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Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises

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REPORT

CLIMATE-RESILIENT DEVELOPMENT FOR SOMALIA

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TABLE OF CONTENTS

ACRONYMS

AIMS	Somalia Aid Information Management System
CCA	climate change adaptation
CMIP5	Coupled Model Inter-Comparison Project 5
CMIP6	Coupled Model Inter-Comparison Project 6
CORDEX	Coordinated Regional Downscaling Experiment
DRM	disaster risk management
ENSO	El Niño Southern Oscillation
FCDO	United Kingdom Foreign, Commonwealth & Development Office
FGS	Federal Government of Somalia
FMS	Federal Member States
IPCC	Intergovernmental Panel on Climate Change
MoECC	Ministry of Environment and Climate Change
NCCP	National Climate Change Policy (of Somalia)
NDC	Nationally Determined Contribution
NDP9	Ninth National Development Plan (of Somalia)
NWRS	National Water Resources Strategy
RCP	Representative Concentration Pathway
SAPS	Support to Agricultural Productivity in Somalia
SPARC	Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises
TX	maximum temperatures (daytime)
TN	minimum temperatures (night-time)
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations Refugee Agency

REFLECTIONS

This report presents a stocktake of Somalia's current efforts in addressing climate change through a qualitative climate risk screening, an assessment of government and development partners' adaptation priorities and recognition of specific climate risks in those priorities. While there are significant challenges in integrating adaptation, mitigation and disaster risk management into socio-economic development, land-use planning and adaptation priorities, these are necessary to help Somalia transition from cycles of recurrent and protracted crises to a more climate-resilient development future.

As Somalia tries to overcome multiple concurrent crises arising from decades of conflict, fragmentation, instability and under-development, it has embraced poverty reduction, inclusive growth and socio-economic development as the vision for its future. Embedding climate adaptation and disaster risk management within socio-economic development and land-use planning can reduce vulnerabilities and exposure to climate change, thereby reducing climate change risks. Climate mitigation through a green energy transition, land-use planning and sustainable use of natural resources within development can reduce the severity and extent of climate change. Both adaptation and mitigation together will reduce climate change risks, although not everyone will benefit equally from such risk reductions.

Addressing climate risks through reducing vulnerabilities and exposure created through socio-economic development

Due to climate change, Somalia will become hotter and experience more heatwaves. Projections in precipitation are more uncertain over the short term, but it is likely that precipitation becomes more variable with increased frequency of both droughts and flooding. However, climate risks for the country are due not only to climate change but also to socio-economic development and governance. Development creates vulnerability and exposure to climate hazards, but it also creates opportunities to enhance mitigation and adaptation capacities. Understanding where and how hazards, exposure and vulnerability intersect is critical to identifying mitigation and adaptation measures that are attuned to Somalia's current development vision, while not reducing its long-term adaptation and mitigation options in the decades to come.

Water is critical to Somalia's socio-economic development, with the semi-arid to arid country depending mainly on aquifers for water supply. The management of this resource will determine the success and sustainability of development and create or reduce vulnerabilities to climate change. Water risks for Somalia over the short to long terms will be heavily mediated by changes in demand related to urbanisation and economic diversification, land-use planning and change as well as the planning, construction and maintenance of water infrastructure for irrigation, livestock watering points and urban use. Drilling of borewells without understanding and monitoring groundwater tables, and expanding irrigation networks along the Jubba and Shabelle rivers without an integrated water management approach, could exacerbate depletions and create a situation in which supplies seem resilient over the short term but, by the medium term, could create water insecurity when coupled with climate change.

The country's economy is at a crossroads. Livelihoods are predominantly based on a mixture of farming and livestock, but urbanisation rates are high. Some 45–60% of the population lives in towns or cities with populations greater than 10,000. People displaced by drought or conflict increasingly decide to stay in urban areas and look to diversify their livelihoods away from agro-pastoralism. This situation challenges the ability of city governments and urban dwellers to provide and access adequate housing, sanitation, water supply, electricity and other services. How cities develop – from the preservation of space for flood control and the reduction of urban heat islands to the construction of electricity, water, sanitation, sewage, buildings and road infrastructures – locks in certain climate risks, not only in the short term but also into the medium and long terms. And, once built, infrastructure is costly to retrofit or relocate.

Assessing climate risks and implementing interventions with the mindset that the country's future livelihoods, economy and governance systems will stay like the current situation fails to acknowledge the dynamism of Somalia's diaspora and private sectors, as well as the peacebuilding efforts of the government. While many of the Sustainable Development Goals may not be fully met by 2030, Somalia is committed to improving living standards, livelihoods, its economy, and its environmental and climate risk management. Because of this dynamism, Somalia's vulnerability profiles, from the individual to the regional and national levels, will not remain static. As the country urbanises and builds more infrastructure to meet economic diversification visions, exposures to various climate hazards will also shift. Therefore, climate and disaster risk assessments and government, humanitarian and development interventions, need to take a forward-looking approach and consider how vulnerabilities, capacities and exposures are likely to shift with climate hazards to make Somalia's development more risk-informed and resilient.

Coherence and coordination of actions from the government

Adaptation priorities identified in national climate policies and sectoral policies do not yet adequately address the varied range of climate change risks to Somalia's economic and social development over the short (2021–2040) to medium (2041–2060) term. This situation is reflected in the government's limited understanding of the interconnectedness between differing threats and trends (such as climate change, rapid urbanisation and conflict) and proposed adaptation options. Trade-offs of actions and policies are not well considered, and there are risks of embedding maladaptation in certain development and adaptation interventions.

Climate risks are currently being addressed in an ad-hoc manner, prioritising short-term, immediate impacts and needs rather than preparing for future shifts in water supplies, water demand, rising temperatures and extreme weather events and their possible impacts on infrastructure, urbanisation and land-use planning. Adaptation priorities are not always framed as coherent messages across policy processes, although successive policy processes make direct reference to previous ones. Policies tend to lack clear and actionable interventions, there are mismatches of priorities across policies, and there is limited alignment between national and state policies.

These challenges are understandable, as crafting climate and disaster risk management policies has taken place in a fractured political context with structural issues posed by a nascent federal system of governance and transitional federal institutions. Furthermore, core state capabilities have been rebuilt while dealing with multiple crises and fragility. Frequent leadership changes and loss of institutional memory during the period of transition have impacted policymaking. It is also perceived that the crafting of climate policies has been a 'tick-the-box' exercise enforced by donors or driven by compliance with international agreements, and where external consultants have had minimal consultations with the government of Somalia or minimal understanding of the government's socio-economic development visions.

Limited ownership of policies, and the leadership to champion them, has negatively impacted their implementation. In turn, many of them lack implementation plans and funding to implement. This situation has further limited the effectiveness of climate policies to assemble different decision makers under a shared vision.

Coherence and coordination of actions from development partners

The fragmented policy landscape for climate adaptation has resulted in development partners implementing largely ad-hoc adaptation and resilience programmes that do not work in synergy to achieve higher-level goals and policies but are more an expression of development partners' strengths and organisational mandates.

Development, humanitarian, climate, and other actors are implementing aid projects purporting to build resilience to current climate shocks and adaptation to future climate risks; however, virtually all projects fail to adequately consider evolving vulnerabilities created by the interaction of present and projected climate hazards, socio-economic development pathways, land-use trajectories, population and urbanisation dynamics, as well as risks that responses to climate and environmental hazards are themselves creating. Only 14% of the 1,326 aid programmes (worth $11.7 billion) recorded in the Somalia Aid Information Management System aim specifically at reducing present vulnerability to climate shocks and stresses while largely neglecting future climate risks. Overwhelmingly, projects favour restoring existing rural livelihoods, such as farming or livestock rearing and trade, or rehabilitating the systems that support these activities, such as local irrigation, rather than considering potential inflexion points for economic diversification, higher value chain jobs and fulfilling people's desire to transition out of agriculture (e.g. young people and Internally Displaced Populations).

Current and future climate risks are particularly overlooked in the water sector. At the project level, many humanitarian projects in the water sector risk locking in climate risks, leading to potential maladaptation due to building and rehabilitating infrastructure without proper hydrogeological surveys. At the sectoral level, water resilience programmes have targeted Federal Member States unevenly despite increasing temperatures and greater evaporation expected across the country.

Development partners have compounded the problem of policy fragmentation. There is intrinsic competition among development actors to access financial and human resources for climate adaptation and resilience. A key example is access to the same pool of funding from the multilateral climate funds, which are limited and present challenging requirements for development partner applicants. This situation has led to poor coordination and an opaque pipeline of adaptation projects in Somalia among development actors, delays to project approvals and implementation, redundancies, and gaps in geographic and thematic coverage of projects, leaving populations and communities underserved.

1. INTRODUCTION

This report, *Climate-resilient development for Somalia*, has been prepared under the United Kingdom Foreign, Commonwealth & Development Office (FCDO)-funded Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises (SPARC) programme. In close collaboration with FCDO Somalia, this report has been shaped to respond to local needs.

Development and humanitarian partners interested in supporting the people of Somalia to cope with climate-induced shocks and stresses are keen to better understand how best to manage and leverage finance to address these recurring crises and support anticipatory measures. There already exists a Somalia stakeholder environmental group – Friends of the Environment – of which the Federal Government of Somalia (FGS)[1] is a co-chair, where there is a consensus on the urgent need to identify and understand the institutional priorities for addressing climate change, as well as the systemic challenges for accessing climate finance. Therefore, this report is part of a series of complimentary research activities:

- the climate-finance landscape in Somalia, which is an internal FCDO report;
- the institutional arrangements for the climate agenda in Somalia, which is an internal FCDO report; and
- a policy brief that summarises key findings of the above reports – *Financing climate adaptation in fragile states: A case of Somalia* – which was published externally.

Together, these reports contribute to an international momentum towards further understanding what it means to increase finance for climate adaptation activities in fragile and conflict-affected contexts.

1 Directorate of Environment and Climate Change (DoECC) within the Office of the Prime Minister has transitioned into a full Ministry (MoECC) on 9 August 2022

More specifically, this report presents a stocktake of Somalia's current efforts in addressing climate change through a brief climate risk assessment and an assessment of government and development partners' adaptation priorities and the recognition of specific climate risks in those priorities. While there are significant challenges in integrating adaptation, mitigation and disaster risk management into socio-economic development, land-use planning and adaptation priorities, there are also opportunities.

According to the ND-GAIN[2] index, which measures countries' climate change vulnerabilities and readiness to adapt, Somalia is highly vulnerable due to its fragile political, economic and social systems. In the past 30 years, Somalia has experienced droughts that have become more intense, frequent and prolonged (UNEP, 2018), and flooding and locust infestations. The 2016–2017 drought alone is estimated to have led to damages and losses of over $3.25 billion, requiring recovery interventions estimated at $1.77 billion (World Bank Group, 2018).

The country is in urgent need of (climate) finance for adaptation and climate resilient development, but the limited capacity of governmental and non-governmental actors to access, implement and monitor climate finance poses a barrier. In addition, current processes and systems for 'Least Developed Countries'[3] to access climate finance are not suitable for fragile and conflict-affected contexts, including Somalia, because of perceived risks of financial instability on the part of some bilateral donors.

The 'Reflections' chapter of this report summarises key outcomes. Chapter 2 of this report introduces current government development priorities and highlights where climate adaptation fits. Chapter 3 of this report presents a qualitative climate risk assessment of Somalia, including overviews of projected climate changes and deep dives on key priority sectors: water, agriculture, livestock, energy and urbanisation. Chapter 4 of this report is an assessment of current government and development priorities on climate adaptation, which outlines key gaps and inconsistencies and a sample analysis of the extent to which current projects are addressing climate resilience. Overall, this report aims to contribute to ongoing efforts to further understand the context of Somalia when thinking about climate resilience and what it means to further leverage finance for climate adaptation in Somalia.

2 https://gain-new.crc.nd.edu/ranking

3 'LDCs' is a category used across the UN system and in much development literature. In this report, we would like to acknowledge current debates that question the use of this terminology and its ahistorical framing. They seek to challenge the power relationships and assumptions inherent in ideas about progress and development. Although, in this instance, we employ the term 'LDCs' to situate this report within the current literature, we will continue interrogating the appropriateness of the term and working with our partners to develop more appropriate language and terminology.


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2. GOVERNMENT DEVELOPMENT PRIORITIES

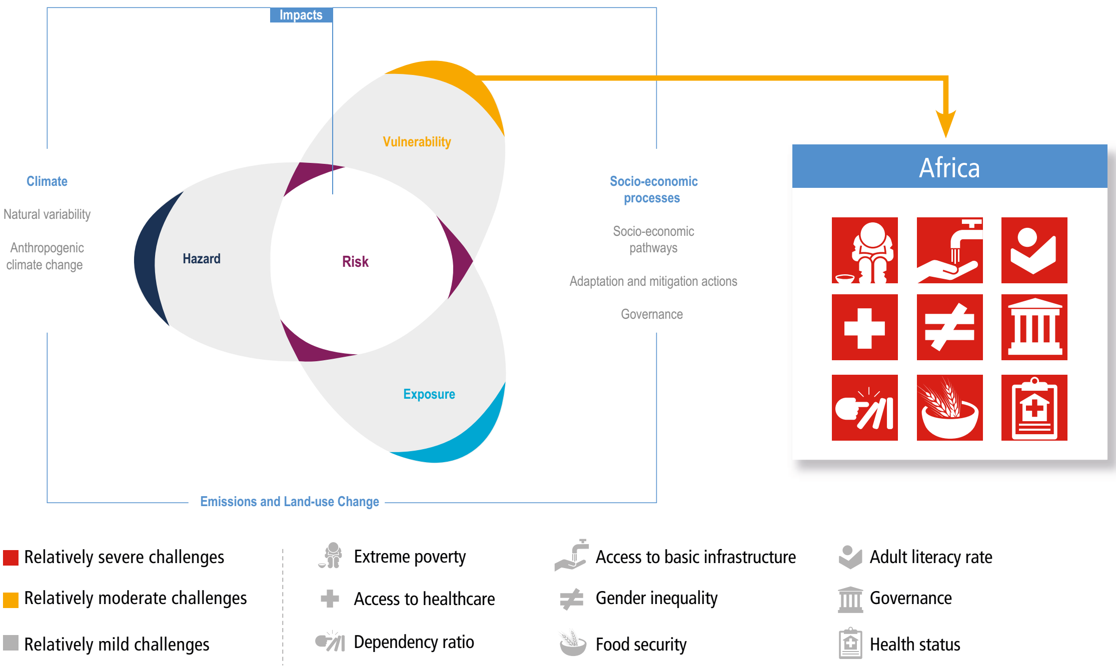
2.1 Adaptation for climate-resilient development

Climate change risks (i.e. the potential for adverse impacts) result not only from changes in temperature, precipitation, sea level rise or other climate variables and hazards but also from the dynamic interaction of these hazards with human socio-economic development, land-use change, population dynamics, conflict, and other human-mediated environmental degradation. Climate change risks can also further result from responses to climate and environmental risk management (Figure 1, Begum et al., 2022).

Vulnerability is the sensitivity of human and ecological systems to suffering harm, but it differs significantly from person to person as well as within and across societies and ecosystems. It is mediated by the strength and evolution of socio-economic development and governance and their influence on ecosystems and preventing climate or other natural hazards from triggering disasters. Due to histories of colonialism, natural resource extraction for foreign markets and ongoing political instabilities in some countries, Africa as an aggregate has high vulnerability (Figure 1).

Human systems embed vulnerability, fragility and exposure to hazards so that when they occur, various negative impacts (what are called 'disasters') result. As noted in the United Nations Office for Disaster Risk Reduction *Global Assessment Report on Disaster Risk Reduction 2015*, 'Exposure and vulnerability, as well as hazard itself (through climate change and environmental degradation) are socially constructed through underlying risk drivers, including globalised economic development, poverty and inequality, badly planned and managed urban development, environmental degradation and climate change' (UNDRR, 2015: 33). Thus, climate change risks result from development trajectories.

FIGURE 1. HUMAN-CAUSED CLIMATE IMPACTS AND RISKS RESULT FROM HUMAN-CREATED VULNERABILITY AND EXPOSURE INTERACTING WITH CLIMATE HAZARDS



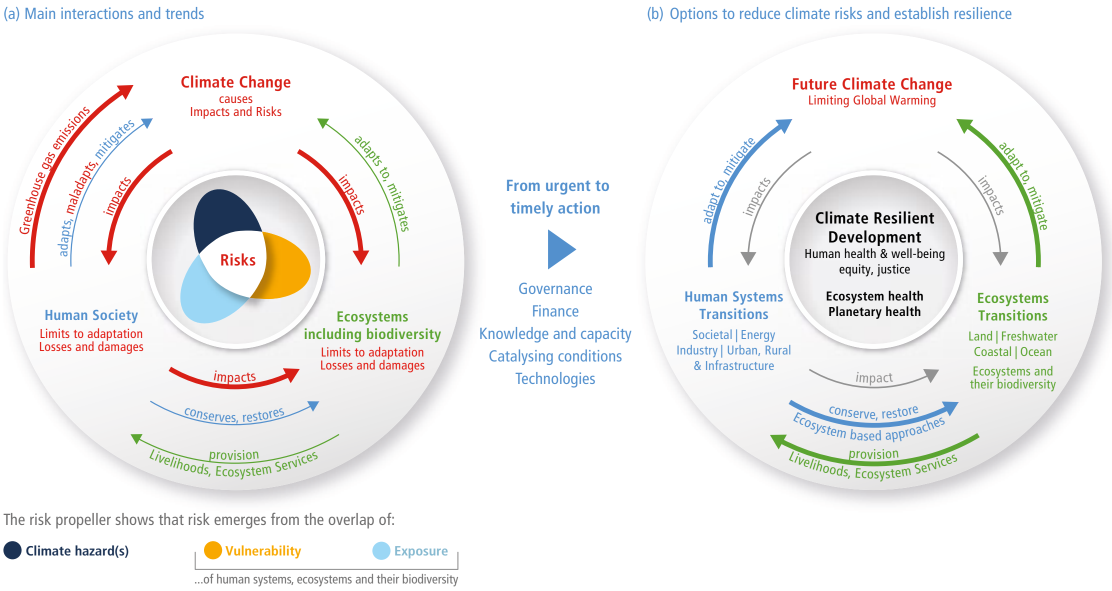
Notes: (a) climate impacts and risks result from the interaction of human-caused climate change with the dynamic choices made in socio-economic development, land-use change, use of natural resources and governance that drive vulnerability and exposure to climate hazards. (b) Vulnerability across Africa (aggregated as a whole) is currently high due to relatively severe challenges in providing access to infrastructure (e.g. water, sanitation or electricity) and services like education and healthcare.

Source: figure adapted from Figure 1.5 and Figure T5.7 of IPCC, 2022.

Understanding how development – both organic and planned – creates vulnerability, exposure and capacities, as well as where and how hazards, exposure and vulnerability intersect, is critical to identifying both mitigation and adaptation measures that are attuned towards Somalia's current development vision while not reducing its long-term adaptation and mitigation options in the decades to come (Figure 2). The Intergovernmental Panel on Climate Change (IPCC) (2022: 12) reiterates that 'future human vulnerability will continue to concentrate where the capacities of local, municipal and national governments, communities and the private sector are least able to provide infrastructures and basic services (*high confidence*)'. Despite these challenges, vulnerability and exposure also offer entry points to begin managing the current drought crisis ravaging the Horn of Africa by reducing disaster impacts through humanitarian actions while laying the seeds of stronger disaster and climate risk management through and within development.

While a longer-term view is challenging, it is essential to incorporate it when considering infrastructure that will last multiple decades and generations, like roads, water and energy projects or buildings. A climate risk management continuum approach is necessary to balance meeting short-term needs of stabilising and reducing the harms associated with current disasters (humanitarian) with preparing and transitioning to a vision of the future (development) and reducing maladaptation and adaptation gaps by incorporating disaster risk management, mitigation and adaptation over the short (next 5–10 years) to long term (beyond 20 years).

FIGURE 2. MOVING FROM CLIMATE RISK CREATION TO CLIMATE-RESILIENT DEVELOPMENT



Note: The IPCC Sixth Assessment report (AR6) has a strong focus on the interactions among the coupled systems: climate, ecosystems (including their biodiversity) and human society.

(a) Human society causes climate change. Climate change, through hazards, exposure and vulnerability, generates impacts and risks that can surpass limits to adaptation and result in losses and damages. Human society can adapt to, maladapt and mitigate climate change, ecosystems can adapt and mitigate within limits. Ecosystems and their biodiversity provision livelihoods and ecosystem services. Human society impacts ecosystems and can restore and conserve them.

(b) Meeting the objectives of climate resilient development thereby supporting human, ecosystem and planetary health, as well as human well-being, requires society and ecosystems to move over (transition) to a more resilient state. The recognition of climate risks can strengthen adaptation and mitigation actions and transitions that reduce risks. Taking action is enabled by governance, finance, knowledge and capacity building, technology and catalysing conditions. Transformation entails system transitions strengthening the resilience of ecosystems and society. In a) the arrow colours represent principle human society interactions (blue), ecosystem (including biodiversity) interactions (green) and the impacts of climate change and human activities, including losses and damages, under continued climate change (red). In b) arrow colours represent human system interactions (blue), ecosystem (including biodiversity) interactions (green) and reduced impacts from climate change and human activities (grey).

Source: Figure TS.2 IPCC, 2022

2.2 Government development priorities

As Somalia makes efforts to overcome multiple concurrent crises arising from decades of conflict, fragmentation, instability and under-development, the FGS has laid out the vision to transition the country from dealing with protracted humanitarian crises into a country with a vibrant and diverse economy. The *Somalia National Development Plan 2020 to 2024* (the Ninth National Development Plan; NDP9) uses this vision to define a future based on poverty reduction, inclusive growth and development.

The objectives of the NDP9 are anchored on four pillars, namely: (1) inclusive politics, (2) security and rule of law, (3) economic development and (4) social development. While socio-economic development is inherently all-encompassing, NDP9 includes amongst its priorities the support and diversification of the economic sectors of livestock, agriculture, fisheries, transport, energy, telecommunications, petroleum, finance, manufacturing and construction. Its main goals focus on improving and strengthening food production systems; rehabilitating and expanding infrastructure, including improving access to clean water, sanitation and electricity; economic diversification; and urbanisation.

The objectives and goals articulated in NDP9 are being used in conjunction with different sector policies (see Table 1) to move the country beyond the current status quo where local livelihoods are highly vulnerable to climate, conflict and financial shocks and stresses (e.g. inflationary food prices linked with the cascading impacts of COVID-19 and now the Russia–Ukraine war) to a more inclusive, resilient and diversified economy. There are some discrepancies in the objectives and the timeframes needed to achieve them as laid out in various policies (KII, 2022); nonetheless, they do lay out goals for strengthening governance, peace and security to strengthen and build an economy that is less reliant on climate-sensitive livelihoods and one that is positioned to take part in global technology opportunities and a diversified future.

TABLE 1. LIST OF FGS POLICIES

Date published	Policy
2021	National Water Resource Strategy 2021–2025
2020	National Food Security and Nutrition Policy 2020 National Drought Plan 2020 National Durable Solutions Strategy (2020–2024)
2019	Integrated Water Resources Management Strategic Plan 2019–2023 The Power Master Plan for Somalia 2019 The National Electricity Bill 2019 Somalia National Water Policy and National Water Resource Law 2019 National Fertiliser Policy, 2019 National Pesticide Policy, 2019
2018	National Energy Policy 2018

Source: compiled by authors

Achieving these socio-economic development objectives will require addressing various challenges, including the degradation of natural resources. Land degradation and deforestation are triggered by overgrazing, agricultural expansion and soil erosion (Warsame et al., 2022). The effects of human-driven degradation are exacerbated by Somalia's natural aridity and high rainfall variability, such as the recent recurrent droughts, even though the 2016–2017 drought was not attributable to climate change (van Oldenborgh et al., 2017). The IPCC (2022: 12) states that 'human and ecosystem vulnerability are interdependent . . . there is increasing evidence that degradation and destruction of ecosystems by humans increases the vulnerability of people (high confidence).'

Despite Somalia being prone to droughts and heavy rainfall events, climate-related issues are currently addressed in an ad-hoc manner (according to interviewees, 2022–2023) and require better embedding within socio-economic development and land-use planning. Climate change risks to the country will evolve, due not only to changes in the frequency and intensity of extreme weather events or shifting seasons, but also to the development trajectories begun today, which lock in vulnerabilities and exposures for the future. Adaptation of human systems and protection of Somalia's ecosystems to facilitate their adaptation are processes that need to be embedded within Somalia's development so that it is climate resilient, equitable and just, keeping in line with the NDP9's priority pillars of inclusive and accountable politics and improved security and the rule of law.

In this report, we focus specifically on climate change risks to five cross-pillar socio-economic sectors mentioned as priorities in the NDP9 under 'Pillar 3: Economic development' and 'Pillar 4: Social development': (1) water, (2) energy, (3) urbanisation, (4) agriculture and (5) livestock (see Table 2). We provide a broad overview of some possible climate risks, drawing from a suite of climate projections, as well as potential socio-economic development trajectories as outlined in government policies and literature. The climate risks presented here do not represent an in-depth quantitative assessment of risks to each sector, only qualitative risk screening. We then assess government disaster risk management and climate change adaptation priorities and proposed interventions, how they could reduce some climate risks, and where further policy and intervention strengthening is required. We also present a synopsis of development partner climate adaptation and disaster risk management priorities and interventions. We assess these in terms of their synergies with government priorities and where they could be at odds with or contribute to risk reduction over the short (2021–2040) and medium terms (2041–2060). How government and development partner priorities account for climate change risks at various time scales will highlight some risks and opportunities for the country's development pathway.

