SUPPORT FOR STRENGTHENING CLIMATE CHANGE ADAPTATION PLANNING

CLIMATE VULNERABILITY ASSESSMENT (CVA) REPORT

SOMALILAND

REPORT COMPILED BY:

FRANCIS JUMA ODHIAMBO, WANDERI J. KARIRA AND MOHAMED AIDARUS

KAALO AID AND DEVELOPMENT (KAD)

ABDIYAREGEELAAYE ROAD, HALGAN VILLAGE,

GAROWE PUNTLAND SOMALIA

FEBRUARY 2024

ACKNOWLEDGEMENTS

The Consultants wishes to express his profound gratitude for the time and effort expended by all stakeholders during the vulnerability assessment. This provided valuable insights, candid perspectives, and above all informed the vulnerability assessment findings. The consultant appreciates the guidance, feedback and support of the **Ministry of Environment and Climate Change of Somaliland** throughout the vulnerability assessment. Especial thanks to the project partner **KAALO AID and Development** for their logistical, human resources and financial support for the vulnerability assessment fieldwork. The consultants are equally thankful to the **United Nations Development Programme (UNDP)** and **Green Climate Fund (UNDP-GCF)** National Adaptation Plan (NAP), for their financial support of the Project. The consultants are grateful to the enumerators – this vulnerability assessment would not have been possible without the dedicated support of the enumerators in the data collection process. It is hoped that that this report will inform the design and implementation of subsequent climate change interventions in Somaliland and beyond.

Executive Summary

Somaliland has an arid to semi-arid climate, which makes it vulnerable to climate change, environmental degradation, drought, and flooding. These factors threaten the livelihoods of local communities, many of whom practice pastoralism, a way of life that depends on dryland resources. This Stakeholder Inclusive Vulnerability Risk Assessment (VRA) Report for Somaliland, therefore, is a key step aimed at understanding the climate change vulnerabilities; it highlights the vulnerabilities of different priority sectors, and informs planning, fund allocation and implementation of strategic Climate Change Adaptation interventions in Somaliland. The VRA assessed the sectoral risks and vulnerabilities to climate hazards (extreme temperatures, floods, drought, pest and disease, locust, cyclone) in the region. The assessed sectors were water, health, agriculture and food security, livestock, biodiversity, coastal and marine are/resources, public works and education.

The VRA identified Somaliland's vulnerabilities as: (i) decreased crop production, (ii) loss of incomes and livelihoods, (iii) emergence of new and aggressive insects, pests and diseases, (iv) increased population displacements and loss of life. With the identified Climate Change Risks and Vulnerabilities in mind, VRA Report goes a step further and proposes the following Climate Change Adaptation Options for Somaliland: (i) Enhance Somaliland's Early Warning Systems; (ii) build greater resilience to hydro and meteorological hazards; (iii) Strengthen sectoral climate change adaptation capacities through adoption of climate smart technologies and approaches; (v) Promote reforestation programmes thus restoring ecosystem health in Somaliland's rangelands; and (v) Support measures aimed at reducing gender inequalities focusing on key priority sectors such as agriculture, health, education, disaster management, etc.

This VRA report further identifies barriers to Climate Change Adaptation as: (i) vastness of regions limiting adequate coverage of large areas of Somaliland's due to high funding levels required for interventions and associated challenges thus assessment of climate risk vulnerabilities as well as the implementation of adaptation interventions; (ii) weak institutional and enabling environment; (iii) low adaptive technology capacity and funding for Climate Change Adaptation; (iv) lack of consistent and updated data over time thus enhancing the effectiveness of new proposed strategies.

The CVA observes that provision of vulnerable populations in Somaliland with climate-adaptive awareness, techniques and capacity, and strengthening of institutional and physical infrastructures will reduce the impacts of climate change because low adaptive capacities to environmental variability, which perpetuate vulnerabilities are replaced by sustainable alternatives and local climate-sensitive solutions. Thus, this assessment report provides a window of opportunity for an outlook towards the future, and clearly the potential climate-adaptive strategies and climate resilient infrastructures if not considered by the government, vulnerabilities in the priority sectors will be pushed to critical levels. Building on the study findings, several recommendations for the way forward are provided. These recommendations are organized around the key elements of enhancing adaptive capacities (inclusion of capacity building and support).

Table of Contents

Executive Summary ii

List of Abbreviations vi

List of Tables vii

List of Figures vii

Definition of Terms viii

I: Introduction and Background 9

Overview 9

Aims and objectives of the Assessment. 10

Description of the Assessment Area 11

1.1.1 Geographical profile 11

1.1.2 Climatic conditions 14

1.1.3 Water Resources 16

1.1.4 Environmental Degradation 17

1.1.5 Socio-economic Environment 17

II: Methodology 19

2.1.1 Conceptualization of vulnerability 19

2.2 The Assessment design and Approach 21

2.2.1 Literature review 21

2.2.2 Consultation with stakeholders. 22

2.2.3 Data collection and Analysis 23

2.3 Methodological and Technical Limitations of the Vulnerability Assessment 26

2.3.1 Filed level data collection challenges. 26

2.3.2 Data gaps and/or unavailability 26

III: Results of the Vulnerability Assessment 26

3.1 Climate Change Vulnerability and Risks Factors in Somaliland 26

3.1.1 Drivers of Somaliland's Climate Change Vulnerability and Adaptive Capacity 27

3.1.2 Contributing Factors to the Exposure of Somaliland to Climate Change Impacts 30

3.1.3 Current and Future Trends of Climatic Variables in Somaliland 33

3.2 Climate Change Risks, Hazards and Vulnerabilities in Somaliland 38

3.3.1 Climate Change Risks and Hazards in Somaliland 38

3.3.2 Climate Change Vulnerabilities 39

3.3 Sectoral Climate Change Analysis 40

3.3.3 Analysis of vulnerabilities of key sectors to Climate Change 40
3.3.4 Climate Change Impact on the Sectors and their Respective Adaptive Options..... 43
3.3.5 Disaster risk reduction approaches..... 54
3.3.6 Gender issues and Adaptive capacity to climate change..... 56
IV: Conclusion and Recommendations..... 57
Conclusion..... 57
Key Messages..... 57
Recommendations to Build a Climate Resilient Somaliland 58
References..... 62
ANNEX 65
Annex 1: Steps in vulnerability assessment 65
Annex 2: Tool used for data collection..... 67

List of Abbreviations

CCVA	Climate Change Vulnerabilities Assessments
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GCF-NAP	Green Climate Fund National Adaptation Plan
INDC	Initial Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-tropical Convergence Zone
MOECC	Ministry of Environment and Climate Change
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

List of Tables

Table 1: Summary of the Geographical Information of Somaliland (MOECC, 2023) 12
Table 2: Distribution of Stakeholders contacted in Somaliland 24
Table 3: Demographic characteristic of household heads in Somaliland 27
Table 4: Access to water indicators 29
Table 5: Community perceptions and experiences on natural disasters in the last 5 – 10 years 31
Table 6: Projected Changes in Multi-Model Median Maximum (TX) and Minimum (TN) temperatures indifferent seasons over short (2021–2040) and medium (2041–2060) terms 35
Table 7: Total monthly rainfall at the Borama and Hargeisa weather stations between 1985 -2015 36
Table 8: CORDEX Africa Median Projections for Percent Change in Precipitation for Somaliland 37
Table 9: Common climate related hazards and potential risks in Somaliland 38
Table 10: Climate Change Vulnerabilities in Somaliland 39
Table 11: Identification of the vulnerable sectors to climate change in Somaliland 41
Table 12: Climate change impacts and potential adaptation options in Agriculture Sector 44
Table 13: Climate change impacts and potential adaptation options in Livestock Sector 46
Table 14: Climate change impacts and potential adaptation options in Water Sector 47
Table 15: List of climate change impacts and adaptation options 49
Table 16: Climate change impacts and potential adaptation options in Education Sector 50
Table 17: Climate change impacts and potential adaptation options in Public Sector 51
Table 18: Climate change impacts and potential adaptation options in Biodiversity 52
Table 19: List of climate change impact and adaptation options 53
Table 20: Approach employed to for disaster risk reduction. 54

List of Figures

Figure 1: Somaliland administrative map 11
Figure 2: Somaliland mean rainfall distribution (2001-2021) adapted from MOECC 2023 15
Figure 3: Somaliland climate zones map adapted from Ullah, 2016. 16
Figure 4: Somaliland strategic water sources map adapted from MOECC 2023 17
Figure 5 Vulnerability concept according to the IPPC AR4 (Deutsche Gesellschaft für Internationale Zusammenarbeit adapted from GIZ (2014). 20
Figure 6: Participants from different government institutions and other stakeholders during a vulnerability assessment workshop conducted in Hargeisa, Somaliland 30th, December, 2023. 23
Figure 7: Focus group discussion (men and women) in Somaliland 24

Definition of Terms

Adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive capacity: The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Climate: Climate of an area or country is known as the average weather over a long period of time. It refers to the characteristic condition of the atmosphere deduced from repeated observations over a long period. More than a statistical average, climate is an aggregate of environmental conditions involving heat, moisture and motion. Climate studies must consider extremes in addition to means, trends, fluctuation, probabilities and their variations in time and space.

Climate change: Refers to a change in the climate system that is caused by significant changes in the concentration of greenhouse gases due to human activities, and which is in addition to the natural climate change that has been observed during a considerable period.

Climate change vulnerability: The degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with adverse impacts of climate change. Impact here refers to a specific change in a system caused by its exposure to climate change.

Sensitivity: Refers to whether the asset or system is located in an area experiencing direct effects of climate variables.

Mitigation: Refers to human interventions to prevent or slow down atmospheric GHG concentrations by limiting current or future emissions, and/or enhancing potential sinks for greenhouse gases.

Sensitivity: Refers to how the asset or system fares when exposed to a climate variable.

I: Introduction and Background

Overview

Climate change and variability pose significant challenges to global and Somaliland livelihoods and affect various economic sectors. The United Nations Framework Convention on Climate Change (UNFCC, 2007) has stated that climate variability is a major global threat. Somaliland has an arid to semi-arid climate, which makes it vulnerable to climate change, environmental degradation, drought, and flooding. These factors threaten the livelihoods of local communities, many of whom practice pastoralism, a way of life that depends on dryland resources (Abdulkadir, 2017). The effects of climate change are wide-reaching, touching nearly every aspect of Somaliland's national development. The ordinary rural pastoral, and agro-pastoral Somali is faced with the harsh reality of climate change through increasing frequency of extreme climate change events. Somaliland and the Horn of Africa is experiencing an increasing frequency of back-to-back extreme climatic events, such as increased intensity of: in Somaliland, it is either flooding and prolonged drought. The droughts have been increasing in frequency and intensity. Climate change can undermine economic growth by causing higher food prices, currency depreciation, conflict, and security threats (Serdeczny et al., 2017; World Bank, 2013). A World Bank study warned that fragile regions contexts, such as Somaliland, face increased cyclical climate-induced shocks, including droughts, floods, and locust infestations, which may lead to internal migration and poverty (World Bank, 2022).

Strategies for Somaliland, strategies aimed at effectively addressing the increasing threats posed by climate change and enhance mitigation and resilience measures require approaches that are targeted and that have specific objectives with clearly defined outcomes (they should be evaluated / monitored by quantifiable and verifiable indicators). Climate Change Vulnerabilities Assessments (CCVA) provide the necessary information needed for the targeted approaches. The need for CCVA is well documented at the global and national levels. The UNFCCC calls on the parties to the convention to take climate change considerations into account in their socio-political, economic, and environmental policies and actions. In doing this, the parties are expected to utilize evidence-based methods such as impact assessments with the aim of minimizing adverse effects of policies and actions on the economy and the environment thereby enhancing climate change mitigation and adaptation. The Paris Agreement requires parties to the Agreement to engage in adaptation planning processes and the implementation of actions including the development of relevant plans and policies; these may include the assessment of climate change impacts and vulnerability with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems.

A number of important initiatives have been pursued, in particular policies, regulations, and institutional reforms that are essential in the nation-building process. Those linked to climate change related actions include the preparation of the 2013 National Adaptation Programme of Action (NAPA), the 2015 Initial Nationally Determined Contributions (INDC) Report to the UN Framework Convention on Climate Change (UNFCCC), draft 2021 National Climate Change Policy, the 2021 National Environment Policy, draft 2021 Environment Act, and the 2018 Initial National Communication (INC) to the UNFCCC. The Green Climate Fund National Adaptation Plan Project (GCF NAP) consisted of the following outcomes: Strengthening institutional coordination and capacity for adaptation planning and implementation at the national level; Enhancing the technical, institutional, and managerial capacity for adaptation planning; Developing the capacities at the national level by active engagement and contribution to technical and strategic analyses

with expert and stakeholder input through a learning-by-doing approach; and the mainstreaming of climate change adaptation considerations into the investment planning processes.

Somaliland been experiencing multiple crisis which include various form of conflict over shared resources that have driven a protracted humanitarian crisis characterized by weak or insufficient governance structures, chronic food insecurity, significant population displacements, inaccessibility of basic services among other issues. Climate change has served to further increase destitution and vulnerability at the household, community, regional and national levels. As such, the multiplicity of climate change impacts in Somaliland calls for a coordinated and integrated approach to Climate Change Adaptation Planning and Implementation. As support to building national capacities on these various priorities, the Green Climate Fund through UNDP is implementing the project "Support for Strengthening Climate Change Adaptation Planning". The project has supported the implementation of the NAP process by strengthening the capacities of academia, decision makers and communities to adapt to the varying climatic conditions, and by facilitating the exchange of knowledge and expertise.

Adapting to the present and future impacts of climate change will contribute to increased resilience of vulnerable communities, particularly those whose livelihoods depend on climate-sensitive sectors, such as the predominant pastoralists and few agro-pastoralists in Somaliland. Thus, as part of the GCF-NAP project, a vulnerability assessment covering several sectors has been undertaken in the Somaliland. The rationale for the vulnerability assessment is based on the need for a comprehensive understanding of the key Climate Change risks and vulnerabilities.

Aims and objectives of the Assessment.

The aim of the Somaliland VRA was to gain a comprehensive understanding Somaliland's climate change risks and sectoral vulnerabilities which would in turn inform Somaliland's Climate Change Adaptation planning process. The Somaliland VRA within the NAP Framework is informed by the need to: (i) Diagnose the magnitude of climate vulnerabilities in Somaliland as part of the National Adaptation Plan implementation process, and (ii) effectively coordinate national level policies and legislation on climate change with regional level climate change adaptation implementation efforts.

Besides, the findings of the vulnerability assessment provide an evidence basis/foundation upon which Somaliland's climate change interventions and initiatives are designed thus enhancing their relevance and effectiveness. This means that such evidence-based Somaliland's Climate change initiatives will address community level vulnerabilities due to a better sectoral understanding of climate change risks and vulnerabilities. The findings of the assessment will therefore: (i) inform participatory action planning processes that lead to community-driven and owned adaptation; (ii) enhance investments in climate smart livelihood upgrading processes; (iii) identify lower risk areas where climate-resilient alternative socioeconomic activities could be established; and (iv) develop targeted early warning systems, training programs in environmental management and DRR, community capacity building, alternative livelihood strategies, etc; (v) inform future advocacy planning; and (vi) select, prioritize, and design appropriate resilient development options.

The assessment was conceived and commissioned by the Ministry of Environment and Climate Change of the Government of Somaliland in collaboration with UNDP, and the assignment carried out by KAALO:

(i) Assess the climate change risks, hazards and vulnerabilities in Somaliland.
(ii) Assess the probability and impact of climatic hazards currently and in the future in Somaliland.
(iii) Identify the vulnerable sectors to climate change in Somaliland and identify their respective adaptive capacities.
(iv) Develop a climate change vulnerability and risk map of Somaliland and develop a list of indicators for the vulnerability to climate change in Somaliland.

Description of the Assessment Area

1.1.1 Geographical profile

Somaliland is bounded by the Red Sea - Gulf of Aden – to the north; Somalia to the east; the Federal Republic of Ethiopia to the south and the west; and the Republic of Djibouti to the northwest. Somaliland covers a land area of 177,000 km^2 (110,000 sq m) and is positioned along the Gulf of Aden with a coastline of 856 km with an Exclusive Economic Zone (EEZ) area of approximately 70,000 km^2. Since its declaration of independence in 1991, Somaliland has become and continues to be comparatively peaceful with the capital city in Hargeisa.

Somaliland has a varying topography featuring coastal plains (Guban), mountain ranges (Oogo) and a plateau (Hawd). The altitude ranges between sea level and 2,633m above sea level at the highest peak. A large portion of the country consist of high plateaus and mountains but without rivers or lakes. According to the FAO (2021), Somaliland had an estimated population of over 3 million and a population density of 22 persons per km^2 in 2021. Approximately 55% of the population live in rural areas, while the remaining 45% live in urban centers. An overview of the areas of Somaliland is given in Figure 1. Further, Table 1 below summarizes the main geographical features of Somaliland.

