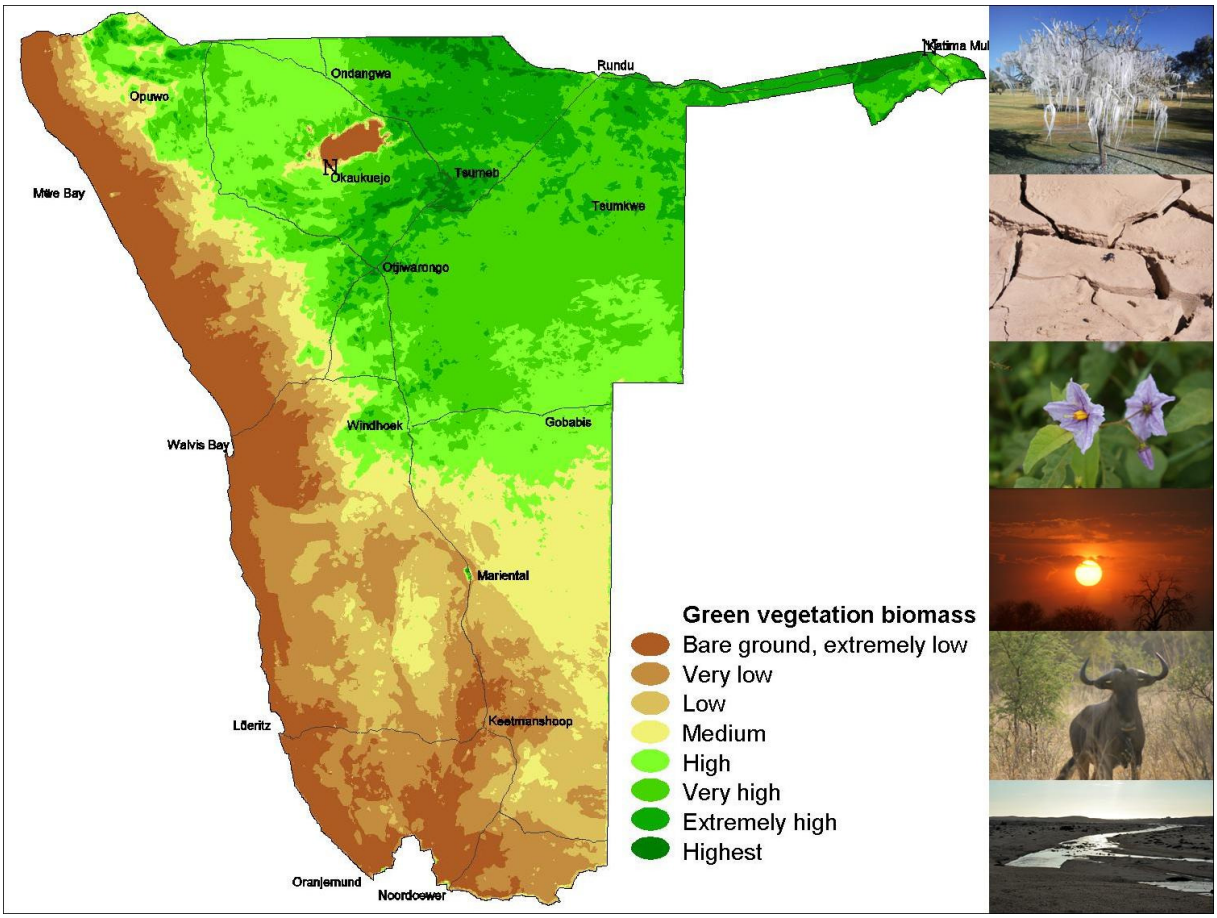
REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

Proposed

Climate Change Strategy and Action Plan



October 2009

The development of this document was made possible with financial and technical support from the United Nations Development Programme (UNDP) Namibia.

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The authors of this document wish to thank the Ministry of Environment and Tourism (MET) for the opportunity to participate in Namibia's climate change policy development process. Gratitude also goes to the National Climate Change Committee (NCCC) for their support. Immense thanks to the UNDP Namibia Country Office for supporting such an important activity that will benefit Namibia in the long-term. Lastly and importantly, thanks to all the stakeholders for their critique, inputs, comments and suggestions that contributed toward this document.

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Structure and Content of the Strategy and Action Plan

This report is divided into 3 main chapters and the annex which contains the action plans for the strategy.

Section 2 provides a background to climate change impacts predicted at global, regional and national scales. It highlights how vulnerable Namibia is to climate change and sets the scene for the need for climate change adaptation and mitigation. It finally outlines the rationale for development of this proposed climate change strategy and action plan for Namibia.

Section 3 describes the guiding principles proposed in the policy to guide the planning, development, implementation and monitoring and evaluation of climate change response activities. These guiding principles drew on the New Delhi Work Programme and the building blocks of the Bali Action Plan.

Section 4 elaborates in some detail what the Namibia climate change strategy is. It explains how the three main responses to climate change would be adaptation, mitigation and tackling cross-cutting issues through adaptation and mitigation. Each of the three aspects is subdivided into themes. Adaptation addresses four themes namely; food security and sustainable resource base, sustainable water resources, human health and well being and infrastructure. Climate change mitigation is addressed through two themes namely sustainable energy and low-carbon development and transport. Cross-cutting issues would be addressed by the following proposed themes; capacity building, training and institutional strengthening, research and information needs, public awareness, participation and access to information, disaster reduction and risk management, financial, resource mobilisation and management, international cooperation and networking and technology development and transfer and legislative development. In this strategy, cross-cutting issues are those key climate change issues that transcend various sectors that are impacted upon by climate change. Cross-cutting issues relate to issues that will be addressed through multi-sectoral and multi-disciplinary activities. Strategic aims have been developed for each theme under adaptation, mitigation and cross-cutting issues.

The **Action Plan** presented in Annex 1 outlines in detail specific proposed activities to address each strategic aim through adaptation or mitigation. For each strategic aim, an "action sheet" has been prepared which contains the following information; aspect, theme, strategic aim, objective, rationale for the strategic aim, proposed activities, time frame, participating agencies and an estimate of financial resources required. In this proposed strategy and action plan, the following time frames are implied; short-term implies 5 years or less, medium term is between 5-10 years and long-term is more than 10 years. This aligns well with timeframes used for the National Development Plans (NPDs).

Abbreviations and Acronyms

AIDS	Acquired Immunodeficiency Syndrome
AOGCM	Atmospheric Ocean General Circulation Models
CAU	Climate Analysis Unit
CBD	United Nations Convention on Biological Diversity
CBO	Community Based Organisation
CBNRM	Community Based Natural Resources Management
CCA	Climate change adaptation
CDM	Clean Development Mechanism
CFC	Chlorofluorocarbons
DNA	Designated National Authority
DRFN	Desert Research Foundation of Namibia
ELTOSA	Environmental Long-term Observatories Network of Southern Africa
FAO	UN Food and Agriculture Organization
HIV	Human Immunodeficiency Virus
GHG	Greenhouse gasses
IPCC	Inter-governmental Panel on Climate Change
LTER	Long-term environmental observation networks
LULUCF	Land use, land use change and Forestry
MAWF	Ministry of Agriculture, Water and Forestry
MDG	Millennium Development Goals
MET	Ministry of Environment and Tourism
NCCC	Namibia has a National Climate Change Committee
NDP 2	National Development Planning 2
NDP 3	National Development Planning 3
NGO	Non Government Organisation
NNF	Namibia Nature Foundation
NRAP	National Poverty Reduction Action Programme
SADC	Southern African Development Community
SNC	Second National Communication
UNCCCD	Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change

1 Executive Summary

1.1 General introduction

1. Climate change stands out as one of the major challenges of the 21st century that threatens progress towards the achievement of national and millennium development goals of many countries including Namibia. The development of a national strategy will enable Namibia to fulfil her obligations of the UNFCCC framework and hence contribute to addressing this global problem. This National Climate change Strategy and Action Plan is part of the background activities of Namibia under the second national communication to develop a national climate change policy and strategy and accompanying action plan.

