SUPPORT FOR STRENGTHENING CLIMATE CHANGE ADAPTATION PLANNING FOR SOMALIA PROJECT

STATE-LEVEL CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT

HIRSHABELLE STATE OF SOMALIA

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List of Abbreviations

CCVA	Climate Change Vulnerabilities Assessments
FGD	Focus Group Discussion
FGS	Federal Government of Somalia
FMS	Federal Member States
GCF-NAP	Green Climate Fund National Adaptation Plan
INDC	Initial Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
MOECC	Ministry of Environment and Climate Change
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
Tour	Terms of Reference
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

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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: 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.

Executive Summary

This Stakeholder Inclusive Vulnerability Risk Assessment (VRA) Report for Hirshabelle State marks a key step aimed at understanding the climate change vulnerabilities in the state by highlighting the vulnerabilities of different priority sectors. The VRA Report generates useful findings for informed planning, funding allocation and implementation of strategic Climate Change Adaptation interventions in the state. The VRA assessed the risks and vulnerabilities to climate hazards (extreme temperatures, floods, drought, pest and disease, locust, cyclone) in priority sectors namely: water, health, agriculture and food security, livestock, biodiversity, coastal and marine are/resources, public works and education in Hirshabelle State.

The VRA findings points to a high vulnerability levels to the impacts of climate change, across the selected priority sectors (water, health, agriculture and food security, livestock, biodiversity, coastal and marine are/resources, public works, and education) in Hirshabelle state. These climate change vulnerabilities are manifested in various forms including (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. Even with the widespread levels of vulnerabilities, several bottle necks such as: (i) lack of access to large areas of Hirshabelle State due to insecurity and associated challenges thus limiting evaluation of climate risk vulnerabilities as well as the implementation of adaptation interventions; (ii) Poor institutional and enabling environment; (iii) low adaptive capacity and funding for Climate Change Adaptation; (iv) lack of consistent and updated state level data over time thus limiting effectiveness proposed strategies are identified as hampering climate change adaptation measure across all the priority sectors in the state. This assessment report provides a window of opportunity for an outlook towards the future, and clearly the key message is that if the state does not adapt to climate change, 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).

For addressing climate hazards driving vulnerabilities across priority sectors:

I. Food Insecurity

- Introduce and promote ingenious/ traditional crop varieties
- Support in terms of in-kind food or cash to alleviate food insecurity and enhance coping strategies.
- Story gardens and other options for agricultural production in urban areas and IDP camps to boost food security
- Diversification of income generating activities.
- Dryland farming in combination with rain water harvesting – trapezoidal bunds, etc.
- Restocking of lost livestock herds
- 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;
- Regenerative farming methods - best agriculture practice, use of best available seeds variety, changes in cropping patterns etc,
- Management of irrigation schemes - efficient irrigation systems along River Shabelle,
- Infrastructure for reliable irrigation (storage – farm ponds, larger storage structures)
- Capacity building of line department staff, to educate farmers about climate change risks, climate smart agriculture practices, etc

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

Overall recommendations to building a resilient Hirshabelle state

i) Enhance the state’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;
iv) Promote reforestation programmes thus restoring ecosystem health in the state’s rangelands; and
v) Support measures aim reducing gender inequalities focusing on key priority sectors such as agriculture, health, education, disaster management, etc.

I: Introduction and Background

Overview

Climate change is a serious threat to socio-economic development in Somalia and Hirshabelle State in particular. The effects of climate change are wide-reaching, touching nearly every aspect of Federal Government of Somalia's national development as well as the potential development of the Hirshabelle State. The ordinary rural pastoral, and agro-pastoral communities in Hirshabelle State are faced with the harsh reality of climate change through increasing frequency of extreme climate change events. Hirshabelle State just like Somalia and the Horn of Africa in general are experiencing an increasing frequency and severity of back-to-back extreme climatic events: in Somalia it is either flooding or the country is facing a biting prolonged drought. The droughts have been increasing in frequency and intensity.

For the Hirshabelle State, 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 targeted approaches that drive the climate change adaptation process at country and state levels.

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.

Since 2012, Somalia has taken several important initiatives to adopt policies, regulations, and institutional reforms that are essential in the state-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) for Somalia consisted of the following outcomes: Strengthening institutional coordination and capacity for adaptation planning and implementation at the Federal and FMS Levels; Enhancing the technical, institutional, and managerial capacity for adaptation planning at the FMS level; Developing the capacities at the Federal Member State 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.

Somalia and by extension Hirshabelle State has been experiencing multiple crisis which include various forms of conflict that have driven a protracted humanitarian crisis. Somalia's humanitarian crisis is characterized by weak or insufficient governance structures, chronic food insecurity, massive population

displacements, inaccessibility of basic services among other issues. The situation is much tougher at the Federal Member States such as Hirshabelle State owing to inadequate technical and governance capacities, lack of funding to deliver basic services as well as occupation of large parts of geographical territory by the Al Shabaab Militant Group.

Climate change has served to further increase destitution and vulnerability at the household, community, regional and federal levels. As such, the multiplicity of climate change impacts in Somalia and Hirshabelle State calls for a coordinated and integrated approach to Climate Change Adaptation Planning and Implementation. To foster and support adaptation in Hirshabelle State, the Federal Government of Somalia, and the UNDP, through the Ministry of Environment and Climate Change in the capacity of National Designated Authority (NDA) and KAALO Aid (KAD), are implementing the project ***"Support for Strengthening Climate Change Adaptation Planning for Somalia"*** funded by the 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.

Strategies to adapt to the present and future impacts of climate change by the Hirshabelle State of Somalia will contribute to increased resilience of vulnerable communities in the State. Communities in the Hirshabelle State whose livelihoods depend on climate-sensitive sectors, such as the agro-pastoralists, pastoralists, riverine and fishermen of in Hirshabelle State will be the immediate beneficiaries. Thus, as part of the GCF-NAP project, a vulnerability assessment covering several sectors has been undertaken in the Hirshabelle State of Somalia. The rationale for state level vulnerability assessment is based on the need for a comprehensive understanding of the key Climate Change risks and vulnerabilities for each Federal Member State. This will enable the Hirshabelle State of Somalia to prioritize climate action.

Aims and Objectives of the Assessment.

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

Besides, the findings of the vulnerability assessment provide an evidence basis / foundation upon which Hirshabelle State's climate change interventions and initiatives will be contextually designed thus enhancing their relevance and effectiveness. This means that evidence-based Hirshabelle State's Climate change initiatives have a higher likelihood of addressing contextually relevant community level vulnerabilities due to a better sectoral understanding of climate change risks and vulnerabilities. The findings of the Hirshabelle State's CVA will therefore: (i) inform participatory action planning processes that lead to community-driven and owned adaptation strategies and practices; (ii) enhance investments in climate smart livelihood upgrading processes; (iii) identify lower risk areas where climate-resilient alternative socio-economic 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 in the Hirshabelle State of Somalia.

The assessment was conceived and commissioned by the Ministry of Environment and Climate Change of the Hirshabelle State of Somalia in collaboration with UNDP and KAALO to:

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

Description of the Assessment Area

The assessment was conducted within the geographical boundaries of Hirshabelle State. Due to access and funding constraints, data was collected from representative locations in ***four districts*** namely: Balcad, Jawhar, Beledweyn and Warsheikh in line with stakeholder consultations at the Hirshabelle's Ministry of Environment and Climate Change, the UNDP NAP Team and KAALO's project implementation team.

1.1.1 Geographical profile

Hirshabelle State is one of the Federal Member States in south-central Somalia and comprises the Hiiraan and Middle Shabelle areas of Somalia. It is bordered by Galmudug State to the north, South West State of Somalia and Benadir region to the south, Ethiopia to the west and the Indian Ocean to the east. Hirshabelle state has a total area of 100,821 km^2 (38,927 sq mi). (Figure 1). Jowhar is the capital of the state. This region has served as the breadbasket for the Horn of Africa throughout history because the Shabelle River provides fresh water and irrigation for crops. The coast has many well-established fishing communities. Table 1 below summarizes the main geographical features of Hirshabelle State

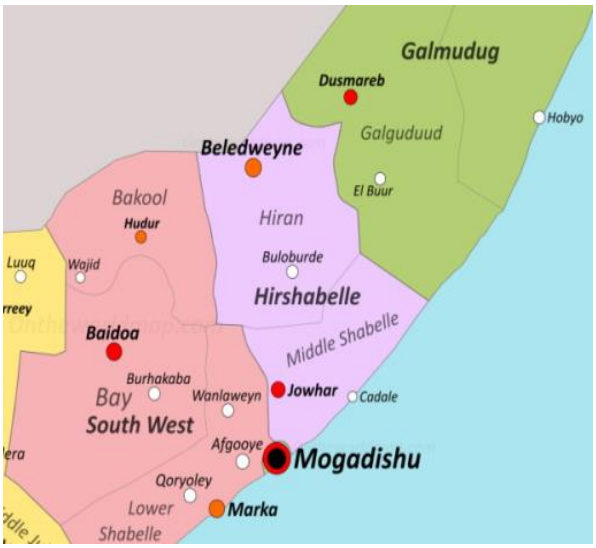

Figure 1: Hirshabelle State administrative map

Table 1: Summary of the Geographical Information of Hirshabelle (FAO-SWALIM, 2013)

