ISSN: 3067-8366
Research Article
Journal of Environmental Science, Sustainability, and Green Innovation

# The Impact of Floods and Climate Change in Somalia: A Comprehensive Review

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**Submitted:** 07 March 2026 **Accepted:** 12 March 2026 **Published:** 17 March 2026

***Citation:*** *Mohamed, J. A., Nageye, I. I., Sulaiman, A. A., Nur, A. H., & Omar, A. H. (2026). The Impact of Floods and Climate Change in Somalia: A Comprehensive Review. J of Environ Sci & Sustain & Green Innov, 2(2), 01-12.*

***Abstract***

*Somalia is at the forefront of a severe climate crisis, trapped in a devastating cycle of extreme droughts and catastrophic floods that exacerbates existing vulnerabilities from decades of conflict and political instability. This comprehensive review synthesizes and analyzes the multifaceted impacts of climate change and flooding on Somalia's environment, society, and economy. Employing a qualitative literature review methodology, the study draws on an extensive range of sources, including peer-reviewed articles, reports from international organizations (e.g., UN, World Bank) [1], and national policy documents. The findings reveal a rapid warming trend and increasingly erratic rainfall, which are destabilizing the Juba and Shabelle river systems the nation's agricultural heartland. These climatic shifts have led to the collapse of climate-sensitive livelihoods like pastoralism and agriculture, triggering widespread food insecurity, acute malnutrition, and one of the world's largest internal displacement crises. The public health system is overwhelmed by recurrent outbreaks of waterborne diseases, such as cholera, and the mental health toll on affected populations is immense. While Somalia has established foundational policy frameworks like the National Adaptation Plan (NAP) and is advancing early warning systems, these efforts are critically undermined by weak institutional capacity, insecurity, and a significant climate finance gap. This review concludes by offering a set of integrated recommendations focused on strengthening governance, investing in resilient infrastructure and water management, enhancing livelihood diversification, integrating climate considerations into public health, and mobilizing sustainable climate finance. The paper underscores the urgent need for a paradigm shift from reactive humanitarian aid to proactive, long-term resilience-building to secure a stable and sustainable future for Somalia.*

**Keywords:** Somalia, Climate Change, Flooding, Adaptation, Resilience, Juba and Shabelle Rivers, Socio-economic Impact, Disaster Risk Management.

## Introduction

Somalia, a nation situated in the Horn of Africa, stands as one of the world's most vulnerable countries to the adverse impacts of climate change. This acute vulnerability is a product of a complex interplay of geographic, socio-economic, and political factors. Over 80% of Somalia's landmass consists of arid and semi-arid lands (ASALs), which are inherently susceptible to extreme weather conditions, including high temperatures, erratic rainfall, and prolonged droughts [2]. The nation's economy is overwhelmingly dependent on climate-sensitive sectors, primarily pastoralism and rain-fed agriculture, which provide livelihoods for approximately 70% of the population [2, 3]. Consequently, any climatic shock reverberates through the very foundation of Somali society, threatening food security, economic stability, and human well-being.

For decades, Somalia has been caught in a vicious cycle of protracted conflict, political instability, and institutional collapse. This fragile context has severely undermined the government's capacity to deliver basic services, manage natural resources, and

invest in critical infrastructure [2]. The compounding pressures of climate change act as a "threat multiplier," exacerbating existing tensions over scarce resources like water and grazing land, and fueling further conflict and displacement [4, 5]. The result is a state of perpetual crisis where communities have minimal resilience to cope with and recover from recurrent shocks.

The manifestations of climate change in Somalia are becoming increasingly severe and frequent. The country is experiencing an alarming oscillation between devastating droughts and catastrophic floods, leaving little time for recovery. The historic drought of 2020–2023, marked by five consecutive failed rainy seasons, led to widespread crop failure, the death of millions of livestock, and pushed millions to the brink of famine [6]. This was immediately followed by the El Niño-induced Deyr floods in late 2023, which affected over 2.4 million people and caused massive displacement and destruction of infrastructure [7, 8]. This relentless cycle of extreme weather events not only causes immense humanitarian suffering but also reverses modest development gains and jeopardizes the nation's ability to achieve the Sustainable Development Goals (SDGs) [9].

The socio-economic fabric of Somalia is being systematically eroded. Livelihoods are collapsing, forcing millions to abandon their homes and seek refuge in overcrowded internally displaced person (IDP) camps, where they face heightened risks of malnutrition, disease, and protection issues [10, 11]. The public health system, already fragile, is overwhelmed by climate-sensitive diseases. Floods contaminate water sources, leading to recurrent outbreaks of cholera and acute watery diarrhea (AWD), while changing temperature and rainfall patterns expand the habitats for vectors of diseases like malaria [12, 13]. Without urgent and integrated action, the World Bank [14] projects that climate change could reduce Somalia's GDP by up to 13.5% by 2060 and push an additional 3 million people into extreme poverty by 2030 [15]. This review seeks to provide a comprehensive analysis of the multifaceted impacts of climate change and flooding in Somalia, synthesizing evidence from a broad range of sources to inform policy and guide interventions toward building a more resilient future.

Climate variability, including increased drought and rainfall extremes that drive severe soil erosion, aridity, and degraded agricultural systems in Somalia, significantly undermines food security and livelihoods, underscoring the urgent need for climate smart agricultural strategies to build resilience among urban farmers (Nur et al., 2024; Mohamud & Nur, 2025; Nur et al., 2025; Nur, 2025; Nur et L., 2025). Somalia, a developing country, is undergoing rapid urbanization with a significant rise in its urban population. Agricultural production in rural areas has declined due to irregular rainfall, inadequate irrigation systems, and poor farming practices, making it insufficient to meet the demands of the growing urban population (Ibrahim, et al.2025).

## Objectives

This comprehensive review aims to synthesize and analyze the existing body of knowledge on the impacts of climate change and flooding in Somalia. The study is guided by the urgent need to understand the complex dynamics of climate vulnerability in a fragile state context and to identify pathways toward enhanced resilience. The specific objectives of this paper are as follows:

**To review and synthesize climatic trends and hydrological patterns in Somalia:** This involves examining historical and projected data on temperature, precipitation, and the frequency of extreme weather events, with a specific focus on the behavior of the Juba and Shabelle river systems, which are central to both the nation's agricultural productivity and its flood risk.

