Climate Centre

CROIX-ROUGE MALIENNE

Climate fact sheet | 2024

Mali

This climate fact sheet summarizes the available information on the climate of Mali and the impact of climate change on humanitarian activities in-country. Each fact sheet 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: The average annual temperature is reasonably constant throughout the country, varying between 27–32°C.

Average annual rainfall: Rainfall varies strongly, with northern and central parts of the country experiencing considerably lower rainfall than the south. In the desert north, which covers two-thirds of the territory, annual average rainfall does not exceed 100mm, while the southern regions experience average annual rainfall of 1,400mm.

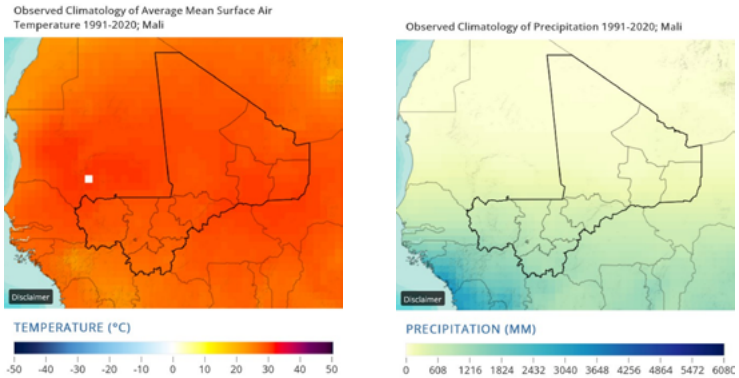

Figure 1: Observed climatology of (left to right) mean temperature and annual mean total precipitation between 1991 and 2020 (from World Bank Climate Change Knowledge Portal).

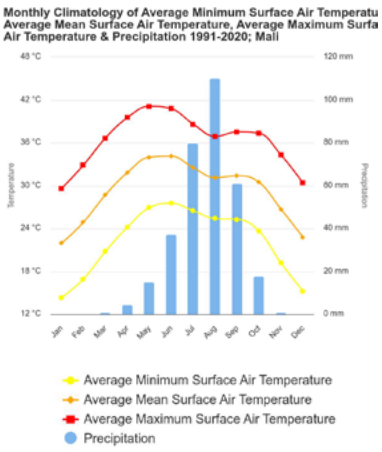

Figure 2: Average monthly climatology 1991–2020 (from World Bank Climate Change Knowledge Portal).

Short overview

In the north, Mali's climate is dominated by the arid Saharan dessert, which transitions into semiarid Sahel towards the south, and into humid savannahs further south. The Niger River flows through the country and seasonally floods the alluvial plain through the Sahelian band. In northern Mali, the rainy season is brief, lasting from July to September. In contrast, southern Mali experiences a five-month rainy season from June to October, with a dry season from October to May, reflecting the variable rainfall across the country. The climate is influenced by the West African Monsoon, which brings large interannual rainfall variability and contributes to recurring droughts and floods which sometimes occur in the same year (USAID, 2019).

The diverse and varied geography of Mali 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. Mali is a high-risk country for humanitarian crises and disasters, ranked 11th out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022).

1.1 Climate change in Mali

Historical climate change	Projected climate change
Temperature	
▪ The mean annual temperatures over Mali have increased at a rate of approximately 0.2–0.3°C/decade in 1961–2015 (Gutiérrez *et al.* , 2021), bringing an increase of around 1.2°C between the 1960s and 2015 (USAID, 2019). ▪ 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 3–4°C for a high greenhouse gas concentration scenario (SSP5–8.5) and 2–3°C for a low greenhouse gas concentration scenario (SSP2–4.5) (Gutiérrez *et al.*, 2021). ▪ Maximum and minimum temperature 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 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, there is no clear trend in rainfall due to high year to year natural variability. Rainfall variability has increased and there has been observed rainfall declines beginning in the 1950s through to the 1980s, with partial recovery from the 1990s onwards.	▪ Mid-century (2040–2060) estimates of annual precipitation changes over Mali indicate an increase dominated by natural variability (Gutiérrez *et al.*, 2021). ▪ The frequency and intensity of heavy precipitation events are projected to increase with potential impacts such as flooding and soil erosion (Seneviratne *et al.*, 2021).

