

Climate and Health Vulnerability Assessment



DJIBOUTI

CIF  **CLIMATE
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Cover image: Djibouti, Etiopía, children at Lake Abbe. February 9 of 2024.

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LIST OF ABBREVIATIONS

AR6	IPCC Assessment Report 6
BAU	Business-as-Usual (Scenario)
CCKP	Climate Change Knowledge Portal [World Bank]
CHVA	Climate and Health Vulnerability Assessment
CHE	Current Health Expenditure
CME	Continuing Medical Education
CMIP6	Coupled Model Intercomparison Project Phase 6
NCCC	National Climate Change Committee
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Coronavirus disease 2019
CRU	Climatic Research Unit [University of East Anglia, UK]
CVD	Cardiovascular Disease
DALYs	Disability Adjusted Life Years
DHIS2	District Health Information System 2
DRM	Disaster Risk Management
ENSO	El Niño Southern Oscillation
EU	European Union
EWSS	Early Warning Score System
FDJ	Djiboutian Franc
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas [emissions]
GHS	Global Health Security
HIS	Health Information Systems
HMIS	Health Management Information System
HNA	Health Needs Assessment
HSS	Health System Strengthening
HVAC	Heating, Ventilation, and Air Conditioning
IGAD	Intergovernmental Authority on Development
ILO	International Labour Organization
INDC	Intended Nationally Determined Contributions
IOM	International Organization for Migration
IPC	Integrated Food Security Phase Classification
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Intertropical Convergence Zone
MoH	Ministry of Health

NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NCD	Noncommunicable Disease
NDC	Nationally Determined Contributions
NDP	National Development Plan
NEML	National Essential Medicines List
NTD	Neglected Tropical Disease
OOP	Out of Pocket (spending on health)
PHC	Primary Healthcare (services)
PM_{2.5}	Fine Particulate Matter
PND5	National Health Development Plan
RCP	Representative Concentration Pathway
SAM	Severe Acute Malnutrition
SGRC	Secretariat for Risk and Disaster Management
SLR	Sea-Level Rise
SMS	Short Message Service
SNCC	National Strategy on Climate Change
SSA	Sub-Saharan Africa
UHC	Universal Health Coverage
UNFCCC	United Nations Framework Convention on Climate Change
VBD	Vector-Borne Disease
WASH	Water, Sanitation, and Hygiene
WBD	Waterborne Disease
WHO	World Health Organization

EXECUTIVE SUMMARY

Djibouti is highly vulnerable to climate change, which exerts immense impacts on human health, the environment, and the national economy. Climate change, combined with natural and human-induced health stressors, aggravates existing health burdens while simultaneously creating new health risks. Increasing temperatures, unpredictable rainfall, and severe climate-related hazards (such as heavy rain-induced floods, rainfall variability, droughts, and heat waves), which influence the geographic range and burden of a variety of climate-sensitive health risks, are affecting human health in multiple ways. They include impacts on vector-borne diseases (VBDs), waterborne diseases (WBDs), health-related mortality and morbidity, air quality risks, direct injuries and mortalities, along with mental health and well-being risks. These climate-related health risks and hazards are putting more pressure on Djibouti's already fragile health system, further undermining its adaptive capacity and resilience.

Given Djibouti's vulnerability to climate-related hazards and risks, the World Bank's Health, Climate, Environment, and Disaster (HCED) Program has conducted a Climate and Health Vulnerability Assessment (CHVA). The objective of this CHVA is to assist decision-makers in Djibouti with planning effective adaptation measures to mitigate climate-related health risks. To do so, the climatology of Djibouti is first depicted by highlighting observed and future climate exposures relevant to health. Then climate-related health risks are examined based on projected climate variability, including identifying the vulnerable populations most at risk. The final step assesses the adaptive capacity of the health system to manage current and future climate-related health risks in order to inform a series of recommendations — at both the national and subnational levels — with the aim of reducing climate-related health vulnerability in Djibouti.

Climatology: Djibouti has seen an increase in mean annual **temperatures**: July is the hottest month with an average temperature of 33.34°C (low of 27.87°C and high of 38.85°C). At the subnational level, the small port town of Obock has the highest mean temperatures while the city of Ali Sabieh has the lowest.

In contrast, Djibouti's mean annual **precipitation** has been decreasing, though this does vary by region, season, and year. During the 1971–2020 period, Djibouti's mean annual precipitation decreased slightly with statistical significance (>95th percentile) at a rate of 2.25 millimeters (mm) per decade. Projected precipitation patterns under SSP (shared socioeconomic pathway) 3-7.0¹ indicate that the main summer rainy season would get wetter by the 2050s. During 2040–2059, Djibouti is expected to experience an August anomaly of 18.26 mm (-32.52, 116.50) nationwide. The capital city will experience an increase in the monthly cumulative precipitation averaging 219.01 mm.

Projected increases in temperatures and declining precipitation across Djibouti during the mid-century are likely to increase the occurrence, intensity, and prolonged **droughts** in the country. Increased frequency of erratic rainfall is also expected to increase the occurrences of **rain-induced floods** and associated **mudslides**.

Climate-related health risks: Djibouti, as with other countries in the Horn of Africa, is highly vulnerable to climate change impacts, including the impacts on water and food security, heat risks, and climate-sensitive infectious diseases. Climate change, combined with natural and human-induced health stressors, aggravates existing health burdens while simultaneously creating new health risks. Increasing temperatures and unpredictable rainfall will affect the geographic range and burden of a variety of climate-sensitive **vector-borne diseases (VBDs)**, such as **malaria, dengue fever, yellow fever, and the chikungunya virus**. Precipitation changes have also increased the burden of **waterborne diseases (WBDs)** significantly throughout Djibouti, as characterized by the high rates of morbidity and mortality across the country, especially among children under five years of age. Projected increases in the frequency of erratic rain-induced flooding will exacerbate the occurrences and spread of **diarrheal diseases** in Djibouti.

The **health risks of high temperatures** are also a concern, with adverse wide-ranging effects on mortality, heat-related injuries, along with mental health and well-being. Increases in average seasonal temperatures and an increase in the frequency and intensity of **heatwave** events are projected to increase health risks among the population in Djibouti. From an occupational standpoint, **extreme heat** also presents a growing health risk in Djibouti. Average rising seasonal temperatures as well as the increased frequency and intensity of heatwave events by the 2050s are projected to elevate health-related morbidity and mortality levels across Djibouti, especially in the regions of Obock and Dikhil.

High levels of **poor air quality** from harmful airborne particulates have also led to an increased incidence of illness and deaths, thus resulting in chronic lung diseases and acute respiratory infections among the Djibouti population. In 2019, **air pollution** was among the top five risk factors for mortality in the country, especially among children under five years of age.

Food insecurity in the country — compounded by high poverty levels — has also worsened due to the increased frequency and intensity of extreme weather events, such as floods and droughts, in Djibouti. In 2021–2022, following three years of little to no rain, Djibouti experienced the worst drought it had ever seen in 40 years, which triggered significant food insecurity among the population in Djibouti. In 2022, 37.1 percent of rural households and 9.7 percent of urban households were affected by moderate to severe **food insecurity**. Food insecurity has also led to increased food prices and conflict.

The adverse effects of floods and droughts on livelihoods, food security, living conditions, property damage and personal injury, or the deaths and injuries of family members have also exerted a toll on **mental health**. Climate change events are key risk factors for trauma, anxiety, depression, and intense negative emotions such as terror, anger, and shock, which are recognized as acute responses to natural disasters.

The extent to which the health system in Djibouti is prepared for changes in hazards, exposures, and susceptibility, and has the capacity to manage them will determine its resilience in coming decades. In this CHVA, Djibouti's adaptive capacity to prevent and manage climate-related health risks is examined according to the World Health Organization's (WHO) six health system building blocks.

- **Leadership and governance:** Djibouti recognizes the impacts of climate change and, as such, has undertaken various adaptation and mitigation plans and programs. However, the country lacks guidance on the integration of climate change adaptation in key national policies. Cross-sectoral coordination, institutional arrangements, and stakeholder engagement mechanisms are currently weak.
- **Health financing:** Although current health expenditure (CHE) per capita (current USD) has increased steadily over the year, health expenditure as a share of the country's gross domestic product (GDP) has not kept pace with the rapidly expanding population. The Ministry of Health (MoH) lacks a budget line dedicated to climate and health strategies, and resource allocations for health services do not consider climate-related hazards as a criterion.
- **Health workforce:** Despite an overall increase in its health workforce, Djibouti faces a critical shortage of skilled healthcare workers. In addition to the low availability, Djibouti also faces significant challenges in the uneven concentration and geographical distribution of health workers. Most of the skilled health workforce is found in urban areas, particularly Djibouti City.
- **Health information systems (HIS):** Although Djibouti has made progress in improving disease surveillance, the country still faces challenges with non-functional surveillance systems and a lack of infrastructure, which affects the country's preparedness and timely response to health impacts related to climate change.
- **Essential medical products and technologies:** Djibouti has a national essential medicines list (NEML); however, the country still experiences limited access to essential medicines and other essential medical products. In addition, it has a critical lack of essential medical equipment — a situation that impacts the health system's preparedness to tackle climate change impacts on health.
- **Health service delivery:** Djibouti lacks adequate health facilities, especially in the rural areas, which are also highly vulnerable to climate change. There are geographical inequalities in the distribution of higher-level public health facilities between rural and urban areas.

Recommendations to reduce climate-related health risks include establishing a climate-smart health system to reduce climate-related health risks and improve overall health service delivery. More specifically, the following activities could be prioritized:

- **Include adaptation and mitigation strategies for the health sector in the next submission of the nationally determined contributions (NDCs) and the National Adaptation Plan (NAP).** This would also include developing a policy strategy for the health sector that accounts for climate and health-related risks, strengthening the role of MoH in climate change adaptation. This Climate and Health Vulnerability Assessment (CHVA) can feed into specific activities to be developed in the forthcoming policy documents.
- **Establish a budget line in MoH for developing and implementing climate and health action plans and interventions.** This would incentivize MoH to develop a Health National Adaptation Plan and integrate climate change as a cross-cutting challenge in other projects and programs, such as those related to surveillance systems or health facilities' infrastructures.
- **Develop and implement national building codes and standards as well as climate-resilient certification systems.** This includes standards for building sustainable and climate-resilient healthcare infrastructures, such as the requirements for the location of new facilities; the expected characteristics of walls, roofs, and ceilings to ensure their capacity to withstand storms and high-speed winds; and contingency plans that account for climate hazards.
- **Establish a laboratory outreach system and laboratory facilities at the subnational level to improve the collection, transportation, storage, and processing of climate-sensitive disease tests, such as malaria, dengue, and diarrheal diseases.** This may include the establishment of a reference laboratory per region to reduce delays in specimen processing as well as patient diagnosis and management. The government of Djibouti and MoH could engage development partners to support the establishment and stocking of regional reference laboratories.
- **Use climate and health vulnerability as a criterion for developing incentives and retention packages for health workforce in areas that are highly vulnerable to climate-related hazards.** Health workforce retention packages should also be introduced in regions that face the highest risks of climate-related hazards (droughts), such as Arta, Ali Sabieh, Obock, and Tadjourah.
- **Develop tailored early warning alerts that account for subnational climate-related exposures to facilitate quick response and preparedness at the community levels.** The Djibouti National Meteorological Agency should collaborate with MoH to create a such a system, which would be particularly important for the flood-prone regions of Djibouti City, Ali Sabieh, and Arta as well as the drought-susceptible regions of Dikhil, Obock, and Tadjourah.

INTRODUCTION

COUNTRY CONTEXT

- 1. Djibouti is a lower-middle-income country whose economy is largely dependent on its strategic location on the Bab el-Mandeb strait.** Djibouti has been experiencing steady economic growth for many years: its gross domestic product (GDP) was USD3.37 billion in 2021 (compared with USD373.4 million in 1985).² The country's economy depends on trade at its busy ports and profits from container transshipments, transit taxes, as well as land lease and storage revenues.³ Other key contributors to the country's economy include the airport, the banking sector, the Addis Ababa-Djibouti railroad, and the trading partnership with Ethiopia.⁴ However Djibouti's economy has been threatened by the impacts of COVID-19 (Coronavirus disease 2019) pandemic, internal civil conflict, and external conflicts such as the Ethiopia Tigray conflict and the Ukraine war, which have affected food prices. For example, it is estimated that fiscal deficit would reach 3.7 percent of the country's GDP in 2022 and 3.6 percent in 2023 due to the adverse effects of the Ethiopia conflict on bilateral trade, the costs of border security and interior enforcement, and the increases in public expenditure on the refugee influx.⁵
- 2. Although Djibouti has attained a lower-middle-income status, overall income inequalities remain high.** The country's economic growth has not been equally reflected in the country's reduction in poverty rates. As of 2017, 17.1 percent of the population lived below the poverty line according to the international reference of USD1.90 per day,⁶ while an estimated two-thirds of the population in Djibouti lived below USD3.20 per day — placing this segment on the lower-middle-income poverty line.⁷ In particular, rural areas had a very high extreme poverty rate of 62.6 percent in 2017. In fact, with a Gini index of 41.6 in 2017, Djibouti had one of the highest levels of income inequality in the Middle East and North Africa region based on the Gini index, which measures income inequality.⁸ The COVID-19 pandemic has further increased inequality gaps and pushed many people in Djibouti into extreme poverty.
- 3. Djibouti has a steadily growing population that is predominantly young and urban.** As of 2021, it had an estimated population of 1.1 million people. Based on an annual growth rate of 1.4 percent, the population is projected to be 1.29 million in 2050. Djibouti's population is disproportionately young, with more than 50 percent below the age of 25 years.⁹ It is one of the urbanized countries in Sub-Saharan Africa (SSA): an estimated 78 percent of the

population (2021) is based in urban areas, particularly Djibouti City.¹⁰ The rural population consists primarily of nomadic pastoralists of cattle, goats, camels, and sheep.

4. **Despite Djibouti's steady economic growth and efforts to address unemployment, long-term unemployment persists especially among young people.** As of 2021, the overall unemployment rate was 28.4 percent (percentage of the total labor force based on a modeled estimate of the International Labour Organization [ILO]). In addition, women experienced higher unemployment rates (39.4 percent) than men (24.6 percent).¹¹
5. **Djibouti's political stability in an unstable region has attracted over 23,000 refugees and 11,000 asylum seekers from the neighboring countries of Somalia, Ethiopia, Yemen, and Eritrea.**¹² The refugees (mostly Somalis and Yemenis) and asylum seekers (mostly Ethiopians and Eritreans) are hosted in the four refugee villages of Ali-Addeh (49 percent), Holl-Holl (23 percent), Djibouti City (20 percent), and Markazi (8 percent).¹³ The refugee and asylum seeker influx comes with two health challenges including the unique health problems faced by refugees and the additional burden of providing health services to refugees on Djibouti health system.
6. **Djibouti is committed to meeting the climate challenge through both adaptation and mitigation measures.** It ratified the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) on November 11, 2016, which aims to limit the global mean temperature increase to well below 2°C compared with pre-industrial levels. Moreover, the government submitted the intended nationally determined contributions (INDCs) in 2015, which set out a target of reducing greenhouse gas (GHG) emissions

by 40 percent in 2030 compared with the business-as-usual (BAU) scenario. Djibouti has a National Climate Change Committee (CNCC) that is responsible for climate change-related policy, coordination, and action.¹⁴

AIMS OF THIS ASSESSMENT AND CONCEPTUAL FRAMEWORK

7. **The objective of this Climate and Health Vulnerability Assessment (CHVA) is to identify climate vulnerabilities and risks as well as adaptation gaps, along with providing recommendations to assist policy makers and practitioners with planning effective adaptation measures to deal with climate-related health risks.** Where available, the proposed measures are also offered at the subnational level to assist regional health planners. Although the recommendations of this CHVA are primarily aimed at the health sector, they are applicable to other sectors dealing with climatic hazards, such as disaster risk management (DRM) and the Djibouti Meteorological Department.
8. **Adaptation priorities need to be accompanied by fundamental and urgent action to mitigate climate change.** It is important to stress how complex the climate challenge is and how hard it is to predict exactly how severe climate exposures facing populations will become. There are many factors that could slightly slow or significantly speed up the rates of change, including positive feedback effects and cascading climatological tipping points, which are the most worrisome. For this reason, mitigating existing GHG emissions as well as developing and implementing measures to protect human health from the changing climate is of paramount importance.