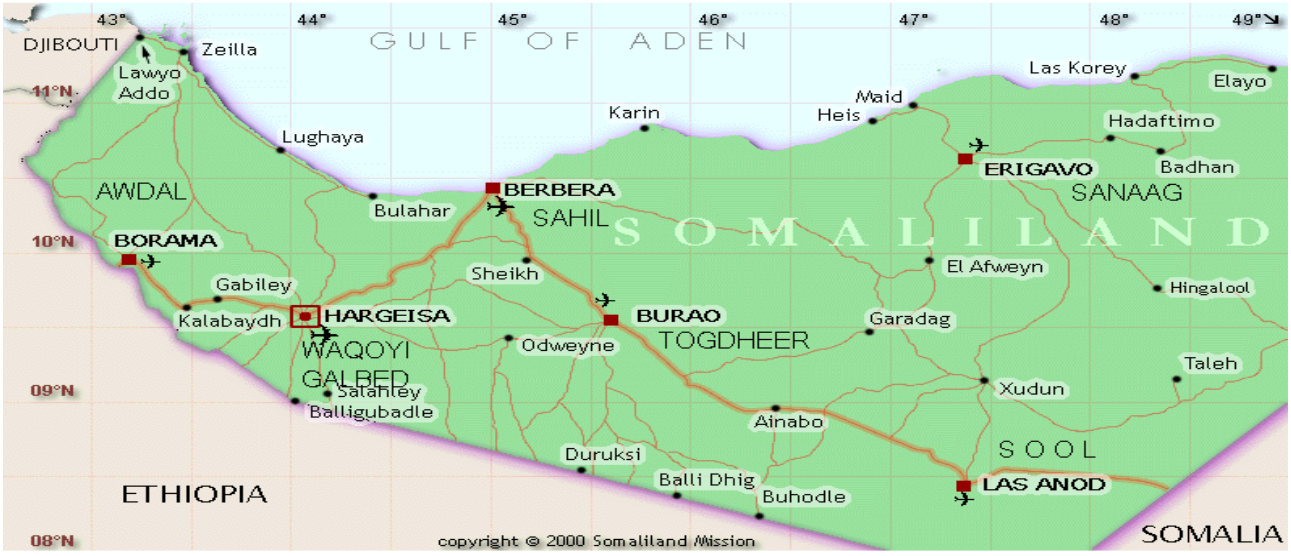


Figure 1: Somaliland administrative map

Table 1: Summary of the Geographical Information of Somaliland (MOECC, 2023)

Geographical features	***Details***
Location	Somaliland is situated in north-west portion of the Horn of Africa bordering the Gulf of Aden in the north, Puntland in the east, the sl Republic of Ethiopia in the south, and the Republic of Djibouti to the west. The capital city in Hargeisa.
Land area	Covers a land area of 177,600 km^2 with a coastline of 856 kilometers long.
Rivers	Has no perennial rivers or lakes but a coastline of 856 kilometers.
Land form/soils	Somaliland has a varying topography featuring coastal plains, mountain ranges and a plateau. The country is divided into three major physiographic provinces: (i) coastal belt; (ii) the mountainous zone incised by numerous seasonal dry rivers; (iii) The plateaus and valleys which include the large undulated Hawd and Sool plateaus and the Nugaal valleys. The highest elevation occur in the Golis mountains near near the Gulf of Aden. Coastal belt and plateaus have mainly undulating topography. Land degradation in Somaliland is only moderate and strong i.e. 37% of Somaliland is degraded (FAO-SWALIM 2007). The most common degradation type are soil loss due to wind and water erosion, loss of soil nutrient in agriculture productive areas, (mainly western part of Somaliland), loss of vegetation cover (in eastern part, parts of north-western and south-eastern) and invasive and non-palatable plant species in western Somaliland.
Temperatures	Temperatures vary with the seasons, with the mean annual temperature ranging from 23°-35°C in the northern coastal regions (e.g. Berbera) while it is cooler in the Saahil mountain region (e.g. Shiekh) where it varies from about 15°-23°C. In the inland areas of Togdheer / Nugaal basins, it varies between 22°-33°C. The mean temperatures is highest from June to August in Gulf of Aden basin areas whereas the peak temperatures occur from May to September in the inland areas of Togdheer / Nugaal basins. In eastern-coastal areas of the central coastal basin, the mean temperature is cooler than the inland and the northern coastal regions and is more or less constant between 25°-28°C throughout the year (FAO SWALIM, December 2021). The relative humidity (RH) is higher in the coastal regions than in the inland areas. In areas near the Gulf of Aden basin which has wide topographical variations, relative humidity in the northern coastal region (Caluula and Berbera) is higher (70-75%) than inland.
Climate	Somaliland's climate is generally described as arid to semiarid with 75% of the area being desert or arid. Only a small part of Somaliland, in the southwest, is semi-arid. The weather is hot and calm between the monsoons (April and September). Somaliland has two distinguishable rainy seasons alternating with two marked dry seasons, the main - Gu - (April to June) and the second – Dayr (or Karan) - (October to December). The dry season are Hagaa - (July to September, littoral showers, but dry and cool) and Jilaal – (January to March, longer dry season).
Rainfall	Somaliland has a high inter-annual rainfall variation with annual rainfall of about 100 mm along the coast increasing to 400 mm on the southwestern part of the country. This high rainfall variability within seasons drastically raises the chances and frequencies of crop failure and difficulties in maintaining or raising livestock herds in the country. The country has low annual precipitation and four seasons: the rainy seasons are Gu' and Deyr, while the dry seasons are Hagaa and Jiilaal. The lesser rainy season, Dayr occurs primarily in the eastern and southeastern regions (Toghdeer, Sanaag, and Sool) of the country, whereas in the western regions (Marodijeh, Gabiley, and Awdal) a similar season but occurring earlier than Dayr, known as Karan is more prevalent.

	Potential Evapotranspiration (PET) varies between 1000 mm - 3000 mm per year with mean annual values for the region being greater than 2000 mm per year. PET is higher than precipitation in all months and in most areas. PET also exceeds rainfall throughout the year and is highest in dry seasons with values between 280mm/month inland and 440mm/month in the coastal areas. In the driest areas, e.g. Berbera, annual PET values exceeds 3000mm per year underlying the necessity of irrigation to avoid crop failure (FAO-SWALIM, 2016).
Land Cover	Land cover consists mainly of natural vegetation. Other cover types include Crop fields (rainfed), Urban and Associated Areas (Settlement/Towns and Airport), dunes and bare lands and Natural Water bodies. The natural vegetation consists of dry deciduous bush land and thicket dominated by species Acacia thorn trees, commiphora, aloes, and candelabra found in the semi-arid regions. The western part neighboring Ethiopia consist of semi-desert grasslands and deciduous shrub land. The western part of Somaliland namely Zeila to Lowyocada along the Red sea coast consist of mangrove trees.
Land use	The main land use in Somaliland is extensive grazing (pastoralism), only 3 percent of the land, is under crop production and a further 7 percent is potentially arable. An estimated 60% of the land is used purely for grazing including transhumance pastoralism and about 40% for crop production where rain-fed agriculture is practiced.

1.1.2 Climatic conditions

Somaliland is classified into three main climatic zones across its regions. These include; (i) desert zone mainly along the costal belt, (ii) very arid zones in the central and western areas and (iii) semi-arid zone in the lower parts of Awdal and present day Maroodijeex. The latter areas receive the best rainfall up to 500 mm to 600 mm per year. Togdheer, Sool, and Saanag regions come next with rainfall amount of between 100 mm and 400mm per year. The coastal belt and a small pocket of the area south of Sool region are characterized by very low rainfall amounts of less than 100 mm per year.

The climate in Somaliland is determined by the north-easterly and south-easterly air flows of the Intertropical Convergence Zone (ITCZ) (Oduori, et al 2007). North-easterly and south-easterly air masses meet in the Intertropical Front (ITF) and raise air upwards to produce rain. The annual movements of the ITCZ from north to south across Africa and back again, give rise to four different seasons in Somaliland comprising two distinguishable rainy seasons alternating with two marked dry seasons (MOECC 2023[1]), as follows:

- *Gu:* April to June, the main rainy season
- *Hagaa/Xagaa:* Jun to August, littoral showers, but dry and cool in the hinterland
- *Dayr/Karan/Deyr:* late August to November, second rainy season
- *Jilaal:* January to March, longer dry season

Southwesterly winds with moist air from the Indian Ocean prevail during the Gu season, considered the main rainy season, while northeasterly winds blowing from the Arabian Peninsula with dry air prevail during the Jilal, the main dry season with virtually no rain expected during the latter season. The lesser rainy season, Dayr occurs primarily in the eastern and southeastern regions (Toghdeer, Sanaag, and Sool) of the country, whereas in the western regions (Marodijeh, Gabiley, and Awdal) a similar season but occurring earlier than Dayr, known as Karan is more prevalent. Karan rains are crucial for successful production of cereals as they arrive during the flowering and grain filling stages of late-maturing local sorghum varieties and recharge groundwater to be tapped during the dry season for both human and livestock consumption. Lack of Karan rains usually results in crop failure and prolonged dry season with negative impact on rural livelihoods.

Rainfall in Somaliland is characterized by high temporal and spatial variability. Low and highly unreliable rainfall is the most serious environmental challenge pastoral and agropastoral communities in Somaliland have faced for decades. Rainfall highly fluctuates within seasons as well as within years across the country. The Hagaa is a special hazard to crop producers since it brings strong, dry winds and little or no rainfall and occurs between the two rainy seasons. Few crops or crop varieties such as the late-maturing sorghum varieties can withstand the high evaporative demand resulting from the strong, dry winds of Hagaa coupled with high daytime temperatures, without irrigation.

[1] Ministry of Environment and Climate Change (MoECC). (2023). Somaliland National Climate Change Policy. https://

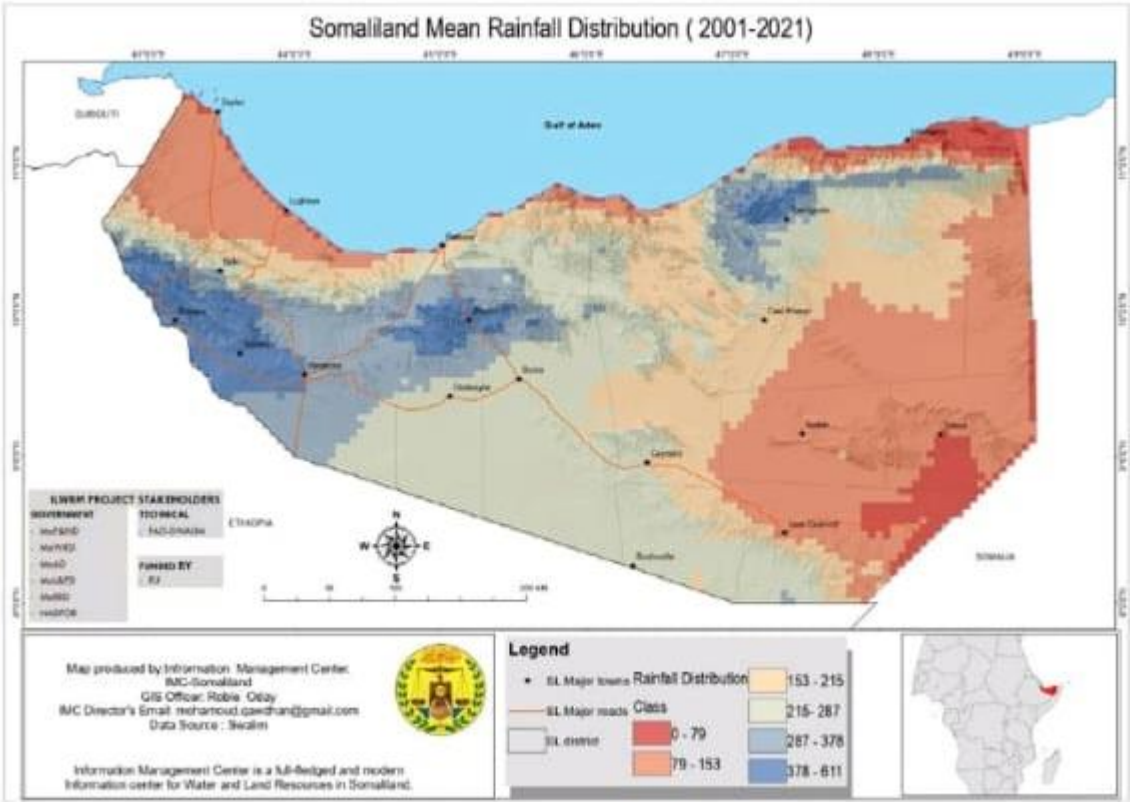


Figure 2: Somaliland mean rainfall distribution (2001-2021) adapted from MOECC 2023

Temperatures vary with the seasons, with the mean annual temperature ranging from 23°-35°C in the northern coastal regions (e.g. Berbera) while it is cooler in the Saahil Mountain region (e.g. Shiekh) where it varies from about 15°-23°C. In the inland areas of Togdheer / Nugaal basins, it varies between 22°-33°C. The mean temperatures is highest from June to August in Gulf of Aden basin areas whereas the peak temperatures occur from May to September in the inland areas of Togdheer / Nugaal basins. In eastern-coastal areas of the central coastal basin, the mean temperature is cooler than the inland and the northern coastal regions and is constant between 25°-28°C throughout the year (FAO SWALIM, December 2021). The relative humidity (RH) is higher in the coastal regions than in the inland areas. In areas near the Gulf of Aden basin which has wide topographical variations, relative humidity in the northern coastal region (Caluula and Berbera) is higher (70-75%) than inland.

Detailed analysis of Somaliland weather data reveals three main climatic zones which are characterized by differences in patters of rainfall:

- The **Desert zone** – receives less than 100 mm of annual rainfall with main rain seasons lasting for only one month. Rainfall is unreliable with daily average temperatures above 34^0C.
- The **Arid zone** – receives less than 400 mm of annual rainfall with main rainfall seasons lasting a maximum of three months. Rainfall is mainly experienced in heavy showers and a large portion is lost through runoff. High temperatures are experienced throughout the year.
- The **Semi-arid zone** – receives between 400 – 600 mm of annual rainfall with rainfall seasons slightly exceeding three months. The zone has a potential for rain-fed cropping supported with irrigation for reliable and good crop harvests.

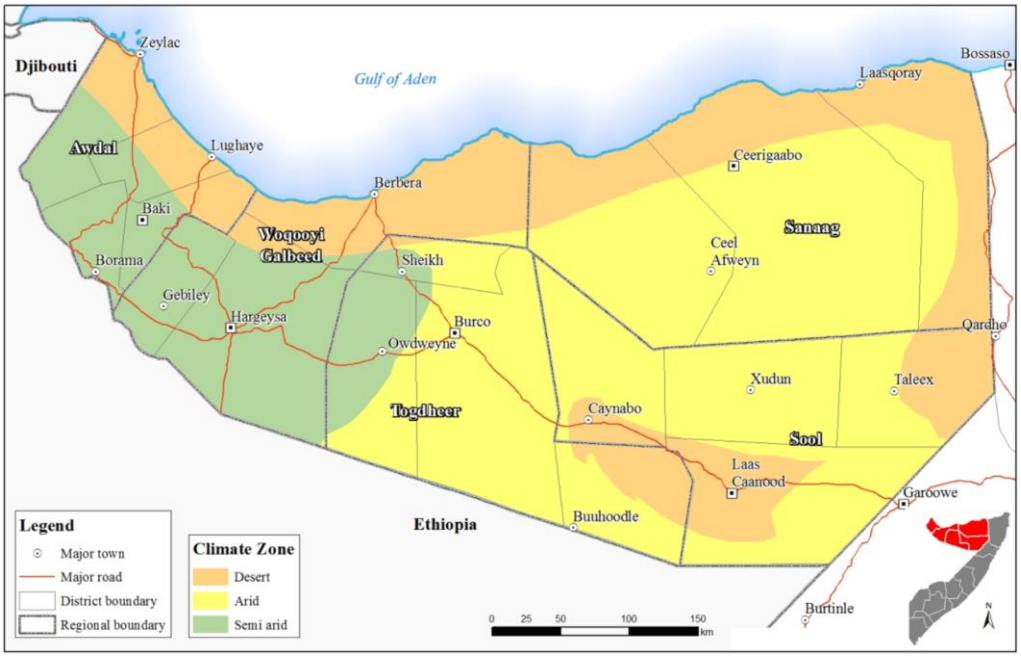


Figure 3: Somaliland climate zones map adapted from Ullah, 2016.

1.1.3 Water Resources

Somaliland is faced with scarcity of water resources with no rivers with perennial flows. Ground water is the main source of water for the majority of people in the country to meet their water needs. The primary water sources include boreholes, hand-dug wells, surface dams and springs. Ground water is harnessed by both rural and urban population to meet domestic and livestock water needs as well as for small-scale irrigation in the country.