TABLE 2. NATIONAL GOVERNMENT DEVELOPMENT PRIORITIES IN SELECT SECTORS

Sector	Objective
Water	• Rehabilitate pre-war irrigation and flood control infrastructure in southern Somalia (e.g. Bari, Galmudug, Hirshabelle, Southwest and Jubaland) along the Jubba and Shabelle rivers • Achieve universal and equitable access to safe and affordable drinking water for all • Rehabilitate water sources: boreholes, shallow wells, dams, springs and berkads • Achieve universal and equitable sanitation and hygiene and end open defecation • Explore large-scale hydropower along the Jubba River
Energy	• Increase access to energy from 15% to 45% of the population by 2024 • Increasing the number of improved charcoal stoves from 2% in 2000 to 30% by 2040 • Increase supply of renewable and non-renewable energy sources (i.e. solar and wind power) • Establish natural regulatory authority for energy market governance and undertake energy market regulatory reforms to improve generation and supply efficiencies and reduce energy prices • Explore large-scale hydropower along the Jubba River • Construction of 220 kV transmission line from Garissa, Kenya to Mogadishu, Somalia • Construction of 500 kV transmission line between Ethiopia and Somalia
Urbanisation	• Ensure access to improved housing and basic services and upgrade slums for all • Provide access to safe, affordable, accessible and sustainable transport systems for all • Rehabilitation of various roads, such as the Kalabayd-Hargeisa-Berbera road, to improve regional integration and trade • Improve internet connectivity: constructing fibre optic cable from Ethiopia to northern Somalia and expansion of Djibouti Africa Regional Express submarine cable to Somalia
Agriculture	• Improve the agricultural productivity of both irrigated and rainfed farming systems • Introduce modern farming techniques, rainwater harvesting and practices to retain soil moisture • Address food security through increased cereal production • Rehabilitate pre-war irrigation and flood control infrastructure in southern Somalia to improve the supply of surface water available to agriculture • Introduce water efficient irrigation techniques and reduce soil salinisation and waterlogging through water use planning and regulation • Enhance institutions to develop legal and administrative capacities to create a more business-enabling environment • Establish national authority for monitoring, regulating and controlling plant health, agro-chemicals, seeds and seed varieties • Enhance agricultural value chains, including agro-food processing

Sector	Objective
Livestock	• Strengthen investments in animal health and disease prevention, • Improve animal nutrition (including exploration of various feed sources and watering facilities) to enhance livestock productivity, herd diversification and size management • Strengthen and introduce modern production techniques, value chains (including expansion of new ones, like poultry and beekeeping, in urban markets), markets and export, thereby diversifying and improving rural job opportunities • Create a Water Management Master Plan to reduce conflicts over water between livestock and agricultural sectors • Improve transportation networks to facilitate animal trade • Explore the deployment of solar and wind power for cold (refrigeration) chains • Construct slaughterhouses and storage • Expand domestic consumption through fostering growing urban markets • Enhance institutions to develop legal and administrative capacities to monitor livestock population and distribution, to assess the status of rangeland and water resources, and to develop and enforce sanitary and phytosanitary measures to meet international standards and requirements of importing countries • Re-establish National Rangeland Agency to enforce policies, laws and traditional systems to rehabilitate and manage rangelands • Improve land tenure management around grazing rights, private enclosures on communal rangeland and commercial fodder production

Note: Socio-economic development objectives compiled from various federal government policies

Source: compiled by authors from MoPIED, 2020; World Bank, 2018; Government of Somalia, 2018; Water Master Plan, 2023; IGAD, 2021

3. CLIMATE RISKS TO SOMALIA'S DEVELOPMENT

3.1 Assessing climate risks to water security for socio-economic development

Somalia's economy is currently primarily pastoral and agro-pastoral. As highlighted in the previous chapter, economic and social development form two key pillars in the country's vision to transition from experiencing protracted humanitarian crises into a country with a vibrant and diverse economy. Interventions under these pillars focus on improving and strengthening food production systems, rehabilitating and expanding infrastructure – including improving access to clean water, sanitation and electricity – and economic diversification and urbanisation (see Table 2, MoPIED, 2020). While traditional agriculture, livestock and fishing-based livelihoods will continue to play a strong role in subnational and national economies over the short term, 45%–60%[4] of the population lives in urban areas, and rural-urban migration is very likely to accelerate (Papachristodoulou et al., 2019).

Key to realising these NDP9 socio-economic development objectives, meeting the realities of urbanisation and laying a more climate-resilient future in the 2030s and beyond will be addressing water security[5] – both in quantity and quality. Except for a semi-arid climate in

4 Papachristodoulou et al. (2019) estimated that, excluding Internally Displaced Populations (IDPs), nearly 45% of Somalia's population lives in urban areas. The inclusion of IDPs raises urban populations to 60%. They also note that many of the IDPs choose to stay in urban areas and that rural–urban migration is accelerating. The authors' estimates do not capture the scale of IDPs relocating to cities because of the current (late 2020–present) drought situation; urban populations are likely higher than 60% and may remain so after the drought abates.

5 United Nations Water defines water security as '[t]he capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human wellbeing, and socio-economic development, for ensuring protection against water-borne pollution, water-related hazards and climate change, and for preserving ecosystems in a climate of peace and political stability'.

parts of the northwest and the south of the country (annual precipitation ranging from ~400 to 600 mm), the majority of Somalia is arid, with annual precipitation ranging from less than 100 to 400 mm (Government of Somalia, 2018; Gadain et al., 2018; Ogallo and Jama, 2020). This aridity is natural but is accentuated by warming temperatures and increasing precipitation variability associated with climate change.

Pastoral, agro-pastoral and agricultural livelihoods in Somalia (see Figure 3) follow the distribution of surface and groundwater supplies and rainfall seasonality (Figure 4). The Jubba and Shabelle rivers – both originating in the southeastern Ethiopian Highlands – are the primary sources of irrigation, livestock and domestic water supply for rural and urban areas in the south during the rainy seasons (Government of Somalia, 2018; Michalscheck et al., 2016). However, areas of the Shabelle River may dry completely during the dry seasons due to abstractions for irrigation and human and livestock use (Michalscheck et al., 2016). The crop-growing areas are confined mainly to irrigated areas near to the rivers (Figure 3). Land preparation and crop sowing occur in the lead up to the rainy seasons, with harvests occurring during the dry seasons (Figure 4). Pastoral and agro-pastoralists are concentrated in regions without consistent surface water supplies. Much of the country, particularly Puntland and Somaliland, is reliant on groundwater accessed through boreholes, hand-dug shallow wells

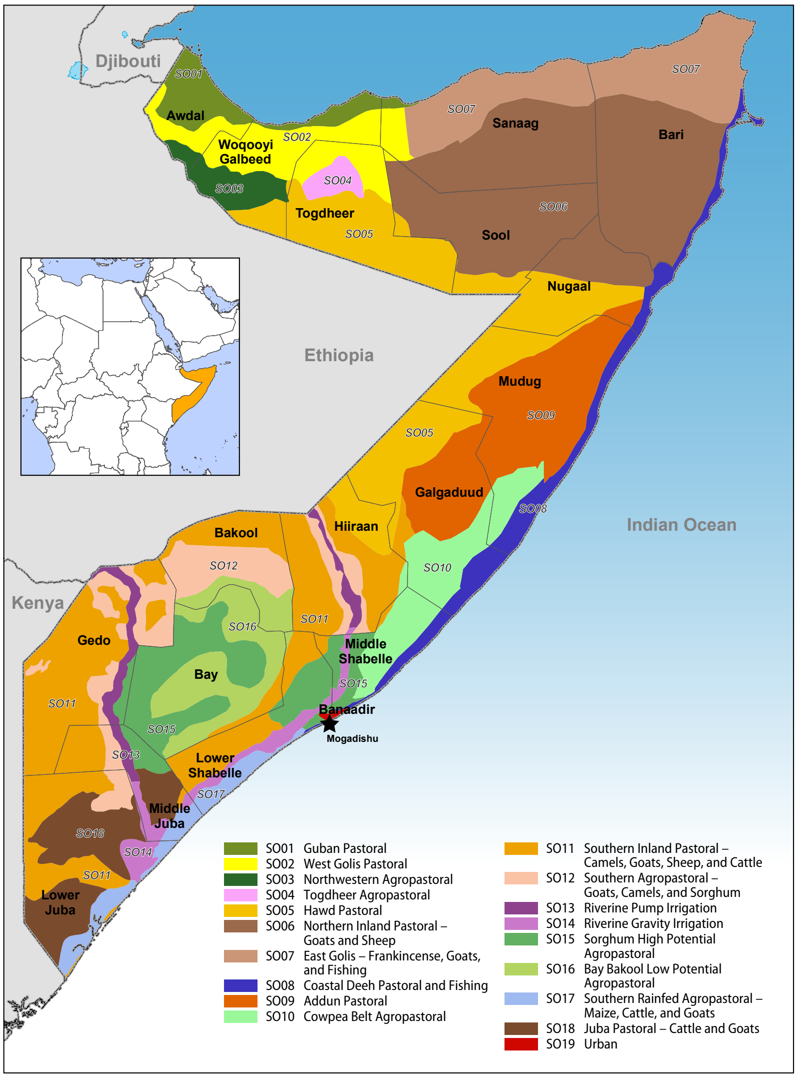
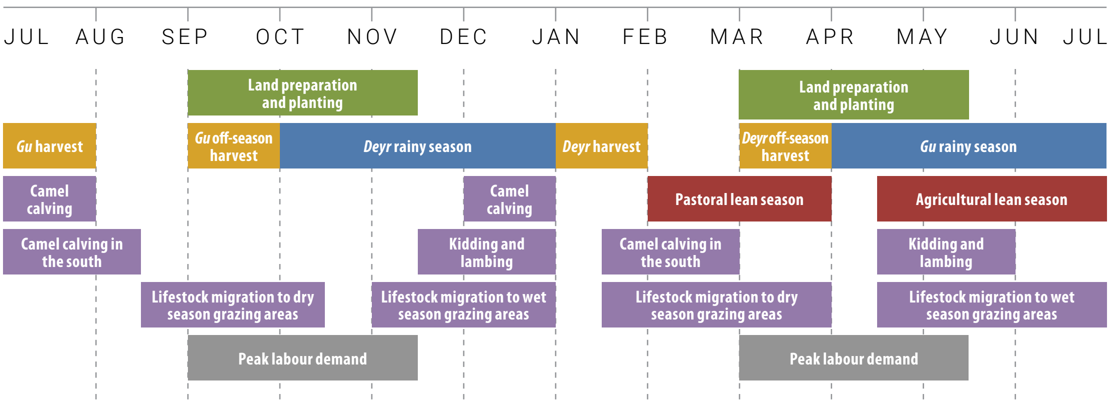


FIGURE 3. SOMALIA LIVELIHOOD ZONES

Source: Famine Early Warning Systems Network, 2015

FIGURE 4. SOMALIA TYPICAL SEASONAL CALENDAR



Source: the Famine Early Warning Systems, 2015

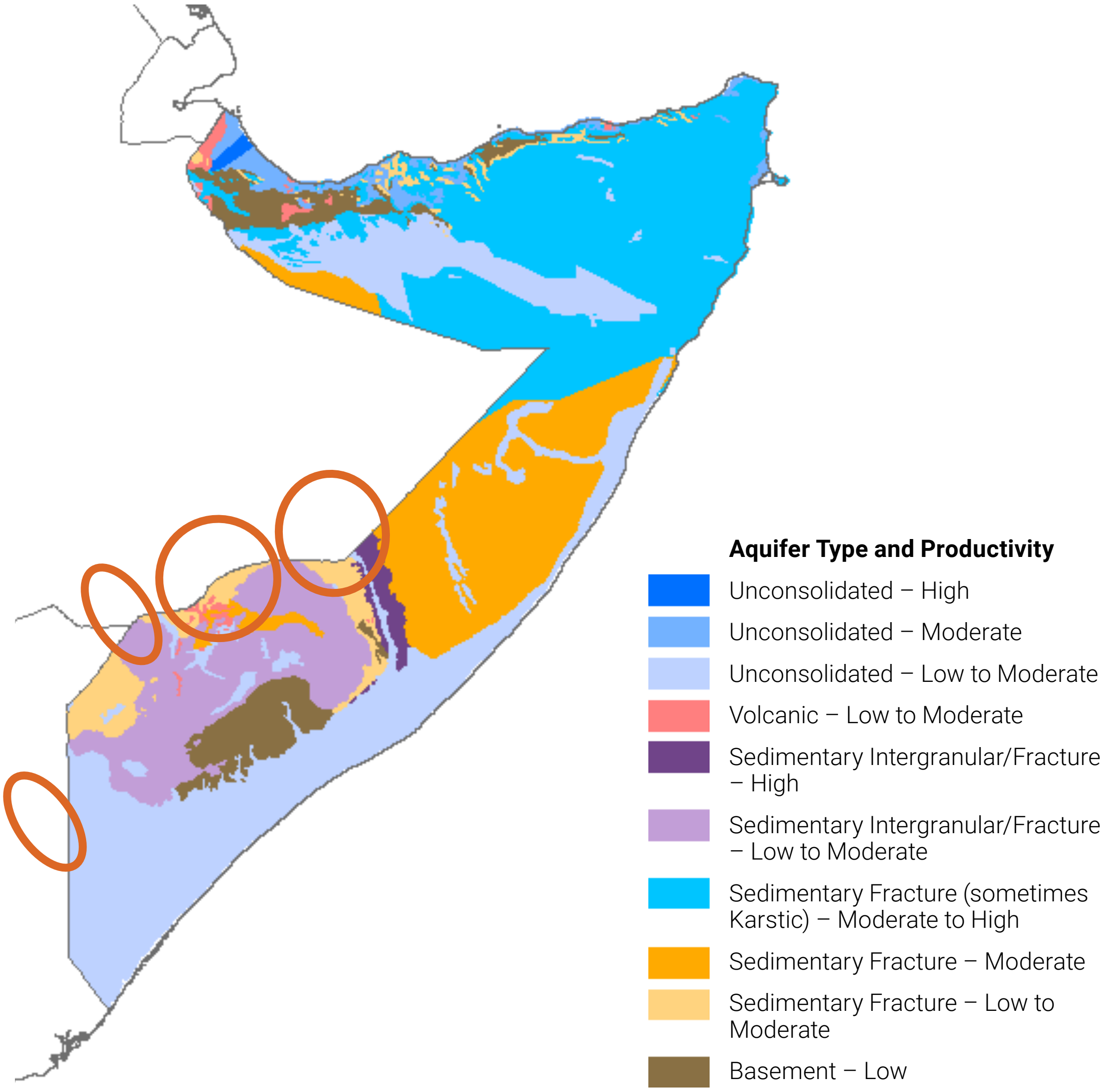
and berkads; deeper aquifers are accessed through boreholes (Gadain et al., 2018; FGS, 2021). Livestock mobility and trade help pastoralists deal with seasonal variations in fodder and water availability in the drylands (Banerjee et al., 2022).

Many of the sedimentary aquifers are dependent on rainfall for recharge to varying degrees (Gadian et al., 2018; Agutu et al., 2019; Moallim, 1993). Alluvial aquifers along the Jubba and Shabelle rivers and the transboundary aquifers of Ethiopia recharge through their connectivity to the rivers and rainfall infiltration through porous outcroppings in south-eastern Ethiopia (Figure 5). However, when rainfall is consistently deficient and surface water evaporation rates are high, water tables in some aquifers decline.

Across rural, peri-urban and urban areas, only 48% of the population has less than a 15-minute walk to drinking water sources and more than half lack access to reliable drinking water (Centre for Humanitarian Change, 2020); by some estimates, only 26% of the population has safe drinking water (Government of Somalia, 2018). Groundwater quality from shallow aquifers is also frequently poor for human and livestock consumption due to high levels of minerals and contamination from agriculture, livestock and urban waste discharges (Government of Somalia, 2018; Gadain et al., 2018). Furthermore, the Somalia Water and Land Information Management have estimated that of the more than 5,000 livestock watering points across the country, roughly half of these are functional under non-drought conditions and only 500 of these are deep boreholes (MoPIED, 2020).

Widespread drilling of borewells and shallow wells without consideration of aquifer recharge rates, infiltration characteristics or water quality for multiple decades has contributed to water insecurity (Government of Somalia, 2018). The tendency to dig wells without adequate hydrogeological information is a problem that various humanitarian agencies have contributed to when trying to provide water to refugee and Internally Displaced Population (IDP) camps since at least the 1980s (Thomas et al., 1986). While there are not enough widespread hydrogeological surveys and ongoing monitoring of wells (there are currently only seven groundwater monitoring wells in the country; of these five are actively reporting, and all were established in 2021 or later (SWALIM, 2023)), existing studies indicate that over-pumping of groundwater led to a decline of 30% in aquifer levels in the north by 2012 (Government of Somalia, 2018). Furthermore, one in three drilled boreholes fail to yield water (ibid.). A cycle of

FIGURE 5. SOMALIA AQUIFERS AND PRODUCTIVITY



Note: Figure adapted from source by the authors by overlaying urban areas and the transboundary aquifers on the base aquifer map (orange circles – derived from Agutu et al., 2019).

Source: Gadain et al., 2018; Agutu et al., 2019

recurrent drought, such as the 2016–2017 drought followed by another from 2021–2023, has likely accelerated groundwater depletion in sedimentary aquifers, such as the Baidoa limestone aquifer, that are recharged predominantly through rainwater infiltration. The over-exploitation of groundwater and failure of boreholes to deliver sufficient, reliable and quality water are risks to water security now and into the future.

Water security is also threatened by deforestation, land-use change and soil erosion, which create conditions for local desertification (Government of Somalia, 2018). Deforestation and land-use change are driven by several factors related to energy and livelihood insecurity, such as overgrazing, unregulated collection of wood for charcoal production and sales, and agriculture expansion into previously forested areas as people flee conflict. For example, in the south, rates of deforestation for charcoal production exceed forest growth (Government of Somalia, 2018; Ogallo et al., 2018), and livestock populations are estimated to exceed the carrying capacity of rangelands, particularly in areas affected by recurrent drought (MoPIED, 2020).

The Jubba and Shabelle rivers have two flood seasons in line with the Gu and Deyr rainy seasons (Houghton-Carr et al., 2011), and heavy rain events can trigger flash flooding along both rivers that inundate farmland, displace people and damage assets (see, for example, ReliefWeb, 2020). Vegetation within river catchments helps to slow the speed of flood waters, improve the resilience of river embankments, maintain streamflow and protect water quality. It can also impact the local recharge rates of various aquifers (Agutu et al., 2019). However, following de-vegetation and land-use change, river catchments often initially experience an increase in streamflow, followed by a long-term decline in flow, localised soil erosion and an increase in desertification and flood damages[6] (De La Paix et al., 2011; Trisos et al., 2022).

Climate change projections and subsequent climate change risks should be evaluated within the context of water scarcity and how it has shaped and been shaped by the country's socio-economic development pathways.

3.2 Climate change projections

3.2.1 Historical climate synopsis

Somalia has a hot climate all year round. The average daily maximum temperatures (TX) and minimum temperatures (TN) of the coastal areas are somewhat lower than interior temperatures, although they are still quite warm (SWALIM, 2007). In higher-elevation areas, such as Erigavo, Hargeisa and Burao, temperatures are somewhat cooler than in lower elevations, although average maximum temperatures still range from approximately 25°C to 31°C depending on the month (ibid.). Inland areas are quite warm, with average maximum temperatures ranging from 30°C to 40°C and average minimum temperatures seldom dropping below 20°C to 25°C except for higher elevations (ibid.). Mean annual temperatures have been warming. The country experienced an area-averaged rate of warming of ~0.17°C/decade between 1950 and 2020, with the rate of warming accelerating to ~0.21°C/decade between 1991 and 2020 (World Bank, 2023).

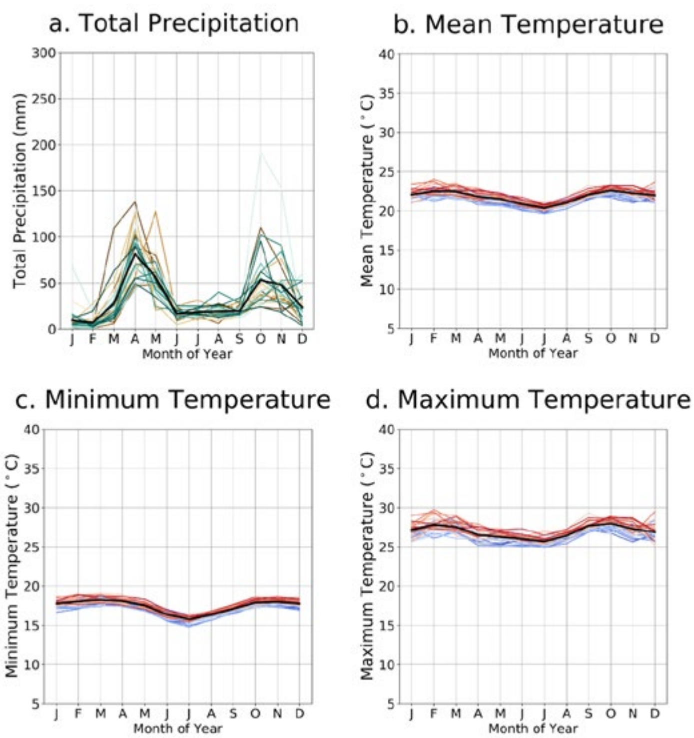
Precipitation is characterised by high variability in the onset, duration and total amounts in the Gu (from ~mid-March to June) and Deyr (from ~mid-September to December) seasons, both of which are part of the complex East African Monsoon System (Funk et al., 2016). Both rainy seasons are triggered by the north-south movement of the Intertropical Convergence Zone and the location of the Somali Jet. The year-to-year variability in seasonal precipitation, particularly in the Deyr rain season, is influenced by the El Niño Southern Oscillation (ENSO) pattern, the Indian Ocean Dipole Mode and the Pacific Decadal Oscillation (Funk et al., 2016; Endris et al., 2018). The warmer phase of ENSO (El Niño) tends to coincide with more intense rainfall and flooding, while rainfall deficits and droughts are often associated with the cooler phase of ENSO (La Niña).

6 The relationships between vegetation cover, land-use change and local hydrology and soil erosion along the Jubba and Shabelle rivers need to be investigated through hydrological studies. The impacts of deforestation and soil degradation on hydrological cycles are better studied in tropical forested areas but are less understood in the semi-arid and arid climates of Somalia.

The spatial distribution of rainfall throughout the country is also uneven and influenced by topography and proximity to the coast. The northern coastline and northeast receive the least annual precipitation (~100 mm) in contrast to Lower and Middle Juba and Middle Shabelle, which receive an average of ~700–800 mm/year (SWALIM, 2007). The interior northwest – parts of Awdal and Woqooyi Galbeed – receive between 400 and 600 mm annually. Annual totals otherwise generally decrease from south to north, with Puntland being quite dry (SWALIM, 2007; Ogallo and Jama, 2020). High day and night temperatures, coupled with low annual precipitation amounts, lead to high rates of evaporation throughout the country.

Climate studies researched for this report do not agree on the characteristics of the two rainy seasons, with some noting Gu rains starting in April and ending in July (as in Figure 6) and others noting Gu as starting approximately in March and ending in June, depending on the region of the country (Ogallo and Jana, 2020; SWALIM, 2007). Similarly, there is considerable year-to-year variability around the onset and withdrawal of the Deyr rains by location. Some of the discrepancies in how the rainy seasons are characterised in different studies might be related to which period over which historical observations were assessed, the underlying datasets and the interpolation methods[7] (1963–1990 for SWALIM (2007) analysis versus 1981–2010 for Ogallo and Jama (2020) and Richardson et al. (2022)). For these reasons, in this report we take the Gu season to span March–June and the Deyr season to span September–December when presenting climate change projections.

FIGURE 6. HISTORICAL HORN OF AFRICA AVERAGE SEASONAL TEMPERATURE AND PRECIPITATION: 1981–2010



Note: Historical observations (1981–2010) of (a) monthly precipitation, (b) average daily mean temperature, (c) minimum temperature and (d) maximum temperature. Each line represents the observation from an individual year. The black line is the average over the 30-year period. Adapted from source description.

Source: Richardson et al., 2022

7 The weather station network collapsed in 1990 with the onset of the civil war, and data collection only began again in 2004 from a limited set of weather stations established under SWALIM. While observations for a few locations in the country extend as far back as 1894, many of the pre-war stations have significant data gaps and/or the quality of the data is questionable; station density was also quite low (SWALIM, 2007). Due to the data gaps, Ogallo and Jama (2020) spatially interpolated rainfall data using SWALIM observations in combination with satellite rainfall data from the Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) data. Richardson et al. (2022) use the European Centre for Medium-Range Weather Forecasts Reanalysis v5 (ERA5) temperature data and the WATCH Forcing Data applied to ERA5 (WFDE5) precipitation data.

3.2.2 Synopsis of short- (2021–2040) and medium-term (2041–2060) climate projections

Climate change projections – for the climate variables of minimum and maximum temperatures and precipitation – for Somalia are derived from the Coordinated Regional Downscaling Experiment (CORDEX) Africa experiment. The CORDEX Africa experiment consists of multiple climate models using different Representative Concentration Pathways (RCPs); the RCPs broadly correspond with different emission pathways that could result in various degrees of mean global warming. We present the multi-model *median* projection value for each of the climate variables for two time periods: the short term (2021–2040) and the medium term (2041–2060). The projections are presented as the absolute change in temperature and percentage changes for precipitation, as calculated against the historical climate reference period of 1986–2005. The projections are augmented by climate projection studies for East Africa and the Horn of Africa. For a more complete description of the methodology, refer to Box 1.

Temperature. Increases in maximum and minimum temperatures are apparent in all seasons over the short and medium terms under both RCP4.5 and RCP8. The magnitude of warming at night (TN) is greater than that of daytime (TX) warming (see also Table 3, Figure 7 and Figures A1–A4 in the Annex). Hotter temperatures in all seasons, particularly the Gu and Deyr rainy seasons, will further increase rates of evaporation and aridity for the country.

The number of extreme heat days in which maximum daytime temperatures exceed 40ºC is likely to increase for Gedo, Awdal, Bari and parts of Lower and Middle Juba regions under RCP4.5 and RCP8.5 for the short term. Each year, by the 2030s, these places could experience between 4 and 30 days of temperatures exceeding this threshold, predominantly during February–April (World Bank, 2023; Gutiérrez et al., 2021). By the medium term, Hiraan, Bay, Bakool and parts of Galgaduud regions are also likely to be affected, and impacted areas could experience more than 40 days of extreme heat per year (ibid.).

TABLE 3. PROJECTED CHANGES IN MULTI-MODEL MEDIAN TX AND TN TEMPERATURES IN DIFFERENT SEASONS OVER THE SHORT (2021–2040) AND MEDIUM (2041–2060) TERMS

Season	Maximum temperatures (TX)		Minimum temperatures (TN)	
	RCP4.5	**RCP8.5**	**RCP4.5**	**RCP8.5**
January–February	**Short:** most of the country could experience TX increases of between 0.9°C and 1.0°C. The northwest (Awdal to Sool) could experience greater warming, while coastal areas in the south (Lower and Middle Juba, and Lower Shabelle) could experience slightly less. **Medium:** all of the country could experience TX of 1.5°–1.7°C greater.	**Short:** most of the country experiences 1.0°–1.3°C warming. Areas in the northwest could experience up to 1.4°C warming. **Medium:** increases in TX for the country range from 1.8°C to 2.2°C. The southern coastal regions, encompassing Mogadishu and Kismaayo, could warm less at 1.5°–1.8°C.	**Short:** southwest (interior) regions of Gedo and Bakool, and western parts of neighbouring regions experience TN warming of 1.1°–1.3°C. Most of the remaining regions experience 0.9°–1.0°C warming, with the northeast region (mainly Bari) experiencing lesser warming of up to 0.8°C. **Medium:** TN for most of the country could warm to 1.7°C. The southwest shows more pronounced warming of 1.7°–2.0°C.	**Short:** the whole coastline from south to north could experience TN warming of 1.0°–1.1°C. Most of the remaining regions, could experience warming of 1.1°–1.3°C, except the southwest and parts of the north bordering Ethiopia, which could experience 1.3°–1.4°C warming. **Medium:** TX could exceed 1.8°C to 2.0°C for coastal areas along a north-south gradient. The interior regions are projected to warm more, from 2.0°C to 2.5°C.

