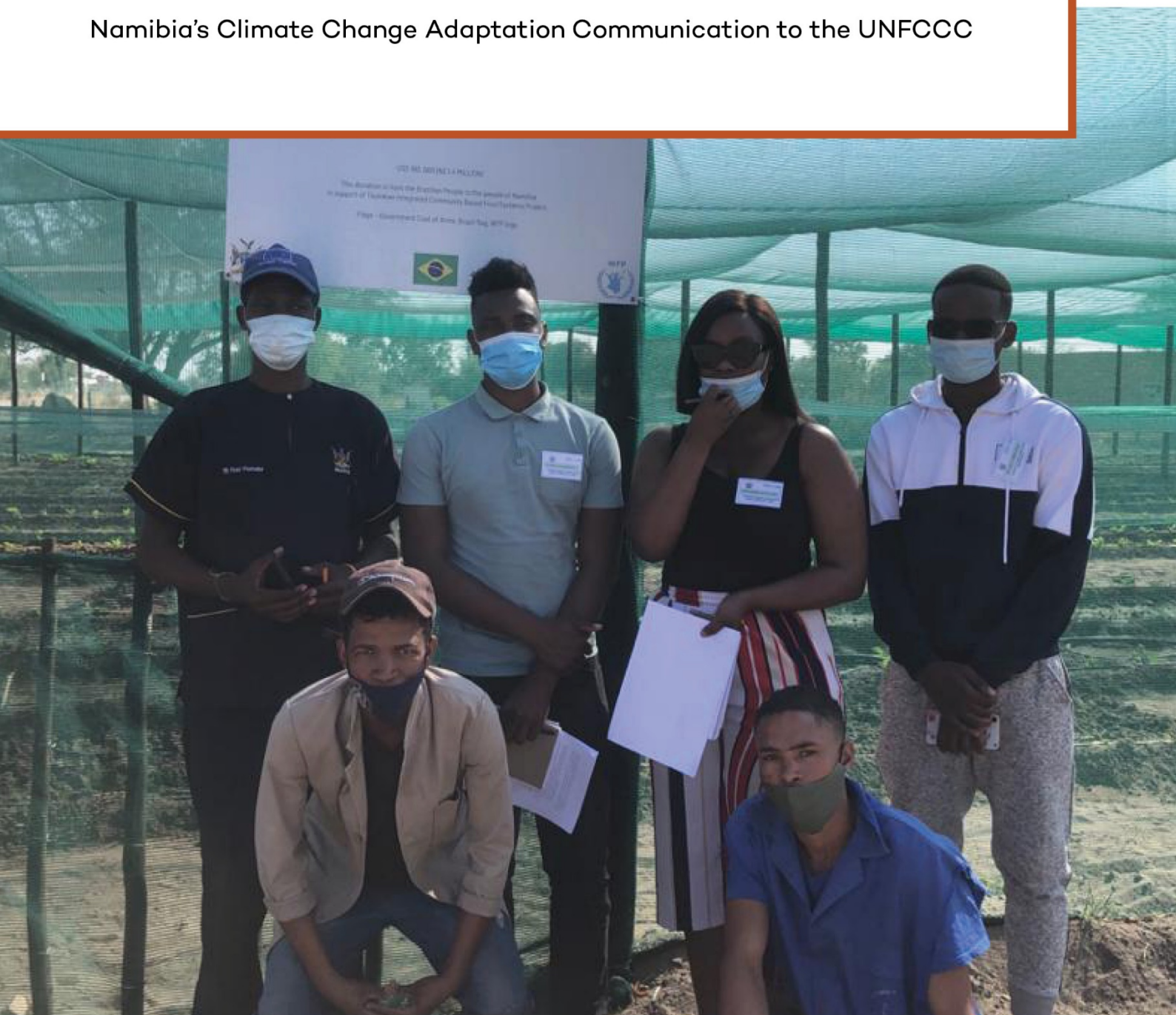
Republic of Namibia
First Adaptation Communication

Namibia's Climate Change Adaptation Communication to the UNFCCC



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Namibia's Climate Change Adaptation Communication to the United Nations Framework Convention on Climate Change (UNFCCC)

Ministry of Environment, Forestry and Tourism
Department of Environmental Affairs and Forestry
Division of Multilateral Environmental Agreements
Windhoek, Namibia

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Acronyms and Abbreviations

AdCom	Adaptation Communication
AFOLU	agriculture, forestry and other land use
ASSAR	Adaptation at Scale in Semi-arid Regions
BUR	Biennial Update Report
CBNRM	community-based natural resource management
COP	Conference of Parties
CRAVE	Climate-Resilient Agriculture in the Vulnerable Extreme Northern-Growing Regions
DRM	Disaster Risk Management
EIF	Environmental Investment Fund of Namibia
GCF	Green Climate Fund
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GST	Global Stocktake
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
MAWLR	Ministry of Agriculture, Water and Land Reform
M&E	monitoring and evaluation
MEFT	Ministry of Environment, Forestry and Tourism
MFMR	Ministry of Fisheries and Marine Resources
MHSS	Ministry of Health and Social Services
NAP	National Adaptation Plan
NC	National Communication
NCCP	National Climate Change Policy
NCCSAP	National Climate Change Strategy and Action Plan

NCRC	National Committee on Rio Conventions
NDC	Nationally Determined Contribution
NDP	National Development Plan
NPC	National Planning Commission
NSA	Namibia Statistics Agency
SCORE	Scaling Up Community Resilience to Climate Variability and Climate Change Project
SDGs	Sustainable Development Goals
TNA	Technology Needs Assessment
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
V&A	Vulnerability and Adaptation

Foreword

Namibia is pleased to submit its First Adaptation Communication (AdCom) in advance of the United Nations Framework Convention on Climate Change's 26th session of the Conference of the Parties to inform the synthesis of the Global Stocktake (GST) in accordance with Article 7 of the Paris Agreement (decision 9/CMA.1).

Namibia's AdCom showcases those climate change adaptation actions still in need of support, and the progress the country has made thus far in the implementation of its adaptation programmes. The document highlights that:

- Adaptation is of **primary importance** to the country and is high on the government's agenda to guarantee the welfare of the people while reducing risks and building resilience.
- Adaptation to climate change is carried out by **various actors** such as government, agencies, the private sector, civil society and at the household level, with the inclusion of gender, youth and marginalized communities encouraged in all adaptation activities.
- Adaptation to climate change presents Namibia with an **opportunity to transform the economy**, strengthen the social and spatial fabric, and become more competitive in the global marketplace.
- Namibia requires **funding, capacity development and technology transfer** in order to fully implement the adaptation measures found in its Nationally Determined Contribution and AdCom.

Financial Needs for the Implementation of Adaptation Actions

The total financial needs for the implementation of adaptation actions are set out in Chapter 4 of this document. The adaptation cost constitutes the cost borne nationally by the country and the cost that will need international support. The projected net cost of adaptation targets was prepared through various national consultations, and the total financing needed for adaptation actions is estimated at **USD 1.72 billion** from 2021 to 2030. The largest funding is required for agriculture (26%, USD 564 million), forestry (21%, USD 454 million) and coastal zones (12%, USD 255 million).

1.Introduction

Climate change has had a negative effect on Namibia, her people and the country's development goals. Adaptation is of primary importance to the country and is high on the government's agenda in order to guarantee the welfare of the people while reducing risks and building resilience. The country has a significant role to play in ensuring that its population is protected from the negative effects of climate change and that it continues developing in a sustainable manner while meeting its reporting obligations. The country has a harsh desert and a low-precipitation climate, worsened by other existing vulnerabilities, along with changing rainfall patterns and rising temperatures.

The country has prioritised adaptation measures as reported in its submitted national reports and highlighted in this Adaptation Communication (AdCom). Under the Paris Agreement (Article 7), Parties were implored to submit and periodically update an adaptation communication, which may include information on the country's priorities, implementation and support needs, plans and actions. The guidance in the submission of the national AdCom was further agreed to by Parties in Katowice, Poland under decision 9/CMA.11. This AdCom comes at a time when the Intergovernmental Panel on Climate Change (IPCC, 2021) Sixth Assessment Report indicates that countries in Southern Africa will have an increased likelihood of hydrological, agricultural and ecological drought.

Scope and Coverage

Namibia has prioritised the implementation of adaptation measures in the following main sectors: agriculture, water resources, coastal zones, tourism, health and disaster risk management (DRM). Information for this AdCom is mainly sourced and repackaged from the following documents:

1. Revised Nationally Determined Contribution (NDC) (2021);
2. Fourth National Communication (NC4) (2020), which includes the Climate Change Vulnerability and Adaptation Assessment Report (V&A Report);
3. National Climate Change Policy (NCCP) (2013);
4. National Climate Change Strategy and Action Plan 2013–2020 (NCCSAP) (2015); and
5. National Development Plans (NDP) amongst other documents.

This was to avoid duplication and additional reporting burden for Namibia as a developing country.

The NDC and the V&A report outline major adaptation and mitigation options, including the co-benefits of mitigation, for the country to reach its target towards achieving the common worldwide goal of limiting global warming. They also outline the means of implementation to reach these targets. The documents report on the current existing vulnerabilities in the country, as well as the risks and threats and their mitigation. This AdCom outlines some of these areas of assessment, including the climate, environment and socio-economic conditions of the country.

[1] UNFCCC Decision 9/CMA.1 https://unfccc.int/sites/default/files/resource/ac19_6b_adcomms.pdf

National Adaptation Reporting Under the UNFCCC and the Paris Agreement

Namibia ratified the United Nations Framework Convention on Climate Change (UNFCCC) as a non-Annex I Party in 1995, and proceeded to adopt and implement policies and measures designed to mitigate the adverse effects of climate change on the environment and to adapt to such change. Namibia also ratified the Paris Agreement in 2016, which reinforces the international framework for adaptation action by establishing a global adaptation goal of enhancing adaptive capacity, strengthening resilience and reducing vulnerability. In the preparation and submission of its national communications, Namibia provided information on the scope of its vulnerability and adaptation assessment, including identification of the most critical and vulnerable areas as encouraged by Paragraph 32 the Paris Agreement. Namibia has prepared and submitted four NCs, four Biennial Update Reports (BURs) and two NDCs to the UNFCCC.