According to assessment of water inventory sources conducted in 2019 across Somaliland by the Ministry of Water Resources Development, the country has a total of 914 water sources including boreholes, hand-dug wells, dams and springs among other sources.

Figure 4: Somaliland strategic water sources map adapted from MOECC 2023

1.1.4 Environmental Degradation

Land degradation in Somaliland is classified as only moderate and strong i.e. 37% of Somaliland is degraded (FAO-SWALIM 2007). The most common degradation type is soil loss due to wind and water erosion, loss of soil nutrient in agriculture productive areas, (mainly western part of Somaliland), loss of vegetation cover (in eastern part, parts of north-western and south-eastern) and invasive and non-palatable plant species in western Somaliland. The rampant natural resource degradation throughout the country, notably, the production of charcoal is increasing Somaliland's vulnerabilities to the climate change while the unsustainable utilization of the environment and natural resources are severely jeopardizing the national economy where the majority of population are dependent on climate-sensitive agriculture and pastoralism-based economic systems for their livelihoods.

1.1.5 Socio-economic Environment

Somaliland has an estimated population of 5 million with 55% of the population being nomadic pastoralists while 45% of the population are either urban / rural dwellers. The population is predominantly a nomadic pastoral community practicing livestock husbandry as a major source of livelihood. Livestock is the major source of income and food for an estimated 70% of the population in Somaliland. Crop production is ranked second to livestock.

Somaliland's national economy is dependent on livestock, agriculture and remittances from the diaspora as the main sources of revenue. Among these sources, livestock is the backbone of the

economy with shipment of sheep, goats, camel, and cattle to Arab countries, mainly Saudi Arabia. Land area suitable for permanent agriculture is estimated to be 10% of the total land area of Somaliland (Somaliland Country profile, 2021). This is in the western regions of Somaliland, where rainfall is higher, and soils are more fertile. Rain-fed agriculture is prevalent, but spate / flood irrigation is also practiced in parts of Togdheer such as Beer, Gatiitaley, and Haahi. The major crops include maize, sorghum and millet. Charcoal production is also widely practiced, in all regions of Somaliland, for both local household consumption and income generation through sales in local markets. Although the export of charcoal is illegal is outlawed in the country, it illegally taken across the borders.

Education in Somaliland is limited with an estimated one out of two female members in a household and 43% of male household members had attained some of basic primary education (Somaliland Health and Demographic Survey, 2020).

Rapid urbanization stemming from migration of destitute pastoralists who have lost their animals, economic migrants, and IDPs and returnees is creating another vulnerable group – urban poor in major towns across regions in Somaliland.

II: Methodology

2.1 Overview

In undertaking the VRA in Somaliland region, the assessment team utilized primary and secondary data to gather key data and frame the VRA. From the beginning to the end of the VRA exercise, the consultant undertook extensive literature analysis and review for the purposes of framing the VRA study as well as for the collection of missing data and complementing the data collected during the field survey. In addition to the secondary data collected during literature review, climatological and weather databases were continuously utilized to draw analytical data and key metrics from which inference was made on climatic patterns over time. This formed the basis for identification of climate risk based on observed patterns and trends over the past 20 years as well as climate risk projections.

At the same time, socio-economic data was gleaned from secondary sources with a view to understanding the socio-economic characterization of Somaliland and ideally identify areas of vulnerability within the socio-political and economic system of Somaliland. Primary data was collected through the field exercise in form of KIIs and FGDs undertaken by the Somaliland Ministry of Environment and Climate Change (MoECC) and KAALO with assistance and coordination support from UNDP NAP Team. The primary data was used to contextual identified vulnerabilities and risk factors with a focus on the 8 sectoral areas identified within Somaliland's Climate Change Adaptation policy framework. Further, stakeholder input was important in framing the potential opportunities for adaptation strategies in the identified sectoral focus area. Quantitative data analysis approaches and in particular thematic analysis were utilized using the NVIVO Qualitative Data Analysis software.

The thematic focus area of the thematic analysis of the Qualitative Data focused on the following key themes: socio-economic factors and physical and environmental sensitivity factors which determine Somaliland's sensitivity / susceptibility to the impacts / outcomes of climate change. The assessment followed the Inter-Governmental Panel on Climate Change (IPCC) 2014 climate risk and vulnerability assessment framework within the context of Somaliland. Following this approach, data was collected on pre-determined specific indicators that were designed to systematically analyze individual contributing factors of climate change vulnerability namely, adaptive capacity, sensitivity, and exposure.

2.1.1 Conceptualization of vulnerability

In line with Intergovernmental Panel on Climate Change (IPCC), AR4 conceptual framework, Somaliland's Vulnerability to Climate Change defines the complex interaction of climate change effects and the susceptibility (risk exposure levels) of a Somaliland's socio-economic and enviro-physical system to the impacts of Climate Change. The IPCC sought to elaborate and advance an approach for understanding vulnerability in its Fourth Assessment Report (AR4) as:

> *the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity‖ (Intergovernmental Panel on Climate Change, 2007).*

Within this perspective, Somaliland's Vulnerability to Climate Change is a function of Somaliland's climate change exposure, sensitivity, and adaptive capacity to cope with climate change effects, as illustrated below:

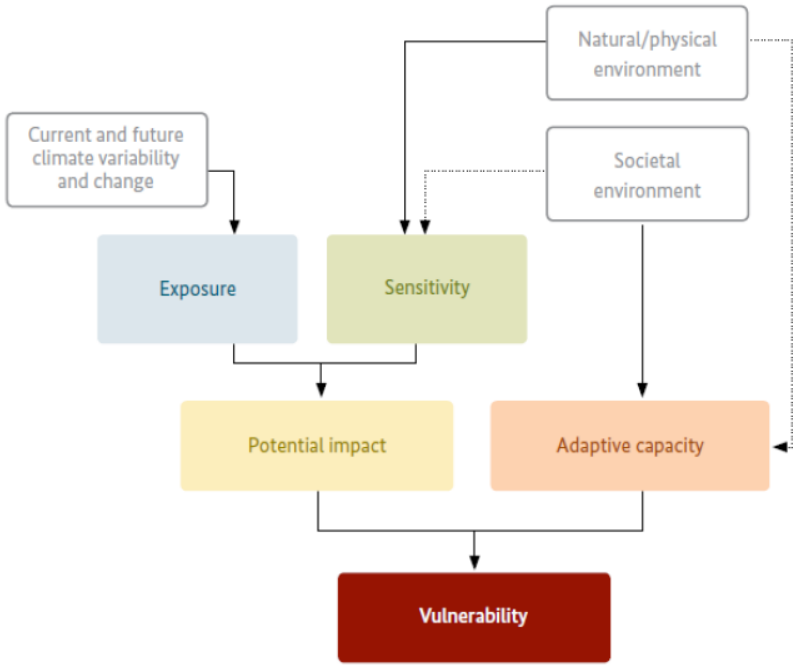


Figure 5 Vulnerability concept according to the IPPC AR4 (Deutsche Gesellschaft für Internationale Zusammenarbeit adapted from GIZ (2014).

Within this conceptual framework:

- ***Somaliland's Exposure*** refers to changes in Somaliland's climatic parameters that might affect socio-ecological systems such as changes in the mean average, spatial and temporal distribution of temperature and precipitation over time.
- ***Somaliland's Sensitivity*** refers to the susceptibility of Somaliland's physical and natural environment to climate change i.e. to its exposure as well as the ability of the system to withstand such exposure. For example, one of Somaliland's climate change sensitivity factors includes agricultural land use systems which are highly susceptible to seasonal droughts and flooding. Agricultural land use systems and communities are at a particularly high risk of exposure from increases in droughts or flooding upstream rainfall which will result in beyond normal downstream flooding and crop loss including the potential for loss of life and displacements.
- ***Somaliland's Potential Impact*** is a factor of exposure and sensitivity. In the above example on sensitivity to flooding, increases in precipitation above the mean precipitation means that there is a high risk of crop and animal losses, as well as displacement and loss of human life due to extreme flooding events.
- ***Somaliland's Adaptive Capacity*** refers, to Somaliland's socio-political, economic and the pysico-environmental system's ability to adjust after exposure to increasing climate variability and extremes, to moderate potential damages, to take advantage of opportunities, and / or to cope with the potential impacts.

2.2 The Assessment design and Approach

The vulnerability assessment was conducted within the geographical boundaries of Somaliland. The assessment methodology contextually developed for Somaliland and is based on a common harmonized framework, indicators, methodology and guidelines which facilitate vulnerability assessments in Somaliland. The steps of assessment have been summarized in Annex 1.

2.2.1 Literature review

Climate change is a serious threat to socio-economic development globally and in Somaliland. The effects of climate change are wide-reaching, touching nearly every aspect of Somaliland's national development.

To effectively address the threats posed by climate change and enhance resilience to its impacts, there needs to be a targeted approach with specific objectives and defined outcomes. Climate Change Vulnerabilities Assessments (CCVA) provide the necessary information needed for the targeted approaches. The need for CCVA is well documented at the global and national levels. The UNFCCC calls on the parties to the convention to take climate change considerations into account in their social, economic, and environmental policies and actions. In doing this, the parties are expected to employ appropriate methods such as impact assessments with the aim of minimizing adverse effects of policies and actions on the economy and the environment geared towards climate change mitigation and adaptation. The Paris Agreement requires parties to the Agreement to engage in adaptation planning processes and the implementation of actions including the development of relevant plans and policies; these may include the assessment of climate change impacts and vulnerability with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems.

Since 2012, Somaliland has taken several important initiatives to adopt policies, regulations, and institutional reforms that are essential in the nation-building process. Those linked to climate change related actions include the preparation of the 2013 National Adaptation Programme of Action (NAPA), the 2015 Initial Nationally Determined Contributions (INDC) Report to the UN Framework Convention on Climate Change (UNFCCC), draft 2021 National Climate Change Policy, the 2021 National Environment Policy, draft 2021 Environment Act, and the 2018 Initial National Communication (INC) to the UNFCCC. The Green Climate Fund National Adaptation Plan Project (GCF NAP) consisted of the following outcomes: Strengthening institutional coordination and capacity for adaptation planning and implementation; Enhancing the technical, institutional, and managerial capacity for adaptation planning; Developing Somaliland's capacities by active engagement and contribution to technical and strategic analyses with expert and stakeholder input through a learning-by-doing approach; and the mainstreaming of climate change adaptation considerations into the investment planning processes.

The multiplicity of challenges associated climate impacts and conflicts in a diverse country such as Somaliland calls for a coordinated and integrated approach to adaptation planning and implementation. To foster and support adaptation to Climate Change, the Government of Somaliland, and the UNDP, through the Ministry of Environment and Climate Change in the capacity of National Designated Authority (NDA) and KAALO Aid (KAD), have implemented a project called Support for Strengthening Climate Change Adaptation Planning funded by Green Climate Fund (GCF). The project has supported the implementation of the NAP process by strengthening the capacities of academia, decision makers and communities to adapt to the varying climatic conditions, and by facilitating the exchange of knowledge and expertise. Adapting

to the present and future impacts of climate change is crucial to secure little gains and increase the resilience of vulnerable communities, in particular for those whose livelihoods depend on climate-sensitive sectors, such as agriculture, nomadic pastoralism, water, energy, tourism, wildlife, and health.

2.2.2 Consultation with stakeholders.

Stakeholder engagement has been ensured through courtesy visits, KII sessions and focus group discussions, organized at crucial steps of the process, at both community and district levels across Somaliland. A formal inception meeting was held on 28th December 2023 between the KAALO team and the Ministry of Climate Environment and Climate Change to discuss modalities of conducting Vulnerability Assessment in Somaliland. The discussion covered data process and management including recruitment of qualified local enumerators, assessment sites and timelines.

The second phase of the assessment entailed fieldwork mission which began with a consultation workshop on vulnerability assessment in Somaliland. The workshop was organized by the Ministry of Environment, Resilience and Climate Change of Somaliland in collaboration with the KAALO and UNDP-NAP team. The meeting was aimed at validating the different sectors for which climate vulnerability assessment was targeted. The deliberations with ministry officials led by Mohamed Abdullahi Duale[2] and supported by Mohamed Abdullahi Yusuf[3], Mohamed Aidarus[4], and Mohamed Yusuf Nour[5]. The workshop meeting with ministry officials resulted in the identification and prioritization of the following key sectors: Water; Health; Agriculture; and food security; Livestock; Biodiversity; Coastal zone; Public works; Disaster Risk Reduction; and Gender and Education. Other workshop participants were drawn from different sectors across Somaliland which include:

- Ministry of Environment and Climate Change.
- National Authority for Disasters and Food Security (NADFOR)
- Ministry of Livestock and Rural
- Ministry of Agriculture Development
- Ministry of Water Resource Development
- Ministry of Fisheries and Marine Resources
- National Agency for Displacement and Refugees (NDRA)
- Ministry of Public Work
- Ministry of Employment and Social Affairs
- Ministry of Public Works and Housing
- Ministry of Transports and Roads
- Ministry of Health
- Ministry of Education
- Civil Society Organizations
- Academia
- Private Sector

[2] Director General Ministry of Agriculture and Climate Change, Somaliland
[3] NAP Coordinator, Somaliland
[4] KAALO-Food Security and Nutrition Program Manager
[5] NAP Coordinator UNDP

2.2.3 Data collection and Analysis

Data collection was conducted from 30th January to 4th February, 2024 through a structured questionnaire designed in Kobo Collect. The study used a combination of primary and secondary methods of data collection. Three methods of primary data collection were used. These were key informant interviews, focus group discussions and direct observations. Primary data collection generated qualitative data, as the focus was on capturing the narratives on the perceptions of changes in climate stress and the corresponding behavioral responses by various actors and stakeholders. In addition, where possible and appropriate, secondary methods of data collection, especially desk review were employed to generate secondary data.

The vulnerability assessment included mixed components (quantitative and qualitative):

- **A quantitative survey** was conducted using structured tools to assess how climate variability and change are experienced either directly or indirectly through its impact on the prioritized sectors. Ten (10) priority sectors were selected; and 37 respondents representing line ministries and CSOs were interviewed across Somaliland. The **key informant interviews** were conducted with representatives from the government, CSOs and community representatives. The goal was to understand the local context.

Figure 6: Participants from different government institutions and other stakeholders during a vulnerability assessment workshop conducted in Hargeisa, Somaliland 30th, December, 2023.

- **Qualitative focus group discussions** (FGDs) were conducted to discuss several topics on climate change vulnerability and determine more detailed perceptions of changes in climate stress and the corresponding behavioral responses. The outcome of the qualitative focus group sessions helps in the identification of general issues and needs, understanding of the participants´ perceptions on climate change, current and potential future climate-related risks, and identification of capacities, local and indigenous knowledge and assets that can be enhanced to strengthen resilience. For each priority sector,

two FGDs were conducted separately, one with men and one with women, ensuring stakeholders engagement and generating a total of 13 FGDs with between 8 -10 participants per FGD.

Figure 7: Focus group discussion (men and women) in Somaliland

- **Direct observation** - The relatively stable and peaceful conditions that characterize Somaliland allowed the study team to travel and physically observe some of the targeted communities in the region. The study team was able to visit IDP camps and peri-urban settlements including government offices. A more in-depth understanding of climate change context in Somaliland was gained by direct observation as a research technique. Observable data included the flooding and displacement in IDP settlements.

Table 2: Distribution of Stakeholders contacted in Somaliland

Mapped sites	Mapped stakeholders (Ministries/ Academia and CSOs)	Focus Group Discussions	Key Informant Interviews
• Gebiley (Arabsiyo) • Baki (Dharar Waxar) • Bali Gubadale • Geed- Deeble • Hargeisa • Hargeisa IDPs • Berbera • Bur'o • Oadwayne (Ceelxume & Habari Heshay)	• Somaliland Disaster Management Agency • Somaliland Roads Development Authority. • Ministry of Livestock Fishery Development • Ministry of Environment and Climate Change • Ministry of Health Development • Ministry of Employment and Social Affairs. • Ministry of Agriculture • Ministry of Water. • Ministry of Education	▪ Biodiversity (2 FGDs) ▪ Agriculture (3 FDG) ▪ Water (2 FGDs) ▪ Health Centres (3 FGDs) ▪ Livestock (2 FGDs) ▪ Coastal Communities (2 FGDs) ▪ DRR (2FGDS)	▪ Biodiversity (3 KII) ▪ Agriculture (3KII) ▪ Water (3KII) ▪ Health Centres (3KII) ▪ Livestock (3KII) ▪ Coastal Communities (2KII) ▪ Gender and Human Rights (3 KIIs) ▪ Education (3KIIs) ▪ Public work (3KIIs) ▪ DRR (2KIIs)

• Sarar	• Horn of Africa Voluntary Youth Committee (Havoyoco- CSO • Agricultural Development Organization (ADO)-CSO • University of Hargeisa-CSO • Amoud University-CSO • Waqaal Water Company		
		16 FGDs	**29 KIIs**

Source: Somaliland VRA

A team of ten (10) enumerators – all locals with extensive knowledge of Somaliland undertook the data collection and stakeholder engagement under the overall supervision of staff from the Ministry of Climate Environment and Climate in Somaliland, UNDP -NAP SP, NAP regional Coordinator Somaliland, and KAALO Aid.