Season	Maximum temperatures (TX)		Minimum temperatures (TN)	
	RCP4.5	**RCP8.5**	**RCP4.5**	**RCP8.5**
March–June	**Short:** TX warming is most pronounced along the western spine (e.g. Gedo region up to Nugal region) and in the north at 0.9°–1.0°C. **Medium:** TX warming ranges from 1.5°C to 1.7°C for most of the country, except for the far northwest.	**Short:** TX warming occurs along the western spine, extending through the middle of the country (on a north–south axis) at 1.0°–1.1°C. The northwest regions (Awdal to Sool) could warm from 1.1°C to 1.4°C. **Medium:** Southern coastal stretches could warm between 1.7°C and 1.8°C. For the remaining regions, TX could warm between 1.8°C and 2.0°C, except for the northwest (2.0°–2.3°C).	**Short:** TN in the north could warm between 1.1°C and 1.3°C; from Bari running along the western spine of the country down through Lower Juba, TN could warm between 1.0°C and 1.1°C. For the remaining regions, TN could warm between 0.9°C and 1.0°C. **Medium:** TN in most of the south warms from 1.5°C to 1.7°C; Mudug and northwards could experience TN warming of 1.7°–2.0°C.	**Short:** TN warming of 1.1°–1.3°C occurs for most of the country. The western interior and the northern regions could experience TN warming of 1.3°–1.5°C. **Medium:** much of the country experiences nights that are 2.0°–2.2°C warmer; the western interior and north could experience nights that are 2.2°–2.5°C warmer.
July–August	**Short:** the majority of the country could experience TX increases of up to 0.9°C. In the northwest, TX increases of up to 1.1°C could be expected. **Medium:** TX increases for the country could be around 1.5°C.	**Short:** most of the country could see TX increases of 0.9°–1.1°C, with northern coastal areas and parts of Gedo and Lower Juba regions bordering Kenya experiencing increases of up to 1.3°C. **Medium:** most of the country could experience daytime warming of 1.5°–1.7°C, with the western spine and northwest experiencing increases ranging from 1.7°C to 2.0°C.	**Short:** TN could be between 0.9°C and 1.0°C warmer for most of the country, except for the north, where temps could be 1.0°–1.3°C warmer. **Medium:** nights in most of the country could be 1.5°–1.7°C warmer.	**Short:** TN could warm between 1.1°C and 1.3°C for most of the country, except for coastal areas from roughly Mudug southwards through Lower Juba, which could warm between 1.0°C and 1.1°C. **Medium:** most of the country could have nights 1.8°–2.0°C warmer, except for the northwest, where nights could warm from 2.0°C to 2.2°C.
September–December	**Short:** southern and south-central regions could experience warming of 0.7°–0.8°C; western regions through to the north could see warming of up to 1.0°C. **Medium:** TX increases for the whole country range from 1.5°C to 1.7°C.	**Short:** TX increases of up to 0.9°C could be experienced in the west extending through to Mudug . In the north, increases between 1.0°C and 1.3°C could be experienced. The southern coastal regions could warm between 0.8°C and 0.9°C. **Medium:** TX increases for the south and central regions (up to Mudug) range from 1.5°C to 1.7°C; the northern reaches of Mudug extending north could experience increases of 1.7°–2.2°C.	**Short:** night warming of 1.0°–1.3°C could occur mostly in a strip along the western border areas with Ethiopia and the northern regions; for the rest of the country, TN could warm between 0.9°C and 1.0°C. **Medium:** nights could warm from 1.5°C to 1.7°C for most of the country, with the northern regions seeing 1.7°–2.0°C warming.	**Short:** interior regions bordering Ethiopia are likely to see warmer nights of 1.1°–1.3°C, while the northern regions of Awdal to Sool could see nights warming by 1.3°–1.4°C. **Medium:** the southern half of the country (from Galguduud southwards) could have nights of 1.8°–2.0°C warmer; Mudug up through the northern regions could experience nights of 2.0°–2.5°C warmer.

BOX 1 SHORT DISCUSSION OF CLIMATE PROJECTION METHODOLOGY

In this report, we utilise climate projections from the Coordinated Regional Downscaling Experiment (CORDEX) Africa experiment. CORDEX is a World Climate Research Programme regional climate modelling initiative. It is also one of the sets of climate modelling experiments contributing to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6). Other modelling experiments contributing to the Assessment include the Coupled Model Inter-Comparison Project 5 (CMIP5, Taylor et al., 2012) and the CMIP6 (Erying et al., 2016). The CORDEX Africa experiment is a collection (ensemble) of climate models (Giorgi and Gutowski, 2015) of which 21 models were run using RCP4.5 and 31 models were run using RCP8.5.

We selected CORDEX Africa projections using RCP4.5 and RCP8.5 but not RCP2.6. RCP4.5 is approximately equivalent to mean global warming of 2°–3°C by 2100 and aligns with current unconditional Nationally Determined Contributions (UNEP, 2021). RCP4.5 is roughly equivalent to the Shared Socioeconomic Pathway (SSP) 2-4.5 used in the CMIP6 models. RCP8.5 represents a world in which greenhouse gas emissions continue to rise, and land-use change from forests to more cropland increases through 2100 (van Vuuren et al., 2011); it corresponds with SSP5-8.5 of CMIP6 and represents a tripling of emissions. RCP2.6 corresponds to keeping the world to roughly 1.5°C of mean warming by 2100, but current international mitigation action is still quite slow, and we are pessimistic about achieving the Paris goals, which is why we chose not to use the RCP2.6 model.

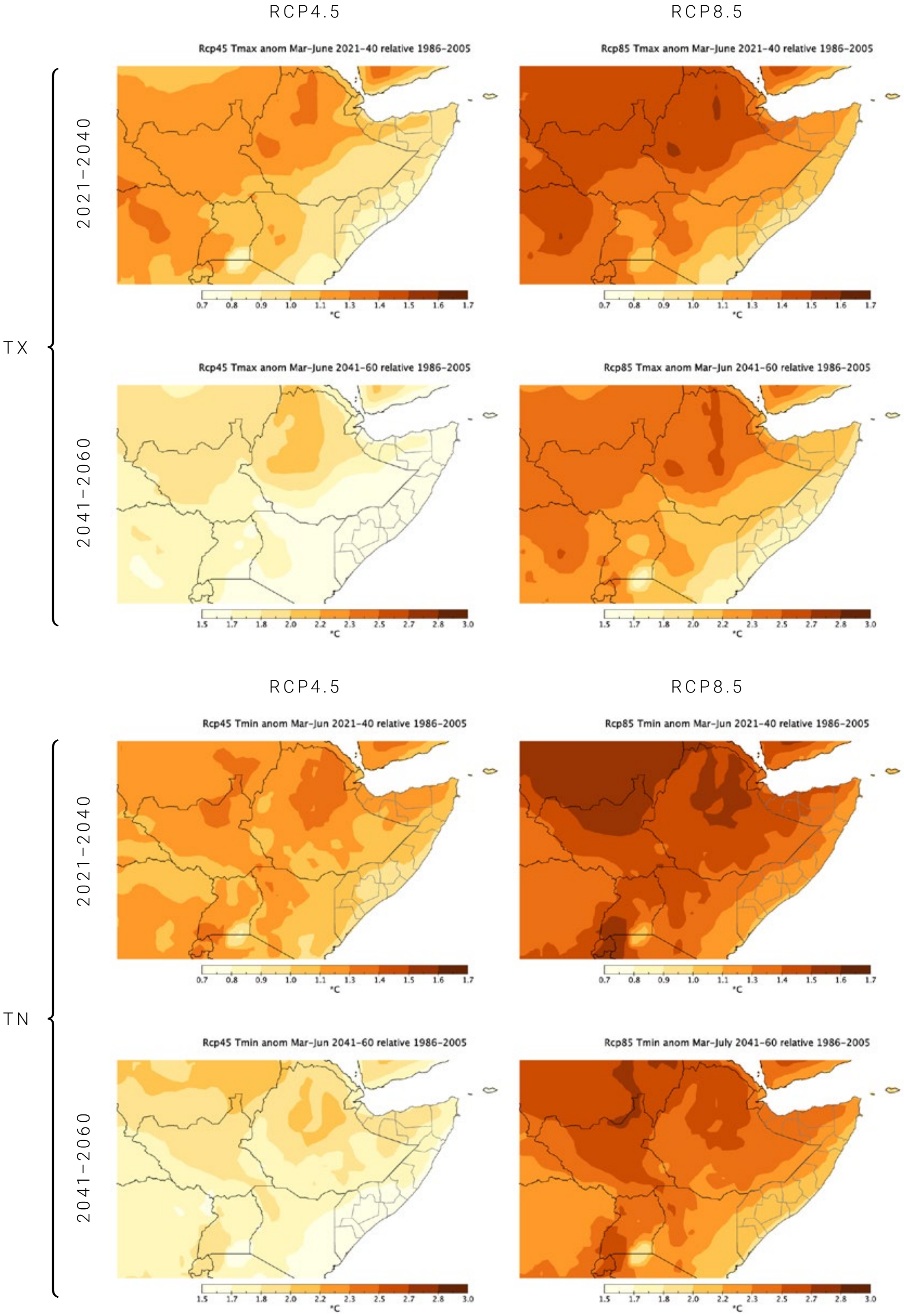
Regional climate models (RCMs) provide higher-resolution climate projections and may better capture regional-scale climate processes than the CMIP5 or CMIP6 general circulation models (GCMs). RCMs are coupled with GCMs to produce higher-resolution projections. The CORDEX Africa multi-model experiment produces climate projections at a resolution of approximately 56 km at the equator, compared to the 100–300 km resolution of GCMs. Because of the higher model resolution, we present the CORDEX Africa median ensemble projection for minimum (TN) and maximum (TX) temperatures and seasonal precipitation totals. The projection data files were downloaded from the IPCC AR6 Working Group 1 Interactive Atlas (Gutiérrez et al., 2021) and analysed for this report.

However, caution must be taken when interpreting the projection results. There is still a fair amount of error (overestimation or underestimation) in CMIP5 and CMIP6 GCMs when replicating historical precipitation statistics, like seasonal mean totals, rainfall extremes or number of rainy days in a season, over many parts of Africa, although there are improvements in the most recent set (CMIP6) (Gutiérrez et al., 2021; Dosio et al., 2021). RCMs from CORDEX tend to overestimate maximum daily precipitation rates (a measurement of extreme precipitation) over southern Africa, East Africa and western Sahel, but they are better at replicating seasonal means (Dosio et al., 2021). Caution must also be taken when evaluating model biases over many parts of Africa due to the low density of weather stations. In Somalia, there are gaps in observations from 1990 to 2006 following the collapse of hydrometeorological monitoring during the war until the Ministry of Agriculture and partners established the Somali Water and Land Information Management monitoring network.

It is important to note that although climate change projections are indicative of what might happen in the future (given different emissions, land use and socio-economic development pathways), they are only scenarios of what might happen. No single model simulation can give a broader picture of how the climate might respond; this is why ranges from an ensemble of models are used.

The Annex of this report depicts projected maximum and minimum temperature increases, and percent changes in seasonal precipitation totals, from the multi-model ensemble median CORDEX Africa projections for RCP4.5 and RCP8.5. The figures cover the Horn of Africa so that changes in the southeastern Ethiopian Highlands can also be assessed, as these have implications for water availability and flooding along the Jubba and Shabelle rivers.

FIGURE 7. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF MAXIMUM DAYTIME (TX) AND MINIMUM NIGHT-TIME (TN) TEMPERATURE INCREASES FOR THE GU SEASON (MARCH–JUNE) IN THE SHORT AND MEDIUM TERMS



Note: The projected changes are relative to the seasonal average maximum and minimum temperatures over the period 1986–2005. The scale of projected temperature changes over the short term ranges from 0.7°C to 1.7°C, and 1.5°C to 3.0°C over the medium term

Source: authors' analysis of the Coordinated Regional Downscaling Experiment (CORDEX) Africa projections, derived from AR6 Working Group I (WGI) Interactive Atlas

Precipitation. There is quite a bit of disagreement amongst the CORDEX Africa climate models and other climate models included in the IPCC Sixth Assessment Report (AR6) over whether precipitation will increase or decrease on an annual or seasonal basis for Somalia (and the Horn of Africa) over both the short and medium terms (Table 4, Figures A5 and A6, Table A3. See also Box 3). The CORDEX Africa multi-model median projections indicate that changes in the Gu and Deyr seasonal rains are likely to be minimal over the short term (2021–2040) and that there might be small increases over the medium term (2041–2060) when compared to 1986–2005 observations.

TABLE 4. CORDEX AFRICA MEDIAN PROJECTIONS FOR PERCENT CHANGE IN PRECIPITATION OVER VARIOUS REGIONS OF SOMALIA AND THE AREA-AVERAGED, MULTI-MODEL PROJECTION RANGE FOR THE NORTH EAST AFRICA REGION

Season	Term	Median projection across Somalia (% change)	North East Africa* 10th and 90th projection range (% change)
Gu			
	2021–2040	RCP4.5: 0 to 15% RCP8.5: 0 to 15%	RCP4.5: -8.1 to 6.8%, median -1.2% RCP8.5: -15.2 to 6.8%, median -2.7%
	2041–2060	RCP4.5: 0 to 10% RCP8.5: 0 to 10%	RCP4.5: -13.5 to 3.7%, median -3.7% RCP8.5: -18.6 to 7.2%, median -5.3%
Deyr			
	2021–2040	RCP4.5: 5 to 15% RCP8.5: 0 to 15%	RCP4.5: -3.0 to 11.3%, median 4.9 % RCP8.5: -0.1 to 11.7%, median 4.7%
	2041–2060	RCP4.5: 5 to 20% RCP8.5: 10 to 25%	RCP4.5: -3.7 to 14.6%, median 7.0% RCP8.5: -0.6 to 21.5%, median 9.4%

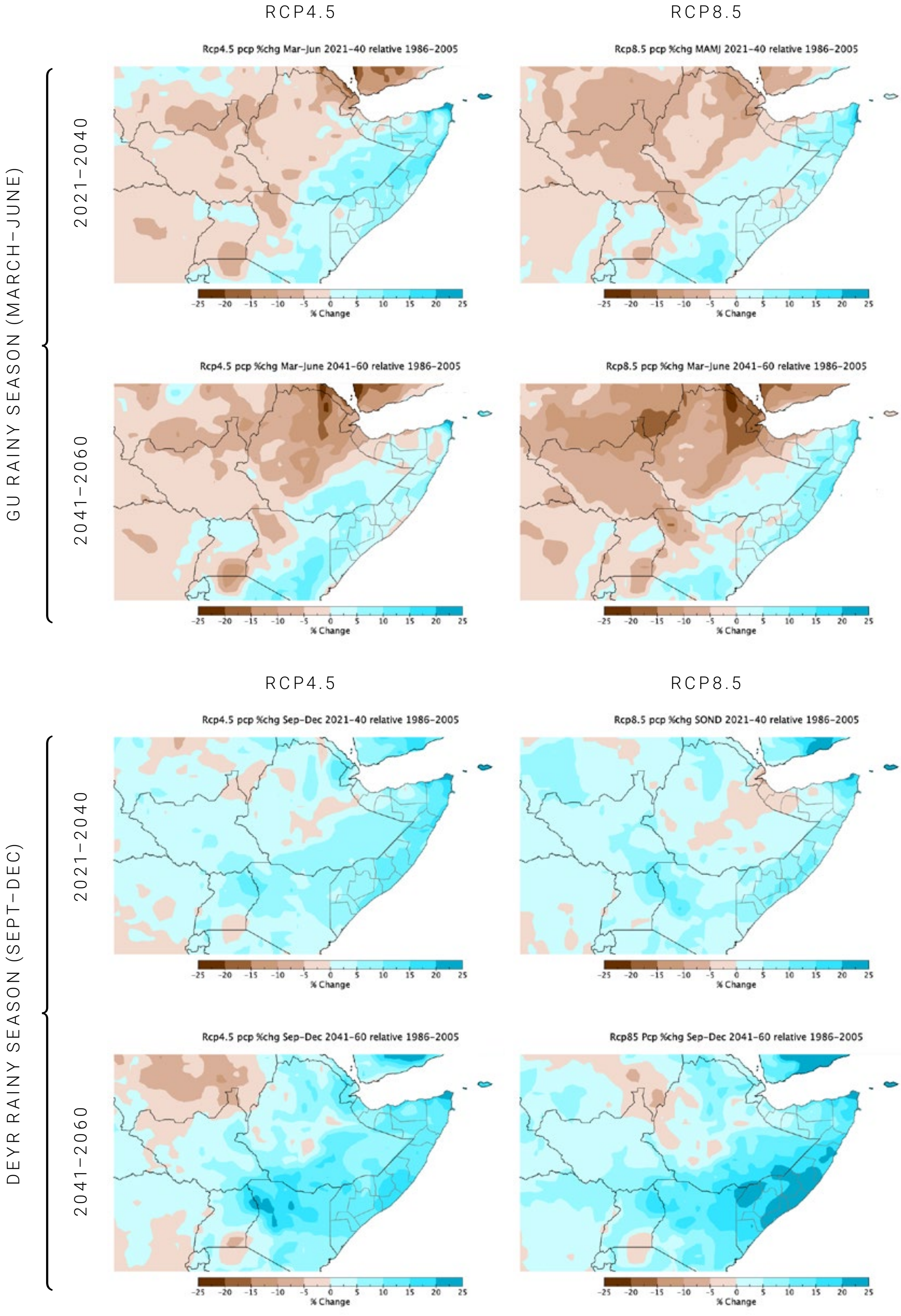
Note: * denotes the 10th and 90th percentile model projection spread is for the area-averaged change over the entire North East Africa modelling region. In the IPCC 6th Assessment, results are presented on the basis of region. Somalia is part of the North East Africa modelling region. Therefore, the subnational percent changes in precipitation for various parts of Somalia will be different from the whole of the North East Africa region's area-averaged values.

Source: authors' analysis of CORDEX Africa projections from IPCC AR6 WGI Interactive Atlas

Looking at the median multi-model projections separately in Table 4 or Figures 8, A5 and A6 could present a potentially misleading picture that seasonal precipitation is likely to remain either unchanged or slightly increase for various parts of Somalia over the short and medium terms. There is model disagreement about the sign of change, with slightly less than half of the CORDEX Africa's 21 models from RCP4.5 and the 31 models from RCP8.5 projecting decreases in precipitation over the short term (see Table A3 in Annex). Some caution is also warranted when interpreting short-term projections, as all ensemble medians from the different climate modelling experiments underestimate the historical April (Gu) precipitation peak and overestimate the October (Deyr) peak, although it is not certain that this bias carries forward into future projections (Dosio et al., 2021).

While there is model disagreement over the short-, medium- and long-term (2070–2099), global climate modelling experiments (CMIP5, CMIP6) and the regional climate modelling experiments (CORDEX Africa and another set called CORDEX-CORE) are largely in agreement about possible increases in annual mean precipitation over much the Horn of Africa over the long term (Dosio et al., 2019; 2021). This annual increase is largely due to potential increases in Deyr rain totals, and there is strong model agreement towards this trend under the scenarios of SSP5-8.5 and, to a lesser extent, SSP2-4.5 (Richardson et al., 2022; Dosio et al., 2019; 2021).

FIGURE 8. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF PERCENT CHANGE IN GU AND DEYR SEASONAL PRECIPITATION TOTALS OVER THE SHORT AND MEDIUM TERMS



Notes: The projected changes are relative to the seasonal observations over the period 1986–2005. The percent change range is -25% to 25% in all figures

Source: authors' analysis of CORDEX Africa projections, derived from AR6 WGI Interactive Atlas

The Jilaal dry season (roughly December–February, depending on the part of the country) is projected to experience an increase in seasonal precipitation totals (ibid.). This could indicate that the Gu rains might begin earlier (as seen in the potential increases over the January–February season by the medium term (Richardson et al., 2022) or that precipitation could increase over these two months in the lead up to Gu. There is high model uncertainty over potential changes in totals for the Gu season over the short to long terms (Dosio et al., 2021), but many models are projecting that it could start and end earlier (Richardson et al., 2022).

By the medium and late terms, however, more models show that the Deyr rains could start and end later, with an overall increase in the season's precipitation totals (ibid.). There is still model disagreement about projected changes in seasonal precipitation totals over the southeastern Ethiopian Highlands – the origins of the Jubba and Shabelle rivers – although regional climate models are in more agreement about potential decreasing precipitation (Dosio et al., 2019; 2021). This will have implications for transboundary water management in both catchments for Ethiopia, Kenya and Somalia, which share the rivers.

While there are still model uncertainties over seasonal precipitation totals, there is good agreement that variability in precipitation is likely to increase over the short and medium terms (Richardson et al., 2022; Dosio et al., 2019; 2021). Heavy rainfall events, which contribute to flooding and soil erosion, among other impacts, are likely to increase in intensity and frequency, as is the frequency of drought. Somalia will have to contend with both drier years and more frequent, severe storms.

3.3 Climate change risks

Climate change risks result not only from changes in temperature, precipitation, sea level rise or other climate variables or hazards but also from the interaction of these with human socio-economic development and land-use trajectories, population dynamics and other human-mediated environmental degradation and change (Figures 1 and 2). These human systems embed vulnerability, fragility and exposure to hazards, such that when hazards occur, various negative impacts (disasters) can result. As noted in the United Nations Office of Disaster Risk Reduction *Global Assessment Report on Disaster Risk Reduction 2015*, 'Exposure and vulnerability, as well as hazard itself (through climate change and environmental degradation) are socially constructed through underlying risk drivers, including globalised economic development, poverty and inequality, badly planned and managed urban development, environmental degradation and climate change' (UNDRR, 2015: 33).

But the climate risks presented in this report can be reduced, and some completely avoided. Embedding adaptation and disaster risk reduction within socio-economic development and land-use planning can reduce vulnerabilities and exposure. Implementing mitigation, green energy transition and sustainable use of natural resources within development can reduce the severity and extent of climate change. Therefore, either adaptation or mitigation will reduce climate change risks, although not everyone will benefit equally from such risk reduction. Better still would be climate change risk reduction by integrating combined adaptation and mitigation efforts within socio-economic development in just, equitable and conflict-sensitive ways.

For these reasons, in this report, climate risks and climate resilience/adaptation options prioritised by various government ministries, humanitarian and development actors are assessed through the lens of their implications to a select set of socio-economic and water security objectives drawn from government policies. Assessing climate risks and implementing interventions with the mindset that the country's future livelihoods, economy (mainly livestock and agriculture) and governance systems will stay similar to the current situation fails to acknowledge the dynamism of Somalia's diaspora and private sectors, as well as the peacebuilding efforts of the government. While many of the Sustainable Development Goals may not be met by 2030, Somalia is committed to improving living standards, livelihoods, its economy, and its environmental and climate risk management. Therefore, climate risk assessments and any interventions that can impact how the country develops over the short to long term need to consider this vision, not stay with the status quo.

3.3.1 Short-term risks: 2021–2040

Short-term climate change risks are those that could arise due to projected shifts in mean and extreme temperatures and precipitation (among other climate variables) interacting with socio-economic development trajectories, population mobility and interventions, such as those outlined in various national and subnational policies from Chapter 1. Here, we focus on a limited set of potential risks to five NDP9 priority sectors: (1) water, (2) energy, (3) urbanisation, (4) agriculture and (5) livestock.

Water sector risks. Water risks for Somalia over the short to long term will be heavily mediated by changes in demand related to urbanisation and economic diversification; land-use planning and change; conservation plans and measures; and the planning, construction and maintenance of infrastructure for irrigation, livestock watering points and urban use, both within Somalia and along shared basins with Ethiopia and Kenya. The lack of transboundary water management plans for transboundary aquifers (Merti aquifer shared with Kenya and the Dawa, Jubba and Shabelle aquifers shared with Ethiopia) and Jubba and Shabelle rivers (developed and implemented in coordination with Ethiopia and Kenya) present significant risks. The inappropriate drilling of boreholes and pumps without consideration of aquifer recharge rates or water quality (Government of Somalia, 2018) presents challenges for water management. Lack of groundwater management and control over borewell placement is a critical risk factor to Somalia's water security that spans from the present through to the long term (2080s).

Climate-driven shifts in temperature and precipitation means and extremes will compound changes in water demand and use. Over the short term (2021–2040), multi-model projections of changes in precipitation during the Gu and Deyr rainy seasons are uncertain. Variability in precipitation will also remain quite high, with the potential for multiple consecutive deficient rainy seasons, like the current drought spanning 2021–2023. Despite uncertainty in short-term precipitation, the increases in TX and TN will lead to higher evaporation and reduced aquifer recharge in some groundwater systems. This projected situation means that the placement of boreholes or other water infrastructure that are expected to serve local populations for a couple of decades must be carefully considered and monitored for overdraft.

Energy sector risks. There is currently a high dependency on charcoal for cooking in rural and urban areas, and it is a significant source of income for rural households. However, charcoal production is also leading to high deforestation rates (with consequent soil erosion, increased rates of soil drying, higher local temperatures, increased surface water runoff, reduced infiltration into aquifers and increased flooding). The country's Initial Communication to the United Nations Framework Convention on Climate Change (UNFCCC) prioritises increasing the number of improved charcoal stoves from 2% in 2000 to 30% by 2040 (Government of

Somalia, 2018). However, continuing charcoal consumption can exacerbate deforestation, desertification and their associated risks and does not improve climate resilience in household- to urban-level socio-economic development and energy security (Ogallo, 2018). A better option would be to focus on solar cookers, distributed and utility-scale solar photovoltaic generation, high-efficiency biogas production, and landfill gas extraction at community scales using biogas or liquefied petroleum gas cookers.

Reliable access to electricity remains low (~33% of urban and 4% of rural areas as of 2018), related to the lack of a national grid (MoPIED, 2020). The generating capacity of private providers is insufficient to meet current loads, let alone meet the future demand growth from socio-economic development. Urban households with connectivity often rely on private providers using diesel-based generators for mini grids, sometimes in connection with grid-tied solar photovoltaics. However, generation costs are high due to diesel fuel costs, and it is not easy to integrate the grids of various operators (ibid.). The NDP9 highlights the potential to develop solar and wind generation in the northern and coastal regions, and there are proposed projects in the Intergovernmental Authority on Development Regional Infrastructure (IGAD) *Master Plan for regional interconnection with Ethiopia, Kenya and Djibouti* (IGAD, 2021).

