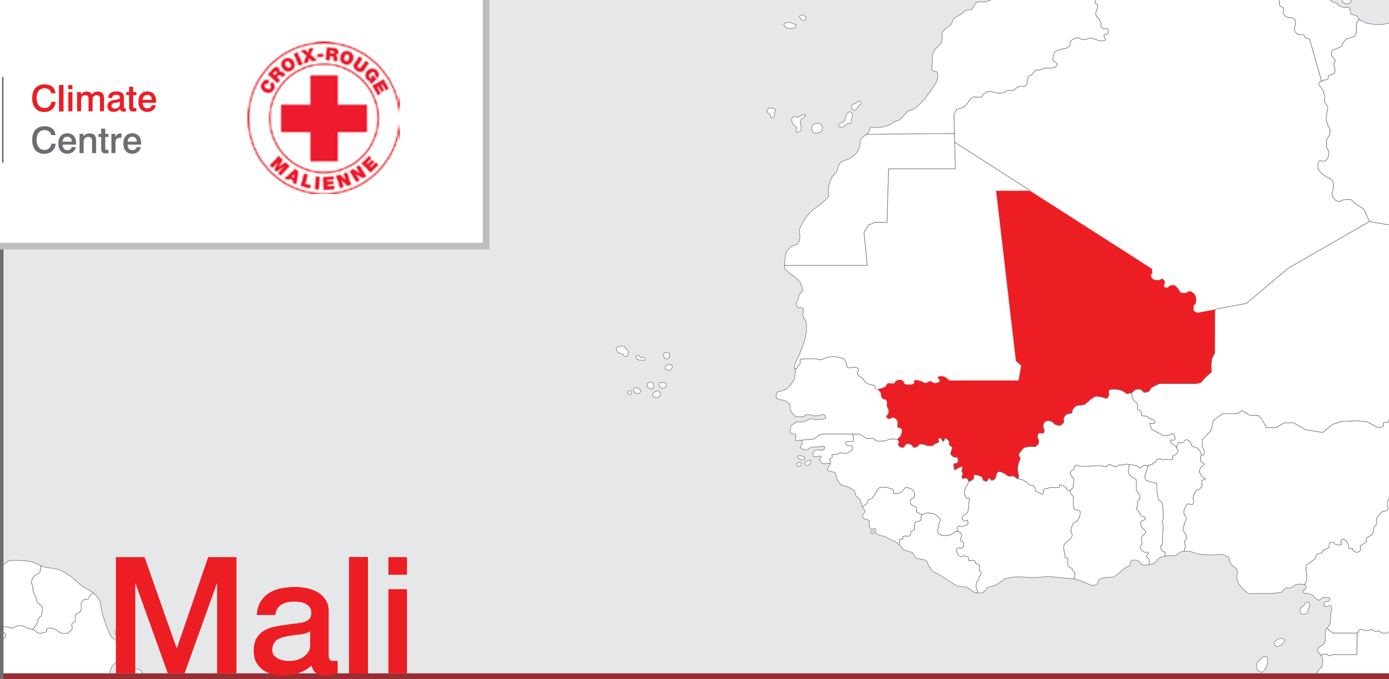
Country-level | Climate fact sheet



Mali

The following climate factsheet summarizes available information on the climate of Mali, 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: Average annual temperature is fairly constant through the country varying between 27°C and 32°C (figure 1a).

Average annual rainfall: Rainfall varies strongly in space with northern and central parts experiencing considerably lower rainfall than in the south. The desert north which covers two thirds of the territory, annual average rainfall does not exceed 100mm. The central Sahel, with annual rainfall average between 200 mm and 600 mm. The southern regions experience average annual rainfall of 1,400 mm (figure 1b).

