kenya (NDMA, 2016). The NDMA has the power to exercise control over all drought risk management and to establish mechanisms, independently or with other stakeholders that will advance the country towards Ending Drought Emergencies (EDE) in Kenya.

2. Priorities of the Movement and climate change

2.1 Scale up climate-smart DRR, early action and preparedness

Observed hazard	Projected Risk
Flooding	
Figure 1 shows the flood frequency across regions of Kenya. Between the years 1990-2020, Kenya experienced 45 major flood events (8 flash floods, 37 riverine floods) which impacted almost 2.5 million people. The flood events led to almost 1400 deaths across the various events The Government of Kenya (2016b) reports that flood related fatalities constitute 60% of disaster victims and that the impacts of flooding are felt in the infrastructure, housing and livelihoods of people. The national adaptation plan outlines that flooding results in losses of 5.5% of GDP every 7 years (Government of Kenya, 2016b).	The World Bank (2021) describes how climate change is expected to increase the risk and intensity of flood events as well as the total average annual rainfall amounts (World Bank, 2021) which could have knock on effects for other hazards and social vulnerability. Intense rainfall is projected to be especially increasing in mountainous areas of Kenya, which could have knock on effects on hazards, increasing the likelihood of mudslides and landslides, posing further threat to civilian populations and infrastructure. In addition, this could lead to further problems as soil erosion and water logging leads to challenges for agriculture and food security in the longer term.
Drought	
Droughts across Kenya but are most frequent in the arid and semi-arid regions which comprise 18 of the 20 most vulnerable counties of the country (World Bank, 2018). Droughts have long-lasting impacts on livelihoods and economy and affect hundreds of thousands of people across the country. Between 1990-2020 Kenya experienced 16 major drought events which in total impacted almost 53 million people. Damages incurred from drought events, which can last several years occur in a variety of ways; crop production and livestock are some of the first sectors to see the impacts but other effects such as forest fires, damages to fisheries and impacts on energy security from sources of hydropower are also areas of the country's economy that are severely impacted by drought (Government of Kenya, 2015).	Aridity is also expected continue increasing with rising temperatures leading to more arid and semi-arid regions and susceptibility to drought, especially more prolonged periods of drought (World Bank 2021). The extent of the drought periods puts increased stress on the communities who are forced to adjust their lifestyles and livelihoods to cope with the lack of rainfall and associated impacts.
Sea level rise	
The World Bank's Climate Change Knowledge Portal (CCKP) highlights this increase in sea level and points out that vulnerability assessments need to be conducted across the coastal regions to better understand what the impacts for coastal communities will be.	Sea levels have been steadily increasing since 1993, this is projected to increase as global sea levels continue to rise, putting pressure on coastal communities to adapt their livelihoods and lives (World Bank, 2021).

It is essential to note that many of these hazards are interrelated and produced compound risks to the same areas and communities. In addition, risk must be understood as the interplay between hazard risk, exposure, and vulnerability which make certain communities, individuals, and sectors more impacted by the hazards. All project design should consider the risk mentioned above and the compounding risks they represent.

Disaster Risk Management Strategies

Kenya's updated NDC (2021) includes a specific focus on enhancing resilience, especially by mainstreaming climate change adaptation into Medium-Term Plans (MTPs) and the County Integrated Development Plans (CIDPs) (Government of Kenya, 2021). Some of the activities that the government has outlined to do this include enhanced Early Warning Systems, reducing flood and drought risks and protecting natural assets such as forests, mangroves, seagrass and coral ecosystems.

In the National Policy for Disaster Management in Kenya, special attention is drawn to making provisions for Indigenous Knowledge resource (Government of Kenya, 2009). Outlining the features of an effective disaster management system, the document highlights the importance of incorporating information from diverse linkages and local source, including monitoring, analysis, early warning system and research, using a network of sources, especially indigenous knowledge resources, traditional technologies, and coping strategies from communities (Government of Kenya, 2009).