Planning, construction and maintenance of energy infrastructure – transmission lines, grid expansion and linkage (particularly to meet urban growth), and installation of both distributed and utility-scale solar (and wind) – will have to be cognisant of significant increases in energy demand (if economic diversification visions are fulfilled) and of higher temperatures and greater precipitation extremes. This is because various types of solar and wind generation and transmission infrastructure have different temperature thresholds at which efficiencies decrease (Opitz-Stapleton et al., 2022); losses can be reduced by positioning solar and wind energy-generating equipment adjacent to areas of high demand. The expected lifetime of utility-scale solar and wind parks ranges from 25 to 40 years and requires significant investment; infrastructure exposure to climate hazards could trigger cascading impacts throughout energy networks and need to be factored into infrastructure planning and construction (ibid.).

Urbanisation risks. Urban expansion through 2030 could be significant due to influxes of IDPs fleeing drought and conflict areas to stay in towns and cities. Slum growth and conversion of land for housing and other urban amenities is occurring without land-use planning, building codes or oversight; the development is largely organic and unable to keep pace with the rapid inflow of migrants. Approximately 2.6 million displaced people live in IDP camps clustered on the borders of major cities. This situation challenges the ability of city governments and urban dwellers to provide adequate housing, sanitation, water supply, electricity and other services. In 2018 around 55% of the urban population had access to improved housing and basic services. This percentage is likely to have dropped recently due to the latest influx of IDPs fleeing drought areas.

How cities develop – their layouts and footprints; preservation of open space for flood control and reduction of heat; construction of electricity, water, sanitation, sewage, buildings and roads – lock in certain climate risks in the short, medium and long terms (Moench et al., 2011). And, once built, infrastructure is costly to retrofit or relocate out of harm's way. Furthermore, those living in substandard housing are particularly vulnerable to heatwaves, whose localised effects are magnified by urban heat islands, such as shanty structures that lack cooling and ventilation (Jay et al., 2021; Moench et al., 2015). Such housing is also more likely to be damaged or destroyed in extreme rainfall events (ibid.). Those areas without adequate sewage or solid waste management may find contaminants entering households or other buildings that have not been raised above street flooding levels, with subsequent health risks for water- and vector-borne diseases. Thus, land-use planning and the establishment and enforcement of building codes, and how urban services are planned and provided, will play a strong role in locking in future climate risks. Risk management in the 2050s (2041–2060) or longer term begins with how Somalia's towns and cities develop over the next 5–10 years.

Agricultural risks. Maize, sorghum, cowpea and sesame are the dominant crops grown throughout the states of Jubaland, South West and Hirshabelle. Maize crops dominate production during both Gu and Deyr rainy seasons in most crop-producing regions (the irrigated areas of Gedo, Lower and Middle Juba, Lower and Middle Shabelle regions; Gavin et al., 2018), except for Hiraan, Galguduud, Bay and Bakool regions, where sorghum and sesame are more prevalent (FSNAU, not dated). Maize yields in Somalia could decline by between 20% and 50% due to hotter temperatures (Richardson et al., 2022), which presents challenges for farmers and crop production objectives articulated in the NDP9. Sorghum is more resilient to warmer temperatures and extended dry periods than maize crops; however, locust plague outbreaks are also likely to increase in frequency, given their linkages to heavy rainfall and the possibility of an increase in the intensity of rainfall events (Richardson et al., 2022; Salih et al., 2020).

Water availability will play a vital role in agricultural productivity. Increasing domestic water demand, upstream abstractions in Ethiopia and Kenya, and shifts in temperature, rainfall and humidity are risk factors to water availability over the short and medium terms. The NDP9 prioritises rehabilitating pre-war irrigation and flood control infrastructure. This action might not be desirable given the potential increase in heavy rainfall events and drought. Therefore, irrigation and flood control infrastructure need to be constructed to reduce evaporative losses (which will increase due to higher day and night temperatures, and heatwaves) and the potential for higher flood levels caused by land-use change and more intense rainfall events. Agricultural irrigation and flood control infrastructure may have a lifetime of several decades and, thus, needs to be designed with potential changes in temperature and precipitation through to the 2060s in mind.

Livestock risks. Sheep, goats and camels are the dominant livestock in Somalia, with populations primarily located in the North Western, North Eastern and Central Zones; cattle production is highest in the Southern Zone and Juba Valley (SOMNIVEST, 2023).

Heat stress in livestock presents a significant climate risk to Somalia's livestock sector over the short to long term. The number of days exceeding 40°C could range from 60 to over 100 days/year (RCP8.5) for the short term for parts of northern Somalia; in parts of Gedo through to Middle Shabelle, it could range from 10°C to 30°C (Gutiérrez et al., 2021). Dairy and meat cattle, sheep, goats, camels and chickens each have different heat stress tolerances. Extreme heat events and overall warmer days and nights, and/or precipitation variability, during key calving, kidding and lambing periods can lead to higher mortality among livestock young and birthing livestock, as well as decreases in milk production (Richardson et al., 2022; Girmay et al., 2018; Rahimi et al., 2021). Heat stress risks can further generate cascading gendered nutrition and economic risks amongst pastoralists and agro-pastoralists, as women often supplement children's nutrition with milk products and augment their incomes from the sale of milk products.

There is also the potential for a reduction in dryland forage yields due to the potential increase in extreme precipitation events, more dry spells and shifts in the onset and duration of the Gu and Deyr rainy seasons, and higher temperatures in all seasons. Rangelands are already degraded due to overstocking and grazing, charcoal production and recent multiple recurrent droughts. Rainfall variability will likely continue to be high over the short term, and evapotranspiration will increase due to hotter temperatures in all seasons. These climate shifts, coupled with current unsustainable use patterns, can potentially exacerbate local desertification and degradation.

There are plans to establish more watering points along livestock migration routes, but this can create maladaptation for pastoralists if it encourages settlement in areas with unreliable and/or contaminated groundwater supplies. Drilling borewells without understanding and monitoring groundwater tables could exacerbate depletions and create a situation in which a watering point seems 'resilient' over the short term but could cause dependencies and localised desertification by the medium term (2041–2060).

3.3.2 Medium-term risks: 2041–2060

Mapping out potential medium-term climate risks is contingent upon extrapolating what Somalia could look like in 2041–2060. There are currently no federal or state government socio-economic policies or objectives extending that far into the future. Furthermore, there is more dynamism in sectors like agriculture and livestock production than in static infrastructure. Extrapolating climate risks to fixed energy, water and sanitation, and urban infrastructure is clearer, as these infrastructures are not so rapidly built and unbuilt. Therefore, we base explorations of future climate risk on two assumptions: (1) short-term objectives outlined in policy will be achieved, and (2) current trends will likely continue. The two assumptions imply that the country may become locked into a particular development pathway, which will influence options for incorporating green energy transitions, climate change adaptation and disaster risk mitigation into future policy planning and interventions.

Water sector risks. Higher temperatures and increasing frequency, duration and intensity of extreme heat events, coupled with more and longer periods of consecutive dry days over the medium term, could further impact some aquifers' recharge and yields, and the concentration of minerals and pollutants in water supplies. However, the extent of climate change impacts on groundwater supplies will depend on individual aquifer characteristics, local land-use change, and water demands set in motion by organic and planned development interventions in subnational to national policies. Plans to improve water security by drilling deep boreholes may prove maladaptive in some locations, particularly if watering points for livestock or towns are established in aquifers more susceptible to higher evaporation and variable rainfall. In coastal areas, aquifers are showing signs of saltwater intrusion, although dedicated monitoring and studies are lacking (Idowu and Lasisi, 2020). However, sea level rise in the Indian Ocean and the potential for stronger storm surges could further increase the risk of saltwater intrusion and fouling of coastal aquifers (Richardson et al., 2022).

Estimating the combined impacts of shifts in precipitation and temperature with potential water demand scenarios for the 2050s on streamflow in the Jubba and Shabelle rivers is difficult due to limited historical streamflow data across the entire catchments and lack of water-demand monitoring. Planned abstractions and reservoir construction in Ethiopia will affect downstream flows in Somalia (Mohamed, 2013; Michalscheck et al., 2016); if intensive abstractions occur in Ethiopia, it is possible that the Shabelle River will only flow in Somalia during the Gu and Deyr seasons (Michalscheck et al., 2016). Domestic water demand will grow, particularly in urban areas; Michalscheck et al. (2016) estimate that domestic demands in southern Somalia could grow from approximately 51.2 hm^3 in 2005 to 235.7 hm^3 in 2055 if urbanisation rates reach 60%. Changes in cropping patterns, planned rehabilitation of pre-war irrigation infrastructure and any expansion of crop areas will also increase water demand. Without considering the impacts of climate change on the rainy seasons, Michalscheck et al. (2016) estimated that, depending on demand increase scenarios and the season, the Shabelle River might not be able to support demand by the 2050s.

Energy sector risks. Large-scale hydropower along the Jubba River should not be considered on the basis of climate risk, as the basin is highly exposed to increasing evaporative losses, hotter temperatures, and more fluctuations in streamflow over the medium and long terms. Large-scale hydropower infrastructure has an expected lifetime of around 80 years (Opitz-Stapleton et al., 2022). Therefore, hydropower construction along the Jubba could expose Somalia to greater national debt and the risk of stranded assets, as well as lost generation capacity due to more variable streamflow when demand is likely to increase due to urbanisation and economic diversification.

The NDP9 mentions a desire to increase renewable energy generation, specifically using wind parks and solar photovoltaics. Somalia has significant solar potential, particularly in the northern regions (see, for example the Global Solar Atlas)[8] and wind potential in the coastal areas and near-shore zones (see the Global Wind Atlas)[9]. The expected lifetimes of utility/small-scale solar and wind installations are 25–40 years and approximately 20 years, respectively (NREL, 2022). Renewable energy infrastructure built around 2030 will need to be designed with potential climate change shifts in temperature and precipitation extremes through the 2060s in mind. Elevated temperatures, sand scouring due to soil erosion and lack of water present challenges (not insurmountable) to wind and solar generation, as well as to transmission lines (Opitz-Stapleton et al., 2022). Envisioned high-voltage interconnection transmission lines connecting Ethiopia, Djibouti, Somalia and Kenya must be built to accommodate sagging, reduce transmission capacity and increase demand associated with the more intense and frequent heatwaves predicted by the medium term. The ability to rebalance loads across the countries will be critical to avoiding regional blackouts, should such regional grids be constructed, as mentioned in the IGAD Regional Infrastructure Master Plan.

Urbanisation risks. Many of the climate change risks to Somalia's towns and cities in the medium term will have been locked in by economic development, land-use planning, population growth and infrastructure construction dynamics over the short term (2021–2040). Urban heat island effects will magnify the impacts of heatwaves, particularly for urban areas in the north and the interior southern and southern-central coast regions. By the medium term, the number of days per year exceeding 40°C could range from 40 to 100+ days, depending on the region. Home and office building designs, and building codes, need to account for protecting occupants from heat while reducing urban heat island effects and promoting energy efficiency.

Paved roads, improved transportation networks, and desired water and sewage infrastructure must be designed to handle more intense (and potentially frequent) rainfall events during the rainy seasons. Urban flash floods and waterlogging will damage infrastructure, disrupt

8 https://globalsolaratlas.info/
9 https://globalwindatlas.info/en

transportation and economic activities, and exacerbate health risks for urban residents. Green spaces – such as urban gardens, communal grazing spaces or parks – need to be preserved and incorporated into cities to provide areas for rainwater infiltration and reduce urban flood risks.

Agricultural risks. There is good agreement in the CORDEX Africa multi-model experiment and among other climate modelling initiatives that the January–February season (Figure A6) is likely to become wetter over the medium term, irrespective of RCP. This situation may lead to greater harvest losses among cereal crops that would have historically been harvested post-Deyr, with wetter and warmer conditions leading to crop fungal infections and rot pre- or post-harvest (Owour et al., 2018; Wielogorska et al., 2019), locust outbreaks or other crop pest issues (Salih et al., 2020). Furthermore, the potential for an increase in favourable conditions for mycotoxin contamination of sorghum and maize pre- and post-harvest carries significant health risks for humans and livestock that consume the crops (Wielogorska et al., 2019).

Additionally, many of the climate models predict that the Gu season will likely start later and end earlier by the medium term. Historically, the Gu season has been the dominant, more reliable cropping period, as a greater proportion of the annual precipitation falls during this period (SWALIM, 2007). Shifts to the Gu season's length and increasing variability in precipitation totals, more intense rainfall events and increasing frequency of dry spells in between rain episodes will have implications for agriculture, livestock and water management.

Heat stress in crops leading to decreased yields and crop losses is very likely in the medium term, depending on the temperature thresholds of specific crops (Richardson et al., 2022). A retrospective study found that Somalia cereal crop losses averaged around 11.5% between 1985–2006, when mean temperatures were 1% warmer than normal (Wasame et al., 2021). Given that TX and TN will be consistently and significantly warmer in all seasons by the medium term, if current cereal cultivars are planted, yields are likely to be reduced simply due to temperature effects alone. When coupled with the likelihood of a greater number of consecutive dry days and more intense rainfall events, crop yield reductions and post-harvest losses could be higher than expected (Richardson et al., 2022) and currently planned for in the NDP9.

Livestock risks. Heat stress (i.e. the number of days exceeding 40°C) could range from 80 to over 100 days/year under RCP8.5 during 2041–2060 for a large area of northern Somalia; larger swaths of the interior southern and south-central regions could experience between 40 and 80 days/year (Gutiérrez et al., 2021). The frequency of heat stress days that could endanger livestock – particularly sheep and goats – is projected to increase significantly in Somalia over the medium term (Rahimi et al., 2021). The extent to which specific livestock are susceptible to heat stress is species-dependent; for example, cross-bred livestock in intensified systems might be less heat tolerant than local breeds (ibid.).

Extrapolating climate change risks to rangeland productivity and fodder for livestock over the medium term is difficult, as the vulnerabilities created through land-use change patterns, environmental degradation, rangeland management and livestock stocking management will influence the capacity of rangeland ecosystems to adapt to hotter conditions with more evaporation. Should current usage patterns carry forward into the future, it is possible that some rangelands may cease to be productive due to human-mediated pressures and climate change.

Similarly, extrapolating livestock disease risks associated with climate change is contingent upon several variables: land-use change, water availability and quality, transboundary disease transmission and changes in disease type, as well as the geographic spread and life cycles of various disease vectors (Bett et al., 2017). Warmer temperatures are associated with an expanding range of livestock disease vectors up to a certain point, beyond which aridity limits the range of some vectors (ibid.). For example, heavy rainfall events historically triggered Rift Valley Fever outbreaks , and its spread was facilitated through trade and cross-border movement of livestock. It is possible that incidents of Rift Valley Fever and other diseases, like leptospirosis, might increase relative to predicted increases in the number of future heavy rainfall events (ibid.), along with the potential for livestock injury and death due to flood events by the medium term (Richardson et al., 2022).

4. CLIMATE ADAPTATION PRIORITIES

4.1 Balancing priorities

Building resilience to climate change is a key theme of NDP9. Besides recognising the risks of climate change to economic growth and livelihoods in the agriculture and livestock sectors, poverty reduction and food security, NDP9 notes that climate-related disasters are a key driver of large-scale displacement and fragility within the country. Climate change is at the core of the economic development pillar of the NDP9. This pillar emphasises enhancing adaptation, building the resilience of the agriculture and livestock sectors to climate change, and scaling up responses to current climate shocks like drought to improve food security and enhance nutrition. NDP9 emphasises the need for climate-smart agricultural practices, rehabilitation and development of water infrastructure, and disaster risk management by establishing an early warning system integrated with existing systems.

The recognition of climate risks existed before NDP9 was formulated. During consultations for the Plan, Members of Parliament noted climate change and droughts as causes of poverty (Federal Government of Somalia, undated). Efforts have been made to address climate change risks through sectoral policies. For example, climate-change-related objectives are integrated within the National Water Resources Strategy (NWRS) under the component of Integrated Water Resource Management. Specifically, in the context of the risks identified above and the transboundary water management plans for aquifers and the Juba and Shabelle rivers, the NWRS encapsulates the need for transboundary basin management (Federal Government of Somalia, 2021). It commits to immediately assessing the Juba and Shabelle surface water systems as well as the transboundary aquifers within the Shabelle basin and in the Merti transboundary aquifer, to support dialogue on transboundary water management with Ethiopia and Kenya. It then commits to developing an agreed policy and principles for regional water resources development with the two countries, supporting improved water utilisation and enhanced investments.

The NWRS prioritises planning and response to climate variability and tackling the impact of climate change on water resources management and development. Measures proposed to this end include building greater understanding of climate extremes' impacts, developing flood and drought risk management strategies and plans, and mainstreaming water priorities into the national climate planning frameworks. However, the NWRS does not address the full suite of risks to water security from climate change. For instance, it does not consider aquifer recharge rates or water quality and resulting considerations for placement of boreholes or other water infrastructure that are expected to serve local populations. It also does not consider changing water demands and climate change projections, such as the risk that the Shabelle River might not be able to support water demand by the 2050s (Michalscheck et al., 2016). Instead, it emphasises irrigated agriculture to increase the scale of cropping along this river.

There is also recognition of the environmental degradation risks from high dependency on charcoal for cooking and the resulting losses of fodder, soil degradation and other environmental challenges. A National Charcoal Policy and a National Forestry Policy and Strategy have been developed to address the over-exploitation of rangeland biomass and eliciting the export of charcoal. However, both policies are currently pending endorsement of the FGS (UN Somalia Joint Fund, undated). The policies have been developed with support from the United Nations Joint Programme for Sustainable Charcoal Reduction and Alternative Livelihoods to promote alternative sources of energy to local charcoal consumption and provide alternative livelihoods to the charcoal value chain beneficiaries involved in charcoal production and trade (ibid).

It has not been possible to comprehensively assess all the sectoral and socio-economic development policies to map how climate change risks are considered or mainstreamed within them, including proposed or planned interventions. Policies have been hard to find, and even local actors engaged for this study do not have access to them. The challenges of state-building, political fragility and institutional deficiencies have prevented the proper handover of documents between leaderships or the creation of information systems that capture all policies and plans. However, interviews conducted for this study suggest that, in general, policies would benefit from mainstreaming consideration of climate change risks to ensure that they contribute to climate change adaptation and that they assess the potential longer-term implications of policies and socio-economic development and natural resource use trends to the creation of climate change risks.

4.2 Government disaster risk and adaptation priorities

The vision to transition to climate-resilient development by reducing vulnerabilities to climate hazards and climate-related disasters, and increasing adaptation capacity also forms the basis for Somalia's environmental and climate change policies (see Box 2). Sectors prioritised under almost all policies are agriculture, water resources, forestry and the marine environment (See Table 5). Disaster preparedness and response to extreme weather/climate events have been identified as additional priorities. These priorities all connect with the national development goals of food security, poverty reduction and assuring the resilience of people and ecosystems to climate change.

However, not all climate risk management priorities of NDP9 have been adequately addressed through existing climate policies. For example, NDP9 recognises the negative impact of climate variability on livestock and human health through vector-borne diseases. However, the 2021

BOX 2. FOCUS ON GOVERNMENT POLICIES

Climate policymaking in Somalia is underpinned by the National Adaptation Programme of Action (NAPA), which was finalised in accordance with guidelines of the UNFCCC in 2013. The Programme identified three priority areas for action: (1) water resources management, (2) sustainable land management and (3) disaster risk management.

Following a hiatus, policy processes and articulation of priorities towards climate-resilient development re-kindled when Somalia prepared its Initial National Communication to the UNFCCC in 2018. This action was followed by the National Environment Policy of 2019, the National Climate Change Policy of 2020 and the National Environment Strategy and Action Plan for 2021–2025. Somalia has also elaborated on the priorities for climate-resilient development in its two NDCs in 2015 and 2021, and highlighted progress, priorities and needs in the *First Adaptation Communication to the UNFCCC* in 2022. Later that year, adaptation priorities were presented by the Ministry of Environment and Climate Change at the 27th Conference of the Parties (COP27) at Sharm El-Sheikh. Somalia has also initiated the process of developing a National Action Plan. The FGS has issued a framework to clarify the approach, vision, guiding principles, institutional framework and key themes for the NAP process.

Other policies that address environmental degradation include the National Voluntary Land Degradation Neutrality Targets 2020, the Somalia National Action Programme for the United Nations Convention to Combat Desertification 2016 and the National Biodiversity Strategy and Action Plan 2015.

Disaster risk management is also closely linked to managing climate risks in Somalia. To that extent, the National Disaster Management Policy of 2018 provides an entry point for leveraging the synergies between disaster risk mitigation and climate change adaptation by developing a project pipeline. The Somalia Recovery and Resilience Framework 2018 also helps progress from early drought recovery to long-term resilience and disaster preparedness and breaking out of the cycle of vulnerability and humanitarian crises.

Nationally Determined Contribution (NDC) to the UNFCCC under the Paris Agreement (Federal Republic of Somalia, 2021) is the only policy that explicitly mentions the need to establish veterinary services and other measures to control livestock disease. The First Adaptation Communication to the UNFCCC (Federal Government of Somalia, 2022), which reports on adaptation progress, priorities and needs, also covers this but only because it is linked to the NDC. In other areas, the linkages between sectoral policies and climate policies remain weak. For example, while the NDC prioritises the development of drainage and stormwater systems in urban centres (especially Mogadishu, Baladweyne, Jowhar and Kismayu) as part of water resources management, the NWRS does not mention this.

There are gaps within climate policies themselves. First, priorities are not always framed as coherent messages across policy processes, despite successive policy processes making direct references to previous ones. For example, while livestock is cited as a sector in its own right under the National Climate Change Policy (NCCP) of 2020, measures to support adaptation for this sector are subsumed under agriculture and food security in the NDC and the National Adaptation Plan (NAP - under development) as mentioned in the Initial Communication to the UNFCCC (see Table 5). Another example can be seen in climate risk management for urban areas. While the NCCP enlists a comprehensive range of priorities to address the climate risks for cities and towns, the NDC neither encapsulates all of them nor builds on them (see Table 6).

TABLE 5. SOMALIA'S PRIORITIES FOR CLIMATE CHANGE ADAPTATION

	National Environment Policy 2020[1]	National Climate Change Policy[2]	NDC 2021[3]	National Environment Strategy and Action Plan for 2021–2025[4]	First Adaptation Communication to the UNFCCC 2022[5]	Priorities at COP27
Overview	Policy to promote sustainable development through sound management of Somalia's natural resources	Overarching national policy to guide responses the impacts of climate change	Updated NDCs - mitigation	Policy to put in place mechanisms and measures to ensure sustainable management and use of the rich natural resources	Reflects Somalia's adaptation progress, priorities and needs going forward	Priorities of the country as presented by the Ministry of Environment and Climate Change at COP27
Objectives related to climate-resilient development	Address Somalia's vulnerability to climate variability, change and risks to achieving long-term development goals Finalise National Climate Change Policy, mainstream climate change into policy and planning processes at all levels, establish an institutional framework for federal and state level institutions to support climate resilience, and develop a strategy to manage the impacts of natural disasters	Attain a climate-resilient economy, in turn supporting the achievement of the national development agenda and sustainable development goals of Somalia Promote and strengthen the implementation of adaptation and disaster risk reduction measures to reduce vulnerability to climate change Minimise susceptibility to the impacts of climate change by establishing adaptive capacity, strengthening capacities for disaster risk reduction and promoting resilience of populations to climate change	Enhance adaptive capacity, strengthen resilience and reduce vulnerability of Somalia's economy and population to climate shocks by mainstreaming climate adaptation into sustainable development	Responding to urgent environment and climate change issues and improving environmental governance, as well as enhancing resource mobilisation for the effective management of natural resources and environment	Adapting to climate change to reduce vulnerability and support resilient economic growth in the face of extreme climate events, such as droughts and floods	Climate change adaptation and building resilience, with mitigation as a core benefit arising from adaptation

	National Environment Policy 2020[1]	National Climate Change Policy[2]	NDC 2021[3]	National Environment Strategy and Action Plan for 2021–2025[4]	First Adaptation Communication to the UNFCCC 2022[5]	Priorities at COP27
Priority sectors	• Agriculture • Livestock • Water resources • Marine resources • Forestry • Wildlife • Mineral resources • Petroleum sector • Energy resources • Rangeland	• Climate-resilient agriculture • Livestock • Water sector • Marine resources • Forestry and biodiversity • Infrastructure • Urban settlements • Disaster preparedness and response	• Agriculture and food security • Water resources • Coastal, marine environment and fisheries • Public health • Energy • Forestry and environment • Human settlements • Infrastructure including roads, bridges • Disaster preparedness and management	• Land degradation • Biodiversity • Aquatic and marine environment • Climate change	• Agriculture and food security • Water resources management • Coastal, marine environment and fisheries • Public health • Energy • Forestry and environment • Human settlements • Infrastructure including roads, bridges • Disaster preparedness and management	• Agriculture • Livestock • Water resources • Fisheries • Energy • Forestry • Wildlife • Infrastructure • Youth

Source: (1) Federal Republic of Somalia, 2019; (2) Federal Republic of Somalia, 2020; (3) Federal Republic of Somalia, 2021; (4) Horn of Africa Sustainability Solutions, undated; (5) Federal Government of Somalia, 2022

TABLE 6. COMPARISON OF ADAPTATION PRIORITIES FOR URBAN AREAS WITHIN NCCP AND NDC

NCCP 2020	NDC 2021
• Ensure that local authorities adopt climate proofed settlement designs • Provide enabling policy environment to ensure climate resilience in urban planning, construction and management • Conduct assessment for hazard mapping, risk reduction and vulnerability of urban settlements in flood-prone areas • Integrate adaptation into human development programmes for resilient building, with particular focus on the poor and vulnerable groups by upgrading informal settlements and living conditions for all • Promote incentives for commercial and public buildings to use energy efficient lighting and appliances • Develop and support improved water supply and waste management systems for cities, including recycling facilities and landfills with methane recovery for electricity generation • Make installations of wastewater treatment plants an integral part of all sewerage schemes. Ensure separate collection, disposal and reuse of recyclable, composite and biodegradable waste (preferably at source) • Monitor rural–urban migration and develop infrastructure and support facilities in smaller agro-based towns and periphery urban areas to reverse rural–urban migration • Develop and implement proper spatial land-use planning that considers current and predicted climate change • Regulate industrial development in urban-designated areas through land-use planning	• Promote a green and climate-resilient building industry • Promote sustainable land management systems and climate-sensitive human settlement developments • Facilitate provision of and access to adequate, affordable and climate-sensitive shelter to vulnerable groups, including IDPs

Source: Federal Republic of Somalia, 2020; 2021

Second, priorities are better defined for sectors such as agriculture, livestock and water in comparison to sectors such as public health. For example, in the case of agriculture, desired actions to address the risks of decreased crop yields, ravaged crops due to locust outbreaks and the risks to farm-based livelihoods include: the provision of drought-resistant seeds and seedlings to the farming community; promoting weather-based insurance schemes for farmers and pastoralists; establishing agricultural institutions to research drought-resistant varieties; building adaptation capacity through climate-resilient agronomic practices for smallholder farmers; and improving post-harvest infrastructure by establishing cooperatives and cooling systems for perishable goods. By contrast, climate change risks to human health (e.g. heat stress and stroke or increases in vector-borne diseases) are proposed to be addressed only through public health awareness campaigns targeted to rural areas.

