SPARC
Supporting Pastoralism and Agriculture in Recurrent and Protracted Crises

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TECHNICAL REPORT

ASSESSING AND FINANCING LOSS AND DAMAGE DUE TO CLIMATE CHANGE IN SOMALIA

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About SPARC

Climate change, armed conflict, environmental fragility and weak governance, and the impact these have on natural resource-based livelihoods, are among the key drivers of both crisis and poverty for communities in some of the world's most vulnerable and conflict-affected countries.

SPARC aims to generate evidence and address knowledge gaps to build the resilience of millions of pastoralists, agropastoralists and farmers in these communities in sub-Saharan Africa and the Middle East.

We strive to create impact by using research and evidence to develop knowledge that improves how the FCDO, donors, non-governmental organisations, local and national governments, and civil society can empower these communities in the context of climate change.

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ACRONYMS

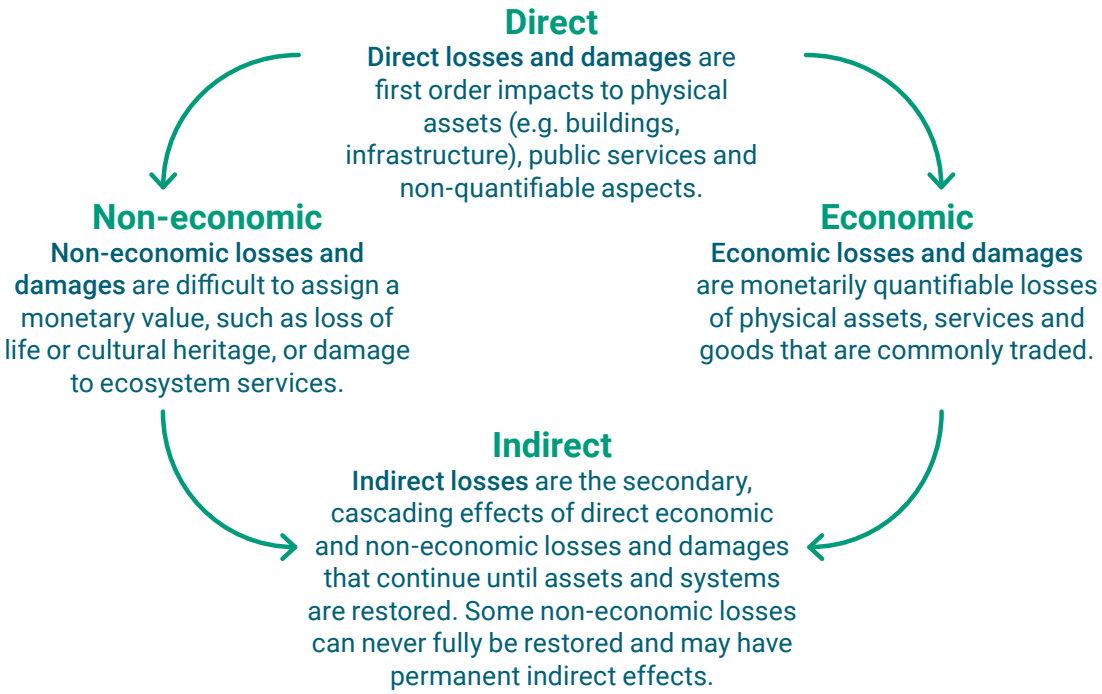
ARC	African Risk Capacity
EEA	Extreme event attribution
ENSO	El Niño Southern Oscillation
FAR	Fractions of attributable risk
IOD	Indian Ocean Dipole
NDC	Nationally Determined Contribution
PDNA	Post-disaster needs assessment
UNFCCC	United Nations Framework Convention on Climate Change

1 INTRODUCTION

Somalia is already experiencing significant losses and damages from human-induced climate change. The direct economic impacts from extreme climate events[1] such as droughts and floods affect vital sectors like agriculture and livestock. Agriculture, including the livestock sector, is Somalia's largest employer and second-largest commodity export. Nearly one fourth of the population are agropastoralists, with smallholder farming making up approximately 80% of total crop production and 70% of marketed produce. More than 60% of the Somali population depends on livestock, which contributes 40% to the country's GDP (Government of Somalia, 2018a).

Losses and damages can result from extreme weather and climate events that occur over a relatively short time — such as floods, heat waves and droughts. They can also stem from slow-onset processes like increasing temperatures and shifting precipitation patterns in seasons, sea-level rise or ocean acidification. These slow-onset processes, in turn, can contribute to desertification, biodiversity loss, land and forest degradation, and salinisation of coastal water and soils. Losses and damages from extreme and slow-onset events manifest in various forms, including direct and indirect losses and damages, and economic and non-economic losses and damages (Figure 1).

FIGURE 1: DIMENSIONS OF LOSS AND DAMAGE FROM EXTREME EVENTS AND SLOW-ONSET PROCESSES



1 For simplicity, we use 'extreme event' throughout the rest of this report as a catch-all to refer to both extreme weather event (e.g. floods or storms) and extreme climate events (e.g. droughts persisting over one or more seasons).

BOX 1: METHODOLOGY FOR CLIMATE-ATTRIBUTABLE DIRECT ECONOMIC LOSS AND DAMAGE

This report follows Newman and Noy (2023) and Panwar et al. (2023) in using information from extreme event attribution (EEA) studies to estimate the plausible climate change-attributable direct economic loss and damage triggered by extreme events in Somalia.

Loss and damage figures for this report are estimated from the records of number of deaths, number of people affected, and total economic damage available in the EM-DAT database (CRED, n.d. (www.emdat.be)). The extrapolation of agriculture losses and damages is based on average contribution of the agriculture sector to the total economic loss and damages reported across post-disaster needs assessment studies that were conducted between 2008 and 2024 in the Sahel and Greater Horn of Africa region.

To quantify the share of loss and damage plausibly linked with climate change, these socioeconomic costs are then multiplied with fractions of attributable risk (or FAR, for short). The FAR is calculated based on information from extreme event attribution studies. It represents the ratio of the probability of the climate extreme occurring with and without climate change. For further details about this methodology and its limitations, please refer to Panwar et al. (2023).