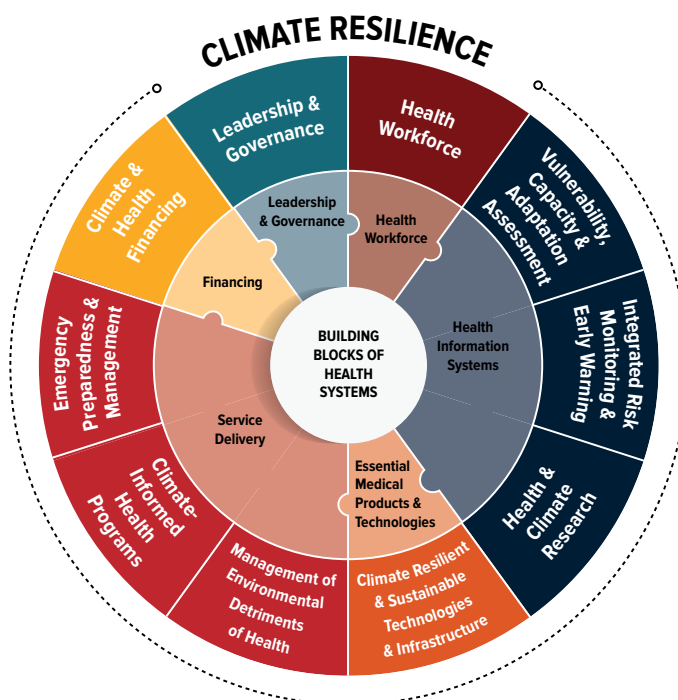
9. Investing in adaptation strategies to proactively address the effects of climate change on health outcomes is critical. This assessment outlines climate risks to health and health systems, the adaptive capacities that are in place to deal with these risks, and the recommendations to meet identified gaps. The primary focus of this assessment is, therefore, on climate adaptation and resilience measures. However, as the Assessment Report Six (AR6) of the Intergovernmental Panel on Climate Change (IPCC) makes clear, “Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered.”¹⁵ Thus, mitigation alone is no longer a sufficient strategy regardless of the pace at which

governments and communities around the world act. Adaptation is now as critical a part of climate action as mitigation. As such, this report focuses on adaptation measures.

10. An operational framework for building climate-resilient health systems is adopted to analyze Djibouti’s adaptive capacity to adequately deal with current and future identified risks. Following this framework (Figure 1), this CHVA is structured around six health system strengthening (HSS) building blocks. These six categories encompass the assessment of capacities and gaps — now and into the future. The CHVA then moves on to consider the 10 components of the health system’s climate resilience.

FIGURE 1:

Operational framework for climate-resilient healthcare systems.¹⁶



Source: World Health Organization. Operational framework for building climate resilient health systems. World Health Organization (WHO), 2015.

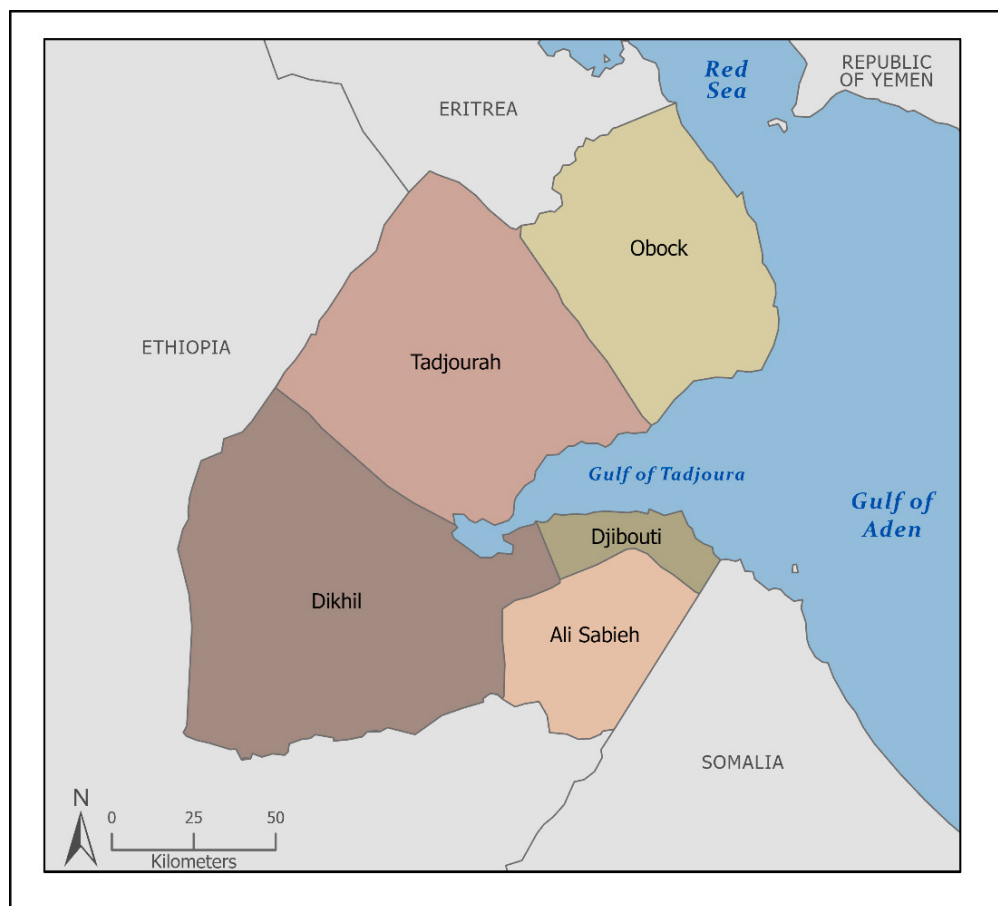
11. This CHVA follows a step-wise linear approach. The first step characterizes the **climatology** in Djibouti — highlighting the observed and future climate exposures relevant to health. The second step examines **climate-related health risks**, including identifying the vulnerable populations most at risk. The final step assesses the **adaptive capacity of the health system** to identify gaps in managing current and future climate-related health risks. Together, these steps inform a series of **recommendations** to reduce climate-related health vulnerability in Djibouti. The CHVA is based on a review of the published literature, national statistics,

and consultations with key counterparts in the Djibouti government, including the Ministry of Health (MoH) and development partners.

12. The CHVA incorporates subnational considerations for health-related climate action. Djibouti is administered through five geographical regions and the capital city of Djibouti City; they are further divided into 20 administrative districts/subdivisions. The regions are Ali Sabieh in the south, Dikhil in the southwest, Arta in the south-central, Djibouti (the capital city) in the east, Tadjourah in the north-central, and Obock in the north (see Figure 2).

FIGURE 2:

Administrative boundaries of Djibouti.



Source: World Bank Cartography Unit

CLIMATE CHANGE: OBSERVED TRENDS AND PROJECTIONS

13. This section describes the observed climatic changes and projected climate trends — highlighting the climate-related hazards as a priority in relation to human health risks in Djibouti. Climate information was taken from the World Bank Group’s Climate Change Knowledge Portal (CCKP), where historical, observed data is derived from the Climatic Research Unit (CRU) at the University of East Anglia. Observed changes in mean annual temperatures, mean maximum temperatures, and mean minimum temperatures, along with precipitation levels for the 1901–2021 period can be found on the CCKP website. Climate data used in the World Bank Group’s CCKP was obtained from the Coupled Model Intercomparison Project, Phase 6 (CMIP6). The CMIP’s efforts are overseen by the [World Climate Research Program](#): it supports the coordination of the production of the global and regional climate model compilations that advance the scientific understanding of the multi-scale dynamic interactions between the natural and social systems affecting climate.

CMIP6 provided the foundational data used to present global climate change projections presented in the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC). It relies on the shared socioeconomic pathways (SSPs), which represent potential societal development and policy scenarios for meeting the designated radiative forcing (measured in watts per square meter [W/m²]) by the end of the century. These scenarios — characterized by different plausible future societal development storylines (influencing future emissions and land use changes) and associated contrasting emission pathways — are used to gauge the corresponding responses of the climate system. Based on an exploration of the

observed climate conditions for the latest climatology, 1991–2020, this assessment projects climate conditions and changes under SSP3-7.0¹⁷ for the near (2030s; 2020–2039) and medium terms (2050s; 2040–2059).

DJIBOUTI’S GEOGRAPHY

14. The Republic of Djibouti is located in the Horn of Africa along the Gulf of Aden at the southern entrance of the Red Sea. Covering a land area of more than 23,000 square kilometers (km²), with a coastline of 372 km, Djibouti is one of the smallest countries in Africa and shares its borders with Eritrea, Ethiopia, and Somalia (see **Figure 3**).¹⁸

Djibouti is a highly arid country with limited arable soil: nearly 90 percent of the country is classified as desert, with approximately 9 percent considered as pasture and approximately 1 percent forest. The terrain comprises arid lands interspersed with shrubs scattered throughout the country's plateaus, plains, volcanic formations, and mountain ranges — some of which reach 2,000 meters (m) in height. Across the country, the altitude varies from 155 m below sea level at Lake Assal to over 2,000 m at Mount Moussa Ali. The eastern region is dominated by high ridges and relatively deep ravines. Western zones are made up of regularly deepening plains and depressions marked by fracturing. The coastal plains in the north of the country include cliffs falling directly to the sea as well as pebble and sandy beaches. Djibouti is considered to be

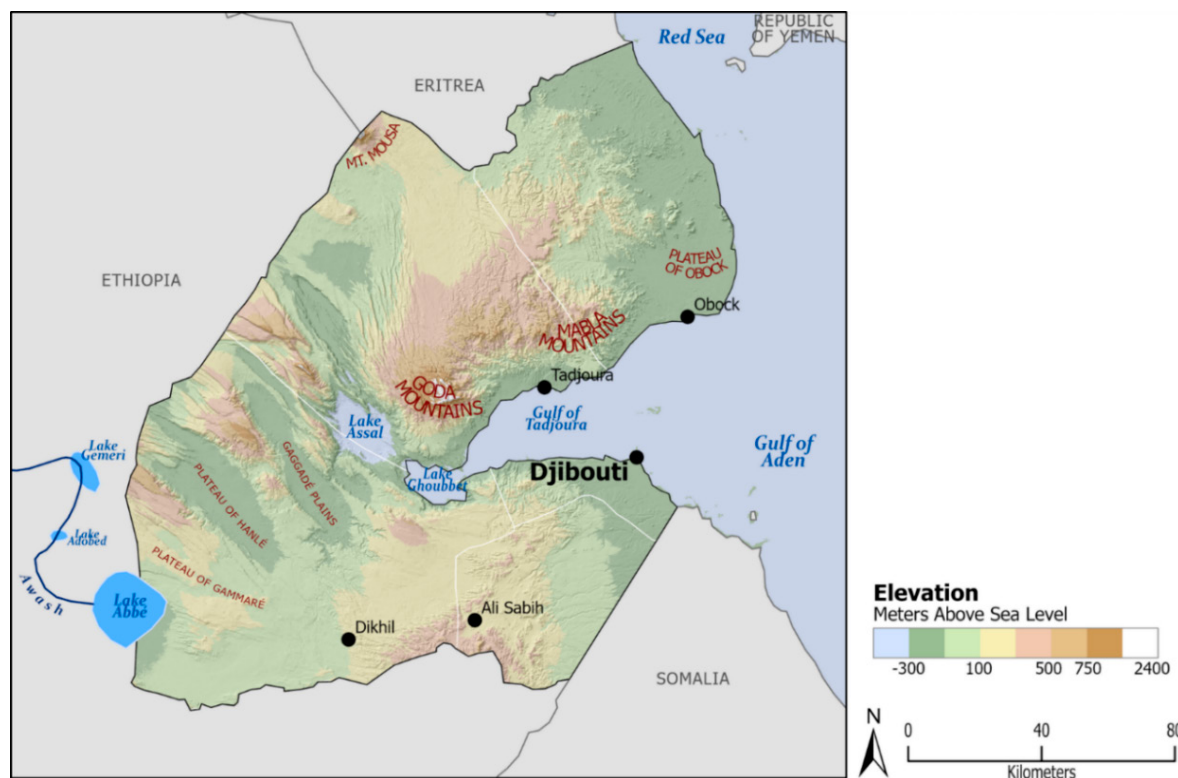
resource-scarce and prone to natural disasters — a status quo that is further exacerbated by water scarcity, poor water management, and poor land-use planning.

OBSERVED AND PROJECTED CLIMATOLOGIES

15. Djibouti has a hot desert climate — characterized by high year-round temperatures and evaporation rates as well as low and irregular amounts of precipitation in the form of two or three rainy seasons per year.¹⁹ Average seasonal temperatures observed during the current climatology's (1991–2020) mildest and most humid months (November–February) ranged from a minimum of 18.98°C in January to a maximum of 31.36°C in November. As for

FIGURE 3:

Elevation of Djibouti and major cities.



Source: Oak Ridge National Laboratory

the hottest months from June to September, the average seasonal temperatures ranged from a minimum of 25.95°C in September to a maximum of 38.85°C in the hottest month of July.

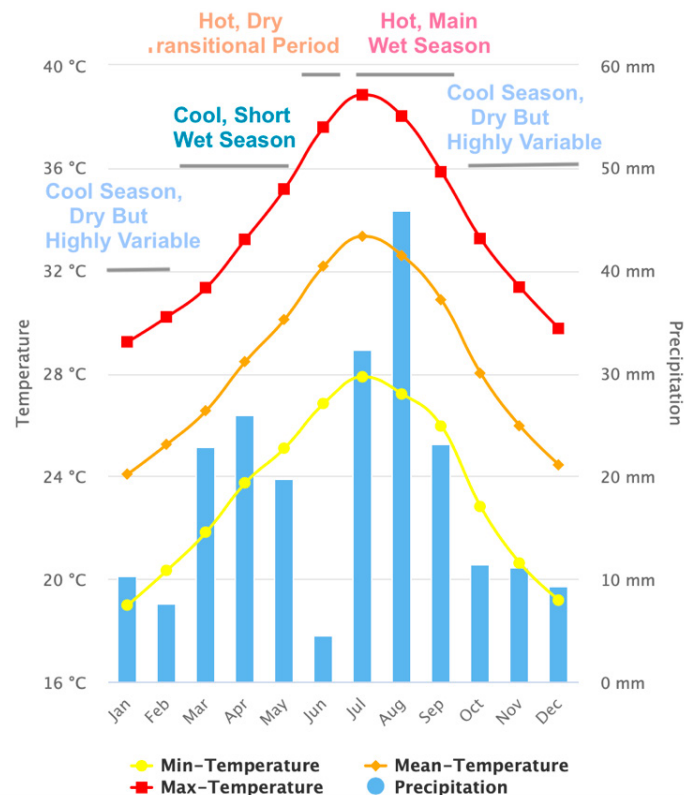
Typically, northeasterly trade winds from the Arabian Sea and the Gulf of Aden result in variable rainfall between the cool months of October and February, followed by a short but more reliable rainy season between March and May.²⁰ These spring rains account for roughly one-third of Djibouti's average yearly precipitation (215 millimeters [mm] for the latest climatology). The driest season, June, receives less than 5 mm on average, during which southerly winds strengthen, often producing violent sandstorms (*khamsin*).²¹

A southwesterly monsoon flow drives Djibouti's main rainy season between July and September (amounting to a little less than half of the yearly precipitation average for the latest climatology).²² During this time, western Djibouti and the mountainous region north of the Gulf of Tadjourah receive roughly twice as much precipitation as eastern Djibouti's arid Gulf of Aden coastline, where the majority of Djibouti's population resides.