Geographical features Details	
Location	Hirshabelle State comprises the Hiiraan and Middle Shabelle areas of Somalia. It is bordered by Galmudug State to the north, South West State of Somalia and Benadir region to the south, Ethiopia to the west and the Indian Ocean to the east.
Land area	100,821 km^2 (38,927 sq mi)
Land Cover	Land cover consists mainly of natural vegetation. Other cover types include Crop fields (both rainfed and irrigated), Urban and Associated Areas (Settlement/Towns), Dunes and Bare lands and Natural Water bodies. The natural vegetation consists of riparian forest, bush lands and grasslands. Woody and herbaceous species include ***Acacia brussei, A. seyal, A. nilotica, A. tortilis, A. senegal, Chrysopogon auchieri*** *var.* ***quinqueplumis, Suaeda fruticosa and Salsola foetida.***
Land form/soils	Hirsabelle is dominated by low-lying alluvial plains, associated with the Shabelle river. These plains mainly have clayey soils, some of which have poor drainage and/or high content of salts. Some of the riverine areas are also liable to flooding. The land is features characterizing Hirshabelle state include: Shabelle river valley that traverse the generally level, undulating morphology of the area; hilly topography in the middle of the region cut by wadis, and gently undulating wide plains toward the coast; and a coastal dune complex
Land use	Land use in region consists mainly of grazing and wood collection for fuel and building material. Rangelands in the Shabelle catchments support livestock such as goats, sheep, cattle and camels. Livestock ownership is private, but grazing lands are communal, making it very difficult to regulate range use. Rangelands are utilised by herders using transhumance strategies (Shaie, 1997). Land cover associated with this land use includes forest, bushlands and grasslands (GTZ, 1990).
Climate	Hirshabelle state has a hot tropical climate, with little seasonal variation. In the first dry season (Xagaa) days are often cool and cloudy all over the region, with light showers in areas close to the coast. In the second dry season (Jilaal) days are hot, or very hot and dry. However, the hottest period coincides with the months of March and April. The region has a high inter-annual rainfall variation and is subject to recurrent drought every 3-4 years, and more severe dry periods every 7-9 years.
Rainfall	The State experiences low annual rainfall (200mm) and four seasons: Gu' and Deyr are rainy, while Haga and Jilal are dry. The state has low annual precipitation and four seasons: the rainy seasons are Gu' and Deyr, while the dry seasons are Hagaa and Jiilaal. The weather is hot and calm between the monsoons (April and September). Hirshabelle has two distinguishable rainy seasons alternating with two marked dry seasons, the main - Gu - (April to June) and the second - Deyr - (October to December). The dry season are Xagaa - (July to September, littoral showers, but dry and cool) and Jilaal – (January to March, longer dry season).
Temperatures	Temperatures vary with the seasons, with the mean annual temperature ranging from 23°-30°C, with a maximum temperature of 41°C in March (Baardheere) and a minimum temperature of 24°C in July. In areas near the major rivers the relative humidity is high, ranging from about 70-80%, but further inland away from the rivers the air is much drier. Relative humidity is higher in the coastal areas, where it usually exceeds 87%.
Rivers	The state has one of the main perennial rivers of the Horn of Africa, flowing from the highlands of Ethiopia towards the Indian Ocean: Shabelle River (1 560 km of which are within Somalia, out of its almost 1 800 km total length).

1.1.2 Climatic conditions

The climate in the Hirshabelle state is tropical arid to dry and sub-humid, and is influenced by the north-easterly and south-easterly air flows of the Intertropical Convergence Zone (ITCZ) over the Ethiopian highlands (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 the State like rest of Somalia, comprising two distinguishable rainy seasons alternating with two marked dry seasons (FAO-SWLIM 2010), as follows:

- Gu: March to June (MAMJ), the main rainy season, like for all over Somalia
- Xagaa: July to September, littoral showers, but dry and cool in the hinterland
- Deyr: September to December (SOND), second rainy season, like for all over Somalia
- Jilaal: January to March, longer dry season, like for all over Somalia

Rainfall in the region is erratic, with a bimodal pattern except in the southern riverine areas close to the coast where some showers may occur even during the Xagaa. Peak rainfall months are centred around Gu season, March to June (MAMJ) and Deyr Season, September to December (SOND). Rainfall amounts and intensity in Hirshabelle is generally 200mm – 300mm annually. However, some parts of Buulo Burdo receives 300mm - 400mm of rainfall annually. Rainfall is characterized by intense, short rainstorms. The region has a high inter-annual rainfall variation and is subject to recurrent drought every 3-4 years, and more severe dry periods every 7-9 years.

Temperatures vary with the seasons and are influenced by altitude and by the strength of seasonal winds. In the first dry season (Xagaa) days are often cool and cloudy all over the region, with light showers in areas close to the coast. In the second dry season (Jilaal) days are hot, or very hot and dry. However, the hottest period coincides with the months of March and April. The annual temperature is 30.41^0C and it is 2.5% higher than Somalia's averages. The average temperature difference between the hottest months (from December to March) and the coolest months (July and August) is only a few degrees, but it is somewhat greater in the inland areas than along the coast. The average maximum temperature per month is 34.77^0C. Relative humidity is higher in the coastal areas, where it usually exceeds 53.35%. Normally, the high relative humidity is compounded by higher temperatures.

The major winds experienced in the region are in response to the north and south seasonal movement of the Intertropical Convergence Zone, and in particular the Intertropical front. The winds in the Hirshabelle state persistently blow from the northeast during Jilaal (January to March), when the weather is hot or very hot, and from the southwest during Xagaa, (July to September), when the weather is cool and cloudy.

The weather is hot and calm between the monsoons (part or whole of April and part or whole of September). In the Jilaal periods, prevailing winds are strong and blow in heavy dust storms from the Arabian Peninsula. Weaker winds generally occur during the intermonsoonal periods of April/May and October/November. Average wind speed varies between 2-6m per second.

The state has three broad climatic zones which are characterized by differences in patters of rainfall:

- The coastal zone - with significant amount of rain occurring from July –August (Hagi rains) that lengthen the Gu season.
- The semi-arid zone – with two strongly defined rainy seasons and an additional light rainy season that may occur during July-August.

- The arid zone – with a lower annual rainfall and a dry period between July-August. The monsoon winds are the most important factor affecting the climate and the timing of the rainy periods. The south-west monsoon winds prevail during June, July and August. The north-east monsoon winds prevail during December, January and February.

1.1.3 Agro-ecological Zones (AEZs)

The state just like the country can be divided into different agro-ecological zones, including Desert, Arid/Sahel, Semi-Arid and Highlands (of mid-altitude and high altitude)[1]. Each of these zones is characterized by specific temperature and moisture regimes and, consequently, specific patterns of crop production and pastoral activities.

The state is considered more favored climatically as compared to the rest of Somalia, and vegetation rich. This region has served as the breadbasket for the Horn of Africa throughout history because the Shabelle River provides fresh water and irrigation for crops. Due to lack of state- wide data, this study provides an overview of areas in the riverine zones of Lower Shabelle basin which falls into four main Agro-Ecological Zones (AEZs) as reflected by and further explained by table 2 below.

The main vegetation types in the riverine zone include closed and open tree canopies on temporarily flooded areas, woodlands, open shrubs, herbaceous and savannah vegetation. Rain-fed farming occupies a large portion of the cultivated area and irrigated agriculture is confined to the flood plains adjacent to Lower Shabelle River (FAO-SWALIM, 2010).

[1] International Institute of Tropical Agriculture, "Agroecological Zones," 2021. [Online]. Available: https://csi.maps.arcgis.com/apps/MapSeries/index.html?appid=7539d22ab46147ce9888589aea4b1a11.

Table 2: Agro-Ecological Zones of Shabelle River catchments

AEZ	Length of growing period in days		Soils		Land suitability *S1=Highly suitable; S2=Moderately suitable; S3=Marginally suitable; N=Not suitable*				Climate
	Gu	Deyr	Description	Classification	Rainfed agriculture	Irrigated Agriculture	Extensive Grazing	Forestry Plantations	
14G	<120	<45	• poor drainage • high salt content	Gleysols, Stagnosols Solonchaks	S2, S3	S2, S3	S2	S2	Moist semi-arid
14S	<120	<45	• high salt content	Solonetz, Solonchaks	S2, S3	N	S2	S2	
14V	<120	<45	• Deep and clayey	Vertisols	S2	S2, S3	S2	S1	
D	Dunes		• Sandy	Arenosols	N	N	S3/N	S3	Various
Length of Growing Period is the number of days that precipitations exceeds half potential evapotranspiration									

1.1.4 Livelihood Profiles

Hirshabelle state has four diverse livelihood systems: pastoralists, Agro-pastoralists, riverine farming, fishing by coastal communities, urban population including internally displaced people. The state, in particular the Middle Shabelle, is one of the most fertile areas in Somalia with food production being the predominant means of making a living. Due to the Shabelle River Valley, the land across Hirshabelle is typically fertile in non-drought conditions and can be used to produce a range of agricultural produce. Agriculture can be roughly divided into large estates and self-sufficient smallholdings. The agricultural area follows the Shabelle River. The area is characterized by an extensive irrigation system with canals and dams for watering the fields. In combination with rainfall, this system makes it possible to farm all year round. Maize, durra, sesame and bananas are among the crops grown (FAO-SWALIM 2010). Along the river there are intensive agricultural activities; maize, paddy rice, beans, sesame, vegetables are grown, along with perennial crops, mainly bananas and citrus plants, while the small dryland farmers or sporadically pastoralists cultivate sorghum or maize along the border between agricultural land and bushland, far away from the irrigated area or rarely in the bushland using shifting cultivation. Mangos and coconuts are also grown in some areas. In the coastal area, trade and fishing are the most common livelihoods (Lewis 2008).