**To analyze the multifaceted socio-economic impacts of climate change and flooding:** This objective focuses on assessing the effects on critical sectors, including agriculture, livestock, and fisheries, and their cascading consequences for food security, livelihoods, poverty, and large-scale internal displacement.

To investigate the public health consequences of climate-related disasters: This includes examining the link between floods, droughts, and the increased incidence of waterborne diseases (e.g., cholera), vector-borne diseases (e.g., malaria), malnutrition, and mental health challenges, particularly among vulnerable populations.

**To identify and assess the specific vulnerabilities of different demographic groups:** This objective seeks to understand how climate impacts disproportionately affect women, children, pastoralists, and internally displaced persons (IDPs), who often have the least capacity to adapt.

**To evaluate current national and international responses, including adaptation strategies and policy frameworks:** This involves a critical review of existing policies such as the National Adaptation Plan (NAP), early warning systems, and on-the-ground interventions to gauge their effectiveness and identify gaps.

**To formulate evidence-based recommendations for policy, practice, and future research:** Based on the synthesis of findings, this paper will propose actionable recommendations aimed at strengthening institutional capacity, enhancing community resilience, and integrating climate action with development and peacebuilding efforts in Somalia.

## Methodology

This study employs a comprehensive literature review methodology to synthesize and analyze the impacts of climate change and flooding in Somalia. Given the complexity of the subject and the fragile context of the country, a qualitative, descriptive approach was chosen to integrate diverse sources of information and build a holistic understanding of the issue. This methodology is well-suited for synthesizing findings from disparate fields—including climatology, hydrology, public health, economics, and social science—to address the multifaceted research objectives.

## Data Sources and Collection

The research is based exclusively on the analysis of secondary data. An extensive search was conducted to gather relevant documents from a wide array of credible sources. The materials collected for this review include:

**Peer-Reviewed Academic Journals:** Articles were sourced from major academic databases (e.g., ScienceDirect, Springer, Taylor & Francis, PubMed) using keywords such as "Somalia climate change," "Somalia floods," "Juba Shabelle hydrology," "pastoralism drought Somalia," and "climate displacement Somalia." These articles provide rigorous, data-driven analysis on specific aspects of the topic.

**Reports from International Organizations:** A significant portion of the data was drawn from publications by the World Bank, United Nations agencies [16, 17, 8, 18, 4], the Intergovernmen-

tal Panel on Climate Change (IPCC), and the Famine Early Warning Systems Network (FEWS NET) [19]. These reports offer extensive data, situational analyses, and assessments of humanitarian needs and responses.

**Government and Policy Documents:** Key national policy documents, such as Somalia's National Adaptation Programme of Action (NAPA) [20], National Adaptation Plan (NAP) Framework, and Nationally Determined Contributions (NDCs), were reviewed to understand the government's strategic approach to climate change.

**Grey Literature:** Reports and assessments from non-governmental organizations (NGOs), research institutes (e.g., Stockholm International Peace Research Institute), and news outlets provided on-the-ground perspectives and timely information on recent events.

The search covered literature published primarily between 1990 and 2026 to ensure a comprehensive historical context while focusing on the most recent data and analyses available.

## Data Analysis and Synthesis

A thematic analysis approach was used to structure the synthesis of the collected information, a method validated in similar reviews on Somalia's public health challenges. The process involved several steps:

**Familiarization:** All collected documents were thoroughly read to identify key concepts, data points, and recurring themes.

**Coding:** Information was systematically coded and categorized according to the research objectives. Key themes included climate trends, hydrological data, socio-economic impacts, public health outcomes, vulnerable groups, and adaptation strategies.

**Theme Development:** The coded data were organized into the main sections of this paper: Introduction, Objectives, Methodology, Findings, Conclusion, and Recommendations. The Findings section was further broken down into logical sub-themes to present a coherent narrative.

**Synthesis and Interpretation:** Information from different sources was triangulated and synthesized to build arguments, identify patterns, and draw conclusions. In-text citations in APA format are used meticulously throughout the report to ensure all claims are traceable to the source material.

### Data Visualization

To meet the requirement of including 10 charts, quantitative data were extracted from the source materials. This included time-series data on temperature and rainfall anomalies, river flow statistics, displacement figures, disease incidence, and survey results. These data were used to generate visualizations to illustrate key trends and impacts within the Findings section. All figures are accompanied by descriptive captions that explain the data and cite the original source.

## Limitations

This study is subject to the limitations inherent in a literature review based on secondary data. The quality and availability of data for Somalia can be inconsistent, particularly for historical periods and in conflict-affected regions [21]. While efforts were made to use the most reliable sources, some data may be based on estimates and projections. Furthermore, as a synthesis of existing work, this review does not generate new primary data. Its contribution lies in the comprehensive consolidation and structured analysis of the current state of knowledge to inform policy and practice.

## Findings

The findings of this review are organized into four thematic sections. The first section details the observed and projected climatic and hydrological trends in Somalia, establishing the physical basis of the crisis. The second section analyzes the profound socio-economic impacts on livelihoods, food security, and displacement. The third section examines the severe public health consequences. Finally, the fourth section assesses the national and international response frameworks currently in place.

### Climatic and Hydrological Trends

Somalia's climate is undergoing rapid and destabilizing changes that are unprecedented in recent history. These shifts are characterized by rising temperatures, increasingly erratic rainfall, and a marked increase in the frequency and intensity of extreme weather events, particularly droughts and floods. These trends are consistent with broader projections for the Horn of Africa; a region identified as a climate change hotspot [22].

### Temperature Increase

Global and regional climate models unequivocally show a significant warming trend across Somalia. Since 1990, the country has experienced an average temperature increase of 1.4°C, a rate faster than the global average [23]. Data from the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) confirms that each of the last four decades has been successively warmer than any decade preceding it since 1850 [24]. For East Africa, average annual surface temperatures are projected to continue rising at a rate higher than the global average, with the most significant increases expected in the arid northern and central regions [25]. Projections under an intermediate emissions scenario (SSP2-4.5) suggest that global warming will reach 2.0°C between 2041-2060, which would translate to even higher localized temperature increases in Somalia, further intensifying heatwaves and evapotranspiration rates [24, 25]. This sustained warming trend directly impacts water availability, soil moisture, and the viability of traditional agricultural and pastoral practices.

