

# Chad

## 1. Country overview

Chad is a landlocked country in the Sahel region facing multiple interdependent challenges. The country struggles with insecurity, entrenched poverty and stagnated economic growth. It has one of the highest child mortality and maternal death rates in the world ([Obiang-Obounou and Fuh 2020](#)). It hosts approximately 450,000 refugees from the region ([UNHCR 2020](#)) – largely displaced by conflict – and is at the bottom of the World Bank's Human Capital Index. Over 80 per cent of the population is engaged in agriculture (Central Intelligence Agency (CIA) 2021). The economic importance of oil has grown since 2004 and is the main source of government revenue ([World Bank n.d.](#)). Natural hazards include drought, desertification, floods and dust-storms ([PreventionWeb 2014](#)).

Chad ranks 181 out of 181 countries in the Notre Dame Global Adaptation Initiative (ND-GAIN) index. The ND-GAIN index summarizes a country's vulnerability to climate change and other global challenges in combination with readiness to improve resilience. This ranking indicates that Chad has extremely high vulnerability levels and low levels of readiness to adapt to climate change ([ND-GAIN 2020](#)).

### 1.1 Climate

The northern part of Chad has an arid desert climate, receiving very little rainfall over the course of the year. Rainfall increases in the southern part of the country, with a wet season from May to October. In the south, the wettest months of July and August usually see 10 or more days of rainfall per month ([International Research Institute for Climate and Society \(IRI\) n.d.](#)).



Figure 1: Map of Chad. Source: Encyclopaedia Britannica, 2012

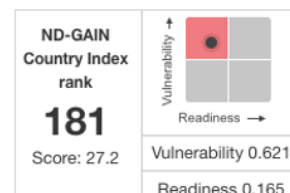


Figure 2: Chad's ND-GAIN Ranking (ND-GAIN 2021).

In the south, temperatures are highest in April, right before the rainy season. During this month, temperature can range from about 40°C during the day to 25°C at night. The coolest month is January, which has nighttime lows reaching below 20°C. In the northern desert areas, the hottest months are June–August ([IRI n.d.](#)).

## 1.2 Climate change

### Historical climate

#### Temperature

Average temperature in Chad has increased by about 1°C in the last 100 years ([IRI n.d.](#)). The biggest increase happened over July–September ([World Bank n.d.](#)).

Between 1960 and 2003, there was an increase of 50 ‘hot’ nights per year ([McSweeney et al. 2010](#)).

### Climate Projections

Temperatures are expected to continue to increase in Chad with climate change, averaging 2–6°C higher by the end of the century, depending on the rate of global climate change ([World Bank n.d.](#)).

Projections suggest by the 2060s, 17–36 per cent of days will be ‘hot’ days. This will increase up to 21–54 per cent by the end of the century, with more rapid increases in the south ([McSweeney et al. 2013](#)).

#### Precipitation and water distribution

There have been no long-term trends in rainfall over the last century, although there have been distinct wetter and drier periods, with severe droughts between 1950 and 1980s and 2005, 2008, 2010 and 2012.

([United States Agency for International Development \(USAID\) 2012](#)). Nonetheless, the early 2000s saw unusually high rainfall during the dry season ([World Bank n.d.](#)).

Climate models disagree about how average rainfall will change in Chad, with some models showing increases and others showing decreases ([World Bank n.d.](#)).

Heavy rainfall events will become more frequent and the amount of rain falling during such events is projected to increase in southern Chad, but decrease in the north ([Deutsche Gesellschaft für Internationale Zusammenarbeit \(GIZ\) 2021](#)).

## 1.3 Climate vulnerability

Like most of the Sahel region, the 1970s and 1980s in Chad was a period of extreme dryness, characterized by frequent and severe droughts. This period was then followed by one of increased precipitation beginning in the 1990s ([Fontaine et al. 2011](#)). The current climate change trend in Chad and neighbouring countries is for higher interannual rainfall variability, affecting total rainfall and its distribution within the rainy season as well as the length of the rainy season ([Sultan et al. 2003](#); [Taylor et al. 2017](#)). This poses serious challenges for rainfed agricultural and agropastoral systems, which are the main sources of livelihoods in Chad ([Nilsson et al. 2016](#)).