Table 3: Main Livelihood Groups in Hirshabelle State

Livelihood profiles	**Main Sources of Food and Income**		**Primary livelihood asset**
	Primary sources of income	**Primary food sources**	
Riverine livelihood	• sale of crops • agricultural labour • self-employment	• Own crop and purchases	• Agriculture land
Agropastoral Livelihoods (Agropastoral Maize/cattle)	• crop sale • agricultural labour • livestock and livestock product sales • self-employment • (fodder sales, firewood, construction materials, etc)	• own production(maize) and purchases	• Agricultural land
Agropastoral Livelihoods (Agropastoral Sorghum/cattle)	• crop sale • agricultural labour • livestock and livestock product sales • self-employment (fodder sales, firewood, construction materials, etc)	• own production (Sorghum) and purchase	• Agricultural land

II: Methodology

2.1 Overview

In undertaking the Hirshabelle State CVA, the Assessment team utilized primary and secondary data to gather key data and frame the CVA. From the beginning to the end of the VRA exercise, the consultant undertook extensive literature analysis and review for the purposes of framing the CVA 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.

Socio-economic data was gleaned from secondary sources with a view to understanding the socio-economic characterization of Hirshabelle State and ideally identify areas of vulnerability within the socio-political and economic system of Hirshabelle State. Primary data was collected through the field exercise in form of KIIs and FGDs undertaken by Hirshabelle's Ministry of Environment 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 Somalia'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 sensitivity / susceptibility of Hirshabelle State 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 Hirshabelle State. 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, Hirshabelle State's Vulnerability to Climate Change defines the complex interaction of climate change effects and the susceptibility (risk exposure levels) of a Hirshabelle State'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, Hirshabelle State's Vulnerability to Climate Change is a function of Hirshabelle State's climate change exposure, sensitivity, and adaptive capacity to cope with climate change effects, as illustrated below:

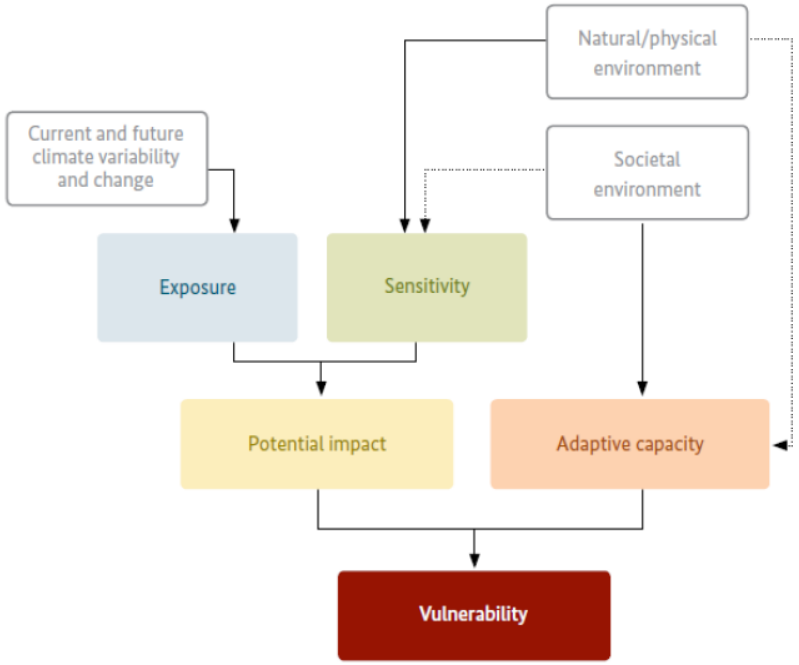

Figure 2 Vulnerability concept according to the IPPC AR4 (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2014)

Within this conceptual framework:

- ***Hirshabelle State's Exposure*** refers to changes in Hirshabelle State'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.
- ***Hirshabelle State's Sensitivity*** refers to the the susceptibility of Hirshabelle State'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 Hirshabelle State's sensitivity factor is riverine agricultural land use systems which are highly susceptible to seasonal flooding. Riverine agricultural land use systems and communities are at a particularly high risk of exposure from increases in upstream rainfall which will result in beyond normal downstream flooding and crop loss including the potential for loss of life and displacements.
- ***Hirshabelle State'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 coupled with disease such as Cholera due to extreme flooding events as has been witnessed in early May 2023 on account of El Nino and the Indian Ocean Dipole.
- ***Hirshabelle State's Adaptive Capacity*** refers, to Hirshabelle State'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 Hirshabelle State. The assessment methodology contextually developed for Somalia and is based on a common harmonized framework, indicators, methodology and guidelines which facilitate individual state-level vulnerability assessments in Somalia. This approach is considered appropriate to achieve comparable results among the FMS. 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 Somalia. The effects of climate change are wide-reaching, touching nearly every aspect of Somali livelihood and impacting on vulnerable communities. 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, Somalia has taken several important initiatives to adopt policies, regulations, and institutional reforms that are essential in the state-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) for Somalia consisted of the following outcomes: Strengthening institutional coordination and capacity for adaptation planning and implementation at the federal level; Enhancing the technical, institutional, and managerial capacity for adaptation planning at the state level; Developing the capacities at the Federal State 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.

The multiplicity of challenges associated climate impacts and conflicts in a diverse country such as Somalia calls for a coordinated and integrated approach to adaptation planning and implementation at the federal level. To foster and support adaptation in the Federal Member States, the Federal Government of Somalia, 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 for Somalia 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 state levels across Hirshabelle State. A formal inception meeting was held on 31st December 2023 between the KAALO team and the Ministry of Climate Environment and Climate Change to discuss modalities of conducting Vulnerability Assessment in Hirshabelle state. The discussion covered data process and management including recruitment of qualified local enumerators, assessment sites and timelines. The meeting was led by Hon. Jabril Kutubi- Minister of State, Hirshabele State and supported by Dr Ahmed Sudi- Technical Advisor MECC and Abdinuur Afyare-NAP coordinator MECC. The KAALO team was represented by Mr. Ismail Mohamed Muse.

The second phase of the assessment entailed fieldwork mission which began with a consultation workshop on vulnerability assessment in Hirshabelle State. The workshop was organized by the Ministry of Environment, Resilience and Climate Change of Hirshabelle 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 Director general of the Ministry of environment and climate change. 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 Hirshabelle state which include:

- Ministry of environment, range land and Climate change.
- Ministry of Disaster Management
- Ministry of Livestock, forestry and Rangeland
- Ministry of Disaster Management
- Ministry of Fisheries and Marine Resources
- Ministry of Women and Human Rights Development
- Ministry of Public Work
- Ministry of Health
- Ministry of Education
- Civil Society Organizations and as well as
- Academia

Figure 3: Enumerator Training Workshop during the Hirshabelle State of Somalia's CVA

2.2.3 Data collection and Analysis

Data was collected from 5th - 10th January 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 carried out across selected sites in Balcad, Warshekh, Beledweyn and Jawhar districts. 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 across the State. 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 at the state level—directly/indirectly through its impact on the prioritized sectors. Eight (8) priority sectors were selected; and 22 respondents representing line ministries and CSOs were interviewed across Hirshabelle State. The **key informant interviews** were conducted at the state level with state government, CSOs and community representatives. The goal was to understand the local context.

Figure 4: Participant making a contribution during FGD session in Warshekh, Hirshabelle State

- **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 14 FGDs with between 8 -10 participants per FGD.

Figure 5: Focus group discussion with male participants in Hirshabelle State

- **Direct observation** - The relatively stable and peaceful conditions that characterize Hirshabelle State 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 Hirshabelle state was gained by direct observation as a research technique. Observable data included the flooding and displacement in IDP settlements.

Figure 6: Focus group discussion with female participants in Hirshabelle State

Table 4: Distribution of Stakeholders contacted in Hirshabelle State

Mapped sites	Mapped stakeholders (Ministries/ Academia and CSOs)	Focus Group Discussions	Key Informant Interviews
1. Balcad District 2. Jawhar district 3. Beledweyn district 4. Warsheikh District	▪ Ministry of environment, range land and Climate change. ▪ Ministry of Disaster Management	▪ Health (4 FGDs) ▪ Livestock (4 FGDs) ▪ Coastal Communities (2 FGDs) ▪ DRR (4 FDGs)	• Ministry of Environment and Climate Change (1 KIIs) • Biodiversity (3 KIIs) • Agriculture (3 KIIs) • Water (2 KIIs)

	▪ Ministry of Livestock, forestry and Rangeland ▪ Ministry of Disaster Management ▪ Ministry of Fisheries and Marine Resources ▪ Ministry of Women and Human Rights Development ▪ Ministry of Public Work ▪ Ministry of Health ▪ Ministry of Education ▪ Civil Society Organizations and as well as ▪ Academia ▪		• Health Centres (2 KIIs) • Livestock (4 KIIs) • CSOs (2 KIIs) • Fisheries & Marines resources (2 KIIs) • Ministry of Women and Human Rights (2 KIIs) • Education (4 KIIs) • Public work (1 KIIs) • DRR (4 KIIs)
		14 FGDs	**30 KIIs**

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

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. These 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 of member states 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 analyse 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 behaviour 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 in each of the four member states.

