



Kenya

This climate factsheet summarizes the available information on the climate of Kenya and the impact of climate change on humanitarian activities in-country. Each fact sheet in the series was written using information from peer-reviewed academic papers, government publications, and other documentation from international non-governmental organizations.

1. Climate overview

Average annual temperature: With the coastal zones and north of the country experiencing annual average temperatures of 24–30°C and above, and the higher elevation areas experiencing annual average temperatures of 12–18°C, Kenya has little seasonal temperature variation due to its geographical location.

Average annual rainfall: Less than 600mm in north and east to over 2,000mm in the west. Highland areas receive approximately 1,000mm of rainfall each year.

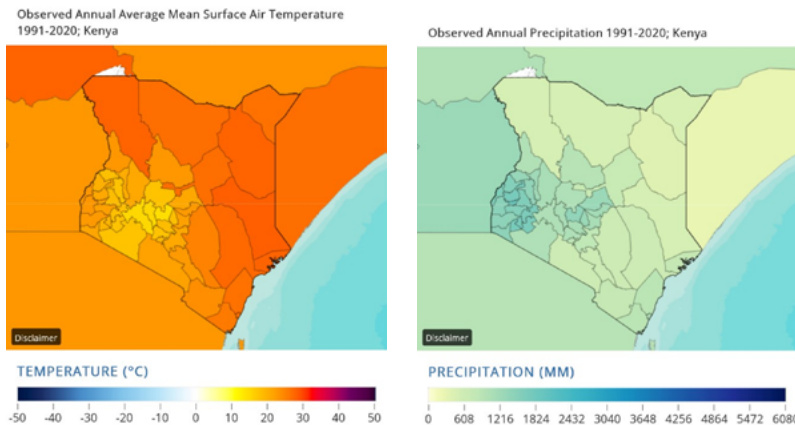


Figure 1: Observed climatology of (left to right) (a) mean temperature and (b) annual mean total precipitation between 1991 and 2020. (Adapted from World Bank Climate Change Knowledge Portal, 2022).

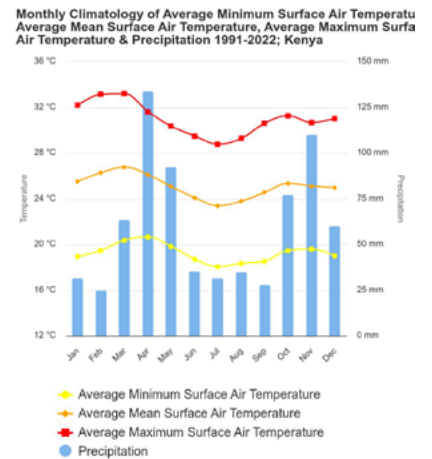


Figure 2: Average monthly climatology 1991–2020. (From World Bank Climate Change Knowledge Portal, 2022).

1.1 Short overview

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

Partly due to the El Niño–Southern Oscillation (ENSO), Kenya is prone to cyclical prolonged droughts associated with below-average rainfall during La Niña episodes. Wetter than normal conditions in most parts of the country are usually observed during El Niño episodes. The 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. Kenya is one of the higher risk countries in the world for humanitarian crises and disasters; ranked 27th out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022).

Extreme weather and hazards

Kenya is at risk from an array of natural hazards. The most predominant hydrometeorological phenomena are droughts and floods, which are impacted directly by the effects of climate change. In addition, Kenya's 1,420km of coastlines faces the threat of rising sea levels also as a result of the changing climate. The World Bank (2022) estimates that 70 per cent 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 socioeconomic impacts on livelihoods and the economy at large.

Climate change in Kenya

Historical climate change

Projected climate change

Temperature

- The mean annual temperature over Kenya has increased at a rate of approximately 0.34°C per decade in 1985–2015 (USAID, 2018).
- The frequency and intensity of hot extremes have increased, and cold extremes have decreased (Seneviratne *et al.*, 2021)
- Mean temperatures over the region are projected to rise until 2050 by at least 1.5–2°C for a high greenhouse gas concentration scenario (SSP5–8.5) and by 1–1.5°C for a low greenhouse gas concentration scenario (SSP2–4.5) (Gutiérrez *et al.*, 2021).
- Maximum and minimum temperatures will increase, and heatwaves 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 a 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 are 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’ (Republic of Kenya, 2015).
- Mid-century (2040–2060) estimates of annual precipitation changes over Kenya under a low emission scenario (SSP2–4.5) and a high emissions scenario (SSP5–8.5) are projected to increase around 10–15 per cent, with enhanced interannual variability (Gutiérrez *et al.*, 2021).
- The frequency and intensity of heavy precipitation events are projected to increase with potential effects of flooding and soil erosion (Seneviratne *et al.*, 2021).