Figure 4 illustrates these seasonal fluctuations, which are influenced annually by the movement of the intertropical convergence zone (ITCZ) and interannually by the strength of a potential El Niño southern oscillation (ENSO).

FIGURE 4:

Monthly and seasonal climatology observed in Djibouti, 1991–2020.



Source: World Bank Climate Change Knowledge Portal

TEMPERATURES

16. Between 1971 and 2020, Djibouti's mean, maximum, and minimum annual temperatures increased by 0.2°C (0.1°C for the minimum annually) per decade.²³ At the national level, this increase has been significant during the fall months for the climatology of the 50-year period. July — the month that had the highest observed temperatures for the climatology of the most recent 30 years — had a mean temperature of 33.34°C, with an average minimum of 27.87°C and a maximum of 38.85°C. January — the month with the lowest observed temperatures for the same period — had a mean of 24.08°C, with an average minimum of 18.98°C and a maximum of 29.23°C. While the temperatures varied by topography and distance from the coast, they were not as pronounced as subnational-level precipitation patterns.

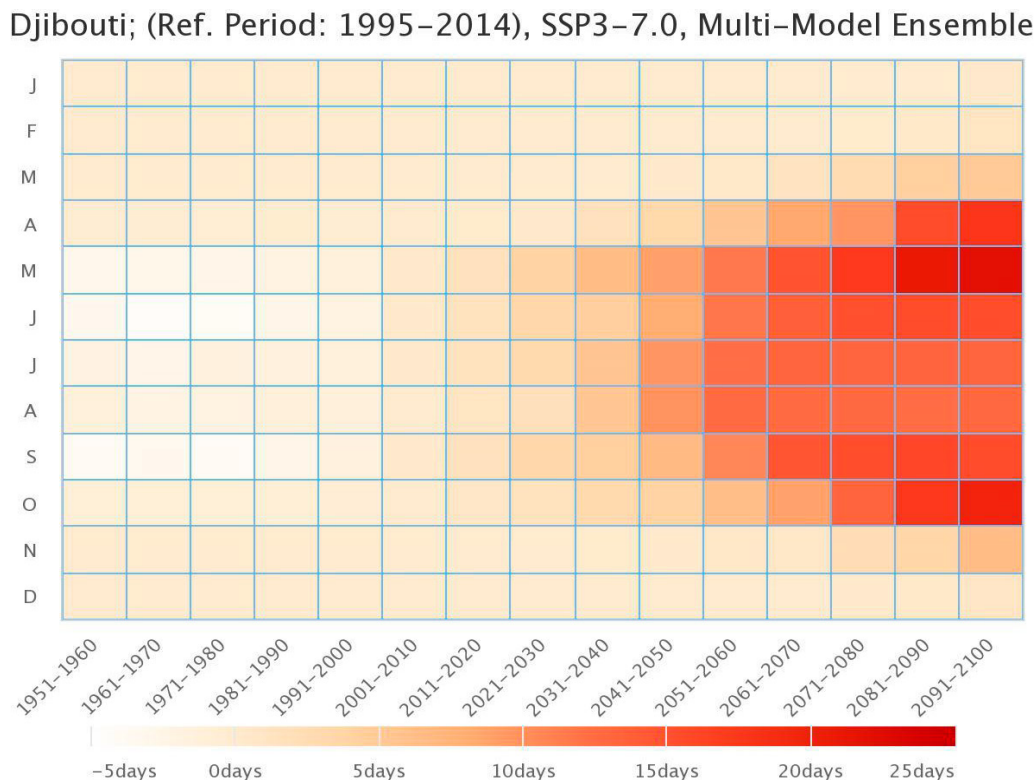
17. Under SSP3-7.0, Djibouti's mean annual temperature will increase by the mid-century while showing greater seasonal uncertainty during summers. The national-level mean annual temperature is projected to increase from 28.33°C during the historical 1995–2014 reference period to 29.74°C by the 2040s and further to 30.50°C (-0.51°C, +0.76°) by the 2060s. Projected summer temperatures have a much wider range of uncertainty. For the 2040–2059 climatology, SSP3-7.0 projects a mean temperature anomaly of 1.07°C for the month of August compared with the historical reference period (-2.48°C, +3.18°C). Similarly, the maximum August temperature anomalies will range from -3.61°C to +3.06°C, with a median of 1.07°C above that of the historical reference period. Given the country's homogeneity, projected temperatures are expected to vary minimally subnationally.

18. The number of hot days above 35°C will increase during the transition months between the warm and cool seasons (April and October) across regions by the 2050s due to the drastic impact of the changes in atmospheric moisture content (see Figure 5). A comparison with the reference climatology (1995–2014) median of 57.51 hot days (>35°C on the heat index) occurring during the summer months (82.86 mean days annually) is illuminating. For example, the coastal city of Obock is expected to experience 80.25 hot days (-30.71 days, +2.67 days) in the summer months for the 2040–2059 period and 129.40 hot days (-22.02 days, +28.49 days) annually. The capital and most populous city, Djibouti City, will nearly match these values by the mid-century. In contrast, the inland city of Dikhil will likely see a drastic increase in hot, humid days by the mid-century to 51.07 days (-24.78 days, +9.12 days) during summer, 65.39 days (-22.23 days, +48.19 days) annually, compared with its historical median of 2.49 hot days during the summer months (2.96 days annually).

19. Importantly, this shift will be accompanied by an increase not only in warm spells (where the daily maximum temperature rises above the 90th percentile based on five-day intervals) but also in tropical nights (nights where the temperatures stay above >20°C). Warm spells will increase nationally from the historical reference period (1995–2014) by an anomaly of 128.65 days (64.76 days, 234.17 days) for the projected 2040–2059 period. Furthermore, the single-day monthly maximum temperatures will increase by annual anomalies of 1.43°C (0.92°C, 2.29°C) and 1.58°C (0.82°C, 2.39°C) for Obock and Dikhil, respectively, based on the comparison of the two periods. These trends are of concern because warm spells are associated with increased risk of insomnia,

FIGURE 5.

Showing projected days with the heat index > 35°C anomaly.²⁴



cardiovascular and respiratory morbidities. The increased frequency of tropical nights is also important because the temperature marks a biophysiological threshold where the human body cannot adequately cool down to achieve restorative sleep.

PRECIPITATION

20. Historically, Djibouti’s mean annual precipitation has decreased, though the trend differs by region, season, and year. For the 1971–2020 period, Djibouti’s mean annual precipitation decreased slightly but with statistical significance (>95th percentile) at 2.25 mm per decade. During the winter months of this period, Obock on Djibouti’s east coast experienced a significant decrease in mean precipitation. The average seasonal rainfall

observed from 1991–2020 shows that Obock received roughly one-third of its annual total rainfall (148.72 mm) from the main rainy season, one-quarter from the short rainy season in spring, and one-quarter from the variable cool and dry season (October to February). By comparison, inland Dikhil received half of a much larger annual total (259.35 mm) during the main rainy season, one-third during the spring short rainy season, and the remainder during the cool and dry season.

Another climatology change is captured in the differences in the season with the highest variability in the rainfall. While Dikhil observed particularly high variability during the short spring rainy season during 1981–1990 compared with the current climatology trend

(1991–2020), Obock’s season with the greatest variability was in the winter months such as December and February, characterized by tighter and less pronounced seasonal peaks that are linked to the short spring and summer main rainy seasons. By comparing the peaks and valleys of the interannual precipitation trends observed and how close they adhered to the current climatology trend of the 1981–1990 and 2011–2020 periods, we can see that the trend varied widely by month and location.

- 21. Projected precipitation patterns under SSP3-7.0 do not signal a clear direction on a national scale in the coming decades, though there are metrics indicating strong potential trends.** The main summer rainy season is projected to get wetter by the 2050s. For 2040–2059, Djibouti is expected to experience a nationwide anomaly of 18.26 mm (-32.52, 116.50) in August. The largest monthly cumulative precipitation quantity for the same period is expected to increase to a mean of 219.01 mm for the capital city. This will most likely occur during the main rainy season: for example, the average largest five-day cumulative precipitation anomaly will be an increase of 21.45 mm during the month of July (-31.67, 90.07) compared with the 1995–2014 reference period. The precipitation amount for the wettest days expected by the end of the century (2080–2099) is likewise projected to increase by an anomaly of 27.37 mm in August (-1.16 mm, 88.98 mm) during the main rainy season compared with the historical reference period (1995–2014).

However, significant uncertainties remain. The percentage changes in precipitation and the annual drought index do not portend a clear signal by the 2030s or the 2050s. For now, March (during the short rainy season) is

expected to have the greatest potential range of precipitation percentage anomaly (median of 11.54 percent [-44.16 percent, 191.70 percent]) for 2020–2039.

CLIMATE-RELATED HAZARDS

- 22. Djibouti is vulnerable to several hazards associated with the ongoing climate change, which presents considerable impacts on population health.** The country is highly vulnerable to droughts, heat waves, floods, and sea-level rises (SLRs). As one of the most water-scarce countries in the world, Djibouti’s vulnerability will be further exacerbated by the anticipated declines in precipitation as well as increases in its temperature and the frequency of extreme events, such as droughts, soil erosion, and desertification, among others.

At the same time, the region will also be impacted by an increase in the frequency and intensity of erratic rainfall, which will lead to mudslides and flash floods. SLRs will also pose a significant threat to the country’s coastline not only due to inundation but also salinization, which increases risks to port infrastructures and tourism along the coast. They are projected to lead to the loss of a sizable proportion of the northern and eastern coastlines due to a combination of inundation and erosion, with consequential losses of agricultural land, infrastructures, and urban areas.

DROUGHTS

- 23. Djibouti is highly vulnerable to severe droughts.** The current drought that started in 2020 followed five consecutive failed rainy seasons, which have affected more than 200,000 people in Djibouti. More generally, the whole of Djibouti has seen an increase

in the occurrences, duration, and intensity of droughts in recent decades. In particular, the eastern coastal region of the country has experienced more severe and extreme droughts between 2007 and 2017, accounting for approximately 80 percent of the drought events.²⁵

Projected increases in temperatures, as well as declining precipitation levels, across Djibouti during the mid-century, are likely to increase the occurrence and intensity of prolonged droughts in the country. By the 2060s, the mean annual temperature is projected to rise to 30.50°C compared with 28.33°C during the 1995–2014 reference period, with minimal differences at subnational levels. Under projected climate change conditions, Djibouti is likely to experience more frequent and intense aridity, with potential for droughts and extreme heat, in addition to critical sea level rise (SLR) resulting in coastal inundation — all of which will adversely affect food and water security, sanitation, and heat-related risks in both coastal and inland areas.

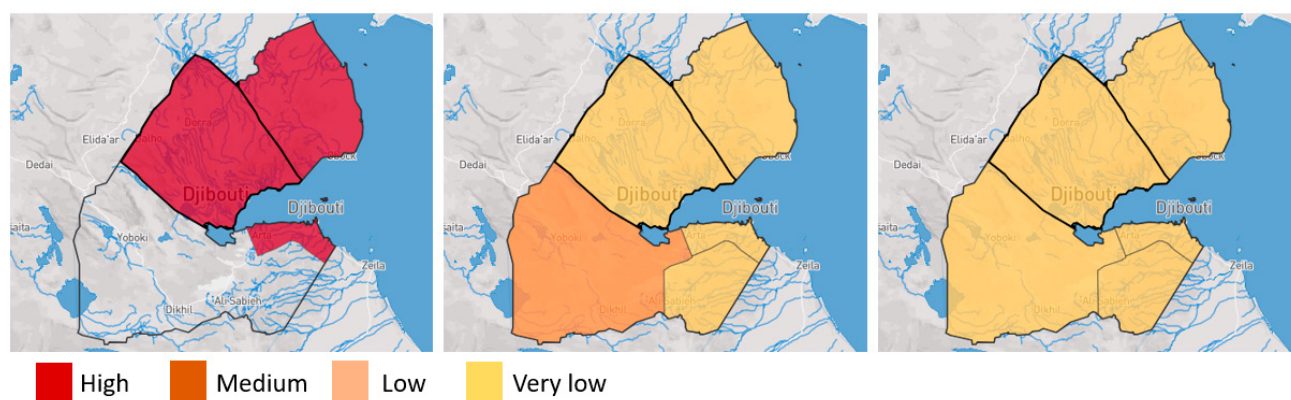
FLOODS

24. Floods are among the most significant climate-related hazards in Djibouti (see Figure 6).

Increases in the frequency and intensity of heavy rains and related flash floods and mudslides are already impacting human health and threatening livelihoods in Djibouti. Coastal urban towns are at the highest risk of flooding. Erratic rains on April 20–21, 2020 caused flash floods that struck Djibouti City and the neighboring suburb of Balbala, resulting in eight deaths and affecting over 110,000 people.²⁶ Under current climate change projections, frequent intense rains in Djibouti will trigger more damaging floods, with severe impacts on health and health infrastructures. Potentially damaging waves are expected to flood the coast at least once over the next 10 years.

FIGURE 6:

Risks of coastal, river, and urban flooding in Djibouti (left to right).²⁷



SEA-LEVEL RISES (SLRS)

25. SLRs significantly threaten coastal communities along the Djibouti coastline and the inhabitants' livelihoods. Djibouti has a coastline of 372 km with an exclusive maritime area of 7,190 km². Djibouti's coastal zone houses more than two-thirds of the population as well as socioeconomic activities. At the same time, the coastline and south of Djibouti City is considered to be at high risk of gradual inundation. Given the ongoing though gradual nature of this threat, it should be considered a relevant inclusion for the coastal planning processes.

Saltwater intrusion also presents a high risk, specifically for low-lying barriers and river mouths along the country's coastline. The coastline of the estuaries located between the Eritrean border and the Gulf of Tadjoura is at risk of coastal zone erosions, specifically the northern part of the Gulf of Tadjoura. Moreover, the vulnerability of Djibouti's coastline is already being exacerbated by human activities, which have degraded coastal areas and their ecological habitats. These degradations are predicted to increase in tandem with SLRs, water warming, and rising water salinity, thus leading to water contamination and poor water quality increasing the risk of water-borne diseases particularly diarrheal diseases in the country.

KEY MESSAGES:

Temperature

- Overall, the mean annual temperature in Djibouti has increased by 0.2°C per decade since 1970, with the highest observed temperatures in the month of July (mean of 33.34°C) and the lowest observed temperatures in January (mean of 24.08°C).
- Under a high-emissions scenario (SSP3-7.0), mean annual temperature will increase by the mid-century though with greater seasonal uncertainty during the summer. A mean temperature anomaly of 1.07°C is projected for the month of August based on the comparison between the reference 1995–2014 and the 2040–2059 periods.

Precipitation

- Mean annual precipitation in Djibouti decreased at 2.25 mm per decade over the 1971–2020 period with variability by region, season, and year.
- Future projections of precipitation under SSP3-7.0 do not signal a clear direction on a national scale for the coming decades, though the main summer rainy season is expected to get wetter by the 2050s. Djibouti is expected to experience an August anomaly nationwide of 18.26 mm during the 2040s.

Climate-related hazards

- **Drought:** Djibouti has seen an increase in the frequency, duration, and intensity of droughts in recent decades. In particular, the eastern coastal region of the country has experienced more extreme droughts triggering water and food insecurity.
- **Extreme heat:** Djibouti's mean annual temperature increased by 0.2°C between 1971 and 2020. At the national level, this increase has been significant during the fall months. The number of hot days above 35°C is projected to increase during the transition months between the warm and cool seasons (April and October) and across the regions by the 2050s.
- **Floods:** Floods, especially coastal flooding, are a significant risk in Djibouti, especially in northern Djibouti, along with Djibouti City and the suburb of Balbala. They are expected to increase in frequency and intensity.
- **Sea-level rises (SLRs):** SLRs significantly threaten coastal communities and livelihoods along the Djibouti coastline. Areas south of Djibouti City have the highest risks of gradual inundation.