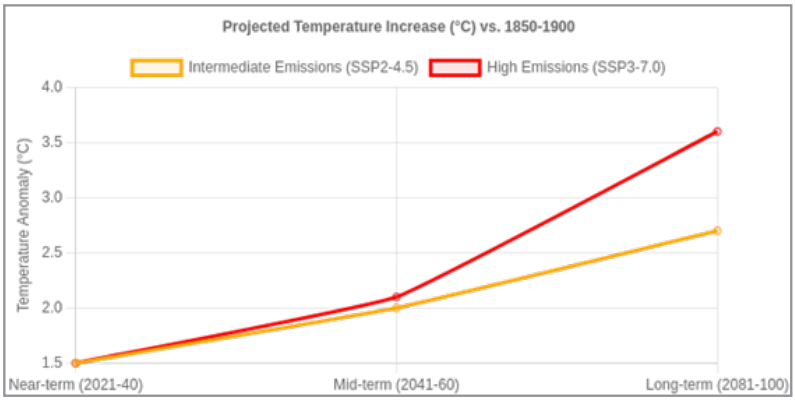


**Figure 1:** Projected Mean Temperature Anomalies for Somalia under Different SSP Scenarios (2021-2100).Source: Synthesized from IPCC (2021a) [25] and CDKN (2022)[25] data for East Africa. Projections are relative to the 1850-1900 baseline.

**Rainfall Variability and Extreme Events**

While temperatures are steadily rising, precipitation patterns have become dangerously unpredictable. Somalia's livelihoods are tied to its two main rainy seasons: the Gu (April-June) and the Deyr (October-December). Historically, these seasons provided reliable water for crops and pasture. However, in recent decades, their performance has become highly erratic, characterized by delayed onsets, poor distribution, and shorter durations [9, 26]. A time-series analysis of rainfall from 1990-2020 shows significant fluctuations, with periods of severe deficit corresponding to major droughts [21]. This variability manifests as a destructive cycle of extreme droughts and floods. Since 1990, Somalia has endured over 30 climate-related hazards, including 12 major droughts and 19 major floods [17]. The frequency of these events is increasing, leaving insufficient time for communities to recover. The 2020-2023 drought was the longest and most severe in the country's recent history, resulting from five consecutive failed rainy seasons [6]. This was immediately followed by the 2023 El Niño-driven Deyr floods, which were among the worst on record, inundating vast areas along the Juba and Shabelle rivers [7]. The IPCC projects that the frequency and intensity of heavy precipitation events will increase across Africa, even in regions that may experience an overall decrease in mean precipitation, signaling a future of more intense, short-lived rainfall and heightened flood risk [28].

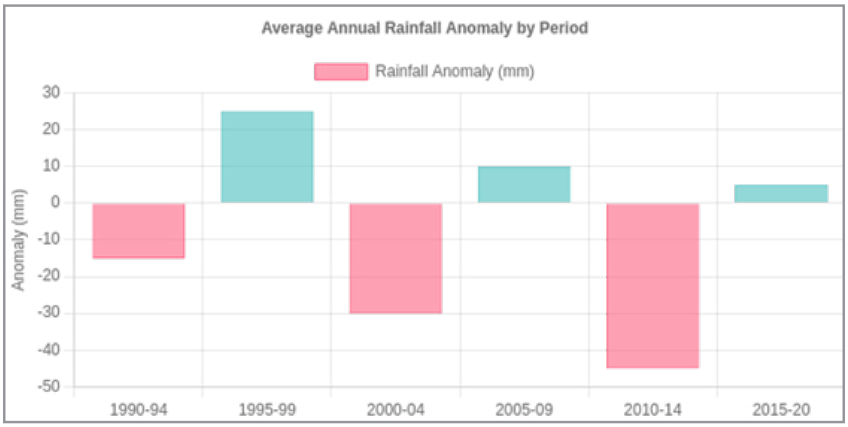


**Figure 2:** Annual Rainfall Anomaly in Somalia (1990-2020).Source: Data adapted from Mohamed et al. (2025) [21] and Climate Change Knowledge Portal (World Bank, n.d.-c)[29]. Anomaly is relative to the 1981-2010 long-term average.

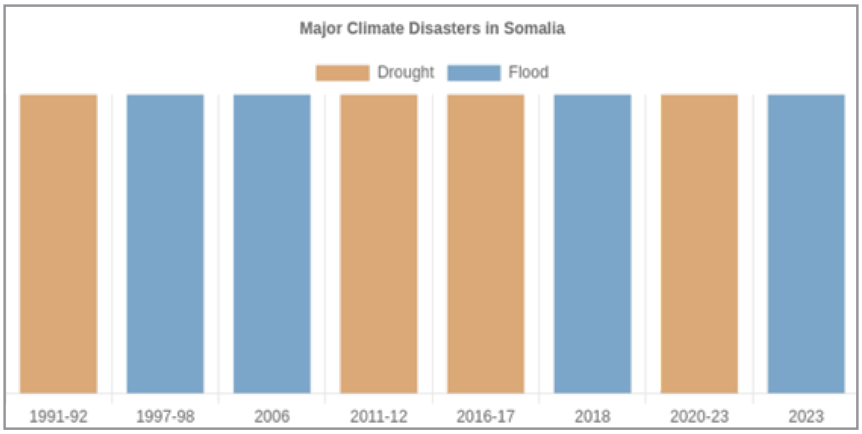


**Figure 3:** Timeline of Major Droughts and Floods in Somalia (1990-2025).Source: Synthesized from World Bank (2020[1]), Momeni et al. (2022) [27], and various humanitarian reports.