It is important to keep in mind that the totals presented in this brief are likely significant underestimates of the actual drought- and flood-related loss and damage in Somalia. This is because loss and damage from past events is known to be underreported in disaster impact databases like EM-DAT, especially for: (1) certain geographies (including Somalia and other countries on the African continent), (2) some indicators (especially economic impact), (3) relatively small local events that may not draw much attention on their own, but that could have high cumulative impact, and (4) specific hazards that are important in Somalia (including drought and heat waves) (EM-DAT, n.d.; Panwar and Sen, 2020; Enenkel et al., 2024).

Estimating climate-attributable losses and damages is essential for ensuring they are appropriately addressed through national and international policy, finance and action. However, past efforts to quantify them have often overlooked the extent to which climate change plays an attributable role in exacerbating the intensity and/or frequency of extreme events. This distinction, though complex, is crucial for shaping appropriate institutional responses and financing mechanisms under the UNFCCC. Despite improvements in data availability and attribution science, there remains a scarcity of assessments that quantify climate change-attributable loss and damage, particularly in data-poor contexts like Somalia. This gap in knowledge hinders effective policy formulation and access to international support.

Hargeisa livestock market buying and selling. Credit ILRI Peter Ballantyne

To help address this gap, this report has two main objectives:

- To provide national-level policy-makers in Somalia with new estimates of current and potential future direct economic climate-attributable loss and damage, to support national planning and international advocacy for loss and damage finance. The report recognises that direct economic losses and damages are only part of the total costs of climate change. Therefore, it also discusses evidence on the indirect economic and non-economic impacts of extreme and slow-onset events.

- To suggest recommendations for Somali policy-makers and the international finance community for addressing loss and damage and dealing with identified loss and damage data gaps.

The report is organised as follows: the second section discusses climate change in Somalia; the third presents evidence on the different dimensions of loss and damage in the country; the fourth section discusses how loss and damage is currently being addressed and financed; and the final section provides recommendations. A synopsis of the methodology for calculating losses and damages is presented in the Box 1; for a more complete description, see Panwar et al. (2023).

2 CLIMATE EXTREMES, CHANGE AND VULNERABILITY IN SOMALIA

2.1 Somalia's recent climate context: what do the attribution studies say?

Somalia receives most of its annual precipitation during two rainy seasons: Gu from ~mid-March to June, and Deyr from ~mid-September to December; there are variations in the onset and length of the rainy seasons depending on the part of the country (Gulati et al., 2023). There is high natural variability in the rainy seasons (abnormally wet or dry), corresponding to cycles in the El Niño Southern Oscillation (ENSO), Indian Ocean Dipole (IOD), the Pacific Decadal Oscillation and other natural climate phenomena (ibid.).

An El Niño, the warm phase of ENSO, is linked with above-average rainfall during Deyr; a positive IOD also leads to above-average Deyr rains (Camberlin, 2009; Onyutha, 2016). When an El Niño event overlaps with a positive IOD, this can lead to an extremely wet Deyr and contribute to severe flooding, such as happened in 1997/1998 and in 2023. Conversely, La Niña, with or without a negative IOD, tends to correspond with rainfall deficits and droughts during both rains, such as happened during the droughts of 2010/2011 and 2020–early 2023. However, flooding in Somalia is not only triggered by heavy rainfall in the country; it may also be triggered by heavy rainfall in the headwater reaches of the Juba and Shabelle Rivers in the Ethiopian highlands (Gulati et al., 2023).

Determining the attribution of climate change to individual flood and drought events in Somalia, or across the Horn of Africa, is challenging due to both a relative lack of attribution studies and the high natural variability of rainy seasons. For instance, studies are inconclusive as to whether climate change played an attributable role in the 2010/2011 drought in which both the Gu and Deyr rains were below normal. The failed 2010 Deyr corresponded with a La Niña without a climate change signal (Lott et al., 2013). The persistent, strong La Niña appears primarily responsible for the delayed onset and failure of the 2011 Gu rains, although climate change might have played a limited role (Lott et al., 2013; Otto et al., 2018).

Studies for Somalia, the Greater Horn of Africa and East Africa have been able to indicate the likely extent of climate change's role in heavy rainfall (contributing to flooding), below-normal rainfall and above-average temperatures (contributing to drought) for some major extreme events between 2000 and 2023 (see Table 1). Other extreme events that contributed to significant direct or indirect losses and damages either do not have attribution studies and/or are within the range of natural variability.

TABLE 1: CLIMATE CHANGE ATTRIBUTION IN MAJOR FLOOD AND DROUGHT EVENTS, 2000–2023

Event	Climate change attribution signal
Floods: heavy rainfall October–December 2006	Not likely. No attribution studies found; but likely related to normal variability (Jury, 2011)
Drought: rainfall deficit October–December 2010	No (Lott et al., 2013; Otto et al., 2018)
Drought: rainfall deficit April–June 2011	Uncertain (Lott et al., 2013; Otto et al., 2018)
Drought: rainfall deficit April–June 2014	Yes, likely – due to warmer air temperatures, and warming sea temperatures in the western Pacific (Funk et al., 2015; Marthews et al., 2019)
Flood: heavy rainfall October–December 2015	Likely – climate change contributed to a very strong El Niño at the same time as a positive IOD (which was within natural variability) (Funk et al., 2016)
Drought: rainfall deficits in Deyr 2016 extending through Gu 2017	Yes – climate change contributed to warmer air temperatures and higher evapotranspiration (Funk et al., 2019; Han et al., 2022)
Flood: heavy rainfall in April 2020 during Gu	No (Thalheimer, 2020)
Drought: Five consecutive deficient rainy seasons from Gu 2021 through Gu 2023	Yes – climate change contributed to lower rainfall, warmer air temperatures and higher evapotranspiration (Kimutai et al., 2023a)
Flood: heavy rainfall October–December 2023	Yes – climate change intensified the positive phase IOD (Kimutai et al., 2023b)

2.2 Climate change projections for Somalia

Climate models agree that year-to-year rainfall variability will continue to increase (Binder et al., 2022). However, they disagree about whether seasonal and annual rainfall will increase or decrease in Somalia in the near term (2021–2040). Over the medium term (2041–2060), climate models point to a potential small increase in Gu and Deyr rains when compared with historical seasonal values from 1986–2005. In the long term (2070–2099), climate models indicate a possible increase in annual mean precipitation, driven by a potential increase in Deyr rains (Gulati et al., 2023); this could potentially increase flooding.