The DRR approach in Kenya has been integrated at the country level in the CIDPs but a number of important challenges still exist to the effective implementation of DRR activities for communities (Nyandiko, 2020). Nyandiko (2020) outlines several challenges that still need to be addressed for enhanced DRR in Kenyan counties. These revolve around sufficient funding, improved coordination, availability of trained personnel and improved engagement of vulnerable populations. In addition, Nyandiko critiques that the policy's examined in their research of 5 counties showed poor alignment with the Sendai framework, leading to calls for better streamlining and mainstreaming of DRR and Climate Change Adaptation across the country.

The Government of Kenya has taken steps to work towards achieving the goals of the Sendai Framework for Disaster Reduction (2015-2020) (UNDRR, 2022) and hosted the African Regional annual meetings for DRR. In 2021, Nairobi hosted the 8th Africa Regional Platform for Disaster Reduction and the 7th High-level meeting on Disaster Reduction, highlighting the country's aspirations to push forward on the disaster reduction agendas. One of the outputs of the meetings was the 'Nairobi Declaration on accelerating the path to achieving the goals and targets of the Programme of Action for the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 in Africa'.

2.2 Reduce health impacts of climate change

Climate change will likely increase health risks from malnutrition, heat stress, air pollution, vector-borne diseases (malaria, dengue fever, Rift Valley fever, tick-borne diseases and schistosomiasis), water-borne diseases, and communicable and non-communicable diseases as the temperature rise and rainfall patterns change (World Bank, 2011).

Temperature rises could drive an increase and geographical shift of mosquito-borne diseases (mainly malaria and dengue fever) distribution to the highland areas (Nosrat *et al.*, 2021). Notably, the rural population at risk of malaria may increase by up to 89% by 2050s and spread to highland areas that have historically been homes to 70% of the population (Government of Kenya, 2018).

Temperature rises, and extreme events will disrupt food systems as agricultural production is impacted, causing food insecurity, hunger, and stunting, especially among the most vulnerable people (World Bank, 2021). Frequent and severe droughts are expected to decrease crop yields and increase pests and diseases. Furthermore, morbidity and mortality related to heat stress are projected to increase as temperature rises, especially in urban areas, due to the urban heat island effect. Heat-related deaths among elderly people may increase from about 45 deaths per 100,000 people by 2080, while for the general population will rise from the annual 0.6% in 2000 to 6.0% by 2080 (Potsdam Institute & GIZ, 2021; World Bank, 2021)

Finally, severe flooding and droughts will increase the risk of contamination and water scarcity leading to an increase in water-borne diseases, such as cholera, typhoid, diarrhea, and Hepatitis A (International Centre on Environmental Monitoring (CIMA) & UNISDR, 2018).

2.3 Sustainable water: resources management, infrastructure and access

Water, Sanitation and Hygiene

Extreme temperatures, rainfall and droughts will lead to reduced water availability and quality and increased damage to water and sanitation infrastructure (AdDB, 2019).

Climate change will further increase the stress on water resources caused by population increase and environmental degradation (USAID, 2018). Glacial loss, increased rainfall variability, temperature increases leading to increased evaporation rates, and increasing contamination of water sources due to flooding and/or drought (will lead to reduced access to surface water for critical (Government of Kenya, 2018; USAID, 2018). Furthermore, the unreliable rainfall and increase in evaporation will change the groundwater infiltration rates, reducing the reliability of groundwater sources (World Bank, 2021).

Hydropower potential is expected to maintain relative stability due to geographic variability in rainfall patterns, with production predicted to increase in some areas and decrease in others (CIMA & UNISDR 2018). Nevertheless, hydropower production has been shown to drop by up to 40% in drought years, increased energy insecurity and shifting reliance to petroleum-based energy production (USAID 2018).

Infrastructure, power and electricity

Hydropower potential is expected to maintain relative stability due to geographic variability in rainfall patterns, with production predicted to increase in some areas and decrease in others (CIMA & UNISDR 2018). Nevertheless, hydropower production has been shown to drop by up to 40% in drought years, increased energy insecurity and shifting reliance to petroleum-based energy production (USAID 2018).