CLIMATE-RELATED HEALTH RISKS

26. Climate change influences human health outcomes and diseases in multiple ways. This section reviews the evidence for the burden of current climate-related health risks in Djibouti and projections of the future risks of health outcomes due to climate change, based on the expected changes in the country's climate under the representative concentrative pathway (RCP) 8.5.²⁸ Health risks are presented according to prioritization and examined according to historical, current, and projected risks, wherever information is available. Risks to the health system related to climate change are covered in Section III on Adaptive Capacity.

27. Climate change is worsening the emergence, re-emergence, and transmission of infectious diseases and increasing the burden of noncommunicable diseases (NCDs). In Djibouti, infectious diseases as well as child and maternal malnutrition are among the leading causes of mortality. Djibouti has one of the highest maternal mortality ratios — 248 maternal deaths per 100,000 live births — almost five times the regional average. In Djibouti, an estimated 58 out of 1,000 children die before turning five years old.²⁹

Neglected tropical diseases (NTDs) — likely to be exacerbated by climate change — are also a significant contributor to the burden of disease in Djibouti. In particular, there are currently sporadic cases of visceral leishmaniasis, soil-transmitted helminths,³⁰ and trachoma (described by the World Health Organization [WHO]) as an ongoing public health problem in Djibouti.³¹ In 2020, as the world was struggling to control the spread of COVID-19 (Coronavirus disease 2019), Djibouti was also facing a resurgence of measles that further strained the health system.^{32, 33} As such, climate-related health impacts would further

exert a strain on the country's health system and threaten its capacity to provide affordable quality health services to all the population in Djibouti, thus emphasizing the importance of building a resilient health system.

28. Risks to health outcomes related to climate change are not evenly distributed in the population, with some groups at greater risk than others. Climate change may exacerbate health inequalities, especially among certain vulnerable population groups including the poor, rural populations, those living in informal urban settlements, women and young children, the elderly, people living with pre-existing conditions and disabilities, along with refugee / displaced populations. Therefore, investment in adaptation and mitigation measures must carefully consider groups who would directly benefit from, or may be disadvantaged by, adopted measures.

29. Djibouti's CHVA assesses seven climate-related health risk categories. These include risks to (a) nutrition and food security risks, (b) vector-borne diseases, (c) waterborne and water-related diseases, (d) heat-related risks,

(e) air quality, (f) direct injuries and mortality, and (g) mental health. Risk categories were selected from the literature review on climate and health risks to Djibouti. Each category was assessed in terms of current and future risks, with considerations for both national and subnational peculiarities, wherever possible. These risk categories represent only the most pressing climate-related health risks to the population of Djibouti, as indicated in national documents such as the National Development Plan (NDP 2020–2024), the National Adaptation Programme of Action (NAPA 2006), and the Third National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) (2021). Other climate-related health risks may include but are not limited to NCDs associated with climate change and direct injuries and mortalities related to floods.

A. NUTRITION RISKS

30. The mechanisms by which climate change affects nutrition via the food system are profound; they include the acute and chronic effects on agricultural production, storage, processing, distribution, and consumption.

Nutritionally secure and stable diets not only depend on agricultural production but also the complex interactions of demand, economics, legislation, conflict, food waste, nutrient losses, food safety, and access.³⁴ Climate variability is already contributing to increases in global hunger and malnutrition.³⁵ While a comprehensive analysis of climate change's impact on the food system is beyond the scope of this assessment, this CHVA examines climate and nutrition linkages through a food security lens in Djibouti as it relates to weather and climate impacts on agricultural productivity.

Agricultural productivity is a key determinant of food availability, and it is affected by weather

and climate in a multitude of ways — from short-term shocks (for example, natural disasters) to longer-term changes in agroecological conditions that can drastically reduce yields or redefine spatio-temporal patterns of crop suitability. Djibouti is already experiencing limited agricultural productivity due to unpredictable rainfall and associated prolonged droughts and devastating floods.

Rural poor communities, who are heavily reliant on agricultural and pastoral activities, are more vulnerable to water scarcity and related food insecurity caused by climate events than other groups.³⁶ For example, in March 2022, 12 percent of the Djibouti population (approximately 122,000 people), particularly the rural communities of Tadjoura, Obock, Dhikil, Arta, and Ali Sabieh, became food-insecure as a result of a drought that was induced by high temperatures and below-average rains.³⁷

31. High morbidity and mortality are the immediate consequences of undernutrition, thereby resulting in a predisposition to infections, particularly those of the gastrointestinal and respiratory systems.³⁸

Globally, undernutrition caused an estimated 45 percent of all deaths among children under five years of age in 2020, with most of those being in low-income countries.³⁹ A similar trend was also identified in the 2011 data when aggregating fetal growth restriction, stunting, wasting, and deficiencies of vitamin A and zinc, along with suboptimal breastfeeding.⁴⁰ Children with severe acute malnutrition (SAM) face a risk of morbidity and mortality 9–11 times greater than their healthy counterparts.⁴¹ The projected burden of SAM in children under five is projected to increase in Sub-Saharan Africa (SSA) — from 8.1 million cases in 2014 to potentially 9.0 million cases by 2030.⁴²

32. Although Djibouti has progressed in addressing malnutrition and hunger, child and maternal malnutrition is one of the leading causes of disability and death in the country, with stunting and wasting also at high levels. Sixty-eight percent of children from Djibouti die before their fifth birthday. Malnutrition directly or indirectly accounts for about 35 percent of all deaths among children under five years.⁴³ In Djibouti, in 2022, malnutrition accounted for an estimated 83 deaths per 1,000 children under five years of age.⁴⁴ Djibouti has one of the highest levels of food insecurity in the world, in which more than 30 percent of its population (aged 6–59 years) is chronically malnourished.^{45,46} When the country was hit by COVID-19, approximately 28,000 people needed food support from the World Bank and the World Food Program.⁴⁷ In terms of stunting, rural communities face higher rates than urban communities, with the regions of Obock (45.9 percent), Dikhil (44.2 percent), and Tadjourah (40.8 percent) having the highest rates of stunting. Wasting (weight-for-height) rates in Djibouti remain high at 17.8 percent — exceeding the WHO severity threshold of 15 percent.⁴⁸

33. Climate change through erratic rains, prolonged droughts, and floods is worsening food insecurity. Increased extreme rainfall triggers soil erosion and reduces soil fertility, which is further aggravated by prolonged drought periods. Moreover, droughts have increased in frequency, duration, and intensity, which has and will likely continue to impact Djibouti's rainfed agricultural areas, potentially leading to reduced crop yields for smallholder farmers. This is particularly significant for Djibouti, as agriculture and related activities are the main source of livelihood for the rural communities (30% of the population).⁴⁹ However, yields are considered to be low

by international comparisons, mainly due to climate shocks such as droughts, with large areas of the country unsuitable for agricultural activities.

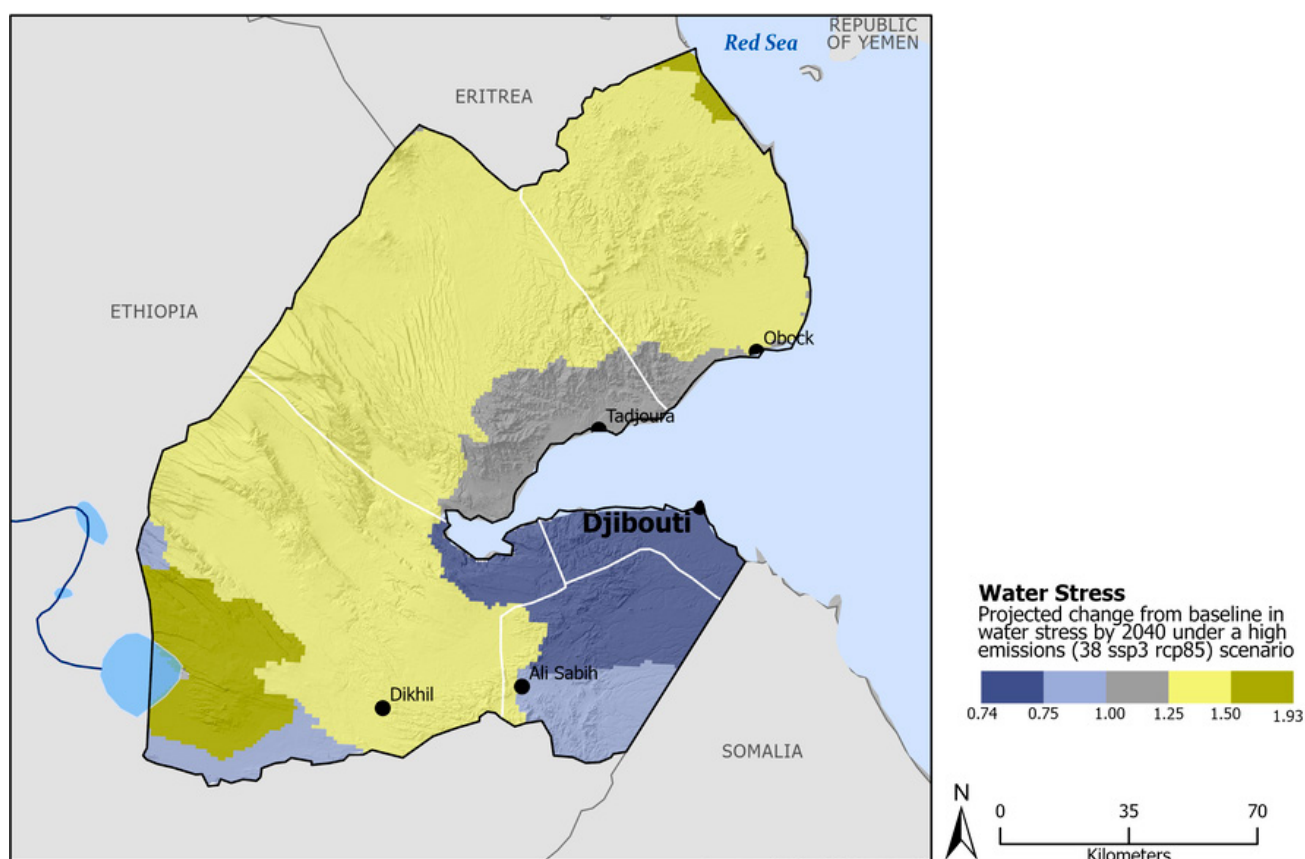
Food security is a significant growing risk due to the acute shocks and chronic changes of climate projections. Compounding factors — such as the Tigray conflict, desert locusts, food prices, and the COVID-19 pandemic — continue to drive up levels of chronic food and nutrition insecurity as well as the prices of staple foods in Djibouti. Poor communities in the Obock region in the north, the livelihood zones of Dikhil and Tadjourah in the northeast, and the pastoral zones of Ali Sabieh and Dikhil in the south are already experiencing chronic food insecurity, which is largely attributed to poor rainfall with ramifications for nutritional status among the rural poor households.⁵⁰ According to the Integrated Food Security Phase Classification's (IPC) country food insecurity analysis for March–June 2022, an estimated 5,000 people are in an emergency situation (IPC Phase 4), approximately 132,000 people are facing acute food insecurity (IPC Phases 3 and 4), while roughly 127,000 people are in crisis (IPC Phase 3) and 423,000 people are under stress (IPC Phase 2).⁵¹ In a changing climate, prolonged droughts and flash floods will continue to worsen food insecurity and lead to associated health outcomes including anemia, cognitive disorders, birth defects, and mental health issues and related concerns.

34. Projected rainfall variability and increases in the frequency and intensity of droughts will significantly impact food security in Djibouti in the 2030s and the 2050s. Water scarcity in Djibouti is pivotal for agriculture and livestock (see Figure 7). Overall, there is a high level of uncertainty regarding projections of precipitation under different climate scenarios

in Djibouti, with key indicators such as the maximum number of dry days (in which the daily accumulated precipitation is less than 1 mm) expected to vary by region and season. However, the shifts in precipitation and the threat of continued drought conditions, coupled with a limited water management infrastructure

and a lack of development in the agricultural sector, will potentially increase the country's vulnerability to food insecurity.

FIGURE 7:
Projected water stress for Djibouti (2040).



Source: Natural Earth, ASTER GDEM Version 3, World Resources Institute

B. VECTOR-BORNE DISEASE (VBD) RISKS

35. Climate is a critical driver of VBD distribution and transmission dynamics. Climate variability causes vector and host ranges to expand or contract, thus shifting disease distribution and seasonality and/or facilitating the emergence or re-emergence of VBDs. For instance, flooding results in the geospatial expansion of breeding sites for vector-borne diseases, such as malaria, chikungunya, and dengue, which are transmitted through mosquitoes. On a local scale, vector abundance is a product of microclimates; the availability of larval sites, shade for resting, sources of blood meals and nectar; and predator density.⁵² Investigating species distribution and seasonality of vectors is valuable for understanding plausible VBD distributions and planning efficient, spatially targeted methods of control.

This assessment focuses on malaria due to its significant impact on morbidity and mortality in Djibouti. There are more than 40 species of *Anopheles* (*An.*); however, *An. arabiensis* and the invasive *An. stephensi* are the principal malaria vectors in urban Djibouti.^{53,54} Other vectors that transmit malaria in Djibouti are *An. funestus*, *An. pharoensis*, and *An. nili*. In Djibouti, malaria risk occurs all year around, though its peak period is between November and May.⁵⁵ Djibouti has seen an increase in the incidence of malaria from 3.4 cases (per 1,000 population at risk) in 2000 to a high of 97.6 cases (per 1,000 population at risk) in 2020. The drastic increase occurred between 2013 and 2020 when malaria incidence leaped from 2.5 in 2013 to 97.6 in 2020.

The other main VBDs in Djibouti are dengue fever (*Aedes* [*Ae.*] *aegypti*), chikungunya (primarily *Ae. aegypti* and *Ae. albopictus*), and yellow fever (*Ae. aegypti*). Dengue risk

is distributed all year around, with a peak between March and October, in both urban and rural areas. Between January 2011 and May 2014, 128 cases of dengue were confirmed at the Bouffard Military Hospital.⁵⁶ A case of the Eastern / Central / South African (ECSA) chikungunya virus was documented in Djibouti in 2019.⁵⁷

Because of the overlapping epidemiological features of dengue fever and malaria, the vectors of both diseases breed in habitats — such as small water pools in discarded utensils adjacent to households, canals often with stagnant water, and wells which increasing the risk of concurrent dengue and malaria infections in Djibouti.⁵⁸

36. In Djibouti, temperature and precipitation are important drivers of malaria epidemics, but their effects on malaria vary depending on the local climate and geography. Overall, evidence has shown temperature to be a more important driver in cooler highland regions, with precipitation being a more significant factor in drier areas. Although the occurrence of endemic malaria is known to be limited to areas below 2,000 meters above sea level, malaria cases were documented in highland-fringe areas beyond the altitude threshold during non-epidemic periods. In fact, highland areas have seen a corresponding increase in the altitude at which malaria transmission is possible, thus exposing non-immune populations in new highland areas to the risk of the disease.

Evidence from the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) on the observed impacts of malaria and its projected risks shows — with a high level of confidence — that higher temperatures and shifting patterns of

rainfall influence the distribution and incidence of malaria in SSA. Further, there is evidence of the increasing incidence of infection caused by *Plasmodium (P.) falciparum* malaria at higher temperatures, particularly in Djibouti.

- 37. Climate change and associated increasing temperatures are already altering the distribution and transmission of vector-borne diseases and the VBD risk will likely worsen in the 2030s and 2050s.** Though rainfall patterns and drought conditions will vary by region and season, the numbers of heat index days >35°C are projected to increase slightly in the Obock region in the 2030s (100.6 days) and further in the 2050s (129.4 days). This includes the approximately 67 dry days projected between the months of June, July, and August — historically considered to be the months of high malaria transmission in Djibouti.