The frequency of 1-in-50 year 5-day extreme rainfall events is projected to increase between 1.9% and 8% by the 2050s (World Bank, 2021; Seneviratne et al., 2021). This is because climate change is already having a detectable influence on the frequency and strength of the ENSO (Haszpra et al., 2020; Cai et al., 2023), intensifying the Indian Ocean Dipole (Cai et al., 2020) and leading to warmer sea surface temperatures in the west Pacific Ocean (Funk et al., 2016). The overall higher likelihood of extreme rainfall events by the 2050s could lead to an increase

in flood events in the absence of water management and land-use planning in Somalia, as well as limited coordination with upstream countries (Ethiopia and Kenya) where the Jubba and Shabelle rivers and some of their tributaries originate.

Uncertainty is especially high about whether meteorological droughts (i.e. rainfall deficits) will become more frequent or not, with different models indicating a potential change in drought frequency between −2% and 20% depending on the emissions scenario (Haile et al., 2020; Gutiérrez et al., 2021). Confidence in agroecological and hydrological drought projections is currently low.

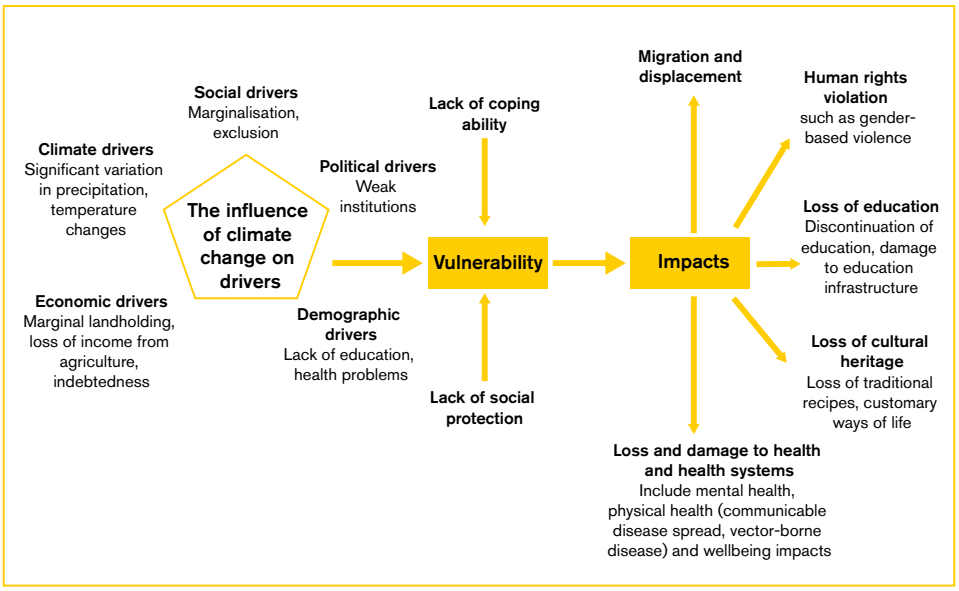
Loss and damage related to extreme heat events is not analysed in the report because of a lack of data on the impacts from past heat events. However, climate models indicate that the number of days exceeding a daytime temperature of 40°C is likely to increase in parts of Somalia by the 2030s (Awdal, Bari, Gedo and parts of Lower and Middle Juba regions), and in additional regions (Bakool, Bay, Hiraan and parts of Galgaduud) by the 2050s (Gulati et al., 2023); indicating that loss and damage from extreme heat deserves greater attention in loss and damage data and climate policy for Somalia.

Finally, there is high certainty that sea levels will rise further along the Somalia coastline due to climate change. Compared to the year 2000, the median model increase is projected to be in the range of 11–12 cm by 2030, 20–21 cm by 2050 and 36–42 cm by 2080, depending on the emissions scenario (Binder et al., 2022).

2.3 Somalia's climate vulnerability context

It is Somalia's high underlying vulnerabilities to climate variability and change that turn the impacts of such extreme events into disasters with significant losses and damages (see Figure 2).

FIGURE 2: VULNERABILITY AND CLIMATE EVENTS LEADS TO IMPACTS



Source: Adapted with permission from Bharadwaj et al. (2024).

The country's vulnerability is fundamentally driven by a lack of socioeconomic development – limited basic services like water and electricity, transportation, schools and healthcare, diversified markets and livelihoods, etc. – due to decades of conflict (Government of Somalia, 2022). Ongoing, protracted violent conflict perpetrated by non-state armed groups, namely Al Shabaab, is threatening the development gains and climate mitigation and adaptation efforts of the current Federal Government. The conflict kills and maims, leads to destruction of infrastructure and market access and presents challenges for government and humanitarian aid access.

The country's economy is at a crossroads. Livelihoods are predominantly based on a mixture of farming and livestock and account for ~65% of GDP and most employment (Government of Somalia, 2018b), 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 agropastoralism (Gulati et al., 2023). This situation challenges the ability of city governments and urban dwellers to provide and access adequate housing, sanitation, water supply, electricity and other services.

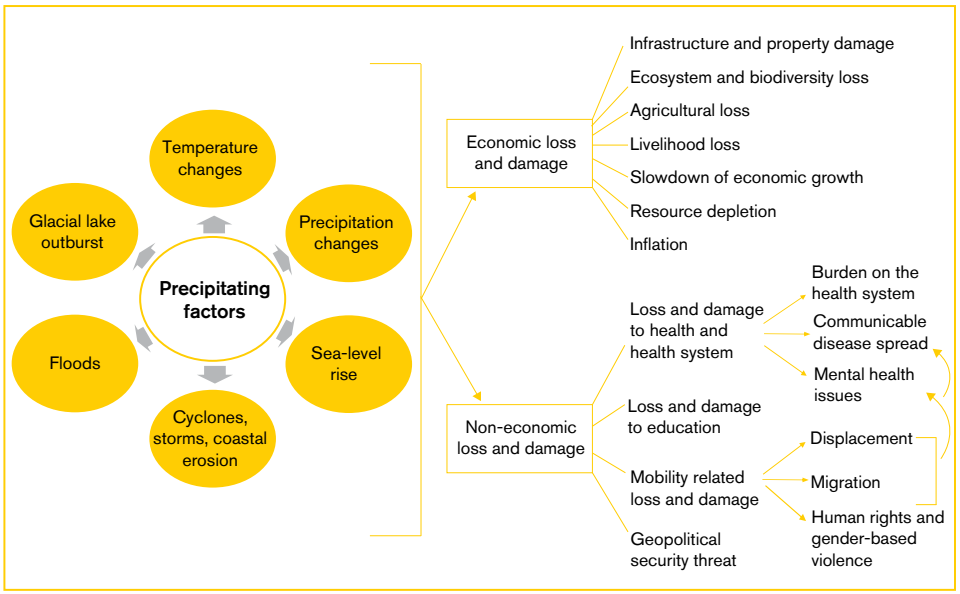
Reliable access to electricity remains low (~33% of urban and 4% of rural areas as of 2018); a situation related to the lack of a national grid (Gulati et al., 2023). There is currently a high dependency on charcoal for cooking in rural and urban areas, and it is a significant source of income for rural 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).