2. Climate change refers to a collection of large-scale. Long-term changes to global climate such as increases in temperature, rainfall and increased frequency of drought and flooding due to significant departure of the earth's climate from average weather conditions. There is sufficient scientific evidence that although climate may vary naturally, human activities, mainly through the use of fossil fuels and changes in land use patterns due to rapid increase in global human population, have caused significant changes in global climate. These human activities have contributed green house gasses such as methane, nitrous oxide, carbon dioxide that have affected the climate.

3. Climate change will cause impacts at global, regional and local scales, According to the IPCC WG1 Fourth Assessment Report (IPCC 2007) the following climate change trends have been predicted at global scale:- Average air temperature will increase between 1.8 ^{o}C and 4 ^{o}C (at 2090 – 2099 relative to 1980-1999, greater warming of surface temperature over land than over the ocean, increased ocean depth temperatures to depths of at least 3000m since 1961, sea ice and snow cover is predicted to contract and shrink because of melting due to high temperatures, sea level rise of between 1.8mm /year (1961-2003) and 3.1mm/year (1993-2003), droughts that will be more intense and of longer duration linked with higher temperatures and decreased precipitation, variable levels of precipitation and more frequent extreme events such as heat waves, tropical cyclones, heavy precipitation and hot extremes.

4. The dependence of Namibia on natural resources implies that climate change will adversely affect the economy. Climate change will cause many impacts in Namibia (Republic of Namibia, 2002; Mfune and Ndombo, 2005; Karuaihe *et al.,* 2007; Dirkx *et al.,* 2008). These include but not limited to the following:- livestock losses, reduced grain/crop production and yields and severe water scarcity due to droughts and increased temperatures, increased incidences of malaria in previously dry areas that will receive more rain due to climate change, spatial shift in the distribution of dominant vegetation types in some ecosystems such as replacement of grassy savannah by a more arid-adapted desert and arid shrub land vegetation type (Midgley *et.al.,* 2004) called bush encroachment. Other predicted impacts include the rise in sea level which will lead to loss of food supply and availability of breeding sites palearctic and resident sea and shorebirds and other organisms, intrusion of salt along coastal habitats and aquifers.

5. Namibia is very vulnerable to impacts of climate change due to its geographic location, variability in patterns of climate as well as due to socio-economic factors. Climate change impacts predicted for Namibia will adversely affect the extent and the speed at which long-term, medium and even short-term national development goals will be achieved. The overwhelming evidence of global warming and consequent impacts on climate compel Namibia to take action and look at the current anthropogenic activities, infrastructure and organizational framework that govern the decisions. A national strategy for climate change adaptation and mitigation is a

necessary course of action. The action will thereby minimize the risks from climate change and contribute to the need for cost effective means of addressing climate change issues.

6. Namibia is developing a Climate change Policy discussion document and a road map for formulating a national policy on climate change. The national climate change strategy will be a necessary tool to facilitate climate change adaptation and mitigation to reduce its impacts on socio-economic development of Namibia.

1.2 Rationale for a Namibia climate change strategy and action plan

7. The Government of Namibia is committed to socio-economic development in order to develop its human resource and reduce poverty through sustainable development. This is enshrined in the constitution of Namibia and articulated in the Vision 2030 and the medium-term development goals as detailed in NDP3. Signing of the Millennium Declaration and progress that has been made towards attainment of Millennium Development Goals (MDGs) affirms further that Namibia is on the path to achieve its development goals.

8. The need for a Namibia specific climate change strategy and action plan is justified by many pertinent issues. A few of which such issues include but are not limited to:-
   - The need to mainstream climate change adaptation and mitigation in the medium- to long-term national development goals.
   - The complex nature of causes and effects of climate change and the fact that these transcend many sectors, requires that we enhance synergies among sectors facilitated by national strategy on climate change.
   - The need to strengthen human, institutional and financial capacity to adapt to effects of climate change justifies the need to develop a strategy that will enhance synergies amongst various climate-change sensitive sectors (Mfune and Ndombo, 2005).
   - Substantial funding required for mitigation and adaptation. The strategy will assist to identify targeted funding that address specific climate change issues in different sectors. To avoid competition for the same funding, a national strategy would help prevent these problems.
   - Differential impacts of climate change will necessitate development of area-specific climate change strategies.
   - Climate change is poorly understood by local communities, policy-makers, natural resource managers, technicians, scientists and even farmers (Mfune and Ndombo, 2005). A national strategy will constitute an important vehicle to collect and disseminate target-specific climate change adaptation actions and responses.
   - Namibia has no policy on climate change. The national strategy will be a necessary tool to facilitate climate change adaptation and mitigation to reduce its impacts on socio-economic development of the country. In addition, the strategy will constitute a framework that will ensure effective implementation of obligations of UNFCCC.

1.3 Policy guiding principles relevant to a Namibia Climate Change Strategy

9. The below policy guiding principles make substantial statements about how Namibia intends to address climate change. These principles provide guidance for a response that is appropriate, effective, efficient, fair, un-discriminatory and timely. In addition, they are informed by relevant, appropriate and contextually suitable information from the New Delhi Work Programme and as well from the building blocks of the Bali Action Plan. The Namibia Climate Change Strategy is therefore based on the following guiding principles.

- ***Mainstreaming climate change into policy and legal framework and development planning.*** The policy discussion paper recognises the need for the prioritisation of climate change issues given Namibia's vulnerability and, the integration of climate change into sectoral policies, as well the mainstreaming into development planning to ensure that it is addressed at appropriate levels at all times.

- ***Sustainable development and ensuring environmental sustainability.*** The policy recognises the need for Namibia to develop in such ways not to compromise the ability of current and future generations to meet their needs.

- ***Country-driven and specific climate change interventions.*** The policy discussion paper recognises Namibia's vulnerability and risks associated with climate change and seeks to provide a response tailored for local, regional and national conditions to effectively and efficiently mitigate and adapt to climate change.

- ***Stakeholder participation in climate change policy implementation.*** The policy discussion paper recognises the importance of meaningful participation in the planning, development and implementation of climate change activities at local, regional and national level. The policy recognises the need to ensure the participation of women, children and other vulnerable/ marginalised groups/ individuals and as well, the use of appropriate local knowledge for adaptation.

- ***Awareness generation, education, training and capacity building.*** The policy discussion paper recognises the need and importance to raise awareness, build capacity and empower stakeholders at local, regional and national levels and at the individual, institutional and systemic levels to ensure a collective and timelier response to climate change. It is as well recognised that in order to secure long-term capacity for climate change in Namibia, there is a need to appropriately integrate climate change into the education system to generate awareness and capacities from the early ages.

- ***Cost effectiveness.*** The policy discussion paper recognises that Namibia has limited resources and thus embodies a principle of achieving cost-effectiveness in the implementation of climate change activities without compromising the desired output and outcome, and by not lowering current conditions and standards.

- ***Sustainable and equitable use of natural resources.*** The policy discussion paper amply recognises Namibia's reliance on natural resources and strongly advocates for the sustainable and equitable use of natural resources as catered for in existing policy, legal and development instruments and, where necessary to enhance the enabling environment.

- ***Human rights-based development.*** The policy discussion paper recognises and embraces the fundamental rights of humankind and further recognises the prediction that the most severe effects of climate change will be felt by the rural poor in general, women, children and marginalised groups/ individuals. It thus advocates for the practicing of human rights-based development in accordance with national and international law at all times during implementation of climate change response activities.

