



Climate change-related extreme heat and health impact in Africa

Rationale

The African region is experiencing the highest temperature rise in history, causing frequent, extreme heat events. This adds more vulnerabilities to existing health systems in African countries. Heat exhaustion, heat stroke, cardiovascular and respiratory diseases, and increased mortality rates in vulnerable populations are common public health problems which lead to negative health outcomes. The impact of extreme heat extends to agricultural productivity, food security, water availability and accessibility, and socio-economic stability. Addressing climate change issues and building climate resilience and a sustainable health system must be prioritized in Africa.

Key messages

- There is a 3 to 20 times increase in droughts under climate change scenarios (projections) with up to 3°C of warming, while droughts in Africa have become more intense, frequent, and widespread over the past 50 years.
- 48.5°C recorded in western Mali, resulted in 102 deaths within four days during Sahel heatwaves from late March and early April 2024, which also impacted Burkina Faso, Chad, Guinea, Niger, Nigeria, and Senegal.
- South Sudan was in an extreme East Africa heat wave between 41°C and 45°C in March 2024.
- 113 million populations were affected by 17 drought events from 2022 to 2024. Most of them were from Sub-Saharan Africa.
- There will be a 49% decline in groundwater recharge and a 24% reduction in groundwater storage in the Klela basin in Mali by 2050, under the RCP8.5 scenario (2.4°C global warming) compared to the 2006 baseline.

Global Warming in Africa

In 2023, Earth's average surface temperature reached the highest level since recordkeeping commenced in 1880. Ten most recent years represent the warmest on record. Africa has impacted these global trends, experiencing significant temperature increases with severe consequences.

Climatic change is evident in comparative temperature data between 1960 and 2022; dark blue indicates areas cooler than average, and dark red signifies warmer areas in Figure 2. These findings underscore the severe impact of global warming on health and environmental stability across Africa. In the meantime, global greenhouse gas emissions have been getting higher over many years.

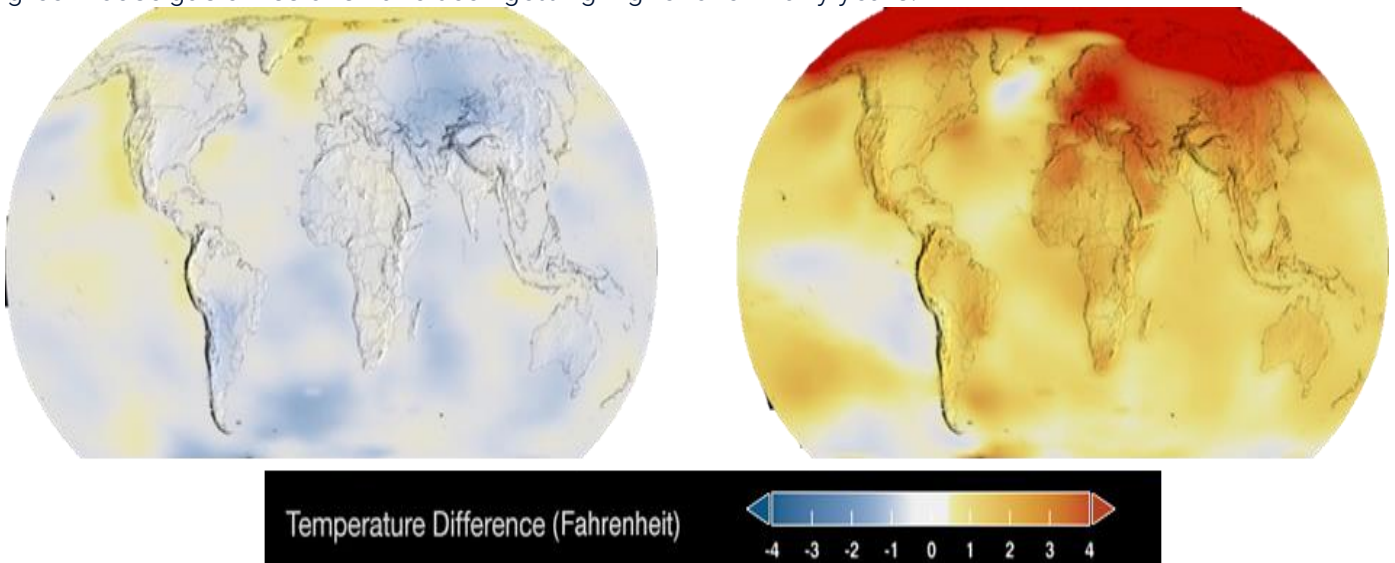


Figure 2: comparison of temperature changes between 1960 and 2022. (source: [NASA, global temperature](#))