1.1 Country Profile

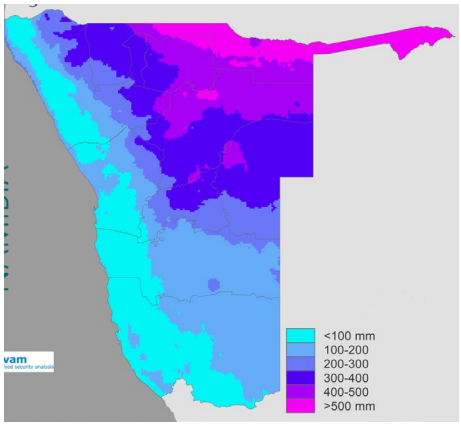
Geography

The Republic of Namibia is situated in the south-western region of the African continent and lies between latitude 17° and 29°S and longitude 11° and 26°E. The country covers a land area of 825,418 km^2 and has a coastline 1,500 km long on the South Atlantic Ocean. Namibia shares borders with Angola in the North, Zambia in the northeast, Botswana in the east and South Africa in the south. Namibia consists of five geographical areas, namely, the central plateau, the Namib Desert, the Great Escarpment, the Bushveld and the Kalahari Desert.

Climate

Namibia is one of the driest countries in sub-Saharan Africa. It is characterised by high climatic variability in the form of persistent droughts, unpredictable and variable rainfall patterns, variability in temperatures and scarcity of water. Rainfall ranges from an average of 25 mm in the west to over 600 mm in the northeast. From a hydrological point of view, Namibia is an arid, water-deficit country. High solar radiation, low humidity and high temperature lead to very high evaporation rates, which vary between 3,800 mm per annum in the south to 2,600 mm per annum in the north. Over most of the country, potential evaporation is at least five times greater than average rainfall.

Figure 1. Namibia's annual rainfall in Namibia, at 5 km resolution, for period 1981–2018



The lowest temperatures occur during the dry season months of June to August. Mean monthly minimum temperatures do not, on average, fall below 0°C. Despite its very dry climate, Namibia holds a remarkable variety of species in habitats and ecosystems ranging from deserts to subtropical wetlands and savannas.

Ecosystems

The Namibian Constitution, under Article 95(1), commits the state to the maintenance of Namibia's ecosystems, essential ecological processes and biological diversity and to the use of living natural resources on a sustainable basis for the benefit of present and future generations. The country's NCCP also commits to ensuring that the government can fulfil its obligations under the Constitution.

The country's terrestrial ecosystems, such as the Namib Desert, feature great biodiversity, with species that are highly adapted to hot, dry conditions, and are partly buffered against climate change by the proximity of the Atlantic Ocean. The Succulent Karroo biome in the southwest, one of the world's global biodiversity hotspots, is regarded as being at high risk of ecosystem boundary shifts and local extinctions under climate change scenarios. It is a diverse and unique biome occurring in an area of winter rainfall, and hence is vulnerable to changes in the seasonality of rainfall projected by some climate change models. There are also many endemic plants with very restricted distributions along the escarpment that are regarded as highly vulnerable to climate change. The escarpment separates the arid deserts from the semi-arid savannas (MET, 2013 cited in MET V&AA, 2020).

Namibia's key ecosystem services include livestock, ground and surface water, fish, soil formation and composition, chemical condition of fresh and saltwater, global and regional climate regulation, tourism and recreation, and spiritual interactions (MET, 2018). Many of these services are facing pressure from habitat change, pollution, invasive species, climate change, illegal use and exploitation.

The country's aridity, high water scarcities and poor land management have also resulted in woody encroachment. These woody species have adverse impacts on savanna ecosystem services such as groundwater recharge and biodiversity. They also decrease these ecosystems' suitability for eco-

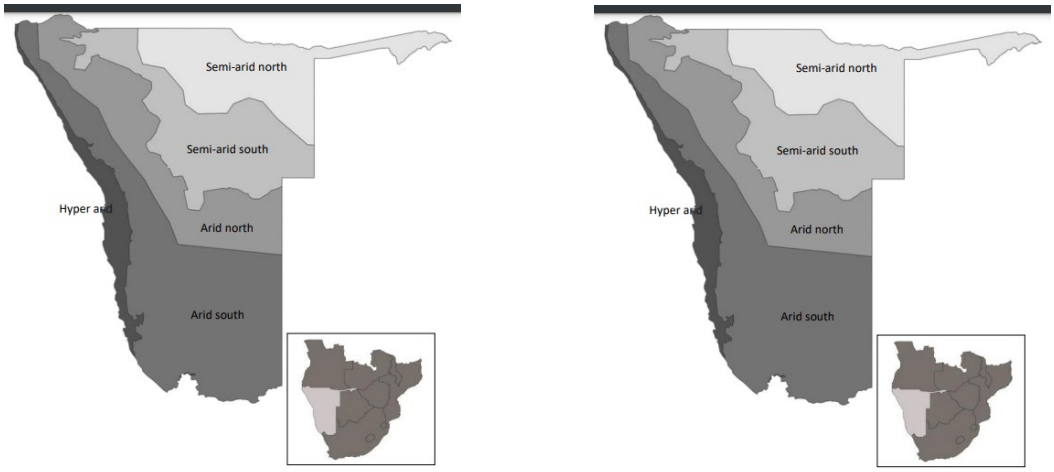
tourism and the carrying capacity for both livestock and wildlife, thus adversely affecting land productivity and rural livelihoods.

Demographics and Social Characteristics

According to the 2016 Namibia Census Demographic survey, the total population of Namibia was estimated at 2,324,388. Women, at 1,194,634, outnumbered men, at 1,129,754. The age composition of the Namibian population indicates that 14% of the population is under the age of five, 23% between five and 14, 57% between 15 and 59, and only 7% is 60 years and above. A total of 43% of Namibia's population lived in urban areas, with 57% in rural areas.

According to the Adaptation at Scale in Semi-Arid Regions (ASSAR) project report of 2018, many communities in Namibia have little capacity to adapt to the impacts of the changes projected at 1.5°C and above, and government-led adaptation often tends to focus on immediate development needs.

Figure 2. The impact of decreased rainfall may result in the increasing expansion of the hyper-arid zone into the arid south, and the loss of land suitable for rain-fed agriculture and livestock grazing



Source: ASSAR Project, 2018

Economy

According to the National Accounts compiled by the Namibian Statistics Agency (NSA) for 2019, the domestic economy slowed down, recording a decline of 1.6% in real value as compared to a growth of 1.1% in 2018. This decline was mainly attributable to the primary industries that recorded a contraction of 8.9%. Furthermore, the secondary and tertiary industries recorded a growth rate of 1.7% and a decline of 0.1% compared to a growth of 1.0% and a decline of 1.2% in 2018, respectively. The main contributor to the national GDP was the tertiary industries (58.3%) followed by the secondary industries with 17.9% and the primary industries with 16.4% (NSA, Annual National Accounts, 2019). The COVID-19 pandemic and the resultant lockdown negatively affected commodity prices and resulted in negative consequences for the tourism sector and for both informal and formal industries. Consequently, a number of service providers cut back workers while others reduced salaries to cut costs and improve cash flow.

Infrastructure

Namibia's long-term development vision, Vision 2030, aims to achieve a prosperous and industrialised Namibia. The document adopts a strategic approach for long-term sustainable development. Major developments have been recorded in the transport and logistics sector as characterised by the roads network spanning more than 47,000 km, which provides access to the various parts of the country. In the railway sector, in terms of kilometre expansion there has not been significant progress, as only 2,687 km of rail are recorded to date from 2,372 km registered at independence in 1990. However, further upgrades have been made on the existing rail lines, while the ongoing projects are expected to expand the network. In the energy sector, Namibia had four power stations at independence, and currently has 20 Independent Power Producers. Energy imports increased by 37%, from 1,190 Gigawatt hours at independence to 1,889 Gigawatt hours by 2019. Since 1992, the government of Namibia has constructed 64 public clinics nationwide, six health centres and four district hospitals.

1.2 National Adaptation Actions and Efforts

Adaptation to climate change presents Namibia with an opportunity to transform the economy, strengthen the social and spatial fabric, and become more competitive in the global marketplace. Most of the current climate change adaptation projects and programmes in Namibia are in the areas of agriculture, fisheries, sustainable land management, government, climate information and research, ecosystems and biodiversity, forestry and energy. The projects tend to focus on capacity-building, knowledge communication, field implementation, and policy formation and integration, with all nationally implemented projects supporting community-based adaptation.

The mainstreaming of climate adaptation in sector policies, plans, and programmes, and the decentralization of it at sub-national levels, require a concerted effort if Namibia's economy is to become climate-resilient by 2030. Financial barriers limit the effectiveness of the adaptation actions country-wide and limit the provision of extension services in rural areas to increase the agricultural capacity of communities. Namibia developed its NCCP to provide the legal framework and overarching national strategy for the development, implementation, monitoring and evaluation of climate change adaptation activities.

In its NC4, Namibia documented and maintained transparency in all frameworks that were used to assess V&A in the country. In its NC4-V&A report, Namibia contextualized information requirements for key sectors in the country, and more specifically the report met the following objectives:

1. Reviewed and identified the most significant information on climate trends and projections for Namibia to prioritize adaptation actions;
2. Reviewed and identified the most significant climate change risks, vulnerabilities and adaptation for the following sectors: agriculture, water resources, tourism, health, coastal zones, human settlements, and ecosystems and biodiversity;
3. Conducted an in-depth analysis of vulnerability to climate change impacts of human settlements (constituencies) of the country; and
4. Provided updated information on responses to climate change.

1.3 Legal Frameworks

National Policy Frameworks and Strategies on Climate Change

The Fifth National Development Plan (NDP5) foresaw a transition to a low-carbon and climate-resilient Namibian economy that offers opportunities to address challenges such as energy and water insecurity. Namibia will seek to aggressively mobilize funding for innovation in these areas through multilateral financing mechanisms such as the Green Climate Fund (GCF) and Global Environment Facility (GEF) and through bilateral and multilateral relationships and partnerships with the private sector.

Namibia's National Climate Change Policy provides a legal framework and overarching national strategy for the development, implementation, and monitoring and evaluation of climate change adaptation activities in Namibia. The guiding principles of the NCCP include mainstreaming climate change into policy, legal frameworks and development planning; ensuring that actions are country-driven and country-specific; encouraging stakeholder participation in the policy's implementation; and promoting transparent planning and decision-making. The following are the goals of the NPCC:

- To develop and implement appropriate strategies and actions that will lower the vulnerability of Namibians and the socio-economic sectors to the impacts of climate change;
- To effectively integrate climate change into existing policy, institutional and development frameworks in recognition of its cross-cutting nature;
- To enhance capacities and synergies at the local, regional and national levels and at the individual, institutional and systemic levels to ensure the successful implementation of climate change response activities;
- To provide, through government, secure and adequate funding resources for effective adaptation investments to climate change and associated activities (capacity-building, awareness-raising, and so on);
- To facilitate climate-proof development to reduce the magnitude and extent of the impacts of climate change.

The Harambee Prosperity Plan acknowledges climate change is a reality of our time and complements the long-term goal of the NDPs and Vision 2030. The plan introduces an element of flexibility into the Namibian planning system by fast-tracking development in areas where progress is insufficient. It also incorporates new development opportunities and aims to address challenges that have emerged after the formulation of the NDPs.