- ***Transparent planning and decision making.*** The policy discussion paper recognises the need for participatory/ consultative planning and decision making to ensure transparency, and the participation of people in the development of response activities that will impact their lives. In addition to ensuring

transparency, participation will ensure the identification and use of appropriate traditional knowledge in climate change adaptation.

- ***Mainstreaming gender, children and the vulnerable.*** The policy discussion paper recognises the need to mainstream gender, child welfare and vulnerable groups into climate change responses at local, regional and national level. This mainstreaming shall be integrated into existing policies and laws and shall be led by the Ministry of Gender Equality and Child Welfare with support from other government agencies (especially at local and regional levels), non-governmental organisations (NGOs) and community-based organisations (CBOs).

- ***Vulnerability.*** Given Namibia's vulnerability to climate change risks and impacts, it would be imperative to develop adaptation and mitigation measures to address the most vulnerable groups of society and sectors. This will ensure that Namibia's response to climate change is focused sustaining livelihoods of the most vulnerable and the socio-economic and economic viability of current sectors.

1.4 Proposed key strategic aims for the strategy

10. The Namibia Climate Change Strategy has been developed on three aspects; adaptation, mitigation and cross-cutting issues. The strategy has adopted a thematic approach in order to address each of the three aspects. Strategic aims have been developed for each of the three aspects as outlined below: Each theme has a set of corresponding strategic aims.

11. **Adaptation**

In the strategy, climate change adaptation is addressed through four themes namely food security and sustainable resource base, sustainable water resources base, human health and well being and infrastructure. The strategic aims for each of these themes are outlined below:-

Food security and sustainable resource base

- Development of climate resilient cropping/ agriculture / production systems
- Development of climate resilient crop varieties / cultivars
- Diversification of agriculture and livelihoods
- Development of climate resilient livestock breeds
- Adaptation against drought
- Conservation, utilisation and development of
    - Forest resources
    - Fisheries and aquaculture (both freshwater and marine)
    - Coastal zone resources
    - Biological resources and maintenance of ecosystems to ensure environmental sustainability

Sustainable Water Resources

- Conserve and manage watershed / catchment areas
- Promote integrated development and management of water resources
- Promote conservation and sustainable use of water resources
- Improve trans-boundary cooperation regarding water resources
- Support institutional and human capacity building in water resources management and use

Human Health and Well being

- Adaptation to climate change related health risks
- Assessment of impacts of climate change on human health and well being
- Expansion of health facilities and network to remote areas
- Improve capture, management, storage and dissemination of health information
- Improve access to sanitation and water
- Increase human resources capacity and improve efficiency
- Support action plans against HIV/AIDS

Infrastructure

- Develop a climate change infrastructure risk assessment guidelines and methodology
- Improve drainage and sanitation facilities in rural and urban areas
- Adaptation to floods
- Adaptation against future sea level rise
- Improve infrastructure spatial planning and development in urban and rural areas
- Improve formal and informal settlement patterns and housing
- Climate-proof existing and future housing and other infrastructure

12. **Mitigation.**

Mitigation is addressed through sustainable energy and low-carbon development and transport themes. The development path that Namibia will adopt especially with regards to energy (e.g. low carbon development path vs. high carbon path) and policies on developments in agriculture and the land-use change and forestry sector will greatly influence the extent of the contribution of Namibia to stabilizing GHG.

Sustainable energy and low carbon development

- Improve efficiency of energy production and use
- Develop and improve renewable energy
- Reduce GHG emissions from Agricultural (crops and livestock) sector
- Reduce GHG emissions from land use, land-use change and Forestry
- Reduce GHG emissions from Industries (e.g. construction, mining)
- Enhance GHG sinks
- Manage rural and urban waste

Transport

- Promote the development of alternative modes of service delivery that will reduce carbon emissions
- Promote development of climate change resilient transport infrastructure
- Diversify transport energy sources
- Improve motor vehicle fuel efficiency
- Promote use of public transport

13. **Cross-cutting issues on adaptation and mitigation:**

The strategy addresses the following themes that are cross-cutting: capacity building, training and institutional strengthening; research and information needs; public awareness, participation and access to information; disaster reduction and risk management; financial, resource mobilisation and management; international cooperation and networking; technology development and transfer; and legislative development.

Capacity building, training, and institutional strengthening

- Strengthen human resource capacity building for climate change
- Main-stream climate change in national, local and sector policies, development plans & program
- Strengthen institutional capacity for climate change management
- Mainstream climate change in the media
- Develop and implement educational program on climate change and its impacts
- Promote and facilitate development of educational materials on climate change
- Improve level of awareness, education, training and capacity building regarding CC in Namibia
- Facilitate and support training of scientific, technical and managerial personnel in climate change
- Develop disaster risk reduction capacity building plans and programmes for climate change.
- Establish Climate Change Resource Centre and Climate Change database

Research and information needs

- Collect data and model climate change an national, regional & local levels
- Monitor ecosystem and biodiversity changes and their impacts
- Conduct climate-proof research
- Undertake research on sea level rise
- Establish a centre for research and training on climate change
- Conduct Inventories on traditional / indigenous knowledge and coping practices
- Undertake studies on the cost of adaptation and mitigation
- Study macroeconomic and sectoral impacts of climate change

Public awareness, participation and access to information

- Public awareness, participation and access to information
- Promote and facilitate development of public awareness materials on climate change
- Facilitate access of climate change information to the public
- Promote public participation in addressing climate change and development of adequate responses

Disaster Reduction and Risk Management

- Improvement of disaster forecasting and early warning systems
- Improvement of disaster preparedness and post-disaster recovery
- Manage risk against loss of income, property and livelihoods
- Develop climate change impact and risk assessment programme
- Institutionalise and strengthen risk disaster management, create mechanism and capacities at all levels of government and communities.

Financial resource mobilisation and management

- Identify resource requirements including funding to support implementation of climate change activities
- Facilitate access to and efficient management and use of resources(credit, education, decision-making) including funds for climate change adaptation and mitigation

International cooperation and networking

- Strengthen and enhance international collaboration, linkages and networking among stakeholders involved in environment and climate change related issues
- Participate in regional and international cooperation programs and activities on climate change

- Promote international North-South and South-South collaborative research that will facilitate generation of Climate change adaptation and mitigation evidence-based information.
- Facilitate achievement of UN environment international obligations under various Conventions especially UNFCCC and Treaties

Technology development and transfer

- Promote and support development of technologies for mitigation and adaptation
- Promote and support technology transfer for mitigation and adaptation

Legislative development

- Review and update existing legislation to reflect climate change issues
- Develop new sector or national policies that address emerging climate change issues

14. Annex 1 to this document proposes specific strategies and actions at sector and cross-sector levels as responses through adaptation, mitigation and the tackling of cross-cutting issues. For each strategic aim an action sheet has been developed that gives the following details: aspect, theme, strategic aim (SA), objective, rationale for the strategic aim, list of activities that should be undertaken to achieve the objective, suggested time frame for implementation, leading delivering agencies and resources and estimated cost. As far possible, given the available time, information was gathered for all fields in an action sheet. Review and revision is however suggested to ensure that information remains current.

2 General introduction

2.1 Climate change: what's at stake at global, regional and national levels

Climate change stands out as one of the major challenges of the 21st century that threatens progress towards the achievement of national and millennium development goals (MDGs) of many countries including Namibia. Despite such potential challenges, much remains largely unknown regarding climate change. Many do not understand the meaning and implications of climate change. This section introduces climate change and how its impacts are likely to affect natural systems and humankind. It outlines the vulnerability of Namibia to climate change. It highlights the need for the country to adapt to, and mitigate impacts of climate change. The importance of education, raising climate change awareness as well as provision of, and access to climate change relevant information to various stakeholders is emphasized.