2.3 Methodological and Technical Limitations of the Vulnerability Assessment

2.3.1 Field 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.
- Insecurity limiting data collection exercise within a radius of 5 km towns.
- Lack of state specific long term and historical trend data on climate indicators as well as lack of state level information on climate change initiatives & dynamics.

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 state 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 is not available for Hirshabelle State. This assessment should be seen as an attempt of systematically unraveling Hirshabelle State's and by large Somalia'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[2]. 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 Hirshabelle. In general, some data are available on climatic exposure components, such as rainfall and temperature data.

III: Results of the State-level Vulnerability Assessment

3.1 Climate Change Vulnerability and Risks Factors in Hirshabelle State

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). Vulnerability and adaptive capacity are a function of the socio-political, economic and ecosystems factors. The assessment provides a review of the socio-political, economic and ecosystem characteristics and contextualizes them to the state's vulnerability / adaptive capacity to climate change.

3.1.1 Drivers of Climate Change Vulnerability and Adaptive Capacity in Hirshabelle State

- **Socio-demographic factors:** The households in Hirshabelle are predominantly male headed at 78 per cent with 22 per cent of the households being female headed. The average size of households in the assessment area is 6 people (HSHDS, 2021[3]). 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 six people as shown in Table 3 below. Most household members in the assessment area attained no education level (66% F, 65% M) with most of them having attained some primary school level of education (18% F, 24% M) as shown in table 3. 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 5: Demographic characteristic of household heads in Hirshabelle state

Background characteristics		Percentage distribution (%)	
		Male	Female
Gender	Household headship	77.8	22.2
Level of education	No education	65.1	66.1
	Some primary education	18.0	23.7
	Completed 8th grade at the primary level	2.4	2.6

[2] 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.

[3] Somalia National Bureau of Statistics (Formerly Directorate of National Statistics, Federal Government of Somalia), Somali Health and Demographic survey - *Hirshabelle Report 2021.*

	Some secondary	1.4	1.4
	Completed secondary	7.3	4.8
	Higher education	2.4	1.0
	Don't know	3.4	0.5

ssment, most household heads in Hirshabelle attained no education or have attained some primary school level of education. The CVA 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[4] 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[5].

- **Livelihood Strategies:** Under the arid and semi-arid areas of Hirshabelle pastoralism and agro-pastoralism are the fundamental basis of livelihoods which makes the state 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 HSHDS, 2021, agriculture and livestock farming plays a vital role in the Hirshabelle economy, and is the primary source of livelihood for most of the state population. 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

[4] Somali women play a significant role in Somalia 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.

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

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 Bank, 2013). In the context of Hirshabelle, 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 4). These include piped water, protected dug wells, tube wells or boreholes, rainwater, and bottled water.

  Households' main sources of drinking water: According to the Hirshabelle HSHDS 2021 report, 62 percent of households get their drinking water from improved water sources. Piped water into dwelling/ yard/plot and surface water are main sources of drinking water for 30.2 per cent and 24.9 per cent of the households with improved and unimproved water sources respectively as shown in the table 4 below.

Table 6: Access to water indicators

Background characteristics		**Percentage distribution (%)**
Main source of drinking water	Improved source (61.6%)	Piped water into dwelling/ yard/plot– 30.2 % Piped to neighbor–2.1% Public tab/ standpipe- 7.9 % Tube well/ borehole- 3.5 % Protected dug well – 15 % Protected spring – 1.1 % Rain water – 1.6 % Bottled water - 0.1 %
	Unimproved source (38.4%)	Unprotected dug well – 6.9 % Unprotected spring – 0.7% Tanker truck/cart with drum – 5.7%

		Water Kiosk – 0.0% Surface water – 24.9% Others – 0.3%

Source: HSHDS 2021

According to the Hirshabelle State Health and Demographic Survey 2021 report, 9.2 percent of the urban households, 47.1 percent of rural households and 75.8 percent of nomadic households have access to non 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: Hirshabelle state is among the administrative zones that faces the most challenges in the South Central Somalia, where Al Shabaab (the militant organization) has its stronghold. This essentially means that most parts of the State are inaccessible and it is difficult / impossible to empower communities towards climate change awareness and adaptation measures. At the same time, the communities are more vulnerable as they do not have access to external resources and assistance to respond to climate change related disasters.

3.1.2 Contributing Factors to the Exposure of Hirshabelle State to Climate Change Impacts

- **Natural vulnerabilities**

Hirshabelle State, under current climate conditions, is exposed to a multitude of natural hazards. According to discussions with climate change stakeholders[6] in the state, some of the climatic hazard that have occurred over the last 10 years in the state were identified as floods, droughts, infestation of invasive species (Prosopis juliflora), locust, cyclone / tropical storm surges as (Table 5).

- **Droughts:** Drought is recognized as the biggest problem facing Hirshabelle state, the cereal basket of Somalia. Droughts are perceived to occur every two to three years in the Dayr and every eight to ten years in both the Dayr and the Gu (FAO, 2006). Eight major droughts in the last four decades have severely affected crop and livestock production in the state, like in Somalia. The onset of 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 average. Maize and

[6] These were the local experts drawn from across line ministries, practitioners, including representatives from community groups, CSOs in Hirshabelle state.

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).

- **Floods:** Flooding is the second most common natural disaster in the state causing greater levels of human vulnerability. Floods have a detrimental effect on people's lives and livelihoods. It can result in the scarcity of drinking water; 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 2023 were very disruptive, and led to widespread floods, resulting in the displacement of people and causing crop and livestock losses that affected large population especially in Belet Weyne district, Hirshabelle State. The incidence of flooding in state is expected to increase in the future. As a result, the impact of floods in agriculture is expected to exacerbate human vulnerabilities. For example, Shabelle River Valley, including regions in Hirshabelle State, agriculture is the key source of employment and income. In view of this, the human vulnerability is considered to be high as, floods cause unemployment and/or underemployment. Besides, during the flood period, a number of vector and water borne diseases increase, resulting in morbidity and mortality among the affected population in region.

- **Pests and diseases outbreak:** The exceptionally moist conditions in the state led to a massive locust outbreak that was the worst in 25 years in Somalia. The 2020 desert locust crisis 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

Analysis of both KII and FGD data collected shown that climate change is projected to increase the state'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.

Table 7: Community perceptions and experiences on natural disasters

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
Locusts infestation	Yes	Likely	Severe
Extreme temperatures	Yes	Likely	Severe
Infestation of invasive species (Prosopis juliflora)	Yes	Likely	Severe

Further, these observations by the community climate actors are corroborated by existing studies, indicating that these natural events are expected to become more frequent and severe in the coming decades, as a result of human-induced global warming.

- Seasonal rainfall patterns may become more variable and erratic aggravating severe drought over the study area (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). Somalia, particularly the northern part experienced very severe tropical cyclone in November 2020 when Gati made landfall in the region becoming the first hurricane-equivalent storm to hit the Horn of Africa[7].

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

3.1.3 Current and Future Trends of Climatic Variables in Hirshabelle State

The focus of the assessment is on temperature and rainfall (precipitation) and their associated impacts in the state. 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 the state. 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 Hirshabelle state 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 Hirshabelle state. Studies are in agreement that increases in maximum and minimum temperatures are apparent in all seasons in Hirshabelle State with the average highest temperatures recorded in March and September of around 35°C, and the lowest temperatures recorded during the months of December and January, of around 22°C, as demonstrated in the figure 7 below. The yearly temperature is 30.41°C and it is 2.5% higher than Somalia's averages. The region typically receives about 59.0 millimeters (2.32 inches) of precipitation and has 71.36 rainy days (19.55% of the time) annually.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Nov	Oct	Dec	Year
Record high °C (°F)	37.48 (99.46)	38.49 (101.28)	40.52 (104.94)	39.51 (103.12)	38.49 (101.28)	37.48 (99.46)	36.47 (97.65)	37.48 (99.46)	39.51 (103.12)	38.49 (101.28)	35.45 (95.81)	36.47 (97.65)	40.52 (104.94)
Average high °C (°F)	34.69 (94.44)	36.21 (97.18)	37.26 (99.07)	35.94 (96.69)	34.91 (94.84)	34.18 (93.52)	33.18 (91.72)	33.98 (93.16)	35.56 (96.01)	33.83 (92.89)	33.32 (91.98)	34.14 (93.45)	34.77 (94.59)
Daily mean °C (°F)	29.35 (84.83)	30.36 (86.65)	31.81 (89.26)	31.96 (89.53)	31.31 (88.36)	30.42 (86.76)	29.3 (84.74)	29.72 (85.5)	30.85 (87.53)	30.32 (86.58)	29.75 (85.55)	29.74 (85.53)	30.41 (86.74)
Average low °C (°F)	21.84 (71.31)	21.94 (71.49)	23.83 (74.89)	25.98 (78.76)	25.64 (78.15)	24.18 (75.52)	23.24 (73.83)	23.28 (73.9)	23.71 (74.68)	24.86 (76.75)	24.36 (75.85)	23.31 (73.96)	23.85 (74.93)
Record low °C (°F)	17.22 (63.0)	16.21 (61.18)	17.22 (63.0)	18.23 (64.81)	23.3 (73.94)	22.29 (72.12)	20.26 (68.47)	19.25 (66.65)	20.26 (68.47)	21.27 (70.29)	20.26 (68.47)	18.23 (64.81)	16.21 (61.18)
Average precipitation mm (inches)	0.58 (0.02)	1.36 (0.05)	30.64 (1.21)	162.51 (6.4)	155.25 (6.11)	8.8 (0.35)	4.41 (0.17)	3.77 (0.15)	9.93 (0.39)	176.45 (6.95)	144.48 (5.69)	9.78 (0.39)	59.0 (2.32)
Average precipitation days (≥ 1.0 mm)	0.18	0.27	2.95	13.62	16.21	2.86	1.38	1.01	2.12	18.88	10.49	1.38	5.95
Average relative humidity (%)	46.62	47.07	49.03	54.91	59.45	55.78	54.72	53.65	52.12	60.14	58.94	47.87	53.35
Mean monthly sunshine hours	11.49	11.69	11.64	12.43	12.65	12.63	12.49	12.59	11.89	11.05	11.1	10.56	11.85