Main driver of climate variability: 1- ITCZ, 2- El Niño Southern Oscillation (ENSO)

Short overview

Mali's climate ranges from desert to semi-arid in the north and centre to tropical wet and dry climate in the south and west. The climate is influenced by the West African Monsoon, which brings

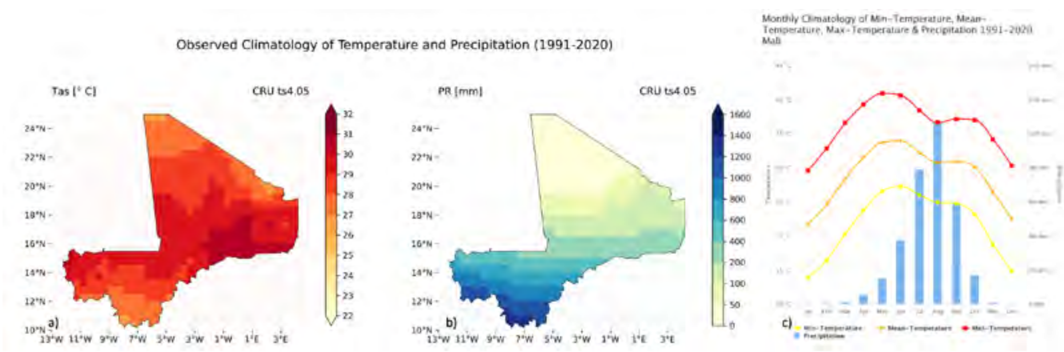


Figure 1: Observed Climatology of mean Temperature (a), annual mean total precipitation (b) and monthly climatology (c) over 1991-2020. (Adapted from World Bank, 2022)

2022

large interannual variability in wet-season rainfall and contributes to recurring droughts and floods. The rainfall season is from June to September. The average temperature varies between 21°C in January and 33°C in May (figure 1c). The El Niño Southern Oscillation (ENSO) creates irregular periodic variation in the temperature as well as sea surface temperature, thus influencing year-to-year variability and extreme weather events such as heatwaves, droughts, and floods. Drier than normal rainfall during July to September is generally associated with the El Niño (warm) phase of ENSO.

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. Ranked 11 out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022), Mali is one of the higher hazard risk countries in the world.

1.1 Climate Change in Mali

Historical Climate change	Projected climate change
Temperature	
▪ The mean annual temperature over Mali have increased at a rate of approximately 0.2°-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 3°-4°C for a high greenhouse gas concentration scenario (SSP5-85) and 2°-3°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, no clear trend in rainfall due to high year to year natural variability. Rainfall variability has increased, observed rainfall declines beginning in the 1950s through the 1980s, with partial recovery from the 1990s onward.	▪ Mid-century estimates (2040-2060) of annual precipitation changes over Mali indicate an increase dominate by natural 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)

2. Priorities of the Movement and climate change

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

Existing Hazard	Projected Risks
Drought	
There is a high risk of extreme heat and water scarcity in all 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/a). The capacities of communities to continue adapting to these more frequent and longer droughts are threatened (Worl Bank, 2021).	Think Hazard, n/a 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 important in some areas that others. The warming in Mali will be higher than the world average (Think Hazard, n/a). The changes in the extreme temperature have more impacts in Mali than the changes in the average temperature (World Bank, 2021). The temperature changes mentioned coupled with the changes in rainfall (reduced or erratic) are expected to increase the incidence and impacts of these disasters (World Bank, 2021).
Flood	
Flood accounted for 50% of the disasters experienced in average annually in Mali in the 1980-2020 period (World Bank, 2021).The natural flood hazard has been exacerbated by agricultural practices and land management in the Niger flood plan, making the area more vulnerable to floods (World Bank, 2021). There is a high risk of flood 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/a).	The environmental damages caused by some agricultural practices coulpled with climate change will cause more frequent floods in already vulnerable areas of the country (World Banl, 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 Law and Policies

In a recent analysis of the disaster management framework of the country, it was highlighted that there is currently no specific law on disaster risk reduction. Moreover, the existing DRR policy framework could be enhanced around one clear policy on DRR, aligned with the Sendai framework.

- Cadre stratégique pour la Relance économique et le Développement durable (CREDD) 2019-2023. One of the 5 focus areas of this strategic document is about climate change resilience and environmental protection. DRR and capacity building of communities on DRR are a central piece of this area.