The data collected through surveys was uploaded onto the Kobo Collect server, acting as a repository, secured by a two-way authentication passcode. The data was downloaded in Microsoft Excel and analyzed through SPSS using descriptive statistical techniques. Qualitative data analysis involved identification, examination and interpretations of patterns and themes in the data.

Further, different approaches were used to analyze data necessitated by the use of several analytical tools in the study. The analyses carried out are presented below:

- **Analysis of the vulnerability of the physical environment to climate risks:** The analysis of the vulnerability of the physical environment to climate risk based on methodological Guide for Mapping Vulnerability to Climate Risks proposed by the Sahel and Sahara Observatory (OSS, 2013). This method focuses on a combination of a series of vulnerability factors with particular attention on topography and land use. This choice of approach is justified by its suitability or adaption to the Sahelian zones but also to analyze the risks associated with climate change, as well as identifies the most vulnerable zones with a view to informed decision-makers on issues related to sustainable land management and the risks associated with climate change.
- **Analysis of climate rationale:** The scope of the analysis covers past and future climate variability/projections, climate vulnerability impacts; climate vulnerability; and identification, assessment, and prioritization of adaptation options/strategies. The study examined a number of issues key among them the behavior of precipitation and temperature; climate risk for each sector identified; and identification and map out of relevant adaptation options or strategies used by the local population across sectors to cope with different climate risks.

2.3 Methodological and Technical Limitations of the Vulnerability Assessment

2.3.1 Filed level data collection challenges.

Challenges during the data collection include but not limited:

- Limited knowledge and understanding of climate change concept among the targeted local communities. This was mitigated through provision of explanations of key concepts before interviews and FGDs.
- Limited participation of communities in FGDs and KIIs session owing to high mobility of the community in search of daily livelihoods.

2.3.2 Data gaps and/or unavailability

In this assessment, significant data gaps and/or data quality was a major challenge. As a result of missing / unavailable data, some analysis levels may be incomplete. In some cases, (for e.g. precipitation data), data was available at the national level which was then up scaled to the national level. In some instances, findings have been generalized based on data availability and proxies.

Future maps were not produced as predicted sensitivity and adaptive capacity data was not captured for Somaliland. This assessment should be seen as an attempt of systematically unraveling Somaliland's vulnerability to climate change.

2.3.3 Projections of climate change

Due to observed data gaps and / or quality issues for climate change projection – for the climate variables of minimum and maximum temperatures and precipitation, this assessment relied on projections derived from the Coordinated Regional Downscaling Experiment (CORDEX) Africa experiment[6]. The projections are augmented with studies for East Africa and the Horn of Africa.

It proved to be difficult to find data sets that indicate projections of climate impacts into the future for Somaliland. In general, some data are available on climatic exposure components, such as rainfall and temperature data.

III: Results of the Vulnerability Assessment

3.1 Climate Change Vulnerability and Risks Factors in Somaliland

Climate change vulnerability is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with adverse impacts of climate change (IPCC, 2010). This VRA identified Somaliland's Climate Change Risk increases in the mean average temperatures over time which are manifested in terms of increasing aridity and desertification through increasing frequency of prolonged drought cycles. The VRA exercise further identified increases in seasonal precipitation at a point in time;

[6] The CORDEX Africa experiment consists of multiple climate models using different Representative Concentration Pathways (RCPs); the RCPs broadly correspond with different emission pathways that could result in various degrees of mean global warming.

manifested by sudden onset and unpredictable flooding events, and tropical storms as the second Climate Change Risk that Somaliland faced over the past 5-10 years.

According to Reisinger et al, (2020), vulnerability to climate change risk will, results from dynamic interactions between climate-related hazards, exposure of a system to these hazards and the adaptive capacity of the human or ecological systems to the identified hazards / risks. For Somaliland its vulnerability is deeply tied to its socio-economic and ecological system. This means that while the identified climate related risks are the vulnerability triggers, systemic weaknesses / factors drive Somaliland's vulnerability. The VRA consequently identifies and increases understanding of the socio-economic and ecological drivers of its vulnerability to climate change. This assessment represents an important step in initiating Somaliland's climate change adaptation discourse and strategies. This section thus delves into the drivers of climate change vulnerability in Somaliland.

3.1.1 Drivers of Somaliland's Climate Change Vulnerability and Adaptive Capacity

Vulnerability and adaptive capacity are a function of socio-economic and ecosystems factors. This section analyses the drivers of Somaliland's Climate Change Vulnerability and Adaptive Capacity. The section reviews the socio-economic and ecosystem characteristics and contextualizes them to Somaliland's vulnerability / adaptive capacity to climate change. These factors are discussed in the section below:

- **Socio-demographic factors:** The households in Somaliland are predominantly male headed at 65.3 per cent with 34.7 per cent of the households being female headed. The average size of households in the assessment area is 6 people (SLHDS, 2020[7]). The lowest number of people in a household was one and the highest number of people in a household in the assessment area was +9. Most households had an average of nine people as shown in Table 2 below. Most household members in the assessment area attained no education level (21% F, 17% M) with most of them having attained some primary school level of education (51% F, 43% M) as shown in table 2. This ultimately increases the household vulnerability to climate change risk while constraining their adaptive capacity as larger households require more resources and are significantly impacted by resource shortages and livelihood challenges associated with climate change. Further, with a majority of the households having no education, their capacity to explore alternative livelihood strategies and to adopt climate smart technologies is limited.

Table 3: Demographic characteristic of household heads in Somaliland

Background characteristics		Percentage distribution (%)	
		Male	Female
Gender	Household headship	65.3	34.7
Level of education	No education	17.3	21.2
	Some primary education	42.9	42.9
	Completed 8th grade at the primary level	6.5	6.5
	Some secondary	9.5	9.5
	Completed secondary	9.8	9.8
	Higher education	11.7	11.7

[7] Central Statistics Department, Ministry of Planning and National Development, Somaliland Government. *The Somaliland Health and Demographic Survey 2020*

	Don't know	2.4	2.4

Source: SLHDS 2020.

As established in this assessment, most household heads in Somaliland attained no education or have attained some primary school level of education. The VRA used percentage of household heads with an average level of education as an indicator to determine vulnerability. Household head's level of education has been found to influence the use of climate change information that is available to them. Household heads with an education are more likely to positively use climate change information available to them to adequately adapt to the impacts of climate change (UNFCCC, 2017).

Gender driven household power imbalances increases the vulnerability of sections of the population who are already marginalized such as women[8] and youth to the impacts of climate change. In Somali communities, women and the youth are marginalized and excluded from household and community decision making and resource ownership / control processes thus further increasing their risk exposure as their input are not captured in climate change adaptation decision making processes. Women and girls are disproportionately affected by the impacts of climate change due to the multiple roles they play in society including childbearing and care, caring for the sick in the household, fetching and cooking food and providing water. Women are also negatively impacted by the humanitarian crises occasioned by disasters such as flooding and droughts[9].

- **Livelihood Strategies:** Under the arid and semi-arid areas of Somaliland pastoralism and agro-pastoralism are the fundamental basis of livelihoods which makes Somaliland vulnerable to climate change, environmental degradation, drought, and flooding. These factors threaten the livelihoods of local communities, many of whom practice pastoralism, a way of life that depends on dryland resources (Abdulkadir, 2017). According to Ministry of National Planning and Development (MNPD, 2011), the livestock sector employs over 70% of the population and accounts more than 60% of the GDP and 85% of foreign exchange. Moreover, farming, fishing and petty trade complement this sector. The livestock, as a source of food, income and savings is not confined to the rural community; many of the urban dwellers engaged in trade and commerce and those who receive remittances are also investing their savings in livestock in the pastoral and agro-pastoral areas with their relatives and respective clans and sub-clans.

  A livelihood refers to how people meet their basic needs, such as food, shelter, health, education, and income (Frankenberger et al. 2000). Ellis (2000) defines a livelihood as the assets, activities, and access that shape the living of an individual or household. Assets, including natural, physical, human, financial, and social capital, are resources people possess, whereas activities enable them to be used for income or needs. However, climate change and natural disasters endanger the assets that people rely on, such as health, agriculture, food security, water, forests, coastal regions, biodiversity, human settlements, and energy and finance sectors (Gezie, 2019). Climate change can undermine economic growth by causing higher food prices, currency depreciation, conflict, and security threats (Serdeczny et al., 2017; World

[8] Somali women play a significant role in Somaliland community; the division of labor is clearly defined and heavily weighted towards women. For instance, traditionally, the nomadic women milks the animals, processes the milk, feeds the family, and cares for and watches the livestock among other roles including firewood collection, cooking, and other household chores.

[9] United Nations Economic and Social Council report on population dynamics, vulnerable groups and resilience to climate change and disasters

Bank, 2013). In the context of Somaliland, given that most of the population derive their income and livelihood from agriculture (70 per cent), it is inferred that majority (70 per cent) of agro-pastoral communities also derive their livelihoods from agriculture (crop and livestock farming). Thus, agro-pastoral communities have a particularly high exposure to climate risks such as droughts and floods as these disrupt their productive and livelihood capacities thus pushing them to displacement and destitution while negatively impacting their resilience capacities. In addition, given the exposure of the agricultural sector to the impacts of climate change, the large percentage of the population depending on rain-fed agriculture for crop farming had declining sizes of their farmlands under irrigation increasing their vulnerability.

- **Access to water:** Easy access to a water source may enhance the quantity of suitable drinking water available to a household and therefore also significantly reduce their vulnerability to the impacts of climate change. Source of drinking water for a household is an indicator of how safe it is to consume. Sources that are likely to provide uncontaminated water suitable for drinking are known as improved water sources (Table 5). These include piped water, protected dug wells, tube wells or boreholes, rainwater, and bottled water.

  Households' main sources of drinking water: According to the Somaliland SLHDS 2020 report, 41 percent of households get their drinking water from improved water sources. Piped water into dwelling/ yard/plot and tanker truck/cart with drum are main sources of drinking water for 17.1 per cent and 31.0 per cent of the households with improved and unimproved water sources respectively.

Majority households get their drinking water from unimproved water sources at 51 per cent with 31 per cent of the households accessing their drinking water from tanker truck/cart with drum. Up to 19.3 per cent of the households' access drinking water from other sources which include unprotected wells, spring and surface water as shown in the table 5 below.

Table 4: Access to water indicators

Background characteristics		**Percentage distribution (%)**
Main source of drinking water	Improved source (40.9%)	Piped water into dwelling/ yard/plot– 17.1 % Piped to neighbor–3.7% Public tab/ standpipe- 2.1 % Tube well/ borehole- 1.3 % Protected dug well – 7.4 % Protected spring – 4.0 % Rain water – 5.2 % Bottled water - 0.2 %
	Unimproved source (59.1%)	Unprotected dug well – 12.4 % Unprotected spring – 4.1 % Tanker truck/cart with drum – 31.0% Water Kiosk – 0.8% Surface water – 2.8%

		Others – 1.8%

Source: SLHDS 2020

According to the Somaliland Health and Demographic Survey 2020 report, 45 percent of the urban households, 38 percent of rural households and 37 percent of nomadic households have access to improved sources of drinking water. Rural and nomadic households are highly dependent on what can be termed as risky water sources and are at a disproportionately higher risk of consuming contaminated water. At the same time, rural and nomadic communities are disproportionately affected by water shortages as a result of prolonged drought events. In cases of prolonged droughts and water shortages, rural households are forced to migrate closer to water sources especially to cater for their animals or rely on assistance through water trucking initiatives. As such, sustainable and consistent access is an important consideration in enhancing Climate Change Adaptation capacity for rural households and communities.

- **Political situation:** Somaliland is exposed to social and political droughts caused by failures of institutions to establish the necessary infrastructure for the required provision of water demand by growing populations and several others (IWMI 2007). More importantly, despite Somaliland regarded highly vulnerable to climate change, the country has no representation in the UNFCCC as either as a party or as an observer. The non-recognition of Somaliland as a nation internationally has limited the involvement of Somaliland into any international efforts of mitigation or adaptation to climate change. However, Somaliland has nurtured strong attachment to a very comprehensive environmental and socio-economic monitoring program of FAO SWALIM and Food Security and Nutrition Analysis Unit (FSNAU).

3.1.2 Contributing Factors to the Exposure of Somaliland to Climate Change Impacts

Natural vulnerabilities

This assessment revealed that Somaliland, under current climate conditions, is exposed to a multitude of natural hazards. Climate change actors and stakeholders[10] reported that floods, droughts, infestation of invasive species (Prosopis juliflora), locust, cyclone/tropical storm surges have been experienced over the last 10 years in the region. The hazards are reported to be frequent and intense, particularly floods and droughts, have caused deaths, crop failures, and livestock losses in Somaliland over the past decade (i.e. 5-10 years). Community perceptions about trends in climate change over the last ten years based on FGDs are reported in Table 6.

- **Droughts:** FGDs participants in all sectors reported frequent occurrence of drought in the region. Drought is one of the biggest problems facing Somaliland. Droughts have severely affected crop and livestock production in the assessment areas in Somaliland. The drought in recent years has had a damaging effect on natural resources, notably by drying up water sources, increasing temperatures, disrupting farming practices and reducing agricultural productivity. According to the Food Security and Nutrition Analysis Unit (FSNAU) and the Famine Early Warning Systems Network (FEWS NET), the 2021 "Deyr" cereal output forecast indicated a drop of 50 to 70 percent below the 10-year

[10] Key stakeholders consulted included experts in the line ministries, practitioners, and representatives from community groups, CSOs across the eight priority sectors for this assessment.

average. Maize and sorghum crop production was 15-25 percent below the 10-year average in the 2020 Gu and 2020 Deyr seasons and 50 percent below average in the 2021 Gu season (FEWS NET/FSNAU). More importantly, the community perceive likelihood of future occurrence (next 10 years) of drought in the region.

- **Floods and soil erosion:** Flooding is one of the most common natural disasters in Somaliland that causes greater levels of human vulnerability. Flood incidences have had detrimental effect on people's lives and livelihoods. It can result in the contamination of water sources; damage to sanitation systems; impact health facilities and services; loss of physical infrastructure such as houses, roads, and other facilities. For instance, the extreme rains in 2019 were very disruptive, and led to widespread floods, resulting in the displacement of people and causing crop and livestock losses that affected large population in Gabiley region. These exceptionally moist conditions led to a massive locust outbreak that was the worst in 25 years in the region. The incidence of flooding is expected to increase in the future. As a result, the impact of floods in agriculture (crop and livestock) is expected to exacerbate human vulnerabilities. The Glibey region is predominantly agro-pastoral zone, agriculture is the key source of employment and income. Human vulnerability is high as incidences of floods cause unemployment and/or underemployment. Besides, during the flood period, a number of vector and water borne disease incidences increase, resulting in morbidity and mortality among the affected population in the area.

- **Tropical storm/cyclone:** FGDs participants in all sectors reported occurrence of tropical storm/cyclone in the region. In 2018, a tropical hurricane, 'Sagar' attributed to the effects of climate change dumped a year's rate of rain, causing flash floods and deaths and destruction of livestock and properties in coastal areas of Somaliland.

- **Locust outbreak:** Incidences of desert locust outbreaks have been observed in Somaliland. This is attributed to the extreme rains in Gabiley region in 2019 which were very disruptive, and led to widespread floods, resulting in the displacement of people and causing crop and livestock losses that affected large population. These exceptionally moist conditions led to a massive locust outbreak that was the worst in 25 years in the region. The 2020 desert locust crisis has also challenged the people. It has had a big impact on food security, triggering further displacement among already vulnerable populations especially women and children. According to FAO Emergency Division, Crisis, desert locust crisis, (2020), the massive locusts could potentially cause large-scale crop damage and plunge the country into greater distress, pushing up malnutrition rates.

Projected Climate Impacts Based on Existing Assessments

Local communities in this assessment reported that climate change is projected to increase the Somaliland's exposure to a multitude of natural hazards. The main indicator used to determine the exposure of the assessment area to the impacts of climate change is occurrence of natural hazards and vulnerability. Community perceptions about trends and likelihood of future occurrence in climate change over the last 5 -10 years and next 10 years based on Key informant interviews and FGDs are reported in Table 6.