Legal and policy framework for disaster risk reduction (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 for Disaster Risk Reduction 2015–2030 and focuses on resilience and a multi-hazard approach.
- [The National Drought Management Authority \(NDMA\)](#), established in 2016, strives to end drought emergencies in Kenya. 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.

2. Priorities of the Red Cross Red Crescent Movement under climate change

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

Observed hazard	Projected risk
Floods	
<p>In 1990–2020, Kenya experienced 45 major flood events (8 flash floods, 37 riverine floods), which impacted almost 2.5 million people. These flood events led to almost 1,400 deaths across the different events.</p> <p>The Government of Kenya (2016b) reports that flood-related fatalities constitute 60 per cent 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 per cent of GDP every seven years (Government of Kenya, 2016).</p>	<p>The World Bank (2022) 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, 2022), which could have knock-on effects for other hazards and social vulnerability. Intense rainfall is projected to increase, especially in the mountainous areas of Kenya, increasing the likelihood of mudslides and landslides; posing further threats 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.</p>
Droughts	
<p>Droughts across Kenya but are most frequent in the arid and semi-arid regions which constitute 70 per cent of the country (World Bank, 2018). Droughts have long-lasting impacts on livelihoods and the economy and affect hundreds of thousands of people across the country. In 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, damage 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, 2016).</p>	<p>Aridity is also expected to 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 2022). 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.</p>
Sea level rise	
<p>The World Bank’s Climate Change Knowledge Portal (CCKP) highlights an 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.</p>	<p>Sea levels have been increasing steadily 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, 2022).</p>

It is important to note that many of these hazards are interrelated and produce compound risks in the same areas and communities. In addition, risk must be understood as the interplay between hazard, exposure and vulnerability which makes certain individuals, communities and sectors more impacted by the hazards. All project design should take such compounding risks into account.

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) as well as the County Integrated Development Plans (CIDPs) (Government of Kenya, 2021). Some of the activities that the Government has outlined 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 resources (Government of Kenya, 2009). Outlining the features of an effective disaster management system, the document highlights the importance of incorporating information from local sources, including analyzing, monitoring and researching hazard data from across the country. It recommends establishing an early warning system using a network of these 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) 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 states that the policies examined in research completed on five 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. In 2021, Nairobi hosted the 8th Africa Regional Platform for Disaster Risk Reduction, highlighting the country's aspirations to push forward on the disaster reduction agenda. One of the outputs of the event 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'. This declaration states a determination to deliver on commitments to the implementation of the Sendai Framework, the Programme of Action, the Africa Regional Strategy for Disaster Risk Reduction, as well as sub-regional and national strategies and plans of action for disaster risk reduction as key instruments for the realization of the Agenda 2030 for Sustainable Development and Agenda 2063: The Africa We Want (UNDRR, 2021).

2.2 Reduce health impacts of climate change

As the climate crisis escalates, its impact on human health and well-being will also accelerate. Climate change is increasing health risks from malnutrition, heat stress, air pollution, changing patterns of infectious disease transmission and making disease outbreaks and pandemics more likely, deteriorating food security, drinking water quantity and quality, sanitation and clean air. (World Bank, 2011).

Temperature rises could drive an increase and geographical shift of mosquito-borne diseases (mainly malaria and dengue fever) to the highland areas (Nosrat *et al.*, 2021). Notably, the rural population at risk of malaria may increase by up to 89 per cent by the 2050s and spread to highland areas that have historically been home to 70 per cent 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, 2022). 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 the temperature rises, especially in urban areas due to the urban heat island effect. Heat-related mortality among the elderly is projected to increase from two deaths annually per 100,000 people in 1990 to 45 by 2080; while, for the general population, annual heat-related deaths will rise from 0.6 per cent in 2000 to 6 per cent by 2080 (Potsdam Institute & GIZ, 2021; World Bank, 2022).

Finally, severe flooding and droughts will increase the risk of contamination and scarcity of water resources, leading to an increase in water-borne diseases, such as cholera, diarrhoea, hepatitis A and typhoid (CIMA & UNISDR, 2018).