2.4. Enable climate resilient livelihoods and economic security

An increase in the frequency, magnitude and extent of extreme weather events is threatening rural livelihoods, especially in the semi-arid and arid regions (Kalele *et al.*, 2021), impacting ecosystem services and therefore critical sectors of the economy such as agriculture and tourism. Models project that climate change will lead to losses "equivalent to 2.6% of the GDP annually" by 2030 (USAid, 2018).

While different populations will experience different threats and pressures due to climate change in Kenya, pastotalists will face particular challenges (Birch,2018). Under increased climate stress, pastoralists need to diversify livelihoods, which is increasingly being adopted as a survival strategy (Herrero et al, 2016; Omolo, 2011). Rising food insecurity associated with climate change is also projected to disproportionately impact refugee populations, who already often live isolated, food-insecures areas.

Staple crops and livestock are at risk due to climate change. Frequent droughts and floods, crop calendar changes, and an increase in crop pests and diseases significantly impact agricultural productivity (Musafiri *et al.*, 2021). The livelihoods of poor people and almost two-thirds of Kenyans dependent on agriculture, primarily rainfed (98%), will be threatened by these shocks (Birch, 2018; USAID, 2018). Agricultural losses will increase by 50%, with the biggest drops anticipated for staple crops such as cassava, sweet potato, wheat, and cabbage, as well as key exports such as tea and coffee (CIMA & UNISDR, 2018; NCCAP, 2018). Livestock exposure to drought will double (CIMA & UNISDR 2018); higher temperatures will increase heat stress, disease prevalence, and death in livestock while also lowering production (NCCAP, 2018). Crops such as beans and maize will need to shift to higher elevations, and lowland crops will experience yield decreases of 20% (USAID, 2018). Geographic impact will spread from concentrations in the west to country-wide (CIMA & UNISDR, 2018). Furthermore, pests infestations are projected to rise, which will cause huge agricultural losses (Kenya News Agency, 2021; Schneider *et al.*, 2022).

Kenya's ecosystem provides valuable resources and services that contribute about 42% of the country's GDP and support 70% of people's livelihoods (National Environment Management Authority (NEMA), 2021). They are also vital for the country's thriving tourism industry. However, climate change is causing significant disruptions to ecosystems such as increased coastal erosion, prevalence of wildfires and coral bleaching—key draws in the tourism sector (USAID, 2018).

2.5. Address climate displacement and protection

Current and future displacement challenges

Current and future displacement challengesKenya is a significant refugee-hosting country, with at least 488,000 refugees and asylum-seekers, who are mainly concentrated in the large refugee camps of Dadaab and Kakuma (UNHCR, 2022). It also hosts 190,000 IDPs (IDMC, 2022), with some research pointing to an average of 80,000 Kenyans internally displaced each year, mainly due to climate disasters such as floods and drought (WACC, 2019).

Kenya will see increased rates of climate displacement in the near future. According to the World Bank (2021) an estimated 28.5 million people will be displaced due to climate shocks in East Africa by 2050. By 2050, about half of the population is expected to live in urban areas (World Bank, 2016), a trend which climate change will exacerbate.

Droughts and floods are key drivers of internal displacement in Kenya. Increased unpredictability in climate patterns has contributed to longer and more intense droughts as well as unusually strong floods (Nicholson, 2017). Increased, out-of-season rainfall in regions such as the Rift Valley are leading to displacement due to flooding – what one researcher has called a 'slow-motion tsunami' (Baker & Samaki, 2021). Droughts have increased in frequency and severity in Kenya and are projected to become even more extreme over the coming decades (Filho *et al.* 2017, FAO & GEF 2018), which is projected to increase rural-urban migration in regions such as Turkana.

Pastoralists will remain particularly vulnerable to the impacts of drought. Based on current trends, estimates predict that 77% of pastoralists and 55% of agro-pastoralists will have insufficient livestock to stay above the poverty line and be forced out of pastoralism by 2030 (Birch, 2018).

Increasing temperatures and unpredictability of rainfall will also affect livelihoods mobility and raise the risk of conflict. Research points to the potential of increased regional conflicts between pastoralist groups based on climate factors (IDMC 2018); in theory pastoralist groups utilise communal land ownership tenure systems, but in practice regulate the use of grazing areas between and within tribes (Kaimba *et al.*, 2011) found that drought related migration from one regulated area into another was a source of conflict, both amongst pastoralists and between pastoralists and settled farmers.