Table 5: Community perceptions and experiences on natural disasters in the last 5 – 10 years

Focus Group Discussion Findings

(based on local communities' observations of climate change impacts)

Natural hazard	Occurrence in last 5-10 years	Likelihood of future occurrence (next 10 years)	Impact of climatic hazards
Floods	Yes	Likely	Severe
Droughts	Yes	Likely	Severe
Crops pest and diseases	Yes	Likely	Severe
Locust infestation	Yes	Likely	Severe
Extreme temperatures	Yes	Likely	Severe
Cyclone	Yes	Likely	Severe

Both KIIs and FGDs participants reported occurrence of droughts and perceive likelihood of occurrence of these natural hazards in their region since they have become more frequent, during the last 5 -10 years. The community perceptions presented in Table 6 is consistent with other studies in the Horn of Africa, which also found that these natural events are expected to become more frequent and severe in the coming decades, as a result of human-induced global warming.

- The interval of drought occurrence in history is highly variable which ranges from an interval of four to 11 years and extended period of two to three years and very recently occur almost every year in Somaliland. The drought occurrence usually coincides with different human and livestock disease and resource base conflicts. The consequence of the recurrent drought has already resulted in loss of livestock, land degradation, crop failure, frequent mobility, increasing of IDPs and destitution in Somaliland.
- Seasonal rainfall patterns may become more variable and erratic aggravating severe drought (Lyon & DeWitt, 2012; Connolly-Boutin & Smit, 2016).
- The intensity of both tropical cyclones and storm surges are likely to increase with rising sea surface temperatures and sea level. The increases in extreme weather and sea conditions are linked to rises in sea surface temperature. A warmer ocean intensifies cyclone activity and heightens storm surges. The destructive impact will generally be greater when storm surges are accompanied by strong winds and make landfall during high tides (Brecht et al. 2012). Somaliland, particularly the northern part experienced very severe tropical cyclone in November 2020 when Hurricane Gati made landfall in the region becoming the first hurricane-equivalent storm to hit the Horn of Africa[11].

[11] https://earthobservatory.nasa.gov/images/147576/gati-makes-historic-landfall-in-somalia

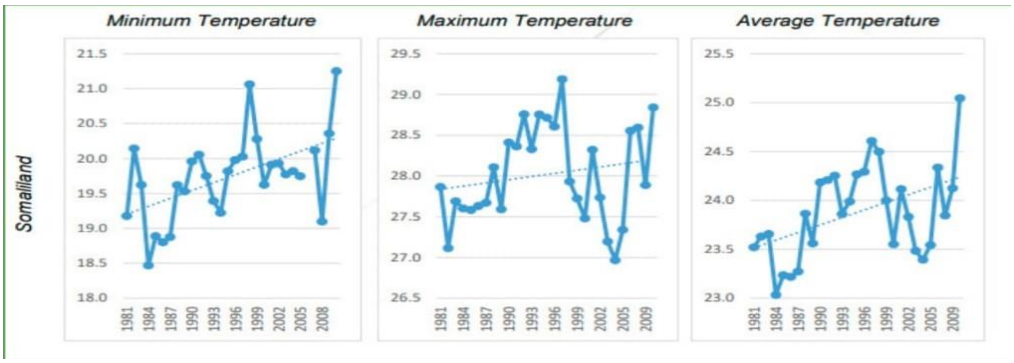
3.1.3 Current and Future Trends of Climatic Variables in Somaliland

This assessment provides an insight of climate change projections for Somaliland. The assessment focuses specifically on temperature and rainfall (precipitation) and their associated impacts. Temperature and Precipitation, and their combination, are the two defining parameters for the growth of natural resources including agriculture produce and rangeland vegetation, sustaining livelihoods of agro-pastoral communities in Somaliland. This assessment, therefore, tries to bridge current information gaps on the subject with the aim of assisting policy planners to address emerging impacts of climate change.

- **Current and Future Trends of Temperature:**

Consistent data on climatology in Somaliland is lacking. However, KIIs and FGDs participants reported occurrence of extreme temperatures and perceive likelihood of its occurrence in the next 5 -10 years. This is also consistent with findings of climate studies in Somaliland. Studies are in agreement that increases in maximum and minimum temperatures are apparent in all seasons with the average maximum temperatures still range from approximately 25°C to 31°C depending on the month (ibid.).

The country experienced an area-averaged rate of warming of ~0.17°C/decade between 1950 and 2020, with the rate of warming accelerating to ~0.21°C/decade between 1991 and 2020 (World Bank, 2023). Recent study carried out by the University of California, Santa Barbara's Climate Hazards Centre for the Thompson Reuters Foundation found, an average, over the last 30 years, daily maximum temperatures in Greater Horn of Africa have risen by about a degree from 33°C to about 34°C (Chen, 2017). The below graphs presents a summary of temperature in Somaliland.



"Community dialogues during the FGDs in all the assessment sites observed a consensus among participants that temperature level has increased in Somaliland during the past 5 -10 years. However, analysis of climatic variables is hampered greatly by lack of up to date region specific data bringing about overreliance on national data."

Future projections for two time periods: the short term (2021–2040) and the midterm (2041-2060) show a likely increase in temperatures. The CORDEX Africa multi-model median projections indicate increases in maximum and minimum temperatures are apparent in all seasons over the short and medium terms under both RCP4.5 and RCP8 when compared to 1986–2005 observations. The magnitude of warming at night (TN) is greater than that of daytime (TX) warming.

The CORDEX Africa multi-model median projections indicate that the number of extreme heat days in which maximum daytime temperatures exceed 40^0C is likely to increase in Somaliland. Each year, by the 2030s, the country could experience between 4 and 30 days of temperatures exceeding this threshold, predominantly during February-April (World Bank, 2023; Gutierrez, et al., 2021). Studies have also shown an increasing trend in both minimum and maximum temperatures in the assessment area and at a global and regional level (King'uyu, Ogallo, & Anyamba, 2000; Easterling, et al., 2009; IPCC, 2014; Ogallo, et al., 2017). Further, studies on the Horn of Africa region that show an increase in temperature (King'uyu, et al., 2000). IPCC among many other past studies have linked global temperature increase worldwide to climate change induced gbblobal warming. Forward into the future, temperature in Somaliland is projected to very likely rise between 1.4 - 1.9 °C by 2030, 1.5 - 2.3 °C by 2050 and 1.4 - 3.4 °C by 2080[12]. The projected increase in temperature increases future drought risk in Somaliland.

12 https://weatheringrisk.org/sites/default/files/document/Climate_Risk_Profile_Somalia_Summary_for_Policymakers.pdf

Table 6: Projected Changes in Multi-Model Median Maximum (TX) and Minimum (TN) temperatures indifferent seasons over short (2021–2040) and medium (2041–2060) terms

Season	Term	Model	Maximum temperatures (TX)	Minimum temperatures (TN)
Jan - Feb	Short term (2021–2040)	RCP4.5	Increases of between 0.9°C and 1.0°C nationally; while the northwest region could experience greater warming.	0.9°–1.0°C warming; with the northeast experiencing lesser warming of up to 0.8°C.
		RCP8.5	Experiences of 1.0°–1.3°C warming; areas in northwest region could experience greater warming up to 1.4°C.	1.0°–1.1°C warming; areas in northwest region could experience greater warming up to 1.4°C.
	Medium term (2041–2060)	RCP4.5	Increases of 1.5°–1.7°C or greater	Warming of 1.7°C nationally
		RCP8.5	Increases of between 1.8°C and 2.2°C nationally	Increase of 1.8°C to 2.0°C
March - June	Short term (2021–2040)	RCP4.5	Warming ranges from 0.9°–1.0°C	Between 1.1°C and 1.3°C.
		RCP8.5	Warming ranges from 1.1°C to 1.4°C.	Warming of 1.1°–1.3°C
	Medium term (2041–2060)	RCP4.5	Warming ranges from 1.5°C to 1.7°C	Warming from 1.7°–2.0°C.
		RCP8.5	Warming from 2.0° to 2.3°C.	Warming of 2.2°–2.5°C
July - August	Short term (2021–2040)	RCP4.5	Up to 1.1°C	Between 1.0°–1.3°C
		RCP8.5	Increases of up to 1.3°C	Between 1.1°C and 1.3°C.
	Medium term (2041–2060)	RCP4.5	Increases of 1.5°C.	1.5°–1.7°C warmer
		RCP8.5	Warming of 1.7°C to 2.0°C.	2.0°C to 2.2°C warmer
September - December	Short term (2021–2040)	RCP4.5	Experience warming of 0.7°– 1.0°C	Between 1.0°C and 1.3°C.
		RCP8.5	Warm between 1.0°C and 1.3°C.	1.3°–1.4°C warming
	Medium term (2041–2060)	RCP4.5	Range from 1.5°C to 1.7°C	Warming from 1.7°–2.0°C
		RCP8.5	Range from 1.7°–2.2°C	2.0°–2.5°C warmer

Source: Adapted from CORDEX Africa projections from IPCC AR6 WGI Interactive Atlas

- **Current and Future Trends of Precipitation (rainfall).** The communities visited during the assessment were unanimous about the occurrence of droughts and flooding caused by extreme variability of rainfall. The community observations indicate the occurrence of severe droughts and flooding which are caused by the extreme variability of rainfall from year to year between different places. The observations made by communities also seem to confirm the scientific facts, which show that climate change is occurring and impacting livelihoods and ecosystem. For instance, the meteorological data of precipitation for both the Hargeysa and Borama regions shows extreme temporal variability of rainfall in all months over the observed stations (Table 7). The mean annual rainfall for Hargeysa and Borama regions is 163 mm / year and 185 mm / year respectively.

Table 7: Total monthly rainfall at the Borama and Hargeisa weather stations between 1985 -2015

	Hargeysa			**Borama**		
	Mean	Max	Min	Mean	Max	Min
JAN	3.81	0.05	21	9.08	42	0.18
FED	4.38	69.28	0.11	8.06	85	0.11
MAR	14.8	86.8	0.01	23.9	108	0.18
APR	36.8	108.1	2.6	36.9	181	0.21
MAY	32	172	1.7	16.1	92	0.06
JUN	7.6	52	0.06	5.4	26.2	0.01
JUL	11.2	38	0.3	22.2	84	0.64
AUG	11.2	44.2	1.5	18.3	49	4.64
SEP	6.2	29.7	2.1	8.88	87	0.98
OCT	19.1	179	0.3	15.89	181	0.11
NOV	12.5	111	0	14.7	122	0
DEC	5.4	41	0	5.9	40	0
ANNUAL	**163.8**	**461**	**59**	**185**	**452**	**76**

Rainfall in Somaliland is also affected mainly by the Inter-Tropical Convergence Zone (ITCZ), monsoonal winds and ocean currents, jet-streams including the 'Somali Jetstream', easterly waves, tropical cyclones, the Indian Ocean and Red Sea conditions, as well as teleconnections with various regional and global scale climate systems. The rainfall is further affected by Quasi-biennial Oscillation (QBO), El-Niño/Southern Oscillation (ENSO), Indian Ocean Dipole (IOD), and intra-seasonal waves (NAPA, 2013).

Future projections for two time periods: the short term (2021–2040) and the midterm (2041-2060) show a likely increase in precipitation. The CORDEX Africa multi-model median projections indicate that changes in the Gu and Deyr seasonal rains are likely to be minimal over the short term (2021–2040) and that there might be small increases over the medium term (2041–2060) when compared to 1986–2005 observations.

Table 8: CORDEX Africa Median Projections for Percent Change in Precipitation for Somaliland

Season	Term	Median projection (% change)
Gu	Short term (2021–2040)	RCP4.5: 0 to 15%
		RCP8.5: 0 to 15%
	Medium term (2041–2060)	RCP4.5: 0 to 10%
		RCP8.5: 0 to 10%
Deyr	Short term (2021–2040)	RCP4.5: 5 to 15%
		RCP8.5: 0 to 15%
	Medium term (2041–2060)	RCP4.5: 5 to 20%
		RCP8.5: 10 to 25%

Source: Adapted from CORDEX Africa projections from IPCC AR6 WGI Interactive Atlas

Table 8 above presents multi-model median projections value for climate variable for two time periods: short- and medium-term periods. The projections are presented as absolute change in temperature, as calculated against the historical climate reference period of 1986-2005.

- The Jilaal dry season (roughly December–February) is projected to experience an increase in seasonal precipitations. This could indicate that the Gu rains might begin earlier (as seen in the potential increases over the January– February season by the medium term (Richardson et al., 2022) or that precipitation could increase over these two months in the lead up to Gu. However, there is high model uncertainty over potential changes in totals for the Gu season over the short to long terms (Dosio et al., 2021), but other models are projecting that it could start and end earlier (Richardson et al., 2022).
- By the medium term, however, more models show that the Deyr rains could start and end later, with an overall increase in the season's precipitation totals. Climate projection models for the region indicate potential decreasing precipitation (Dosio et al., 2019; 2021).
- Projection models are agreement that variability in precipitation is likely to increase over the short and medium terms (Richardson et al., 2022; Dosio et al., 2019; 2021). Heavy rainfall events, which contribute to flooding and soil erosion, among other impacts, are likely to increase in intensity and frequency as is the frequency of drought. Somaliland will have to contend with both drier years and more frequent, severe storms.

Further, other studies have observed increases and decreases in precipitation in regions of Somaliland in the recent past. The studies have shown a high degree of interannual variability with recurrences in high/low value extremes that are often associated with floods / droughts (Easterling, et al., 2009; IPCC, 2014; Ogallo, et al., 2017). Some of these extremes occurred during El Nino /La Nina years. The IPCC (2014) indicated an increase in temperature of 0.8-1°C has already been observed in East Africa (including Somaliland) with projected increase of 2-3°C in the mid-term period (2046-2065). The IPCC report also projected a 20 to 30% increase in precipitation for East Africa in the mid-term period (2046-2065). However, rainfall trends in eastern Africa are considered highly variable both spatially and temporally, and the gain in precipitation increases may be offset by higher evaporation resulting from rising temperatures.

Different projection models, however, show quite some variance in their projections on how strong and reliable the observed trends will be. What the models agree on is that there will very likely be high inter-annual variability in the amount of precipitation, meaning that there will be both wetter and drier years. Precipitation rates determine the occurrence of both drought and flood hazards. The projected increase in precipitation for the region, increases future flood risk in some parts of Somaliland.

3.2 Climate Change Risks, Hazards and Vulnerabilities in Somaliland

3.3.1 Climate Change Risks and Hazards in Somaliland

Hazard refers to the potential occurrence of climate-related physical events or trends that may cause damage and loss. The most common climatic hazards in Somaliland were identified by the technical staff of line ministries and community groups. The potential risks from these hazards were also identified. As previously stated in this report, floods and droughts are the most common climate related hazards that occur in the country. In Table 10 below, precipitation and temperature are the climate variables whose impacts results in the identified hazards that have negative impacts on the human and ecological systems in Somaliland. The interaction of the climatic hazards with the exposed human and ecological systems in the region results into climate change risks identified in table 10 below. It is observed that precipitation can lead to either of the two identified climatic hazards depending on the magnitude and intensity. For instance, low precipitation leads to drought hazard which has been occurring in the region while high precipitation leads to flood hazard. The risks associated with either occurrence of the precipitation variable is the occurrence of floods and droughts and rise in the river water levels (including Somaliland coastlines) in the case of high (extreme) precipitation. The temperature variable is mostly associated with drought hazard in the region which exposes Somaliland to the risk of frequent drought incidences.

Community Perceptions and Experiences on Climatic Change Risks and Hazards

Discussions held with community groups across sampled study sites observed that floods and droughts are the most common climate related hazards that occur in the region. These climate change risks not only result from changes in temperature, precipitation or other climate variables or hazards but also from the interaction of these with local communities' socio-economic development and land use trajectories, and other human-mediated environmental degradation and change. The occurrence of periodic droughts and floods lately experienced, not only in the assessment but in most regions of Somaliland, could be attributed to climate change.

Summary of potential risks from climate hazards occurring in the region were identified and are also described in table 9 below.

Table 9: Common climate related hazards and potential risks in Somaliland

Climatic variable	Climatic hazard	Climatic change risk
Precipitation • High	Floods	• Increased flooding incidences • Rise in water levels • Increases of vector and water borne diseases (human and livestock) • Invasive weeds

• Low	Droughts	• Occurrence of droughts • Resource-based conflicts • Disease outbreaks (human and livestock)
Temperature (heat stress)	Droughts	• Increased Drought incidence

3.3.2 Climate Change Vulnerabilities

Vulnerability refers to a low adaptive capacity and little ability to recover from climatic shocks and other environmental or socioeconomic hazards. The communities in the assessment areas are particularly highly vulnerable to both climate change and climate variability. The vulnerability of these communities to climate change results from a combination and interactions among multiple factors including dependence on rainfed agriculture, lack of or only low education, among other factors as earlier discussed in previous sections of this report.

Climate change vulnerabilities contribute to the risk of the occurrence of climate change impacts. Somaliland's climate change vulnerabilities manifest in various forms including decreased crop production, loss of income, emergence of new and aggressive insects, pests and diseases, loss of livelihoods and loss of life among others. The analysis focused on a set of most common climate change risks identified by the key informants and community groups contacted during this assessment (Table 10).