1.4 Institutional Arrangements

Institutional Arrangements for Supporting National Adaptation Action

Adaptation to climate change is comprised of various actions by government, agencies, the private sector, and civil society and at the household level. It involves improving society's ability to cope with the resulting impacts, meaning both positive and negative climatic conditions across time and policy scales. The present structure for the implementation of climate change activities consists of a multi-

sectoral National Committee on Climate Change, which oversees the implementation and coordination of sector-specific and cross-sectoral NDC activities while also providing advice and guidance on them.

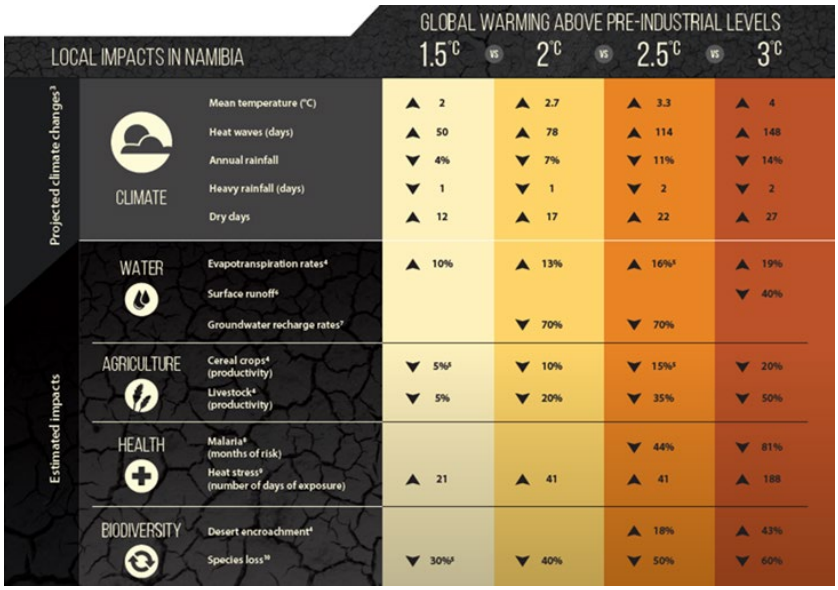
This committee was recently replaced by the amalgamated National Committee on the Rio Conventions (NCRC), which merges all three Rio Conventions—UNFCCC, UN Convention on Biological Diversity) and UN Convention to Combat Desertification—under one umbrella to streamline the work. The NCRC reports to the Parliamentary Standing Committee on Natural Resources and Economics, which advises the Cabinet of the Republic of Namibia on relevant climate change policy matters.

The Ministry of Environment, Forestry and Tourism (MEFT) is responsible for drafting and implementing national policies and strategies on environmental issues in the country. MEFT is also the climate change coordinating ministry, through the Climate Change Unit established within the MEFT. National Focal Point to the UNFCCC reports on climate change activities to the UNFCCC. MEFT monitors, tracks and follows Conference of the Parties (COP) decisions on NDCs, including funding possibilities, and transmits these to the concerned institutions. Sectoral activities rest with the respective ministries through their concerned directorates.

2.0 Adaptation Sectors: Impacts, Vulnerabilities and Risk Reduction

Namibia is one of the climate change vulnerability hotspots in the southern Africa region (ASSAR, 2019). The country's vulnerability stems from its climate, landscapes, and socioeconomic and environmental characteristics (i.e., its geography). Drought is common given Namibia's hot, dry climate and erratic rainfall. Localized water scarcity, desertification and land degradation are all key drivers of climate change from an environmental perspective. Threats to the country's biodiversity include habitat destruction and uncontrolled development, forest clearing, overstocking, the unsustainable harvesting of wild plants and animals, unequal resource distribution, fencing, and the fragmentation of protected areas.

Figure 3: Projected climate changes and impacts of global warming on Namibia



Source: (ASSAR (2019) cited in MET V&A Assessment Report, 2019

The country is particularly vulnerable to flooding and droughts. As such, it is imperative that the country be prepared for natural disasters. The agriculture, tourism and fisheries sectors are especially critical for adaptation due to their income-generating activities and high contribution to the GDP.

In terms of social groups, the poor and rural populations of Namibia are considered most vulnerable to the impacts of climate change due to their reliance on climate-dependent livelihoods (MET, 2011). Women are identified as particularly vulnerable given gender inequalities in accessing productive resources and income. Female-headed households also rely to a greater extent than male-headed households on climate-dependent subsistence agriculture, and to a lesser extent on wages and salaries (MET, 2011). Those households across the country that are affected by HIV/AIDS are also considered more vulnerable, as their members often cannot work, which puts a strain on household income and financial resources (MET, 2011). Finally, undereducated youth are considered vulnerable

due to their limited economic options. As such, several government institutions have set goals for the participation and promotion of both youth and women in the decision-making process.

Methods Used for V&A Assessment

For the development of the Fourth National Communication, climate change impacts and vulnerability were assessed for the most vulnerable sectors, namely water resources, agriculture, forestry, coastal zones, tourism, human health and disaster risk management.

Namibia conducted desk reviews of national reports, policies and strategies, and also followed the UNFCCC guidelines and the IPCC framework to conduct its V&A assessment for 2019. In addition to using recognised calculation methodologies, the country also held various national, regional and local consultations during the NDC iteration process to garner information from various stakeholders. The vulnerability to climate change is assessed using an index-based approach under the IPCC framework, which requires the measurement of exposure and sensitivity to the climate change risk factors. Together, these are responsible for the potential impact of climate change risk factors, and the adaptive capacity to manage and respond to those risks.

2.1 Ecological and Socioeconomic Impacts and Risks of Climate Change

Namibia has persistent structural inequalities as well as skewed access to productive assets such as land. These elements, coupled with poverty and unemployment levels, reduce the capacity of most Namibians to cope with and mitigate the adverse impacts of climate change.

Water Resources

Namibia relies on dams, ephemeral rivers and aquifers for its water supply, although the northern regions also rely on the shared perennial rivers. These water resources are supplemented to a limited extent by unconventional sources, such as reclaimed water and desalination. The absence of perennial rivers in Namibia's interior means that the country is reliant on rainfall as its natural water source. The semi-arid climate over most of the country, coupled with high evaporation rates, makes the country one with a net water deficit (mean annual rainfall minus potential evaporation), ranging from -4,000 mm in the southeast to -1,600 mm in the northeast.

To ensure sustainable long-term access to water, and to effectively manage and conserve the country's water resources with the uncertainty of climate change, the following adaptation options are pertinent, among others:

1. Promote efficient water harvesting techniques;
2. Recycle and re-use water;
3. Promote the use of desalination technologies to increase water supply; and
4. Promote and encourage integrated water resource management.

Table 1: Vulnerability and risk assessment for the water sector in Namibia

Sector	Exposure analysis (climatic driver)	Sensitivity analysis (stressors)	Impact analysis (adverse effects)	Adaptation priorities (actions required)
Water	Reduction in rainfall Increase in temperature Increase in evaporation rate	High water demand: current water usage already exceeds reliable yield High levels of variability in rainfall from year to year, resulting in frequent droughts Deteriorating water quality of major river systems, water storage reservoirs and groundwater resources	Increase in water demand from agriculture and settlements Increased erosion and sedimentation of dams Increased evaporation loss from dams Affected biological and microbiological processes	Mainstream climate change adaptation within national water policies, plans and funds Infrastructure development, operation and maintenance Groundwater needs to be protected by preventing groundwater degradation and unwise exploitation

Source: Namibia V&A Assessment Report, 2019

Coastal Zones

Namibia has no natural or human-made protective infrastructure for coastal storm surges, and hence these areas are highly vulnerable to sea-level rise. The most significant drivers of climate change risks and vulnerability that are of importance to coastal environments and fisheries are the modification of terrestrial climatic and hydrologic processes, changes in coastal and oceanic circulation processes, ocean acidification, increased sea surface temperature, sea-level rise, increase in sea storminess and changing wind systems.

The adaptation measures proposed for coastal zones are classified as "no-regrets" and "additional" options that are proactively designed to counter sea-level rise. No-regrets options are efforts that would have been undertaken even if climate change were not happening. In the context of sea-level rise, no-regrets options available to Namibia include the enforcement of development restrictions within the coastal buffer zone; the reduction of the degradation of wetlands, estuaries, dune cordons and sandbars; the integration of sea-level rise scenarios into future planning decisions; the incorporation of sea-level rise risks into disaster management strategies; and the alleviation of poverty and improvement of living conditions.

In terms of mitigation co-benefits, Namibia also has an abundance of blue carbon waiting to be discovered and reported on. With the tenth longest coastline (1,572 km) in Africa (Kirui, 2018), Namibia's blue carbon ecosystems hold great potential as nature-based solutions to mitigate climate change. Namibia has therefore proposed future blue economy adaptation activities in its NDC 2021.

Table 2: Vulnerability and risk assessment for the coastal zone in Namibia

Sector	Exposure analysis (climatic driver)	Sensitivity analysis (stressors)	Impact analysis (adverse effects)	Adaptation priorities (actions required)
Coastal zone	Sea level rise Modification of terrestrial climatic and hydrologic processes Change in coastal and oceanic circulation processes Ocean acidification Increased sea surface temperature Increase in sea storminess Changing wind systems	Direct wave impacts, coastal flooding and inundation, and erosion and under-scouring Land-use change	Intrusion of saltwater Loss of or changes to coastal wetlands Higher (ground)water levels and limited soil drainage Flooding of low-lying areas and resultant damage erosion of beaches and bluffs	Land use planning Designation of flood areas, high-risk areas and development-free zones Construction of dikes, groynes, bank protection and sea walls Beach nourishment and dune protection

Source: Namibia V&A Assessment Report, 2019

Agriculture and Food Security

Agriculture is a key sector of the Namibian economy. It is not only the largest employer, but also critical to livelihoods and food security. Over two-thirds of households practice subsistence cropping and pastoralism, mostly on communally held lands. Agricultural production ranges from the intensive production of horticultural crops to the large-scale production of cereals, mainly maize and pearl millet. Less than 10% of the land surface is used for crop production, while nearly 75% is used for livestock production. Climate change is negatively impacting this sector in the following ways, among others:

1. Stock losses and reductions in grain production due to periodic droughts;
2. Decreases in the yields of rain-fed crops;
3. Increasing temperatures and more variable precipitation across the country, likely to have significant impacts on a wide variety of crops;
4. Spatial shifts in the optimum growing regions for field crops; and
5. Effects on plant and animal diseases and insect distribution that adversely affect crop yields and livestock production.