2.3 Ensure sustainable water supplies

Water, Sanitation and Hygiene (WASH)

Extreme temperatures, rainfall and droughts will lead to reduced water availability and quality and increased damage to water and sanitation infrastructure (AfDB, 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 needs such as agriculture, sanitation and drinking water, exacerbating food and water insecurity and threatening livelihoods (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, 2022).

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 per cent in drought years, increasing energy insecurity and shifting reliance to petroleum-based energy production (USAID 2018).

Infrastructure and electricity

Hydropower potential is expected to remain relatively stable due to geographic variability in rainfall patterns, with production predicted to increase in some areas and decrease in others (CIMA & UNISDR 2018). However, hydropower production accounts for about a half of Kenya's domestic electricity production and because of reduced hydro production in recent years, power outages occurred and increased reliance on petroleum-based thermal generation (USAID, 2018). Using petroleum-based thermal generation causes both environmental degradation and health problems for people. Also, projections of sea level rise and increased heavy precipitation events put energy, transportation and building infrastructure at risk (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 per cent of the GDP annually” by 2030 (USAID, 2018).

While different populations will experience different threats and pressures due to climate change in Kenya, pastoralists will face particular challenges (Birch, 2018b). 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 in isolated, food-insecure 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 almost two-thirds of Kenyans who are dependent on agriculture – which is primarily rainfed (98 per cent) – will be threatened by these shocks (Birch, 2018a; USAID, 2018). Agricultural losses will increase by 50 per cent, with the biggest drops anticipated for staple crops such as cabbage, cassava, sweet potato and wheat as well as key exports such as tea and coffee (CIMA & UNISDR, 2018; Government of Kenya, 2018). The exposure of livestock to drought will double (CIMA & UNISDR, 2018); higher temperatures will increase heat stress, disease prevalence and death in livestock while also lowering production (Government of Kenya, 2018). Crops such as beans and maize will need to shift to higher elevations, and lowland crops will experience yield decreases of 20 per cent (USAID, 2018). These geographic impacts of climate change will spread from concentrations in the west to countrywide (CIMA & UNISDR, 2018). Furthermore, pest 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 per cent of the country’s GDP and support 70 per cent of people’s livelihoods (NEMA, 2021). They are also vital for the country’s thriving tourism industry. However, climate change is causing significant disruption to ecosystems such as increased coastal erosion, prevalence of wildfires and coral bleaching, impacting areas that are key draws in the tourism sector (USAID, 2018).

2.5. Address climate displacement and protection

Current and future displacement challenges

Kenya 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, 2021). It also hosts 190,000 internally displaced persons (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 droughts (WACC, 2019).

Kenya will see increased rates of climate displacement in 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 that time, too, about half of the population of Kenya is expected to live in urban areas (World Bank, 2016) – a trend which climate change can 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 is 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 per cent of pastoralists and 55 per cent of agro-pastoralists will have insufficient livestock to stay above the poverty line and be forced out of pastoralism by 2030 (Birch, 2018a).

Increasing temperatures and the 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 use 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 (Government of Kenya, 2018).

Migration law and policies

- Multiple national and regional frameworks in East Africa and the Horn address people displaced by climate change, either explicitly or through interpretation, although there is a need for implementation (Wood & Abuya, 2021; UNHCR, 2021).
- For example, the **Kampala Convention for Internally Displaced People** is the world’s first and only binding agreement for protecting IDPs from natural disasters.
- In specific situations, the 1951 Refugee Convention and the 1969 Organisation of African Unity’s **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.

2.6 Policy

Relevant information from the [Nationally Determined Contribution \(NDC\)](#) (2021)

The next review of the document is envisaged in 2025 (Government of Kenya, 2016).

GHG emissions reduction target: Reduce Kenya’s greenhouse gas emissions by 32 per cent by 2030 – a goal that could be raised with the support of the international community. This represents an estimated budget of 62 billion US dollars. Kenya does not have a net zero target in place (Climate Action Tracker, 2022).

Area of focus on adaptation: In terms of adaptation, Kenya aims to integrate climate change into 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 (Government of Kenya, 2021).

Inclusion of DRR: Yes, adopting an enhanced risk-based approach to climate change adaptation, introducing robust Early Warning Early Action systems and enhancing the 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.** This comprehensive document integrates disaster risk management in the health-related adaptation measures and the overall objective of the policy (Government of Kenya, 2016).
- **Climate Change Act:** Signed in 2016, this framework established the National Climate Change Council, Directorate and Fund (Government of Kenya, 2016).
- **National Climate Change Action Plan (NCCAP)** from 2018–2022, which outlines Kenya's climate commitments and is being updated every five years. Under the NCCAP, sector representatives define priority mitigation actions that are designed to ensure that sectors achieve their sectoral targets (Government of Kenya, 2018).
- **Kenya Climate Smart Agriculture Strategy (2017–2026)**, which includes objectives such as increasing adaptive capacity and the resilience of farmers, pastoralists and fisher-folk; minimizing agricultural emissions; and providing support through institutional frameworks (Government of Kenya, 2017).