Camels in Somalia. Credit: EU_ECHO / Anouk Delafortrie

Water is critical to Somalia's socioeconomic development. Water security is threatened by deforestation, land-use change and soil erosion, which create conditions for local desertification (Government of Somalia, 2018b). 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 the expansion of agriculture into previously forested areas as people flee conflict. For example, in the south, rates of deforestation for charcoal production exceed forest growth (ibid.), and livestock populations are estimated to exceed the carrying capacity of rangelands, particularly in areas affected by recurrent drought (Government of Somalia, 2020a). Water and environmental management together not only determine the success and sustainability of the country's socioeconomic development but also create or reduce vulnerabilities to climate change.

These vulnerability factors combine with extreme events and slow-onset processes to trigger the disasters – the economic and non-economic losses and damages – that Somalia is experiencing (see Figure 3). Recurrent extreme events, coupled with slow-onset events, further exacerbate the vulnerability of Somalia's people, their livelihoods and ecosystems, by eroding assets and savings, keeping or pushing people into poverty, disrupting markets and impacting natural resources. Some of these losses and damages are explored in more depth later in the report. Breaking the vulnerability traps and cycles will require a significant strengthening of ambition and action around climate-resilient development on the part of the Federal Government of Somalia and its states' governments. However, Somalia will face difficulties in achieving climate-resilient development including poverty eradication without significant climate finance, including from loss and damage funds.

FIGURE 3: EXTREME AND SLOW-ONSET EVENTS TRIGGER LOSSES AND DAMAGES



Source: Adapted with permission from Bharadwaj et al. (2024).

3 LOSS AND DAMAGE FROM CLIMATE CHANGE IN SOMALIA

3.1 Direct attributable human and economic loss and damage from extreme events

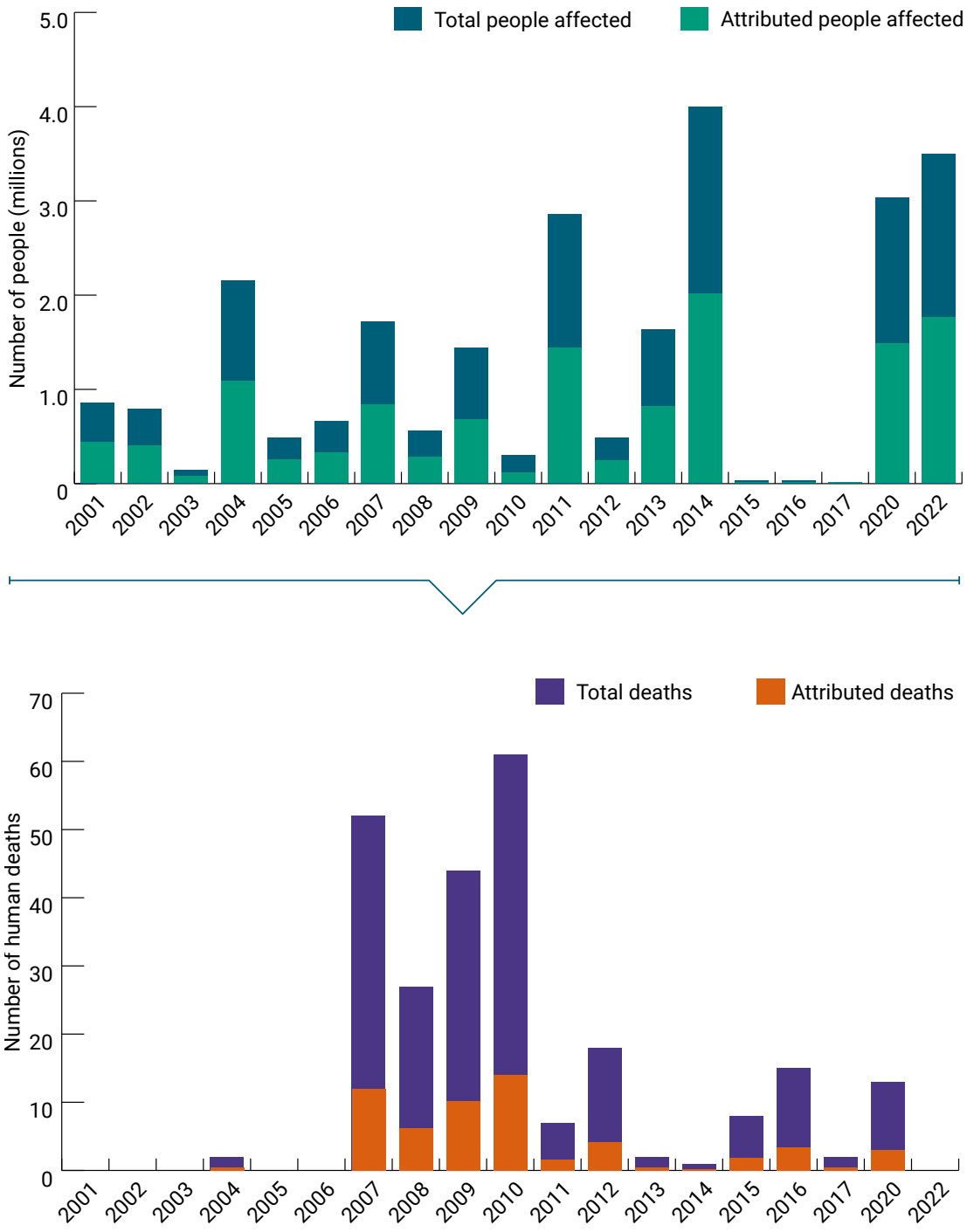
Climate change is likely to have played a role in about half of the total 20,300 recorded human deaths associated with flooding or drought in Somalia between 2000 and 2021. A total of 31 million people are estimated to have been directly affected by droughts and floods – through injury, losing homes or assets or suffering other direct impacts. About 45% of this total is associated with events influenced by climate change (Figure 4).