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

2.1 Scale up climate-smart disaster risk reduction (DRR), early action and preparedness

Existing hazard	Projected risks
Droughts	
There is a high risk of extreme heat and water scarcity in the country (with the exception of Kayes that has medium risk of water scarcity). This means that droughts and 'prolonged exposure to extreme heat, resulting in heat stress, is expected to occur at least once in the next five years' (ThinkHazard!, n.d.). The capacities of communities to continue adapting to these more frequent and longer droughts are threatened (World Bank, 2021).	Think Hazard!, n.d. indicates that 'it is virtually certain that there will be more frequent hot temperature extremes over most land areas during the next fifty years', the warming being more critical in some areas than others and higher in Mali than the world average (Think Hazard!, n.d.). These changes in extreme temperature are expected to have more impact in Mali than changes in average temperature (World Bank, 2021). Temperature changes coupled with the differences in rainfall (reduced or erratic) are expected to increase the incidence and impacts of droughts (World Bank, 2021).
Floods	
Floods accounted for 50 per cent of disasters experienced on average annually in Mali in 1980–2020 (World Bank, 2021). The natural flood hazard has been exacerbated by agricultural practices and land management in the Niger flood plain, making the area more vulnerable to floods (World Bank, 2021). There is a high risk of flood in all regions (with the exception of Kidal that has medium risk). This means that 'potentially damaging and life-threatening river floods are expected to occur at least once in the next 10 years'. (ThinkHazard!, n.d.).	The environmental damage caused by some agricultural practices coulpled with climate change will cause more frequent floods in already vulnerable areas of the country (World Bank, 2021).

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 law and policies

- Mali has a National Strategy for Disaster Risk Reduction that is aimed at improving institutional mechanisms for disaster risk management and disaster risk reduction (DRR) as well as increasing DRR funding. However, the country has faced challenges in its implementation (World Bank, 2022).
- *Cadre stratégique pour la relance économique et le développement durable (CREDD) 2019–2023*. One of the five focus areas of this strategic document is about climate change resilience and environmental protection. DRR and the capacity building of communities on DRR are central to this focus.

2.2 Reduce health impacts of climate change

Due to climate change, the frequency of droughts, floods and heatwaves is expected to increase, leading to health risks including hunger, malnutrition and the rise and spread of waterborne diseases (Tomalka *et al.*, 2020).

The impact of climate change on water supply and agriculture is expected to increase the risk of malnutrition and hunger in Mali. In 2022, about 1.2 million children in Mali were malnourished due to various factors, including food insecurity (IPC, 2022). Declines in agricultural production, especially during drought events, will worsen food insecurity and increase malnutrition further (Nagarajan, 2020).

Secondly, recurrent flooding increases the risks of waterborne diseases due to increased water stagnation, water contamination, and damage to hygiene and sanitation infrastructure in the country (Zamudio, 2016). Flooding also exacerbates prevalent pathogens and pathogenic contamination of shallow aquifers (due to inadequate sanitation systems), which are a primary source of drinking water in Mali (USAID, 2021). Additionally, droughts reduce the amount of water available for hygiene and sanitation purposes, increasing the risk of disease transmission. The challenge of low coverage of safe water and sanitation services in the country (with additional risks of contamination due to flooding and water shortages during dry seasons) will likely increase the risks of diarrhoeal diseases (Nagarajan, 2020; USAID, 2018).

Thirdly, heat-related mortality is expected to increase as temperatures rise (Tomalka *et al.*, 2020). Higher temperatures are expected to lengthen the transmission season and increase the geographical range of diseases such as meningitis and malaria (Zamudio, 2016). Meningitis is particularly a problem in southern Mali, mainly in the dry season. The disease is expected to spread as a hotter and drier climate increases dust and humidity (USAID, 2018). In contrast, malaria infections are expected to reduce as temperatures rise above the thermal threshold of *Anopheles* mosquitoes (USAID, 2018). However, in southern Mali, malaria risks will increase due to the high frequency of flooding (Tomalka *et al.*, 2020).

Finally, the impacts of climate change may also affect mental health, especially when it pertains to the trauma associated with loss of crops and other climate-sensitive sources of income and livelihood (Hallegatte *et al.*, 2016).

2.3 Ensure sustainable water supplies

Water, Sanitation and Hygiene (WASH)

Droughts decrease the water available for drinking and other domestic uses. Temperature rises and the increased prevalence of drought due to climate change will also likely increase evaporation rates and lead to a decline of water bodies (USAID, 2021; Nagarajan, 2020). Water availability is expected to decline by up to 20 per cent in south-western Mali (Tomalka *et al.*, 2020). Drought is the greatest hazard in the country and results in as many as 400,000 people being affected by water scarcity per annum (GFDRR, 2019). Drought is also expected to lead to a decline in groundwater recharge, despite many people relying on shallow aquifers, which respond quickly to variations in rainfall (Al-Gamal, 2021; USAID, 2021). This means that these people will be affected by water scarcity during periods of drought. The Bani River basin in Mali was highlighted as one of the plausible climate change scenarios reviewed in the 5th Assessment Report of the Intergovernmental Panel on Climate Change, in which the basin is estimated to experience substantial reductions in runoff with cascading effects on livelihoods across the catchment (Ruelland *et al.*, 2012).