Climate finance

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](#). These grants range from about 20,000–50,000 US dollars and are intended to support community-level initiatives. The Global Environment Facility's Small Grants Programme sits under the United Nations Development Programme and has a [National Coordinator in each country](#). Some countries have national climate funds, which may be accessible to the National Society. Other funding from bilateral donors, national climate funds, or multilateral climate funds like the Adaptation Fund, CREWS, or GCCA+ could be explored.

National Societies cannot apply directly for climate finance from the [Green Climate Fund](#), but they can be an implementing partner for an accredited entity. National Societies can investigate national GCF projects that are being designed and use the opportunity to create partnerships.

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

Additional resources

Climate Centre. (2022). *Fact sheet on climate finance*. Red Cross Red Crescent Climate Centre. <https://www.climatecentre.org/wp-content/uploads/Fact-Sheet-on-Climate-Finance.pdf>

Climate Centre. (2022). *Entry points for National Societies on climate finance partnerships*. Red Cross Red Crescent Climate Centre. <https://www.climatecentre.org/wp-content/uploads/Entry-Points-for-Climate-Finance>

References

- AfDB. (2019). *Kenya: National climate change profile*. African Development Bank. <https://www.afdb.org/en/documents/kenya-national-climate-change-profile>
- Baker, A. & Samaki, K. (2021). 'Environmental crises are forcing millions into cities: Can countries turn climate migrants into an asset?' *Time Magazine*. <https://time.com/5953402/climate-migrants-kenya-floods/>
- Birch, I. (2018a). 'Agricultural productivity in Kenya: barriers and opportunities', *K4D Helpdesk Report*. Institute of Development Studies. https://assets.publishing.service.gov.uk/media/5c70028ee5274a0ecbe9a1c2/483_Agricultural_Productivity_in_Kenya_Barriers_and_Opportunities.pdf
- Birch, I. (2018). 'Economic growth in the arid and semi-arid lands of Kenya', *K4D Helpdesk Report*. Institute of Development Studies. https://assets.publishing.service.gov.uk/media/5c6fd72aed915d4a315f6552/482_Economic_Growth_in_the_Arid_And_Semi-Arid_Lands_of_Kenya.pdf
- CIMA & UNISDR. (2018). *Disaster risk profile: Kenya*. International Centre on Environmental Monitoring & United Nations International Strategy for Disaster Reduction. https://www.preventionweb.net/files/64257_kenyareportreviewedweb.pdf
- Climate Action Tracker. (2022). *Kenya*. <https://climateactiontracker.org/countries/kenya/policies-action/>
- DRMKC. (2022). *Kenya country profile*. INFORM Index for Risk Management. Disaster Risk Management Knowledge Centre. <https://drmkc.jrc.ec.europa.eu/Inform-Index/Portals/0/InfoRM/CountryProfiles/KEN.pdf>
- Endris, H.S., Omondi, P., Jain, S., Lennard, C., Hewitson, B., Chang'a, L., Awange, J.L., Dosio, A., Ketiemi, P., Nikulin, G., et al. (2013). 'Assessment of the performance of CORDEX regional climate models in simulating East African rainfall', *Journal of Climate*, 26, 8453–8475. <https://journals.ametsoc.org/view/journals/clim/26/21/jcli-d-12-00708.1.xml>
- FAO & GEF. (2016). *Restoration of Arid and Semi-Arid Lands (ASAL) of Kenya through bio-enterprise development and other incentives under the Restoration Initiative*. Food and Agriculture Organization & Global Environment Facility. <http://www.fao.org/gef/projects/detail/en/c/1113301/>
- Filho, L., Nzungu, W., Muasya, G., Chemuliti, J. & Kalungu, J.W. (2017). 'Climate change responses among the Maasai community in Kenya', *Climatic Change* 145, 71–83. <https://link.springer.com/article/10.1007/s10584-017-2087-9>
- Government of Kenya. (2021). *Kenya's updated Nationally Determined Contribution*. Ministry of Environment and Forestry, Republic of Kenya. <https://unfccc.int/sites/default/files/NDC/2022-06/Kenya%27s%20First%20%20NDC%20%28updated%20version%29.pdf>
- Government of Kenya. (2017). *Kenya Climate Smart Agriculture Strategy 2017–2026*. Ministry of Environment and Forestry, Republic of Kenya. https://www.adaptation-undp.org/sites/default/files/resources/kenya_climate_smart_agriculture_strategy.pdf
- Government of Kenya. (2018). *National Climate Change Action Plan 2018–2022*. Ministry of Environment and Forestry, Republic of Kenya. <https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2018/10/8737.pdf>
- Government of Kenya. (2009). *National Policy for Disaster Management in Kenya*. Ministry of State for Special Programs, Republic of Kenya <https://www.theelephant.info/documents/national-policy-for-disaster-management-in-kenya/>
- Government of Kenya. (2016). *Kenya National Adaptation Plan 2015–2030*. Ministry of Environment and Forestry, Republic of Kenya. https://www4.unfccc.int/sites/NAPC/Documents%20NAP/Kenya_NAP_Final.pdf
- Gutiérrez, J.M., Jones, R.G., Narisma, G.T., Alves, L.M., Amjad, M., Gorodetskaya, I.V, Grose, M., Klutse, N.A.B., Krakovska, S., Li, J., Martínez-Castro, D., Mearns, L.O., Mernild, S.H., Ngo-Duc, T., van den Hurk, B., & Yoon, J.-H. (2021). 'Interactive Atlas', in *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, et al. (Cambridge University Press). <http://interactive-atlas.ipcc.ch/>
- Herrero, M., Addison, J., Bedelian, C., Carabine, E., Havlík, P., Henderson, B., Van De Steeg, J., Thornton, P.K. (2016). 'Climate change and pastoralism: Impacts, consequences and adaptation', *Revue scientifique et technique (International Office of Epizootics)* vol. 35(2), 417-433. doi:10.20506/rst.35.2.2533
- IDMC. (2018). *Drought stricken communities hit by destructive floods in the Horn of Africa*. Internal Displacement Monitoring Centre. <https://www.internal-displacement.org/expert-opinion/drought-stricken-communities-hit-by-destructive-floods-in-the-horn-of-africa>