Direct economic loss and damage to the agriculture sector in Somalia are estimated to have totalled $5.68 billion, of which about half – $2.84 billion, representing 5% of agriculture GDP on average between 2000 and 2021 – could be attributable to climate change. This means that climate-attributable livestock and crop loss and damage of (on average) $129 million are already incurred each year in Somalia.

From 2008 to 2011, a series of droughts in the Horn of Africa triggered a cycle of heightened and persistent food insecurity. In combination with other factors – including conflict, low incomes, escalating global commodity prices, marginalisation of certain ethnic groups and insecurity limiting humanitarian access – the droughts are estimated to have plunged 17% of the population of southern and central Somalia into famine conditions (Majid and McDowell, 2012; Maxwell and Fitzpatrick, 2012). The cascading impacts of the droughts exacerbated poverty and other elements of vulnerability in the country.

A peak in human deaths can be observed in 2010 during the severe 2010/2011 drought. More than 250,000 deaths in Somalia were caused by the ensuing famine. However, the famine arose from the combined interaction of political instability, difficulties in securing and distributing humanitarian aid because of insecurity (namely Al Shabaab), and border closures (Slim, 2012; Majid and McDowell, 2012). While neighbouring countries Kenya and Ethiopia also experienced high rates of food insecurity and malnutrition, only Somalia officially experienced famine (ibid.). The number of deaths and people affected during 2010/2011 is emblematic of the importance of addressing underlying drivers of vulnerability, such as insecurity, as part of efforts to reduce losses and damages.

FIGURE 4: NUMBER OF DEATHS AND PEOPLE AFFECTED FROM DROUGHTS AND FLOODS IN SOMALIA



Source: Authors' analysis, based on disaster damage records of EM-DAT, using global average fractions of attributable risk for floods and droughts. Note: years 2000, 2001, 2002, 2008, 2009, 2011, 2014, 2015 and 2021 have no reported deaths in the EM-DAT database and are likely missing data.

The 2016–2017 drought pushed 20 million people into acute food insecurity in Ethiopia, Kenya and Somalia (Lung et al., 2021). The drought severely affected agriculture and livestock sectors in Somalia, causing estimated crop and livestock production losses of $1.7 billion and damages to crops and from deceased livestock of $350.7 million (Government of Somalia, 2018a). As the drought was unfolding, Saudi Arabia imposed a livestock import ban on animals from Somalia due to suspicions of Rift Valley Fever. This led to a decline in the value of Somali exports, of which the livestock trade typically accounts for about 80% of the total. The ban contributed to a decline in currency and worsened the external trade balance at a time when Somalia was having to import food to meet basic food requirements (ibid.).

Parts of the country had little chance to recover from the impacts of the 2016–2017 drought before being impacted by a widespread locust plague (across many parts of the Horn of Africa). Harvest failures and crop losses allowed little economic respite, particularly in the northern part of the country (Levine et al., 2023).

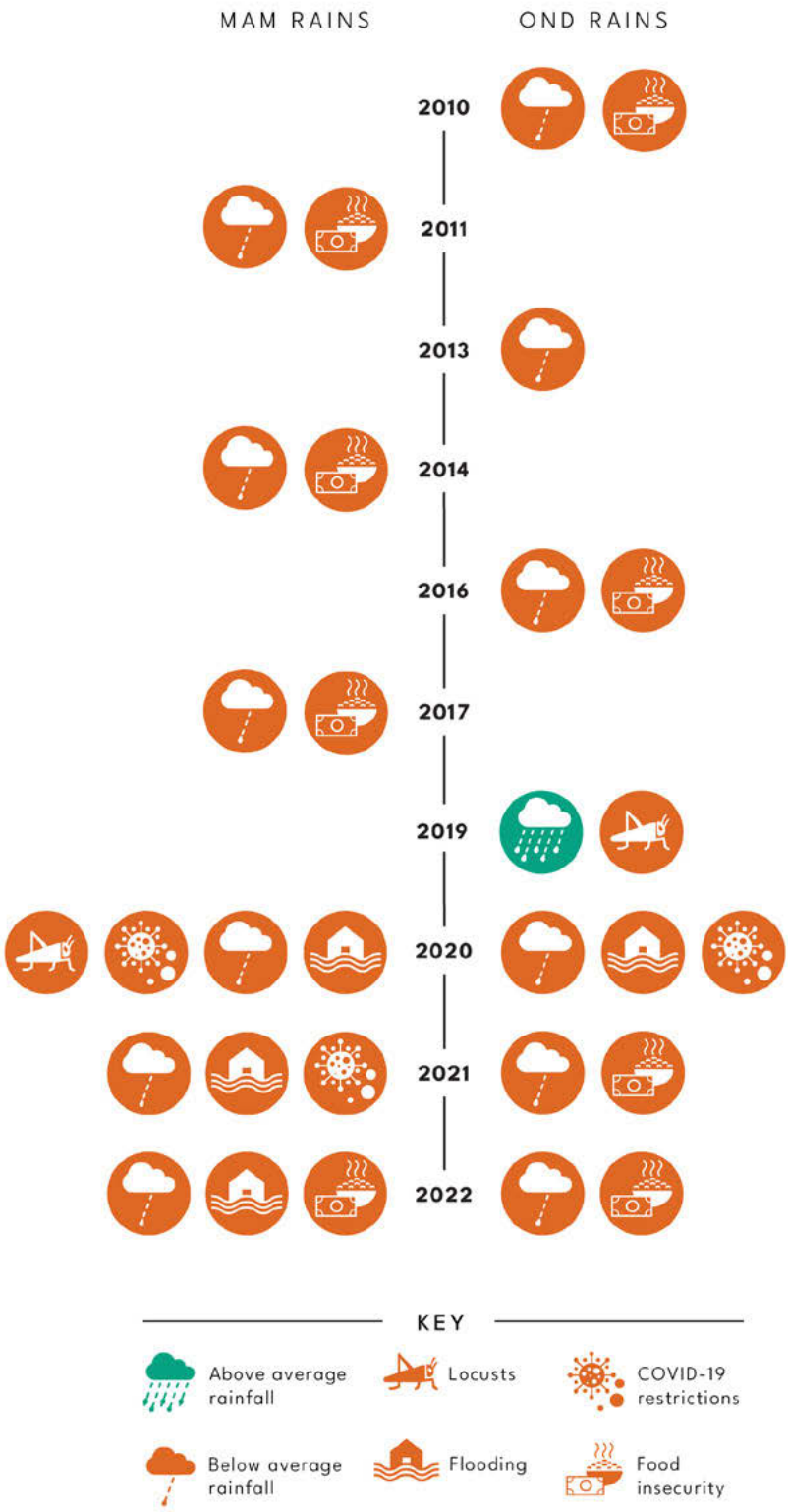
Somalia was hit again with an extended drought over five failed rainy seasons between 2020 and 2022. Farmers and herders lost large shares of their agricultural income, plunging entire communities into poverty. Over eight million people, almost half the country's population, were left acutely food insecure. Some 3.7 million people were internally displaced in search of food and fodder (FEWS NET, 2023). The direct economic losses and damages were exacerbated by concurrent, cascading economic impacts of the COVID-19 pandemic (Levine et al., 2023).