2.1.1 Our changing climate

Climate is the long term average weather condition of a large area of the earth's surface considered over a relatively long time while weather is the state of the atmosphere at a given time (Republic of Namibia, 2003a). Variables that meteorologists use, in order to measure daily weather include temperature, rainfall, humidity, cloudiness, sunshine, air pressure and wind (IPCC, 2001). Climate can be described at the global, regional and local scales. Climate may vary (climate variability) in time and space beyond that of individual weather events (IPCC, 2001) and may be caused by natural processes within a given climate system. However, certain human (also referred to as anthropogenic) activities, such as burning of fossil fuels, also contribute to climatic variability through release of greenhouse gases such as carbon dioxide (CO_2), methane and nitrous oxide (NO_2). The climate of the earth has varied significantly from the average weather conditions over the past few centuries (Republic of Namibia, 2003a). The earth's atmosphere has become hotter, over and above that accounted for by natural variability (IPCC, 2001). Such significant departure from the average weather condition (climate) called 'climate change' exerts its impacts at global, regional/ sub-regional, national and local scales. It is not easy to predict, with any level of certainty, the effects of climate change.

2.1.2 Global perspective

Climate change causes global warming, an increase in the earth's temperature due to an increase in heat-trapping gases, referred to as greenhouse gases (GHG) (IPCC, 2001, Topfer and Hunter, 2002). It is difficult to precisely know the effects of the alteration of the global climate cycle on a specific area, or system because of the complexity of the variables involved in the climate system.

The earth's near surface temperatures have increased by about 0.6 ^{o}C between the pre-industrial era (1850s) and the current levels (IPCC, 2001, 2007). According to the IPCC WG1 Fourth Assessment Report (IPCC 2007) the following climate change trends have been predicted at global scale;

- Average air temperature will increase between 1.8 ^{o}C and 4 ^{o}C (at 2090 – 2099 relative to 1980-1999
- Greater warming of surface temperature over land than over the ocean
- Increased ocean depth temperatures to depths of at least 3000m since 1961
- Sea ice and snow cover is predicted to contract and shrink because of melting due to high temperatures
- Sea level rise of between 1.8mm /year (1961-2003) and 3.1mm/year (1993-2003)

- Droughts that will be more intense and of longer duration linked with higher temperatures and decreased precipitation
- Variable levels of precipitation
- More frequent extreme events such as heat waves, tropical cyclones, heavy precipitation and hot extremes.

Climate change will adversely affect the ability of physical and biological systems to sustain human development including socio-economic development. Climate change will reduce benefits derived from ecosystem goods and services. Crop failures and other negative agricultural impacts, will affect world food availability, accessibility, utilisation and the stability of food systems. Food insecurity is likely to influence world food markets. For instance, food shortage may lead to high food prices. Climate change will adversely constrain the ability of the vulnerable, mainly the poor in many developing countries, to cope with adverse impacts of climate change because they have low capacity to respond (i.e. to mitigation or adapt).

The differential capacity to adapt to climate change between developed and developing countries will dictate the extent to which targets for mitigation will be achieved as well as the ability to adapt to climate change. Due to unprecedented frequency and extent of disasters, many insurance companies world-wide may retreat from covering for weather- and climate-related events (e.g. floods, wildfires, etc.), many food-secure people and financially stable families may be plunged into serious states of vulnerability that have previously been associated mainly with developing countries (FAO, 2008b). Namibia has not been spared from such retreat of insurance coverage. After the 2007 Mariental floods in the Hardap Region, many farmers, local people and residents in and around the town lost their property, crops and livestock. Insurance companies immediately withdrew coverage of disasters such as floods in the area.

While the UNFCCC is a framework that has been agreed upon by many Parties globally to address climate change, the effectiveness of its implementation still remains a challenge partly because of the principle of common but differentiated responsibility. The global consensus under UNFCCC is implemented at national level according to the level of magnitude of GHG emissions and ability to address the problems. Hence, development of a national strategy will enable Namibia to fulfil her obligations of the Convention and hence contribute to addressing this global problem.

2.1.3 Regional perspective

Recent advances in mathematical modelling and understanding of the physical processes of the climate system has enabled availability of more reliable predictions of regional climate change (Christensen *et al.,* 2007). Projections are mainly based on Atmospheric-Ocean General Circulation models (AOGCMs). General circulation models are the fundamental tool used for assessing the causes of past change and projecting change in the future (Dirkx, *et. al.,* 2008). These models represent interactions between different components of the climate system such as the land surface, the atmosphere and the ocean (Dirkx, *et. al*., 2008). In order to produce predictions at finer spatial scale (regional and local) a 'downscaling' technique is used. Temperature and rainfall are central to understanding trends of climate change at regional level.

The following climate change impacts have been predicted for Southern Africa (Christensen *et al.,* 2007);

- The median temperature will increase between $3^{O}C$ and $4^{O}C$, with the highest seasonal projections in September, October and November;
- Increase in precipitation in tropical parts of southern Africa and drying in extreme southwest in winter;

- Increased intensity of high-rainfall events, doubling of the frequency of extreme wet seasons;
- About 20% increase in the frequency of extreme dry winters and spring.

The combined effect of increases in temperature and drying will adversely affect most ecosystems and agriculture and livestock production in southern Africa. An increase in the frequency of extreme events is capable of causing severe flooding, soil erosion and water damage to man-made infrastructure. Such events will threaten the livelihoods and income levels of many people especially the poor rural subsistence farmers who will bear the brunt of the impacts. Arid and semi-arid countries such as Namibia, the driest country south of Sahara, will be most affected (Karuaihe *et al.*, 2007) by such drying and reduced precipitation. The threat of changing climate and higher average temperatures will decrease the availability of fresh water resources in the region. Even without climate change occurring, water availability has been identified as the main development constraints with absolute water scarcity predicted by as early as 2020 (MET-ISOER 2004). The Bates *et al.* (2008) report on climate change and water states that there is a high confidence that southern Africa will face fresh water reduction in availability as a result of climate change.

The threat of increased severity of climatic events poses concerns over the ability of countries to adapt and respond to these unpredictable climatic events. Resource management plans and strategies are in place throughout southern Africa to prevent overexploitation of resources. However an overlying climate change strategy to identify and integrate cross-sectoral priorities at the regional level has not yet been defined and implemented.

2.1.4 National perspective

Namibia is one of the driest countries in southern Africa (mean rainfall annually 25mm-700mm). This is a result of the location of the cold Benguela Current that flows along the western shore of Namibia. This cold current is powered by the South Atlantic anticyclone high-pressure system. The cold water in combination with high pressure reduces the quantity of water the atmosphere can contain, which results in the transport of cold, dry air into Namibia, resulting in low precipitation. During the summer months of November-April the heating of the continent causes the southerly portion of the Inter Tropical Convergence Zone (ITCZ) to transport moisture from the tropics down into Northern and Eastern Namibia (Dirkx *et al*., 2008). This increase in moisture results in higher levels of precipitation during these months. The southern area of Namibia receives precipitation from mid-latitude storms that pass over South Africa. The northern edges of these systems sometimes pass over southern Namibia bringing considerable quantities of precipitation, which can account for half the annual total. Along the coast fog constitutes a large portion of the available moisture for as much as 146 days per annum (MET-ISOER 2004).

Climate in Namibia is inherently highly variable. Climate change is therefore an added stressor on this variability. Recent historical trends of climate in Namibia (based on data from selected Meteorological stations) reveal that there has been consistent increase in daily maximum temperatures (Dirkx *et al.,* 2008). It is not easy to detect and predict trends in climate in areas like Namibia that have highly variable climates. This is because some regions of the country may receive extreme rainfall events which will add a large proportion to the annual rainfall. While more variable pattern of rainfall is predicted for Namibia, climate change will cause increased aridity due to the combined effect of variable rainfall and increased evaporation (30%) by 2020. In addition, sea levels are predicted to rise up by 30cm. There will also be increased frequency of hot days, heat waves, drought, heavy rainfall events, etc. (Republic of Namibia, 2002; Scholes *et al.,* 2004).