- Kaimba, G.K., Njehia, B.K., & Guliye, A.Y. (2011). 'Effects of cattle rustling and household characteristics on migration decisions and herd size amongst pastoralists in Baringo District, Kenya', *Pastoralism: Research, Policy and Practice*, 1(1), 18. <https://doi.org/10.1186/2041-7136-1-18>
- Kalele, D.N., Ogara, W.O., Oludhe, C., & Onono, J.O. (2021). 'Climate change impacts and relevance of smallholder farmers' response in arid and semi-arid lands in Kenya', *Scientific African*, 12, e00814. <https://doi.org/10.1016/j.sciaf.2021.e00814>
- Kenya News Agency. (2021). *Government announces measures to tame increasing pests and disease*. <https://www.kenyanews.go.ke/government-announces-measures-to-tame-increasing-pests-and-disease/>
- Musafiri, C.M., Kiboi, M., Macharia, J., Ng'etich, O.K., Kosgei, D.K., Mulianga, B., Okoti, M., & Ngetich, F.K. (2021). 'Adoption of climate-smart agricultural practices among smallholder farmers in Western Kenya: Do socioeconomic, institutional and biophysical factors matter?', *Heliyon*, 8(1), e08677–e08677. <https://doi.org/10.1016/j.heliyon.2021.e08677>
- NEMA. (2021). *Kenya state of environment report (2019–2021)*. National Environment Management Authority. https://www.nema.go.ke/images/Docs/EIA_1840-1849/Kenya%20State%20of%20Environment%20Report%202019-2021%20final-min.pdf
- Nicholson, S.E. (2017) 'Climate and climatic variability of rainfall over Eastern Africa', *Reviews of Geophysics*, 55, 590–635, doi:10.1002/2016RG000544
- Nosrat, C., Altamirano, J., Anyamba, A., Caldwell, J.M., Damoah, R., Mutuku, F., Ndenga, B., & LaBeaud, A.D. (2021). 'Impact of recent climate extremes on mosquito-borne disease transmission in Kenya', *PLOS Neglected Tropical Diseases*, 15(3), e0009182. <https://doi.org/10.1371/journal.pntd.0009182>
- Nyandiko, N. O. (2020). Devolution and disaster risk reduction in Kenya: Progress, challenges and opportunities. *International Journal of Disaster Risk Reduction*, 51, 101832. <https://doi.org/10.1016/j.ijdr.2020.101832>
- Omolo, N.A. (2011) 'Gender and climate change-induced conflict in pastoral communities: Case study of Turkana in northwestern Kenya', *African Journal on Conflict Resolution*, vol. 10(no. 2). doi:10.4314/ajcr.v10i2.63312
- PIK & GIZ. (2021). *Climate risk profile: Kenya*. Potsdam Institute for Climate Impact Research & Gesellschaft für Internationale Zusammenarbeit. https://www.adaptationcommunity.net/wp-content/uploads/2021/01/GIZ_Climate-risk-profile-Kenya_EN.pdf
- Ranasinghe, R., Ruane, A.C., Vautard, R., Arnell, N., Coppola, E., Cruz, F.A., Dessai, S., Islam, A.S., Rahimi, M., Ruiz Carrascal, D., Sillmann, J., Sylla, M.B., Tebaldi, C., Wang, W., & Zaaboul, R. (2021). 'Climate change information for regional impact and for risk assessment', in *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, et al. (Cambridge University Press). <https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-12/>
- Republic of Kenya. (2015). *Second National Communication to the United Nations Framework Convention on Climate Change*. United Nations Framework Convention on Climate Change. <https://unfccc.int/resource/docs/natc/kennc2.pdf>
- Schneider, L., Rebetez, M., & Rasmann, S. (2022). 'The effect of climate change on invasive crop pests across biomes', *Current Opinion in Insect Science*, 50, 100895. <https://doi.org/10.1016/j.cois.2022.100895>
- Seneviratne, S.I., Zhang, X., Adnan, M., Badi, W., Dereczynski, C., Di Luca, A., Ghosh, S., Iskandar, I., Kossin, J., Lewis, S., Otto, F., Pinto, I., Satoh, M., Vicente-Serrano, S. M., Wehner, M., & Zhou, B. (2021). 'Weather and climate extreme events in a changing climate', in *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, et al. (Cambridge University Press). https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter11_SM.pdf
- UNDRR. (2021). *Eighth Africa Regional Platform for Disaster Risk Reduction*. United Nations for Disaster Risk Reduction. <https://afrp.undrr.org/2021/home-africa-regional-platform-disaster-risk-reduction.html>
- UNHCR. (2021). *Climate change forum in Cape Verde gives voice to forcibly displaced persons in Africa*. United Nations High Commissioner for Refugees. <https://www.unhcr.org/afr/news/latest/2021/9/6144b5874/climate-change-forum-in-cape-verde-gives-voice-to-forcibly-displaced-persons.html>
- USAID. (2018). *Climate Risk Profile: Kenya*. United States Agency for International Development. https://www.climatelinks.org/sites/default/files/asset/document/2018_USAID-ATLAS-Project_Climate-Risk-Profile-Kenya.pdf