There are several challenges in groundwater management in Mali. A key challenge remains the uneven distribution of groundwater reserves, with less access in the populous south (USAID, 2013). Mineral and saline content is also estimated to vary widely, which is an important consideration for sourcing drinking water. More recently, Díaz-Alcaide *et al.* (2017) conducted a review of 26,040 boreholes – both successful and unsuccessful (insufficient water) – throughout the country, and concluded that groundwater is widely available across nearly 80 per cent of the country, but highly productive boreholes are rare. In this study, the Inner Niger Delta was exceptional in that it had a high success and yield rate. The inadequate sanitation services and poorly constructed water wells also contribute to the contamination of groundwater resources – a risk that is increased during flood events (USAID, 2021).

2.4 Enable climate-resilient livelihoods and economic security

Frequent droughts, temperature rise and variation of rainfall patterns (duration, onset and termination) due to climate change are expected to impact all major livelihood activities in Mali (Capero *et al.*, 2021; Sanga *et al.*, 2021). Rainfed and traditional subsistence agriculture (crop farming and pastoralism), fishing and trade are the major livelihood sources for Malians and agriculture employs about 80 per cent of the population, accounting for about 42 per cent of the GDP (Nagarajan, 2020; GFDRR, 2019). Consequently, the impacts of climate change pose a significant threat to local livelihoods in Mali.

Seasonal flooding in the Inner Niger Delta and Senegal River basin is a natural hydrological cycle that also supports local livelihoods (CIAT *et al.*, 2021; USAID, 2021). However, excessive flooding during periods of increased rainfall, which are expected to worsen with the changing climate, destroys crops and kills livestock (USAID, 2021). It is estimated that the annual agricultural losses due to floods are as high as 10 million US dollars (GFDRR, 2019).

The expected increase in drought and rises in temperature will also decrease water availability for agriculture and fisheries (AfDB, 2018). In the north, desertification, high temperatures, drought and a shorter rainy season are already reducing vegetation, affecting grazing and increasing livestock mortality (CIAT *et al.*, 2021; Nagarajan, 2020; USAID, 2018). In addition, pasture yields are expected to reduce by 5–36 per cent (Netherlands Ministry of Foreign Affairs, 2018) with a significant impact on livestock farming. In the south, a decrease in the usual River Niger flooding will reduce the yield of crops that rely on this natural hydrological cycle (AfDB, 2018). Higher temperatures and drought will likely also affect the production of major crops such as cotton, maize, millet and sorghum in Mali (Sanga *et al.*, 2021).

A hotter and drier climate will increase local exposure to anthrax (due to reduced water availability) as well as zoonotic poultry diseases such as avian flu and Newcastle disease, ultimately impacting human and animal health in the country (USAID, 2018). A wetter and warmer climate also increases the risk of further zoonotic diseases such as Rift Valley fever and African swine fever (USAID, 2018).

Finally, droughts lead to a decline in riverine water levels leading to decreased fish productivity (AfDB, 2018). Declines in fish stocks cause fishers to migrate to other areas with plentiful fish (Nagarajan, 2020). However, the migration opportunities for fishers are reducing due a combination of overall population increase and decreases in fish productivity, creating challenges for both livelihoods and overall ecosystem services in Mali (Netherlands Ministry of Foreign Affairs, 2018).

2.5 Address climate displacement and protection

Current and future displacement challenges

Conflict and the presence of non-state armed groups drive extensive displacement in Mali, with over 154,000 people displaced internally in 2022 (IDMC, 2023) and 152,000 in 2023 (IDMC, 2024). The total number of internally displaced people because of conflict and violence at the end of 2023 in Mali counted 344,000 (IDMC, 2024). Approximately 24,000 people were displaced by disasters in 2022 (IDMC, 2023). Floods that struck the region of Mopti in Mali in September and December 2022 resulted in widespread destruction of homes in an aera also widely affected by conflict (IDMC, 2023) while flooding in 2020 affected thousands of already displaced people and refugees (UNHCR, 2020). Seasonal livelihoods migration is also common, particularly for youth and adolescents, who move from rural areas to cities for work such as domestic labour – a practice that is growing as agricultural yields diminish.