C. WATERBORNE DISEASE (WBD) RISKS

- 38. In Djibouti, diarrheal diseases are responsible for high levels of morbidity and mortality.** They cause 6.94 percent of disability adjusted life years (DALYS) among children under five years, mainly due to the *Salmonella* serovars and the *Shigella* species, and 4.27 percent of total DALYS for all ages.^{59, 60} In 2020, it was found that 364 deaths (5.44 percent of total deaths) were attributed to diarrhea diseases in Djibouti, which was an inevitable outcome of the country's unsafe water, sanitation, and hygiene (WASH) practices and infrastructure.⁶¹
- 39. The spread of enteric diseases can occur through the direct use of contaminated water for swimming, bathing, and drinking; the contamination of food that is farmed or washed using contaminated water**

sources; or person-to-person transmission. Households with unimproved water and sanitation facilities are most at risk of increases in diarrheal diseases.⁶² Furthermore, the water and sanitation systems in Djibouti have not received sufficient investment. Over 15 percent of the population in Djibouti practice open defecation and an estimated 78 percent lack access to improved sanitation facilities.⁶³ The population is thus vulnerable to the transmission of diseases such as cholera, diarrhea, dysentery, hepatitis A, and typhoid.

- 40. Rising temperatures speed up the life cycle and survival of pathogens and vectors,⁶⁴ making it ideal for the rapid proliferation and persistence of pathogens and the concomitant increase in the episodes of diarrheal diseases.⁶⁵** More intense droughts are also associated with reduced water quality and disease outbreaks. The lack of fresh rain during droughts prevents the opportunity to flush out stagnant waters. As sources become overused, water quality will deteriorate, leading to increased person-to-person spread of diseases and the risks of outbreaks, even away from the direct source of contamination. Furthermore, warmer waters will contribute to increases in toxic algae blooms in fresh waters, resulting in associated cases of food poisoning from affected aquatic foods and resulting in outbreaks.
- 41. At the same time, shifting patterns of rainfall and an increase in heavy precipitation events in Djibouti will also play a major role in the transmission of diseases⁶⁶ by influencing the proliferation, and dissemination of infectious agents, particularly through the water and sanitation systems.⁶⁷** Djibouti often experiences riverine and flash floods, especially along the coastal areas and in Dikhil, with groundwater and sewer flooding

presenting hazards to human health. The increased frequency of floods in Djibouti will exacerbate challenges with water pollution and subsequently increase the risks of diarrheal diseases.⁶⁸ The inundation of agricultural lands, villages, towns, and cities contaminates fresh water with human and animal sewage along with agricultural and other pollutants while increasing sediment loads in rivers, thus undermining water quality. Furthermore, flies and other pests tend to proliferate in flood waters, risking food contamination as bacterial pathogens attach to leafy crops under flood and drought conditions.⁶⁹

42. In low-income countries, changes in climate are expected to influence diarrhea rates,⁷⁰ though the extent will vary depending on climate change scenarios and local factors.⁷¹

While country-level projections of climate-attributable diarrheal disease are unavailable, projected increases in diarrheal deaths due to climate change in the African region among children aged below 15 years are 48,000 and 33,000 by 2030 and 2050, respectively.⁷² The East African subregion is projected to be impacted the worst by cholera, particularly during and after El Niño events.⁷³ It is estimated that 20,000–30,000 additional cholera deaths among children aged below 15 years old could be attributed to climate change.⁷⁴

D. HEAT-RELATED MORTALITY AND MORBIDITY

43. The health risks of heat are wide-ranging, including effects on mortality, heat-related injuries, along with mental health and well-being. Health effects caused by heat include the direct effect of heat stress, heat rash, cramps, exhaustion, dehydration, and the acute exacerbation of pre-existing conditions

such as respiratory and cardiovascular diseases (CVDs), with further risks of detrimental interactions for those on medications. Longer-term mental health risks are also an important effect to consider. Apart from the impacts on individuals, the exposure of the whole population to an extreme heat event should also be considered, as the significant increases in hospitalizations can impose a severe strain on health systems.⁷⁵

Finally, several factors will also influence mortality and morbidity in relation to extreme heat events. The magnitude of the aforementioned impacts will be influenced by the timing, duration, and intensity of the temperature event, the levels of acclimatization (an individual's adaptive response to a hot environment), the built environment (for example, the urban heat island effect⁷⁶), the adaptive capacity of the affected populations, and the resilience of infrastructures and institutions, among others.⁷⁷

44. Extreme heat also presents a growing occupational health risk in Djibouti.⁷⁸ Physical work capacity can decrease when high temperatures and humidity exist for several months each year, with some global assessments estimating that the annual loss of healthy work hours would be tripled (ranging from 3 percent to 18 percent) by 2100.⁷⁹ Although there is a lack of reporting on heat-related injuries, illnesses, and deaths amongst occupations in Djibouti, studies from other countries indicate that workers in agriculture and construction are at particularly high risk of occupational heat stress.⁸⁰ Climate-based indices can be used to quantify workdays lost to extreme heat, reflecting recommended heat strain thresholds.⁸¹

45. Both the increases in the average seasonal temperatures and an increase in the

frequency and intensity of heatwave events are projected to increase the health risks in Djibouti in a changing climate.^{82,83}

Although there is no specific data on the impacts of heat on health in Djibouti, there is a potential threat of elevated mortality. Obock and Djibouti City have the highest average temperatures with institutional working adjustments recommended for the peak season / months (for example, July, August, and September). Further, based on climate change projections, all the regions in Djibouti will likely experience increases in the number of hot days (TMax>35°C) and tropical nights (>20°C) by 2050 under a high-emissions scenario. Moreover, projected increases in summer days (Tmax > 25°C) are expected to be pronounced for the entire country. This would expose more people to potentially life-threatening temperatures with implications for the health of those populations, particularly vulnerable groups such as pregnant women, children under five years of age, people over 65 years, and people living with pre-existing conditions.

E. AIR QUALITY RISKS

46. Climate change influences other sources of air pollution, with the annual global mortality rate driven by the fossil fuel's contribution of fine particulate matter (PM_{2.5})⁸⁴ estimated to be 10.2 million per year.⁸⁵ Changes in wind patterns and strength will lead to increased PM_{2.5}, such as atmospheric dust, desertification in some regions that promotes dust formation, and increased risks of wildfires, in tandem with the presence of heat and droughts, thus resulting in severe health impacts from widespread smoke inhalation. The interaction of high temperatures with air quality can also affect levels of ozone, pollutants, and aeroallergens, thus leading

to acute exacerbations of chronic respiratory and cardiovascular conditions.⁸⁶ For example, extreme heat and high humidity can trigger asthma symptoms and can also increase overall respiratory infections in individuals with underlying chronic obstructive pulmonary diseases (COPDs).⁸⁷

Furthermore, changes in wind patterns and increased desertification can increase the long-range transport of air pollutants. Under certain atmospheric circulation conditions, the transport of pollutants — including aerosols, carbon monoxide, ozone, desert dust, mold spores, and pesticides — may occur over large distances and timescales typically of 4–6 days, which can lead to adverse health impacts.⁸⁸ Other key contributors to poor air quality in Djibouti include biomass, methane emissions, air pollutants from container ships, power plants, diesel generators, waste burning / garbage disposal, and vehicle emissions.^{89,90}

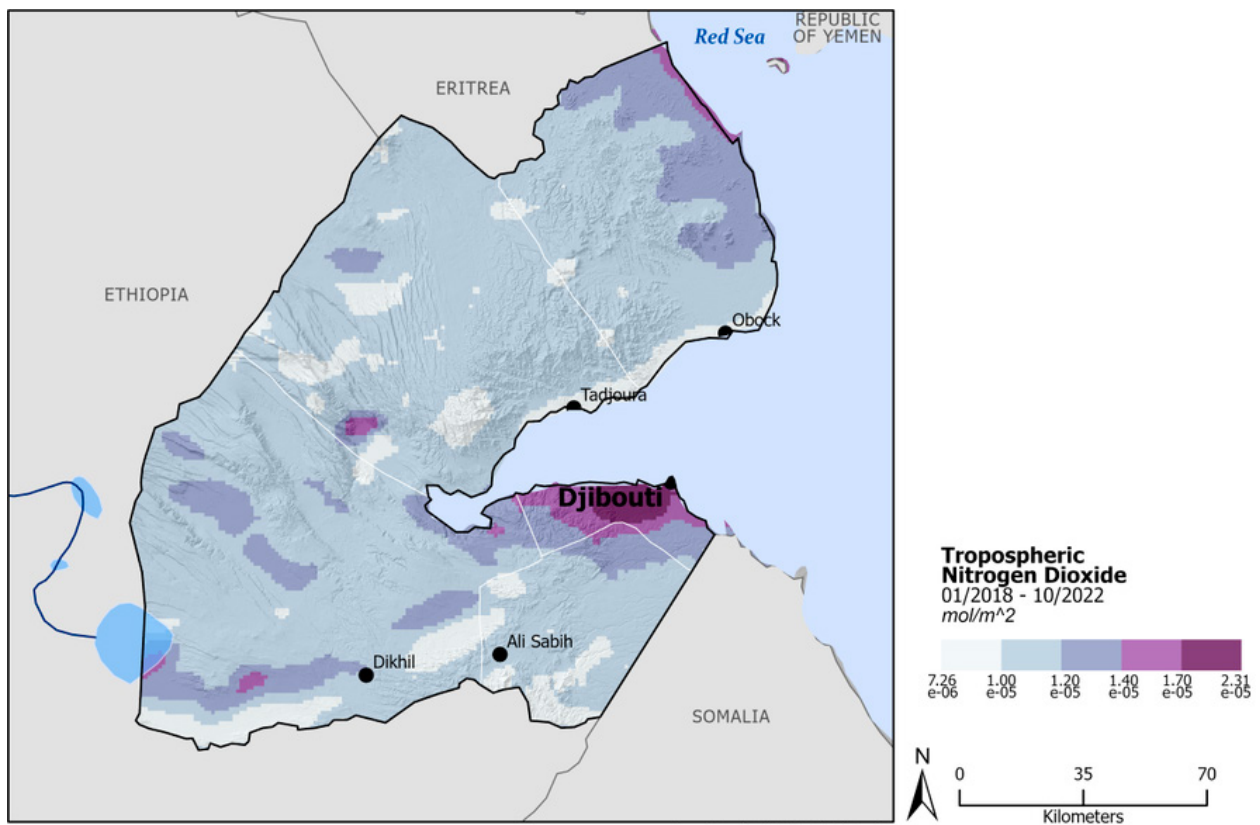
47. In Djibouti, in 2019, air pollution was among the top five risk factors of mortality, especially among children under five years old.⁹¹ In 2016, it was estimated that the mortality rate attributed to ambient and household air pollution was 156 per 100,000 population in Djibouti, compared with 169.73 regionally and 92.43 globally.⁹² In 2019 alone, in Djibouti, 453 deaths were attributed to exposure to outdoor PM_{2.5}, with a further 201 deaths attributed to household air pollution and 6.52 to ozone.⁹³ Air pollution also accounted for 11 percent of all deaths among children under five years old in 2019.⁹⁴ Moreover, air pollution was also responsible for deaths related to the following conditions: COPD (37 percent), stroke (29 percent), ischemic heart disease (28 percent), lung cancer (26 percent), lower respiratory infection (26 percent), diabetes (23 percent), and neonatal (17 percent).⁹⁵ Other possible

outcomes include exacerbations of asthma and the advancement of dementia.

48. The State of Global Air research group estimated that the entire Djibouti population lived in areas with PM_{2.5} concentration levels above the 2021 WHO Air Quality Guidelines for healthy air — 5 micrograms per cubic meter (µg/m³).⁹⁶ In fact, the population-weighted average PM_{2.5} concentration

rose from 35 µg/m³ in 2019 to 39 µg/m³ in 2021.^{97,98} Available data indicates that smog areas of high pollution remain, with the coastal zone in Djibouti City showing the worst air pollution of 46 µg/m³, making it the most polluted part of the country (as indicated by the high levels of tropospheric nitrogen dioxide — see **Figure 8**), with the dry months of December, January, and June having the highest concentrations of particulate matter.

FIGURE 8:
Tropospheric nitrogen dioxide (NO₂).



Source: Natural Earth, ASTER GDEM Version 3, Sentinel-SP OFFL No2

F. DIRECT INJURIES AND MORTALITY

49. Mortality and direct injuries — associated with heavy rains-induced flash floods, mudslides, and landslides — seriously risk lives and human health in Djibouti (see Table 1 and Figure 9). An increase in the frequency and intensity of heavy rains are triggering flooding, flash floods, landslides, and mudslides. Coastal urban towns are at the highest risk of flooding. Between November 21 and 23, 2019, Djibouti received over 295

mm of rainfall, which was equivalent to two years of rainfall. The flash floods triggered by the heavy erratic rainfall caused 11 deaths and affected approximately 250,000 people, mostly in Djibouti City (200,000 people).⁹⁹ Subsequently, heavy rains from April 20–21, 2020 induced flash floods in Djibouti City and the suburb of Balbala, causing eight deaths and affecting approximately 110,000 people.¹⁰⁰ Projected increases in erratic rain-induced floods will likely result in more direct injuries and deaths in Djibouti.

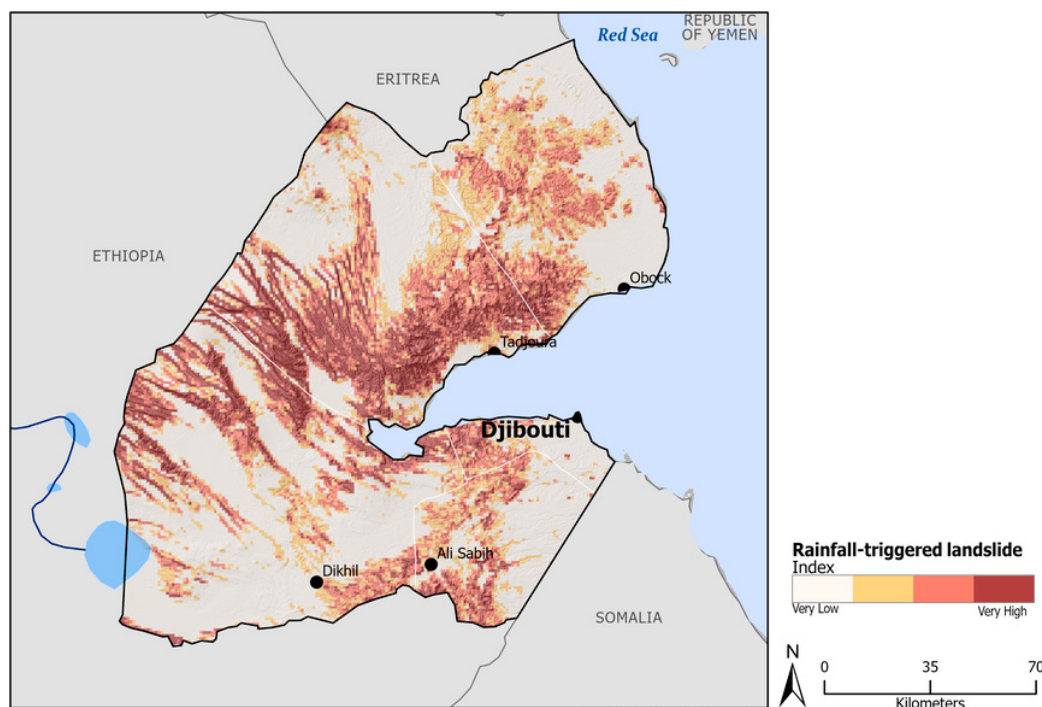
TABLE 1:

Extreme weather events, injuries, and mortality in Djibouti from 1980 to 2022.¹⁰¹

Extreme Events	Events Count	Total Deaths	Total Affected
Flood	17	250	852,300
Drought	10	0	1,380,176
Storm	2	2	25,775

FIGURE 9:

Rainfall-induced landslides in Djibouti.