**Hydrology of the Juba and Shabelle Rivers**

The Juba and Shabelle rivers are the only perennial rivers in Somalia and form the agricultural heartland of the nation, often described as its "breadbasket" [30]. Both rivers originate in the Ethiopian highlands, making them transboundary resources critical for Somalia's water and food security. Their flow is highly seasonal, peaking during the Gu and Deyr rainy seasons in response to rainfall in the upper catchments [31].

Historically, extensive irrigation infrastructure, including barrages and canals, supported large-scale commercial agriculture along these rivers. However, since the collapse of the state in 1991, this infrastructure has fallen into disrepair, severely compromising water management and flood control capabilities [31]. The riverbanks are now riddled with hundreds of open or weak points, making riverine communities extremely vulnerable to flooding during periods of high flow. During the 2023 floods, analysis by FAO SWALIM identified 190 open breakage points along the Shabelle and 109 along the Juba, which directly contributed to the widespread inundation [32].

Hydrological data reveals the extreme variability of river flows. For instance, the mean monthly flow of the Shabelle River at Belet Weyne can range from as low as 13.8 $m^3/s$ in February to over 152 $m^3/s$ in May [31]. During extreme rainfall events in the Ethiopian highlands, these flows can surge dramatically, overwhelming the river channels and causing catastrophic flooding. The 2023 floods saw water levels at Belet Weyne exceed the 50-year return period, inundating the entire town and surrounding farmlands [33, 34]. The lack of a transboundary water-sharing agreement with Ethiopia further complicates forecasting and management, as upstream dam operations can significantly alter downstream flows with little warning.

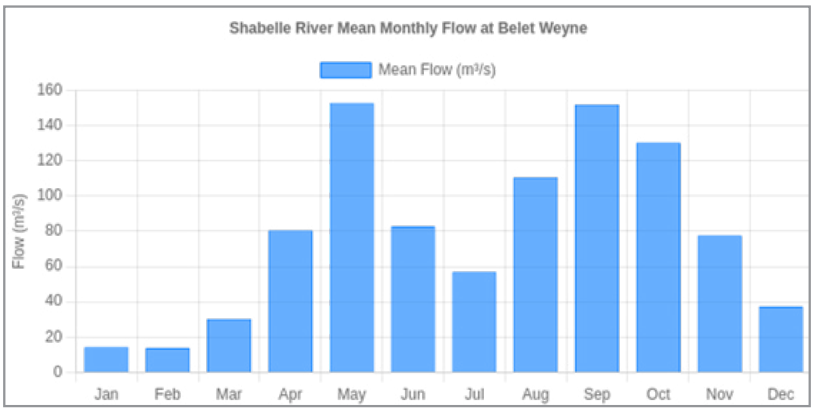


**Figure 4:** Mean Monthly River Flow of the Shabelle River at Belet Weyne ($m^3/s$).Source: Data from Houghton-Carr et al.[31], Annex A.4.

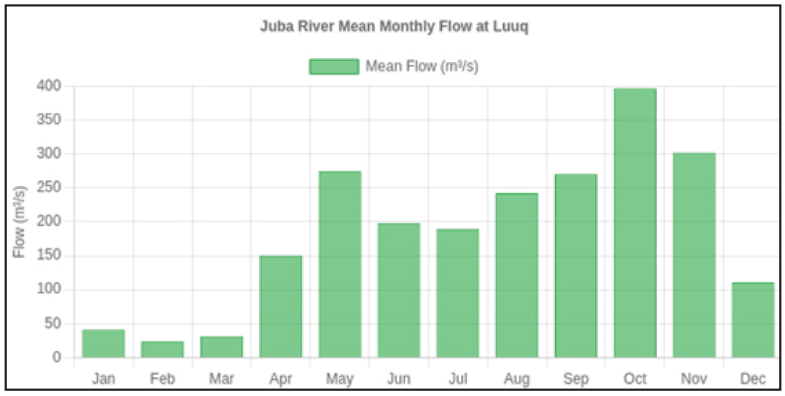


**Figure 5:** Mean Monthly River Flow of the Juba River at Luuq ($m^3/s$).Source: Data from Houghton-Carr et al. (2011) [31], Annex A.3.

**Socio-Economic Impacts**

The escalating climate crisis is inflicting devastating socio-economic costs on Somalia, undermining livelihoods, exacerbating poverty, and driving one of the world's most severe humanitarian crises. The impacts are most acutely felt in the agriculture and livestock sectors, which form the backbone of the economy and support the vast majority of the population.

**Impact on Agriculture, Livestock, and Food Security**

Pastoralism and agriculture, which account for about 40% of GDP and up to 80% of export earnings, are directly exposed to climate variability. The recurrent and prolonged droughts have had a catastrophic impact on both sectors. The 2020-2023 drought, for example, resulted in a 70% reduction in crop yields in key agricultural regions and led to the death of an estimated 3 million livestock [35]. A study in southwest Somalia documented the scale of these losses, with pastoralist households losing over 60% of their goats, camels, and cows, and nearly 75% of their sheep during a single drought period [36]. Such massive losses of livestock, which represent the primary financial asset for pastoralist families, decimate household wealth and push them into destitution.

Floods are equally destructive. The 2023 Deyr floods inundated vast tracts of agricultural land along the Juba and Shabelle rivers just as crops were nearing harvest. The Post-Disaster Needs As-

sessment (PDNA) reported that the floods destroyed infrastructure, crops, and stored commodities, with recovery and reconstruction costs estimated at US$230 million [7]. In Belet Weyne alone, the floods submerged over 28,000 hectares of farmland [34]. This destruction of productive assets leads directly to severe food insecurity. By 2023, an estimated 6.6 million people—nearly 40% of the population—were experiencing acute food insecurity, with 1.8 million children at risk of severe malnutrition. Projections for 2025 indicate that 4.4 million people could still face crisis-level food insecurity due to the compounding effects of climate shocks.