Protection

Climate change has been labelled a "threat to Kenya's security" due to its potential to drive increases in disasters, gender inequality, environmental degradation, multidimensional poverty, and conflicts over natural resources (Republic of Kenya, 2018).

Migration Law and Policies

- Multiple national and regional frameworks in Eastern Africa and the Horn address people displaced by climate change either explicitly or through interpretation, although there is a need for them to be implemented (Wood & Abuya 2021, UNHCR 2021).
- For example, the Kampala Convention for Internally Displaced People is both the world's first and only binding agreement for protecting IDPs by natural disasters.
- In specific situations the 1951 Convention and the 1969 OAU Convention Governing the Specific Aspects of Refugee Problems in Africa can also protect climate-induced displaced people. In 2020, Member States of the Intergovernmental Authority on Development (IGAD) region – including Kenya – adopted a free movement protocol that allows people at risk of disasters and climate change to enter other IGAD states.

Relevant information from the Nationally Determined Contribution (NDC) (2021)

The next review of the document is envisaged in 2025 (Ministry of Environment and Forestry, 2016).

GHG Emissions Reduction target: reduce its GHG emissions by 32 % by 2030 – a goal that could be raised with the support of the international community. This represents an estimated budget of 62 bullion $US. Kenya also does not have a net 0 target in place. (Climate Action Tracker, 2022)

Area of focus on Adaptation: In term of adaptation, Kenya aims to integrate CC in its medium- and long-term strategic planning, including in DRR policies. DRR, health, loss and damage, and nature-based solutions play an important role in the solution proposed (Ministry of Environment and Forestry, 2021).

Inclusion of DRR: Yes, adopting an enhanced risked-based approach to climate change adaptation, robust EWEA systems and enhance climate resilience of local communities are at the centre of the NDC on adaptation. It also includes climate resilience in all sectors of the economy.

National Designated Entity: Kenya Industrial Research and Development Institute

Key stakeholders: Ministry of Energy, Ministry of Environment and Forestry, Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works, National Climate Change Council, National Environment Management Authority.

Other National Policies on Climate

- National Adaptation Plan in the UNFCCC. This comprehensive document integrates disaster risk management in the health-related adaptation measures and the overall objective of the policy (Ministry of Environment and Forestry, 2016).
- Climate Change Act: Signed in 2016, this framework established the National Climate Change Council, Directorate, and Fund (Ministry of Environment and Forestry, 2016).
- National Climate Change Action Plan (NCCAP) from 2018-2022, which outlines Kenyan climate commitments and is being updated after every five years. Under the NCCAP, sector representatives define priority mitigation actions that are designed to ensure that sectors achieve their sectoral targets (Ministry of Environment and Forestry, 2018).
- Kenya Climate Smart Agriculture Strategy (2017-2026), which includes objectives such as increasing adaptive capacity and resilience of farmers, pastoralists, and fisher-folk, minimize agricultural emissions, and provide support through institutional frameworks (Republic of Kenya 2017).

Climate finance

National societies cannot directly apply for climate finance from the GCF, but they can be an implementing partner for an accredited entity (Climate Centre, 2022a).

National Societies can explore options for accessing climate funds through smaller funds, such as the GEF's Small Grants Programme or the FFEM's Small Scale Initiatives Program. Other funding from bilateral donors, national climate funds, or multilateral climate funds like Adaptation Fund, CREWS, or GCCA+ could be explored (Climate Centre, 2022a).

Engaging in national climate adaptation planning is vital for accessing climate finance.

Additional Resources

Climate Centre. (2022a). Factsheet on Climate Finance. https://www.climatecentre.org/wp-content/uploads/Fact-Sheet-on-Climate-Finance.pdf

Climate Centre. (2022b). Entry points for National Societies on Climate Finance partnerships. https://www.climatecentre.org/wp-content/uploads/Entry-Points-for-Climate-Finance-Partnerships.pdf

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