The droughts were followed by Deyr floods in 2023, which decimated recovering farming and livestock activities in central and southern Somalia and contributed to some $126.6 million in damages and $49.5 million in losses (SoDMA, 2024). The cumulative effect of the prolonged 2021–2023 drought followed by flooding was to push four million people (21% of the population) into emergency food insecurity.

On average, direct economic impacts from droughts and floods in Somalia amounted to 7.9% of the country's GDP between 2000 and 2021, excluding the 2010 drought event. About half (3.3% of GDP) of these total losses and damages could be attributable to climate change. Including the 2010/2011 drought, which led to economic damages[2] of over $4 billion, this proportion of attributable loss and damage rises to 8.4% of GDP. Furthermore, on average between 2000–2021 these attributable direct economic losses and damages are equal to 86% of government revenues without the 2010 drought event (over 200% of government revenues including the 2010 drought event). This comparison indicates the financial challenges the Government of Somalia is facing, confronted with the economic consequences of extreme events – particularly when there are concurrent shocks or crises such as the COVID-19 pandemic or ongoing insecurity – while trying to find budget to promote climate-resilient socioeconomic development.

2 The economic damages here exclude climate-attributable statistical loss of life (SLOL) of $4.1 billion.

FIGURE 5: SHOCK TIMELINE IN SOMALIA, 2019–2022



Note: Not all parts of Somalia were affected to the same extent by each of these shocks.

Source: Figure 6, Levine et al. (2023).

3.2 Indirect economic and non-economic losses and damages from extreme weather events

The direct impacts of extreme events can trigger cascading, indirect economic and non-economic losses and damages. Flooding may destroy or damage roads and transport infrastructure; this limits access to markets and hampers farming and pastoral trade activities. Damaged infrastructure can have cascading indirect economic losses that increase the cost of transporting crops/livestock to markets. These market disruptions can in turn contribute to price volatility through commodities shortages and knock-on effects on producers, transporters and the purchasing power of consumers (FAO, 2021; OCHA, 2021). The simultaneous damage and destruction of crops/livestock products reduces incomes and abilities to purchase commodities, at a time in which prices may have risen, and can contribute further to food insecurity. The destruction of infrastructure can further have cascading effects, such as hampering access to essential services and to the timely delivery of humanitarian assistance during emergencies (Government of Somalia, 2024).

The direct impacts of drought can also trigger cascading, indirect losses and damages. Droughts can reduce the quality and quantity of grassland fodder for livestock, as well as water availability (Levine et al., 2023; Government of Somalia, 2021). Such disruptions compromise livestock health and mortality, and affect milk and meat production, further impacting incomes and food security (Levine et al., 2021). Heat waves can trigger heat stress in livestock, leading to reduced feed intake, lower milk production, and greater disease susceptibility (Das et al., 2016; Rahimi et al., 2021).

There are also significant non-economic losses and damages ranging from loss of lives, loss of cultural heritage, mental and physical health impacts, migration and displacement, and loss of ecosystem and biodiversity (Abebe et al., 2023). However, non-economic losses are difficult to quantify and are currently considered only to a limited extent in loss and damage estimates and financing frameworks. The types of non-economic losses and damages that have been associated with extreme weather events in Somalia include:

3.2.1 Environmental impacts and biodiversity loss

Droughts, floods, and storms contribute to deforestation, soil erosion, desertification, and biodiversity loss (FAO, 2021). Somalia already faces significant challenges with soil erosion due to poor agricultural practices (Government of Somalia, 2021), and high rates of deforestation for charcoal production (Gulati et al., 2023). Flooding in particular exacerbates human-caused degradation activities; flood scouring accelerates soil erosion and waterlogging contributes to nutrient leaching, thereby reducing soil fertility and agricultural production.

3.2.2 Conflict and displacement

Extreme events are also a factor of displacement and can exacerbate some types of conflict, with profound repercussions for cultural heritage and social cohesion as people seek alternative livelihood opportunities and coping strategies in the areas to which they have been displaced. While conflict and violence have been the primary drivers of internal displacement in Somalia for decades, extreme events have become more significant triggers of displacement in recent years. Large-scale displacement, including that triggered by extreme events, has also been linked to lack of vaccination, gender-based violence for women and girls, and mental health problems in Somalia and other countries in the region (Lindvall et al., 2020).

Furthermore, extreme events have contributed to competition over access to water, land and grazing areas in Somalia (Albany, 2022; Government of Somalia, 2018b).

3.2.3 Human health

Declining agricultural productivity and livestock losses have contributed to food insecurity and malnutrition among Somalia's farming and pastoral communities (Government of Somalia, 2018b). Droughts and floods can reduce access to clean drinking water and – in combination with inadequate sanitation facilities – increase the risk of vector- and waterborne diseases such as cholera, diarrhoea, malaria, and dengue fever (ibid.). Childhood malnutrition during droughts is linked to high mortality and hampers children's long-term physical and mental development potential (ibid.)

3.3 Projected future climate-attributable risks related to extreme events

Direct and indirect economic losses and damages may increase in the future due to climate change in the absence of strengthened adaptation action, especially in the case of flood-related impacts. This could result in projected cumulative attributable direct economic loss and damage of $24–$27 million from floods by the 2050s, or up to a total of $1.2 billion if statistical loss of life (SLOL) is considered in addition to economic damages. In the case of meteorological drought, cumulative attributable loss and damage may reach $5.0–$5.4 billion by the 2050s, or $91.2–$98.8 billion when SLOL is also included in the estimate. These figures do not include any indirect impacts or non-economic impacts from droughts and floods, so they are likely a severe underestimate of the total potential future loss and damage.