Figure 7: Monthly temperatures (Min, High) in Hirshabelle State, Somalia

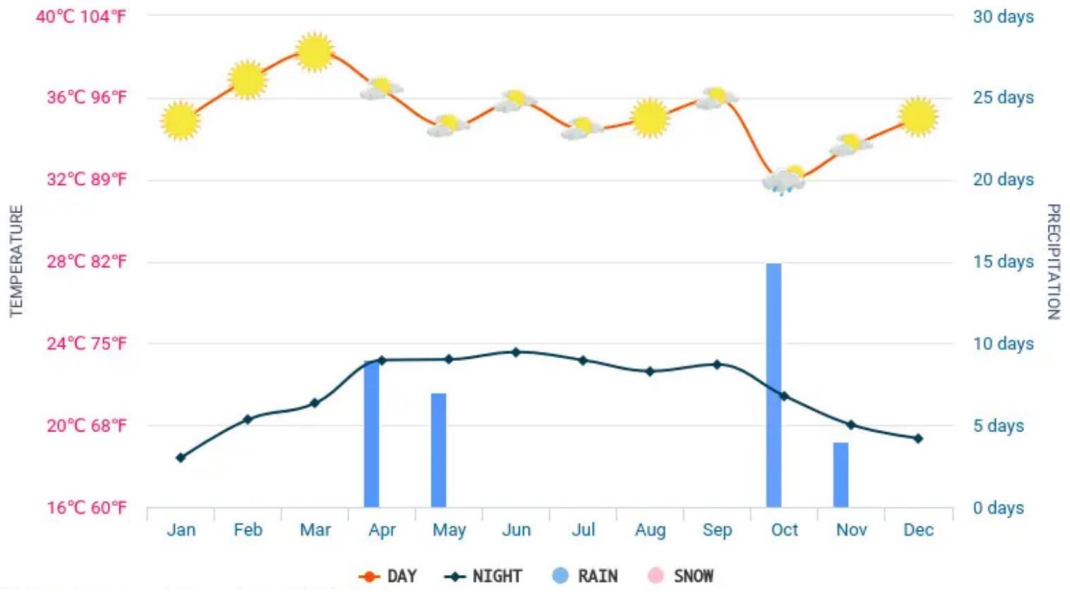

Figure 8: Average monthly temperature and precipitation of Hirshabelle State, Somalia

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 South Central Somalia including Hirshabelle state. Each year, by the 2030s, the region could experience between 4 and 30 days of temperatures exceeding this threshold, predominantly during February-April (World Bank, 2023; Gutierrez, et al., 2021).

Table 8: 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 lower Shabelle region could experience slightly less.	1.1°–1.3°C. warming
		RCP8.5	experiences of 1.0°–1.3°C warming	1.3°– 1.4°C warming
	Medium term (2041–2060)	RCP4.5	could experience increases of 1.5°–1.7°C or greater	1.7°C nationally; while southwest shows more pronounced warming of 1.7°– 2.0°C.
		RCP8.5	increases of between 1.8°C and 2.2°C nationally; while southern warm less warming of 1.5°–1.8°C.	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 0.9°C and 1.0°C.
		RCP8.5	Warming ranges from 1.0°–1.1°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 1.5°C to 1.7°C
		RCP8.5	Warming between 1.7°C and 1.8°C.	Warming of 2.0°–2.2°C
July - August	Short term (2021–2040)	RCP4.5	Up to 0.9°C	between 0.9°C and 1.0°C
		RCP8.5	increases of up to 1.3°C	Between 1.0°C and 1.1°C.
	Medium term (2041–2060)	RCP4.5	Increases of 1.5°C.	1.5°–1.7°C warmer
		RCP8.5	Warming of 1.5°–1.7°C	1.8°–2.0°C warmer
September - December	Short term (2021–2040)	RCP4.5	Experience warming of 0.7°– 0.8°C	between 0.9°C and 1.0°C.
		RCP8.5	Warm between 0.8°C and 0.9°C.	1.1°–1.3°C warming
	Medium term (2041–2060)	RCP4.5	Range from 1.5°C to 1.7°C	Warming from 1.5°C to 1.7°C
		RCP8.5	Range from 1.5°C to 1.7°C	1.8°–2.0°C warmer

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). Results also correlate with studies on the Horn of Africa region that shows 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 global warming. Forward into the future, temperature in Somalia 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[8]. The projected increase in temperature increases future drought risk in Hirshabelle State.

- **Current and Future Trends of Precipitation (rainfall).**

Hirshabelle State, like the rest of Somalia, has low annual precipitation and four seasons: the rainy seasons are Gu' (April to June) and Deyr (October to November which sometimes includes September), while the dry seasons are Hagaa/*Xagga* (July to September) and Jiilaal (December to March). This assessment concentrated within the two main rainfall seasons namely Gu' and Deyr. The focus was on Beledweyne district in Hirshabelle State owing to limited availability of up to date data. The mean annual rainfall for the Beledweyne is between 200 mm/year and 300 mm/year. As the rainfall in Shabelle catchments varies significantly from year to year, it causes severe droughts every seven to ten years (FAO, 2005).

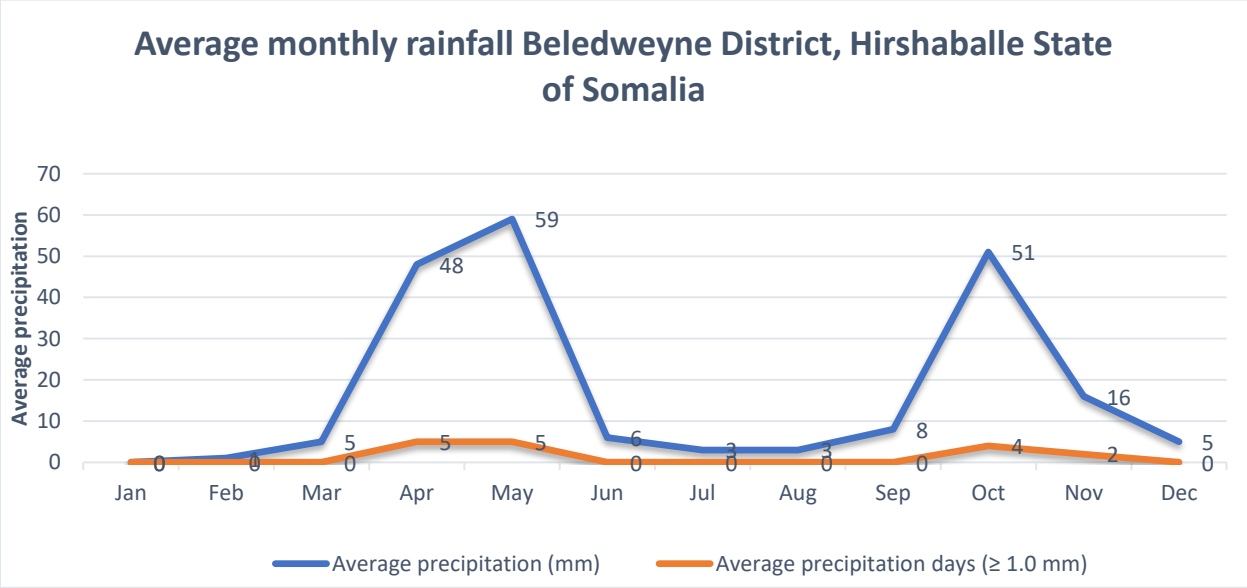

Figure 9: Average monthly rainfall Beledweyne District, Hirshabelle State

Rainfall in the State 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

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

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 9: CORDEX Africa Median Projections for Percent Change in Precipitation over various regions of Somalia

Season	Term	Median projection across Somalia (% 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%

Table 7 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, depending on the part of the country) 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. Somalia 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 Somalia in the recent past. The studies have shown 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.

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 Hirshabelle State.

3.2 Climate Change Risks, Hazards and Vulnerabilities in Hirshabelle State

3.3.1 Climate Change Risks and Hazards in Hirshabelle State

Hazard refers to the potential occurrence of climate-related physical events or trends that may cause damage and loss. Floods and droughts are the most common climate related hazards that occur in the state. 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 Hirshabelle state. The interaction of the climatic hazards with the exposed human and ecological systems in the state 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 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 Shabelle water levels (including Hirshabelle Indian Ocean coastlines) in the case of high (extreme) precipitation. The temperature variable is mostly associated with drought hazard in the state which exposes Hirshabelle state to the risk of frequent drought incidences.