Climate change is predicted to have numerous impacts on Namibia (Republic of Namibia, 2002; Mfune and Ndombo, 2005; Karuaihe *et al.,* 2007; Dirkx *et al.,* 2008). These include, but are not limited to the following;

livestock losses, reduced grain/ crop production and yields and severe water scarcity due to droughts and increased temperatures. The incidence of malaria is predicted to increase in dry areas that will receive high rainfall due to climate change while increased susceptibility to respiratory and gastro-intestinal infections due to drought, poor nutrition and poor sanitation may also occur. It is predicted that there will be a spatial shift in the distribution of dominant vegetation types in some ecosystems such as replacement of grassy savannah by a more arid-adapted desert and arid shrub land vegetation type (Midgley *et.al.,* 2004). Bush encroachment will reduce grazing rangeland for livestock and grazing and browsing wildlife. Spatial shift of some species such as the *Aloe dichotoma* is predicted.

Along the coastal areas, the rise in sea level will lead to loss of food supply and availability of breeding sites palearctic and resident sea and shorebirds and other organisms. The intrusion of salt along coastal habitats and aquifers will affect the growth and distribution of some species of plants and other micro organisms. Climate change impacts predicted for Namibia will adversely affect the extent and the speed at which long-term, medium and even short-term national development goals will be achieved. It is clear that the cost of addressing impacts of climate change will far outweigh the cost of no action. Action on climate change is required across all sectors (public, private and NGOs). A national strategy for climate change adaptation and mitigation is a necessary course of action.

2.1.5 Namibia's vulnerability to climate change

Namibia is vulnerable to climate change for several reasons. Its geographic location within the subtropical atmospheric high pressure zone contributes to its aridity. Namibia receives low but highly variable rainfall (25-700mm) and is characterised by high temperatures that may range from 3^0C to 40^0C (may reach –10 ^{0}C) (Mendelsohn, *et al.,* 2002). The rates of evaporation are high (with only 1% of rainfall available to recharge ground water). Namibia also experiences natural inter-annual and inter-decadal climatic variability. These factors interact to make Namibia the driest country south of the Sahara (Republic of Namibia, 2002).

The diverse rangelands, arable land, and mineral deposits make up valuable natural resource base on which the economy of Namibia depends (Karuaihe *et al.,* 2007). These diverse ecosystems provide goods and services that are valuable to both the livelihoods of all Namibians at local as well as national level. Livestock production (beef and small stock [sheep & goats]) is the most common land use on rangelands in Namibia although game farming and mixed wildlife / livestock production is being promoted and is a growing industry (Republic of Namibia, 2002). In Namibia, the majority of the population (about 61%) live in rural areas and depend on agriculture for their subsistence (Republic of Namibia 2002, Kuvare *et al*., 2008). The environment-based tourism is a fast growing and significant industry. In Namibia, biodiversity-based enterprises including the capture and trade in bush meat, skins and other products, hunting etc contribute to the economy. Namibia is a world leader in Community Based Natural Resource Management (CBNRM) programme that addresses both sustainable natural resource management and use and socio-economic development (Long et al., 2004). The conservancy approach has resulted in increase in wildlife, generation of income for local communities and creation of new jobs (NACSO, 2007). For instance, in 2006, consumptive use of wildlife generated about N$8.3 million from conservancies in Namibia. The above indicate that the economy of Namibia largely depends on its natural resources. Most predicted impacts of climate change will adversely affect natural resources. This makes Namibia very vulnerable to impacts of climate change.

According to the MET-ISOER (2004) the top threats to Namibia's environment include land degradation and desertification, water availability and depletion of natural resources. These sectors cover all areas of Namibia and have the potential to impact all levels of the country if their degradation in quality continues. By implementing

management plans and policies directed at improving the quality of these factors, the vulnerability of Namibia to climate change could be drastically reduced.

Socio-economic factors also make Namibia vulnerable to climate change. Namibia has a high proportion (61%) of people that live in rural areas. The population is youthful in character; 39% was younger than 15 years of age. Namibia is expected to have grown by 66% by 2031. The projected increase in the population will exert more pressure on the land and other resources. This will worsen the vulnerability of many people as well as natural resources to impacts of climate change. Poverty, lack of income and lack of employment opportunities greatly worsen the vulnerability of households to impacts of climate (Dirkx *et al.,* 2008). This is because these factors influence the resilience of households to cope with impacts of climate change. About 28.8% of the population in Namibia in 2003/2004 about were categorized as poor on the basis of food consumption rate criteria (Republic of Namibia, 2006. Poor people generally have difficulties to access productive resources. Literacy rates can serve as an indicator of people's changes to have other sources of livelihoods and income. The 2001 housing and Census report revealed that about 42% of the group that had no formal education stated that their main source of income was subsistence farming. This group would be very vulnerable to impacts of climate change on crops and livestock as well as land degradation that is likely to occur due to climate change.

The prevalence of HIV/AIDS pandemic in Namibia is very high (21.3%) according to 2004 UNAIDS report. Women account for more than half of adults estimated to have HIV/AIDS. HIV\AIDS prevalence rates are highest amongst people aged between 25 and 29years and for the young people aged 15-24, women are most affected (Republic of Namibia 2005). HIV/AIDS will adversely constrain agricultural productivity and food security since it will reduce the capacity of the infected to participate in productive activities but also limit their adaptive capacity. Climate change impacts therefore will interact with these limitations amongst the infected and hence increase their vulnerability. In Namibia the 15-59 year olds make up 52% of the population (Republic of Namibia 2003). HIV/AIDS therefore disproportionally affects the most productive segment of the population, which if they live to their adulthood will bear the brunt of impacts of climate change.

It is clear from the foregoing that Namibia is very vulnerable to impacts of climate change due to its geographic location, variability in patterns of climate and climatic variability as well as due to socio-economic factors. The need for a national strategy to address climate change adaptation and mitigation cannot be overemphasized.

2.1.6 Looking to the future

The climate system is very complex and is largely not very well understood. The manner in which the climate system, its components and their interactions will respond to climate change is not easy to study. This is partly because while some impacts of climate change are taking place now, the majority are predicted to occur in future, albeit in decades to come, where there is uncertainty in terms of variability and mean values of weather and other constituent factors. Accurate knowledge of the current Namibian climate as well as identifying areas that are most likely to be affected by climate change in the near future will enable planning and prevention measures to be implemented. This will help reduce the detrimental effects that climate change could have on Namibia in the future.

It is not possible to predict and quantify, with a high level of confidence or accurately, the future effects of climate change, in order to provide accurate basis for development of measures of changes that could be taken to prevent or minimize these impacts. However, the overwhelming evidence of global warming and consequent impacts on climate (IPCC, 2001, 2007) compel us to undertake action and look at the current anthropogenic activities, infrastructure and organizational framework that govern the decisions made in Namibia today. By doing this it will

enable the adequate implementation of practices and investments that are adaptive enough for a number of potential issues that may come up as a result of climate change. This will thereby minimize the risks from climate change. There is a need to come up with cost effective means of addressing climate change issues. Development and implementation of national strategy for climate change adaptation and mitigation is very important.

2.1.7 Climate change mitigation

Global warming, an increase in the earth's temperature, has been attributed to an increase in heat trapping gases, referred to as greenhouse gases (GHG) (IPCC, 2001, Topfer and Hunter, 2002). GHG occur naturally in very low concentrations but substantially high levels of these gases have been detected and attributed to human activities (IPCC, 2001, 2007). Mitigation aims at reducing emissions of GHG and has been and remains the heart of the climate negotiations from the time UNFCCC was agreed upon in Rio de Janeiro, Brazil in 1992 (Box 1).