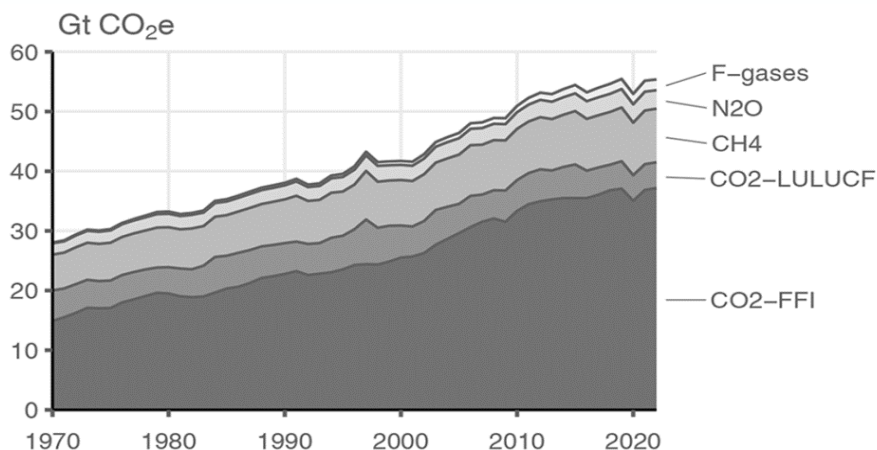


Figure 3: Global total greenhouse emissions (source: Indicators of Global Climate Change 2023) [NASA, global temperature](#))

- Even modest temperature increases due to global warming profoundly impact Africa, exacerbating extreme heat and drought conditions.
- Africa has experienced over a 1°C rise since 1901, leading to more frequent and intense heatwaves, such as the recent 48.5°C spike in the Sahel.
- This rise intensifies heat-related illnesses and mortality, especially among vulnerable groups. Reduced rainfall in North and Southern Africa exacerbates water scarcity, leading to severe droughts (see Table 1).
- These changes strain water resources, increase food insecurity, and displace populations, illustrating the severe consequences of temperature rise.

No	Disaster Type	Country	Start Year	End Year	Total Affected people
1	Drought	Ethiopia	2022	2023	24100000
2	Drought	Cabo Verde	2022	2022	46093
3	Drought	Niger	2022	2022	4400000
4	Drought	Chad	2022	2022	2135362
5	Drought	Djibouti	2022	2022	192168
6	Drought	Uganda	2022	2022	518000
7	Drought	Burkina Faso	2022	2022	3500928
8	Drought	Cameroon	2022	2022	2389127
9	Drought	Central African Republic	2022	2022	2221692
10	Drought	Democratic Republic of the Congo	2022	2022	25972806
11	Drought	Malawi	2022	2022	2678193
12	Drought	Mali	2022	2022	1735753
13	Drought	Nigeria	2022	2022	19110398
14	Drought	Sudan	2022	2022	11839300
15	Drought	Zambia	2024	2024	5000000
16	Drought	Malawi	2024	2024	
17	Drought	Zimbabwe	2024	2024	7600000
				Total	113,439,820

Table 1: number of droughts occurred in Africa 2022-2024 (source: [Public EM-DAT platform \(emdat.be\)](https://emdat.be/))

Health Impact of Extreme Heat in Africa

Extreme heat impacts health in Africa, where many countries are especially vulnerable due to a combination of high temperatures and socioeconomic factors. With the increasing temperature of global warming causes high mortality and morbidity risk in Africa. Figure 3 shows the temperature-related mortality risk with projection figures from 2020 to 2099 with different scenarios. The health impacts of extreme heat in Africa include:

Heat stress related illnesses: higher temperatures can lead to a significant rise in core body temperature and heart rate, causing heat stress and heat stroke conditions which can be fatal, particularly for individuals with pre-existing health conditions such as cardiovascular diseases, obesity, or respiratory issues.