Community Perceptions and Experiences on Climatic Change Risks and Hazards

Climate change risks not only result from changes in temperature, precipitation or other climate variables or hazards but also from the interaction of climate related hazards with local communities' socio-economic development and land use trajectories, and other human-mediated environmental degradation and change. According to discussions held with community groups across sampled study sites in Hirshabelle state, floods and droughts are perceived to be the most common climate related hazards that occur in the region.

Table 10: Common climate related hazards and potential risks in Hirshabelle state

Climatic variable	Climatic hazard	Climatic change risk
Precipitation • High	Floods	• Increased flooding incidences due to riverbank breakages, • Rise in water levels • Increases of vector and water borne diseases
• Low	Droughts	• Occurrence of droughts • Disease Outbreaks
Temperature (heat stress)	Droughts	• Increased Drought incidence

3.3.2 Climate Change Vulnerabilities

Climate change vulnerabilities contribute to the risk of the occurrence of climate change impacts. Hirshabelle state'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 9).

Table 11: Climate Change Vulnerabilities in Hirshabelle State

Climate Change Risks	Vulnerabilities
(Precipitation) • Flooding • Rise in water levels – river Shabelle & Indian ocean coastlines	• Livestock diseases • Loss of income • Loss of livelihoods (crops & livestock) • Inadequate water supply • Emergence of new and aggressive insects and pests • Loss of income and wealth • Low milk productivity • Spread of infectious and contagious infections • Loss of lives • Decreased crop production • Food scarcity including pasture
(Temperature) • Droughts • Airborne diseases	• Forced migration in search of livelivelihoods • Increased cost of living owing to hikes in water prices • Decreased productivity • Emergence of aggressive and invasive insects and pests • Loss of productive agricultural land and pasture • Loss of income • Declining livestock productivity • Loss of livelihoods (crops & livestock) • Inadequate water for human and livestock use • Loss of lives • Competition for control over diminishing ecological yields

3.3 Sectoral Climate Change Analysis

3.3.3 Analysis of vulnerabilities of key sectors to Climate Change

The assessment identified priority sectors such as Agriculture (crop, livestock, and fisheries), water and health as vulnerable sectors to the impacts of climate change as shown in Table 10 below. The assets impacted by climate change in the identified sectors are categorized into natural, physical, human, social and financial assets and are highlighted in the table 10 below. The assessment further gives a description of the various assets in priority sectors.

Table 12: Identification of the vulnerable sectors to climate change in Hirshabelle State

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
		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	

					• Increased incidences of injuries and deaths due to flooding • Increased vulnerability of those living with terminal diseases
Temperature • Droughts • Airborne diseases	Agriculture (Crops)	Natural	Crops and sources of water for crop farming	Yes	• 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
		Physical	Access to markets (roads), means of transportation, supporting infrastructure	No	
		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

Agriculture sector plays a vital role in the Hirshabelle economy, and it is the primary source of livelihood for most of the state population. Agricultural production is practiced along the Shabelle River. This assessment established that maize, sorghum, cowpea and sesame are the dominant food crops grown by farmers in Hirshabelle state. Vegetables and fruits such as onion, sem sem, banana, lemon are mainly grown for commercial purposes.

Maize is the dominant crop grown during Gu and Deyr rainy season in most crop producing regions along the Shabelle River. This sector has been continuously buffeted by 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 State. The assessment VRA established that crops continue to be the main sources of economic activity, employment and livelihoods in the region especially in the rural population. FGD participants observed that households grow crops for semi-commercial (a part is for own use and another part is sold) purposes.

Climate Change Impacts on the Agriculture Sector

Perception of the community groups indicated that agriculture sector remains threatened with changes in climate, associated extreme hazards. FGDs participants observed that climatic hazards such as floods and droughts directly impact the sector especially on production activities hence the livelihoods of people in the state. Floods predominantly affect the low-lying areas along the Shabelle River. Droughts have affected most parts of the state 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. 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 farm lands affecting cropping 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 from line ministries perceive increased reoccurrence of extreme weather events such as floods, droughts and storms in the state.
- Climate projection models for the region predicts more weather events such as days with high or very low temperatures, and extreme precipitation.
- Increasing reoccurrence of extreme weather events can only increase already worsening vulnerabilities through losses in agricultural sector and the supporting sectors
- Local communities have very low adaptive capacities despite of the exposure of the agriculture sector

This study provides the way forward in terms of support required to adapt and mitigate adverse effects of climate change for the sector through taking measures such as:

- Capacity building of farmer groups - farmers awareness schemes, to educate farmers about climate change risks;
- Regenerative farming methods - best agriculture practice, use of best available seeds variety, changes in cropping patterns etc,
- Story gardens and other options for agricultural production in urban areas and IDP camps to boost food security
- Dryland farming in combination with rain water harvesting – trapezoidal bunds, etc.
- Management of irrigation schemes - efficient irrigation systems along River Shabelle,
- Infrastructure for reliable irrigation (storage – farm ponds, larger storage structures)
- Capacity building of line department staff, to educate farmers about climate change risks, climate smart agriculture practices, etc

2. Livestock sector

Livestock are the mainstay of rural people's livelihood strategies in Hirshabelle State. Pastoralism has proved to be the best way for rural people to secure their livelihoods. Hirshabelle state has a strong livestock sector, contributing significantly to household incomes and provide substantial funding for small businesses and basic service provision in and around towns. Hirshabelle enjoys the greatest share of the 7.5 million goats exported annually than any other state in the Federal Republic of Somalia. In the 2000s, the region enjoyed massive exportation of goat and camel meat to the UAE from Beledweyne airport.

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 are 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 faced with a myriad of challenges, including Climate change and variability, high levels of soil and land degradation and biodiversity loss. The extreme weather events such as 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. Additionally, the sector is faced with threats from extreme degradation of natural vegetation due to overgrazing, intensive collection of fuelwood, charcoal and building materials, coupled with the increasing expansion of agriculture into the rangelands. Invasive species such as the *Prosopis juliflora* tree that hinder access to the grazing grounds also affect livestock activities.

Climate Change Impacts on the Livestock Sector

Climatic hazards such as floods and droughts directly impact the sector especially on production activities hence the livelihoods of people in the region.

In Kooshin, a village in Beledweyne district, the community have lost livestock to droughts 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 the state and local communities.

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

- The pastoral communities have very low adaptive capacities which need to be built through state-led progressive initiatives and supported by all other actors in the sector for synergies and complementarities for greater impact.
- State government-led initiative such as breed enhancement, restocking program, improved fodder production, and livestock farmers' capacity building including trainings on fodder production and water storage need upscaling in order to increase resilience of the local pastoral communities and achieve continuous good livestock production.
- Good livestock production supported with effective rangeland management and ecosystem protection programs must be initiated to increase the resilience of these communities
- Climate proofed water supplies critical to livestock production, movement and marketing in the state
- Capacity building of pastoral groups to develop grazing management and marketing plans is needed
- Significant investments are needed to support the restoration and management of the rangelands. In addition to traditional approaches of rangeland restoration, including recent approaches which emphasizes nature-based solutions and restoration of the biodiversity.

In order for pastoralism to be sustainable in Hirashabelle state, the following measures are proposed for building adaptive capacities as follows:

- Provide pastoral and agro-pastoral communities with improved access to climate smart water systems (gravity/solar/wind energy) for pasture/fodder production and accessible water for livestock.
- Establish contingency boreholes that should be part of the management of drought season grazing areas;
- Provide investments to support restoration and management of the rangelands through:

1. Strengthening existing local pastoral groups or CBOs – rangeland committees, water committees, etc on measures to support rangeland and environmental restoration. These may include development of management tools such as community grazing management plans.
2. Rangeland management and restoration through:
    - Identification of specific target areas where rangeland interventions area required;
    - Identification of areas suitable for reseeding & fodder bulking
    - Hay making, storage and marketing
    - Management of Prosopis Juliflora which has invaded many rangeland areas. Productive utilization of *Prosopis* is seen an option to open up infested rangelands.
    - Water harvesting technologies for fodder production.
    - Support for fodder produce harvesting and seed saving

3. *Water Sector*

Communities in Hirshabelle state have insufficient water infrastructures limiting water access. According to the FGDs participants, climate change has exacerbated water shortage for livestock and crop production activities and domestic use across the state.

The state lack climate resilient water infrastructure with numerous efforts for expansion of water access so far initiated often regarded as unsustainable and fails to strategically incorporate climate change in development of climate resilient water infrastructure. For instance, the District Water Agency Commission in Middle Shabelle region has developed a contingency plan that ensures water availability to the population during an emergency (e.g. floods, droughts). However, it is not clear whether the plan has defined any specific approach towards climate risk informed planning. Also, there is a greater low level of awareness regarding the need to develop climate resilient infrastructure.

> In Ex Balcad and Xawo Tako villages in Middle Shebelle region, community members reported a general lack of reliable source of water all year round for their domestic use and production activities. To cope with lack of access to water sources the community has developed overreliance on seasonal shallow wells leading to increased livelihood vulnerabilities.

The emerging scenario in the region depicts a situation in which agricultural production and domestic water demand has been affected / unmet. Deterioration of water infrastructure, coupled with lack of rainwater harvesting skills and capacity have impacted agro pastoral activities including rain-fed farming.

Impacts of Climate Change on the Water Sector

The heavy dependence of the population on natural water source renders the water sector highly exposed to the impacts of climate change. These climatic hazards such as extreme temperature, drought and floods have been experienced over the past 5 – 10 years with associated impacts mostly related to water shortage, limited water availability, destruction of water infrastructure (floods), etc.