WACC. (2019). *Climate change displacement on the rise in Kenya, but local media pay scant attention*. World Association for Christian Communication. <https://waccglobal.org/climate-change-displacement-on-the-rise-in-kenya-but-local-media-pay-scant-attention/#:~:text=28%20Aug%202019%20Climate%20change,local%20media%20pay%20scant%20attention&text=An%20average%20of%2080%2C000%20people,WACC%2Dsupported%20media%20monitoring%20study>.

Wood, T. & Abuya, E. (2021). 'It's time for answers for Africa's 'climate refugees'', Thomas Reuters Foundation News. <https://news.trust.org/item/20210507102525-8r0ig/#:~:text=In%20East%20Africa%2C%20in%202020,the%20impacts%20of%20a%20disaster>.

World Bank. (2024). *Health and Climate Change*. <https://www.worldbank.org/en/topic/health/brief/health-and-climate-change>

World Bank. (2022). *Kenya: Current climate*. Climate Change Knowledge Portal. <https://climateknowledgeportal.worldbank.org/country/Kenya/climate-data-historical>

World Bank (2018) Kenya's Pastoralists Protect Assets from Drought Risk with Financial Protection. <https://www.worldbank.org/en/news/feature/2018/11/05/kenyas-pastoralists-protect-assets-from-drought-risk-with-financial-protection>

World Bank (2016) *Republic of Kenya : Kenya Urbanization Review*. <https://documents1.worldbank.org/curated/en/639231468043512906/pdf/AUS8099-WP-P148360-PUBLIC-KE-Urbanization-ACS.pdf>