Dehydration and cardiovascular problems: extreme heat condition frequently causes dehydration, which exacerbates cardiovascular strain, putting high risk in elderly and those with chronic ng the risk of severe health complications.

Impact on Mental Health: Substantial evidence indicates that extreme heat exacerbates existing mental health conditions by causing stress and inflammation in the brain, impaired the brain function.

Labour and productivity: Outdoor manual workers are highly vulnerable with prolonged exposure to high temperatures, cause negative impact their well-being, safety, psychological behaviour, and productivity.

Social inequalities: poorer communities often expose extreme heat, but have less access to cooling measures, access to health care leading to worse health outcomes.

Observed Impacts of Extreme Heat on Health in Africa

- Emergency department visits and hospital admissions rise significantly at moderate-to-high temperatures.
- Increased mortality rates are observed on days with elevated temperatures in several African countries, including Burkina Faso, Ghana, Kenya, South Africa, and Tanzania.
- The most common cause of death associated with extreme heat involves cardiovascular diseases, increased incidences of respiratory conditions, stroke, and other non-communicable diseases that are also linked to high temperatures.

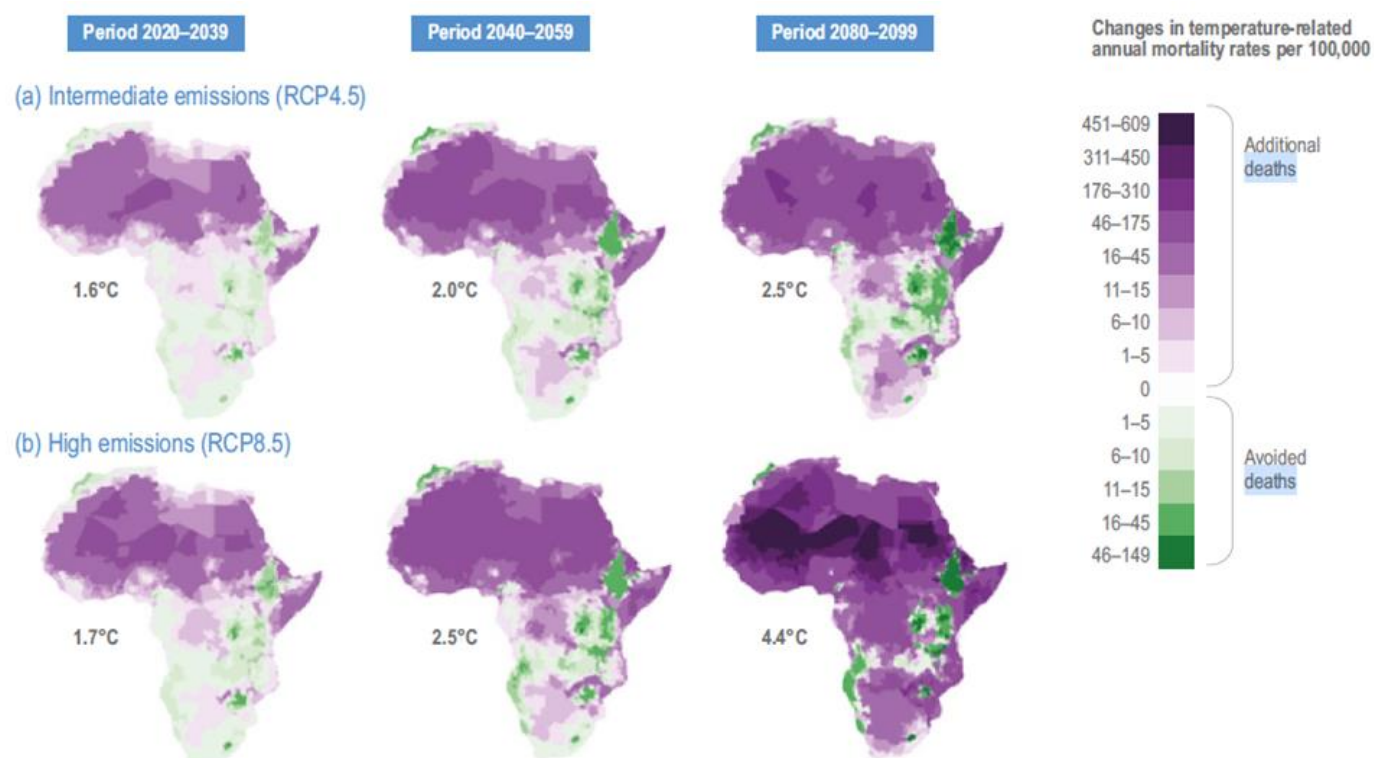


Figure 4: Temperature-related mortality risk in Africa with increased global warming (source: Climate Change 2023 Synthesis Report, chapter 9, Africa)

Relation with mortality and morbidity in extreme heat condition

- Excess death rates from non-optimal temperatures in sub-Saharan Africa are nearly double the global average. 24% of the more than 5 million annual global deaths associated with non-optimal temperatures occur in Africa.

Temperature-related mortality projection

- Above 1.5°C, the risk of heat-related deaths rises sharply, with at least 15 additional deaths per 100,000 annually across large parts of Africa.
- For 2.5°C global warming, there could be 50–180 additional deaths per 100,000 people annually in regions of north, west, and east Africa.
- For 4.4°C global warming, this could increase to 200–600 additional deaths per 100,000 people annually.
- In South Africa (all 52 districts), 43.8% of heat-related mortality (1991–2018) due to climate change can be translated to dozens of deaths per year. The elderly and children under 5 are the most vulnerable to heat exposure.

Health impact in disease context