Table 3: Vulnerability and risk assessment in the agriculture sector in Namibia

Sector	Exposure analysis (climatic driver)	Sensitivity analysis (stressors)	Impact analysis (adverse effects)	Adaptation priorities (actions required)
Agriculture	Reduction in rainfall Changes in rainfall distribution Increase in drought frequency Increase in heatwaves	Land-use change Water stress Invasive alien plants	Reduction in productivity in the crop and livestock sectors Increased pressure on water resources	Conservation agriculture Climate-smart agriculture Use of water-efficient irrigation systems and practices Desalinization of seawater for irrigation purposes

Source: Namibia V&A Assessment Report, 2019

Tourism

Namibia's tourism industry has undergone rapid growth in the past three decades, with an average increase in international arrivals of 16% per year on average. This growth has however been undermined by the COVID-19 pandemic. Prior to the pandemic, the growth rate made tourism the fastest-growing sector of the Namibian economy. Tourism in Namibia relies largely on the wildlife sector. Changes in the quality of wildlife viewing, wildlife numbers and vegetation because of climate change are expected to affect the demand for wildlife tourism, which is estimated to be as much as a 15% reduction in tourism demand.

Table 4: Vulnerability and risk assessment for the tourism sector in Namibia

Sector	Exposure analysis (climatic driver)	Sensitivity analysis (stressors)	Impact analysis (adverse effects)	Adaptation priorities (actions required)
Tourism	Increase in temperature Decrease in rainfall Increase in heatwaves Changes in wildfire patterns	Habitat and ecosystem fragmentation Land-use change Invasive alien plants	Reduction in the quality of wildlife and wildlife numbers Reduction in nature-based tourism demand Reduction in number of nature-based tourists	Promotion of landscape-based tourism Integrating ecosystem-based adaptation within Community-Based Natural Resources Management (CBNRM) programme Promotion of adventure tourism

Source: Namibia V&A Assessment Report, 2019

Table 5: Vulnerability and risk assessment for the terrestrial ecosystem in Namibia

Sector	Exposure analysis (climatic driver)	Sensitivity analysis (stressors)	Impact analysis (adverse effects)	Adaptation priorities (actions required)
Terrestrial Ecosystems	Rising temperatures Temperature extremes Decrease or increase in rainfall amount Rising carbon dioxide Changes in wildfire patterns	Habitat fragmentation Land-use change Invasive alien plants	Changes across the biomes through the alteration of existing habitats, seasonal rainfall, species distribution, and changing the way ecosystems function. Threats vary in importance between the biomes, increase over time, and increase with the level of GHG.	Land-use planning Land management Ecosystem-based adaptation Mainstreaming of stewardship programs Monitoring and evaluation

Source: Namibia V&A Assessment Report, 2019

Disaster Risk Management

With climate change contributing to an increase in disaster risk, disaster risk management is a vital and urgent component of any climate change adaptation programme. As part of climate change adaptation policies and investments, Namibia needs to focus on reducing its vulnerability and planning for measures to mitigate natural disaster risks, including early warning systems.

Infrastructure

Different human settlement types and locations have varying vulnerabilities and different capacities to adapt to various hazards. For urban areas, there can be a deficit in infrastructure and in the provision of services due to climate change. Some recommended adaptation priorities are the improvement of climate-resilient engineering and building standards for infrastructure in the housing, rail, transport, coastal, waste management, telecoms, refrigeration and energy sectors. In terms of infrastructur development and energy, economic diversification can provide mitigation co-benefits. With this in mind, the country can look at enhancing the use of renewable energy potential across the ocean and coastal environments (hydro, desalination, fogging, solar, wind and geothermal).

Table 6: Vulnerability and risk assessment for human settlements in Namibia

Sector	Exposure analysis (climatic driver)	Sensitivity analysis (stressors)	Impact analysis (adverse effects)	Adaptation priorities (actions required)
Human Settlements	Increase in temperature Reduction in rainfall Increase in rainfall intensity Increase in drought frequency	Deficit in infrastructure and provision of services	Different human settlement types and locations with varying vulnerabilities and capacities will experience the hazards in different ways, with informal settlements and their population being the most exposed	DRM Mainstreaming of no-regret interventions Principles of water-sensitive urban design (WSUD) and consideration for ecological infrastructure

Source: Namibia V&A Assessment Report, 2019

Human Health

Based on the 2016/17 Namibia Intercensal Demographic Survey and the 2006/07 National Demographic and Health Survey, the main causes of death in children under five years (which can co-occur)—diarrhoea (42%), undernutrition (40%), malaria (32%) and acute respiratory infections (30%)—have a strong environmental component linked to climate. The main causes of adult mortality are AIDS, tuberculosis and malaria. Since these diseases often co-occur, it is difficult to establish the exact cause of death. Climate change is already exacerbating the causes of infant and adult mortality, and this will likely worsen in the future. There is a need to conduct a quantitative vulnerability and risk assessment for the health sector. This will help to identify the most important health risks, as well as the most vulnerable populations or communities.

Table 7: Vulnerability and risk assessment for human health in Namibia

Sector	Exposure analysis (climatic driver)	Sensitivity analysis (stressors)	Impact analysis (adverse effects)	Adaptation priorities (actions required)
Health	Drought frequency Increase in temperature Increase in heat waves	Quadruple burden of disease in Namibia and people from neighbouring countries Poor housing, infrastructure and service delivery Change in the geographical distribution of diseases, e.g., malaria might spread southward. New diseases might develop. Catastrophic events affecting water supply and agriculture may have short- and long-term effects on the health of the population. It would be essential to include these contributing factors and their health impacts in the sensitivity analysis.	A changing climate can have myriad impacts on the health sector. There is a lack of understanding on the linkages between climate and health in Namibia (e.g., quantitative link between high temperatures and mortality).	Cross-sectoral cooperation and collaboration Adaptation strategies tailored to regions or communities based upon their risks and vulnerability Measuring and monitoring the effects of climate change on health will be very important.

Source: Namibia V&A Assessment Report, 2019

Gender

In 2020, Namibia's female population amounted to approximately 1.31 million inhabitants, while the male population amounted to approximately 1.23 million (Statistica, 2020). According to the Agricultural Survey by the Namibia Statistics Agency, the greatest percentage of subsistence farming households in the country are headed by women. However, women are also said to have limited access to capital, productive land, knowledge and services; and these factors, in turn, decrease women's resilience and adaptive capacities. Women are also more exposed and vulnerable to climate change because of social roles, discrimination and poverty levels. For instance, they receive less education on what to do once climate change hits, and are not involved in political decisions and household decision-making processes that affect their lives. Cultural norms related to gender sometimes limit women's ability to make quick decisions on whether to move to safer ground in

disaster situations until it is too late. Men can still go out and look for employment and financial means while a woman stays behind to take care of their families and communities.

In the implementation phase of the NDC 2021, detailed baseline gender and youth climate assessments and evaluations that include just transition strategies will be conducted. These will include the priority sectors of Agriculture, Forestry and Other Land Use (AFOLU) and agriculture. Consequently, informed capacity-building and planning for gender- and youth-oriented climate actions and just transition training will be carried out in defined focal points.

Youth

Climate change affects food security, the availability of water, a range of health conditions, and housing security. Climate change can also cause changes in the growing seasons for crops. This makes it hard for people in rural areas to grow their crops and livestock and to sell their products to pay for their children's school fees. The children are then forced to drop out of school to help their parents with fieldwork to provide food for their families. Climate change can have an effect on children's physical health, as they may have difficulties in breathing and are exposed to parasites, diseases and bacteria.

Marginalized People

Marginalized groups are among the first to face the direct consequences of climate change, due to their dependence upon, and close relationship, with the environment and its resources. This consists of indigenous communities such as the Himba, who depend on pastoralism, and the San people, who depend on hunting and gathering. These practices are not only for procuring food and supporting the local economy, but also form the basis for their cultural and social identity. Some of the concerns facing indigenous peoples in the region include the change in species and availability of traditional food sources, and reduction in weather prediction, posing serious challenges to human health and food security.

Indigenous and Local Knowledge

Indigenous and local knowledge gives the local community understanding and perceptions with regard to the causes and impacts of climate change and responses to it, which may provide them with resilience towards climate change. Communities from different parts of the world use local knowledge about ecosystems to recognize and respond to the impacts of climate change in all their variability. With this knowledge, locals can reduce deforestation, save food and avoid water scarcity.

2.2 Identified National and Regional Vulnerabilities

National Vulnerabilities

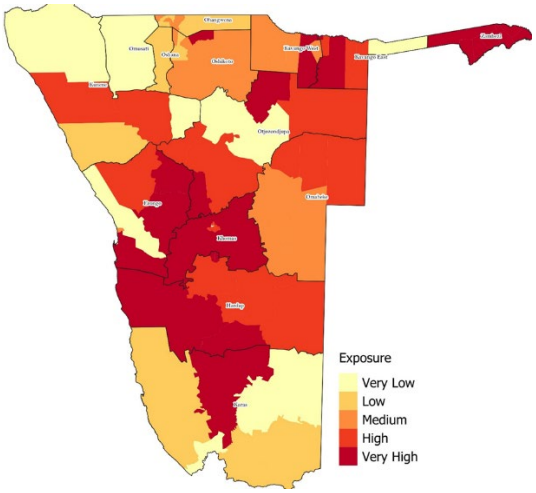
Namibia's vulnerability to climate change is particularly acute due to its highly variable climate and the high reliance of local livelihoods and important economic sectors on climate-related natural resources. This vulnerability is further enhanced by the difficulty of delivering services and infrastructure to a small population spread out over vast distances. Each aspect of this vulnerability is expected to be compounded by continued population growth and economic development. Namibia's

vulnerability has increased in recent years; areas of particular concern include the country's high water dependency ratio, its limited dam capacity, and its dearth of paved roads (as a percentage of all roads). In terms of its readiness to respond to climate change, Namibia's score has been improving but vulnerability remains high (ND-GAIN, 2020). The main areas of weakness in terms of readiness relate to the country's social readiness, specifically the country's levels of social inequality and innovation (ND-GAIN, 2020).

Regional Vulnerabilities

In Namibia, some rural constituencies are more vulnerable to climate change impacts than others. Relatively speaking, the Omusati, Kavango (east and west) and Zambezi regions are highly vulnerable to the impacts of climate change based on data provided in the V&A Assessment done for the NC4. The Omusati region has the highest number of constituencies that are vulnerable to climate change impacts followed by the both the Kavango East and West regions. In contrast, the majority of the constituencies in the Karas, Hardap and Erongo regions have low NCCVI scores, implying low vulnerability to climate change risk.