Box 1: OBJECTIVE OF THE UNFCCC

The ultimate objective of this convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the convention, ***stabilisation of greenhouse gas concentrations in the atmosphere*** at the level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

UNFCCC (1992)

The Kyoto protocol, signed in 1997 set emission targets for developing countries to reduce their collective GHG emissions by at least 5% by the period 2008 and 2012, relative to the 1990 levels. This could be achieved by either cutting emissions directly or increase the 'sinks' of such emissions by planting trees and conserving natural habitats. The Kyoto Protocol also established the basis to allow countries to 'trade' in emissions and a clean development fund' to help developing countries to consider adopting a low-emissions development path that would still meet the needs for energy and growth (Republic of Namibia, 2001).

To date, Namibia has undertaken GHG inventories in 1994 (du Plessis, 1999) and in 2000 (Hartz and Smith, 2008). Both inventories reveal that Namibia contributes very little to global GHG emissions (4,797Gg and 8,9800 Gg CO_2 equivalent in 1994 and 2000 respectively). For comparison USA and Malawi emitted 6,048,786 Gg and 29,114 CO_2 equivalent (Topfer and Hunter, 2002 and DEA, 1997 respectively). However, Namibia is a net 'sink' for GHG based on the estimated amounts of CO_2 equivalents that are removed from the atmosphere from land use change and forestry (-10,560 Gg and -5716 Gg in 2000 and 1994 respectively)(du Plessis, 1999, Hartz and Smith, 2008). The Bali Action Plan (2007) emphasises the need for urgent action, calling Parties to enhance national / international action on climate change by considering 'nationally appropriate actions by developing countries in the context of sustainable development, supported and enabled by technology, financing and capacity building in a measurable, reportable and verifiable manner' (Winkler, 2008).

Although Namibia is a net sink and that its major actions on climate change will address adaptation, some action has been undertaken to address mitigation. The Ministry of Environment has undertaken a national energy review for

UNFCCC in order to assess the cost and benefits of fuel switching for motor vehicles that contribute to GHG, to facilitate adoption of alternative energy technology, to investigate possibility to build local entrepreneurship for CDM projects, to investigate the potential for incorporation of more efficient lighting and energy use technologies in public and private buildings and assess the level of afforestation and agro-forestry activities in relation to climate change (Republic of Namibia, 2007). Namibia needs to solicit or set aside funds for future projects on afforestation and agro-forestry projects, improved energy systems, efficient lighting and solar heating schemes and improved stoves. These while addressing climate change mitigation, will also contribute to sustainable development and realisation of national development goals.

A national strategy on climate change should explore the possibility of how Namibia, as a developing country can benefit from or participate in the global 'carbon market' through the Clean Development mechanism of the Kyoto Protocol .The CDM allow polluters in developed countries to pay for the incremental cost of 'clean development' in developing countries in exchange for the carbon credits so accrued. This stands to be a significant incentive for the private sector in developing countries to participate in climate change mitigation. It could form an important source of financing sustainable development including rehabilitation of degraded rangelands in Namibia. The Africa Ministerial Conference on the Environment help in Nairobi in May 2009 identified the energy sector, reduction of emissions from deforestation and forest degradation, land use, land-use change and forestry (LULUCF) and using and maximising opportunities from the international carbon market as key areas of mitigation which African Governments should tackle.

Although Namibia is not obliged to reduce GHG, being a non-annex 1 country, it stands to benefit from the funds for renewable energy projects through the CDM. True, Namibia's GHG emissions are minimal in a global context yet uses electricity from South Africa that is largely generated mainly by fossil fuels. This is not included in the GHG inventories in Namibia's INC and SNC. Hence mitigation in the form of clean energy and renewable energy should be regarded as a priority.

2.1.8 Climate change adaptation

The IPCC (2001) defines adaptation as the adjustment in natural or human systems to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities. Adapting to climate change is a process of improving society's ability to cope with the resulting impacts (positive and negative) of changes in climatic conditions across time- and policy scales. Adaptation can take two forms; it can either be a specific action, for example changing the crop grown by farmers, also termed autonomous adaptation (FAO, 2007); or a process, for example, of creating a conducive environment which will allow farmers to respond to change, also termed planned adaptation (FAO, 2007). Adaptation can also be a systematic change, such as institutional reforms and changing tenure rights to promote investments the will improve financial security.

As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), Namibia has achieved a great deal to address issues of climate change and to fulfil its obligations under the convention. These include but not limited to: establishment of Namibia Climate Change Committee, Initial National Communication (Republic of Namibia, 2002), Greenhouse Gas Inventory of 1994 and 2000, National Climate Change public awareness, education and dissemination of materials, Assessment of the capacity and needs required to implement Article 6 of the UNFCCC and a country study on MDG7 and Climate Change Challenges and Opportunities. Namibia also established a designated National Climate Change Committee under the Ministry of Environment and Tourism. It is a technical committee that draws its membership from selected government Ministries and other organisations. Its role is to advise government on issues of climate change adaptation and Mitigation. A special climate change Unit,

with a Climate change coordinator, has been operational since the early mid 1990' within the Directorate of Environmental Affairs. The Ministry of Environment and Tourism has been designated as the Namibia Designated National Authority on Climate Change.

The MET strategic Plan also outlines some priority climate change adaptation activities aimed amongst other, at raising public awareness of impacts of climate change. Several climate change specific studies initiated through the Ministry of Environment and Tourism (MET) have been conducted and some are still ongoing. These include Namibia's in-depth study on climate change vulnerability and adaptation assessment; Research on farming systems needs to enable adequate adaptation to climate change and Adapting to climate change through the Improvement of Traditional Crops and Livestock Farming (CCA) in Namibia. In addition, the Second National Communication Project focused on the following:- development of programs on adaptation to climate change, in-depth vulnerability assessment, research needs of farming systems change (enable adaptation), public awareness education & training programs, Afforestation & agro-forestry and development of a National strategy on climate change and adaptation Namibia has received funding for some of the above studies from the UNDP/GEF. Namibia has received further support for climate change adaptation through UNDP to undertake a four years Programme of up to US$4 million to support the establishment of national framework that will address all future climate change adaptation. This project is funded by the Government of Japan.

Despite all that Namibia has undertaken and achieved to address issues of climate change, there is no national policy that specifically addresses climate change. A Namibia Climate Change Policy would provide the legal framework to address climate change. Furthermore, the accompanying Strategy and Action Plan would facilitate implementation of relevant and pertinent climate change issues in order to achieve sustainable development as well as attain Millennium Development goals. The present discussion paper is part of the background activities of Namibia under the second national communication to develop a national climate change policy and strategy and accompanying action plan.

2.1.9 Awareness raising, education, information and public participation

Climate change will affect many sectors in Namibia. Many impacts of climate change will also be area specific hence requiring area-specific actions for adaptation. It will not be easy and effective to undertake both autonomous and planned adaptation if little is known about causes of climate change, how it will impact different sectors and areas. In order to make well-informed decisions, information is an important tool especially in the context of climate change where there is high uncertainty. Targeted information, its source (s), the target group, and how it will be used are important elements for determining the impacts and response that such information will generate. For instance, farmers will need timely and area-specific early warning weather information to enable them to make decision on when to prepare gardens for planting and varieties of crops to plant. Knowledge of potential drought would enable them decide how much of their farm produce should be sold, stored or consumed to ensure food security (FAO, 2008).

Article 6 section (a)(i-iv) of UNFCCC affirms the commitment of Parties that they will develop and implement educational and public awareness programs on climate change and its impacts, promote and facilitate public access to information on climate change and its effects, promote public participation in addressing climate change and its effects and develop adequate responses as well as train scientific, technical and managerial personnel (UNFCCC 1992). Namibia has taken action to address requirements of Article 6 of UNFCCC and related environmental issues.