Third, the adaptation interventions identified in policies do not adequately address the plausible and varied range of climate change risks to Somalia's development. As identified from the climate risk assessment, water security lies at the heart of meeting socio-economic development objectives, meeting the realities of urbanisation and laying growth and land-use trends a more climate-resilient future for the 2030s and beyond. Therefore, maintaining resilient water systems is critical, which necessitates investments in infrastructure development that anticipate future demand and investments in anticipatory actions that help the water sector anticipate and respond to shocks or that address the underlying drivers of

BOX 3. ADAPTATION PRIORITIES FOR THE WATER SECTOR

A review of Somalia's climate-relevant policies indicates the following priorities for the water sector:

- periodic reviewing of existing national and water-related sectoral policies (such as agriculture, energy, environment) to ensure they adequately address climate-related challenges
- strengthening water diplomacy and transboundary water management
- enhancing institutional arrangements for water conservation and management
- developing a National Water Resources Management Master Plan that mainstreams climate change and the implementation of Integrated Water Resources Management Strategy
- mainstreaming climate change in the design of water resources infrastructure
- protecting river catchments and other sources of freshwater to secure a steady supply of freshwater across all sectors and communities
- improving water harvesting, recycling, reuse and efficiency
- investing in mega-dams and community-level infrastructure, including berkeds, shallow wells, ponds, solar-powered boreholes and water pans
- investing in basic and portable water supply for households
- investing in drainage and storm-water systems in urban centres, especially Mogadishu, Baladweyne, Jowhar and Kismayu
- developing flood and drought monitoring and control systems.

Source: Federal Republic of Somalia, 2020; 2021

vulnerability (Balfour, 2023). However, adaptation interventions for the water sector do not focus on anticipatory action (see Box 3). There is no attempt to identify problem areas, such as water scarcity, risks related to flood water or water contamination, issues of access and affordability, or even possible disease outbreaks (ibid.). Policies also provide no indication of how they interact with assessments of and planning for drought recovery and resilience building, which need to occur at multiple levels.

Another example comes from the adaptation interventions identified for urban centres. While the environmental challenges for urban expansion, such as the absence of land-use planning, building codes, and provision of basic services, are well understood and are addressed by the interventions identified in the NCCP and, to some extent, in the NDC, no attention has been paid to interventions that would make urban centres resilient to urban heat island effects or to integrating nature-based solutions that provide for rainwater infiltration to reduce urban flood and public health risks.

Fourth, some of the interventions proposed within policies focus on a single climate hazard, not recognising how other climate hazards could generate risks. Nor do they adequately consider a range of climate change projections and implications for changes in the frequency, intensity, duration and spatial extent of climate extremes or shifts in local climates. They also do not sufficiently recognise the interconnected nature of interventions and the longer-term implications arising from these interconnections. For example, there are plans to establish more watering points along livestock migration routes, but additional watering points could create maladaptation for pastoralists if they encourage settlement in areas with unreliable and/or contaminated groundwater supplies. Drilling of borewells without understanding and monitoring groundwater tables could exacerbate depletions. Furthermore, while watering points may seem 'resilient' over the short term, by the medium term (2041–2060), they could create dependencies and further accelerate localised desertification.

Fifth, policy priorities also extend to measures such as establishing anti-poaching squads and developing a computerised fisheries vessel registration. While these are relevant to sectoral development and managing climate risks within, the actual costs, which required capacities to implement along with equity and livelihood implications for those depending on such livelihoods, are not adequately considered. This suggests potential for improving the government's policy prioritisation processes and underlying expertise.

Sixth, the adaptation priorities identified in the key policies are too general and do not provide concrete adaptation actions. Many policies lack implementation plans. For example, priorities for the livestock sector under the NCCP and NDC 2021 include improving animal productivity and animal breeds to increase resilience to climate change (e.g. addressing livestock heat stress), but they do not indicate what interventions need to be prioritised and for which species.

Finally, policies overlook the fact that climate risks are mediated by development choices. Considering that exposure and vulnerability can be reduced through appropriate adaptation interventions, sustainable and resilient economic development per se would generally lead to higher levels of adaptation. However, development choices that fail to consider climate projections over the short to long terms, equitable development or sustainable use of natural resources will lock-in maladaptation and limit future climate risk management options.

Unsurprisingly, climate policymaking and implementation remains uneven, with policies lacking depth, coordinated priorities, and alignment between national and state levels. The crafting of climate and disaster risk management policies has taken place in a landscape of fractured political context, structural challenges posed by a nascent federal system of governance and institutions in formative stages. Rebuilding of core state capabilities while dealing with multiple crises and fragility detracts from policymaking. Furthermore, frequent leadership changes and loss of institutional memory during the transition period have impacted policymaking and ownership.

It is understood that policy documents were held by the Directorate of Environment and Climate Change (DoEcc) (the predecessor to the Ministry of Environment and Climate Change (MoECC)), and the ministries or their institutions have little awareness of or access to them (KII, 2022). MoECC has identified this limitation and is developing an inventory of existing policies pertaining to climate change (KII, 2022). However, this exercise is likely to be time-consuming, as policies have been hard to find in the absence of a formal handover from the DoECC to MoECC upon the latter's creation (KII, 2022). It was suggested that climate change policies have been developed in response to compliance with donor requirements as a 'tick-the-box' approach or by donor-funded external expert consultants with minimal consultation with and within the government (KII, 2022).

Implementation also falls short because not all Federal Member States (FMS) have integrated climate change sufficiently as a priority within the tasks of MoECC (KII, 2022). According to the NCCP, FMS should establish a State Committee on Climate Change to coordinate climate change response at the state level, and Municipal Committees on Climate to coordinate climate change response at municipal levels. However, none of the FMS and districts have established these committees as of the time of writing (KII, 2022).

4.3 Partner disaster risk and adaptation priorities

While humanitarian assistance has been, and will continue to be, vital to disaster response and recovery, the 2021–2023 drought is leading to greater recognition that humanitarian assistance is insufficient in the face of climate change and that a focus on supporting the FGS and FMS in transitioning to climate-resilient development is needed. A non-exhaustive review of the current priorities of the main Development Assistance Committee donors, multilateral and regional development banks, and agencies of the United Nations (henceforth collectively referred to as development partners) working in Somalia suggests that adaptation to climate change is not always an explicit priority area of support within their country strategies; however, most development partners are supporting absorption and adaptation to climate change through projects and programming directed towards improving food security, protecting livelihoods, strengthening agricultural value chains, supporting economic diversification and strengthening resilience more broadly (KII, 2022). In other words, the entry point for their support in adapting to climate change lies in development programmes. Many bilateral donors also channel their support for climate change adaptation by funding multilateral organisations.

High-level mapping of the direct support provided by development partners for climate change adaptation, as well support for climate change adaptation under development programmes relative to the adaptation priorities identified under Somalia's main climate policies, suggests that there is a strong collective focus on agriculture, food security and water resources (see Table 7).

Development partners are increasingly looking at interventions that not only support short-term needs but also enable longer-term adaptation and climate-resilient development by offering opportunities for micro socio-economic and macro socio-economic benefits and peace dividends (Key Informant Interviews). For example, the World Bank's *Water for Agro-pastoral Productivity and Resilience* ('Biyoole') project addresses the increasing risk of water scarcity on livelihoods and the intrinsic risk of conflict over scarce resources. In developing water and agricultural services using multi-purpose water supplies, the project focuses on increasing water conservation and storage through the construction of sand dams, which make water available for longer in a dry period, rather than boreholes, which are not always a cost-effective or a reliable solution for resilience to extreme drought (Richey, 2022).

Development partners also recognise the need for disaster risk management, including anticipatory action, as part of climate change adaptation. They are directing support towards increasing the accessibility and quality of information and communication through climate services, and providing remote sensing and anticipatory analysis. For example, the United States and the United Kingdom support the establishment of a pilot groundwater monitoring programme of critical aquifers across the Horn of Africa, including Somalia, with the ultimate objective of supporting drought alert systems. Such monitoring systems are critical to understanding what water resources are available and how they are being impacted by abstraction and climate change (H2H, 2022).

TABLE 7. CURRENT PRIORITIES OF DEVELOPMENT PARTNERS IN SOMALIA COMPARED WITH SOMALIA'S STATED POLICY PRIORITIES

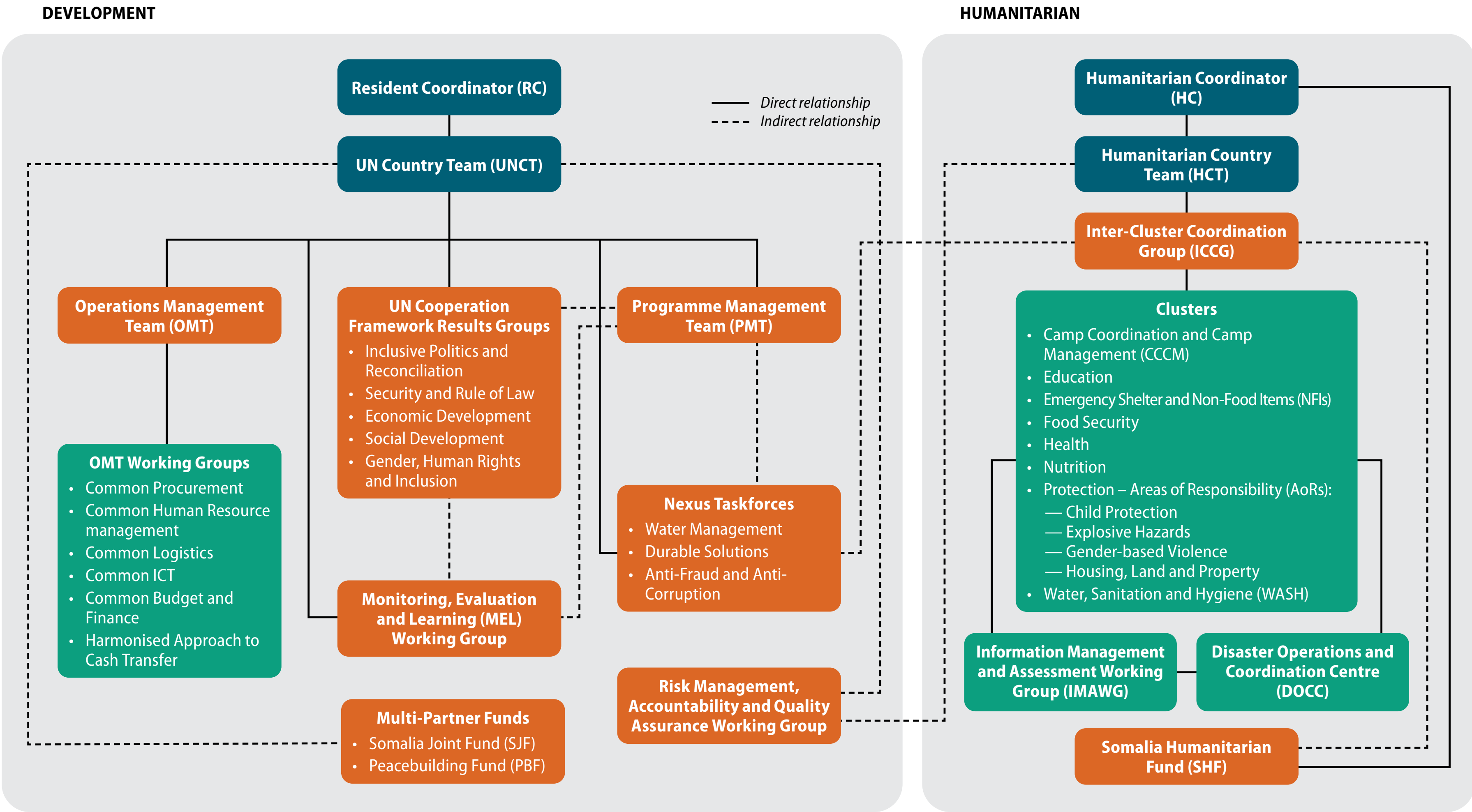
	NCCP 2020	NDC 2021	COP27	AFDB	DK	EU	FAO	GER	NL	NOR	SWE	UNEP	UNDP	UK	WB
Agriculture and food security	Y	Y	Y	X	X		X	X	X	None			X	X	
Livestock	Y	Y	Y		X		X						X		
Water and Watershed Management	Y	Y	Y	X		X	X	X	X		X		X	X	X
Coastal, marine environment and fisheries	Y	Y	Y		X								X		
Forestry and environment	Y	Y	Y				X					X	X		
Infrastructure	Y	Y	Y	X											
Urban/Human settlements	Y	Y						X							X
Disaster preparedness and management	Y	Y					X				X	X	X		
Public health		Y													
Wildlife			Y												
Energy			Y	X		X						X	X		X
Youth		Y	Y										X		

COP27, 27th Conference of the Parties; AFDB, Africa Development Bank; DK, Denmark; EU, European Union; FAO, Food and Agriculture Organization of the United Nations; GER, Germany; NL, Netherlands; NOR, Norway; SWE, Sweden; UNEP, United Nations Environment Programme; UNDP, United Nations Development Programme; UK, United Kingdom; WB, World Bank. Source: authors' analysis

There are, however, three areas of concern. First, development partners do not appear to have a shared understanding of climate change risks, including over different time scales (KII, 2022). Few actors share climate risk assessments in the public domain and it is not clear if various development actors have conducted comprehensive climate risk assessments, not only for proposed interventions but also the risks those interventions could create. Second, projects are not always designed based on data sourced from communities where climate hazards are being experienced (KII, 2022). Third, the understanding of climate risks and, therefore, the broader priorities for adaptation varies between development and humanitarian actors (KII, 2022). This lack of complementarity means that humanitarian actors responding to specific shocks frequently institute measures that are reactionary in nature, without paying attention to the longer-term implications of these measures or whether or not they contribute to adaptation (KII, 2022). This situation could lead to maladaptation over the short to long term.

A key issue is that humanitarian and development actors have separate coordination mechanisms, and coordination between these two groups remains indirect at best (see Figure 9). There are separate humanitarian and development teams even within multi-mandate organisations. Assisting Somalia to move beyond crisis risk management to climate-resilient development requires a shared understanding of short-, medium- and long-term climate

FIGURE 9. UNITED NATIONS AID COORDINATION IN SOMALIA: MARCH 2022



Source: workshop of the Climate Change, Resilience and Adaptation Working Group Somalia on 16 January 2023.

change risks; what and how adaptation actions address these to deliver climate-resilient development; and what types of development investments are needed to not only deliver the vision of NDP9 but enable Somalia to take part in green energy and other economic opportunities evolving globally. A group of non-governmental organisations and United Nations actors are coordinating under a Climate Change, Resilience and Adaptation Working Group to share knowledge and advocate for more focus on climate resilience and adaptation in development and humanitarian action. However, the group finds it challenging to position itself within the existing government and United Nations coordination system.

4.4 Climate risk and resilience in aid interventions

The lack of a shared understanding of climate change risks between the different actors responsible for resilience building, including development, humanitarian, climate and other stakeholders, affects the quantity and quality of interventions aimed at building climate adaptation in Somalia. Presently, most official international finance to address climate impacts is provided through short-term humanitarian relief, while dedicated climate finance to build longer-term climate adaptation is less than 6% of annual needs (i.e. $321 million inflows vs. $5.5 billion annual needs) (Federal Government of Somalia, 2021; Meattle et al., 2022). Without increased adaptation efforts, the cost of recurrent climate-related humanitarian crises will only increase, rendering short-term interventions unsustainable (Cao and Gulati, 2022). Therefore, it is imperative to understand whether and how existing interventions are building adaptation to climate change.

An assessment of 1,326 aid projects active in Somalia between 2005 and 2023 was reported in the Somalia Aid Information Management System (AIMS)[10] (see Box 4) to understand the approaches used to reduce climate change risks as identified in the climate risk assessment in Chapter 2, and the extent to which they reflect national adaptation priorities (outlined in the preceding policy analysis).

The assessment indicates that there is poor consideration of risks related to present climate variability and, to an even greater extent, future climate change risks in all types of aid projects. As of February 2023, 1,326 aid programmes and interventions were recorded in the AIMS database for a cumulative investment value of $11.7 billion. Almost half of the value of these interventions (307 projects worth $5.5 billion) targeted resilience objectives, but only 14% of the interventions (103 projects, $1.6 billion) aimed at specifically reducing risks (either by reducing vulnerability or exposure) created by climate extremes and shifts. Most resilience-building projects (204 projects, $3.9 billion) had generic resilience objectives, such as non-specific livelihood diversification, or were short-term humanitarian responses to extreme weather events, such as droughts and floods (see Figure 10).

This focus on short-term climate responses can also be observed at the sectoral level. Between 2005 and 2023, most aid funding in Somalia went to the food security (32%), social protection (6%) and health (11%) sectors, which are traditionally associated with humanitarian relief (see Figure 11).

10 The Aid Information Management System is a knowledge platform managed by the Ministry of Planning, Investment and Economic Development, where development partners self-report data on all aid flows, including development, humanitarian, climate, disaster risk reduction and peacebuilding projects. See https://aims.mop.gov.so/

BOX 4. METHODOLOGY FOR ASSESSMENT OF CLIMATE RISK AND RESILIENCE IN AID INTERVENTIONS

This research assessed 1,326 aid projects active in Somalia between 2005 and 2023 reported in the Somalia Aid Information Management System to assess their approaches to reducing climate risks (identified in the climate risk assessment in Chapter 2) and the extent to which they reflect national adaptation priorities (outlined in the preceding analysis). The analysis was conducted through a two-part assessment.

First, we used a keywords-based approach to analyse individual project titles and descriptions for terms or sentences related to climate change risk, hazard, exposure and vulnerability reduction, or enhancing resilience or adaptation. The analysis revealed that projects could be categorised into:

- those that aim to **reduce climate change risks specifically**, where there is a clear and direct link between project activities and reduction of vulnerability or exposure to specific climate hazards
- those that **build general resilience or are humanitarian interventions**, where activities target resilience building in general terms (or to non-climate hazards), or where activities address the impacts of climate extremes but do not address underlying vulnerabilities or exposure and are clearly aimed at the short-term response, lifesaving and recovery activities, such as such as temporary cash transfers, income support, or water, sanitation and hygiene services in IDP camps
- other projects that did not aim to reduce climate change risks or increase resilience.

While keyword-based analysis is a tried and tested approach for adaptation finance assessments (see the United Nations Environment Programme Adaptation Gap Report 2022, which carries out an analogous analysis; UNEP, 2022), the key limitation of this approach is that it is dependent on the quality of data reported and the expert judgement of the researchers carrying out the assessment. We adopted a conservative approach where we excluded entries in the database that provided a limited amount of evidence to discern whether projects aimed to reduce climate change risks or build resilience (e.g. projects where keywords were identified in the title but there was no description text to describe activities or how adaptation or resilience goals were to be achieved, or how far into the future considering any types of climate projection information or climate risk assessment).

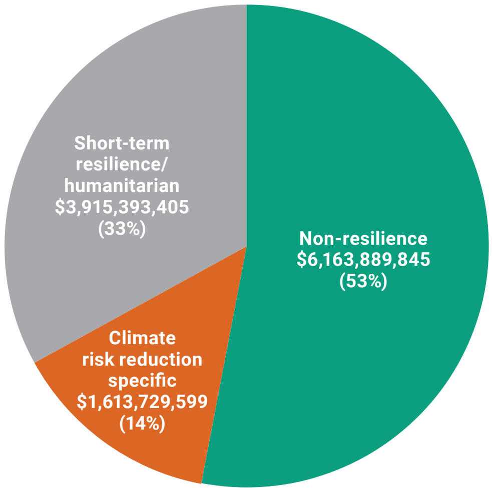
Second, out of the sample of projects focused on reducing climate risks and building general resilience, we further sampled a subset of 31 projects for in-depth analysis based on monetary value and sectoral distribution. We reviewed publicly available project documentation, including project concept notes, environmental and social risk assessments, baseline assessments, mid-term reviews and final evaluations to gain a nuanced understanding of the projects' efforts regarding:

- whether they address only present or also future climate risks
- the potential effectiveness of climate interventions in the short, medium or long terms
- whether climate interventions consider multiple, concurrent threats, particularly conflict risks together with climate risks
- the sustainability of climate interventions beyond the lifecycle of the project itself.

As is often the case, documentation for aid projects may not always be in the public dominion. Even when publicly available, they may be updated sporadically as projects and programmes advance; therefore, they may not always reflect all the intended and implemented (resilience and adaptation) activities. This is a known limitation in aid project analysis, which we mitigated in part through our two-step selection process and by targeting large-scale programmes for the in-depth analysis.

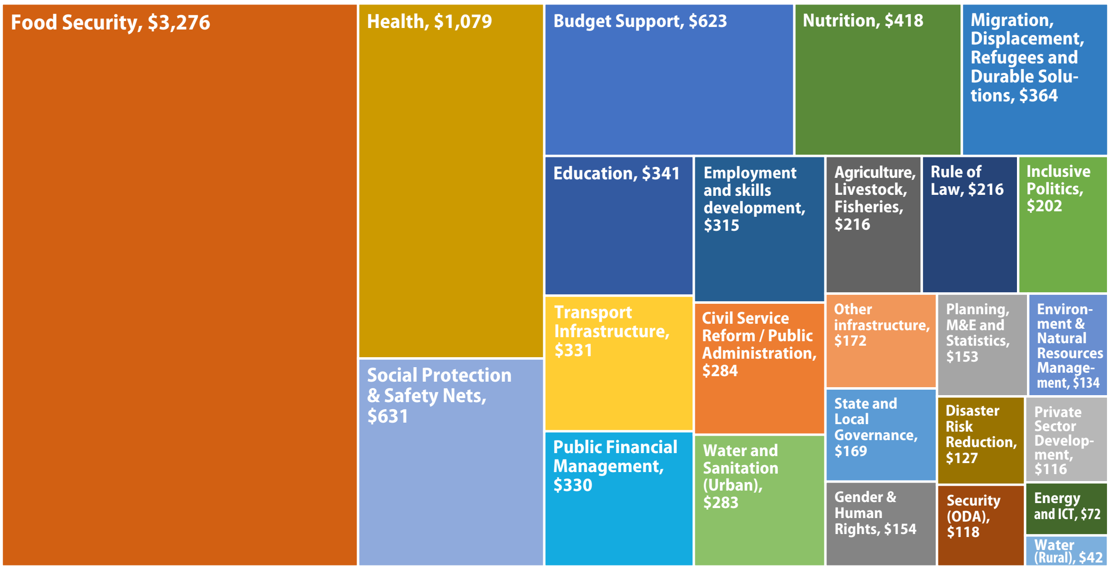
Source: authors' analysis

FIGURE 10. SHARE OF AIMS INTERVENTIONS TARGETING CLIMATE RISK REDUCTION AND SHORT-TERM RESILIENCE



Source: authors' analysis with AIMS data.

FIGURE 11. AID INTERVENTIONS IN SOMALIA, BY SECTOR, 2005–2023 ($ MILLION)



Source: authors' analysis with AIMS data.

These findings highlight that, despite Somalia's willingness and commitment to transition from responding to short-term emergencies to climate-resilient development, the country has yet to break away from the cycle of recurrent and protracted humanitarian crises and emergency management.

A detailed documentation analysis for 20 climate risk reduction and general resilience/ humanitarian projects further highlights a focus on present risks. The research focused on 31 projects, but detailed documentation for 11 projects was not publicly available, whereas 15 of the remaining projects specifically aimed at reducing climate risks and 5 were humanitarian projects (see Annex 2).

Of those 20 projects, only 12 had available documentation, and these had a strong focus on reducing current impacts and risks related to current climate hazards and other concurrent threats (e.g. locust infestation, environmental degradation, conflict). This was reflected in project documentation that provided:

- descriptions of the climate context, including frequency, intensity and duration of key climate-related hazards (i.e. drought, flood)
- analyses of vulnerabilities of communities, institutions and systems exposed to these climate risks (e.g. IDPs' gendered access to water, sanitation and hygiene; child malnutrition; unsustainable abstraction rates of borehole and river gauge and flood early warning systems; low-income-earning pastoralists)
- goals to increase anticipatory copying or adaptive capacities (e.g. separate latrines, development of nature-based water harvesting infrastructure, community-driven investments in water access and management, improvement in livestock services, development of irrigation schemes and use of climate-smart seeds).

Most projects (15 of 20) also included 'do no harm' considerations by focusing on the interplay between climate variability and conflict mediated through, for instance, the use of natural resources, competition for water, tension between pastoralists and farmers and intra-household tension for cash transfers or land ownership, and how the resulting risks affect vulnerable groups in different ways, including women, girls, children, the elderly and poor households. Projects utilised various measures to mitigate these risks, including performing conflict and gender analyses and environmental and social risk assessments to devise management plans during project design; some programmes also devised strategic environmental assessment frameworks to account for the cumulative effects of individual interventions within a large programme. Other measures include co-designing interventions with communities to address specific needs, creating complaint mechanisms, performing separate consultations for vulnerable groups, creating peace committees, developing community action adaptation plans, and considering clan influence on project implementation.

That said, only three programmes (out of 20) included adequate considerations of future climate change projections and risks in addition to current climate variability; all other programmes did not include any information or had simplistic characterisation of climate change risks at different time scales, despite claiming to build adaptation to present and future climate change (see for example Box 5). Appropriate considerations involved discussion of climate projections by reputable sources (e.g. SWALIM, ICPAC); discussion of projection uncertainties; and discussion of long-term risks identified by the interaction of alternative future climate, socio-economic development and land-use trajectories, population dynamics, and other human-mediated environmental degradation and change. These analyses were used to select different adaptation options, discuss their trade-offs, and make robust decisions for project design and implementation. For instance:

- The World Bank-funded Biyoole project included a whole section in its concept note that discussed various adaptation options, their benefits and their pitfalls, leading to the selection of sand dams, instead of boreholes, for water harvesting as they are less dependent on groundwater recharge and are more economical. This action aimed to avoid lock in of maladaptation.