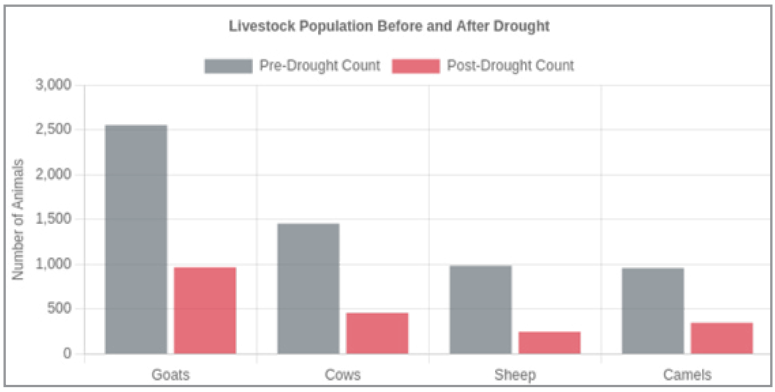


**Figure 6:** Livestock Losses Reported by Pastoralists in Southwest Somalia due to Drought.Source: Data adapted from Ahmed & Mahamed (2026)[36].

**Livelihood Erosion and Displacement**

Climate shocks are systematically eroding the five key livelihood assets (natural, financial, physical, social, and human) that communities rely on for resilience [36]. Natural assets like water sources and pasture are degraded. Financial assets, primarily livestock, are lost. Physical assets, such as irrigation canals and roads, are destroyed by floods. Social assets, including traditional clan-based support networks, are strained to the breaking point as entire communities are affected simultaneously. Human assets are diminished through malnutrition, disease, and disrupted education.

This widespread livelihood collapse is a primary driver of mass displacement. Unable to sustain themselves in rural areas, millions of Somalis have been forced to migrate, mostly to urban and peri-urban centers, in search of humanitarian assistance and alternative livelihoods. As of early 2025, the number of internally displaced persons (IDPs) in Somalia reached a record high of 3.8 million [37]. Climate change is a significant and growing driver of this displacement. During the 2020-2023 drought, 1.3 million people were displaced, while the 2023 floods displaced another 1.2 million [6, 7]. A time-series analysis from 1990-2020 confirmed a strong correlation between climate variables (particularly rainfall deficits) and net migration patterns [21].

These displaced populations often end up in informal settlements on the outskirts of cities like Mogadishu, Baidoa, and Kismayo. These camps are typically overcrowded and lack basic services such as clean water, sanitation, and healthcare, creating conditions ripe for disease outbreaks and exacerbating the vulnerability of already traumatized populations [11, 17].

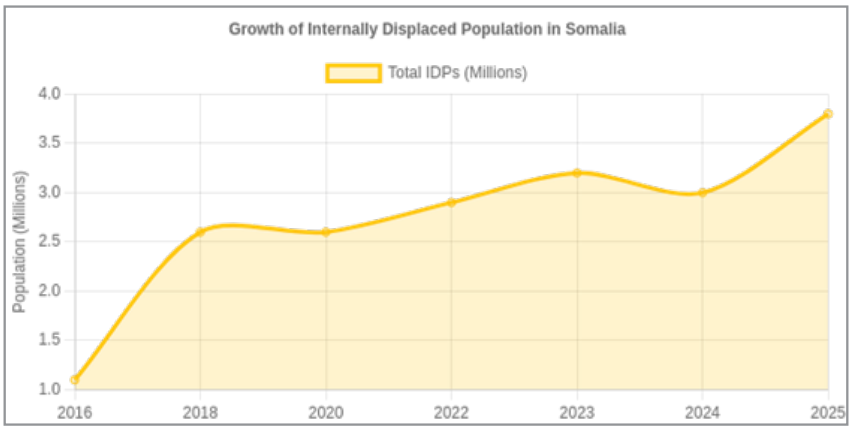


**Figure 7:** Trend of Internal Displacement in Somalia (2016-2025).Source: Synthesized from IOM (2025) [37], UNHCR (n.d.-b) [38], and OCHA data. Note: Figures represent total IDP population at different points in time

**Land Degradation and Resource Conflict**

Beyond the immediate impacts of floods and droughts, climate change is accelerating slow-onset environmental degradation. Rising temperatures and erratic rainfall reduce vegetation cover, leading to soil erosion and desertification. This is clearly visible in satellite-derived Normalized Difference Vegetation Index (NDVI) data, which shows significant negative anomalies (indicating stressed or sparse vegetation) across vast areas of the country during drought years compared to years with good rainfall [19, 37]. This degradation of rangelands reduces their carrying capacity for livestock, forcing pastoralists to move more frequently and into new areas.

The increasing scarcity of natural resources, particularly water

and pasture, is a significant driver of local conflict. Competition over dwindling resources exacerbates inter-communal tensions and clan rivalries [5]. Pastoralist groups clash over access to wells and grazing areas, and tensions rise between pastoralists and sedentary farmers as livestock encroach on agricultural land. These climate-induced conflicts add another layer of insecurity to an already fragile state, creating a feedback loop where conflict undermines communities' ability to adapt to climate change, and climate change fuels further conflict [43].

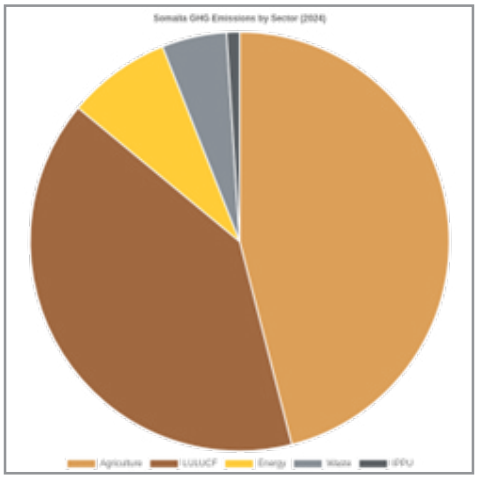

**Figure 8:** Greenhouse Gas (GHG) Emissions Profile of Somalia by Sector (2024).Source: Data from Somalia's Third Nationally Determined Contribution (UNFCCC, 2025) [23].

**Public Health Impacts**

The convergence of climate change, displacement, and a fragile health system has created a public health crisis in Somalia. Extreme weather events directly and indirectly increase the burden of infectious diseases, malnutrition, and mental health disorders, with devastating consequences for the population, especially the most vulnerable.