These include:

- Production of the Initial Communication Booklet, poster and factsheet on climate change in Namibia in 2003. This booklet has been translated into 4 vernacular languages to promote public awareness.
- Completed a study to assess the capacity and needs required to implement Article 6 of the UNFCCC in Namibia in 2005. The study revealed that most stakeholders including those highly likely to be impacted by climate change e.g. farmers, had very little understanding of how climate change will affect them.

Public awareness is important because it empowers various stakeholders, especially local people and commercial farmers, to undertake adaptive response activities. Access to and understanding of climate change information on the other hand will be an important decision-making tool for adaptation and mitigation. For instance, the most vulnerable, including farmers, women, the poor, the youth, need to know causes and effects of climate change, adaptive coping mechanisms to effects of climate change such as growing of short maturing varieties of the millet Okashana in North Central Namibia. They need to know safety nets and buffers for the time of adversity caused by impacts of climate such as harvest failure due to drought (Mfune and Ndombo, 2005).

The importance of climate change awareness and understanding is affirmed by the objectives of the Nairobi Work Programme (NWP) on impacts, vulnerability and adaptation to climate change. The objectives of NWP are to improve the understanding ability of Parties especially those from developing countries to be able to assess impacts, vulnerability and adaptation. The other aim of NWP is to assist all Parties to make informed decisions on practical adaptation actions and measures to respond to climate change on the basis of a sound scientific, technical and socio-economic basis taking into account current and future change and variability. Hence a national climate change strategy should contain amongst others, programs and activities that will promote awareness, education, public participation and provision of targeted climate change information. A well informed society is an empowered society

2.2 Rationale for a climate change strategy

The Government of Namibia is committed to socio-economic development in order to develop its human resource and reduce poverty through sustainable development. This is enshrined in the constitution of Namibia and is also articulated in the Vision 2030 and the medium-term development goals as detailed in NDP3. The NDP 3 theme, *"accelerating economic growth through deepening rural development*" between 2008-2012, affirms the Government's commitment to improve the living standards of the people of Namibia especially the rural population that make up about 61% of the population Karuaihe *et al*., 2007). The signing of the Millennium Declaration and progress that has been made towards attainment of Millennium Development Goals (MDGs) testifies further that Namibia is on the path to achieve its development goals. However, there are many changes which beset Namibia.

In addition to many development challenges which Namibia faces (see Box 2), climate change is an additional stressor that may derail the achievement of national development goals through sustainable development if not checked. Despite what Namibia has undertaken towards climate change adaptation and mitigation, the need for a Namibia-specific climate change strategy and action plan is justified by several pertinent issues, outlined below;

Box 2. Namibia's Development Challenges

- Poverty and inequality.
- Human health and welfare including HIV/AIDS.
- Land issues including equitable access to land and sustained productivity.
- Devolution and governance.
- Improve access to existing knowledge and generate new knowledge regarding issues that affect sustainable development.
- Limited human resources and capacity.
- Limited water resources.
- Unsustainable natural resource management and loss of wildlife and biodiversity.
- Gender equality and women's empowerment.
- The need for a stable macro-economic environment.
- Population growth and settlement patterns.
- Increasing competition for shared resources.

Source: MET-UNDP-NNF, 2002

- There is need to mainstream climate change adaptation and mitigation in the medium- to long-term national development goals. Predicted impacts of climate change will adversely affect the extent and magnitude as well as the speed at which national development goals and MDGs will be achieved.

- Causes and effects of climate change are complex and transcend different sectors, and some elements cross-cutting, yet many policies and programs are developed and implemented by sector, with no due consideration of common elements. The need to enhance synergies among sectors will be facilitated by national strategy on climate change.

- In order to adequately tackle climate change adaptations and mitigation, the capacity of government ministries and agencies, the private sector and civil society must be strengthened. In Namibia, limited human, institutional and financial capacity to adapt to effects of climate change justifies the need to develop a strategy that will enhance synergies amongst various climate-change sensitive sectors (Mfune and Ndombo, 2005). This will ensure cost-effectiveness and greater and efficient implementation of cross-cutting climate and climate change related activities.

- Adaptation and mitigation to climate change is very expensive hence will require substantial funding (UNDP, 2008). Inadequate financial and other resources hinder achievement of national development goals. There is need to identify targeted funding that address specific climate change issues in different sectors. To avoid competition for the same funding, a national strategy would help prevent these problems.

- Climate change will have different effects in different parts of Namibia (Mfune and Ndombo, 2005, Dirkx *et al.,* 2008). Different sectors as well as people will be affected differently and hence responses for adaptation will also differ. For instance, people living in flood prone areas will adapt will need to have better ways of forecasting floods. For farmers, they will need to receive early warning regarding onset of rains or possibility of droughts to enable them make decisions on what varieties of crops to plant and time of planting. There is need

therefore to enhance awareness of impacts of climate change and possible adaptive options as well as coping strategies. Differential impacts of climate change will necessitate development of area-specific climate change strategies. A good such example is the community information toolkit on adaptation, titled 'Natse Otweya', meaning 'we are also coming' (IECN, 2008). This toolkit is a resource package developed for farmers in the North-Central Regions in Namibia on climate change adaptation. Therefore a national climate change strategy will facilitate development of public awareness messages, access to information as well as resources.

- Climate change is poorly understood by local communities, policy-makers, natural resource managers, technicians, scientists and even farmers (Mfune and Ndombo, 2005). Stakeholders that will receive the brunt of effects of climate change need to have information on the nature of climate change impacts, extent of impacts and how to adapt to such impacts. For example, people living in flood-prone areas will need advance warning of flooding and how to respond. Appropriate action to impacts of climate change will only be possible if stakeholders receive or have relevant and timely information. A national strategy will constitute an important vehicle to collect and disseminate target-specific climate change adaptation actions and responses.

- The development and transfer of technology (e.g. renewable energy technologies, water harvesting, drought – resistant varieties etc) is critical to addressing both mitigation and adaptation (Bali Roadmap, 2009, Nairobi declaration of the African process for combating climate change, May 2009). Technology may enhance development of responses that will enable different stakeholders to adapt to impacts of climate change. For instance. Development of drought- tolerant livestock breeds will contribute to both food security and income for local farmers. Low carbon technologies will contribute to economic growth while reducing GHG emissions. A national climate change strategy will ensure the growth path adopted by the government will contribute to industrialisation and economic growth but also ensure environmental sustainability while addressing climate change adaptation and mitigation.

- Climate change is a global problem and its impacts do not respect national boundaries. For example, while Namibia does not contribute significant amounts of GHG, yet she is very vulnerable to impacts of climate change. Since all Parties to UNFCCC are obliged to undertake specific activities, there is already a wealth of information and data as well as good adaptation and mitigation practices that can be shared. National, regional and global collaborations and networking on climate change will best be achieved through a national climate change strategy.

- Namibia has no policy on climate change. The national strategy will be a necessary tool to facilitate climate change adaptation and mitigation to reduce its impacts on socio-economic development of the country. In addition, the strategy will constitute a framework that will ensure effective implementation of obligations of UNFCCC.

3 Guiding principles for Namibia's climate change strategy

The development of Namibia Climate Change Strategy and Action Plan is based on some guiding principles outlined in the NEW Delhi Work Programme and also on the basis of the building blocks of the Bali Action Plan. The Namibia Climate Change Strategy is therefore guided by the following principles:-

3.1 Mainstreaming climate change into the policy and legal framework and development planning

In order for Namibia to achieve its Vision 2030 goals, climate change issues must be integrated into its national Development Planning. Climate change is an additional stressor to many factors that affect achievement of national Development goal. Therefore mainstreaming climate change into National Development planning will ensure that climate change is included as a priority that needs to be addressed in development plans. This will facilitate due attention to climate change by various sectors and enable annual budgeting for climate change activities relevant to respective Government Ministries and Departments. This will also help mobilise funds both in-country and from other sources to implement climate change activities.