Source: Natural Earth and ASTER GDEM Version 3

G. MENTAL HEALTH AND WELL-BEING RISKS

50. The association between climate change-related events and mental health can be direct or indirect, short-term, and long-term. In 2019, mental health disorders accounted for an estimated 970.1 million cases in the country — a 48.1 percent increase from 654.8 million cases in 1990.¹⁰² Acute events (such as a flood) in the short term can precipitate a psychopathological pattern similar to experiencing traumatic stress. For example, mental health impacts in children can be manifested as behavioral disorders. Exposure to extreme or prolonged weather-related impacts may also result in delayed mental impacts, such as post-traumatic stress symptoms, in the future or psychological impacts on younger generations. Nonetheless, the impact of climate change and climate extreme events on mental health and well-being can be mediated by individual and community resilience.

51. To assess mental health in the context of climate change, the full spectrum from mental illness to psychological and social well-being, or “psychosocial health,” is considered. This allows for the incorporation of considerations of well-being and resilience,¹⁰³ which is particularly relevant for Djibouti. They include the background strain on the resilience of the population due to food and income insecurity; the status of refugees and conditions arising from regional conflicts involving neighboring countries; long-term climate stresses; as well as limited opportunities for psychological or psychiatric assessments and diagnoses to inform an analysis. The concept of mental health and well-being can thus be framed as a spectrum of “psychosocial health” — encompassing the diverse psychological and social strains of climate change impacts such

as housing, water and income insecurities, as well as living in physically uncomfortable drought or humid conditions.

52. The increased frequency and intensity of extreme weather events, such as floods and droughts, are potentially leading to the increased risk and prevalence of mental disorders. The impact of floods and droughts on livelihoods, food security, living conditions, damage of property, personal injury, or the death and injury of a family member may trigger direct trauma, anxiety, depression, and intense negative emotions such as terror, anger, and shock, which are recognized as acute responses to natural disasters. These extreme events can also result in long-lasting psychological distress.¹⁰⁴

Extreme heat¹⁰⁵ can also aggravate mental health symptoms, increase the risk of suicide,¹⁰⁶ and conflict.¹⁰⁷ More generally, research has shown that hot nights are associated with insomnia, with consequences that include susceptibility to disease and chronic illness,^{108,109} along with psychological and cognitive functioning.^{110,111,112} Research in other countries has projected levels of heat-related excess mortality for mental disorders.¹¹³

53. The trends between increasing temperatures and associated mental disorders have also been found concerning self-harm and suicide rates. Some findings suggest that suicide rates increased by 0.7 percent and 3.1 percent, respectively, for a 1°C increase in the monthly average temperature.¹¹⁴ Two likely mechanisms could account for such a phenomenon. First, direct physiological effects on the brain are hypothesized to influence emotional control, aggression, and violent behavior. Second, high temperatures generate negative economic shocks, particularly in

agriculturally dependent communities, which is critical for the subsistence farming population in Djibouti.¹¹⁵ These economic losses have been shown to translate into increased suicide risk.¹¹⁶ Although there is a lack of information

on mental health disorders' incidence and prevalence in Djibouti, global figures show that 14 percent of the global burden of disease can be attributed to mental health illnesses.¹¹⁷

CLIMATE CHANGE IMPACTS ON HEALTH OUTCOMES

	CURRENT RISK	PROJECTED RISK
Food Security & Nutrition	- Djibouti has one of the highest levels of food insecurity in the world, with more than 30 percent of the population (aged 6-59 years) chronically malnourished. - In Djibouti, malnutrition accounted for an estimated 83 deaths per 1,000 children under five years of age and 248 maternal deaths per 100,000 live births in 2022. - Rural poor communities — such as those in Ali Sabieh, Arta, and Dikhil — who rely heavily on agricultural and pastoral activities are more vulnerable to water scarcity and related food insecurity.	- In a changing climate, prolonged droughts and flash floods will continue to worsen food insecurity and associated health outcomes — including anemia, cognitive disorders, birth defects, mental health issues. - Increases in projected precipitation and prolonged drought conditions, coupled with the lack of development in the agricultural sector, is predicted to increase vulnerability to food insecurity in Djibouti.
Vector-borne diseases (VBDs)	- Djibouti has seen an increase in the incidence of malaria from 3.4 cases (per 1,000 population at risk) in 2000 to a high of 97.6 cases (per 1,000 population at risk) in 2020. - In Djibouti, malaria risk occurs all year around, peaking between November and May.	Climate change and associated increasing temperatures are already altering the distribution and transmission of VBDs and the VBD risk in Djibouti, and these rates are projected to worsen in the 2050s.
Waterborne diseases (WBDs)	- In Djibouti, diarrheal disease causes 6.94 percent of DALYS among children under five years old, mainly due to Salmonella serovars and Shigella species, and causes 4.27 percent of total DALYS for all ages. - The increased frequency of floods in Djibouti exacerbates challenges by causing water pollution.	Projected increases in warm temperatures, shifting patterns of rainfall, and an increase in erratic heavy rainfall events will increase water contamination and related WBDs.

CLIMATE CHANGE IMPACTS ON HEALTH OUTCOMES

	CURRENT RISK	PROJECTED RISK
Heat-related mortality & morbidity	• Extreme heat also presents a growing occupational health risk in Djibouti.	• Average rising seasonal temperatures as well as the increased frequency and intensity of heatwave events by the 2050s are projected to elevate health-related morbidity and mortality levels across Djibouti, especially in the regions of Obock and Dikhil.
Air quality & respiratory health	• In 2019, air pollution was among the top five risk factors for mortality, especially among children under five years old. • In Djibouti, it was estimated that the mortality rate attributed to ambient and household air pollution was 156 per 100,000 population in 2016.	• Rising temperatures are projected to increase the occurrence and spread of particulate matter and pollutants, increasing air pollution and thus leading to increases in chronic and acute respiratory diseases.
Direct injuries & mortality	• In 2019, flash floods triggered by heavy erratic rainfall caused 11 deaths and affected about 250,000 people, mostly in Djibouti City (200,000 people).	• Projected increases in erratic rain-induced floods will likely cause more direct injuries and deaths in Djibouti.
Mental health & well-being	• Extreme weather events, such as floods and droughts, are becoming more frequent and intense in Djibouti, potentially leading to the increased risks and prevalence of mental disorders.	• Increased temperatures will continue to affect agricultural productivity and water availability, livelihoods, and increased poverty, with implications for negative mental health outcomes.



ADAPTATIVE CAPACITY OF THE HEALTH SYSTEM

HEALTH SYSTEM OVERVIEW

54. Djibouti has a centralized healthcare system that is administratively managed by the central government. The Djibouti Ministry of Health (MoH) is mandated to develop and implement a national health policy, including planning, coordinating, and overseeing the implementation of healthcare policies and programs in all five regions of the country. Healthcare provision in Djibouti is dominated by government / public health facilities, followed by the private for-profit health sector and charity health facilities. Traditional healers and traditional medicine, along with traditional birth attendants, also play an integral role in the healthcare system of the country.^{118,119}

A. LEADERSHIP AND GOVERNANCE

55. The Republic of Djibouti recognizes the impacts of climate change and, as such, has undertaken various adaptation and mitigation plans and programs. Key national adaptation plans and policies in Djibouti include the Intended National Determined Contributions (INDCs, 2015), the Third National Communication (2021), the National Adaptation Programme of Action (NAPA, 2006), and the National Strategy on Climate Change (SNCC, 2017) (see Table 2 for additional climate and health policies). Nevertheless, these documents do not identify climate change impacts on health and the health system as a priority, and MoH has limited available information and guidelines on addressing climate-related health risks. For instance, there is a lack of climate change adaptation strategies in the INDCs (2015).

56. National climate adaptation plans and strategies in Djibouti have unclear and limited guidance on the integration of climate change impacts on health and health systems, which has been hampered by weak cross-sectoral coordination, institutional arrangements, and stakeholder engagement mechanisms. While the NAPA identifies agriculture and water and hygiene as priorities for furthering climate adaptation interventions, no framework is provided for collaborative action with MoH for relevant health risks.

Furthermore, there is a lack of integration of climate change and health across all national adaptation and health strategies, thus weakening the efforts to address the health impacts of climate change and building a climate resilient health system. For instance, MoH, under the National Health Development Plan (PNDS 2018–2022) does not outline adaptation and resiliency to climate change as one of the strategies of the PNDS.

In contrast, the National Development Plan (2020–2024) identifies key health recovery financing measures that can contribute to building a climate-resilient health system, namely (a) ensuring a comprehensive upgrade of health service delivery, (b) introducing digital technologies in healthcare delivery, and (c) investing in renewable energy for health to ensure universal access in rural communities.

B. HEALTH FINANCING

57. Health expenditure as a percentage of Djibouti's gross domestic product (GDP) has remained at 3 percent on average over the past two decades.¹²⁸ Although Djibouti's current health expenditure (CHE) per capita (current USD) has increased steadily over the year,¹²⁹ its health expenditure as a share of the GDP has not kept pace with the rapidly

TABLE 2:

Key Climate Change and Health-Related Policies.

DATE	POLICY/ PLAN
2022	National Development Plan (2020–2024) ¹²⁰
2021	The Third National Communication superseded the Second National and the First National Communications to the United Nations Framework Convention on Climate Change (UNFCCC) ¹²¹
2020	Djibouti Country Strategic Plan ¹²²
2019	National Adaptation Plan (NAP)
2018	National Strategy for the Prevention of Different Forms of Malnutrition in Djibouti ¹²³
2018	National Health Development Plan (PNDS — 2018–2022) supersedes the PNDS (2013–2017)
2017	National Strategy on Climate Change (SNCC) ¹²⁴
2015	Intended Nationally Determined Contributions (INDCs) ¹²⁵
2014	Vision Djibouti 2035 (2012–2035) ¹²⁶
2006	National Adaptation Programme of Action (NAPA) ¹²⁷
2006	Decree No. 2006-0192 / PR /MID establishing the National Risk and Disaster Management Framework
2004	National Risk and Disaster Management Strategy

expanding population.¹³⁰ Even though out-of-pocket (OOP) expenditure declined from 51 percent of its CHE in 2000 to 24 percent in 2019,¹³¹ the level of OOP expenditure is still high enough to push households into financial catastrophe and impoverishment.

Health financing in Djibouti is derived primarily from public resources, with taxes and grants being the main source. However, domestic general government health expenditure declined from approximately 62 percent in 2013 to 46 percent in 2017, though it increased to 54 percent in 2019.¹³² The government's health expenditure as a share of total health expenditure was only 4.4 percent in 2015.¹³³

External health expenditure constitutes an important source of health financing, although the amount has fluctuated since 2002, with a slight overall decrease. Specifically, the shares of external health expenditure out of the CHE were as follows: 25 percent in 2002, 15 percent in 2003,¹³⁴ 19 percent in 2012, 27 percent in 2016, and 20 percent in 2018.¹³⁵

58. Since 2014, the country has set up health insurance schemes that provide UHC to its people. However, they do not take into account climate-vulnerable populations. The Universal Health Insurance Law was enacted in 2014 to ensure the coverage of all individuals in Djibouti through the Compulsory Health Insurance Scheme and the Social Assistance Programme. According to the law, every citizen is provided with complimentary fundamental medical coverage at the primary level of care. The insurance provides services on vaccines; consultations for children under five; reproductive health (pre- / post-natal consultations) and examinations including ultrasound and family planning; as well as treatments of diseases such as tuberculosis, malaria, epidemics,

and public health problems. It also covers 100 percent of basic care services such as consultations (children and adults) by a general practitioner, a standard check-up, radiology examinations, and the delivery of essential drugs.

The Compulsory Health Insurance Scheme covers formal workers, as well as retirees and their dependents, while the Social Assistance Programme is reserved for vulnerable populations and their dependents.¹³⁶ Additionally, the country has established the Universal Student Health Insurance Scheme for the University of Djibouti students aged less than 35 years. Although Djibouti has in place various risk pools, these pools are fragmented and do not consider climate-vulnerable populations.

59. MoH lacks a budget line dedicated to climate and health strategies and resource allocations for health services do not consider climate-related hazards as a criterion. The NDP 2020–2024 outlines three strategies for the health sector with limited integration of climate change, estimating a total cost of 4 billion Djiboutian franc (FDJ). It set out (a) FDJ1.7 billion for ensuring a comprehensive upgrade of the health service delivery, (b) FDJ0.9 billion for digital technologies for healthcare delivery, and (c) FDJ1.3 billion for investing in renewable energy as a resiliency measure for ensuring health service delivery in rural areas.

Most of the financing mechanisms for developing climate action in Djibouti depend on development partners such as the Green Climate Fund (GCF), which is supporting five projects at a total resource allocation amount of USD38.1 million. However, the projects on energy, agriculture, water, and infrastructure

financed by GCF have limited integration and coordination with the health sector which hinders the advancement of climate and health action.¹³⁷

C. HEALTH WORKFORCE

60. Despite an overall increase in its health workforce, Djibouti faces a critical shortage of skilled healthcare workers. Although the establishment of the faculty of medicine at the University of Djibouti in 2007 led to an increase in the number of healthcare professionals from 1,664 in 2008 to 3,381 in 2017,¹³⁸ Djibouti still ranks the lowest in terms of the density of skilled health workers (physicians, nurses, and midwives) per 10,000 population in the Eastern Mediterranean region after Somalia and Afghanistan.¹³⁹ The capacity of the limited number of professional health workers is further strained by an increasing population, the influx of refugees from neighboring countries, emergencies, and the resurgence of infectious diseases.

In addition to the low availability of its health workforce, Djibouti faces significant challenges in the uneven concentration and geographical distribution of health workers. Most of the skilled health workforce is in urban areas, particularly Djibouti City. As a result, healthcare services are inaccessible to the rural population and most of the urban poor.

Climate change will further exacerbate the adverse impact on the health workforce through mechanisms related to changes in the frequency and intensity of extreme weather events. Such events may affect a facility directly or its workers' ability to reach the facility, as well as alter the patterns of climate-sensitive diseases to which health

professionals may not be able to respond in a timely manner.¹⁴⁰

61. Djibouti's workforce is below the WHO minimum threshold of 4.45 per 1,000 population necessary for the achievement of UHC.¹⁴¹ The government of Djibouti has made improvements in child and maternal health through investments in training medical service providers, improvements in the procurement of medicines, and general health service delivery however the country still faces significant shortages of healthcare workers.¹⁴² In 2014, Djibouti had a ratio of 0.2 physicians as well as 0.7 nurses and midwives per 1,000 population.¹⁴³ In general, there are an estimated total of about 221 physicians in Djibouti.¹⁴⁴ In 2014, Djibouti had 488 nursing personnel, 210 pharmacists, 19 dentists, and 19 dental assistants.¹⁴⁵ In 2017, there were an estimated 3,381 health workers¹⁴⁶ in the country, which was inadequate in meeting the health needs of an increasing population with the addition of approximately 35,000 refugees and asylum seekers.¹⁴⁷ More detailed information and data on health professionals — such as their numbers, cadres, and skill sets including their knowledge of climate and health — are unavailable.

D. HEALTH INFORMATION SYSTEMS (HIS)

62. Although Djibouti has made progress in improving disease surveillance, the country still faces challenges with non-functional surveillance systems and a lack of infrastructure, which affects the country's preparedness and timely response to health impacts related to climate change. According to the 2021 Global Health Security (GHS) Index report on Djibouti, the country does not have an accredited national facility to serve as a national

reference laboratory.¹⁴⁸ As of 2018, Djibouti did not have a secure system or national guidelines for the collection, transportation, and storage of specimens.¹⁴⁹

63. While Djibouti has a Health Management Information System (HMIS), there are inadequate finances for its effective maintenance and an integrated surveillance of climate-sensitive diseases that accounts for seasonal outlooks and weather data does not exist. Furthermore, the country does not yet have a District Health Information System 2 (DHIS2) to support evidence-based health policies and decisions to build climate resilience.¹⁵⁰ Djibouti still largely depends on paper-based health recording systems, especially in rural areas, which are highly vulnerable to damage by floods.