2.2 Reduce health impacts of climate change

Due to climate change the frequency of heat waves, floods and droughts is expected to increase leading to several health risks including malnutrition, hunger, and the rise and spread of water-borne disease (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 are malnourished due to several factors, including food insecurity (Integrated Food Security Phase Classification (IPC), 2022). Declines in agricultural production, especially during drought events, will worsen the food insecurity and malnutrition situation (Nagarajan, 2020).

Secondly, recurrent flooding increases the risks of water-borne 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 is 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).

Thirsdly, 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. Meningitis is expected to increase as 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 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 Sustainable water: resources management, infrastructure and access

Water, Sanitation and Hygiene

Droughts decrease the water available for drinking and other domestic uses. Temperature rises and 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% in Southwestern 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). Therefore, these people will be affected by water scarcity during droughts. The Bani River Basin in Mali was highlighted in one of the plausible climate scenarios reviewed in the IPCC 5th Assessment Report (A2 scenario), in which the basin is estimated to experience substantial reductions in runoff, which could have 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 higher success and yield rate. The inadequate sanitation services and poorly constructed water wells also contribute to 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% of the population, accounting for about 42% of the GDP (Nagarajan, 2020; GFDRR, 2019). Conequently, 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 USD 10 million (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 the vegetation and 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% (Ministry of Foreign Affairs of the Netherlands, 2018). This will have 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 liekly 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) and poultry diseases such as avian flu and Newcastle disease ultimately impacting human and animal health in the country (USAID, 2018). Droughts also cause annual agricultural losses estimated at USD 9.5 million (GFDRR, 2019) In contrast, a wetter and warmer climate increases the risks of animal diseases such as Rift Valley Fever and the transmission of African swine flu (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 (Ministry of Foreign Affairs of the Netherlands, 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 249,000 people displaced internally in 2021 (IDMC 2022). Approximately 6,000 people were displaced by floods in 2021, 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 (DGPC 2018 in IFRC 2021). Most recently, flooding in 2020 affected 8,968 households, spread across all regions of Mali. The capital city of Bamako is particularly flood-prone, with informal settlements in Bamako and substandard housing particularly at risk of urban flooding. In 2021 over 6,000 people were affected by flooding (IDMC 2022).

Displaced people in Mali, including 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 flooding event damaged the infrastructure of a camp in the Mopti region of Mali. The International Organization for Migration reported that heavy rains associated with the flooding event 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 correlation, particularly in areas with fewer crop diversification (Defrance et al. 2020)

Climate change is projected to cause significant (up to 40%) drops in agricultural capacity in Mali (Pearson et al. 2013), which may increase migration and displacement. In many areas, yields have already dropped dramatically (ICRC 2021). This highlights the need for climate change adaptation to address 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 and Knox 2012, Madurga-Lopez et al. 2021). The three main pathways identified for this 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 and 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 by 31% for energy, 25% for agriculture, 39% for land use and forestry, and 31% for waste sectors by 2030 compare to business as usual scenario.

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

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

National Designated Entity: Agence Nationale de la Météorologie/ National Meterology 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 by: FAO, World Bank, FED, European Union, UNDP, WRI, African Development Fund, bilateral cooperation with Germany, Canada, France, Nertherlans, Belgium, Norway and Sweden (NDC Partnership, n/a).

Additional Climate Policies

- *Politique Nationale des changements climatiques* (National Climate Change Policy) (2011). DDR is a one of the 8 targets of the policy. Health also has an imortant role in the policy.
- Third Communication to the UNFCCC (2020). The communication draws the landscapes for adaptation projects until 2030, identifying priorities areas compatible with the NDC, and a focus on nature-based solutions. In 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, 2022).

The country has a complete environmental policy framework, including policies on biodiversity, forest, agriculture, environmental protection and water management among others. Moreover, it is developing additional legal instruments to facilitate the climate transition (MEADD, 2022).

Climate finance

Mali is part of several Green Climate Fund (GCF) regional projects and has two countries specific project including one focusing on adaptation 'Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Mali Country Project' (GCF, 2022). National societies cannot directly apply 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 about $20,000 to $50,000 USD and are intended to support community-level initiatives. The GEF Small Grants Programme sits under UNDP 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 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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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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