TABLE 2: PROJECTIONS OF FUTURE DROUGHT AND EXTREME RAINFALL IMPACTS IN SOMALIA

2050s projected cumulative attributable loss and damage	
Floods	**Droughts**
Different scenarios indicating a 1.9% to 8% increase in the probability of a 1-in-50 year 5-day rainfall event occurring	Different scenarios indicating a -2% to +20% increase in the probability of a meteorological drought occurring
Economic damage only, excluding statistical loss of life	
$24–$27 million	$5.0–$5.4 billion
Total economic damage and statistical loss of life	
$1.1–$1.2 billion	$91.2–$98.8 billion

Note: Estimates are based on multi-model climate experiments using the scenarios SSP2–4.5 / RCP 4.5 and SSP2–8.5 / RCP 8.5 for East Africa and Somalia.

Sources: Haile et al. (2020), Gutiérrez et al. (2021), Seneviratne et al. (2021) and World Bank (2021).

3.4 Future direct and indirect loss and damage from slow-onset events

Although their impacts may be less visible or immediate compared to more sudden-onset extreme events, slow-onset events, such as sea-level rise or increasing desertification and shifting seasons, can cause profound and long-lasting losses and damages. In contrast with extreme event impacts, which are comparatively well documented, evidence on loss and damage related to slow-onset events is more limited in Somalia (and beyond) (Pichon et al., forthcoming). This section provides an overview of different slow-onset events and discusses the available evidence on related losses and damages for Somalia.

3.4.1 Changes in seasonal and annual rainfall

Rising temperatures and increased rainfall variability present significant challenges to the agriculture and livestock sectors in Somalia, including for crop yield potential. Mean temperatures of 1% above normal have been found to result in average cereal crop losses of around 11.5% between 1985 and 2006 (Warsame et al., 2021). In the future, higher temperatures could lead to a decline in yields, especially for crops such as maize or wheat that are relatively vulnerable to changes in the climate (Richardson et al., 2022). However, there are still high uncertainties in projections of the direction and extent of change in future yields for major staple crops such as rice, maize, cowpeas, millet and sorghum in Somalia (Binder et al., 2022).

Warmer temperatures and higher rainfall during the rainy seasons influence crop pest behaviour. In 2019–2020, hot weather contributed to a major desert locust outbreak which destroyed thousands of hectares of pastures and cropland across East Africa, including Somalia (Levine et al., 2023; OCHA, 2021). The projected changes in temperatures and rainfall patterns may further increase the likelihood of such events by enabling favourable conditions for the breeding, development and migration of desert locusts in the Horn of Africa in the future (IPPC Secretariat, 2021).

Overall higher day- and night-time temperatures in all seasons stress livestock, resulting in increased mortality – especially of young and birthing animals – and reduced milk production (Das et al., 2016; Rahimi et al., 2021). Higher temperatures accelerate the evapotranspiration of fodder vegetation and water availability, thus contributing to livestock losses and affecting pastoralists' mobility patterns (Binder et al., 2022; Gulati et al., 2023). Nonetheless, the extent to which rangeland productivity will be impacted through the 2050s is difficult to extrapolate. This is because land use and livestock management patterns, insecurity and land tenure influence how well rangeland ecosystems and pastoralists can adapt to hotter conditions (Gulati et al., 2023).

3.4.2 Sea-level rise and warmer coastal waters

Likely impacts from sea-level rise in Somalia include infrastructure damage and loss from coastal flooding, and saltwater intrusion into coastal areas, leading to loss of agricultural and grazing lands, and contaminating freshwater aquifers and impacting urban areas like Mogadishu (Government of Somalia, 2018b). The southern part of Somalia is particularly vulnerable and exposed to these impacts because coastal elevation is lower, population density is higher, and vegetation cover is declining due to deforestation and other human activity (Government of Somalia, 2018b; El-Shahat et al., 2021). Fishing-based livelihoods and cultural heritage are already threatened by foreign fishing fleets; warmer coastal waters are contributing to extensive coral bleaching, ocean acidification and harmful algal blooms that will increase under climate change and could further decimate such livelihoods (Government of Somalia, 2018b).

4 FINANCE FOR ADDRESSING CLIMATE-RELATED LOSSES AND DAMAGES IN SOMALIA

Impacts from climate change – including loss and damage from extreme events and slow-onset processes – are already overwhelming the absorptive capacities of the Somali population and the national government. In combination with high underlying vulnerabilities and ongoing conflict and fragility, events such as the recent droughts and floods can turn into protracted crises and famines. They also deepen the country's dependence on multilateral and bilateral donor inflows and ad hoc humanitarian assistance, as Somalia's own limited fiscal base is not strong enough to absorb shocks; nor to enable sufficient adaptation investments. The Federal Government's budget is equivalent to only about 4% of GDP, compared to average government expenditure of over 20% across sub-Saharan Africa (IMF, 2024). Of this, just about half is domestic revenue while the other half consists of donor grants (Government of Somalia, 2018a), and direct economic loss and damage has accounted for an annual average of 86% of government revenues.

Relief efforts in Somalia have, to date, largely been funded through international humanitarian appeals. In 2023, for instance, humanitarian actors requested $2.6 billion, over twice as much as the amount requested in 2021, to address drought impacts. However, human security needs can be difficult to anticipate and humanitarian funding is often chronically under-resourced (Development Initiatives, 2023). Furthermore, unlike annual humanitarian aid allocations to protracted crises, which are relatively stable (Saez and Bryant, 2023), humanitarian emergency assistance tends to be focused on large-scale events that attract significant media attention (Scott et al., 2021). This characterisation does not usually apply to more frequent, localised events. Nor does it apply to the slow-onset changes for which the impacts are harder to trace and which could be better managed through climate-resilient development. Those impacts that remain unaddressed by the government and humanitarian institutions are ultimately imposed on the Somali population.

More recently, the Federal Government of Somalia has started to recognise the potential support that may be available to address future loss and damage through international funding mechanisms – under the UNFCCC and beyond. This includes, for instance, the new Loss and Damage Fund that was agreed at COP27 and that is now being set up. Somalia's 2024 workplan to implement its Nationally Determined Contribution (NDC) includes raising awareness of the extent of climate change-related loss and damage, and emerging finance opportunities to help address it, among central and sub-national government units.