Figure 5: The exposure of constituencies to climate-related risks



Source: Namibia's V&A Assessment Report, 2019

The Zambezi region is most exposed to flood risks as a result of its higher levels of precipitation and expected increases in summer rainfall. This vulnerability will be further compounded by population growth; the north of the country is already more densely populated than other regions of the country. The dry southwest of the country (Karas and Hardap regions) is particularly vulnerable to drought. The town of Walvis Bay in the Erongo region is identified as being highly vulnerable to sea level rise and storm surges, as much of the city lies at less than two metres above sea level (MET, 2009). The town, along with other urban centres, is experiencing considerable rural-urban migration, a trend that is expected to at least continue if not increase as rural livelihoods are strained by climate change impacts.

3.0 Namibia's Climate Change Adaptation Goals, Actions and Challenges

3.1 Introduction

Current national progress in the implementation adaptation priorities and actions

The government recognizes that many of its sectoral policies were developed before climate change emerged as a key issue for the country, and as such, these policies must be revised to better integrate climate change considerations. However, despite ongoing efforts, climate change issues are not yet adequately mainstreamed into key national policies and sectoral strategies. A rapid review of national policies and sectoral strategies in key vulnerable sectors, such as agriculture, water resources, tourism, and health, shows that climate change issues, although recognized, have not always been mainstreamed. For instance, the National Water Policy (2008), National Health Policy Framework (2015), and National Agriculture Policy (2015), among others, recognize climate change as a potential risk or threat, but do not include concrete actions to adapt to and mitigate climate change risks.

3.2 National Adaptation Goals and Actions

According to the NDC 2021, Namibia has planned a number of adaptation actions for the short term (2020–2025) and medium term (2020–2030) to meet its development needs, and also in response to the SDGs. Increased adaptive capacities and reduced vulnerabilities are of central importance for Namibia's natural and human systems. Specific examples of adaptation objectives come in the form of climate smart agriculture, economic and livelihood diversification, smart irrigation and water management systems, and the development of early warning systems, climate data and forecasting. These actions are iterated and further discussed in Chapter 4 of this AdCom; however, they consist of the seven major selected adaptation sectors as per the NDC: water resources, agriculture, forestry, coastal zones, tourism, health, and disaster risk management. Each of these is discussed in more detail in the following sub-sections.

3.2.1 Water Resources

Led by the Ministry of Agriculture, Water and Land Reform (MAWLR), Namibia identified the following adaptation actions to carry out in the water resources sector:

- Provide full support for integrated water resources management in Namibia.
- Establish best practice systems for improving the efficiency of water use, particularly in irrigation.
- Coordinate the use of surface and groundwater resources and artificially increase the recharge rate of groundwater aquifers to reduce evaporation.
- Improve water demand management, particularly at the local level and in the agricultural, industrial, mining and tourism sectors.

- Establish nation-wide monitoring and control of groundwater use more strictly.
- Prioritize seawater desalination.

In terms of Blue Economy, the country proposed the following future adaptation activities:

- Enhance water use efficiency and management.
- Promote integrated water resources development and management practices including the artificial replenishment of groundwater tables.
- Attract investments for the desalination of seawater for human use, blue forestry and urban greening, and food security interventions.
- Advance wastewater reuse and recycling technologies at the municipal and industry level.

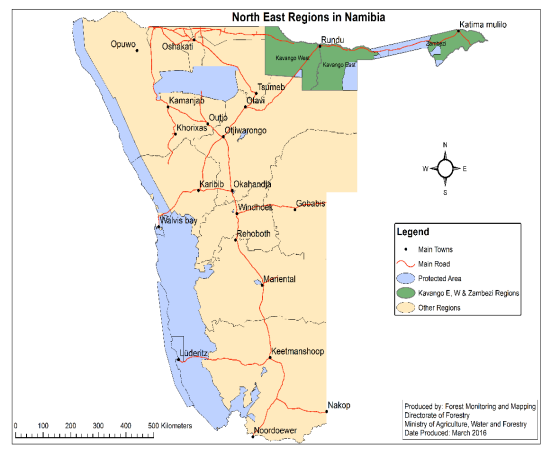
3.2.2 Agriculture

Led by the MAWLR, Namibia plans to carry out the following adaptation actions in the agricultural sector:

- Promote the diversification of crops and improve crop varieties that are that adapted to climate change.
- Enhance access to farming inputs (i.e., improved seeds and fertilizers) and maintain consistency in yields.
- Promote protected cultivation and improved planting methods for enhancing water use; promote efficiency and crop productivity (e.g., greenhouses, mulching, spot planting and zero tillage).
- Promote the construction of water harvesting infrastructure for efficient water-saving irrigation systems and domestic use.
- Promote climate resilience in livestock management through strategies such as the promotion and conservation of better adapted livestock breeds, best practices for rangeland management (sustainable bush harvesting, restoration of rangeland), the creation of fall-back grazing areas, and mixing small and large stock herds of various breeds.
- Enhance integrated pest and disease management as an ecosystem approach to crop and livestock production and protection.
- Improve support services and capacity-building to enhance the resilience of crop and livestock production to climate change by promoting research, trials and up-scaling climate-smart farming systems that increase resilience to climate change.

Box 1. Local projects under MAWLR that provide good examples of best practices and lessons learned

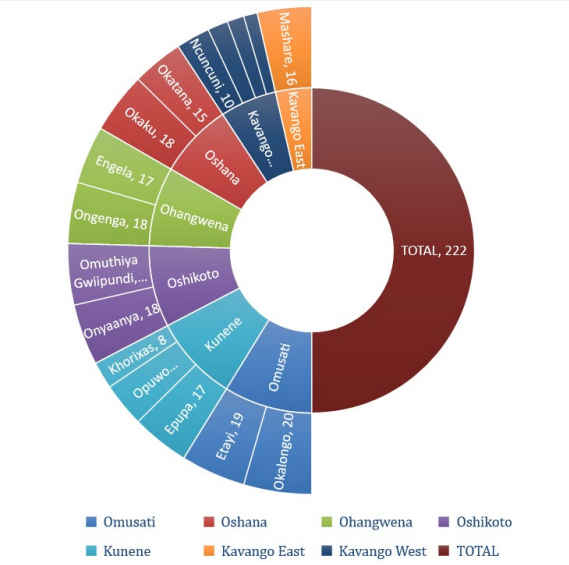
The **CRAVE Project** (Climate-Resilient Agriculture in the Vulnerable Extreme Northern-Growing Regions) (2017–2022) is a GCF-funded programme managed by the Environmental Investment Fund of Namibia (EIF) and implemented through MAWLR. The project aims to scale up the adoption of conservation agriculture and climate-resilient agricultural practices to increase food productivity.



Area of operation of the Climate-Resilient Agriculture in the Vulnerable Extreme Northern-Growing Regions (CRAVE) 2017–2022

Source: CRAVE Project, EIF

The **SCORE Project** (Scaling Up Community Resilience to Climate Variability and Climate Change) (2015–2019) was funded by GEF, with UNDP as the implementing agency. SCORE was jointly implemented by MEFT and MAWRD. The project enabled vulnerable subsistence rural households and small-scale farmers, who mainly depend on rain-fed agriculture, to diversify their livelihoods, produce crops for the market, feed their families, and store grains for the next season.



Total SCORE project beneficiaries for micro-drip irrigation gardens in regions per constituency

Source: SCORE Project 2019, MEFT

Over the years, the government has provided assistance to farmers through various programmes and projects to ensure that proper adaptation measures are in place for the country's population to maintain resilience, particularly during drought and flood seasons. The CRAVE and the SCORE Projects, among others, are examples of projects where the government works with its development partners and through bilateral relations to fund climate change adaptation projects. Through these projects, Namibia has introduced climate-smart agriculture through micro-drip irrigation gardens and conservation agriculture through the enhancement of rain-fed crops.

3.2.3 Forestry

Led by the MEFT, Namibia plans to carry out the following adaptation actions in the forestry sector:

- Restore the savanna through bush thinning for increased land productivity, improved food security, improved groundwater recharge and increased biodiversity.
- Increase bush biomass utilisation and value addition, including bush-based animal feed production, biochar application, drought resilience, improved food security, bush-to-energy, employment and income creation.
- Support agroforestry interventions to ensure food security (biomass of fodder, meat and Non-Timber Forest Products) in Namibia's most vulnerable communities.

3.2.4 Coastal Zones

Led by the Ministry of Fisheries and Marine Resources (MFMR), Namibia plans to carry out the following adaptation actions throughout the coastal zones:

- Introduce legislation to reduce property and infrastructure development in environmentally sensitive areas and areas at risk of sea-level rise.
- Research and monitor sea-level rise.
- Undertake vulnerability mapping.
- Collaborate with the insurance market to guide investment in coastal areas.
- Develop an early warning system.
- Rehabilitate wetlands and estuaries.
- Install sea walls barriers and barrages.

In terms of Blue Economy, the country proposed the following future adaptation activities.

Coastal land-use planning:

- Protect the 1,500 km of coastline beaches against erosion, which will include the prioritization of Ecologically or Biologically Significant Marine Areas, meaning islands, wetlands and riverine basins.
- Update the agro-ecological zones to include ocean industries and areas and strengthen coastal beach erosion management systems.
- Establish a Coastal Vulnerability Index for sea-level rise.

Marine fisheries and aquaculture:

- Implement effective environmental monitoring systems including environmental and sanitary surveillance and warning systems along the coastline.
- Establish partnerships to facilitate the generation of knowledge (basic and applied) through the alliance of research institutions, public regulators, and ocean and marine industries.
- Identify and proclaim marine protected areas to conserve biologically sensitive sites.

Marine mining:

- Ensure that exploration and mining within the marine protected areas comply with the environmental and economic regulatory framework.
- Enact a legal framework benchmarked against global environmental best practices to facilitate sound marine exploration and environmentally sustainable mining activities.

Value addition and food manufacturing:

- Reduce fish-meal-based by-products from fresh fish.
- Promote innovations in food processing, food loss reduction and waste reduction.

Coastal agriculture:

- Scale up climate-smart technologies to increase the crop, livestock and fisheries' productivity.
- Adopt a conservation agriculture approach as the basis for sustainable coastal farming and improved food security.
- Use irrigation water-saving technologies and organic soil nutrient sources.

3.2.5 Tourism

Led by the MEFT, Namibia plans to carry out the following adaptation actions in the tourism sector:

- Promote sustainable tourism and provide capacity-building for climate change innovation in Namibia's tourism sector.
- Implement conservancies, tourism and adaptation programmes using community-based natural resource management (CBNRM).
- Promote CBNRM data collection and archiving.
- Diversify livelihoods in communities dependent on CBNRM initiatives such as the Namibian Conservancy programme and Community Forests.

In terms of Blue Economy, the country proposed the following future adaptation activities:

- Promote eco-tourism and wildlife tourism.
- Support conservation and technological development to enable the tourism sector to deal properly with climate change.