64. Djibouti faces challenges with the delayed dissemination of early warning information, thus affecting early response in the face of floods and droughts. While there is a monitoring network set along the Oued de Ambouli watershed that indicates the water levels and provides text messages via the short message service (SMS) before flooding, the communities are alerted only shortly before flooding, therefore undermining a timely response.¹⁵¹

Similarly, even though Djibouti's Secretariat for Risk and Disaster Management (SGRC) has an information system database — Desinventar — for collecting, storing, and sharing climate-related disaster data (the numbers of deaths, injuries, people displaced, damaged infrastructure and facilities), funding is limited. The system's last update was in 2012.¹⁵²

Moreover, Djibouti does not have a national weather and forecasting station; instead, it relies on the numerical portal run by the

Climate Prediction and Application Centre of Intergovernmental Authority on Development (IGAD) in East Africa, which is based in Nairobi. This leads to challenges with the reliability and accuracy of forecasts, integration with key stakeholders for preparedness and response in the face of climate hazards, and the integrated surveillance of climate-sensitive diseases.

E. ESSENTIAL MEDICAL PRODUCTS AND TECHNOLOGIES

65. Health sector purchases are primarily placed under the budget allocated to MoH. In 2004, the Central Purchasing Agency of Essential Medicines was established in Djibouti to ensure the sufficient supply and distribution of medicines and supplies. However, the limited resources allocated to the health sector are largely spent on wages at the expense of medical equipment, drugs, and materials.¹⁵³ This has contributed to the decline in the quality and quantity of public health services provided.

66. Although Djibouti has a national essential medicines list (NEML), the country still experiences limited access to essential medicines and other essential medical products. Djibouti's NEML was last updated in 2007, falling short of the WHO's update in 2021.¹⁵⁴ In addition, Djibouti's NEML has 218 medicines¹⁵⁵ — far shorter than WHO's recommended 479 medicines. Djibouti's NEML also has either a lack of essential medicines or a low supply for some conditions including oncology¹⁵⁶ and cardiovascular diseases (CVDs).¹⁵⁷ There are insufficient funds to purchase essential medical products including gloves and gauze, personal protective equipment, and laboratory reagents, along with equipment needed for the diagnosis

and treatment of both communicable and non-communicable diseases.¹⁵⁸

As a result, health facilities are faced with drug stockouts of medicines for cancer, diabetes, high blood pressure, as well as cardiovascular and chronic respiratory diseases — conditions that will be worsened by climate change, making them likely to be key disease burdens among the population in Djibouti in the 2050s. Vulnerable populations like children and mothers also experience the shortages of essential medicines.¹⁵⁹ Finally, the lack of a harmonized price list of essential medicines and essential medical products, especially in the private sector, makes access to quality-assured essential medicines a challenge.¹⁶⁰

67. Djibouti has a critical lack of essential medical equipment — a situation that impacts the health system’s preparedness to tackle climate change impacts on health. Inventory data on the availability of essential medical equipment in health facilities in Djibouti collected in 2022 shows that the equipment available is not enough to provide basic health services, such as maternal and child health care. With projected increases in severe flood occurrences, heat waves, and climate-related health risks in Djibouti in the 2050s, the demand for essential medical equipment will increase while accessibility to the few health facilities with the medical equipment will be limited due to poor road conditions caused by flooding.

F. HEALTH SERVICE DELIVERY

68. There are also geographical inequalities in the distribution of higher-level public health facilities between rural and urban areas. In 2019, Djibouti had 66 public health facilities, including health posts, community

health centers, and hospitals for a population slightly above 1 million.¹⁶¹ Most of the health facilities are in the urban areas, especially Djibouti City (see Figure 3). Twenty three of the 66 public health facilities, including all eight tertiary hospitals, are in the capital — Djibouti City, where about 600,000 people live.¹⁶² Even so, the facilities are not enough to meet the health needs of 78 percent of the urban population.

69. Djibouti lacks adequate health facilities, especially in the rural areas, which are highly vulnerable to climate change shocks. People living in remote rural areas frequently face significant challenges in accessing healthcare services, as laboratory, surgery, and specialized services provided at the district hospitals are often too far away from rural populations, thus increasing their vulnerability and risk to climate-related hazards. This is largely attributed to the lack of health facilities, with the few health facilities available facing constant drug and medical supply stockouts and understaffing, thereby resulting in poor, inadequate, and inaccessible services. With inaccessible healthcare services, the rural population — the majority who live in extreme poverty (62.6 percent) — are left to deal with high costs from private health facilities. Private clinics offer services at a cost that is not affordable by the majority of the poor population in Djibouti.

Limited health facilities and services, especially for some illnesses (such as mental health) and for services (such as diagnostic imaging and radiology services along with maternity services), in rural areas force people to visit traditional health healers, herbalists, and traditional birth attendants. These professionals are not trained to provide skilled health services and their interventions can lead to complications and premature deaths.

TABLE 3:Public Medical Facilities (2019).¹⁶³

FACILITY TYPE	DISTRICT	OWNERSHIP
Tertiary Hospital	8	Govt.
Hospital Medical Center	5	Govt.
Health Post	41	MoH
Community Health Center	12	MoH

70. Djibouti has made progress in improving accessibility to health and medical services to the population in Djibouti living in rural areas, though floods make access more challenging. Djibouti's MoH developed several initiatives between 2017 and 2018 to address healthcare needs in rural areas. Medical caravans were dispatched to the southern, Obock, and Tadjouran regions to assist the rural poor. With the assistance of the European Union (EU) and the International Organization for Migration (IOM), a program was established in 2017 to provide medical aid to migrants and vulnerable populations along migratory routes. Additionally, in 2018, a 20-bed medical center was built in Obock with IOM's support, benefiting migrants and locals. Despite these efforts, floods pose a challenge, as they impact roads and bridges, thus hindering access to health facilities and the delivery of supplies to facilities.

71. Health infrastructures, including those constructed with a lack of building codes that account for climate-related hazards, are unprepared to withstand acute climate shocks, thus affecting healthcare service delivery. In the aftermath of Cyclone Sagar, a rapid assessment revealed that in Djibouti alone, 14 health facilities were damaged by the floods, thus affecting health service delivery

to the urban population and neighboring suburbs.¹⁶⁴ On April 11–14, 2004, Djibouti received torrential rains that induced strong flash floods, affecting many areas and causing the Ambouli River to burst its banks. The flash floods destroyed four main health center structures serving the affected communities, caused damage to the health equipment, and washed away medicine and documents.¹⁶⁵

72. Djibouti experiences a dire lack of accessible and affordable primary healthcare (PHC) services in most regions, most of which are needed for improved preparedness and response mechanisms that can address climate-related health impacts effectively. Moreover, there are big gaps in the provision of emergency services in all the regions of Djibouti. For example, among the district hospitals and health posts in the different regions, very few have emergency units: three out of 10 in Arta, one out of 10 in Dikhil, one out of five in Obock, one out of six in Tadjoura, and none out of seven in Ali Sabieh. A similar trend applies to the lack of laboratories, communal pharmacies, and Caesarean services even in Ali Sabieh and Obock — the regions hosting a large number of refugees.

SUMMARY OF HEALTH SYSTEM ADAPTIVE CAPACITY GAPS FOR DJIBOUTI

BUILDING BLOCK	GAPS
Leadership & Governance	- Climate change adaptation plans have limited to no integration of health as a key sector for furthering climate change action as well as lack health adaptation strategies for climate change. - Climate change impacts on health are not articulated in key health policies of relevance.
Health Financing	- Fragmented risk pools do not consider climate-vulnerable populations. - There is no budget line for the development and implementation of climate and health strategies. - The estimated costs of priority interventions on climate-related impacts on health and the health system are lacking.
Health Workforce	- Djibouti ranks lowest in terms of density of skilled health workers (physicians, nurses, and midwives) per 10,000 population in the Eastern Mediterranean region, after Somalia and Afghanistan. Most of the health workforce is concentrated in urban areas (mainly Djibouti City). - There is no information on the level of technical capacities in the country and workforce knowledge on climate change and health.
Health Information Systems (HIS)	- There is a lack of infrastructure for surveillance systems, including the lack of a central reference laboratory, delays in publishing an updated version of the Demographic and Health Survey, and dependence on paper-based health recording systems. - Djibouti does not have a national weather and forecasting station. It relies on a numerical portal that is run by the Climate Prediction and Application Centre of the Intergovernmental Authority on Development (IGAD) based in Nairobi, thus undermining the timeliness of information needed. Integrated surveillance — accounting for seasonal outlooks and weather data — is non-existent.

BUILDING BLOCK	GAPS
Essential Medical Products & Technologies	• The lack of a harmonized price list of essential medicines and essential medical products, especially in the private sector, hinders access to quality-assured essential medicines. • Inventory data on the availability of essential medical equipment in health facilities in Djibouti collected in 2022 shows that the equipment available is not enough for providing basic health services. • The limited availability of essential medicines hinders preparedness efforts in the face of climate hazards, such as floods, which are frequent in the country.
Health Service Delivery	• Djibouti faces a lack of health facilities, especially in the rural areas, which are highly vulnerable to climate hazards. • There is a lack of provision of crucial health services in most regions, most of which are needed for improved preparedness and response mechanisms to address climate-related health impacts. • Health infrastructures, including those constructed with a lack of building codes that account for climate-related hazards, are unprepared to withstand acute climate shocks.

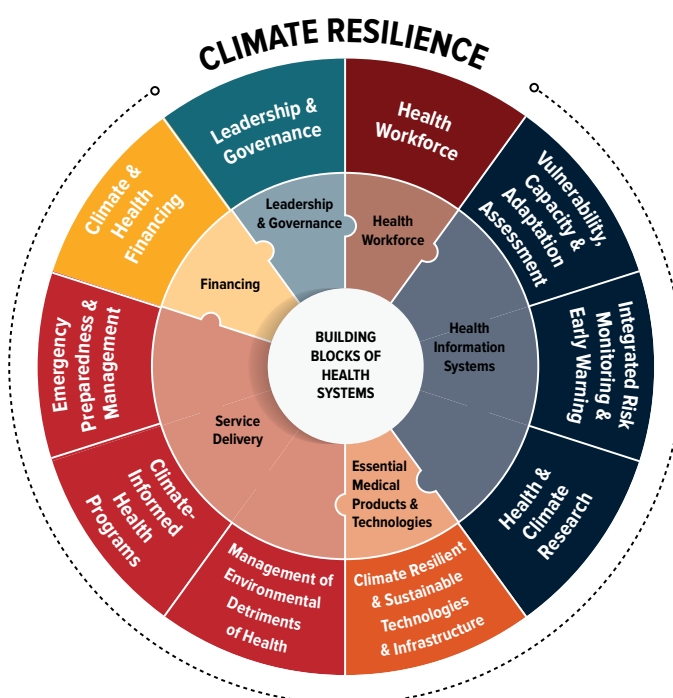


RECOMMENDATIONS TO ENHANCE HEALTH SYSTEM RESILIENCE TO CLIMATE CHANGE

73. This section outlines a set of recommendations to enhance Djibouti's health system resilience and adaptation to climate change, including potential health interventions and strategies that can be put in place. The recommended options are based on an assessment of both the magnitude of the current and projected climate-related health risks and the existing gaps in adaptive capacity for managing and / or preventing these risks. This section is organized, using the WHO operation framework for climate-resilient health systems (**Figure 10**).

FIGURE 10:

Operational framework for building climate-resilient health systems.



LEADERSHIP AND GOVERNANCE

74. Include adaptation and mitigation strategies for the health sector in the next submission of the Nationally Determined Contributions (NDCs) and the National Adaptation Plan (NAP). This should also include developing a policy strategy for the health sector that accounts for climate and health-related risks and strengthening the role of the Ministry of Health (MoH) in climate change adaptation. This Climate and Health Vulnerability Assessment (CHVA) can feed into specific activities to be developed in the forthcoming policy documents.

HEALTH FINANCING

75. Establish a budget line in MoH for developing and implementing climate and health action plans and interventions. This would incentivize MoH to develop a Health National Adaptation Plan and integrate climate change as a cross-cutting challenge in other projects and programs, such as surveillance systems or health facilities' infrastructure.

HEALTH SERVICE DELIVERY

76. Develop and implement national building codes and standards as well as a climate-resilient certification system. This includes standards on building sustainable and climate-resilient healthcare infrastructure, such as norms for the location of new facilities; walls, roofs, and ceiling characteristics that can withstand storms and high-speed winds; along with contingency plans that account for climate hazards. The certification system would include an assessment of the facilities vis-à-vis existing climate-resilient infrastructure codes and identify health facility needs, hence facilitating the prioritization of resource

allocations and support enforcement. Such a system may be integrated into existing health facility quality assessments.

77. Develop training modules in weather forecasting and climate-related health risks for personnel at MoH to improve its surveillance capacity. For example, climate change and seasonal outlooks should be factored into the newly launched program on digitizing Djibouti's disease surveillance and monitoring system. This should be done in collaboration with MoH, the Djibouti National Meteorological Agency, and the Climate Prediction and Application Centre of the Intergovernmental Authority on Development (IGAD), based in Nairobi.

78. Develop a communication strategy for better practices on sanitation and hygiene at the household / community level, with the aim of decreasing open defecation rates and improving practices for water use. This may include the distribution of hygiene kits for diarrheal diseases control, especially in rural communities. MoH and the Djibouti National and Sanitation Authority should collaborate to develop this strategy.

ESSENTIAL MEDICAL PRODUCTS AND TECHNOLOGIES

79. Establish a laboratory outreach system and laboratory facilities at the subnational level for improving the collection, transportation, storage, and processing of climate-sensitive disease tests such as for malaria, dengue, and diarrheal diseases. This may include the establishment of a reference laboratory per region to reduce delays in specimen processing and patient diagnosis and management. The government and MoH could engage development partners to support

the establishment and stocking of regional reference laboratories.

80. Develop a public health supply chain resilience strategy for guiding the procurement of medical products and equipment during extreme weather events. This includes the development of contingency plans that pre-position medicines to account for seasonal outlooks for floods and storms.

HEALTH WORKFORCE

81. Use climate and health vulnerability as a criterion for developing incentives and retention packages for health workforce in highly vulnerable areas to climate-related hazards. Health workforce retention packages should also be introduced in regions facing the highest risk of climate-related hazards (droughts) such as Arta, Ali Sabieh, Obock, and Tadjourah.

82. Develop health workforce training packages on climate change and health linkages. They should include modules on addressing the additional health burden caused by climate change impacts as well as preparedness and response to climate change.

HEALTH INFORMATION SYSTEMS (HIS)

83. The Djibouti National Meteorological Agency, in collaboration with MoH, should develop tailored early warning alerts that account for subnational climate-related exposures to facilitate quick response and preparedness at the community level. For example, these alerts should take into account the fact that regions of Djibouti City, Ali Sabieh, and Arta are more prone to flooding while the regions of Dikhil, Obock and Tadjourah are more prone to droughts.

TABLE 4:

Categorization of recommendations.

Timeline: Short-term = less than two years, Medium-term = between two and five years,

Long term = more than five years.