## 2. Humanitarian sectors and climate change

### 2.1 Water and habitat

The shrinking of Lake Chad in the 1980s became a global symbol of climate change. The lake did recover partially in the 1990s, during a wetter period, but has not returned to its original extent. It has subsequently remained stable in the most recent two decades, with significant seasonal fluctuations ([Duc Pham et al. 2020](#)). At one point, the Lake's shrinking was also thought to be an example of poor land management and over-extraction for irrigation; but recent studies have concluded that extraction likely played a very limited role in the reduction of its size as compared to the change in rainfall ([Lemoalle et al. 2012](#)). Lake Chad remains an important feature of the region's hydrology, with most rivers in Chad acting as tributaries to the lake. For adjacent areas, the lake serves as an important source for irrigation (mostly small-scale farming) and fishing ([Sarch and Birkett 2000](#)). One benefit of the global interest in Lake Chad is that there have been more studies on Chad's hydrology as compared to other parts of the region. Chad's groundwater recharge, including for shallow aquifers accessible by pumping, are considered active. This means that extracting groundwater to smooth variability within seasonal rainfall patterns represents a high potential adaptation strategy for the country ([Duc Pham et al. 2020](#)).

However, projections suggest that a combination of higher temperatures, more erratic rainfall and population growth may decrease per capita water availability by 75 per cent by 2080, compared to 2000 ([GIZ 2021](#)). Due to conflict and lack of infrastructure, currently only 43 per cent of the population has access to water services and only 10 per cent to sanitation ([Joint Monitoring Programme 2017](#)), and climate change will likely aggravate the pressures on water supply.

### 2.2 Economic security

Conflict and the presence of non-state armed groups in Chad has had deep, long-lasting effects on economic security ([Nagarajan et al. 2018](#)). It is difficult to ascertain the relative effects of the many stressors in the region as compared to the insecurity. Rainfall variability experienced in Chad adds to the existing pressures by straining agricultural and agropastoral systems. More recent studies have highlighted the negative role of increased temperatures on agricultural productivity in the region, assessing that heat stress on crops may have a stronger negative impact on yields than changes in rainfall ([Sultan et al. 2013](#)).

Both temperature increases and variable rainfall make harvest rates low and unpredictable; and, therefore, require the local population to stabilize household incomes in other ways – notably through labour migration and day labour ([Maastricht Graduate School of Governance \(MGSOG\) 2017](#)). Consumption is stabilized through regional and international food markets, with households purchasing imported staple foods. Therefore, food price and availability in Chad is not only affected by local production, but also regional and global production, as well as stressors which disturb markets, such as conflict within the region ([FAO 2016](#)).

A major impact of climate change in Chad relates to food insecurity: 38.4 per cent of the population is below the international poverty line, and the country as a whole is categorized by the World Health Organization (WHO) as a “low-income food-deficit country” ([WHO n.d.](#)). It is one of the world’s most food insecure countries: 40 per cent of children aged under five suffer stunting and low height connected to malnutrition ([World Food Programme \(WFP\) n.d.](#)); and, in 2020, an estimated 6.4 million people were in need of humanitarian assistance ([OCHA 2020](#)). Recently, metrics of food insecurity have increased, as severe insect and pest invasions as well as floods have destroyed agricultural production, leading to widespread and severe food insecurity with long-term health implications. In 2019, for instance, the number of children with acute malnutrition jumped by 59 per cent compared to the previous year, notably due to low agricultural yields caused by droughts and pests ([FAO 2019](#)). These hazards are expected to intensify and become more frequent under climate change.

## 2.3 Health

The disease burden in Chad is already significant and resources limited – just 9 per cent of the government’s total expenditure goes to the healthcare sector ([WHO n.d.](#)) – and climate change is projected to increase this burden. Notably, the extreme weather events and alterations in climate seasonality and averages all impact the spread of vector- and waterborne diseases, strain food and water resources which in turn has implications for public health, and lead to increased mortality and morbidity ([WHO 2018](#)).