3.2.6 Health

Led by the Ministry of Health and Social Services (MHSS), Namibia plans to carry out the following adaptation actions in the health sector:

- Strengthen the capacity of health professionals in epidemic preparedness and response.
- Recruit and train community health workers to provide emergency first aid.
- Improve staff training on the prevention and treatment of malnutrition.
- Enhance and further mainstream climate-related awareness.

- Improve access to timely and relevant information.
- Strengthen the policies required to effectively address both slow-onset and catastrophic events.
- Develop health-centred adaptation strategies.
- Climate-proof the public health system.
- Strengthen and provide capacity-building for water and sanitation systems.

3.2.7 Disaster Risk Management

Led by the Office of the Prime Minister, Namibia plans to carry out the following adaptation actions in response to DRM and as part of resilience-building:

- Strengthen capacities for disaster risk preparedness, contingency planning and risk reduction.
- Implement vulnerability and risk mapping.
- Improve information flow and communications between formal structures at the national, regional and community levels.
- Support community-based adaptation practices in both rural and urban areas.
- Improve the monitoring and documentation of extreme events.
- Develop pro-poor disaster insurance schemes.

3.2.8 Sectoral Integration

The government of Namibia has many legal and policy instruments that are either directly or indirectly linked to the environment and climate change, such as the National Land Policy, the National Drought Policy, and the Agriculture Policy, to mention a few. To promote adaptation, the NCCP framework seeks to enhance synergies between sectors and stakeholders. The policy promotes the enhancement of synergies amongst sectors and stakeholders for effective and efficient adaptation responses to climate change in Namibia. The policy as a framework further facilitates the identification of sector and cross-cutting climate change strategies and actions for implementation to lower both Namibia's overall risks and the risks of the most vulnerable groups and sectors. The policy also provides a legal basis for resource mobilisation to address climate change adaptation.

It is also important at this point to note that the policy goes beyond borders to collaborate with regional and international instruments, protocols and conventions, such as the climate-change-related policies and strategies of the Southern Africa Development Community, the Sustainable Development Goals (SDGs) and the Rio Conventions, to mention a few.

3.3 NDC Process

The updated NDC seeks to accelerate Namibia's socio-economic growth by taking a holistic approach to addressing sector-specific vulnerabilities and directing funding to adaptation for effective climate action. The government listed seven sectors as being especially vulnerable: water resources, agriculture, forestry, coastal zones, tourism, health and disaster risk management. The government has prioritized action on climate change and introduced a national climate change policy; however, success in the implementation of these actions is closely related to donor engagement and financing.

3.4 Barriers, challenges and gaps in the implementation of adaptation actions

Some of the recurrent gaps Namibia has been facing in the implementation of adaptation actions include inadequate human capacity, lack of in-depth vulnerability studies, limited access to the latest technologies, limited coverage of the country for systematic observation, relatively low awareness of a large segment of the population and, last but not least, insufficient funds to correct the gaps and barriers while enabling the country to embark on adaptation in sectors that are already strained by climate change. Some of the key barriers are:

1. Lack of coordination and conflicting programme implementation;
2. Framing of climate change as an environmental issue;
3. Lack of access to information;
4. Lack of effective decentralization and limited institutional capacity at the local level;
5. Reactive approach versus long-term planning; and
6. Insufficient evidence base on the benefits of adaptation versus costs.

During the iteration of this AdCom, Namibia hosted extensive national and regional consultations with regard to the implementation of adaptation actions. The stakeholders identified the following barriers and challenges, among others:

- Adaptation activities are mostly donor-driven, and once a project closes, there is no follow-up on the interventions.
- Smallholder farmers still cannot afford appropriate agricultural inputs and implements despite being given government subsidies.
- Some farmers have produced good yields following the adoption of conservation agriculture. However, they face limited access to markets, especially with regard to selling legumes.
- In-depth regional studies are needed for each region, not only on climate adaptation needs, but also on needs related to capacity-building, investment and financial flows relating to climate change.
- With regard to gender and youth, most lead farmers are women, and youth participation is very minimal in this area.

4. Means of Implementation and Support Needs

Box 2. Critical needs

- Financial and technical assistance to help the MEFT initiate, develop and implement the National Adaptation Plan (NAP) in order to address additional adaptation planning and align with the NDC process.
- Update of the Technology Needs Assessment (TNA) considering the changing, advanced environment.
- Private-sector resource mobilisation to implement the NDC (mitigation and adaptation) and related actions to achieve the SDGs.
- Monitoring, evaluation and reporting of the processes and impacts of adaptation actions to track the implementation of adaptation activities and the achievement of goals.

4.1 Introduction

Namibia needs funding, capacity development and technology transfer in order to fully implement the adaptation measures found in its NDC 2021. This section presents an overview of the means of implementation across the areas of finance, capacity-building and technology.

The financing of climate change adaptation actions is project-based and funded by international development partners without a coordinated and consistent system to track progress quantitatively. Efforts have been recently made to include climate change issues in the national development planning framework and to measure progress on the results of the investments. The climate change resource centre and centralized database are not yet established for the coordination of climate change observation systems. The latter is particularly needed if meteorological data are to be processed for the establishment of an early warning system for preparedness for extreme events, such as country-wide drought or flooding in the north-central regions and the north-eastern floodplains.

If the funding available under the financial mechanism of the UNFCCC remains at its current level and continues to rely mainly on voluntary contributions, it will not be sufficient to address the estimated future financial flows needed for adaptation. However, with the right policies and incentives, a substantial part of the required additional investment and financial flows could be covered by currently available sources. National policies can assist in shifting investments and financial flows made by private and public investors into more climate-friendly alternatives and optimizing the use of available funds by spreading the risk across private and public investors. Improvement in mechanisms, and an optimal combination of them—such as the carbon markets, the financial mechanism of the Convention, Official Development Assistance, national policies and, in some cases, new and additional resources—will be needed to mobilize the necessary investment and financial flows to address climate change.

Most of the adaptation activities are implemented with funding from donors and international multilateral institutions such as the GCF, the Adaptation Fund, the GEF, the European Union, the United States Agency for International Development, GIZ (German agency for international cooperation), the Japan International Cooperation Agency, and so on. However, local institutions such as the Environmental Investment Fund also provide support to climate change adaptation activities.

Several members of the NDC Partnership have already pledged to support Namibia's ambitions through the Partnership Plan, including the African Development Bank, the Food and Agriculture Organization of the United Nations, the French Development Agency, the European Commission, the Federal Republic of Germany (through GIZ and KfW [German investment and development bank]), the UNDP, the World Bank and the World Resources Institute. Several Namibian banks, including the Namibia Development Bank and NedBank, have shown strong interest in investing in climate-smart projects. A growing community of development partners, private sector actors and government institutions is pulling together behind the need to address climate impacts to achieve global climate goals. Namibia has embraced the NDC Partnership's integrated planning process to strengthen coordination, resource mobilisation and transparency on NDC implementation.

The priority areas requiring support set by the government and confirmed by the development community, private sector and others include:

- Developing better framework conditions for effective climate change governance.
- Strengthening coordination across national and international stakeholders to fast-track decisions and interagency collaboration.

4.2 Financial Support

Financial Needs

The estimated costs of Namibia's adaptation actions in the priority sectors are set out below in sections 4.3.1 to 4.3.7. Costing each action involved identifying the cost for sub-actions, including upfront capital costs (e.g., infrastructure), ongoing maintenance costs, capacity-building and training, and the human resources needed to implement the action. A further desk review included an assessment of similar actions previously completed within the country at national or subnational levels. It is important to note that costs for some actions may change over time; it may be necessary to reconsider cost estimates as new information comes to light. For example, costs may decrease over time due to falling technology costs or barriers being removed by relevant policies.

Table 8. Estimated adaptation finance needed from 2021 to 2030

Adaptation measures (USD)	
Unconditional	0.17 billion
Conditional	1.55 billion
Total (USD)	**1.72 billion**

Financial needs remain high amid ongoing efforts. Most actions that need financing and mobilisation of future resources will require a blend of national and foreign funds. The net cost for the established NDC adaptation measures is estimated to be more than USD 1.72 billion for the ten-year period from 2022 to 2032. This comprises about 32% of the total requirement of about USD 5.33 billion for climate change (both mitigation and adaptation) action in that ten-year timeframe. Table 8 summarises the approximate worth of the finance needed for adaptation over the next ten years. The unconditional measures, which will be paid by the government, make up 10% of the overall projected support needed for adaptation, and the conditional funding amounts to 90%.

In addition, Namibia needs assistance in terms of:

- Technical assistance to the Ministry of Finance (MoF) in developing and implementing climate finance tracking and monitoring tools, and strengthening their capacity to effectively track and report on public, public-private partnerships, and international climate financing flows and expenditures.
- Strengthening the technical and coordination capacity of the MoF and the National Planning Commission (NPC) to align development and budget planning with mitigation and adaptation strategies and projects (in terms of appropriate tools for screening and analysis).
- Support for an assessment study on the existing national climate finance architecture and, based on the findings, designing improvements to climate financing mechanisms and the policy environment.

4.3 Investment and Technological Support

International support is required in the form of finance, technology transfer, technical assistance, and capacity-building. Improving access to public and private financing sources is, therefore, a high priority for Namibia. Meeting the additional investment and financial flows would require a combination of:

- Commitments by developed countries to provide additional financial assistance to developing countries under the Convention;
- Appropriate national policies to encourage private investment and domestic government investment in mitigation and adaptation measures;
- Optimal use of the funds available under the Convention and from other sources to spread the risk across public and private sources;
- Expansion of the carbon market through more stringent commitments by Annex I Parties to increase demand and possible additional mechanisms to increase supply; and
- New sources of predictable funds to provide additional external financial flows to developing countries for adaptation.

Technological Needs Assessment

An updated TNA is needed to take into consideration appropriate adaptation technologies, climate technology financing, climate resilient infrastructure and other development projects.