Table 10: Climate Change Vulnerabilities in Somaliland

Climate Change Risks	**Vulnerabilities**
(Precipitation) Flooding Rise in water levels	• Decreased crop production. • Food scarcity including pasture. • Emergence of new and aggressive insects and pests • Loss of income • Low milk productivity • Livestock diseases • Loss of livelihoods • Inadequate water supply • Spread of infectious and contagious infections • Loss of life
(Temperature) Droughts Airborne diseases	• Decreased productivity. • Emergence of aggressive and invasive insects and pests • Loss of productive agricultural land • Loss of income • Declining livestock productivity • Loss of livelihoods • Inadequate water for human and livestock use. • Loss of life • Spread of contagious and infectious diseases

3.3 Sectoral Climate Change Analysis

3.3.3 Analysis of vulnerabilities of key sectors to Climate Change

Discussion with key stakeholders including community groups led to identification of Agriculture (crop, livestock, and fisheries), Water and Health as vulnerable sectors to the impacts of climate change in Somaliland. The assets impacted by climate change in the identified priority sectors are categorized into natural, physical, human, social and financial assets. The assessment further gives a description of the various assets in each sector as shown in Table 11 below.

Table 11: Identification of the vulnerable sectors to climate change in Somaliland

CLIMATE CHANGE Risks	EXPOSED SECTOR	ASSETS	ASSETS DESCRIPTION	IMPACTED	DESCRIPTION OF IMPACTS ON SECTORAL ASSETS
Precipitation • Flooding • Drought	Agriculture (Crops)	Natural	Crops and sources of water for crop farming	Yes	• Damage to crops in the fields during flooding. • Outbreak of crop diseases and pests. • Loss of productive agricultural land due to rise in water levels.
		Physical	Access to markets (roads), means of transportation, supporting infrastructure	Yes	
		Human	Level of crop farming knowledge, availability of information on crop farming	No	
		Social	Access to social network e.g. membership to farmer groups, access to extension services	No	
		Financial	Income from crop farming, access to credit	Yes	
	Livestock	Natural	Availability of pasture/fodder and grazing fields.	Yes	• Loss of livestock grazing fields due to flooding • Outbreak of fungal diseases due to flooding • Unhygienic conditions in livestock holding spaces/shades due to flooding
		Physical	Access to markets	Yes	
		Human	Knowledge and skills in livestock rearing	No	
		Social	Access to community evacuation centers	No	
		Financial	Income from livestock keeping	Yes	
	Water	Natural	Sources of water	Yes	• Destruction of water and sanitation infrastructure due to flooding • Increased difficulty in accessing water sources due to destruction of roads by floods
		Physical	Access to water	Yes	
		Human	Skill and knowledge in water sector services; access to traditional water management practices and technologies	No	
		Social	Access to community evacuation centers	No	
		Financial	Income from water and investments in the water sector	No	
	Health	Natural	Occurrence of diseases and types of diseases	Yes	• Increased incidences of waterborne diseases due to floods • Destruction of health facilities in flood prone areas • Increased incidences of infectious diseases in dry periods • Increased incidences of injuries and deaths due to flooding • Increased vulnerability of those living with terminal diseases
		Physical	Access to health facilities and availability of health facilities	Yes	
		Human	Knowledge and skills in health	No	
		Social	Access to social health support (community Emergency management programs)	No	
		Financial	Investments in the health sector.	Yes	
Temperature	Agriculture	Natural	Crops and sources of water for crop farming	Yes	

• Droughts • Airborne diseases	(Crops)	Physical	Access to markets (roads), means of transportation, supporting infrastructure	No	• Extreme loss of soil moisture due to elevated temperatures • Crop failures due to drought and extreme heat • Outbreak of crop pests and diseases. • Loss of crop productivity due to long dry spells and droughts
		Human	Level of crop farming knowledge, availability of information on crop farming	No	
		Social	Access to social network e.g. membership to farmer groups, access to extension services	No	
		Financial	Income from crop farming, access to credit	Yes	
	Livestock	Natural	Availability of pasture/fodder and grazing fields.	Yes	• Depletion of livestock water sources due to prolonged droughts and dry spells • Loss of income to livestock farmers • Loss of pasture and grazing fields
		Physical	Access to markets	No	
		Human	Knowledge and skills in livestock rearing	No	
		Social	Access to community evacuation centers	No	
		Financial	Income from livestock keeping	Yes	
	Water	Natural	Sources of water	Yes	• Depletion of underground water sources due to prolonged droughts and dry spells • Drying up of rivers due to prolonged dry spells and droughts
		Physical	Access to water	Yes	
		Human	Skill and knowledge in water sector services; access to traditional water management practices and technologies	No	
		Social	Access to community evacuation centers	No	
		Financial	Income from water and investments in the water sector	No	
	Health	Natural	Occurrence of diseases and types of diseases	Yes	• Increased pressure on the health system due to increased incidences of communicable diseases mainly caused by general water scarcity • Reduced productivity of the population due to heat stress
		Physical	Access to health facilities and availability of health facilities	No	
		Human	Knowledge and skills in health	No	
		Social	Access to social health support (community Emergency management programs)	No	
		Financial	Investments in the health sector.	Yes	

3.3.4 Climate Change Impact on the Sectors and their Respective Adaptive Options

1. Agriculture sector

This assessment established that maize, sorghum, cowpea, and sesame are the dominant crops grown by farmers in Somaliland. Maize is the dominant crop grown during Gu and Deyr rainy season in most crop producing regions of country. Both livestock and crop subsectors and the associated livelihoods have been continuously buffeted by the increasingly fragile and degraded natural environment and more frequent and severe cycles of drought and floods. These factors have severely impacted food security and livelihoods in the country. The assessment VRA established that livestock and crops continue to be the main sources of economic activity, employment, and livelihoods in Somaliland especially in the rural population. FGD participants observed that households grow crops for semi-commercial / subsistence purposes.

Climate Change Impacts on the Agricultural Sector

Analysis has established that the agriculture sector remains threatened with changes in climate, associated extreme hazards. Climatic hazards such as floods and droughts directly impact the sector, especially on production activities hence the livelihoods of people in Somaliland. Floods predominantly affect the low-lying areas. Droughts have affected most parts of the region due to the intermittent rainfall patterns occasioned by long dry spells. Flooding has led to the loss of productive agricultural land and loss of crop productivity. Flooding has been observed to encourage the outbreak of fungal diseases in livestock, destruction of livestock grazing fields and pasture and inundates livestock holding areas, leading to unhygienic conditions in those spaces. Loss of soil moisture and soil fertility have been connected to incessant droughts in the region. The sector further faces other challenges including an increase in invasive species that out-compete native grasses, and reduced diversity of plant species. Invasive species such as the *Prosopis juliflora* tree that hinder access to the grazing grounds also affect livestock activities. The sector has also been impacted by desert locust infestations and outbreaks destroying cropland and pastures.

Key message on adaptive capacities/ on climatic impacts adoption options for agriculture sector

Local communities and experts contacted both perceive probability of increased occurrence of extreme weather events such as floods, droughts, and storms. Similarly, climate projection models for the region predict more weather events such as days with high or very low temperatures, and extreme precipitation. With the increased occurrence of extreme weather events, losses in the agricultural sector and the supporting sectors can increase worsening vulnerabilities.

The communities have adjusted to and coped with climate change and variability to some extent through their experiences. However, these communities have low adaptive capacity due to a multitude of factors including low economic base, low education, inadequate adoption of improved technologies, low and highly variable rainfall, and high dependence on rainfed agriculture. Some of the strategies adopted by these communities to cope with or minimize the negative impacts of climate change and climate variability include: storing food grains for use during the dry season and droughts; and diversifying cultivated crop plants.

During the validation workshop with stakeholders, suitable adaptation options suitable for the resilient development of agricultural vulnerability were identified as follows:

Table 12: Climate change impacts and potential adaptation options in Agriculture Sector

Impact	Adaptation options
Low/decreased crop production	• Farmers awareness schemes, to educate farmers about climate change risks, best agriculture practice, efficient irrigation systems, use of best available seeds variety, changes in cropping patterns etc, • Adaptation of best agricultural practices; recommendation / use of least water intensive crops, use of climate resilient crops, and water efficient irrigation systems such as sprinkler and drip irrigation, particularly where traditional methods are still being used; and • Capacity building of line department staff, to educate farmers about climate change risks, climate smart agriculture practices, etc • Establishment of a National Meteorological Monitoring System (Early Warning System)
Inadequate water supply	• Increase of water harvesting techniques collection of runoffs in agricultural areas to increase the availability of water for agricultural use. • Soil and water conservation Practices • Use of drought-tolerant cereals. Such as Cowpea and Maize, Sorghum represent the most important crops in Somaliland context. • Technical capacity development training programs at the institutional level and community/farmers level in sustainable farming practices and modern irrigation systems (Smart Agriculture System). •
Emergence of new and aggressive insects and pests	• Integrated Pest Management to protect crops and reduce risks •
Loss of income and livelihoods	• Diversification of food production appropriate to the natural ecosystem and introduction of high-value drought-resistant crops and agro-forestry • Establishment of farmers cooperatives •
Reduction in soil fertility	• Comprehensive Land-use Survey for Sustainable Land Management • To improve soil condition, promote the use of different types of crops (crop rotations) in the same plot in sequenced seasons.

	•
Food insufficiency	• Establishment of Seed banks and food banks to increase food security, in particular, in the event of a disaster to reduce risks of hunger malnutrition, and diseases in vulnerable communities. •

2. Livestock Sector

Livestock are the mainstay of rural people's livelihood strategies in Somaliland. Pastoralism has proved to be the best way for rural people to secure their livelihoods. However, livestock remains one of the main sources of economic activity employing over 70% of the population in Somaliland. The sector contributes significantly to household incomes and provide substantial funding for small businesses and basic service provision in and around towns in the country.

Interviews conducted with stakeholders in livestock sector revealed that livestock production represents a key source of livelihood for the population. The main purposes for rearing livestock include: milk and meat production, and animal draught power that provide incomes for their subsistence and to support income generation. The main animals reared were goats, sheep, camel among others. The main sources of fodder for livestock were maize and grass (traditional grazing), and natural seasonal pasture.

The sector is however faced with several constraints, especially climate change. The country has been ravaged by extreme weather events which bring destruction of livestock and crops fields. Additionally, livestock sector is faced with threats from extreme degradation of natural vegetation resulting in major reduction in the quantity and nutritional quality of the vegetation available for grazing in the rangelands. Degradation of natural vegetation is as a result of expansion of localized deserts and barren areas due to overgrazing, intensive collection of fuelwood and building materials, coupled with the increasing expansion of agriculture into the rangelands.

Climate Change Impacts on the Livestock Sector

Livestock sector is faced with threats of climate change. Climatic hazards such as floods and droughts directly impact the sector especially on production activities hence the livelihoods of people in the region.

In the villages of Qoyta and Ceel-xume ood-wayne, the communities reported loss of livestock to droughts and floods during the past 5-10 years. Also, over the same period participants in all FGDs reported experiencing destruction of the rangeland and forest landscapes in the region which affected the availability of forage and water storage for livestock leading to the reduced potential of livestock sector productivity, translating into a negative effect on the economy of Somaliland and local communities.

Key message on adaptive capacities/ on climatic impacts adoption options for livestock sector

Overall, the findings of the assessment clearly demonstrate low adaptive capacities among local communities which have either been built from progressive efforts or are in various stages of planning and implementation of government led initiatives. However, there are significant government initiative taken to address these constraints, including those led by individuals engaged in livestock activities. The adaptive measures deployed include: support to livestock farmers geared towards enhancing access to improved

breed or breeding techniques, climate information, early warning system, capacity building trainings for instance on fodder production and water storage. However, for pastoralism to be sustainable, effective rangeland management and ecosystem protection programs must be initiated to increase the resilience of these communities and achieve continuous good livestock production. Therefore, in view the perceived climatic risks measures are proposed for building adaptive capacities as follows:

Table 13: Climate change impacts and potential adaptation options in Livestock Sector

Impact	Adaptation options
Pasture shortage and grass/browse	• Enhance fodder production – promotion and adoption of FMNR techniques, seed baulking etc • Capacity building to promote rangeland management practices
Low production	• Enhanced awareness campaigns about breeding techniques adapted to climate change • Creation or strengthening of existing institutions or bodies with mandates (at different levels) to enforce policies, laws and traditional systems to rehabilitate and manage rangelands already increasingly becoming degraded •
Water shortages	• Strengthen investments in livestock production assets for instance water storage and supply systems to increase water access and availability through construction and rehabilitation of boreholes; rain water harvesting technologies
Disease outbreaks – animals sicknesses	• Strengthen investments in animal health and disease prevention
Loss of livestock/livelihoods	• Restocking those who lost their livestock • Enhance preparedness and responses for the relevant disaster and risks • Country wide dissemination of weather information •

3. Water Sector

Both key informant discussion and FGDs participants observed that climate change has exacerbated water shortage for agricultural production and domestic use in the region. Communities have insufficient water infrastructures.

With the direct heavy dependence of the population on natural water sources, the water sector remains highly exposed to the impacts of climate change. Analysis has shown that all respondents contacted during the assessment recognized the impact of climate hazards on the water sector in the past 5-10 years. These climatic hazards were identified as extreme temperature, drought, floods and tropical cyclone. The impact of climate hazards is mostly related to water shortage, limited water availability, destruction of water infrastructure (floods), etc.

Climate-related events result in increased water logging, affecting water, and sanitation and hygiene systems (WASH), access to safe and clean drinking water, access to water for domestic cooking and cleaning purposes, and access to water for irrigation.

Key message on adaptive capacities/ on climatic impacts adoption options for Water sector

Enhanced availability of and access to water remains crucial for local communities. Despite some efforts towards this, the Somaliland has a large part of its population accessing water from unsafe sources (unimproved water sources) with most of the population facing acute water shortages due to overdependence on rainwater and lack of water storage options.

- None of the community's main water sources are available all year round.
- An increase in duration and intensity of droughts may result in greater irrigation needs for crops and may also hamper crop production in the region.
- Low rainfall in the dry period is expected to further increase the scarcity of water.

The multiple impacts of climate change across sectors most severely affects the poor, marginalized, women and children, PLWDs and the IDPs, resulting in forced migration, increased vulnerabilities, and death. This situation is aggravated by the heavy degradation of water infrastructure that supplies households with water coupled with insufficient urban and rural water harvesting and treatment infrastructure. At the same time, there is lack of a harmonized strategy towards the development of water infrastructure in Somaliland resulting to an ad hoc unsustainable developments and investments in Somaliland's water sector. Overall, this VRA indicates that local communities have inadequate knowledge and adaptive capacity in the water sector. Urgent potential adaptation options for the water sector are therefore required outlined as:

Table 14: Climate change impacts and potential adaptation options in Water Sector

Impact	Adaptation options
Loss of water for irrigation	• Improve water resource management through watershed management, and water harvesting techniques • Construction of river embankments, check dams, and retaining walls to protect flood-prone areas • Establishment of Water Development Committees • Capacity building initiative at an institutional level to increase knowledge relating to climate change impacts. • Rehabilitation/expansion of water infrastructure based on climate change inclusive hydrological modelling, considering climatic risks to water infrastructure in the region • Promote best water management practice, such as rain water harvesting technologies • Establish well managed operation and maintenance for water sector actors, to avoid water losses • Improve natural resource management, for instance, growing of more trees to control temperature and to reduce water losses

	•
Water shortage for domestic use	• Establish strategic water points (boreholes) to increase water availability during dry seasons. • Improve maintenance of water infrastructure systems and water supply systems in towns and cities. • Improve groundwater recharge and discourage groundwater abstractions • Capacity building of local communities, to enhance urban and rural rain water harvesting – water storage systems • Strengthen climate change education and awareness creation
Low quality of water	• Use of water treatment initiatives (chlorination) and fencing of open water bodies. • Promote the use of troughs and drainage systems in water resources/bodies used by livestock. • Capacity building of line department staff, to enhance access to quality services for urban and rural water supply • Establish well managed operation and maintenance for water sector actors, to avoid water losses
Destruction of sanitation and hygiene systems (WASH)	• Improve maintenance and promote the use of climate-resistant materials in the construction of water supply systems. •

4. Health

The assessment findings indicate that impacts of climate hazards on health sectors are diverse in Somaliland. They are mostly at the origin of increasing disease prevalence and loss of life because during floods, health diseases like cholera and malaria increase due to water pollution and water scarcity. The assessment also found that floods contribute to the increase vectors borne diseases and gastro-intestinal diseases because of the increased prevalence of vectors.

Impacts of Climate Change on the Health Sector

Both KIIs and FGDs participants identified major health-related climate change impacts as the increase in respiratory illnesses and waterborne diseases associated with climatic hazards such as droughts and floods. For instance, participants reported observing an increase in occurrence of droughts and flooding which caused diseases such as cholera which thrives in both dry and wet conditions resulting from the compromised hygiene situations that prevail whenever there is a large-scale occurrence of droughts and flooding.