**Waterborne and Vector-Borne Diseases**

Floods and droughts severely compromise Water, Sanitation, and Hygiene (WASH) infrastructure, creating ideal conditions for the spread of waterborne diseases. Only 52% of the Somali population has access to basic water services, and this figure drops to 38% for basic sanitation [12]. During floods, water sources become contaminated with fecal matter, leading to widespread outbreaks of cholera and Acute Watery Diarrhea (AWD). In 2023, over 18,300 cholera cases were reported, and the surge continued into 2024 [13]. During droughts, water scarcity forces communities to use unsafe water sources, similarly increasing transmission risk. IDP camps are epicenters for these outbreaks due to overcrowding and inadequate sanitation [11]. In 2022 alone, over 130,000 cases of acute diarrheal diseases were recorded, the highest in five years [6].

Climate change is also altering the transmission patterns of vector-borne diseases. Rising temperatures and changes in rainfall patterns are expanding the geographical range of mosquito breeding grounds. This has led to an increased risk of malaria transmission, particularly in southern Somalia and in regions where the disease was previously less common [6, 41]. Climate projections for 2025 indicate that rising temperatures in regions like Gedo, Hiraan, and Bay could further heighten the risk of malaria outbreaks [11].

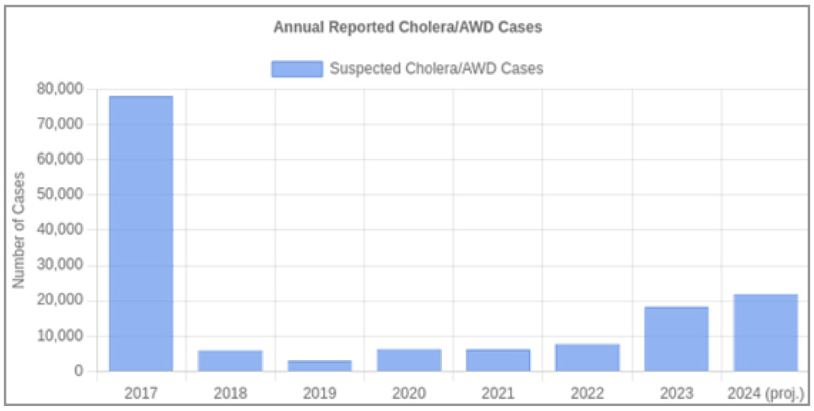


**Figure 9:** Reported Cholera/AWD Cases in Somalia (2017-2024).Source: Synthesized from WHO (2022) [18], PMC (2025d) [13], and OCHA humanitarian reports.

**Malnutrition and Vulnerable Groups**

The link between climate-induced food insecurity and malnutrition is direct and devastating. Crop failures and livestock deaths decimate household food supplies and income, leading to widespread malnutrition, particularly among children and pregnant women. As of 2025, an estimated 1.6 million children under five are projected to be acutely malnourished, with over 400,000 at risk of severe acute malnutrition (SAM), a life-threatening condition [11]. During the 2022 drought, excess mortality was estimated at 43,000, with half of those deaths occurring

among children under five [6]. Malnutrition severely weakens the immune system, making children highly susceptible to other deadly diseases like measles and pneumonia, creating a vicious cycle of illness and mortality. Pregnant women are also at extreme risk. Somalia already has one of the world's highest maternal mortality ratios, at 692 deaths per 100,000 live births, a figure driven by food insecurity and inadequate healthcare [11]. Climate shocks exacerbate these risks, as women often have to travel longer distances to find food and water, increasing their physical burden and exposure to harm. Within traditional Somali culture, women's roles as primary caregivers and providers of food, water, and fuel make them disproportionately vulnerable when droughts and floods occur [2].

**Mental Health**

The psychological toll of recurrent disasters, displacement, and loss is immense but often overlooked. A significant portion of the Somali population, particularly IDPs, suffers from mental health disorders. Studies have found that up to 30% of displaced persons experience depression or anxiety, and a substantial number suffer from post-traumatic stress disorder (PTSD) [6]. The constant stress of survival, the trauma of losing homes and livelihoods, and the uncertainty of the future contribute to a silent mental health crisis. Despite the clear need, mental health services are critically lacking, with only an estimated 0.5 psychiatrists per 100,000 people in the country [11].

**National and International Response Frameworks**

In response to the escalating climate crisis, the Federal Government of Somalia (FGS), with support from international partners, has begun to establish policy frameworks and implement programs aimed at building resilience. However, these efforts are challenged by weak institutional capacity, insecurity, and a significant financing gap.

**Policy and Institutional Frameworks**

Climate-related security risks and peacebuilding in Somalia. Stockholm International Peace Research Institute (SIPRI)."> Somalia has made important strides in integrating climate change into its national development agenda. The National Development Plan (NDP-9, 2020-2024) explicitly recognizes climate change as a root cause of poverty and a major threat to the country's development objectives [2]. Key policy documents have been developed to guide climate action, including:

National Adaptation Programme of Action (NAPA, 2013) : An early framework that identified urgent and immediate adaptation needs.

**National Climate Change Policy (NCCP, 2020):** A comprehensive policy to guide a nationwide response to climate change, covering adaptation, mitigation, and community resilience.

**National Adaptation Plan (NAP) Framework (2022) and NAP (2025):** These documents provide a strategic roadmap for medium- and long-term adaptation planning. The NAP aims to integrate climate change adaptation into national and sectoral policies, strengthen institutional coordination, and mobilize finance for adaptation priorities [2, 42].

**Nationally Determined Contribution (NDC):** Somalia submitted its updated NDC in 2025, outlining its commitments under the Paris Agreement. As a low-emitting country (contributing only 0.019% of global emissions), Somalia's NDC prioritizes adaptation while also setting conditional mitigation targets, particularly in the Agriculture, Forestry, and Other Land Use (AFOLU) and energy sectors [23].

Institutionally, the establishment of the Ministry of Environment and Climate Change (MoECC) in 2022 was a critical step toward providing dedicated leadership and coordination for climate action [12].