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 in some cases. 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 resilient water infrastructure in Hirshabelle state resulting to an ad hoc unsustainable developments and investments in the state's water sector.

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 in the state. Despite some efforts towards this, the State has a large part of its population accessing water from unsafe sources (water canals, shallow wells and boreholes) with parts of the majority of the population facing acute water shortages due to overdependence on rainwater and also lack of water storage options.

- None of community's main water source is 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 including livestock production in the state.
- Low rainfall in the dry period is expected to further dry up rivers and water sources.
- A greater low level of awareness regarding the need to develop climate resilient infrastructure is evident.

Overall, an appropriate risk informed planning where different water infrastructure and capacity development options are required to address specific climate hazards in the state. Various options that should be considered as part of building climate resilient water infrastructure are as follows:

- Conjunctive use of surface and groundwater sources. In some areas groundwater quality is not as fresh as surface water. However, in the situation where drought affects the surface water availability, groundwater can be used to ensure water access continue;
- Extending or developing groundwater assets. It is recognised that in Hirshabelle state droughts are a feature and, under climate change, may become more severe and more frequent. Groundwater can provide a more reliable source than surface water although availability and water quality can constrain the development of new groundwater sources;
- Building more robust groundwater infrastructure. Handpumps can be used extensively for community based water sources. With the cost of solar powered water pumping options becoming more affordable, the option to equip a borehole or shallow well with a solar array and pump should be considered more attractive and feasible;
- Rehabilitation and solarisation of existing borehole can be a way to improve climate resilience as it reduces operational costs which releases funds for other operational and maintenance costs;
- Building large dams and pans. The aim is to build a dam or pan that has sufficient capacity to provide a supply across multiple seasons so that if there is a failed rainy season the water access can be assured.
- Building multi-use water infrastructure in the rural communities serving livestock, and/or irrigation as well as domestic uses. The water asset should consider design for the point of collection that make appropriate provision for the different users with domestic users, especially women and girls needs taken into consideration.

Other additional urgent potential adaptation options for the water sector include:

- Support for agro-pastoralist communities in Shabelle river ecosystems to prepare micro-catchments that are useful in tapping water during the rainy season. As a result, water regeneration is enhanced.
- Adaptation of best water management practice; such as rain water harvesting technologies,
- Improvement of groundwater recharge and discouraging groundwater abstractions,
- Capacity building of line department staff, to enhance access to quality services for urban and rural water supply,
- Capacity building of local communities, to enhance urban and rural rain water harvesting – water storage systems,
- Strengthening climate change education and awareness creation.
- Better natural resource management, for instance, growing of more trees to control temperature and to reduce water losses together with adverse climate change impacts

4. Health

Limited access to water sources of good quality, particularly during floods and droughts, presents a serious health challenge in Hirshabelle state. Sources of water such as ground water sources are saline and require intensive treatment to attain acceptable quality standards for human, animal or irrigation use (Ex Balcad village in Middle Shebelle region, saline boreholes and shallow wells in Xawo Tako villages in Middle Shebelle region, etc). Ground water thus remains optimally unexploited whilst the population uses what is available which poses health risks or have to travel long distances to fetch water from safer wells, boreholes, or river Shabelle. Reliance on other alternative unsafe water sources such wells and boreholes expose communities to significant health risks to waterborne diseases such as diarrhea, cholera and typhoid fever.

Impacts of Climate Change on the Health Sector

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

Both KIIs and FGDs participants identified major health-related climate change impacts as the increase in respiratory illnesses and waterborne diseases caused by climatic hazards. For instance, the major impact of changing climatic conditions observed in the state was the increase in heat waves, and subsequently heat strokes 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 the state has been experiencing prolonged droughts for the past 5 years, resulting in further depletion of water resources.

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.

Village/community	Extreme temperature-related illnesses or deaths	Drought-related illnesses or deaths	Floods-related illnesses or deaths	illnesses or deaths-related to malaria, Dengue or RVF	illnesses or deaths-related to gastrointestinal diseases (e.g. cholera, etc.)
Haawo taako	100	40	58	47	29
Balcad	10	40	60	10	50

Key Message Climate Change Impacts and Adaptive Capacities / Options for 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 and needs to be addressed.
- Health impacts related to the use of unsafe water from multiple alternative water sources that are unregulated require awareness of the safety of the water source
- Without safe water for drinking, food preparation, handwashing and general hygiene and sanitation, even basic health outcomes will prove difficult to achieve and sustain.

Table 13: 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	1. Promote public health awareness campaigns targeted to rural areas 2. Raising funds for climate-induced disease response 3. Enhance waste management capacity 4. Introduce and promote ingenious/ traditional crop varieties 5. Improve coordination between stakeholders [NGO, Govt., communities] 6. Develop human resources and skills

5. Education

Main climatic hazards impacting education sector in the state include floods, drought and extreme temperature. The vulnerability assessment focused on education access by learners including education infrastructure. The education sector is a pillar of development in the State.

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 high turnover among teaching staffs, 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 14: 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 drop-outs 3. Migration/displacement 4. Loss of livelihoods (parents) 5. Damage to local roads due to floods	1. Enhancing education 2. Better planning for construction (improved school infrastructure) 3. Rehabilitation of drainage of road networks increase water flow 4. Flood proof/resilient housing

6. Public works

The assessment team observed that Climatic hazards such as extreme temperatures or heat stress, droughts, floods, tropical storm, among others hazards to 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 region 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 15: 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 5. Damage of houses and livestock holding areas 6. Damage to local roads due to floods	1. Rehabilitation of drainage of road networks increase water flow 2. More bridges or culverts for increasing flow in the floodplains 3. Better planning for construction (improved school infrastructure) 4. Flood proof/resilient housing 5. Land use planning

Key Climate Change Impact and Adaptive Capacity Messages for 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 across the state.

7. Biodiversity

The stakeholders during assessment observed that climatic hazards such as extreme temperatures or heat stress, droughts, floods, among others 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 14 below.

Table 16: 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	1. Increase the coordination and capacity of implementing agencies. 2. Prepare and implement plan for the conservation of biodiversity. 3. Implement different rules and regulations. 4. Build awareness of the people 5. Incorporate biodiversity in all development planning. 6. Increase the forest lands through afforestation

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

Climate change is contributing to loss of biodiversity in state of Hirshabelle. 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 through:

- Environmental restoration as well as rangeland restoration by identifying specific measures that enhance the biodiversity within given area/regions across the state at the same time as restoring the productive capacity of the rangelands;
    - Soil & water conservation measures (swales, terraces, micro-catchments, etc)
    - Nature-based solutions such as the development of enclosures to reduce grazing pressure and allow the natural process of regeneration to take place;

- In places where soil texture leads to sealing, interventions such as cutting and laying of brash have been shown to break up surface seals and allow infiltration and natural processes of regeneration;
- Riparian restoration efforts that protect river banks from erosion can help to maintain riparian areas which are known to be important food and biodiversity banks;
- Water source conservation (springs, wetlands, groundwater recharge areas)

- 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

Hirshabelle state's coast has well-established fishing communities that depend on the fisheries sector as main livelihood activity. However, climate change has also affected the marine resources, fishing activities and the subsistence of households. The FGD participants observed that climatic hazards such as extreme temperatures or heat stress, coastal floods, among other hazards have significant impacts on the coastal and marine resources in the state. In addition, the fishing communities have endured decades of meager production yields due to the lack of adequate equipment, skills, resources, and markets. Nevertheless, the Hirshabelle's Ministry of Planning has identified the strategic goal of developing the fishing industry as being a top economic development priority.

Interviews and focus group discussions with stakeholders and coastal communities revealed that several techniques/equipment are employed in the fish harvesting in Hirshabelle, including: traps, cast net, lift net, handline and hooking. Fisher folks also use small boats, mini trawls as the harvesting equipment. The dominant fish species harvested include: Yellow fin tuna, mackerel, emperor, grouper, saw shark snapper, lobster, shrimps, skipjack tuna, kawakawa tuna, billfishes,mahimahi and sea turtle. Despite the variety of fish resources, poor processing facilities, old fishing gear and the isolation of fishing communities constitute the weaknesses prevalent in the sector.

Impacts of Climate Change on Coastal Marine resources

Discussion with Ministry of Fisheries and Marine Resources 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 in the state. 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 17: 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. 3) Change in fish breeding season (early breeding). 4) Change in habitat of fish/migration of aquatic animal.	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. 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

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 of 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 Hirshabelle State perceive drought, pest and diseases, floods associated with rising River Shabelle and seal levels as the common disasters faced by local communities over the past 5-10 years. Main common approaches adopted by both communities and the government officials are aimed at preventing or reducing the loss of life and property by mitigating the impact of disasters. **Error! Reference source not found.** presents a summary of the steps in disaster risk reduction and associated relevant approaches.

Table 18: Approach employed to for disaster risk reduction.