However, there are several potential hurdles that may hamper Somalia's ability to harness emerging international loss and damage finance opportunities. These include:

- **The ability of the Federal Government of Somalia and its partners to quantify loss and damage associated with climate change and to articulate loss and damage financing needs to help meet the wide range of losses and damages experienced in the national context.** National climate and development policies and plans in Somalia,

such as the National Adaptation Plan Framework, the NDC or the National Drought Plan (Government of Somalia, 2020b; 2021; 2022), provide only limited systematic quantification of the current and future cost of climate change-related loss and damage, neither do they offer comprehensive strategies to mobilise finance for addressing it. For instance, Somalia's revised 2021 NDC implementation framework considers loss and damage from extreme events and slow-onset processes. But while the NDC projects a total of $48.5 billion adaptation and mitigation need until 2030, it does not provide a more specific breakdown of the needs for addressing loss and damage. Post-disaster needs assessments (PDNAs) that capture flood and drought direct impacts on a variety of sectors have been conducted for several recent events in Somalia such as the 2016/2017 drought (Government of Somalia, 2018a) and the 2023 floods (SoDMA, 2024). They give some insight into the volume and sectoral distribution of loss and damage from extreme events. However, PDNAs are not available for all major extreme events, take time to produce, and are expensive to carry out, so they are likely prohibitive in cost for smaller events. Comprehensive systems and a national database to record impacts from extreme events do not currently exist in Somalia. Loss and damage from slow-onset processes and non-economic impacts are even less systematically captured.

- **The total volume of funds that will be mobilised for the Loss and Damage Fund. Initial commitments to the Loss and Damage Fund when it was operationalised at COP28 amounted to $700 million.** This is a drop in the ocean compared to estimates of global loss and damage funding needs, which tend to start at hundreds of billions of USD annually and are projected to increase over time, reaching into the trillions by 2050 (UNEP, 2023; Tavoni et al., 2024). As this brief has shown, the climate-attributable direct economic losses and damages from droughts and floods in Somalia alone could amount to between $5 billion and $100 billion by the 2050s (Table 2); this figure excludes indirect impacts, slow-onset processes and non-economic loss and damage. Whether the Loss and Damage Fund will have enough resources available to make a difference in addressing impacts from extreme events and slow-onset processes in Somalia (or elsewhere) in the future – given the estimated amounts of loss and damage in the country – will depend on its ability to sufficiently capitalise and replenish the fund. And it will also depend on the country's ability to mobilise development, and climate adaptation and mitigation funding to address underlying structural vulnerabilities.

- **The willingness of donors to channel resources to fragile and conflict-affected countries and the modalities for accessing such funds for the government and non-government entities. Somalia has already experienced major challenges in accessing climate finance for mitigation and adaptation from multilateral climate funds.** In 2019/2020, international climate adaptation finance flows only met about 5% of Somalia's estimated annual needs and multilateral climate funds only contributed around 1% to the total. Reasons for the limited climate finance flows to Somalia have included complex access requirements on the side of the funds, as well as capacity constraints within the Government of Somalia to get accredited and secure funding (Gulati et al., 2023). The extent to which loss and damage finance mechanisms learn from these experiences and facilitate access for fragile and conflict-affected countries will prove significant for the Federal Government of Somalia's efforts to address losses and damages and move forward with climate-resilient socioeconomic development.

A man sits by the river in Garbahaarey town in the Gedo region of Somalia. Credit: AMISOM

5 CONCLUSIONS AND POLICY RECOMMENDATIONS

Somalia is already experiencing significant direct and indirect economic and non-economic losses and damages in which climate change has played a role. Somalia's contributions to global emissions are minimal; the global community's role in providing equitable financial support to addressing climate-attributable loss and damage and for mitigation, adaptation and development is paramount. Based on the provisional estimates provided, and the challenges to financing for addressing loss and damage which are identified in the earlier sections, this final section proposes some recommendations to the Federal Government of Somalia and to loss and damage finance mechanisms and donors.

- **Raise the ambition for resources that are mobilised through international loss and damage finance, including via contributions to the new Loss and Damage Fund, and ensure access for institutions in vulnerable and conflict-affected countries.** This is critical in order to come closer to matching the estimated funding needs that are emerging from an increasing number of global studies (UNEP, 2023) and more specific regional or national assessments such as provided in this brief.

- **Strengthen the Government of Somalia's financial preparedness for addressing loss and damage from extreme weather events and slow-onset processes.** The Federal Government's National Drought Plan for Somalia already proposes the establishment of a national drought contingency fund, which is yet to be operationalised (Government of Somalia, 2020b). The Government also signed a Treaty and a Memorandum of Understanding with the African Risk Capacity in 2021 (African Union, Federal Republic of Somalia and ARC, 2021). Two years later, in 2023, ARC paid out for the first time in Somalia, releasing $3.38 million to local and national Start Network member organisations to address drought impacts under an ARC Replica drought insurance policy (ARC, 2023). Such disaster risk financing instruments – those that are arranged in advance of a disaster – can help the Government and its development and humanitarian partners increase financial planning for addressing loss and damage (Panwar et al., 2023). Given the limited fiscal space of the Federal Government, technical assistance as well as premium and capital support from partners – such as that provided through the different funding instruments of the Global Shield – will remain critical to establishing and maintaining disaster risk finance instruments like contingency funds or insurance coverage in Somalia in the future.

- **Provide financial and technical support to strengthening loss and damage data in Somalia, including by leveraging the Santiago Network.** A first step would be to strengthen systems and capacity within the national government for the regular and systematic collection of loss and damage data. To better capture the different dimensions of loss and damage from extreme events and slow-onset processes (direct, indirect, economic, non-economic), it is important that data collection systems extend beyond PDNAs and common frameworks of disaster impact databases; for instance, deploying participatory approaches or remote sensing technology. Support should also extend to data use in order to ensure that it feeds into national planning and international reporting. In 2024, the UNFCCC has started inviting countries to report data specifically on loss and damage and related financial requirements for the first time. This is done through two mechanisms: (1) a call for information issued by the Standing Committee on Finance, and (2) countries' Biennial Transparency Reports that need to be submitted by the end of the year (Serdeczny et al., 2024). However, few countries are doing this so far, and Somalia – given limited government capacity, data gaps and resource constraints – faces particular challenges in this regard.

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