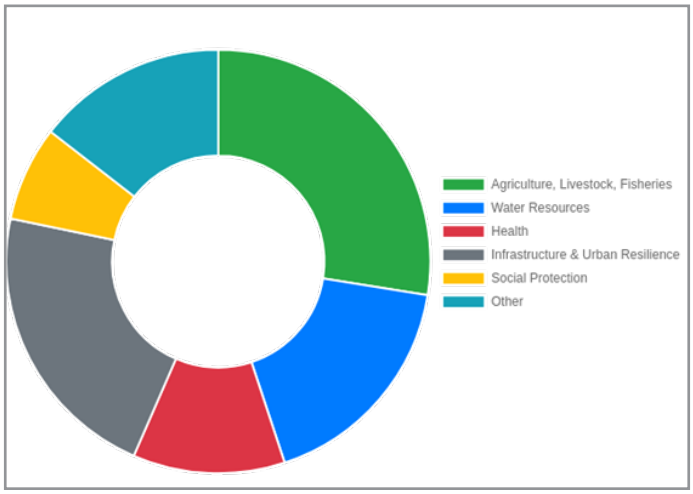


**Figure 10:** Planned Adaptation Investment by Sector in Somalia's NDC (2025-2035).Source: Data from Somalia's Third Nationally Determined Contribution (UNFCCC, 2025) [23].

**Early Warning and Disaster Management**

Significant progress has been made in strengthening early warning systems (EWS) to mitigate the impact of disasters. The Somalia Water and Land Information Management (SWALIM) project, managed by the FAO, plays a crucial role in providing hydrological and climate forecasts. SWALIM monitors river levels, rainfall, and vegetation conditions, issuing regular bulletins and flood advisories [42].

Building on this, Somalia has embraced the global Early Warnings for All (EW4All) initiative. A national roadmap, validated in 2025, aims to ensure every person in Somalia is protected by a multi-hazard early warning system by 2027 [43]. This initiative focuses on strengthening risk knowledge, improving forecasting, enhancing warning dissemination (through radio, SMS, and community networks), and bolstering community preparedness. The National Multi-Hazard Early Warning Centre (NMHEWC),

established in 2019, serves as the central hub for this coordinated effort.

The effectiveness of these systems was demonstrated during the 2023 and 2024 flood seasons. Anticipatory action, triggered by early warnings, allowed for the pre-emptive evacuation of over 154,000 people and the distribution of cash assistance to 218,000 households before the 2023 floods hit [43]. This resulted in a significant reduction in the number of people affected by the 2024 Gu floods compared to the previous year, demonstrating the life-saving potential of proactive disaster risk management.

**On-the-Ground Adaptation Interventions**

Various projects, supported by partners like the UNDP, World Bank, and GEF, are being implemented to build resilience at the community level. These interventions focus on several key areas:

**Climate-Smart Agriculture:** Promoting the use of drought-tolerant crop varieties (such as sorghum), efficient irrigation techniques (e.g., solar-powered drip irrigation), and improved soil and water conservation methods. Over 300 farmers have been trained in these practices to enhance productivity and fight drought [44].

**Water Management:** Investing in water infrastructure, including the rehabilitation of boreholes, construction of sand dams, and implementation of rainwater harvesting systems to improve water security for both human consumption and livestock [45].

**Infrastructure Resilience:** Rehabilitating critical infrastructure to withstand climate shocks. This includes reinforcing river embankments to prevent flooding and building flood-resilient roads and urban drainage systems. In 2023, 11 rehabilitated river breakage sites on the Juba River were handed over to local authorities [46]. A new project launched in 2026 aims to boost climate resilience in 17 cities across Somalia [16].

**Nature-Based Solutions:** Using ecosystem-based approaches, such as reforestation, rangeland restoration, and bioengineering for riverbank stabilization, to reduce flood risk and combat land degradation [47, 4].

**Financing Climate Action**

Despite these efforts, a massive financing gap remains a primary obstacle to scaling up climate action. The total estimated cost for implementing the adaptation and mitigation measures in Somalia's 2025 NDC is approximately USD 6.9 billion through 2035 [23]. Given Somalia's fragile economy and limited domestic resources, achieving these goals is heavily dependent on international climate finance.

Research indicates that while adaptation finance has a significant positive effect on fund flows to Somalia, there is a widespread underfinancing of climate projects [15]. Accessing international funds from mechanisms like the Green Climate Fund (GCF) and the Adaptation Fund is often hampered by complex application processes and the country's weak institutional capacity. The government is working to improve its public financial management systems and has established an Aid Information Management System (AIMS) to better track and coordinate external support [23]. However, moving from a reliance on short-term humanitarian aid to long-term, predictable development and climate finance remains a critical challenge [48].

## Conclusion

This comprehensive review confirms that Somalia is at the epicenter of a severe and accelerating climate crisis, the impacts of which are profoundly reshaping its environmental, social, and economic landscape. The nation is trapped in a destructive cycle of increasingly frequent and intense droughts and floods, driven by rising global temperatures and highly erratic precipitation patterns. This climatic volatility acts as a powerful threat multiplier, exacerbating the vulnerabilities of a country already weakened by decades of conflict, political fragility, and deep-seated poverty.

The findings demonstrate that the impacts of climate change are not abstract or distant; they are a devastating daily reality for millions of Somalis. The country's economic backbone—pastoralism and rain-fed agriculture—is collapsing under the strain of recurrent climate shocks. Catastrophic livestock losses and widespread crop failures have triggered a chronic food security crisis, pushing a significant portion of the population into acute hunger and malnutrition. This has led to the systematic erosion of livelihood assets, leaving communities with little to no capacity to withstand future shocks and forcing millions into internal displacement. The resulting humanitarian crisis is one of the most complex in the world, with IDP camps becoming hotspots of disease, poverty, and protection risks.

The public health consequences are equally dire. The degradation of WASH infrastructure during floods and droughts has fueled recurrent outbreaks of waterborne diseases like cholera, while changing climatic conditions are expanding the threat of vector-borne diseases such as malaria. Vulnerable groups, particularly children, women, and the displaced, bear the heaviest burden, suffering from life-threatening malnutrition, heightened disease susceptibility, and severe mental health trauma.