The second major impact of changing climatic conditions that communities observed, has been the increase in heat waves which lead to increased cases of heat strokes in the region, particularly during the dry season. The increase in prolonged and frequent heat waves causes heat-related ailments e.g. heat stress and stroke, and even death as has been established in this assessment. The assessment has shown

that Somaliland has been experiencing prolonged droughts for the past 5 years, resulting in further depletion of water resources. Changing climate conditions have enforced limitations on crop cultivation, affecting food security and restricting the availability of nutritious food choices. These factors contribute to the incidence of malnutrition and chronic diseases such as diabetes.

Focus Group Discussion Findings

(based on local communities' observations of climate change impacts)

FGDs conducted with communities revealed that annual deaths of family members from respiratory illnesses and waterborne diseases. Summarized cases of reported illness/deaths caused by climatic hazards such as droughts and floods for the past 5 years are highlighted below.

Extreme temperature-related illnesses or deaths	Drought-related illnesses or deaths	Floods-related illnesses or deaths	illnesses or deaths-related to malaria, Degue or RVF
500	630	130	1,500

Key Message Climate Change Impacts and Adaptive Capacities / Options for Somaliland's Health Sector

Major health-related climate change impacts as the increase in respiratory illnesses and waterborne diseases caused by climatic hazards such as droughts and floods are prevalent. These are attributed to the incidences of extreme precipitation that results in floods that destroy the existing health facilities in the flood prone areas.

Reduced rainfall and inadequate food availability increase malnutrition risks. Pregnant and lactating women, young children and the elderly are particularly vulnerable to malnutrition, which can have long-term developmental consequences for children, resulting in stunted growth and development. Uneven accessibility, affordability and quality of health services only exacerbates climate-related health risks. Older people, especially older women and people with a disability, face additional challenges accessing health services.

Table 15: List of climate change impacts and adaptation options

Climatic impacts	Potential adaptation options
1. Malnutrition 2. Heat stroke/ excessive sweating 3. Emerging and reemerging infectious diseases [dengue, malaria etc] 4. Water-borne diseases (diarrhoea, typhoid, skin diseases) 5. Increase in chronic disease	• Expand community-level nutrition programs • Enhance surveillance of disease outbreaks and provide rapid responses to control epidemics. • Make provisions for a safe water chain and sanitation facilities to limit outbreaks of waterborne diseases and implement strong public awareness programs to promote better hygiene. • Increase health workers' awareness of the relationship between climate change and health. • Put in place contingency plans to develop climate change-resilient health systems. • Promote public health awareness campaigns targeted to rural areas • Raising funds for climate-induced disease response • Enhance waste management capacity

	• Introduce and promote ingenious/ traditional crop varieties • Improve coordination between stakeholders [NGO, Govt., communities] • Develop human resources and skills • Strengthen public health systems by building hospitals and supplying them with medicine, equipment, and well-trained personnel. • Assess the impacts of climate change on human health and wellbeing. • Establish early-warning systems • Improve the capture, management, storage, and dissemination of health information. •

5. Education

Main climatic hazards impacting education sector include floods, drought and extreme temperature. The assessment team visited Gunburaha and Jabaaqo school, University of Hargeisa and Amoud University. The vulnerability assessment focused on education access by learners including education infrastructure. The education sector is a pillar of development.

Impacts of Climate Change on the Education Sector

Climate hazards impact the education sector in different ways. Drought-related displacement has drastically affected learners' access to education services. Because of the prolonged drought, the sector experienced the following effects: disruption of school calendar in the region; scarcity of adequate safe water in schools; scarcity of nutritious food for children and their families; and increased enrollments in displacement destinations resulting in stretched existing school resources.

Parents were impacted through loss of livelihoods, decrease of income of families leading to inability to pay school fees, displacement and migration, and health problems. For school staff, the climate hazard has resulted in loss of livelihoods, low morale, displacement, migration, and health problems. For school infrastructure, climatic hazards have mainly damaged the school infrastructure and water supply.

Extreme temperatures have resulted in reduced contact hours between teacher-pupil, roofs wasting away/rusting, increased water needs, among others. Flooding has resulted to classrooms destruction, buildings destruction and waterways destruction.

Key message on adaptive capacities/ on climatic impacts adoption options for Education sector

Damage to physical infrastructure from climate-related events and natural calamities impacts the regular operation of schools and other educational services. With increased occurrence of climatic hazards such as droughts and flooding, discontinuation of education and an increase in school dropout rates are likely to increase in the region.

Table 16: Climate change impacts and potential adaptation options in Education Sector

Climatic impacts	Potential adaptation options

1. Damage of educational institutions 2. Discontinuation of education / school dropouts 3. Migration/displacement 4. Loss of livelihoods (parents) 5. Damage to local roads due to floods	• Assess the inclusion of climate change adaptation in school curricula. • Design appropriate educational material with climate change issues • Integrate climate change adaptation issues into the formal education curriculum. • Integrate climate change adaptation into the education policy. • Develop and implement a public awareness mechanism for climate change adaptation • Constructing Climate Resilience buildings - flood proof/resilient housing • Introducing Greening Schools and School farming to adapt the climate change • Promoting water Harvesting practices to schools

6. Public works

The assessment team observed that Climatic hazards such as extreme temperatures or heat stress, droughts, floods, tropical storm, among others hazards also have significant impacts on the public works sector in areas visited.

Impacts of Climate Change on the Public Sector

The major impact of changing climatic conditions observed are in the form of flash floods causing damages to educational institutions, houses, and local earthen roads which are inundated or blocked by flood water. The most impacted are vulnerable groups including women, children, elderly people, students, and low-income people. The continuing deterioration of physical infrastructure in the country makes access to farms and market outlets costly, and unprofitable. Such conditions also make interventions by aid agencies extremely challenging in supporting other interventions in other sectors.

Climatic impacts and potential adaptation options for the resilient development of physical infrastructure vulnerability are identified as follows:

Table 17: Climate change impacts and potential adaptation options in Public Sector

Climatic impacts	Potential adaptation options
1. Damage of educational institutions 2. Loss due to floods in some areas 3. Damage to bridges, culverts and roads 4. Loss due to riverbank erosion	• Rehabilitation of drainage of road networks increase water flow • More bridges or culverts for increasing flow in the floodplains

5. Damage of houses and livestock holding areas 6. Damage to local roads due to floods	• Better planning for construction (improved school infrastructure) • Flood proof/resilient housing • Land use planning •

Key Climate Change Impact and Adaptive Capacity Messages for Somaliland's Public Infrastructure Sector

Planned development of infrastructure in this region must be prioritized as the most important adaptation option. Unplanned development coupled with the lack of regular maintenance and repairs of physical infrastructure especially water and roads due to the prolonged insecurity, weak government institutions, and the absence of effective community organizations will only serve to exacerbate the impacts of climate change.

7. Biodiversity

The stakeholders during assessment observed that climatic hazards such as extreme temperatures or heat stress, droughts, floods, among other hazards have significant impacts on the biodiversity sector in the region.

Impacts of Climate Change on Biodiversity

According to the participants, climate change is destroying habitats of fauna and flora in assessment area. The participants reported biodiversity loss and degradation of rangeland as a significant impact of climatic hazards on rangelands (natural grasslands, wetlands, etc.) in the areas. For the forest biodiversity (flora and fauna), main impacts of different climate hazards on this sector included biodiversity loss, wildlife habitat destruction. Detailed climate change impacts and the adaptive capacity of biodiversity is presented in table 15 below.

Table 18: Climate change impacts and potential adaptation options in Biodiversity

Climatic impacts	Adaptation options
1. Damage to ecosystems 2. Change in patterns of ecosystems. 3. Penetration by invasive alien species which threaten existing indigenous species. 4. Change of habitats. 5. Degradation of rangeland/biodiversity loss. 6. Forced change in livelihood options. 7. Possible increase of epidemic diseases	• Protecting and managing key Biodiversity, such as forests and protected areas • Restoring degraded areas through reforestation, afforestation, and other restoration activities • Enhancing the resilience of habitats to climate change through the use of climate-smart conservation practices • Implementing management actions to reduce threats to species, such as controlling invasive species and reducing habitat fragmentation • Increase the coordination and capacity of implementing agencies.

	• Building awareness of the importance of biodiversity and the impacts of climate change on ecosystems and species • Providing training and capacity building opportunities for communities to participate in conservation activities • Establishing monitoring programs to track changes in ecosystems and species over time • Prepare and implement plan for the conservation of biodiversity. • Implement different rules and regulations. • Involving local communities in conservation planning and decision-making processes • Incorporate biodiversity in all development planning. • Increase the forest lands through afforestation

Key message on adaptive capacities/ on climatic impacts adoption options for Biodiversity sector

Climate change is destroying biodiversity especially biodiversity rangelands in Somaliland. Scarcity of resources especially biodiversity loss can exacerbate competition over communal resources and increase internal communal conflicts. It is thus necessary to protect the existing habitats of fauna and flora and create new suitable habitats for the endangered species. Droughts, floods, among others hazards are major barrier for development of the region; therefore, proper management of the climatic hazards should be strengthened. Community participation in local initiatives to protect biodiversity is paramount to enhance protection of the biodiversity. Community participation can be enhanced through training, awareness campaigns, local stakeholder meetings, IEC material distribution, etc.

8. Coastal and Marine Areas / Resources

Impacts of Climate Change on Coastal Marine resources

Discussion with Ministry of Fisheries staff and local community the study established that adverse impacts of climate change on coastal and marine resources are perceived differently among the local communities. Identified adverse impacts of climate change include fish reduction, migration, and extinction of some species leading to loss of livelihoods among the fishing households. The impact was also felt on the mangroves by their reduction and destruction of coral reefs habitat among others. The impact of floods on the coastal communities were also visible with reduction of fishing activities, fishing species, fish availability, and loss of livelihoods.

Table 19: List of climate change impact and adaptation options

Potential impacts	Adaptation options
1) Reduced production of fish species. 2) Increase in fish diseases due to the climate change induced salinity.	1. Innovation and dissemination of resilient fish varieties 2. Development of policies regarding the management of marine resources; shoreline management and coastal protection action plans

3) Change in fish breeding season (early breeding). 4) Change in habitat of fish/migration of aquatic animal.	3. Conduct training of fisheries on knowledge of climate change 4. Arrange training for the fishers on fish culture and management. 5. Undertake fisheries resource inventory to create baseline data. 6. The fisher folks be provided with stronger boats equipped early warning systems tools 7. Need for regular and massive training for fishermen so that they are educated and skilled enough to capture and culture fish in a more environmentally sound and sustainable manner 8. Capacity building of line ministries to champion development and execution of policy and laws is critical regard for successful implementation of adaptation options.

Key Messages on Climate Change Impacts and Adaptive Capacities for Coastal Marine Resources

- Projected increases in sea temperature and sea level will negatively affect coastal fish nesting and fishing grounds and increase the frequency and severity of flooding of low-lying coastal lands.
- There is severe degradation of both marine and coastal environments occasioned by weak or absent governments and lack of active fishery management.
- Need for regular and massive training for fishermen so that they are educated and skilled enough to capture and culture fish in a more environmentally sound and sustainable manner.
- Capacity building of line ministries to champion development and execution of policy and laws is critical regard for successful implementation of adaptation options.

3.3.5 Disaster risk reduction approaches

The communities in Somaliland perceive drought, floods associated with rising rivers and seal levels as the common disasters faced by local communities over the past 5-10 years. Main common approaches adopted by both the communities and the government officials are aimed at preventing or reducing the loss of life and property by mitigating the impact of disasters. Table 17 presents a summary of the steps in disaster risk reduction and associated relevant approaches.

Table 20: Approach employed to for disaster risk reduction.

Steps of disaster risk reduction	Approach/actions employed
Mitigation	• Construction of strategic warehouses • Early Warning Systems • Community awareness and orientation • Better preparation towards disaster recovery from a major natural catastrophe,

	• Community trained on good agricultural practices (climate hazard in agriculture and livestock sector) • Rangelands restoration including tree planting
Preparedness	• Awareness raising campaigns on community early warning system. • Prepare policies, strategies, awareness system, financial and equipment support to face the disaster. • Livestock's vaccination • Measures to control pests and diseases (usage of pesticides and insecticides) • Communicate with the government about potential disaster risk. • Community awareness • Provide lifesaving. • Smart climate agriculture e.g. drip irrigation
Response	• Provision of food, non-food items and shelter to affected communities • Community mobilization for support • Livestock treatment campaigns • Evacuation of affected communities through coordinated multi-agency including local government authorities
Recovery	• Financial support pastoralist and agricultural communicates (restitution) including the fishing communities • Diverse support for affected communities (food, mosquito net, hygiene kit, drinking water, health, construction of shelters etc. • Multi-agency coordinated resource mobilization development partners, NGOs (local and international), well-wishers etc. • Rehabilitation of public infrastructure affected – roads, schools, health facilities, markets, and other facilities • Providing shelter to affected communities • Developing recovery strategies and plans • Rehabilitation of community water points- boreholes

Key Messages on key approaches for Disaster Risks Reduction

For mitigation to be effective action must be taken before the occurance of disaster to reduce the human and financial consequences. Community discussion revealed a general lack of capacities to cope with the local distaers such droughts, floods caused by heavy rains, including winds. For response, evacuation of affected communities, existing early warning and response systems (such as the Food Security and Nutrition Analysis Unit of the United Nations Food and Agriculture Organization) and government institutions should support analysis, coordination and response initiatives. The following specific actions and or/options are recommended to build community resilience in coping with climate-related disasters in Somaliland:

- Financial support impacted or at risk communicates (restitution)
- Diverse support for affected communities (food, mosquito net, hygiene kit, drinking water, health, construction of shelters etc.
- Multi-agency coordinated resource mobilization development partners, NGOs (local and international), well-wishers etc.
- Rehabilitation of public infrastructure affected – roads, schools, health facilities, markets, and other facilities
- Developing and implementation of recovery strategies and plans

- Rehabilitation of boreholes.

3.3.6 Gender issues and Adaptive capacity to climate change

Women actively participate and engage in all key productive sectors, especially in agricultural value chains from production to sale and end-use of the produce. This assessment has established existence of institutional weakness that have contributed to increased vulnerabilities of women to climate-related events in Somaliland.

During a session with Ministry of Labor and Family affairs official, it emerged that there is a lack of affirmative action aimed at strengthening the capacity of women and girls to fight or adapt to climate hazards in different sectors. For instance, none of the institution has in place a gender policy or strategy despite of working together with other government or non-governmental institutions in providing support to communities during periods of climate disasters (e.g. floods, droughts, etc).

Key Messages on Climate Change Impacts and Adaptive Capacities in Addressing Gender Vulnerabilities.

Women are more affected by the natural disasters in Somaliland which increases their vulnerability to climate change, as climate change is expected to increase the number of disasters. The need for a gender focused initiatives to increase women‘s adaptive capacity and decrease their sensitivity is emphasized. However, if gender sensitive development projects are not taken up in time, women would experience displacement and hunger, while facing additional burdens due to climate change and disasters.

This study presents specific measures necessary as supportive options in addressing Gender vulnerabilities and improving adaptive capacity as follows:

- Supportive measures are required to reduce gender inequalities in Somaliland, focusing on key priority sectors such as agriculture, health, education, disaster management, etc.
- Need for gender mainstreaming in development initiatives, plans and policies to address climate change impacts.
- Institutional and technical support for local institutions championing women agenda would go a long way in increasing capacity of the local women.

IV: Conclusion and Recommendations

Conclusion

The Somaliland CVA findings point to a high vulnerability profile to impacts of climate change, across the selected sectors. The assessment identified vulnerabilities in the considered priority sectors that were targeted in CVA exercise i.e. i.e. water, health, agriculture and food security, livestock, biodiversity, coastal and marine are/resources, public works, and education. Further, the assessment identified adaptation options that should be considered as a response to the identified vulnerabilities. Water resources are fast depleting, agriculture and livestock sectors are heavily affected, and local populations are highly disaster prone. Extreme temperatures will be a major issue in the coming decades. With the information on the outlook towards the future, if the country does not adapt to climate change, vulnerability will be pushed to critical levels.