- The African Development Bank-funded Drought Resilience and Sustainable Livelihoods Program in the Horn of Africa also considered alternative adaptation solutions, deciding not to build large water infrastructure due to poor availability of hydrogeological data.
- The Global Environment Facility-funded Enhancing Climate Resilience programme included detailed context and climate analyses at the member-state level in addition to the national level and favoured nature-based water solutions to avoid high infrastructure costs and locking in maladaptive trajectories.

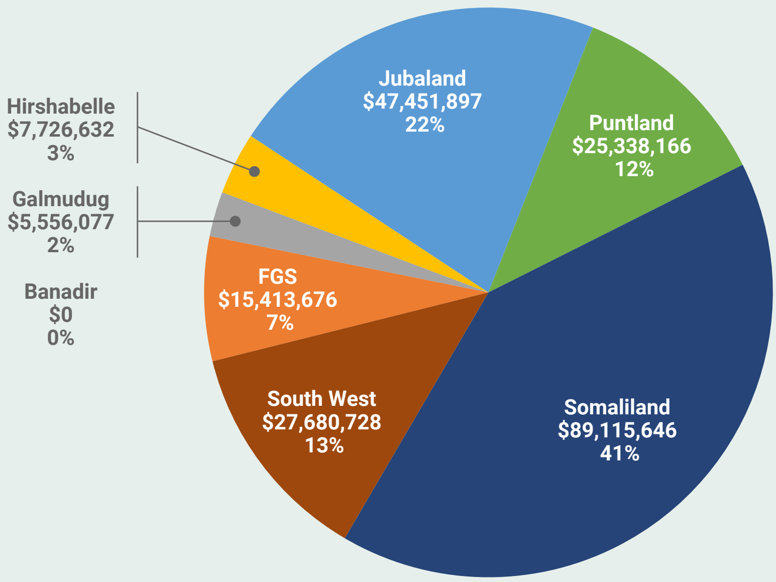
Poor attention to future climate change risks can be particularly problematic when using hard adaptation measures, such as building physical infrastructure for water (see Box 5), due to higher risks of locking in maladaptation. Even though most projects (60 of 103 projects) in the AIMS database employed soft adaptation measures (e.g. planning, policy formulation, governance and nature-based solutions) to specifically reduce climate risks, 34 projects used hard measures (building infrastructure) and are at a higher risk of creating and locking in maladaptation.

BOX 5. SHORT- TO LONG-TERM CLIMATE RISKS TO THE WATER SECTOR IN SOMALIA

The importance of water security to realising Somalia's socio-economic development and climate objectives has been highlighted throughout this report. This box provides a snapshot of aid projects in the water sector in Somalia, analysing whether and how they are addressing some climate change risks.

Between 2014 and 2022, 42 projects with a cumulative investment value of $218.2 million targeted the water sector in Somalia, 25 of which provided humanitarian relief and 17 aimed at reducing climate risks. By member state, Somaliland (41%) and Jubaland (22%) received the most funding, whereas Hirshabelle (3%) and Galmudug (2%) received the least (see Figure 12).

FIGURE 12. WATER SECTOR CLIMATE RISK REDUCTION AND GENERAL RESILIENCE PROJECTS BY MEMBER STATES 2014–2022



Source: authors' analysis with AIMS data.

(continued on next page)

The assessment of these projects indicates that they are not addressing short- to long-term climate risks either at the strategic level or at the project level. At the strategic level, Hirshabelle and Galmudug are areas with the least amount of funding going to water projects but are quite arid, receiving only 200–400 mm/year with high natural rainfall variability, and are dependent on aquifers for water supplies; warmer temperatures and the increasing likelihood of both floods and droughts will further stress aquifers (see the climate risk assessment in Chapter 2). On the other hand, Jubaland, which has received the most funding for water-related projects has higher annual precipitation compared to other FMS and more diversified sources of water (the Jubba River and aquifers), although the lack of a shared transboundary water management plan with Ethiopia (where the Jubba originates) and tentative government ideas of building large-scale hydropower along the river may pose significant climate change risks. Similarly, plans to rehabilitate and expand irrigation networks without considering climate change or increasing demand in both countries could further jeopardise water security in southern Somalia. Such funding actions also fail to reflect national adaptation priorities where water has been prioritised under almost all existing policies.

All in all, water adaptation investments need to target FMS more evenly, given warmer temperatures and greater evaporation expected across the country.

At the project level, many of the humanitarian projects in the water sector we reviewed could lock in certain climate risks and maladaptation due to building and rehabilitating infrastructure without conducting proper hydrogeological surveys that consider impacts on water quantity, aquifer recharge rates and water quality, as well as different demand and climate change projections wherein water sources may not be able to support demand by the 2050s in some parts of the country. Also, many resilience interventions in the water sector do not focus on disaster risk management, including anticipatory action, mitigation of risks related to flooding or water contamination, challenges with access and affordability or disease outbreaks (Balfour, 2023).

Our assessment of project maladaptation risks also involved considering the sustainability of climate risk management interventions beyond the project's lifecycle. Half of the 20 projects designed provisions to ensure they were self-sustainable in the long run, mostly by focusing on building the capacity of local communities and institutions to plan for disaster risk reduction and managing infrastructure (e.g. water committees) or by establishing partnerships with the private sector. These measures were deemed 'medium quality' in terms of project sustainability potential due to the common challenges with local-level capacity and access to finance. Of the 20 projects, three were deemed to have better sustainability provision, as they focused more on addressing systemic drivers of vulnerability, such as diversifying livelihoods opportunities into non-agricultural and pastoral sectors and market-creation mechanisms.

Overall, most of the 20 projects have short-term (4 projects) to medium-term (9 projects) adaptation effectiveness potential, and only two projects contribute to adaptation to long-term climate risks.

5. KEY FINDINGS

A focus on water security is necessary to realise Somalia's socio-economic development and climate adaptation objectives. The dominant climate hazard that impacts Somalia's economy is prolonged droughts, such as the 2021–current drought that has triggered food insecurity. In addition, the country often experiences floods during the rainy seasons, in which heavy rain events can trigger flash floods in the Jubba and Shabelle river basins. These two rivers are the primary sources of irrigation, livestock and domestic water supply for rural and urban areas in the south during the rainy seasons. The importance of vegetation within river catchments to help slow flood water speed and depth, improve the strength of river embankments against flood waters, maintain streamflow and protect water quality is crucial, but deforestation for charcoal production and agriculture currently undermines flood protection. In addition to droughts, areas of the Shabelle may dry completely during the dry seasons due to water abstractions for irrigation and human and livestock use. Groundwater supplies are also under pressure from high demand due to a lack of consideration of aquifer recharge rates, infiltration characteristics or water quality. One in three drilled boreholes is failing to yield water. Furthermore, groundwater quality is frequently poor for both human and livestock consumption and, overall, over-exploitation of groundwater and failure of boreholes threaten water security now and into the future irrespective of climate change.

Agriculture yields are further threatened by inefficient water resource management. Temperature increases are apparent across Somalia, negatively affecting yields of key crops (maize, sorghum, cowpea and sesame) in crop-growing areas, which are largely confined to irrigated areas in proximity to the Jubba and Shabelle rivers. For example, maize yields are at risk of being reduced by 20%–50% depending on temperature increases, but sorghum is more resilient to higher temperatures and extended dry periods. Current policies aimed at doubling crop production might not be realistic, given potential limitations to water supplies due to both unmanaged demand and climate change. In turn, current policies do not prioritise more efficient irrigation methods or conservation farming to reduce water consumption and loss.

More sustainable water security solutions are needed to protect livestock and pastoral livelihoods. Livestock mobility and trade are key strategies by which pastoralists deal with seasonal variations in fodder and water availability in drylands. However, of the 5,000 livestock watering points across the country, only half are functional under non-drought conditions and only 500 of these are deep boreholes. Current livestock populations are estimated to exceed the carrying capacity of rangelands. As temperatures rise, so does heat stress risks to livestock, including increased mortality and decreased milk production. Temperature increases and greater precipitation variability will impact water availability and quality, while facilitating the spread of existing and novel livestock diseases within and across national borders. Addressing water security for livestock production is key, but careful considerations are needed to avoid maladaptation. Policy priorities call for establishing more watering points along livestock migration routes; however, this could prove maladaptive if it encourages settlement in areas with unreliable and/or contaminated groundwater supplies. Also, drilling borewells without understanding and monitoring groundwater tables could exacerbate depletions and create a situation in which a watering point seems 'resilient' over the short term but, by the medium term, could create dependencies and further localised desertification processes.

There is no urban planning and, therefore no formalised 'green' or climate risk management for towns and cities. In a country where 45%–60% of the population lives in urban areas, a lack of urban planning has and will continue to pose economic, social and environmental challenges. But urbanisation may also bring opportunities for economic diversification and growth. Whether urbanisation brings more risks than opportunities for Somalia will depend heavily on how it manages urban growth, land-use planning, building codes, transportation, and the provision of water, sanitation and electricity, healthcare and education services. There have been increases in slum growth and conversions of land for housing and other urban amenities; however, to date, this has largely been without any land-use planning, building codes or any oversight. Overall, there is inadequate housing, sanitation, water supply, electricity and other public services. As these cities grow, there is the potential to lock in climate risks and maladaptation, particularly in water, sanitation, transportation, energy and building infrastructures. Therefore, there is an urgent need for green, risk-informed urban planning to better manage future climate risks over the short to long term.

Solar and wind energy need to be developed to support human well-being, livelihoods and economic diversification. Sources of electricity and energy for cooking are currently not largely renewable and contribute to environmental degradation. The energy sector should be moving towards the comparative advantage of solar and wind energy and avoid large-scale hydropower due to already high levels of stress to water resources. This includes transitioning household cooking methods (most of the population depends on charcoal for cooking, and national charcoal targets are questionable) to opportunities in biogas and solar cooking. In addition, when addressing the issue of low access to electricity, there is a need to move away from diesel and establish both distributed (micro-) and utility-scale solar power generation, wind farms and interregional transmission lines to Ethiopia and Kenya.

Climate adaptation and mitigation need to be embedded in land-use planning and socio-economic development. As Somalia tries to overcome multiple concurrent crises arising from decades of conflict, fragmentation, instability and under-development, it has embraced poverty reduction, inclusive growth and socio-economic development as the vision for the future. Embedding climate adaptation, disaster risk management and mitigation within socio-economic development and land-use planning can reduce vulnerabilities and exposure to climate change. Climate mitigation through a green energy transition, land-use planning and sustainable use of natural resources within development can reduce the severity and extent of climate change. Together, adaptation and mitigation will reduce climate change risks, although not everyone will benefit equally from such risk reductions. Adaptation priorities identified in national climate policies and sectoral policies do not yet adequately address the varied range of climate risks to Somalia's economic and social development over the short (2021–2040) to medium terms (2041–2060). This is reflected in the limited understanding of the interconnectedness between differing threats and trends (such as climate change, rapid urbanisation and conflict) and proposed adaptation options. The trade-offs of actions and policies are not well considered, and there is the potential to embed maladaptation in certain development and adaptation interventions.

Future climate projections must be considered. According to multi-model climate change projections, temperatures are projected to rise, whereas shifts in rainfall totals and the timing of the two rainy seasons (Dyer and Gu) are more uncertain. The country is already arid, but due to increasing temperatures in all seasons and more heatwaves, aridity through evaporation will increase irrespective of uncertainties in precipitation. Precipitation variability is naturally high, but this variability is likely to increase in the future. Both drought and flooding should be expected.

There is limited understanding of and action to address Somalia's climate risks. The climate change risks just outlined result not only from changes in climate, but also from vulnerabilities, exposures and capacities created through socio-economic development and land-use change. Planning for potential climate change shifts in the 2040s through to the 2080s over the expected lifespan of major infrastructure will be key to ensuring Somalia's development is climate resilient. Adaptation is not an endpoint but a process, and it needs to include a flexible and continuously updated assessment of climate risks in light of climate change projections as well as socio-economic development trends and policy trajectories. Understanding how development – both organic and planned – creates vulnerability, exposure and capacities, as well as where and how hazard, exposure and vulnerability intersect, is critical to identifying adaptation measures that are attuned to the long-term vision of Somalia's development. Risks continuously change and are driven as much, and sometimes more, by development than climate change alone. Therefore, not acting accordingly is a risk itself.

There is limited mainstreaming of climate adaptation priorities across national, state and sectoral policies. Across national climate policies (NDC 2021, National Climate Change Policy, National Environment Policy 2020 and the National Environment Strategy and Action Plan for 2021–2025), sectors that have been prioritised include agriculture, water, forestry, marine and disaster risk preparedness. However, these policies lack depth in interventions, there are mismatches of priorities across policies, and there is limited alignment between national and state policies. However, the newly established MoECC, which has taken over the responsibility of addressing climate change from the former DoECC, has already identified this limitation and is embarking on ambitious plans to have more cohesive leadership. Included in these plans are decentralising efforts to address climate change effectively, which includes the FMS implementing visions set by the centralised MoECC through the establishment of State Committees on Climate Change for coordination at the state level.

Development and humanitarian actors must recognise that adaptation to climate change over the short to long term must be urgently stepped up. Presently, most official international finance to address climate impacts in Somalia is provided through short-term humanitarian relief, while dedicated climate finance for climate adaptation is less than 6% of annual needs (i.e. $321 million inflows vs $5.5 billion annual needs). Without increased adaptation efforts, the cost of recurrent climate-related humanitarian crises will only increase, rendering short-term interventions unsustainable. Reliance on humanitarian finance to respond to climate extremes (notably prolonged droughts) is likely to continue over the short term in Somalia; however, not only are development actors financing climate adaptation increasing efforts to improve the country's adaptative capacity, but humanitarian and peacebuilding actors are seeing first-hand the need to manage the short- to long-term risks from climate change. Currently, there is a strong collective focus on agriculture, food security and water scarcity, as well as increasing recognition of the importance of the linkages between disaster risk management and adaptation, including: strengthening the networks of automated weather stations, river gages and aquifer monitoring systems; improving data sharing, communication with and coordinating with existing regional climate early warning systems; and enhancing anticipatory action prepositioning humanitarian aid in accordance with seasonal climate forecasts.

Current adaptation interventions risk maladaptation because development and humanitarian partners do not currently conduct robust climate risk assessments nor have a shared understanding of climate risks. To our knowledge, based on reviews of the AIMs database, most development and humanitarian interventions do not conduct even basic climate change risk screenings that incorporate climate change projections over the short to medium term or that evaluate the potential maladaptation risks that they could be creating. Also, the lack of complementarity across actors means that humanitarian actors responding to specific shocks frequently implement measures that are reactionary in nature and fail to pay attention to the longer-term implications of these measures. Poor attention to future climate risks can be particularly problematic when utilising hard adaptation measures, such as building physical infrastructure, as these can lock in maladaptation if semi-quantitative to quantitative climate risk assessments have not been conducted. Overall, these factors can create maladaptation over the short to long term, and there is an urgent need for improved coordination and collaboration between these actors.

In conclusion, these insights serve as a stepping stone for the FGS and development and humanitarian partners to better understand current climate risk management gaps and more effectively address them in policies and interventions. Addressing these gaps can accelerate the ability of all actors to leverage further finance for climate adaptation activities in Somalia.

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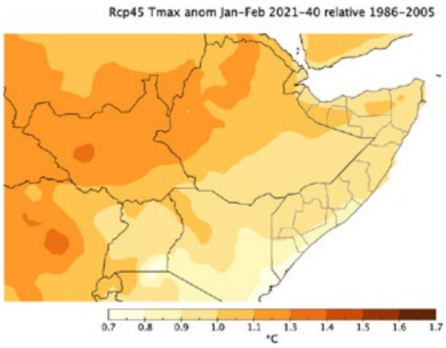
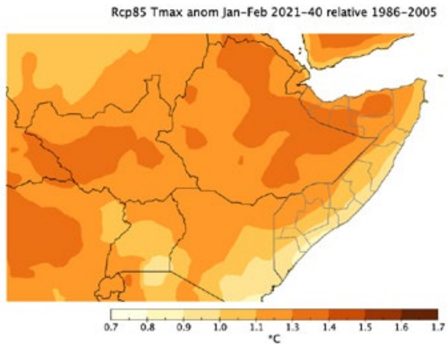
ANNEX 1: CORDEX AFRICA CLIMATE PROJECTIONS FOR HORN OF AFRICA

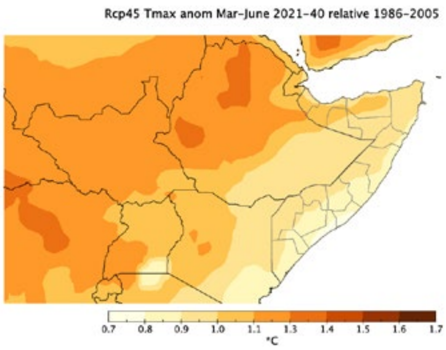
FIGURE A1. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF MAXIMUM TEMPERATURE (TX) INCREASES OVER 2021–2040 (SHORT TERM) RELATIVE TO 1986–2005. THE LEFT COLUMN DEPICTS PROJECTIONS USING RCP4.5; THE RIGHT COLUMN DEPICTS PROJECTIONS USING RCP8.5. THE TEMPERATURE ANOMALY SCALE IS FROM 0.7°C TO 1.7°C

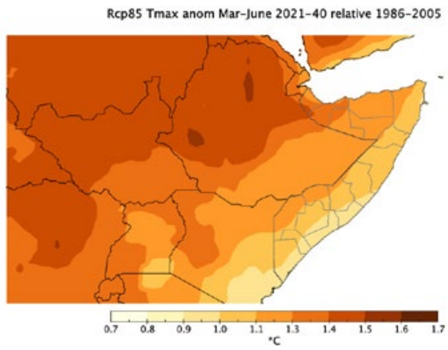
JANUARY–FEBRUARY



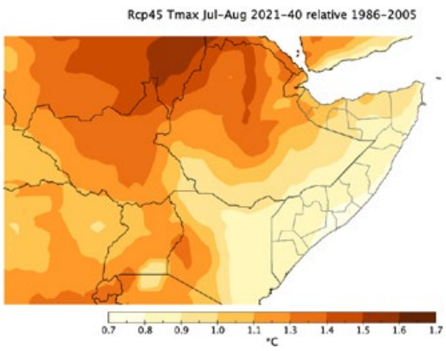


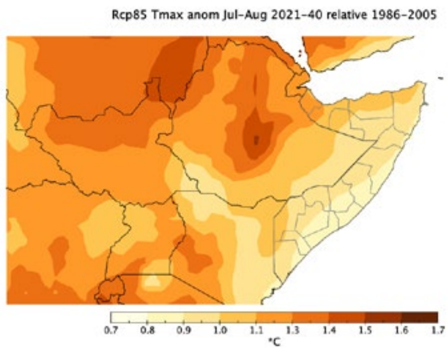
MARCH–JUNE



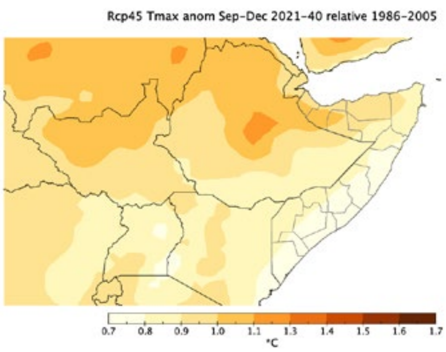


JULY–AUGUST





SEPTEMBER–DECEMBER



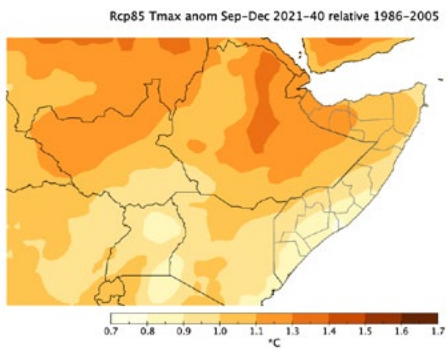
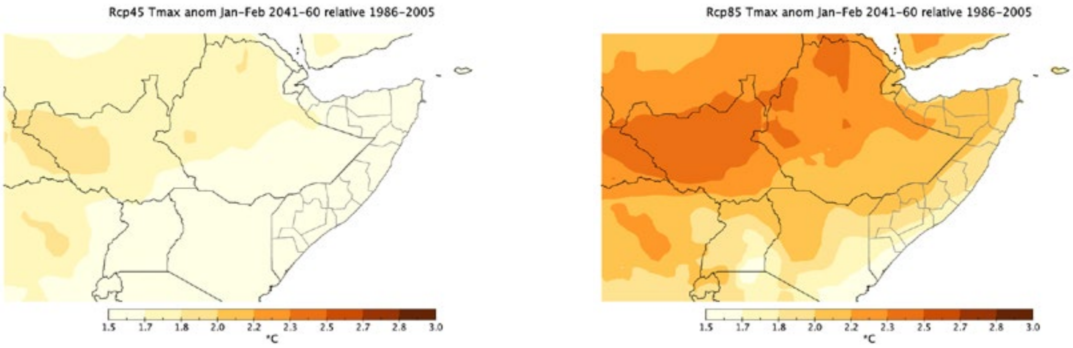


FIGURE A2. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF MAXIMUM TEMPERATURE (TX) INCREASES OVER 2041–2060 (MEDIUM TERM) RELATIVE TO 1986–2005. THE LEFT COLUMN DEPICTS PROJECTIONS USING RCP4.5; THE RIGHT COLUMN DEPICTS PROJECTIONS USING RCP8.5. THE TEMPERATURE ANOMALY SCALE IS FROM 1.5°C TO 3.0°C

JANUARY–FEBRUARY



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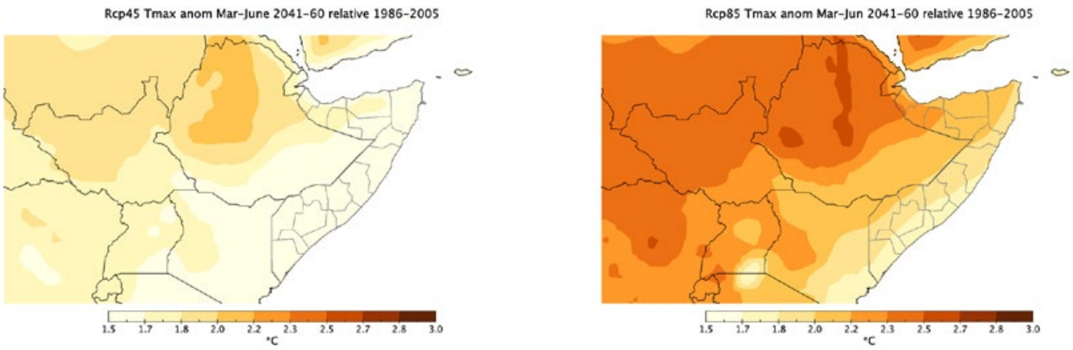

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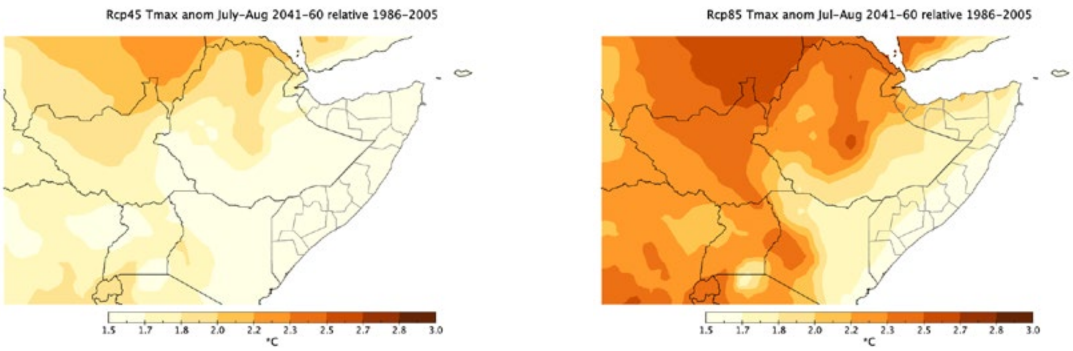

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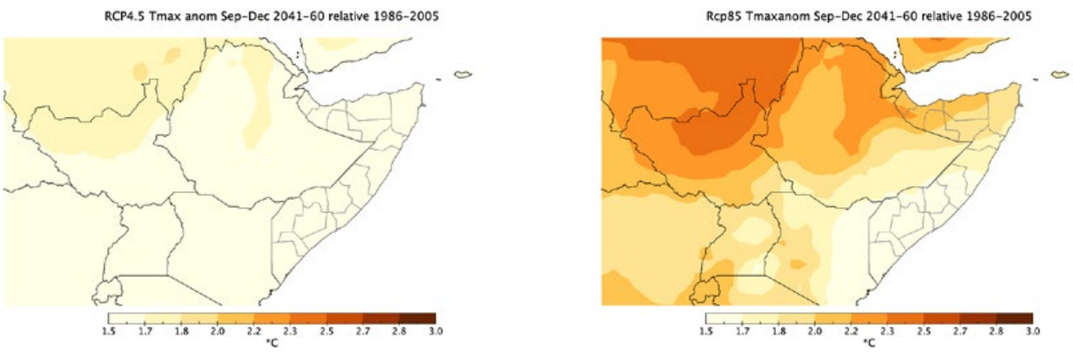
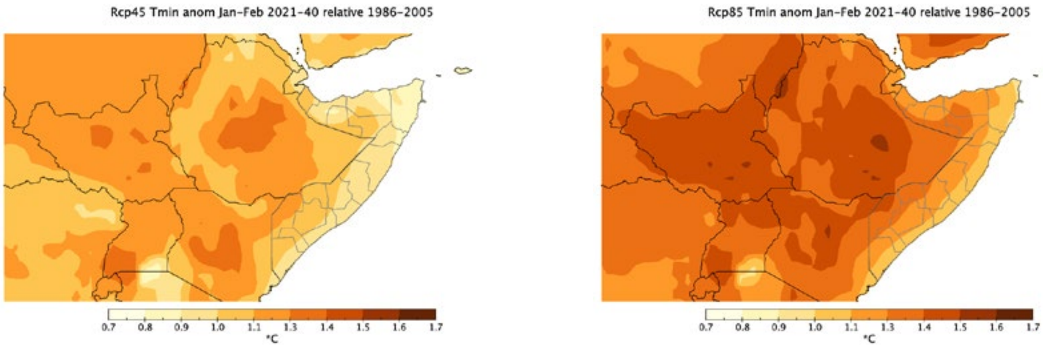


FIGURE A3. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF MINIMUM TEMPERATURE (TN) INCREASES OVER 2021–2040 (SHORT TERM) RELATIVE TO 1986–2005. THE LEFT COLUMN DEPICTS PROJECTIONS USING RCP4.5; THE RIGHT COLUMN DEPICTS PROJECTIONS USING RCP8.5. THE TEMPERATURE ANOMALY SCALE IS FROM 0.7°C TO 1.7°C