In response, Somalia has made commendable progress in establishing national policies and frameworks for climate action, such as the National Adaptation Plan (NAP) and updated NDC. Efforts to build early warning systems and implement on-the-ground adaptation projects show promise and have demonstrated life-saving potential. However, these initiatives are dwarfed by the scale of the challenge. They are constrained by formidable barriers, including weak institutional capacity, pervasive insecurity, and, most critically, a massive climate finance gap. The transition from a reactive, humanitarian-led response to a proactive, nationally-owned, and development-oriented approach to climate resilience is essential but remains elusive without substantial and sustained international support.

In conclusion, the future stability and development of Somalia are inextricably linked to its ability to manage the impacts of climate change. Breaking the feedback loop between climate shocks, resource scarcity, conflict, and humanitarian crisis requires a paradigm shift. This shift must involve integrated, conflict-sensitive, and gender-responsive strategies that simultaneously address immediate needs and build long-term adaptive capacity. Without a concerted and scaled-up effort from both national stakeholders and the international community, Somalia faces a future of deepening instability, poverty, and human suffering, a stark injustice for a nation that has contributed negligibly to the global emissions driving the crisis.

## Recommendations

Based on the comprehensive analysis of the impacts of climate change and flooding in Somalia, the following recommendations are proposed to guide policy, investment, and practice towards building a climate-resilient nation. These recommendations are interconnected and designed to be implemented through a coordinated, multi-stakeholder approach.

### Strengthen Governance and Institutional Capacity for Climate Action

**Operationalize the National Adaptation Plan (NAP):** The Federal Government of Somalia, with support from international partners, should prioritize the full implementation of the NAP. This requires developing detailed, costed sectoral action plans, clarifying institutional roles and responsibilities at both federal and state levels, and establishing a robust monitoring and evaluation (M&E) framework to track progress

**Enhance Cross-Sectoral Coordination:** Establish a high-level, inter-ministerial coordination body, led by the Ministry of Environment and Climate Change (MoECC), to ensure that climate resilience is mainstreamed across all sectors, including agriculture, water, health, infrastructure, and finance. This body should also facilitate coordination between government, humanitarian actors, development partners, and the private sector.

**Build Technical Capacity:** Invest in long-term capacity-building programs for government staff at national and sub-national levels. This should include training in climate science, vulnerability assessment, adaptation planning, climate finance mobilization, and project management to ensure national ownership and sustainability of climate initiatives.

### Scale Up Investment in Resilient Infrastructure and Water Management

**Invest in Climate-Proofed Water Infrastructure:** Prioritize investments in diversified and resilient water systems. This includes the construction and rehabilitation of drought-proof boreholes, sand dams, and rainwater harvesting systems for rural and pastoral communities, alongside upgrading urban water supply networks to reduce reliance on expensive and carbon-intensive water trucking

**Modernize and Rehabilitate Riverine Infrastructure:** Develop a comprehensive strategy for the Juba and Shabelle rivers that combines structural measures (e.g., rehabilitating pre-war barrages, systematically closing river breakages, and constructing strategic flood defenses) with nature-based solutions (e.g., riverbank restoration with vegetation, watershed management) to manage flood risk and support irrigation

Promote Transboundary Water Cooperation: The FGS should actively pursue diplomatic channels to establish a data-sharing and cooperative management agreement with Ethiopia for the Juba and Shabelle basins. This is critical for improving flood forecasting, managing water flows, and ensuring long-term water security

### Enhance Livelihood Resilience and Food Security

**Promote Climate-Smart Agriculture and Pastoralism:** Scale up the adoption of climate-resilient practices, including the widespread distribution of drought-tolerant crop varieties, promotion of agroforestry, and implementation of conservation agriculture. For pastoralists, focus on improving rangeland management, expanding access to veterinary services, and developing fodder production and storage systems [23, 44].

**Diversify Livelihoods:** Support programs that provide alternative income-generating opportunities for rural and displaced populations, particularly for women and youth. This could include vocational training in non-agricultural sectors, support for small and medium-sized enterprises (SMEs), and development of value chains for products like sesame and groundnuts.

**Strengthen Social Protection Systems:** Link anticipatory action with national social protection systems. Develop scalable safety nets, such as cash and voucher assistance programs, that can be rapidly expanded in response to early warnings of drought or flood, helping households protect their assets and avoid negative coping strategies [48].

### Integrate Climate Change into Public Health Systems

**Build Climate-Resilient Health Infrastructure:** Invest in upgrading and climate-proofing health facilities, particularly in rural and flood-prone areas. This includes ensuring a reliable supply of clean water and energy (e.g., through solar power) and stockpiling essential medical supplies for climate-related health emergencies [12].

**Strengthen Disease Surveillance and Response:** Enhance the Integrated Disease Surveillance and Response (IDSR) system by integrating it with climate and environmental data. This will enable the forecasting of high-risk periods for cholera, malaria, and other climate-sensitive diseases, allowing for pre-emptive public health interventions like vaccination campaigns and vector control [12].

**Integrate Mental Health and Psychosocial Support (MHPSS):** Recognize and address the mental health impacts of climate change. Integrate MHPSS into primary healthcare and humanitarian response, particularly in IDP camps and communities affected by recurrent disasters [6].

### Mobilize Climate Finance and Enhance Partnerships

**Develop a National Climate Finance Strategy:** The FGS should develop a clear strategy to mobilize the resources needed to implement its NDC and NAP. This should include building the capacity to directly access international climate funds (e.g., GCF, Adaptation Fund), exploring innovative financing mechanisms like blended finance, and creating an enabling environment to attract private sector investment in areas like renewable energy and resilient agriculture [49].

**Strengthen Partnerships and Localisation:** International partners should align their funding with Somalia's national priorities and work to channel more resources directly through local institutions and civil society organizations. This will enhance national ownership, build local capacity, and ensure that interventions are context-specific and sustainable.

**Advocate for Climate Justice and Loss and Damage:** Somalia should continue to advocate on the international stage for climate justice, emphasizing the need for financial support for loss and damage. As a country that is disproportionately affected by a crisis it did little to cause, securing dedicated financing for recovery and reconstruction after climate disasters is a matter of equity and justice (UNFCCC, 2025) [23, 50-69].

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