Malaria Distribution and Incidence (Observed impact)

Influence of high temperature and rainfall patterns change the distribution and incidence of malaria (especially in Sub-Saharan Africa).

- Up to 10.9 million km² of sub-Saharan Africa is highly suitable for year-round malaria transmission,
- The central African region, parts of the southern coast of West Africa, and the East African coast are currently the most suitable climates for endemic malaria transmission.
- In East Africa, higher temperatures have led to the expansion of the Anopheles mosquito vector into higher altitudes and an increased incidence of Plasmodium falciparum infections. Malaria incidence and outbreaks are linked to moderate monthly rainfall and extreme flooding.
- In West Africa, studies indicate positive and negative correlations between malaria incidence and increases in mean monthly temperatures. The abundance of Anopheles gambiae s.s. is associated with mean diurnal temperature.
- Incidences increase 1–2 months after periods of rainfall in southern and west Africa.
- High relative humidity is also positively linked with malaria incidence.

Projected risks

- Both malaria vector hotspots and malaria prevalence will be increased under RCP4.5 and RCP8.5, with projection by 2030 (1.5°C–1.7°C global warming)
- Under RCP4.5, in East and Southern Africa, between 50.6 and 62.1 million people will be at risk of malaria by the 2030s (1.5°C global warming), increasing to 196–198 million by the 2080s (2.4°C global warming).
- High-risk areas by 2030: northern Angola, southern Democratic Republic of the Congo (DRC), western Tanzania, and central Uganda are projected.
- By the 2080s, high-risk areas will extend to western Angola, the upper Zambezi River basin, north-eastern Zambia, and the east African highlands.

Observed Impacts of Climate on Mosquito-Borne Diseases

- Global intensification and expansion: It has intensified mosquito-borne viruses, such as dengue, Zika, and Rift Valley fever (RVF), even expanded into higher altitude areas.
- Warming temperatures have increased the environmental suitability for mosquito vectors, and droughts and flooding further enhance transmission. Droughts create breeding sites in open water storage near human settlements, while flooding facilitates mosquito proliferation and virus spread.
- Diseases vectored by urban-adapted Aedes mosquitoes pose a significant threat in rapidly growing African cities.
- The expansion of the dengue virus can lead to outbreaks, with higher mortality and incidence of dengue haemorrhagic fever in endemic transmission areas.