4.3.1 Water Resources

Led by MAWLR, Namibia identified the costs of implementing the following priority actions in the water resources sector:

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Provide full support for integrated water resources management	Sustainable management of water resources More positive and water-conservative attitudes and practices Cross-sectoral use of water monitoring and management data	USD 17,600,000	Unconditional
Establish best practice systems for improving the efficiency of water use	Decrease in water losses and wastage Decrease in water costs	USD 15,000,000	Unconditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Coordinate the use of surface and groundwater resources and artificially increase the recharge rate of groundwater aquifers to reduce evaporation	Improved allocation between users and uses Decrease in pressure and treatment of other water resources Stimulation of water-saving and use efficiency	USD 7,200,000	Unconditional
Improve water demand management, particularly at the local level and in the agricultural, industrial, mining and tourism sectors	Improvement in synergy and engagement among water users Improved water allocation and abstraction limits Improved productivity	USD 17,400,000	Conditional
Monitor and control groundwater use more strictly	Reduced losses and wastage Improved productivity	USD 58,275,000	Unconditional
Prioritize seawater desalination	Diversification of water supply Increased resilience to reduced per capita freshwater availability Provision of safe drinking water due to the high quality of output water Decrease in pressure and treatment on other water resources	USD 78,650,000	Conditional

4.3.2 Agriculture

Led by the MAWLR, Namibia calculated the costs of carrying out the following adaptation actions in the agricultural sector:

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Promote the diversification of crops to hedge against erratic rainfall and shorter seasons (Climate-Smart Agriculture)	Increased resilience to climate change and natural disasters Promotion of climate-friendly agriculture business value chain Sustained or increased productivity and profitability	USD 19,500,000	Conditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Develop improved crop varieties that adapt to climate change (Climate-Resilient Agriculture)	Improved plant genetics Increased resilience to climate change and natural disasters Improved food production	USD 24,750,000	Conditional
Enhance access to farming inputs (i.e. seed and fertilizer) and maintain consistency in yields (Climate-Resilient Agriculture)	Increased productivity facilitates reduced deforestation and helps the integrity of forests, which are important carbon sinks Increased carbon sequestration potential of agricultural soils by contributing to their building up of soil organic matter	USD 26,250,000	Conditional
Promote protected cultivation and improved planting methods for enhancing water use efficiency and crop productivity (e.g. greenhouses, net houses, mulching, spot planting and zero tillage) (Climate-Resilient Agriculture)	Increased productivity facilitates reduced deforestation and helps the integrity of forests, which are important carbon sinks	USD 9,817,500	Conditional
Promote the use of water targeting only the irrigation of high-value crops (Climate-Resilient Agriculture)	Water conservation and increased availability in other sectors	USD 12,925,000	Conditional
Promote climate resilience in livestock management through strategies such as the creation of fallback grazing areas and mixing small and large stock herds of various breeds (Climate-Smart Agriculture)	Reduced land degradation Improved pasture and agroforestry practices	USD 283,306,375	Conditional
Enhance integrated pest management as an ecosystem approach to crop production and protection (Climate-Resilient Agriculture)	Decreased negative impacts on the broader ecosystem, making farming systems more resilient to climate change Revitalization of the important role of extension, research and the public and private sectors for pest forecasting, surveillance, detection	USD 120,000,000	Conditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
	and control, as these are vital services to increase resilience		
Improve support services and capacity-building to foster crop production that is resilient to climate change by promoting research, trials and up-scaling climate-smart farming systems that increase resilience to climate change	Improved knowledge, capacity and buy-in by other agricultural sector players Job creation and improved capacity of youth involved in the agriculture business		

4.3.3 Forestry

Led by MEFT, Namibia estimated the costs of carrying out the following priority adaptation actions in the forestry sector:

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Promote savanna restoration through bush thinning for increased land productivity, improved food security, improved groundwater recharge and increased biodiversity	Improved food security and water management Conservation of biodiversity	USD 240,000,000	Conditional
Enhance bush biomass use and value addition (bush-based animal feed production, biochar application, drought resilience, improved food security, bush-to-energy, employment and income creation)	Biodiversity conservation	USD116,000,000	Conditional

Support agroforestry interventions to ensure food security (biomass of fodder, meat and Non-Timber Forest Products) in Namibia's most vulnerable communities	Shade provision, soil fertilization, fruit production or timber value, because they provide diversified habitats and income sources, and allow alternative adaptation	USD 98,000,000	Unconditional

4.3.4 Coastal Zones

Led by the MFMR, Namibia estimated the costs of carrying out the following priority adaptation actions along the coastal zones:

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Introduce legislation to reduce property and infrastructure development in environmentally sensitive areas and areas at risk of sea-level rise	Reduced pollution Conservation of marine ecosystems	USD 14,962,500	Conditional
Research and monitor sea-level rise	Keeping track of ocean and coastal areas—monitoring and assessing how these areas are changing—will facilitate keeping coastal communities, economies and ecosystems healthy Environmental observations and forecasts Early detection of water pollution and rapid response Risk assessment data for pollution impact	USD 33,000,000	Conditional
Undertake vulnerability mapping	Guidance on climate change planning and support of resilience to anticipated climate change by enhancing planners' understanding of the nature of vulnerability to climate change	USD 8,662,500	Conditional
Collaborate with the insurance market to guide investment in coastal areas	Adequate risk assessment, eventuality planning and adaptation	USD 7,350,000	Unconditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
	Better understanding of climate change property risks and appropriate coverage		
Develop an early warning system	Preparation of diverse sectors and communities for climate-related events Protection of human lives, biodiversity, infrastructure and property, land and jobs, and support for long-term sustainability Facilitates public and private sectors in planning, protecting economies and saving money in the long run	USD 30,250,000	Conditional
Rehabilitate wetlands and estuaries	Restoration of ecosystems and conservation of biodiversity Water pollution remediation and reduction	USD 48,000,000	Conditional
Install sea walls barriers and barrages	Protection of infrastructure and property Reduced replacement, maintenance and insurance costs	USD 113,300,000	Conditional

4.3.5 Tourism

Led by MEFT, Namibia estimated the cost of promoting sustainable tourism and providing capacity building for climate change innovation in tourism sector:

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Promote sustainable tourism and provide capacity-building for climate change innovation in Namibia's tourism sector	Lower ecological impact Conservation of biodiversity Reduction of land, air and water pollution	USD 57,435,000	Conditional

	Support of local communities by direct engagement and stimulating their economies Environmentally aware and conscious tourists		
Implement conservancies, tourism, and adaptation programs based on community-based natural resource management (CBNRM)		USD 412,940,000	Conditional
Promote community-based natural resource management data collection and archiving		USD 3,580,500	Unconditional
Diversify livelihoods in communities dependent on CBNRM initiatives such as the Namibian Conservancy Programme and Community Forests		USD 112,640,000	Conditional

4.3.6 Health

Led by the MHSS, Namibia estimated the costs of carrying out the following priority adaptation actions in the health sector:

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Strengthen the capacity of health professionals in epidemic preparedness and response	Established mechanisms for developing and implementing an Emergency Risk Management Programme Competence in the management of the risks of internal and external emergencies, including epidemics Adaptation to the specific challenges of an epidemic, whatever the nature of the disease and the resources needed, and even in the event of a concurrent emergency	USD 15,960,000	Conditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Recruit and train community health workers to provide emergency first aid	Personnel are fully aware of their roles in preparing for, and responding to, an emergency, improving community well-being and confidence in the health care system	USD 9,450,000	Unconditional
Improve staff training on prevention and treatment of malnutrition	Improved local community being wellbeing Early detection of malnutrition Greater awareness in the local community of nutrition planning and supplementation Improved health care system	USD 11,550,000	Conditional
Enhance and further mainstream climate-related awareness	Better understanding by the local community of health and other impacts of global warming and measures to address climate change Increase in literacy encourages changes in attitudes and behaviour and enables the local community to adapt to climate change trends	USD 4,830,000	Unconditional
Improve access to timely and relevant information		USD 9,450,000	Unconditional
Strengthen the policies required to effectively address both slow-onset and catastrophic events	Improved health and reduced resources use Increased resource efficiency Economic security Sustainability of ecosystems Increased economic dynamism	USD 8,610,000	Conditional
Develop health-centred adaptation strategies	Enhanced and further mainstreamed climate-related awareness Mitigation of slow onset and catastrophic events Establishment of a climate-proof the public health system	USD 3,025,000	Unconditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
	Strengthened water and sanitation systems Decrease in vector- and water-borne diseases (malaria, cholera)		
Climate-proof the public health system		USD 13,200,000	Conditional
Strengthen and provide capacity-building for water and sanitation systems		USD 23,100,000	Conditional

4.3.7 Disaster Risk Management

The actions and estimated costs to strengthen capacities for disaster risk preparedness, contingency planning, and risk reduction are included in the table below:

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Strengthen capacities for disaster risk preparedness, contingency planning and risk reduction	Establishment of necessary regulatory quality for disaster risk standards to be applied effectively Achievement of critical development objectives Reduced poverty New partnerships between smallholder farmers and agribusiness Potential for more resilient agriculture. Through partnerships, businesses can reduce their losses as well as support the public sector to more effectively build capacity and reduce disaster risks. Continual development of institutions, political awareness, financial resources, technology	USD 577,500	Unconditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
	systems, and the wider social and cultural enabling environment Establishment of early warning systems, designing of evacuation strategies		
Implement vulnerability and risk mapping	Identification of other vulnerable groups that would otherwise be missed and incorporated into the planning and mitigation and adaptation process	USD 1,102,500	Unconditional
Improve information flow and communications between formal structures at the national regional and community levels	Increased awareness and effective regulation and dedicated investments in disaster management	USD 1,102,500	Unconditional
Support community-based adaptation practices in both rural and urban areas	Establishment of alternative means of income i.e. diverse livelihoods, networks, social protection, and so on Development of leadership and other managerial/functional capacities in areas such as stakeholder engagement, situation assessment and vision definition, formulation of policies and strategies Training in first aid for community members and survival skills in adverse conditions	USD 1,680,000	Unconditional
Improve monitoring and documentation of extreme events	Improvement in monitoring and evaluation Improved disaster management and response efforts	USD 24,750,000	Conditional

Adaptation action	Co-benefits (mitigation, environmental, social)	Finance costs (USD)	Conditional/ unconditional
Develop pro-poor disaster insurance schemes	Poverty alleviation and enhanced resilience to climate change impacts. Insurance promotes opportunities by helping to lessen financial repercussions of volatility and, in the longer term, create a space of certainty within which investments, planning and development activities can be undertaken. Safety net and buffer for people shortly after a catastrophic event Insurance can spur transformation by incentivizing risk reduction behaviour and fostering a culture of prevention-focused risk management.	USD 7,975,000	Unconditional

4.4 Support for Cross-cutting Issues

Capacity-building

To measure the impact of climate measures on key development indicators, such as GDP, jobs, skills, revenue distribution inequalities and gender inequality, a national Green Jobs Assessment Model will be developed. The assessment's findings and process of multi-stakeholder dialogues will help Namibia foster evidence based NDC policymaking and a just transition.

Namibia will seek to promote youth participation in climate change projects and awareness campaigns, since young people and future generations will inherit the worst impacts of the climate crisis and bear the future costs of today's decisions.

Priority areas of capacity-building for the government include:

- Support MEFT and other sectors to develop proposals for bankable projects by strengthening the capacity of staff at central, regional and local government levels.
- Build capacities of national staff to undertake costs/benefit analysis, and climate change risk and vulnerability assessments and gender assessments to inform future national and sectoral adaptation planning and targets.