COMPONENTS	RECOMMENDATIONS	CATEGORY
Leadership & Governance	Include adaptation and mitigation strategies for the health sector in the next submission of the Nationally Determined Contributions (NDCs) and the National Adaptation Plan (NAP).	Short
Health Financing	Establish a budget line in the Ministry of Health (MoH) for developing and implementing climate and health action plans and interventions.	Medium
Health Service Delivery	Develop and implement national building codes and standards that complement a climate-resilient certification system.	Medium
	Develop training modules in weather forecasting and climate-related health risks for MoH personnel to improve surveillance capacity.	Short
	Develop a communication strategy to improve practices on sanitation and hygiene at the household / community level, with the aim of decreasing open defecation rates and improving practices for water use.	Short

COMPONENTS	RECOMMENDATIONS	CATEGORY
Essential Medical Products and Technologies	Establish a laboratory outreach system and laboratory facilities at the subnational level to improve the collection, transportation, storage, and processing of climate-sensitive disease tests such as for malaria, dengue, and diarrheal diseases.	Medium
	Develop a public health supply chain resilience strategy that guides the procurement of medical products and equipment during extreme weather events.	Short
Health Workforce	Use climate and health vulnerability as a criterion for developing incentives and retention packages for the health workforce in areas that are highly vulnerable to climate-related hazards.	Medium
	Develop health workforce training packages on climate change and health linkages, with modules on addressing the additional health burden due to climate change impacts as well as preparedness and response to climate change.	Short
Health Information Systems (HIS)	The Djibouti National Meteorological Agency should collaborate with MoH to develop tailored early warning alerts that account for subnational climate-related exposures to facilitate quick response and preparedness at the community level.	Medium

ANNEXES

ANNEX A. ADAPTIVE CAPACITY RAPID ASSESSMENT

LEADERSHIP AND GOVERNANCE				
Questions	Assessment			
	Yes	No	Partial	N/A
1.1: Does the country have a national climate change and health plan / strategy?				
1.2: Is health mentioned as a priority in the Nationally Determined Contributions (NDCs)?				
1.3: Is there a designated focal point responsible for health and climate change in their ministry of health (MoH)?				
1.4: Is there a multi-sectoral technical working group / committee focused on climate change and health?				
1.5: Does the MoH actively participate in climate change coordination and /or working groups?				
1.6: Is there a memorandum of understanding (MOU) between the MoH and key climate change-related ministries / departments (for example, Environment, Meteorological Services, Agriculture, and Water)?				
1.7: Are decision-makers (both within the MoH and outside) aware of climate change and health risks and potential adaptation options?				
1.8: Does relevant information related to climate change and health risks and adaptation reach key stakeholders across sectors?				
1.9: Is climate change included in health plans at subnational levels?				

HEALTH WORKFORCE

Questions	Assessment			
	Yes	No	Partial	N/A
2.1: Are there dedicated full-time staff devoted to climate change and health?				
2.2: Are the number of healthcare workers above 4.5 per 1,000?				
2.3: Are health workers adequately distributed between urban and rural areas?				
2.4: Is the health workforce aware of the health risks of climate change?				
2.5: Are there capacity-building programs focused on climate change and health within the MoH?				
2.6: Have the MoH staff received training on climate change and health in the last two years?				
2.7: Does the health workforce have the technical capacity to interpret and utilize climate change information (for example, scenarios, projections, and forecasts) to inform planning / decision-making?				
2.8: Is climate change and health included in the educational curriculum (for example, schools of public health, medicine, and nursing)?				
2.9: Are there context- or country-specific climate change and health training / educational materials available for the health workforce?				

HEALTH INFORMATION AND DISEASE SURVEILLANCE SYSTEM

Questions	Assessment			
	Yes	No	Partial	N/A
3.1: Has the country completed a climate change and health vulnerability and adaptation or risk assessment?				
3.2: Do surveillance systems exist for climate-sensitive diseases (for example, heat related illnesses, vector-borne diseases [VBDs], and waterborne diseases [WBD])?				
3.3: Does the country have a centralized monitoring system for climate-related diseases?				
3.4: Do health surveillance systems integrate meteorological and/or environmental information?				
3.5: Are there efforts from the MoH to utilize national climate / meteorological information?				
3.6: Does the country have a climate-informed early warning system for any health risks?				
3.7: Are there early warning systems in place for climate change-related extreme events / hazards? (for example, flooding, droughts, and storms)?				
3.8: Does MoH coordinate with disaster / hazard-focused early warning systems?				

ESSENTIAL MEDICAL PRODUCTS, TECHNOLOGIES, AND INFRASTRUCTURE

Questions	Assessment			
	Yes	No	Partial	N/A
4.1: Have the country's healthcare facilities been assessed for climate resilience?				
4.2: Are health facilities accessible to rural communities?				
4.3: Do healthcare facilities implement measures to remove mosquito-breeding sites?				
4.4: Have healthcare facilities employed adaptive measures to protect against climate change-related hazards (for example, flood walls or drainage systems)?				
4.5: Does the national laboratory have the capacity to conduct diagnostic tests for climate-sensitive diseases?				
4.6: Are building codes for healthcare facilities to protect against climate change-related hazards in place and enforced?				
4.7: Have healthcare facilities implemented "greening" activities (for example, tree planting and cooling designs)?				
4.8: Are there efforts to incorporate long-term planning (for example, urban design) to reduce climate change and health impacts?				
4.9: Are health facilities adequately equipped to prepare for and respond to climate change-related hazards (for example, stockpile of medical/emergency supplies)?				

HEALTH SERVICE DELIVERY

Questions	Assessment			
	Yes	No	Partial	N/A
5.1: Has the country enacted legislation mandating universal healthcare coverage (UHC)?				
5.2: Are there climate change-specific health programs underway in the country?				
5.3: Does health service delivery have contingency measures for extreme weather events (for example, floods, storms, and heatwaves)?				
5.4: Does current public health planning consider climate change information (for example, scenarios, projections, and forecasts)?				
5.5: Has the MoH implemented any climate-health awareness campaigns to increase public awareness?				
5.6: Is there access to safe water, sanitation, and hygiene (WASH) in over 80 percent of the country?				
5.7: Do over 80 percent of healthcare facilities have access to safe WASH and healthcare waste removal / storage?				
5.8: Have multi-hazard risk assessments been conducted in the country?				
5.9: If conducted, do multi-hazard risk assessments include potential health risks?				

FINANCING

Questions	Assessment			
	Yes	No	Partial	N/A
6.1: Is the MoH currently receiving international funds to support climate change and health work?				
6.2: Is there dedicated funding within the MoH for climate change and health activities?				
6.3: Is the health expenditure percentage of the country's gross domestic product (GDP) above the recommendation of the World Health Organization (WHO)?				
6.4: Is the national health budget dependent on donors or foreign aid?				
6.5: Are there climate considerations in the national health budget?				

ANNEX B. LONG LIST OF RECOMMENDATIONS

COMPONENT 1: LEADERSHIP AND GOVERNANCE

- Develop strategic plans for climate-related health risks that account for subnational and geographical differences in climate hazard exposures and related health risks. For example, the plans should account for the fact that the regions of Obock, Tadjourah, and Djibouti City are at high risk of coastal flooding while the regions of Tadjourah, Dikhil, and Ali Sabieh are prone to wildfires.
- Incorporate climate health risks into national policies and strategies wherever possible and ensure their implementation at the subnational level. For example, there is a need to integrate climate-informed assessments that take into account geographical and subpopulation vulnerability into the health policy and decision-making to better support the resilience of the healthcare system and the equitability of health service delivery.
- Establish a climate adaptation and resilience working group.

COMPONENT 2: HEALTH WORKFORCE

- Create and implement interventions to attract and retain a sufficiently skilled health workforce in order to provide adequate health services to populations, especially in remote rural areas such as those in the Tadjourah region. Health workforce retention packages should also be introduced in regions facing the highest risk of climate-related hazards (droughts), such as those of Arta, Ali Sabieh, Obock, and Tadjourah. Retention packages should also include risk reduction and emergency protocols, as well as proper housing, salary increments, bonuses, and basic services for health workers.
- Conduct regular climate and health workforce knowledge and needs assessments to integrate climate change-related health impacts into workforce planning.
- Introduce climate change and health education in medical and paramedical school curricula and physician training and continuing medical education (CME).
- Introduce regular refresher courses for continued learning and provide on-the-job training opportunities to increase the health workforce's understanding of how climate change impacts health, including climate-related health risks / diseases and their diagnoses, as well as modules on preparedness and response to climate change.

COMPONENT 3: VULNERABILITY, CAPACITY, AND ADAPTATION ASSESSMENT

- Develop a toolkit for health needs assessments (HNAs) specific to climate-related health risks.
- Conduct regular HNAs both at the national and subnational levels to guide equitable resource allocations and priority setting for improved health outcomes in communities more prone to climate hazards.

- Develop guidance tools / toolkits to guide healthcare management to assess the resilience of different health facilities in urban, rural, and climate hazard-prone areas.

COMPONENT 4: INTEGRATED RISK MONITORING AND EARLY WARNING

- Set up functional early warning systems that can predict and alert communities to climate hazards and related health risks. This includes using effective and efficient communication methods to pass on information to communities and other stakeholders. Popular and quick methods that consider the context should be used. For example, alerts should be translated into languages commonly spoken in a community. Local / religious leaders and celebrities should be involved in the communication since they are respected and trusted by their community members.
- Conduct campaigns to create awareness of the linkage between climate change and human health, including climate-related health risks and the first-aid responses to take, at an individual and household level.
- Develop early warning score systems (EWSS) to guide the early and quick diagnosis of climate-related diseases, including acute diarrheal diseases (such as cholera) and vector-borne diseases (VBDs).
- Strengthen early surveillance and response systems for climate-related health risks to enhance the preparedness and adaptive capacity of the health system and increase climate-related health risk incident monitoring to inform disease prevention efforts / interventions.
- Develop heatwave alert systems for urban and rural populations and the action to be taken by communities and health facilities.

COMPONENT 5: HEALTH AND CLIMATE RESEARCH

- Advocate for the increased awareness of climate and health through conducting research. For example, advocacy messages should include climate hazards and the related health risks, population, the most-at-risk geographical areas, and the suggested course of action.
- Increase institutional capacity and building centers for research to conduct more climate and health research in Djibouti, which can be financed through government investment and international collaborations.
- Improve effective strategies and channels for climate and health research dissemination for different audiences including policy makers, the civil society, and the scientific audience.
- Strengthen the effective communication of climate change and related health risks as well as the use of evidence to inform climate-health policies and interventions, both at the national and subnational levels.

COMPONENT 6: CLIMATE-RESILIENT & SUSTAINABLE TECHNOLOGIES AND INFRASTRUCTURE

- Invest in improving indoor ventilation and filtration in health facilities, for example, by using low-cost infrastructure modifications such as providing open skylights and extra windows, especially in waiting and consultation rooms.
- Healthcare facilities should schedule and conduct regular preventive maintenance on the main heating, ventilation, and air conditioning system (HVAC) components to identify opportunities for energy-efficiency improvements and upgrades.
- In addition, there is a need to invest in training skilled HVAC technicians.
- Scaling up passive / natural space-cooling measures (renewable energy) in healthcare facilities to reduce energy costs and prevent the overheating and destruction of medical devices and laboratory equipment. For example, health facilities in Djibouti would benefit from the use of a hybrid solar system, especially in rural areas where access to hydroelectricity is low.
- Promote smart lighting strategies and improve energy efficiency in health facilities by investing in energy-saving light bulbs and motion-sensor light bulbs.
- Install rainwater harvesting systems and water storage tanks (underground or aboveground tanks) for household water security and constantly treat the water to provide potable water at health facilities and in communities.
- Invest in eHealth, telemedicine innovation, healthcare call centers, solar and rechargeable battery-powered mobile clinics, laboratories, and pharmacies (training health workforce, technical capacity, and financial investment). These should be introduced and reinforced, especially in urban areas, to free resources, including the health workforce and finances, for rural areas.
- Use white paint with a cooling effect or two-layer cooling paint, instead of commercial white paint, in health facilities.
- Invest in waterproofing solutions for health facilities, medical equipment, devices, patient files such as antimicrobial cement sealers, and metallic storage cabinets in flood-prone areas.
- Invest in solar-powered health facilities, especially in rural remote areas that are off the power grids. Health facilities in Djibouti would benefit from the use of hybrid energy systems to power equipment / essential medical devices as well as life-saving services and procedures — including deliveries, emergencies, surgeries, Caesarean deliveries, blood transfusions, sample storage, medicines, and vaccines.
- Invest in cost-effective and efficient solar-powered mobile health clinics in all regions of Djibouti, especially those in remote rural communities with no or limited health facilities.
- Invest in acquiring essential medical equipment and supplies to deal with the additional burden due to climate sensitive diseases, including medicines and medical supplies for climate sensitive disease, ultrasound machines, standard X-ray machines, anesthesia machines, and oxygen cylinders.

COMPONENT 7: MANAGEMENT OF ENVIRONMENTAL DETERMINANTS OF HEALTH

- Utilize and support community-led approaches to promote hygiene and sanitation. For example, establish a community-led total sanitation model that encourages working together with communities and supporting them to conduct their own appraisal and analysis of the sanitation situation — identifying the main problems, causes, and sustainable local targeted solutions.
- Educate communities on the health risks of poor sanitation, such as open defecation, especially in a changing climate. It is recommended that educational materials and communication on the hazards of open defecation as it relates to water quality and waterborne disease risk are used, especially among rural communities, slum dwellers, and those residing in temporary disaster shelters after extreme weather events.
- Enlist medical colleges and schools to collaborate with district- and local-level community groups to support dialogues, promote awareness, and develop prospective climate and health programs, such as health promotion programs focused on climate-related health risks. Engagement could include the use of mainstream media or community-level climate and health training modules.
- Invest in planting trees on health facility / hospital premises and plants in health facility wards, waiting and consultation rooms for health promotion and wellness, improving air quality, and providing cooling in health facilities.

COMPONENT 8: CLIMATE-INFORMED HEALTH PROGRAMS

- Invest in awareness campaigns on climate-related health risks — using local and national radios, television, and push notifications. Involve and engage community leaders and civil society in order to ensure better communication in the most vulnerable and remote rural communities. Campaigns should cover preventive measures and the management of environmental determinants of health including water, sanitation, and hygiene (WASH) programs, boiling of drinking water, and the proper disposal of human waste.
- Create a national multi-sectoral program on food security and nutrition, with implementation plans for different sectors and levels — including national, subnational, and local levels. The different sectors include health, education, and agriculture / livestock.
- Institute community nutrition education programs that train women how to prepare nutritious and balanced meals for their households, especially concerning children, pregnant women, and the elderly.
- Create a national emergency food bank to help those in drought- and flood-prone areas, especially the poor and vulnerable households.

COMPONENT 9: EMERGENCY PREPAREDNESS AND MANAGEMENT

- Invest in the construction of emergency units in district hospitals and health posts to facilitate quick response and management in the face of climate change-induced hazards and related health risks, including heat shocks, direct injuries, and other related conditions.
- Develop climate adaptation and resilience plans to guide the evaluation of the most significant climate-related health risks and vulnerabilities.
- Integrate the health impacts of climate change into emergency preparedness plans.
- Conduct routine climate resilience assessments of health facilities and infrastructures, taking into account geographical differences in climate hazard vulnerabilities.
- Conduct routine assessments of climate risks and vulnerabilities.
- Invest in purchasing ambulances for health facilities, mobile team vehicles, and supplies, especially those in the remote and rural areas of Ali Sabieh, Arta, and Tadjoura.

COMPONENT 10: CLIMATE AND HEALTH FINANCING

- Advocate for investing sufficient funds in health care to build climate-resilient health systems, both in terms of climate-resilient health facilities / infrastructure and equipment but also in the recruitment and training of more skilled health workforce to attend to the extra health burden of climate-related health risks.
- Advocate for including climate change and related health risks in national, subnational, and local budgets and programs.
- Design a detailed resource mobilization plan for financial resources to support climate-resilient health systems. For example, this plan would include putting together a list of all public, private, and donor funding sources and commitments (how much, for how long, and the reliability of the funding source).
- Design a strategy for scaling resource mobilization from private investors and the public sector to support health adaptation plans and strategies to deal with climate change so as to reduce donor dependence and improve health financing stability.
- Subsidize health services for poor people living in flood- and drought-prone regions.



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