JANUARY–FEBRUARY



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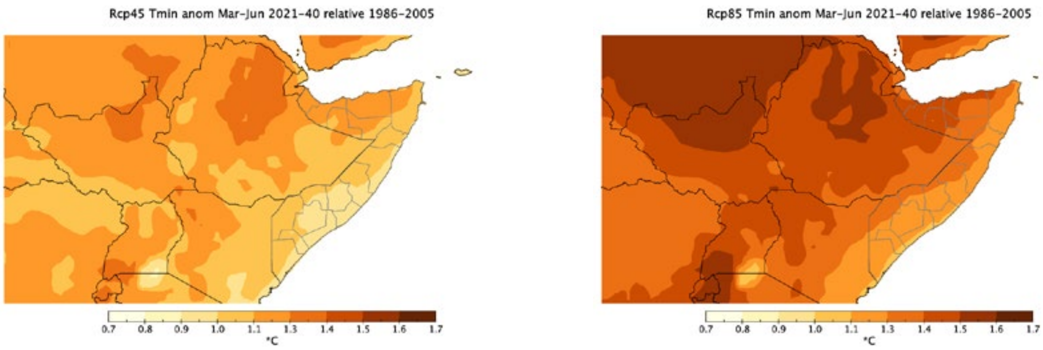
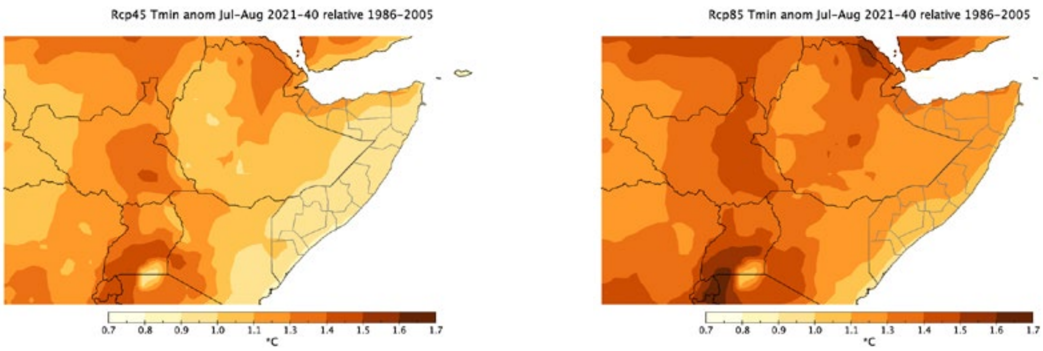


JULY–AUGUST



SEPTEMBER–DECEMBER

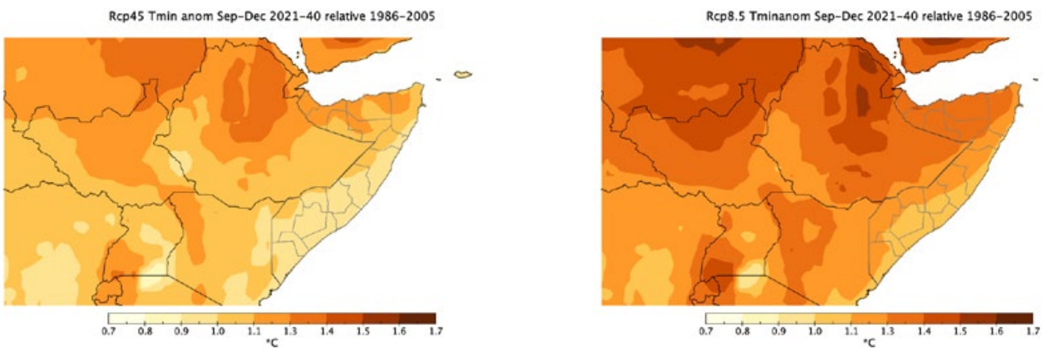
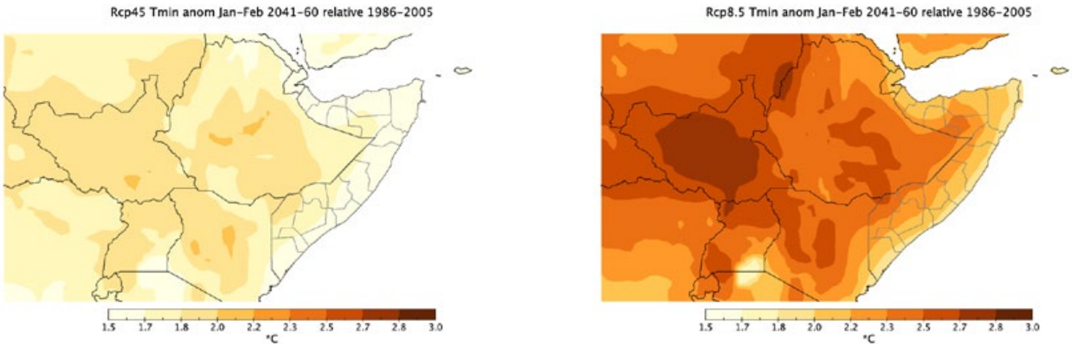
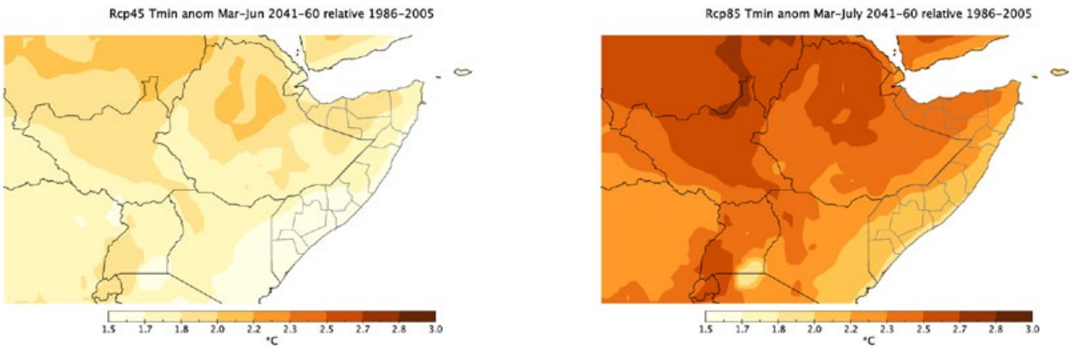


FIGURE A4. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF MINIMUM TEMPERATURE (TN) INCREASES OVER 2041–2060 (MEDIUM TERM) RELATIVE TO 1986–2005. THE LEFT COLUMN DEPICTS PROJECTIONS USING RCP4.5; THE RIGHT COLUMN DEPICTS PROJECTIONS USING RCP8.5. THE TEMPERATURE ANOMALY SCALE IS FROM 1.5°C TO 3.0°C

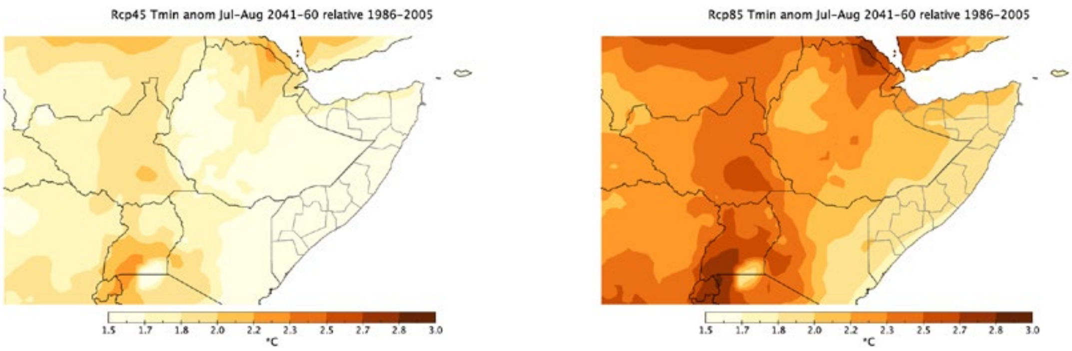
JANUARY–FEBRUARY



MARCH–JUNE



JULY–AUGUST



SEPTEMBER–DECEMBER

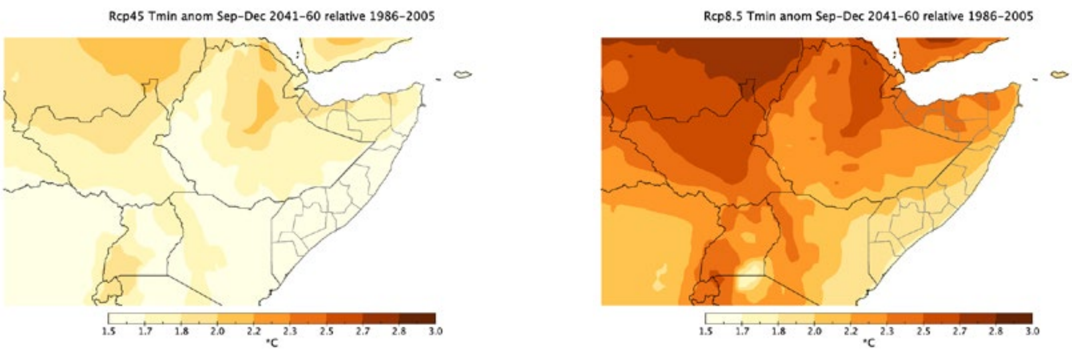
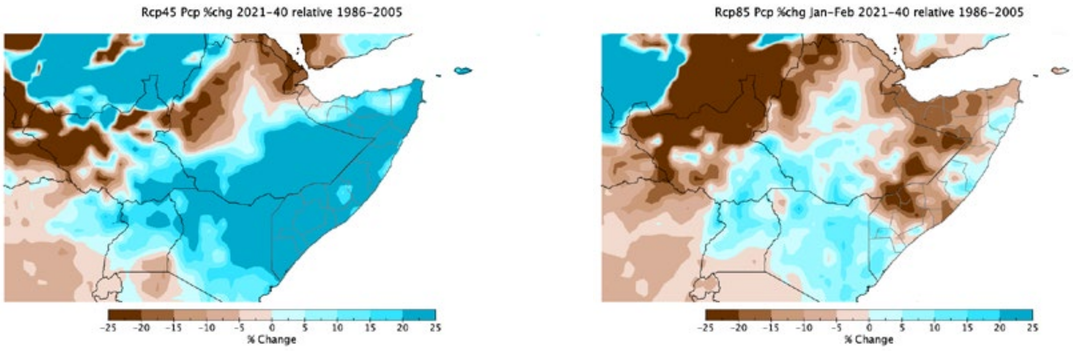


FIGURE A5. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF PERCENT CHANGE IN SEASONAL PRECIPITATION TOTALS OVER 2021–2040 (SHORT TERM) RELATIVE TO 1986–2005. THE LEFT COLUMN DEPICTS PROJECTIONS USING RCP4.5; THE RIGHT COLUMN DEPICTS PROJECTIONS USING RCP8.5. THE PERCENT CHANGE SCALE RANGES FROM -25% TO 25%

JANUARY–FEBRUARY



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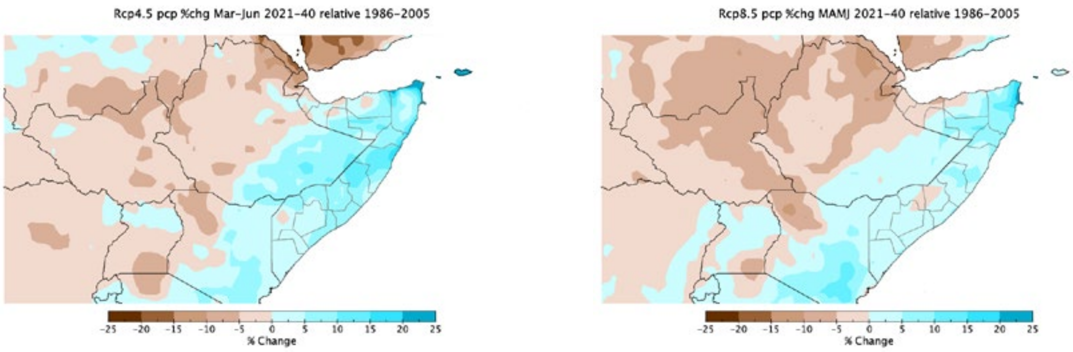
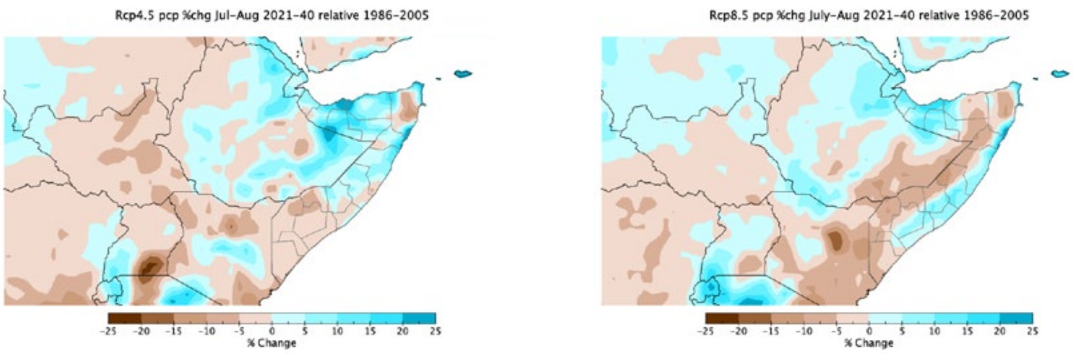


JULY–AUGUST



SEPTEMBER–DECEMBER

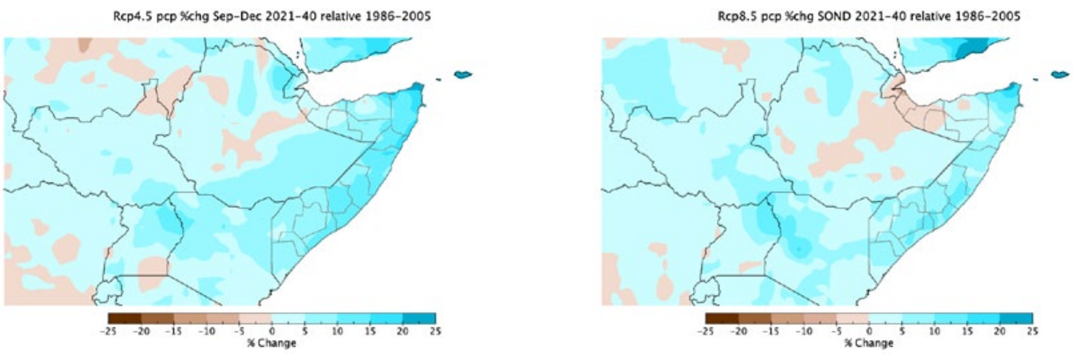
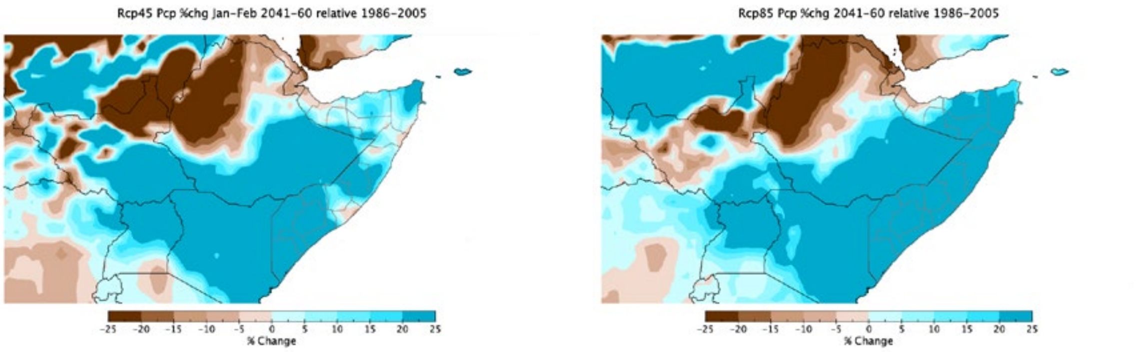
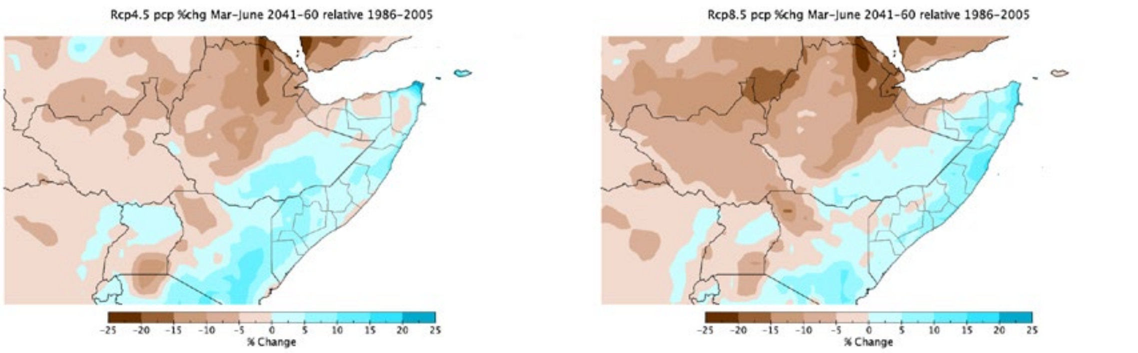


FIGURE A6. CORDEX AFRICA MULTI-MODEL MEDIAN PROJECTION OF PERCENT CHANGE IN SEASONAL PRECIPITATION TOTALS OVER 2041–2060 (MEDIUM TERM) RELATIVE TO 1986–2005. THE LEFT COLUMN DEPICTS PROJECTIONS USING RCP4.5; THE RIGHT COLUMN DEPICTS PROJECTIONS USING RCP8.5. THE PERCENT CHANGE SCALE RANGES FROM -25% TO 25%

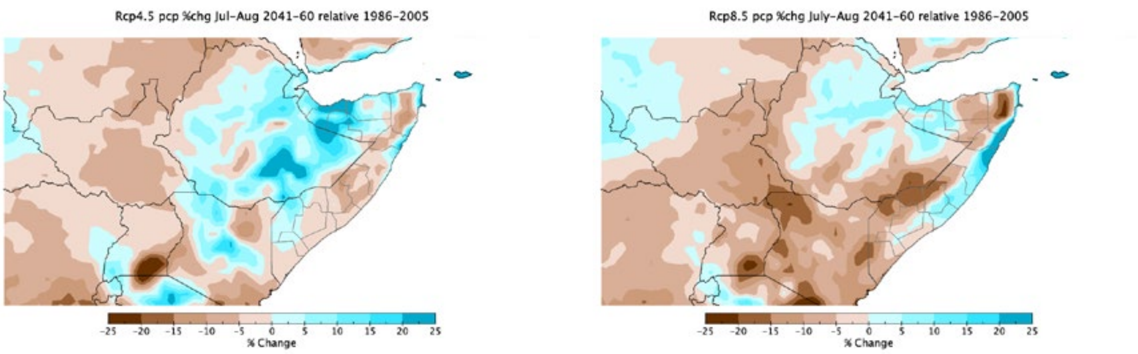
JANUARY–FEBRUARY



MARCH–JUNE



JULY–AUGUST



SEPTEMBER–DECEMBER

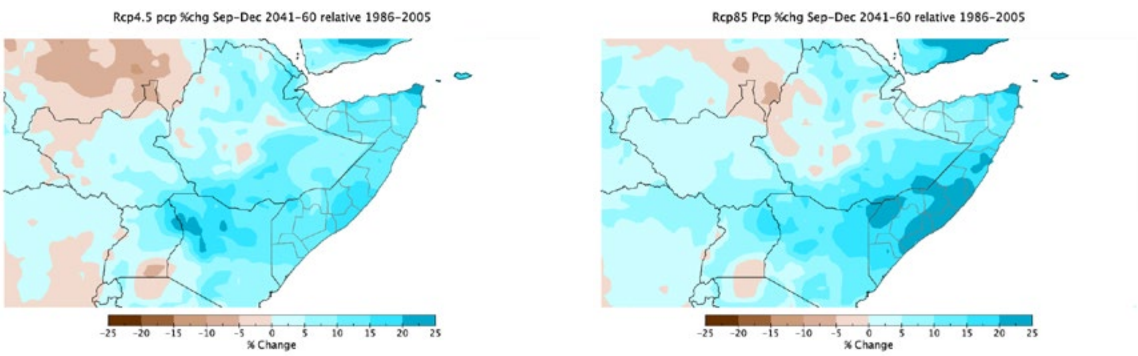


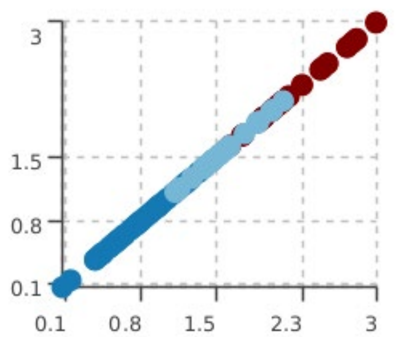
TABLE A1. CORDEX AFRICA: NORTH EASTERN AFRICA REGION. AREA-AVERAGED MULTIPLE CLIMATE MODEL PROJECTIONS ARE PRESENTED FOR SEASONAL AND ANNUAL CHANGES IN MAXIMUM TEMPERATURES OVER THE SHORT TERM (2021–2040) AND MEDIUM TERM (2041–2060), RELATIVE TO 1986–2005

Maximum temperature (TX) changes for 2021–2040		
Season	**Scenario and model spread* (°C)**	
January – February	RCP4.5 RCP8.5	0.7 to 1.4, median 1.1 0.9 to 1.6, median 1.2
March – June	RCP4.5 RCP8.5	0.8 to 1.4, median 1.1 0.9 to 1.6, median 1.3
July – August	RCP4.5 RCP8.5	0.6 to 1.5, median 1.1 0.8 to 1.5, median 1.1
September – December	RCP4.5 RCP8.5	0.7 to 1.3, median 1.0 0.7 to 1.4, median 1.1
Annual	RCP4.5 RCP8.5	0.8 to 1.3, median 1.0 0.9 to 1.5, median 1.2

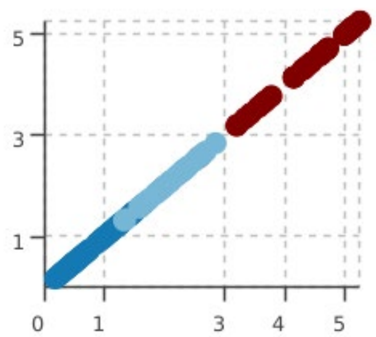
Maximum temperature (TX) changes for 2041–2060		
Season	**Scenario and model spread* (°C)**	
January – February	RCP4.5 RCP8.5	1.2 to 2.1, median 1.6 1.6 to 2.7, median 2.1
March – June	RCP4.5 RCP8.5	1.4 to 2.0, median 1.7 1.8 to 2.6, median 2.2
July – August	RCP4.5 RCP8.5	1.3 to 2.0, median 1.6 1.6 to 2.8, median 2.1
September – December	RCP4.5 RCP8.5	1.2 to 1.9, median 1.5 1.4 to 2.6, median 2.0
Annual	RCP4.5 RCP8.5	1.4 to 2.0, median 1.6 0.6 to 2.6, median 2.1

Model uncertainty (annual only)

RCP4.5: 21 models



RCP8.5: 31 models



■ Short term (2021–2040) ■ Medium term (2041–2060) ■ Long term (2081–2100)

High model agreement: All models under both scenarios project an increase in maximum temperatures into the future.

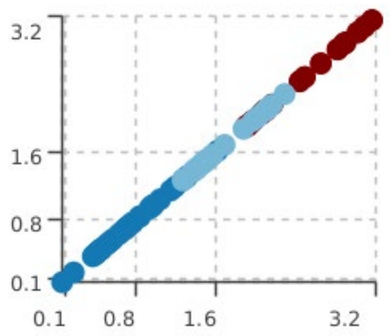
TABLE A2. CORDEX AFRICA: NORTH EASTERN AFRICA REGION. AREA-AVERAGED MULTIPLE CLIMATE MODEL PROJECTIONS ARE PRESENTED FOR SEASONAL AND ANNUAL CHANGES IN MINIMUM TEMPERATURES OVER THE SHORT TERM (2021–2040) AND MEDIUM TERM (2041–2060), RELATIVE TO 1986–2005

Minimum temperature (TN) changes for 2021–2040	
Season	**Scenario and model spread* (°C)**
January – February	RCP4.5 0.8 to 1.5, median 1.1 RCP8.5 0.9 to 1.7, median 1.3
March – June	RCP4.5 0.8 to 1.5, median 1.1 RCP8.5 1.0 to 1.8, median 1.4
July – August	RCP4.5 0.8 to 1.5, median 1.1 RCP8.5 0.9 to 1.6, median 1.2
September – December	RCP4.5 0.8 to 1.5, median 1.1 RCP8.5 0.9 to 1.6, median 1.3
Annual	RCP4.5 0.8 to 1.5, median 1.1 RCP8.5 1.0 to 1.7, median 1.3

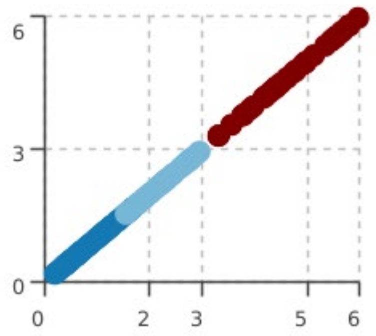
Minimum temperature (TN) changes for 2041–2060	
Season	**Scenario and model spread* (°C)**
January – February	RCP4.5 1.3 to 2.2, median 1.7 RCP8.5 1.8 to 2.8, median 2.4
March – June	RCP4.5 1.4 to 2.1, median 1.1 RCP8.5 1.8 to 2.8, median 2.4
July – August	RCP4.5 1.4 to 2.1, median 1.7 RCP8.5 1.6 to 2.6, median 2.1
September – December	RCP4.5 1.3 to 2.1, median 1.7 RCP8.5 1.6 to 2.8, median 2.3
Annual	RCP4.5 1.4 to 2.1, median 1.7 RCP8.5 1.7 to 2.8, median 2.3

Model uncertainty (annual only)

RCP4.5: 21 models



RCP8.5: 31 models



■ Short term (2021–2040) ■ Medium term (2041–2060) ■ Long term (2081–2100)

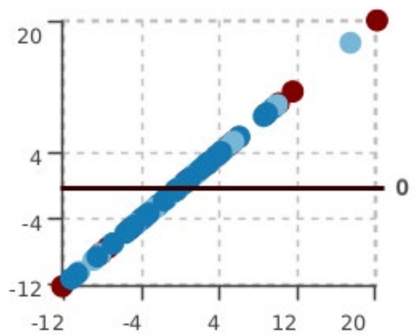
High agreement: all models under both scenarios project an increase in minimum temperatures into the future. Models are less certain about severity of TN increases in the long term, with a larger spread of potential increases than over the short and medium terms.