- Enhance the capacity of national advisers to provide guidance to sectors to formulate climate change indicators, mainstream climate change actions, and identify and use related tools for data collection, data management, data storage, data retrieval and reporting.
- Strengthen capacities in National Planning Commission (NPC) and MEFT in designing impact assessments for adaptation measures to set up baselines for different sectors (ex-ante analysis) and later evaluate the impact of different policy and project interventions (ex-post assessment).
- Improve research capacity.

Research

Namibia currently lacks in-depth vulnerability studies for the various regions in the country, as identified in the regional consultations. As such, the country needs additional research capacity:

- Discipline-specific, interdisciplinary and transdisciplinary research to inform biophysical and social vulnerability assessments for each region in Namibia.
- Impact assessment and follow-up after donor-funded projects are completed, such as through committing and funding one or two post-graduate research studies.
- Evidence-based research on the costs and benefits of climate change adaptation.
- Climate-resilient rural development (what are the opportunities for adaptation if rural development policy is implemented? What is the adaptation deficit for each region in Namibia?).

Gender

Climate change policies that take gender-based vulnerability into account and consider the unique contribution that women can make could help advance gender equality and women's empowerment while fighting climate change. Consideration is to be given to the following:

- Establish a gender-based climate and risk management working group.
- Review the gender-based climate legal framework and policy.
- Develop a gender and youth climate strategy and incorporate it into NDCs.
- Develop a just transition strategy and a green job assessment model for Namibia.
- Include gender considerations in climate agriculture initiatives.
- Facilitate affected women's participation in decision-making, thereby assuring that their points of view on forest use are taken into account.
- Promote and increase women's equal participation via gender-related goals or affirmative action.
- Include gender indicators in forestry management monitoring and evaluation.

Specifically, as per the NDC

1. Enhance the understanding of gender differences and address inequities. These are critical for improving the effectiveness and sustainability of marine resources and fisheries.
2. Address the constraints to improving gender equity and equality in coastal zones and fisheries.
3. Improve women's engagement and active involvement in potential adaptation actions, including building adaptive capacity through education and information, protecting property or land, increasing awareness of impacts, maintaining well-being, sustaining economic growth, and taking advantage of new opportunities.
4. Monitor the gender balance in fisheries and aquaculture production.
5. Employ timely decision-making processes for adaptation to climate change. These are crucial to avoid the costs of inaction and to ensure environmental, social and economic sustainability of seafood production.
6. Engage and ensure the active participation of women in:
    - Discussing policy development, decision-making and strategies for climate change adaptation and mitigation at all levels of action.
    - Addressing tourism climate change-related issues such as women's employment in tourism, working conditions, women's participation in planning and management, gender roles and women's rights.
    - Providing for climate-change-sensitive gendered dimensions of health care (including mental) and health-seeking behaviours.
    - Considering women's and men's relative and different capacities, power, social resilience, vulnerabilities and resources in climate change adaptation strategies. It is important to note that gender roles and relations can either enable or constrain adaptive capacities.
    - Identifying gender-oriented opportunities to adapt to climate change and to enhance health equity. In addition to putting in place gender-friendly infrastructure, adaptation measures are to address the underlying causes of vulnerability, such as poverty, lack of empowerment, and weaknesses in health care, education, social safety nets and gender equity.
    - Undertaking gender-sensitive assessments and gender-responsive interventions that enhance health and health equity.
    - Conducting gender-sensitive research, including the collection, analysis and reporting of gender-related data, to better understand the health implications of climate change and climate policies.
    - Integrating gender analysis into vulnerability and risk assessments to establish the different ways in which disasters affect men and women. A full understanding of gender roles and norms is crucial for all vulnerability and risk assessments. Social roles and a gender-specific division of labour lead to different and specific degrees of exposure and vulnerability for women and girls as distinct from those for men and boys.

- Ensuring that adaptation and risk management policies and practices take into account the dynamic nature of vulnerability and exposure and that they directly address the drivers of vulnerability, in particular those related to gender.
- Ensuring the equal participation and capacity-building of women and men is the cornerstones of effective intervention. Women's resource management capacities are an important basis for designing meaningful responses to climate change and disaster prevention, response and recovery. Efficient programming requires a balance between the liabilities and capabilities of both women and men.
- Ensuring participation of women on an equal footing in the green economy, notably in regard to their access to clean energy and technology as users and providers of services as well as in subnational, national and multilateral processes related to climate change, disasters and emergency situations.

Youth

Box 3. Critical needs for the youth of Namibia

- Technical assistance to the National Youth Service to address the absence of youth in climate change adaptation and to develop tailor-made structural policies to streamline youth into adaptation projects.
- Awareness-raising, education, training and capacity-building.
- Improved planning and decision-making which includes youth in order to promote good governance.

Namibia recognises that youth are a driving force for higher climate ambition. Implementation of the NDC intends to provide employment opportunities for youth and support for youth entrepreneurship. Key actions to increase youth engagement in adaptation include:

- Empower youth and define mechanisms to enable their engagement and the integration of different water resources management processes.
- Engage and invest in climate-smart agriculture targeting youth in both urban and rural areas.
- Engage and solicit youth for active participation in sustainable forestry initiatives, adaptation and policy reforms.
- Conduct youth awareness-raising and solicit their active involvement in tourism-related issues and adaptation in a changing climate. This also includes issues such as assessment of the vulnerability of World Heritage sites to climate change impacts and the potential implications for tourism. Tourism's positive role in helping to secure the future of many World Heritage sites in a changing climate is to be taken into account.
- Raise awareness among youth about various health-related issues that may arise as a result of climate change. This includes the consideration of psychological vulnerabilities such as mental illness and, depression, and the need to prepare and build resilience in the face of extreme events due to the changing climate. This also includes climate change's effects on physical health and building capacity in regard to the resiliency of communities, families, and young people to climate impacts.
- Engage youth on adaptation strategies that set out possible ways communities, youth included, can address anticipated, current and future climate threats to public health.
- Conduct capacity-building to encourage an innovative youth-centred approach for preparedness and response actions to address climate-related emergency and disaster situations.

Private sector engagement

- Partner with the government on investment for key water infrastructure projects, including the rehabilitation and modernization of existing infrastructure.
- Promote and engage the private sector to monitor rates of deforestation and share this information with affected and interested stakeholders (e.g., scientists, land managers, traditional authorities, policymakers, general public, and so on).
- Mobilize private-sector resources to implement the NDC (mitigation and adaptation) and SDG-related actions.
- Develop a stakeholder consultation manual or climate finance booklet for the private sector.

4.5 Oversight and Management Support

Namibia has institutional management, coordination and reporting arrangements in place. The NCRC and its sub-working groups will oversee and track the implementation of climate change issues. Namibia is currently developing a robust transparency reporting system on its NDC, which will also act as the monitoring and evaluation (M&E) instrument. This will enable the country to monitor the effectiveness of its adaptation actions, including access to the means of implementation, particularly

climate finance. Overall, the following actions have been identified to strengthen capacities to manage the adaptation process and carry out M&E of adaptation actions:

- Strengthen and build capacity of the NCRC to facilitate NDC implementation and alignment with National Development Plan 6, Namibia Vision 2030, the National Policy on Climate Change, the National Climate Change Strategy & Action Plan 2013–2020, the developed NAP and the SDGs.
- Establish a robust National Monitoring, Evaluation and Reporting system to track adaptation actions together with SDGs actions in coordination with the NPC, the NSA and the MoF.
- Strengthen the technical and coordination capacity of the MEFT, the MoF and the NPC to align development and budget planning with adaptation strategies and projects (in terms of appropriate tools for screening and analysis).
- Support coordination within the current framework: MEFT; Parliamentary Standing Committee on Economics, Natural Resources and Public Administration; NCRC and NPC to create a clear operational strategy, process, and plan.
- Develop an overarching NDC implementation strategy that is costed and integrates SDG-related actions into sector-specific investment plans.

5. Conclusion

The Namibian government considers climate change adaptation as an important aspect of attaining the SDGs, and to ensure that it has a population that is resilient to the negative impacts of climate change. To enable our people to reach this goal, more is needed in terms of financial assistance, appropriate technology transfer, capacity-building, education and awareness.

References

ASSAR (Adaptation at Scale in Semi-Arid Regions of Namibia) Project. (2018). *What global warming of 1.5 and higher mean for Namibia?* Research conducted by the University of Cape Town and University of Namibia.

IPCC, 2021. Summary for Policymakers. In: *The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press.

Kirui, T.K. (2018). Countries in Africa with the Longest Coastlines. *World Atlas.* http://www.worldatlas.com/articles/countries-in-africa-with-the-longest-coastlines.html.

Ministry of Environment, Forestry and Tourism. (2009). *Sea-Level Rise in Namibia's Coastal Towns and Wetlands: Projected Impacts and Recommended Adaptation Strategies: Final Report*. Windhoek, Namibia.

Ministry of Environment, Forestry and Tourism. (2015). *National Climate Change Strategy & Action Plan 2013 – 2020.* Windhoek, Namibia.

Ministry of Environment, Forestry and Tourism. (2015b). *Third National Communication of the Republic of Namibia to the United Nations Framework Convention on Climate Change*. Windhoek, Namibia.

Ministry of Environment, Forestry and Tourism. (2018). The development of strategies to maintain and enhance the protection of ecosystem services in Namibia's state, communal and freehold lands. *Volume I: A national assessment of Namibia's Ecosystem Services*. Namibia's National TEEB (The Economics of Ecosystems and Biodiversity) Study

Ministry of Environment, Forestry and Tourism. (2019). Climate Change Vulnerability and Adaptation Assessment Report. *Namibia's Fourth National Communication to the United Nations Framework Convention on Climate Change*. Windhoek, Namibia.

Ministry of Environment, Forestry and Tourism. (2020). *Fourth National Communication of the Republic of Namibia to the United Nations Framework Convention on Climate Change*. Windhoek, Namibia.

Ministry of Environment, Forestry and Tourism. (2021). *Fourth Biennial Update Report (BUR4) to the United Nations Framework Convention on Climate Change*. Windhoek, Namibia

Ministry of Environment, Forestry and Tourism. (2021). *Nationally Determined Contributions (NDC) of The Republic of Namibia to the United Nations Framework Convention on Climate Change*. Windhoek, Namibia.

Namibia Statistics Agency. (2019). *Annual National Accounts, 2019.*

National Planning Commission. (2017). *Namibia's 5th National Development Plan (NDP 5*). Windhoek, Namibia.

ND-GAIN. (2020). *Notre Dame Global Adaptation Initiative: Namibia.*

Office of the President. (2004). *Namibia Vision 2030*. Windhoek, Namibia.

Republic of Namibia. (2016). *Harambee Prosperity Plan: Namibian Government's Action Plan towards Prosperity for All.* Windhoek, Namibia.

Statistica. (2020). *Namibia total population from 2010 to 2020, by gender.* https://www.statista.com/statistics/967893/total-population-of-namibia-by-gender/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