Key Messages

Given the findings from CVA exercise, the key messages for Somaliland are:

1. Somaliland's socio-political, economic, and environmental challenges are key drivers in its communities' and country's vulnerability to climate change risk. Urgent concerted efforts must be made to address these challenges across household, community and national levels. A stakeholder driven contextual approach to building Somaliland's adaptation capacity to climate change will be critical.
2. Available climatological data and trends point to a continuation and worsening of climate change risk in Somaliland like other regions in the Horn of Africa. Without adaptation measures being put in place and given the high exposure risks for priority sectors of Somaliland and the weak socio-political, economic, and environmental systems, the country is remains vulnerable.
3. Somaliland's stakeholders should intensify ongoing efforts by local communities and institutional initiatives across all the priority sectors to cope with the adverse impacts of climate change. There is a general sense of urgency among the actors and stakeholders that the country needs to intensify its efforts to become less vulnerable to climate change.
4. Somaliland should endeavor to increase investments in its adaptive capacity in the priority sectors assessed thus reducing vulnerability. Measures to reduce exposure to hazards, for instance investment in increasing the adaptive capacity of people and sectors are available, such as provision of weather information, extension services, livelihood support programs (provision of planting materials to farmers) and so on.
5. Systemic marginalization is deepening societal vulnerabilities to Climate Change Risk in Somaliland. As such, stakeholder inclusive measures in each of the priority sectors must be taken to address systemic marginalization and reduce gender imbalances and other marginalization bottlenecks that leave a significant proportion of Somaliland's society (women, girls, youth, minority clans, IDPs, PWDs etc) highly vulnerable to climate change impacts.
6. The good will among stakeholders to provide sound information about climate vulnerability is much needed to support decision making for adaptation planning in the country.
7. This assessment provides the possibility to compare the climate vulnerability of different sectors so that funding allocation of new projects under various streams of climate finance can be supported.

Recommendations to Build a Climate Resilient Somaliland

The CVA findings points to a high vulnerability to the impacts of climate change, across the selected sectors in Somaliland (water, health, agriculture and food security, livestock, biodiversity, coastal and marine are/resources, public works, and education). Clearly, with the information on the outlook towards the future, if the country does not adapt to climate change, vulnerabilities in the priority sectors will be pushed to critical levels. Based on the CVA findings, the specific recommendations are divided into two broad categories enhancing the state's and its communities' adaptive options: (i) for addressing key issues of climate hazards driving vulnerabilities across priority sectors; and (ii) way forward, as presented below:

Recommendations

Addressing key issues of climate hazards driving vulnerabilities across priority sectors

I. Food Insecurity

- Farmers awareness creation schemes, to educate farmers about climate change risks, best agriculture practice, use of best available seeds variety, changes in cropping patterns etc,
- Improve access to inputs and market linkage for livestock and crop production
- Adaptation of best agricultural practices; recommendation / use of least waters intensive crops, use of climate resilient crops;
- Introduce and promote ingenious/ traditional crop varieties
- Capacity building of line department staff, to educate farmers about climate change risks, climate smart agriculture practices, etc
- Support in terms of in-kind food or cash to alleviate food insecurity and enhance coping strategies.
- Restocking of lost livestock herds
- Diversification of income generating activities.

II. Water Scarcity

- Rehabilitation of water infrastructure and /or construction of news community water assets
- Building or rehabilitation of dams, flood control systems, boreholes water channels
- Establishment of water efficient irrigation systems such as sprinkler and drip irrigation, particularly where traditional methods are still being used
- Establishment or strengthening of water management committees to help sustain water sources
- Increase local capacities for integrated water resource management

III. Fodder Production and Rangeland Rehabilitation

- Fodder distributions for livestock health and maintaining livelihoods.
- Promote water harvesting, storage and recharge for integrated use in the rangelands
- Introduction and promotion of improved fodder cultivation

IV. Pest and disease control (livestock and crops)

- Capacity building of farmer groups - farmers awareness schemes, training support on safe use of pesticides and safe practices control including handling of handheld devises for pest control;
- Mentor farmer groups as "climate change champions" who can provide training to vulnerable communities; and able to act as soon as an early warning is received or when an outbreak takes place

V. Women empowerment to address environmental issues, climate risks and NRM

- Capacitating the Ministry of Women to mainstream climate-smart methodologies and coordinate the establishment of women-led Integrated Natural Resource Management Networks as well as contributing to women's economic empowerment and resilience to climatic shocks, through the implementation of small, household level projects.
- Awareness raising, and capacity-building support, based on a gender sensitive assessment of women and youth awareness, understanding, priorities and capacities to address environmental issues, climate risks, NRM and marginalization.
- Capacity building for members of women producer groups for inclusion and participation in natural resource governance structures

Overall recommendations to building a resilient Somaliland

I. Climate Risk Management and Action

a. Strengthen the capacity of the line ministries in climate change adaptation sectoral and stakeholder coordination especially in awareness building through the generation of relevant and contextual production, distribution, and use of climate information that responds to the needs of decision-makers, as well as pastoralists and other stakeholders.
b. Develop a climate risk map / atlas – a risk-informed decision-making toolkit to be used to map critical vulnerabilities at the local administrative level and to drive National Level Climate Change Adaptation Policy and Advocacy efforts.
c. Establish a climate risk commission / department / agency for coherence in mainstreaming climate risks at both the sectoral and across governance levels including at community levels.
    i. Provide up to date and maintain well-documented, operational, and real-time national datasets of daily rainfall values and temperature (both T-min and T-max).
    ii. Develop a mechanism to share datasets with universities, research centers, the line ministries, and other partners.
    iii. Maintain and use the above datasets to support national strategic planning as well as decentralized innovation and adaptation.
    iv. Utilize / leverage the climate trend datasets in early warning and early action policy, strategy and implementation and importantly ensure the linkage and access of these information at the community levels.
d. Enhance Early Warning Systems to build greater resilience to hydro and meteorological hazards at both the national and community levels while ensuring linkage to Disaster Preparedness and Coordination at the National and Community Levels.
e. Enhance local knowledge and biological cues management on forecasting weather and taking proper actions before the intervention of the public sector.

II. Focused Investments Towards Climate Change Adaptation

a. Prioritize the development and investments in Climate Smart Agriculture and Pastoralism systems to strengthen resilience in the agriculture and food, livestock Sectors.
b. Integrate climate vulnerability–based financing instruments into investment decision-making while also developing and implementing a strategy for Somaliland to benefit from the global Climate Change Adaptation & Mitigation financing instruments and mechanisms.
c. Build climate risk–informed infrastructure (roads, schools, and health institutions), improve awareness raising among the local people living on disaster prone areas, and provide support for resettlement.

III. Deal with Systemic Climate Change Adaptation Bottlenecks

a. Develop, strengthen, and communicate local climate change adaptation funding opportunities for the at-risk people / communities; both financial institutions (suppliers) and demanders (farmers organizations, cooperatives, entrepreneurs, small businesses operators (SMEs), women and youth on green climate financing to enable the at-risk local people access loans for their small businesses.
b. Develop an enabling environment and instruments that will foster coordination between the relevant ministries in the priority sectors seriously affected by climate disasters, with the support of relevant stakeholders (private sector, civil society organizations, INGOs, Bilateral and Multilaterals, Funding mechanisms, etc.
c. Restore the landscape to rehabilitate and reintegrate natural ecosystems by trees planting, creating forest and rangeland ecosystems.

IV. Collaborative and Synergistic Stakeholder Engagement for Climate Change Adaptation

a. Assist Somaliland's line ministries and sectoral agencies to organize and develop a high-level, multi-sectoral coordination body / mechanism geared towards strengthening the climate change green climate fund campaign agenda and guide policy development.
b. Support development of Somaliland's contextual climate impact monitoring tools / platforms that are tailored to Somaliland's needs and identified climate risks and vulnerabilities. These will strengthen localized climate change monitoring and forecasting thus enhancing stakeholder understanding of evolving capacity needs for climate change adaptation in Somaliland These efforts will also build stakeholder capacity to understand climate variability and change and the need for flexibility and adaptation.
c. Strengthen community understanding of climate change while further investing in community ownership of climate change adaptation strategies and investments including leveraging indigenous knowledge and capacities to build community adaptation and readiness to climate change.
d. Create an enabling environment and expand opportunities for climate change adaptation advocacy platforms for Somaliland at the local, regional and global levels. This will enhance climate change funding and support thus enhancing / building investments in climate change adaptation.

V. Address Gender vulnerabilities in all key priority sectors

a. Support measures aimed at reducing gender inequalities focusing on key priority sectors such as agriculture, health, education, disaster management, etc.

b. Undertake gender mainstreaming in development initiatives, plans and policies to address climate change adaptation initiatives.
c. Provide institutional and technical support for local institutions championing women agenda to increase capacity of the local women

References

Abdulkadir, G. (2017). Assessment of drought recurrence in Somaliland: Causes, impacts and mitigations. *Journal of Climatology & Weather Forecasting, 5(2)* https://doi.org/10.4172/2332-2594.1000204

Brecht H., S. Dasgupta, B. Laplante, S. Murray, and D. Wheeler.2012. "Sea-Level Rise and Storm Surges: High Stakes for a Small Number of Developing Countries." *Journal of Environment & Development* 21 (1).

Carbone, F. and Accordi, G. 2000. The Indian Ocean coast of Somalia. Marine Poll. Bull. 41(1-6): 141-159.

Connolly-Boutin, L., & Smit, B. (2016). Climate change, food security, and livelihoods in sub-Saharan Africa. *Regional Environmental Change*, 385–399.

Dosio A., Jones, R., Jack, C., L., … and Hewitson, B., (2019) 'What can we know about future precipitation in Africa? Rbustness, significance and added value of projections from a large ensemble of regional climate models' Climate Dynamics 53: 5833–5858

Dosio A., Jurry, M., Almazroui, M., ….and Tamoffo, A. (2021) 'Projected future daily characteristics of African precipitation based on global (CMIP5, CMIP6) and regional (CORDEX, CORDEX-CORE) climate models' Climate Dynamics 57: 3135–3158

Ellis, F. (2000). *Rural livelihoods and diversity in developing countries*. Oxford University Press https://global.oup.com/academic/product/rural-livelihoods-and-diversity-in-developing-countries-9780198296966?cc=us&lang=en&

FAO 2006. Access to water, pastoral resource management and pastoralists' livelihoods. Lessons learned from water development in selected areas of Eastern Africa (Kenya, Ethiopia, Somalia). LSP Working Paper 26. Nathalie Gomes. Available online at: http://www.fao.org/es/esw/lsp/cd/img/docs/LSPWP26.pdf

FAO-SWALIM, i.e. Somalia Water and Land Information Management (2010). Atlas of the Juba and Shabelle Rivers in Somalia. Nairobi: FAO-SWALIM. Available from http://www.faoswalim.org/subsites/River_Atlas_Files/River_Atlas_Documents/index.html

Food and Agriculture Organization (FAO), 2015. Somalia Water and Land Information Management

FAO Emergency Division, April 2020. Crisis, desert locust crisis. Somalia and FAO strengthen cooperation to curb the spread of desert locust (available at http://www.fao.org/emergencies/fao-in-action/stories/stories-detail/en/c/1271751/).

Food and Agriculture Organization of the United Nations (FAO). (2021a). Multidimensional context Somaliland. Food and Agriculture Organization of the United Nations (FAO).

https://reliefweb.int/report/somalia/food-and-nutrition-security-resilience-programme-report-multidisciplinary-context-and

Frankenberger, T., Drinkwater, M., & Maxwell, D. (2000). *Operationalizing household livelihood security: A holistic approach for addressing poverty and vulnerability*. CARE. https://www.mkatherinemccaston.com/PDF/operationalizing_household_livelihood_security.pdf
GIZ. (2014). The vulnerability sourcebook: Concept and guidelines standardised vulnerability assessments. Retrieved from https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/va/vulnerability-guides-manuals-reports/Vulnerability_Sourcebook_-_Guidelines_for_Assessments_-_GIZ_2014.pdf

Gezie, M. (2019). Farmer's response to climate change and variability in Ethiopia: A review. *Cogent Food & Agriculture*, *5*(1), 1613770. https://doi.org/10.1080/23311932.2019.1613770

Intergovernmental Panel on Climate Change (IPCC). (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the. Geneva, Switzerland: Intergovernmental Panel on Climate Change. Retrieved December 18, 2023.

Luling, Virginia (2002). Somali Sultanate: The Geledi City-State over 150 Years. New Jersey: Transaction Publishers.

Lyon, B., & DeWitt, D. G. (2012). A recent and abrupt decline in the East African long rains. *Geophysical Research Letters*, Volume 39, Issue 2, L02702.

Muchiri, P. W. (2007). Climate of Somalia. Technical Report No W-01. Nairobi: FAO-SWALIM. Available from http://www.faoswalim.org/ftp/Water_Reports/Cleared/W-01-Climate%20of%20Somalia.pdf

Oduori, S., Vargas, R. & Alim, M. 2007. Land Use Characterisation of a Selected Study Area in Somaliland. FAO-SWALIM. Project Report No. L-04. Nairobi, Kenya

Richardson, K., Calow, R., Pichon, F., New, S. and Osborne, R. (2022) Climate risk report for the East Africa
Region. Met Office, ODI and FCDO

Serdeczny, O., Adams, S., Baarsch, F., Coumou, D., Robinson, A., Hare, W., Schaeffer, M., Perrette, M., & Reinhardt, J. (2017). Climate change impacts in Sub-Saharan Africa: From physical changes to their social repercussions. *Regional Environmental Change,* 17(6), 1585–1600. https://doi.org/10.1007/s10113-015-0910-2

Ullah, S. (2016). *Territorial diagnostic report of the land resources of Somaliland. FAO-SWALIM, Nairobi, Kenya*. https://www.faoswalim.org/resources/site_files/L%20-21%20Land%20diagnostic%20report%20.pdf

United Nations Framework Convention on Climate Change (UNFCC). (2007). *Climate change: Impacts, vulnerabilities and adaptation in developing countries.* https://unfccc.int/resource/docs/publications/impacts.pdf

World Bank. (2013). *The World Bank and agriculture in Africa*. http://go.worldbank.org/GUJ8RVMRL0

World Bank. (2022). *Mapping climate change and drought in Somalia.* https://blogs.worldbank.org/africacan/mapping-climate-change-and-drought-somalia

ANNEX

Annex 1: Steps in vulnerability assessment

Step	Approach	• Methodology/Details of vulnerability assessment
Planning the assessment	Setting of scope	• This is the first step in adaptation planning. Current climate vulnerability will be considered. • To develop vulnerability indicators and highlight the drivers of vulnerability.
	Selection of type of vulnerability assessment	• Integrated vulnerability assessment (based on biophysical, socio-economic, and institution and infrastructure-related vulnerability indicators). • Evaluate the existing tools on vulnerability and disaster risk assessment in terms of their alignment with the 4th Assessment Report of Intergovernmental Panel on Climate Change (IPCC-AR4) and the framework adapted; and to align with the National Adaptation Plan (NAP).
	Selection of sector, spatial scale, community/system, and period of vulnerability assessment	• ***Sectors:*** Climate-related sectors particularly: Water, Health, Agriculture and food security, Livestock, Biodiversity, Coastal zone, Public works, Education, Disaster Risk Reduction, Gender and Education; and general indicators; • ***Spatial scale:*** Assessment conducted • ***Period:*** Based on the availability of data
	Identification and selection of indicators for vulnerability assessment	• The assessment will be based on sets of common indicators to capture specific characteristics.
Gathering data	Data collection methods	• A mix of primary and secondary data
	Field assessment and stakeholder consultations	• Will be carried out using participatory methods such as focused group discussions (with local community), one to one consultations in the form of key informant interviews (with line ministries, NGOs and local authorities), etc.

		• Field assessments will also be used for identifying potential adaptation measures and also capture mitigation benefits (as co-benefits) options.
Analysis and interpretation	Quantification and measurement of indicators	• All indicators will be quantified using a mix of primary and secondary sources of data, where appropriate. The database used in the assessment along with its sources will be provided in main report.
	Representation of vulnerability	• Table, graphs, and spatial maps will be used to represent vulnerability and its drivers.
	Identification of drivers of vulnerability for adaptation planning	
Elaborating the VRA report	Potential adaptation measures/options	• These options will be prioritized based on – Environmental and Social (E&S) and gender impacts as identified from field assessment by the local community and other stakeholders consulted. • Vulnerability assessment reports with indicators generated and presented but based on the availability of data
VRA report validation	Validation workshop	• A validation workshop will be conducted where relevant stakeholders from line Ministries and Departments will be invited including other key stakeholders. •
Revised and final report	Report preparation and revision	• Based on the inputs received, the consultant will finalize the VRA reports incorporating all comments, recommendations received from all consultation workshops, KAALO, UNDP team, and line ministries.

Annex 2: Tool used for data collection

PART A: For COMMUNITIES (FGDs and KIIs)


Agriculture Part A.docx


Biodiversity Part A.docx


Coastal Sector Part A.docx


Disaster Risk Reduction-Part A.docx


Health Sector- Part A.docx


Livestock Sector_Part A.docx


Water Sector Part A.docx


Education Sector Part A.docx

PART B: Line ministries, Civil Society Organizations engaged in conservation (KIIs)


Agriculture Part B.docx


Biodiversity Part B.docx


Coastal Sector Part B.docx


Disaster Risk Reduction B.docx


Education Part B.docx


Health Sector Part B.docx


Livestock Part B.docx


wATER Sector Part B.docx


Public Work_PART .docx


Gender.docx