Climate and health projections in Africa are showing expanded ranges of malaria and dengue fever transmission due to climate change; in particular, higher altitude or dry areas that were not suitable for mosquitos may rapidly become so, and areas that are already familiar with the disease may find themselves overburdened with increases in and the intensification of cases ([Tanser et al. 2003](#); [Ermert et al. 2012](#); [Sintayehu et al. 2020](#)). In Chad, both malaria and dengue fever are already among the leading causes of death ([Grove 2020](#)) and incidence of cases and deaths is already observed to be increasing, notably linked with more frequent flooding and high temperatures ([WHO n.d.](#)). For instance, in 2013, malaria deaths in the country doubled compared to the previous year – the season had been characterized by erratic precipitation and severe, intermittent dry spells which experts postulated increased the breeding and survival rates of the malaria-carrying mosquito ([The New Humanitarian 2013](#)).

Large outbreaks of cholera have occurred in Chad since the 1970s. UNICEF calculates that the country saw almost 32,000 reported cases in 2003–2013, particularly in the border regions with Cameroon, Niger, and Nigeria ([UNICEF n.d.](#)). Severe outbreaks occur throughout the year, as much in dry seasons or droughts when water quality and quantity is lower and people migrate ([UNICEF n.d.](#)), as in the rainy season when flooding impacts water sources and helps the bacteria to propagate further ([Médecins Sans Frontières \(MSF\) 2019](#)). As climate change increases the chances of extreme weather and decreases the supply of potable water, there is a risk of increased incidence and geographical expansion in water-borne diseases, such as this one.

Hotter temperatures could have severe health implications for Chad. As seen above, these events are projected to increase in frequency, duration and intensity over the coming decades. Projections suggest heat-related mortality may increase up to three-fold by 2080, driven by the increased exposure to heat waves and more frequent ‘hot’ days ([GIZ 2021](#)). The health implications of temperature rise are particularly dangerous for people above 65 years of age and those with pre-existing conditions and disabilities, such as diabetes and heart disease

([WHO n.d.](#)). Chad's capital city of N'Djamena is one of the hottest in the world, with average high monthly temperatures never going below 31°C and an average high temperature in April of 41°C ([Weather Atlas n.d.](#)). Electricity poverty and limited electrical grid connection ([World Bank n.d.](#)) makes it difficult for households to cope with extreme heat.

## 2.4 Protection

As in other countries in the region, climate change is considered to have a multiplying effect ([Moran et al. 2018](#)) on the underlying stresses in Chad, including long-standing political instability, stagnant growth, increasing inequality and conflict ([Duc Pham et al. 2020](#)). The presence of non-state armed groups continues to produce widespread protection concerns. The reduction of size of Lake Chad in the 1970s and 1980s reduced water access to the local population, requiring increasing numbers of people and animals to congregate around the lake's smaller perimeters. This, in combination with insecurity in neighbouring countries, has put significant pressure on the areas closest to the lake, which are now the most frequent sites of violence and conflict. This has encouraged many people to migrate inland away from more abundant growing areas, making them less vulnerable to violence, but more vulnerable to livelihood failures ([ACTED 2020](#)).

Chad hosts more than 442,000 refugees and has over 170,000 Internally Displaced People (IDP) ([United Nations High Commissioner for Refugees \(UNHCR\) n.d.](#)). Displaced people, 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 2010 torrential rains wiped out crops and shelters in two refugee camps (Yarounga and Moula) in the south-eastern region of Chad, creating widespread food insecurity in an area that is very difficult for humanitarian actors to access for emergency distributions ([UNHCR 2010](#)).

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 existing 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, flooding and sandstorms.

## 2.5 Policy

Chad is a signatory to the Paris Agreement 2015, which it ratified in January 2017 ([United Nations Framework Convention on Climate Change \(UNFCCC\) n.d.](#)). Chad submitted its Nationally Determined Contributions (NDCs) to the UNFCCC in 2015. NDCs outline a country's climate change mitigation and adaptation commitments. Chad has committed to an unconditional greenhouse gas (GHG) emissions reduction of 18.3 per cent by 2030, against a 'business as usual' scenario. It has also submitted a conditional reduction target of 71 per cent in GHG emissions by 2030. Chad's adaptation priorities include improved water access, agriculture, livestock and fishery strengthening, and improved climate and weather forecasting ([UNFCCC 2015](#)).

These priorities are also included in Vision 2030: The Chad We Want ([Republic of Chad 2017](#)) which outlines the national government's plan to become an emerging economy with sustainability as a key consideration. Reducing desertification, improving environmental protections and climate change adaptation are all included as priorities within the vision ([United Nations Development Programme \(UNDP\) n.d.](#)).

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