Although more attention has been paid to the impacts of droughts in Mali, floods are increasingly causes of displacement and harm. An analysis completed by the Government's civil protection on the impacts of floods of the past 30 years (1989–2018) shows a steep increase in flood impacts in all measured areas: destroyed dwellings, affected people, loss of assets as well as deaths, disappearances and injuries (IFRC, 2021). The 2020 African Sahel floods, for example, affected 8,968 households, spread across all regions of Mali. The capital Bamako is particularly flood-prone, with informal settlements in the city and substandard housing particularly at risk of urban flooding. In 2021, over 6,000 people were affected by flooding in the country (IDMC, 2022) and, in 2023, 1,300 people were affected in the region of Mopti (IDMC, 2024). At the end of 2023 around 8,000 people in total were living in displacement due to disasters (IDMC, 2024).

Displaced people in Mali, including internally displaced persons (IDPs) and refugees, are often particularly vulnerable to climate extremes. This includes flood events that can quickly destroy the limited infrastructure in camps, as well as heatwaves that leave people with few options for cooling and shelter. In June 2019, a major flood event damaged the infrastructure of a camp in the Mopti region of Mali. The International Organization for Migration (IOM) reported that heavy rains associated with the flooding destroyed the tents sheltering 304 IDPs, leaving them exposed to the elements (Floodlist, 2019).

Internal and international drought-induced migration is projected to substantially increase in Mali (Defrance *et al.*, 2020; Smirnov *et al.*, 2022). Research examining the historical impact of droughts on migration in Mali found a positive correlation between migration and drought, particularly in areas with less crop diversification (Defrance *et al.*, 2020)

Climate change is projected to cause a significant (up to 40 per cent) drop in agricultural capacity in Mali (Pearson & Niaufre, 2013), which may increase migration and displacement. In many areas, yields have already dropped dramatically (ICRC, 2021), which highlights a need for climate change adaptation that addresses drivers of migration.

Protection

Environmental stress plays, and is projected to continue to play, an exacerbating role in driving conflict and displacement in Mali (Jones-Casey & Knox, 2011, Madurga-Lopez *et al.*, 2021). The three main pathways are the impact of climate change on resource availability and livelihood insecurity; farmer–herder conflict; and mobility and resource competition in the south of the country (Madurga-Lopez *et al.*, 2021).

Around the world, people in detention frequently have heightened vulnerability to natural disasters due to spatial marginalization resulting from prison locations on hazard-prone land and/or isolation from emergency evacuation services; limited to no connections to social networks, which are crucial aspects to hazard resilience; and political marginalization, including lack of policies and services to prevent disaster impacts on imprisoned populations (Gaillard & Navizet, 2012). These vulnerabilities, coupled with more frequent and intense disasters due to climate change, may leave prison populations in especially precarious positions to hazards such as extreme heat, dust storms and floods.

2.6 Policy

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

Emission target: Commitments to reduce greenhouse gas emissions by 31 per cent for energy, 25 per cent for agriculture, 39 per cent for land use and forestry, and 31 per cent for waste sectors by 2030, compared to a 'business as usual' scenario.

Area of focus on adaptation: Agriculture, livestock, forestry, ecosystem management, civil society and communities, meteorological data, energy, waste management and capacity building – with water being cross-cutting. Financing of adaptation is estimated at 8 billion US dollars and selection criterion for projects are presented in the NDC.

Inclusion of DRR: Yes, is it one of the selection criteria for adaptation projects in the country with an exosystemic approach to DRR and a focus on weather forecasts.

National designated entity: Agence Nationale de la Météorologie/National Meteorology Agency

Key stakeholders: Ministère de l'environnement, de l'assainissement et du développement durable; Agence de l'environnement et du développement durable; Comité national des changements climatiques.

Additional support from: FAO, World Bank, FED, European Union, UNDP, WRI, African Development Fund, bilateral cooperation with Germany, Canada, France, Nertherlands, Belgium, Norway and Sweden (NDC Partnership, n.d.).

Additional climate policies

- *Politique Nationale des changements climatiques* (National Climate Change Policy) (2011). DDR is one of the eight targets of the policy. Health also has an imortant role in the policy.
- Third Communication to the UNFCCC (2020). The communication draws the landscape for adaptation projects until 2030, identifying priority areas compatible with the NDC and focusing on nature-based solutions. To complement, the National Action Plan for Adaptation (NAPA) was submitted in 2007 and is currently being revised to become the country's National Adaptation Plan (NAP) (MEADD, 2021).
- The country has a complete environmental policy framework, including policies on biodiversity, forests, agriculture, environmental protection and water management among others. Moreover, it is developing additional legal instruments to facilitate the climate transition (MEADD, 2021).

Climate finance

Mali is part of several Green Climate Fund (GCF) regional projects and has two country-specific projects, including one focusing on adaptation 'Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Mali Country Project' (GCF, 2022). National Societies cannot apply directly for climate finance from the Green Climate Fund (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. These grants range from 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 (Climate Centre, 2022a).

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

Additional resources

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