Steps of disaster risk reduction	Approach/actions employed
Mitigation	• Community trained on good agricultural practices (climate hazard in agriculture and livestock sector) • Rangelands restoration including tree planting

	• Evacuation of at risk communities through voluntary initiatives e.g. breached river banks, sea fronts • Better preparation towards disaster recovery from a major natural catastrophe, • Early Warning Systems • Community awareness and orientation •
Preparedness	• Increase community early warning system. • Prepare policies, strategies, awareness system, financial and equipment support to face the disaster. • Use of ground water boreholes • Livestock's vaccination • Provide fishing gears including lifesaving items to fisher folks • Use of modern irrigation techniques; • Communicate with the government about potential disaster risk. • Community awareness • Provide lifesaving. • Smart climate agriculture e.g. drip irrigation
Response	• Community mobilization for support • Livestock treatment campaigns • Evacuation of affected communities through coordinated multi-agency including local government authorities • Provision of food and shelter to effected communities •
Recovery	• Financial support pastoralist and agricultural 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 • Moving shelter from affected communities • Developing recovery strategies and plans • Rehabilitation of boreholes

Key Messages on key approaches for Disaster Risks Reduction

For mitigation to be effective action must be taken before the occurrence of disaster to reduce the human and financial consequences. Community discussion revealed a general lack of capacities to cope with the local distaers such 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 coordination mechanisms (such as the federal Somalia Disaster Management Agency and interstate Inter Emergency Sub-Sectoral Coordination Group) 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:

- Financial support pastoralist and agricultural 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
- Moving shelter from affected communities
- Developing 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 increased vulnerabilities of women to climate-related events in the state.

Participants during KII session reported a lack of affirmative action within their respective institutions aimed at strengthening the capacity of women and girls to fight or adapt to climate hazards in different sectors in the state. 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 Hirshabelle state 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 the state, 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 VRA for Hirshabelle state is a key milestone in understanding the climate change vulnerabilities that the state and communities are facing. The VRA linked the sectoral exposure to differentiated climate change risks / hazards i.e. extreme temperatures, floods, drought, pest and disease, locust, tropical storms etc and ultimately identified not only the vulnerability inducing factors but also potential adaptation pathways.

The VRA findings point to a high vulnerability profile to impacts of climate change, across all the priority sectors. The assessment identified vulnerabilities in the considered priority sectors that were targeted in VRA excercise. 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 and precipitation will be a major issue in the coming decades. With the information on the outlook towards the future, if the State does not adapt to climate change, vulnerability will be pushed to critical levels.

Key Messages

Given the findings from VRA exercise, the key messages for Hirshabelle state are:

1. Adaptation measures put in place focus in addressing exposure to hazards and risks in the sectors and the socio-political, economic and environmental systems
2. Concerted stakeholder driven contextual approach and efforts to building Hirshabelle state's adaptation capacity to climate change is critical.
3. Intensification of ongoing efforts by local communities and institutional initiatives to cope with the adverse impacts of climate change is important and urgent
4. Increasing investments in the adaptive capacity of people and sectors including the State, for instance provision of weather information, extension services, livelihood support programs (provision of planting materials to farmers) and so on are key in reducing vulnerability.
5. Inclusivity of significant proportion of vulnerable groups (women, girls, youth, minority clans, IDPs, PWDs etc) to address systemic marginalization and reduce gender imbalances and other marginalization bottlenecks critical for greater impact.
6. The good will to provide sound information about climate vulnerability is important to support decision making for adaptation planning in the State.
7. Funding allocation of new development projects based on the climate vulnerability of priority sectors for greater impact.

Recommendations to Build a Climate Resilient Hirshabelle State

The CVA findings points to a high vulnerability to the impacts of climate change, across the selected sectors in Hirshabelle state (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 state 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

V. Food Insecurity

- Introduce and promote ingenious/ traditional crop varieties
- Support in terms of in-kind food or cash to alleviate food insecurity and enhance coping strategies.
- Story gardens and other options for agricultural production in urban areas and IDP camps to boost food security
- Diversification of income generating activities.
- Dryland farming in combination with rain water harvesting – trapezoidal bunds, etc.
- Restocking of lost livestock herds
- 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;
- Regenerative farming methods - best agriculture practice, use of best available seeds variety, changes in cropping patterns etc,
- Management of irrigation schemes - efficient irrigation systems along River Shabelle,
- Infrastructure for reliable irrigation (storage – farm ponds, larger storage structures)
- Capacity building of line department staff, to educate farmers about climate change risks, climate smart agriculture practices, etc

VI. 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

VII. 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

VIII. 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

The way forward – actions and support required

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. Develop a climate risk map/atlas – a risk-informed decision-making toolkit to be used to map critical vulnerabilities at the local administrative levels.
b. Establish a climate risk commission or department with mandate to mainstream climate risks in a decentralized manner.
c. Enhance Early Warning Systems to build greater resilience to hydro and meteorological hazards.
d. Enhance local knowledge and biological cues management on forecasting weather and taking proper actions before the intervention of the public sector.

III. Focused Investments Towards Climate Change Adaptation

a. Develop Climate Smart Agriculture to strengthen resilience in the agriculture and food, livestock Sectors.
b. Integrate climate vulnerability–based financing instruments into investment decision-making.
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.

IV. Deal with Systemic Climate Change Adaptation Bottlenecks

a. Develop and enhance the funding opportunities for the at-risk people; both financial institutions (suppliers) and demanders (farmers organisations, 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 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 organisations, 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.

V. Collaborative and Synergistic Stakeholder Engagement for Climate Change Adaptation

a. Encourage ownership by community mobilization of local development problems as they relate to climate related events so that they become more active participants in developing solutions.
b. Improve participation on issues of climate change from conceptualization to realization and restitution.
c. Encourage the creation of sustainable advocacy platforms through capacity building in the domain.

VI. Address Gender vulnerabilities in all key priority sectors

a. Support measures aim 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 impacts.
c. Provide institutional and technical support for local institutions championing women agenda to increase capacity of the local women

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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 for states 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:*** State-level assessment conducted • ***Period:*** Based on the availability of data
	Identification and selection of indicators for vulnerability assessment	• State-specific assessments will be based on sets of common indicators to capture state-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 Identification of drivers of vulnerability for adaptation planning	• Table, graphs, and spatial maps will be used to represent vulnerability and its drivers.
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 state-level indicators generated and presented per member state but based on the availability of data
VRA report validation	Validation workshop	• State-level validation workshop will be conducted per federal member state 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 finalise the VRA reports incorporating all comments, recommendations received from all consultation workshops, KAALO, UNDP team, and line ministries.

Annex 2: Schedule followed for field work data collection in Hirshabelle State

DATE & TIME	ACTIVITY DESCRIPTION	RESPONSIBLE/PARTICIPANTS
16th Nov 2023	Final revized Vulnerability Assessments tool shared to UNDP and KAALO	**Kevin**
19th – 22nd Nov , 2023	Uploading VRA tools to KOBOCollection	**KAALO (Abdirashid and Ismail)**
23th Nov , 2023	Online meeting with the NAP coordinators , Amoud university, UNDP and KAALO for the Prensenation of the VRA PLAN in the respective states and shared the Schedule of the Mission per state.	**KAALO/UNDP/AMOUD**
6th -7th Dec 2023	Travel to Mogadishu- Jawhar -Hirshabelle state	Ismail/Abdirashid /NAP coordinator/UNDP –Aden
9th Dec 2023	Meeting with Ministry Environment and climate change of Hirshabele state on the Discussion of the VRA as well as the invitation respective sectors.	Ismail/Abdirashid /NAP coordinator/UNDP –Aden
10th Dec 2023.	Training Data collection enumerators and Consulations in Hirshabelle State.	Ismail/Abdirashid /NAP coordinator/UNDP –Aden
11th Dec 2023	KIIS Data collection for line ministries in Hirshabele	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
12th Dec 2023	**Biodiversity/Ministry of Environment ·** Visit to communities residing in areas hosting biodiversity resources - **FGDs/KIIs** with community leaders, community members including men, women, and youths	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden

DATE & TIME	ACTIVITY DESCRIPTION	RESPONSIBLE/PARTICIPANTS
12th Dec 2023	**Vulnerability assessment – agriculture and food security**: Visit to 1 community - FGDs/KIIs with community members including men, women, and youths.	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
13th Dec 2023	**Vulnerability assessment – Water sector** Visit to 1-2 communities FGDs/KIIs with community members including men, women, and youths.	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
14th Dec 2023	**Vulnerability assessment – health** Visit to - communities FGDs/KIIs with community members including men, women, and youths.	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
14th Dec 2023	**Vulnerability assessment- Ministry of Livestock and animal husbandary.** Visit to - communities FGDs/KIIs with community members including men, women, and youths and Communities.	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
16th Dec 2023	**Vulnerability assessment – Marine and coastal resources -** Visit to - communities FGDs/KIIs with community members including men, women, and youths and Communities.	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
16th Dec 2023	**Vulnerability assessment- Ministry of Women and Human Rights Development-** Visit to - Ministry and women organizations - KIIs	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
17th Dec 2023	**Vulnerability assessment- Ministry of Education** Visit to – Schools and Regional education offices KIIs	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden

DATE & TIME	ACTIVITY DESCRIPTION	RESPONSIBLE/PARTICIPANTS
17th Dec 2023	**Vulnerability assessment – Public work/ DRR** Field visit KIIs with companies rehabilitating the roads, and in charge of DRR response.	Enumerators/ Ismail/Abdirashid /NAP coordinator/UNDP –Aden
31st Dec 2023	Analysis of collected Data and share the 1st First VRA Draft Report in Hirshabelle state.	**Consultant**
15th Jan 2024	State-level validation workshop in SWS	**Ismail/NAP coordinador/UNDP-Aden**

Annex 3: 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