Projected Risks

- Increased populations Aedes aegypti and Aedes albopictus mosquitoes which transmit dengue, yellow fever, and other viruses, are projected to increase, including in high-altitude regions.
- Expansion Beyond Current Ranges: Aedes albopictus may expand beyond the current range, till to reach western central Africa into Chad, Mali, and Burkina Faso by mid-century under >2°C global warming scenarios.
- By 2050, populations exposed to these vectors in Africa will be doubled. By 2080, nearly triple under >2°C global warming.
- Southern limits of dengue transmission in Namibia and Botswana, as well as the western Sahel, are projected to expand under 1.8°C–2.6°C global warming scenarios.
- Climatic conditions favour mosquitoes, and increased animal trade may expand the geographic range of zoonotic diseases like Rift Valley fever (RVF), posing significant threats to human and animal health with strong socioeconomic impacts.

Observed impact of diarrhoeal diseases

- Africa has the highest rates of death due to diarrhoeal diseases globally.
- Many children experience repeated diarrhoeal episodes, resulting in impaired growth, stunting, immune dysfunction, and reduced cognitive performance.
- High land and sea temperatures and precipitation extremes increase the transmission of bacterial and protozoal diarrhoeal disease agents by contaminating drinking water and food.
- Cholera incidence rises with temperature. Outbreaks are most frequent in East and Southern Africa following tropical cyclones.
- Rapid urbanization increases the demand for freshwater in areas with strained water and sanitation infrastructure.
- Water scarcity reduces the frequency and adequacy of hand washing, increasing disease transmission.

Projected Diarrhoea Deaths

- Climate change is projected to cause 20,000–30,000 additional diarrhoeal deaths in children under 15 years old under 1.5°C–2.1°C global warming. West Africa is expected to be the most affected region, followed by East, Central, and Southern Africa.
- Cholera Outbreaks: Cholera outbreaks are anticipated to impact East Africa most severely during and after El Niño-Southern Oscillation (ENSO) events.

Observed Impacts of Extreme Heat and Climate Change on Nutrition and Food Security in Africa

More than 250 million Africans are undernourished, primarily in central and east Africa, leading to increased childhood stunting, cognitive impairments, and trans-generational effects. Undernutrition is strongly associated with hot climates, as high temperatures adversely affect agricultural productivity and food security. Example: In Burkina Faso, low crop yields resulted in approximately 110 deaths per 10,000 children under five years old, with 72% of these deaths attributable to adverse climate conditions during the growing season.

Locust Infestations:

Climate-linked locust infestations pose a major risk to food security in Africa, as these infestations devastate crops and pasture lands, exacerbating food scarcity. It occurred from 2019 to 2022. Locust swarms as large as cities can consume food equivalent to 35,000 people daily. A Locust outbreak could leave nearly 5 million people in Africa facing starvation. Although the UN declared the locust surge over in February 2022, the region remains at risk of future infestations due to climate change and other unprecedented factors.

WHO Response

- The World Meteorological Organization (WMO) Call for Tailored Climate Information:
- The "tailored climate information" is required to integrate into the health data system, underscoring the importance of interactive climate data in health data analysis.
- High-quality climate information will support the decision-making processes and outcomes in climate-friendly health policy development and implementation.
- evidence and data on climate change and its societal impacts should be available to inform strategies and actions.
- To effective response, key focal persons require quality data, advanced computing and analytical capabilities, methods, tools, models, training, robust institutional architectures, appropriate governance structures, and funding for health research.
- Primary healthcare systems in Africa must prioritize the diagnosis and management of heat-related illnesses, such as heat stress, heatstroke, and dehydration, which disproportionately affect vulnerable populations, including the elderly, children, and those with chronic health conditions.
- Health facilities must ensure infrastructure resilience, such as reliable electricity for cooling systems and adequate water supplies, while also implementing robust public health education campaigns to inform communities about preventive measures and the hazards of extreme heat.

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Sources

The Integrated African Health Observatory supported the production of the factsheets. The graphics are used from the different published reports from the references listed above.

Photography: A local woman fetches water from unsafe source in cholera prone Konso zone, SNNP Region of Ethiopia

Location: Gofa Zone, Ethiopia. © WHO /Mulugeta Ayene

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Fact sheet produced by: Wai Phyo Thant, Lydia Nobert, Serge Bataliack, Erbetto Tesfaye