TABLE A3. CORDEX AFRICA: NORTH EASTERN AFRICA REGION. AREA-AVERAGED MULTIPLE CLIMATE MODEL PROJECTIONS ARE PRESENTED FOR SEASONAL AND ANNUAL PERCENT CHANGES IN PRECIPITATION TOTALS OVER THE SHORT TERM (2021–2040) AND MEDIUM TERM (2041–2060), RELATIVE TO 1986–2005

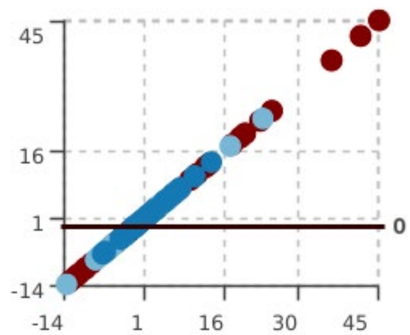
Precipitation % changes for 2021–2040	
Season	**Scenario and model spread (%)**
January – February	RCP4.5 -4.1 to 6.0, median 1.2 RCP8.5 -26.0 to 21.3, median 0.8
March – June	RCP4.5 -8.1 to 6.8, median -1.2 RCP8.5 -15.2 to 6.8, median -2.7
July – August	RCP4.5 -4.1 to 6.0, median 1.2 RCP8.5 -7.2 to 8.5, median 0.6
September – December	RCP4.5 -3.0 to 11.3, median 4.9 RCP8.5 -0.1 to 11.7, median 4.7
Annual	RCP4.5 -4.1 to 6.0, median 1.2 RCP8.5 -4.2 to 3.9, median 0.9
Precipitation % changes for 2041–2060	
Season	**Scenario and model spread (%)**
January – February	RCP4.5 -8.2 to 5.4, median 0.8 RCP8.5 -16.4 to 55.9, median 18.3
March – June	RCP4.5 -13.5 to 3.7, median -3.7 RCP8.5 -18.6 to 7.2, median -5.3
July – August	RCP4.5 -8.2 to 5.4, median 1.2 RCP8.5 -11.1 to 8.8, median -2.8
September – December	RCP4.5 -3.7 to 14.6, median 7.0 RCP8.5 -0.6 to 21.5, median 9.4
Annual	RCP4.5 -8.2 to 5.4, median 0.8 RCP8.5 -6.6 to 6.3, median 1.6

Model uncertainty (annual only)

RCP4.5: 21 models



RCP8.5: 31 models



■ Short term (2021–2040) ■ Medium term (2041–2060) ■ Long term (2081–2100)

Low model agreement: large uncertainty in future annual precipitation trends for both scenarios. Some models project an increase (above the zero line), while others project a decrease.

ANNEX 2: IN-DEPTH PROJECT ANALYSIS – LIST OF PROJECTS

Note: **Projects highlighted in red** did not have any publicly available information. Project information is self-reported by funders and implementers and may contain inaccuracies.

Project title	Description	Start year	End year	Funder(s)	Value ($)
Life-Saving and Sustainable WASH Interventions for Drought and Conflict Affected Populations of Somalia/ Somaliland	This project aims to improve the public health status and living conditions of conflict and disaster-affected populations in Somalia/Somaliland through sustainable water, sanitation and hygiene interventions. The project specifically targets affected populations in Lasanood district in Sool, Badhan district in Sanaag, and Buaro and Buhoodle districts in the Togdheer regions of Somaliland/Somalia.	2020	2021	King Salman Humanitarian Aid and Relief Centre	2,000,000
Somali Resilience Program (SomReP) 2	SomReP aims to support vulnerable pastoral and farming households in the rural and peri-urban areas of Somalia. SomReP is implemented by a consortium of seven international agencies and was established in response to the 2011 drought in hopes of preventing future disasters. In the context of climatic variability, poverty and the fragile political and security environment in Somalia, it is critical to have the adequate coping mechanisms to withstand recurring shocks and disasters, such as drought and conflicts. The Program aims to enable households to adapt, absorb and transform these shocks into something manageable. SomReP interventions help equip the targeted households with the proper tools, resources and competencies to increase their household productivity. Some of the interventions include resource management, early warning systems, business development, livelihood support, animal husbandry, farming, cash transfers and other safety nets and resilience-building efforts.	2019	2023	Sweden	14,665,250

Project title	Description	Start year	End year	Funder(s)	Value ($)
Drought Resilience and Sustainable Livelihoods Program in the Horn of Africa (DRSLP Phase II)	The main goal of DRSLP Phase II is to stabilise the pastoral and agro-pastoral production systems, improve livelihoods and improve the resilience of the production systems. The programme's specific objectives include improving: • water availability and accessibility, as well as the environment through land degradation and desertification control measures • livestock production and management, animal health and infrastructure for market access • human and institutional capacities to handle agro-pastoral production, improve policy and institutional frameworks • opportunities for women in terms of water management, accessing markets and generating more income. Project Components: • Natural Resources Management • Market Access and Trade • Livelihoods Support • Capacity Building and Project Management Expected Outcomes: • Improved agriculture and livestock productivity and production • Improved access to natural resources • Diversified livelihood source	2014	2023	African Development Bank	21,000,000
Building Resilience Communities in Somalia (BRCiS,DEVCO2): Drought Recovery and Resilience in Hiran, Galgaduud and South Mudug Regions	The BRCiS project is a humanitarian consortium that takes a holistic approach to supporting Somali communities in developing their capacity to resist and absorb minor shocks without undermining their ability to move out of poverty. The consortium consists of Cooperazione e Sviluppo (CESVI), Concern Worldwide, the Norwegian Refugee Council (NRC), the International Rescue Committee and Save the Children International. Cutting across the 'Humanitarian–Development' spectrum, the BRCiS programme balances its response to short-term humanitarian needs with the longer-term aim of building community and household capacities to deal with the shocks and stresses that drive humanitarian needs. Thus, the project provides a variety of humanitarian and rehabilitation/development assistance that improves the absorptive (short-term) and adaptive (medium- and long-term) capacities of communities and households. The nexus of the two results in transformation of the communities from cyclically vulnerable to having in-built capacities to handle shocks and stresses. The overall objective of the project is to contribute to strengthening the resilience of drought-affected communities and Internally Displaced Population (IDP) households in Hiraan, Galgaduud and South Mudug regions of Somalia. The project targets 85,580 drought-affected pastoralists, agro-pastoralists, urban poor and IDPs (11, 782 households, HHs) in 38 communities across Hiraan (Matabaan and Beletweyne), Galgaduud and South Mudug (Abudwaq, Hobyo, Dhusamareb and Cabudwaq) regions of Somalia. Out of this total number of beneficiaries, 1,500 children are targeted in Bari and Nugaal regions of Puntland as part of the emergency education component. As a member of the BRCiS consortium, CESVI implements the project activities in Beletweyne (Hiraan), Galkayo and Hobyo (Mudug).	2017	2020	Directorate-General for International Cooperation and Development (DG DECVO)	177,623,611

Project title	Description	Start year	End year	Funder(s)	Value ($)
Improving Disaster Risk Management and Food Security to Strengthen Resilience in Somaliland	This project works to increase the food security of agro-pastoral and pastoral communities through the use of improved, agro-ecological methods and good agricultural practices that are adapted to climate change and consider the principles of the One Health approach. The project's aims are to increase the agricultural production,reduce harvest and post-harvest crop losses, increase food safety, and reduce economic and political gender inequality as well as high youth unemployment through measures in the fields of income improvement, food security and food safety as well as disaster risk management. The project works to strengthen governmental institutions as well as villages in the selected regions of Maradi Jeex, Saaxil and Togdheer in the field of disaster risk management. The project further aims to contribute to the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030.	2020	2023	Germany	11,149,425
Breaking the Climate-Conflict Cycle in Galmudug, Somalia	This project addresses the climate-conflict nexus in Somalia and seeks to address and reverse the 'multiplier effect' that climate change has on violent conflict in specific regions of the country and to enhance the capacity of conflict- and displacement-affected communities to adapt to the negative effects of climate change.	2022	2023	EU	6,382,979
Breaking the Climate-Conflict Cycle in Hirshabelle, Somalia	The primary focus of this project is to reduce environmental-induced displacement and conflict in Hirshabelle State, specifically in Mataban, through a holistic approach involving tangible investment in natural resource infrastructure, pragmatic innovations for water and energy capture, livelihood opportunities in the agro-pastoralist sector and reforestation.	2022	2024	EU	2,127,660
Somalia Multi-Sectoral Humanitarian Response Program	The goal of the Somalia Multi-Sectoral Humanitarian Response Program is to reduce the vulnerability of populations in Somalia affected by the multiple shocks of drought, COVID-19 and desert locust invasion, prioritising IDPs, rural pastoralists and agro-pastoralists.	2021	2022	Bureau of Humanitarian Affairs	20,775,000
Food Security in the Horn of Africa, Measures to Combat Drought in Somalia (Urban Food Security Project)	The Urban Food Security Project aims to improve food, nutrition and water security and increased resilience to disasters in vulnerable Somaliland communities. The project supports prerequisites for improved food security regarding the dimensions of access to and physiological utilisation of food from drought-driven IDPs, returnees and vulnerable residents in Kismayo.	2017	2022	Germany	17,272,727
Emergency Post Flood Food Production and Drought Mitigation	This project seeks to address food insecurity challenges resulting from erratic climatic patterns. It does so through five key components: (1) maximised food production in severely flooded riverine areas by transforming ongoing emergency status to opportunities to secure good harvests (2) future flood and drought impacts mitigated through the improvement of water intrastructure and management systems (3) employment and resilience built within extremely disadvantaged coastal communities; (4) information and evidence base maintained and strengthened for effective, efficient programming (5) emerging livelihood needs addressed and opportunities seized.	2018	2019	FCDO	15,813,738

Project title	Description	Start year	End year	Funder(s)	Value ($)
Building Resilience: Provision of Safety Net Assistance in the Form of Unconditional Cash-Based Transfers that Improve their Food Security and Enhance Self-Reliance	Provision of unconditional cash transfers to targeted poor and vulnerable households in rural areas.	2022	2025	World Bank	110,790,106
Building Resilience: Supporting Food-Insecure People to Withstand Shocks and Stresses Better Throughout the Year	Provision of conditional and unconditional food and/or cash-based food assistance and nutritional messaging to food-insecure households through predictable safety nets, including school meals.	2022	2022		87,395,685
Enhancing Climate Resilience	Approximately 70% of Somalis are dependent on climate-sensitive agriculture and pastoralism. As floods and droughts become more severe and frequent in Somalia, there is a need to find approaches that can reduce the sensitivity of farmers and pastoralists to increasing rainfall variability. With natural resource degradation also rampant throughout Somalia, most notably for charcoal production, Somalia is becoming increasingly vulnerable to conflicts over scarce resources. Climate change and resource scarcity are exacerbated by the absence of policies on land-use and disaster risk management at the national level. At local levels, communities lack the financial, technical and informational resources needed to build their resilience to climate change as well as the knowledge of how to prepare for extreme weather impacts. To address these issues, Least Developed Countries Fund (LDCF) financing will be used to support ministries, districts and non-governmental organisations/community-based organisations (CBOs) to integrate climate change risks in natural resource management and disaster preparedness. Climate risk management will be institutionalised from national to local levels. CBOs will be revitalised to take the lead on implementing community-based, ecosystem-based flood preparedness and other adaptation measures. To support community-led activities, water will be captured using small-scale infrastructure, and flood impacts will be reduced with water diversion techniques and reforestation. With 73% of the population under 30 years of age, youth will be sensitised with climate change knowledge so that they can serve understaffed ministries and support on-the-ground CBO efforts. Furthermore, the project will empower women to market and to scale-up distribution of adaptation technologies, providing them with an improved asset base. With such activities aimed to support resilience to climate change, in conjunction with other ongoing initiatives of relevance outlined in this project document, LDCF resources are expected to also build governing and planning capacities at the national and district levels and to enhance the adaptive capacity of vulnerable populations throughout Somalia.	2014	2019	Global Environmental Facility, United Nations Development Programme	12,326,481

Project title	Description	Start year	End year	Funder(s)	Value ($)
Emergency Food Security Program Phase two (EFSP II)	EFSP II is designed to improve food security for vulnerable drought- and conflict-affected HHs in the Galgadud, Mudug, Sanaag and Sool regions through UCT and CCT with nutrition as complementary.	2019	2021	United States Agency for International Development	31,000,000
South West State Drought Recovery Program	This project improves resilience and increases adaptive capacities of communities and households in Somalia to protect their livelihoods over continuing shocks. The focus will be on strengthening three key capacities: (1) absorptive, adaptive and transformative capacities so that communities can better adapt their livelihoods to stressed conditions (2) be organised for and have contingency resources to absorb shocks and stress (3) have governance mechanisms to manage livelihoods resources, manage disaster risk reduction plans, build contingency resources, manage natural resources and mitigate conflict.	2017	2019	ACF, ACTED, ADRA, World Vision, EU	6,710,227
Biyoole Project - Water for Agro-Pastoral Productivity and Resilience - P167826	The Water for Agro-Pastoral Productivity and Resilience, or 'Biyoole', project's development objective is to improve water and agricultural services among agro-pastoralist communities in dryland areas of Somalia. There are four main components to the project: (1) supporting the development of multiple use water sources ($15 million) (2) institutional and capacity development ($6 million) (3) supporting sustainable land management and livelihoods development around water points ($9.50 million) (4) project management, monitoring and evaluation, knowledge management and learning ($9 million). The project seeks to enhance water infrastructure and livelihoods support in rural drylands of Somalia, covering 100 rural communities across all 6 states, with the potential for rapid scale-up. Biyoole will help improve rural resilience in all six states. Biyoole will dampen the impacts of climate change by providing improved access to water and by strengthening the adaptive capacity and livelihood resilience of rural communities. The initial focus of Biyoole is to strengthen resilience in the northern and central parts of Somalia that are more frequently affected by drought. The project will also help improve the availability of water for longer periods, thereby reducing water-related displacement and resources-based conflicts. Pilot projects (with sand dams, in particular) have demonstrated that water harvesting and storage in drylands can be increased through investment in small dams, such as sand dams, subsurface dams and infiltration galleries. Biyoole will also support income generation through sustainable livelihoods for vulnerable people and catalyse economic growth in rural areas. Enhanced water access will support domestic use and livestock watering (and improved health outcomes), small-scale irrigation and environmental services.	2019	2023	World Bank	10,209,484

Project title	Description	Start year	End year	Funder(s)	Value ($)
Joint Resilience Programme Somalia - Supporting Resilient Smallholder Farming System	This project is a joint venture between the United Nations World Food Programme (WFP) and Food and Agriculture Organization of the United Nations (FAO) working with the Ministry of Agriculture and Irrigation and the farmers' cooperatives. The project consolidates and complements FAO's and WFP's past and ongoing interventions for enhancing livelihoods, resilience and economic development. The outcome of the project will be to enhance food and nutrition security and incomes, thereby improving the resilience of communities to threats and crises.	2019	2023	Sweden	6,376,196
Community Resilience in Somaliland and Puntland (CRISP)	The CRISP project aims to strengthen the resilience of the vulnerable community members dwelling in Puntland and Somaliland. The two main CRISP project outcomes are to: (1) increase the capacity of communities to prepare for and manage climate-related shocks and disasters through Climate Adaptive Village methodology, community contingency planning, and strengthening the management and financial planning of community institutions that are responsible for collective infrastructure (2) strengthen livelihood security through action in four thematic areas: (a) water (b) agriculture (c) livestock/fisheries (d) income diversification. The project's target beneficiaries are (107,219 individuals corresponding to 15,317 households) vulnerable agro-pastoral households, women and youth.	2018	2022	EU	5,402,111
Leveraging Resilience Gains in Southwest State Somalia: Food Security to Market Entry	This project aims to increase the resilience of chronically vulnerable Somali people, households, communities and systems to climatic shocks and other related risks in targeted pastoral, agro-pastoral, coastal and peri-urban livelihood zones by 2023.	2020	2023	BMZ, Germany	4,022,989

Project title	Description	Start year	End year	Funder(s)	Value ($)
Protection and Assistance to IDPs living in Somalia	According to the 2019 Humanitarian Response Plan, Somalia has one of the largest populations of IDPs in the world, with an estimate of 2.6 million IDPs, the majority of whom are in south-central Somalia. Somalia continuously experiences floods and droughts, including in the past few years, and this has instigated more displacements, especially in Kismayo, Baidoa and Mogadishu. Lack of livelihood and land evictions are other drivers of displacement in many parts of Somalia. The significant increase of populations in urban centres has intensified pressure on already limited services, such as health, education and housing. The rising trend of forced evictions, influenced by increasing urban population density, growing property prices and a lack of tenure security or regulatory frameworks, constitutes a significant and prevalent protection threat for IDPs and poor urban families. IDPs are exposed to a higher risk of forced eviction because of exposure to unequal power dynamics and exploitative relationships with landowners, through informal settlement managers (frequently called 'gatekeepers'). According to 2019 Humanitarian Response Plan, between January and October 2018, over 234,000 persons were evicted throughout Somalia, representing a 40% increase compared to the same period in 2017. Mitigating measures leveraged by the United Nations Refugee Agency (UNHCR) to address these risks include advocacy (both direct and through clusters), eviction monitoring (through the UNHCR-led Protection and Return Monitoring Network (PRMN)), and proactive measures to support government-led local integration strategies and capacity building of local authorities to support and extend housing, land and property rights to populations of concern. Capacity building of the Benadir Regional Administration on lawful evictions is a significant element of UNHCR's engagement in the EU-funded multi-partner REINTEG project implemented in Benadir. According to assessments carried out by NADOFOR and FSNAU between December 2018 and January 2019, about 1,588,250 people in Somaliland need humanitarian assistance due to poor performance of seasonal (Dery) rains in 2018. Regions that are experiencing drought and critical food insecurity include Togdheer, Sool, Sanaag, Saahil and Awdal regions. Hawd pastoral areas in Maroodi Jeex regions are in critical conditions while Sahil and Awdal, known as Guban pastoral, are in a state of emergency. This aggravates the humanitarian crisis by increasing vulnerabilities and protection risks to IDPs. Many IDPs in protracted displacement remain in situations with no progress towards durable solutions, resulting in systemic marginalisation. The protection crisis is also characterised by entrenched but fluid societal divisions, aggravated by competition for resources, compounded by chronic poverty and underdeveloped legal and policy frameworks, and hampered by governance. All these factors impact humanitarian assistance delivery and the right to freedom of movement.	2020	2020	UAE	109,000
Protection and Return Monitoring Network (PRMN)	PRMN is a UNHCR-led trend analysis project uniquely designed to monitor, document and report on population movements and protection challenges in Somalia. Essentially, it is a coordinated system of humanitarian agencies providing a range of protection services designed to inform humanitarian planning, trigger appropriate protection responses, facilitate advocacies at different levels and enhance assessment capacities across Somalia.	2021	2021	UNHCR	1,400,000

Project title	Description	Start year	End year	Funder(s)	Value ($)
PRMN	PRMN is a UNHCR-led trend analysis project uniquely designed to monitor, document and report on population movements and protection challenges in Somalia. Esseintially, it is a coordinated system of humanitarian agencies providing a range of protection services designed to inform humanitarian planning, trigger appropriate protection responses, facilitate advocacies at different levels and enhance assessment capacities across Somalia. Overall, PRMN seeks to achieve three central outcomes around which the project logic is framed: (1) availability of information necessary to inform responsive and strategically targeted humanitarian response in Somalia (2) enhanced access to emergency protection assistance for populations victimised by serious protection incidents (3) facilitation of joint multi-sectoral assessments.	2021	2021	UNHCR	1,400,000
PRMN	PRMN is a UNHCR-led trend analysis project uniquely designed to monitor, document and report on protection challenges and displacements, including returns of populations in Somalia. The project is conceptualised on protection and population movement trend analysis framework. Essentially, it is a coordinated system of humanitarian agencies providing a range of protection services designed to inform humanitarian planning, trigger appropriate protection responses, facilitate advocacies at different levels and enhance assessment capacity across Somalia. Overtime methodologies and outputs have been refined and diversified to accommodate evolving context dynamics, including key evaluation recommendations. PRMN seeks to achieve three central outcomes around which the project logic is framed: (1) availability of information necessary to inform responsive and strategically targeted humanitarian response in Somalia, (2) enhanced access to emergency protection assistance for populations victimised by serious protection incidents and (3) facilitation of joint multi-sectoral assessments.	2022	2022	UNHCR	1,519,926
Provision of Shelter Assistance to IDPs and Host Communities in Puntland and Galmudug States	The project aims to enhance the protection and improve the basic living conditions of protracted and spontaneous IDPs and vulnerable host communities in Puntland and Galmudug states through the construction of 200 transitional (hybrid) shelters with verandahs and HH family latrines, the provision of 3,000 in-kind Non-Food Item, the provision of 3,000 Emergency Shelter Kits through cash and housing land and property support. Support will prioritise communities affected by recurrent shocks, droughts, flooding and conflict that have been exacerbated by poor past rainy seasons in many parts of the regions.	2021	2021	UNHCR	750,000

Project title	Description	Start year	End year	Funder(s)	Value ($)
Support to Agricultural Productivity in Somalia (SAPS)	The SAPS project (€3.5 million overall financing envelope) is uniquely designed to bridge the gap between humanitarian and development financing, and the mutually reinforcing objectives of peace building and sustainable development. The overall project goal is to enhance food security and peace stabilisation in the project area through community infrastructure and increased agricultural productivity. The goal achievement is expected to contribute to a socio-political stabilisation of the project area, through reconciliation and peace building. The project will support the Government of Somalia to develop the agricultural production capacity in the Lower Shebelle region by improving the 32.7 km Primo Secondario canal that flows from the Janale barrage past Golweyn to Buulo Mareer and about 7 km of the Bakooro canal and tail drainage channel. To ensure the long-term sustainability of the rehabilitated infrastructures, SAPS proposes to devolve the canal management to the introduction of a third-party canal operator who, under a Public-Private Partnership arrangement, will be responsible for the canal operation and maintenance under the overall supervision of the Ministry of Agriculture. In parallel, large landowners and small farmers owning land along and nearby the canal will receive climate adaptive and agricultural support (i.e. agricultural packages, introduction to drought resistance crops, specific agricultural trainings; establishment of farmers field schools, demonstration plots, etc.). To achieve the above-mentioned project goal, the inception phase of the project will work on sensitising local communities to the long-term benefits of the productive infrastructures as well as to other agriculture and capacity building activities promoted by the project. These activities will be key for ensuring SAPS's successful implementation. Given the continuing low-level conflict in the region, SAPS could be crucial for stemming this conflict by creating common economic interests and therefore for reducing the incentives for clans to engage in conflict. The successful implementation of SAPS could be also significant to pave the way for the design of other development/humanitarian projects, which are currently limited in the area due to security instability. Detailed analyses and mappings of all clans in the region have already been initiated and will feed into project planning and implementation. The International Fund for Agricultural Devlopment and its partners have developed flexible and innovative means of project implementation and supervision, customised to the context and the challenges of the area.	2017	2020	Italy - AICS	3,977,273
Rural Livelihoods Adaptation to Climate Change (RLACC II)	RLACC II is expected to improve the resilience of pastoral and agro-pastoral communities to climate change through: • introducing adaptation strategies to reduce the negative impacts of climate change and strengthen the capacity of pastoral/agro-pastoral households to cope with climatic hazards • enhancing the capacity of communities to not only absorb shocks but to also effectively adapt their livelihoods to harsher climatic conditions • helping pastoral and agro-pastoral households manage drought risks • supporting community-led initiatives to protect, conserve and restore natural resources in a sustainable and climate-resilient manner • strengthening the participation of pastoral communities in planning and implementing activities pertaining to their development outcome • improving resilience to climate change.	2017	2023	Global Environmental Facility, African Development Bank	9,986,683

Project title	Description	Start year	End year	Funder(s)	Value ($)
Social Transfers for Vulnerable Somali People (SAGAL)	The SAGAL project is part of the EU Trust Fund's Inclusive Local and Economic Development programme and will provide long-term support to the challenges of chronic poverty and vulnerability of mothers, youth and the elderly. The project will be implemented, in partnership with the Ministry of Labour and Social Affairs, by the Somali Cash Consortium led by Concern Worldwide, which also includes Danish Refugee Council, the Norwegian Refugee Council and the Save the Children International. SAGAL aims to improve the lives of more than 265,000 individuals facing conflict, climate-related shocks and disasters. The project will provide these individuals with regular, monthly, cash-based social transfers while also supporting the development of a government-owned social protection system, in line with the Somalia Social Protection Policy. SAGAL has two components: (1) to reduce vulnerability and poverty by limiting the impact of shocks and disasters through the provision of cash-based social transfers to support targeted households and the linking of humanitarian and development approaches (2) to support the building of social protection systems required for a government-led social protection system.	2020	2024	Directorate-General for International Cooperation and Development (DECVO)	31,034,483
SC190055 - Integrated Floods and Drought Response in Central and Southern Somalia	Integrated Floods and Drought Response in central and southern Somalia	2019	2020	Japan	767,857
Programme for Sustainable Charcoal Reduction and Alternative Livelihoods (PROSCAL) European Union (EU)	The overall goal of PROSCAL is to promote energy security and more resilient livelihoods through a gradual reduction of unsustainable production trade and use. The programme has four major objectives: (1) mobilise key stakeholders in the region and build institutional capacity among government entities across Somalia to effectively monitor and enforce the charcoal trade ban, as well as the development of an enabling policy environment for energy security and natural resources management (2) support the development of alternative energy resources (3) facilitate transition towards livelihood options for stakeholders in the charcoal value chain that are sustainable, reliable and more profitable than charcoal production (4) start reforestation and afforestation throughout the country for the rehabilitation of degraded lands. The interventions planned under the Programme would trigger local economic opportunities, thus reducing poverty, halting environmental degradation, improving energy security, enhancing climate and livelihood resilience, promoting social equity amongst vulnerable groups (youth, IDPs and women), diversifying energy sources, reducing conflict and promoting peace and development.	2017	2019	EU	1,533,897
Sida-NRC Strategic Framework Humanitarian Partnership	The overall objective of this project is to ensure that vulnerable displacement-affected populations, including those in hard-to-reach areas, have access to basic humanitarian assistance as well as durable solutions and resilience-based programming in Somalia.	2021	2021	Sweden	1,285,047

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