3.2 Sustainable development and ensuring environmental sustainability

The Namibia climate change will also be guided by sustainable development and environmental sustainability. Namibia has embraced the principle of sustainable development as an important cornerstone as outlined in the constitution, Vision 2030, and NDPIII. The goal of sustainable development is that development activities(social-economic) carried out to provide better livelihoods for the present generations do not compromise that ability of natural resources and ecological systems to provide for future generations. Achievement of sustainable development will ensure environmental sustainability. In this regard, activities undertaken to address adaptation and mitigation of climate change should be guided by sustainable development and environmental sustainability.

3.3 Country-driven and specific climate change interventions

The effects of climate change will vary between countries and in different parts of each country. Different parts of Namibia will be impacted differently by climate change. The New Delhi Programme recognises the need to establish a country-driven work programme that will enhance co-operation, coordination and exchange of information among governments, intergovernmental and non-governmental organisations and community-based organisations and private and public sectors. A country–driven programme will ensure that proposed actions address specific needs and circumstances in Namibia and reflect national development priorities (Mfune and Ndombo, 2005). This can also be extended to community-specific strategies and action plans that will address local climate change issues. Local or country-specific actions, developed through participation and dialogue will ensure a shared vision, acceptance and implementation of planned activities (Vision 2030).

3.4 Stakeholder participation in climate change policy implementation

Causes and effects of climate change are complex and transcend different sectors. The uncertainty of some effects of climate change and the fact that most effects will occur in future, necessitate the need for concerted effort and co-operation of different stakeholders from different sectors that may contribute to causes of climate change or those who will implement action plans that address climate change. Being cognisant of financial constraints and inadequate human and material resources to implement UNFCCC activities, and the need to avoid duplication of

activities, the strategy will be developed on the principle of cost-effectiveness. In addition the strategy will be developed through consultative process to foster ownership of strategy and ensure effective implementation

3.5 Awareness generation, education, training and capacity building

Climate change is perhaps the greatest environmental challenge confronting humankind in the twenty-first century. While there is scientific evidence that climate has changed significantly due to anthropogenic causes, there is more that needs to be understood especially by the majority who will bear the brunt of effects of climate change and those that need to take action to adapt and mitigate climate change. The development of a country's human, scientific, technological, organisational, and institutional and resources capabilities to address climate change (Capacity-building) (United Nations, 1992) cannot be overemphasised. In order to effectively address climate change, there is need to enhance awareness of climate change issues amongst the people and all stakeholders and also facilitate their participation to address climate change adaptation and mitigation. The New Delhi Work Program of Article 6 is emphatic that public awareness programs on climate change should be developed, promoted and implemented by each party to the UNFCCC. In Namibia, the need to raise awareness and strengthen capacity to adapt (public participation) is further highlighted in the National Biodiversity Strategy and Action Plan. The principle of awareness and participation of all stakeholders will be integrated into the Namibia climate change strategy and action plans.

3.6 Cost effectiveness

Women and the youth especially children are more prone to poverty, lack of income, poor access to productive resources and lack of employment opportunities (Dirkx *et al*., 2008). Yet women make up over half the population of Namibia. On the other hand, the youth are most likely to experience predicted future impacts of climate change when they become adults (Mfune and Ndombo, 2005). The women and youth are most likely to bear the brunt of the effects of climate change. In order for Namibia to realise its development goals especially poverty reduction and improved living standards especially of rural people including women and children, in the face of challenges of climate change, the strategy on climate change adaptation and mitigation shall be guided by the principle of mainstreaming gender and youth.

3.7 Sustainable and equitable use of natural resources

Namibia, its people and economy, has a strong reliance on natural resources. It is thus imperative ensure at all times the sustainable and equitable use of natural resources as catered for in existing policy, legal and development instruments and, where necessary to enhance the enabling environment.

3.8 Human rights-based development

A national policy should recognise and embrace fundamental human rights and must recognise the prediction that the most severe effects of climate change will be felt by the rural poor in general, women, children and marginalised groups/ individuals. The practicing of human rights-based development in accordance with national and international laws must be ensured at all times during the planning, development, implementation and monitoring and evaluation (M&E) of climate change response activities.

3.9 Transparent planning and decision making

Participatory/ consultative planning and decision making is at the heart of Namibia's climate change response. Openness and sharing of information promotes transparency, and will garner support and trust from those people who would participate in the planning, development, implementation and M&E of response activities that will impact their lives. In addition to ensuring transparency, participation will ensure the identification and use of appropriate traditional knowledge in climate change adaptation.

3.10 Mainstreaming gender, children and the vulnerable

The mainstreaming of gender, child welfare and issues pertaining to vulnerable groups must be included in climate change responses at local, regional and national level. This mainstreaming shall be integrated into existing policies and laws and shall be led by the Ministry of Gender Equality and Child Welfare with support from other government agencies (especially at local and regional levels), non-governmental organisations (NGOs) and community-based organisations (CBOs).

3.11 Vulnerability

Given Namibia's vulnerability to climate change risks and impacts, it would be imperative to develop adaptation and mitigation measures to address the most vulnerable groups of society and sectors. This will ensure that Namibia's response to climate change is focused, and helping to sustain the livelihoods of the most vulnerable and the socio-economic and economic viability of sectors.

4 Proposed strategic aims of the strategy

The Namibia climate change strategy is divided into three aspects namely Adaptation, Mitigation and Cross-cutting issues for adaptation and mitigation. The strategy will take a thematic approach in order to address each aspect. Adaptation is addressed through 3 themes, namely: food security and sustainable resource base, sustainable water resources, human health and well being and infrastructure, while sustainable energy and low-carbon development and transport will address the aspect of mitigation. Cross-cutting issues will be addressed by the following themes:- capacity building, training and institutional strengthening, research and information needs, public awareness, participation and access to information, disaster reduction and risk management, financial, resource mobilisation and management, international cooperation and networking and technology development and transfer and legislative development. The thematic approach adopted in this strategy is based on key sectors which the African Ministerial Conference on the Environment identified in the framework of the African climate change adaptation program (AMCEN, May 2009). These key sectors include agriculture, water, coastal zones, health, infrastructure, biodiversity and ecosystems, forestry, energy, urban management and tourism. For mitigation, the conference identified the energy sector, reduction of emissions from deforestation and forest degradation, land use, land-use change and forestry (LULUCF) and use and maximising opportunities from the international carbon market. Transport is also highlighted as a key issue for climate change adaptation and mitigation.

4.1 Adaptation

4.1.1 Food security and sustainable resource base

In Namibia, climate change is predicted to severely influence variability of rainfall, shortening of rainy season, increases in temperature, increase potential evapo-transpiration and sea level rises etc. Predicted increases in aridity

and hence droughts will in turn influence agricultural production, forestry, fisheries resources, water resources, biodiversity as well as different ecosystems. These impacts will affect food availability and supply. Climate change will negatively impact on food security and the natural resource base in Namibia. In particular, the poor and vulnerable, especially women and children will be severely affected. Therefore, under the theme of food security and sustainable resource base, the following strategic aims shall be undertaken:-

Agriculture

- Development of climate resilient cropping/ agriculture / production systems
- Development of climate resilient crop varieties / cultivars
- Diversification of agriculture and livelihoods
- Development of climate resilient livestock breeds
- Adaptation against drought

Forestry

- Conservation, utilisation and sustainable development of forest resources

Fisheries and aquaculture

- Conservation, utilisation and sustainable development of fisheries and aquaculture (incl. marine and freshwater aquaculture)

Coastal zone

- Conservation, utilisation and sustainable development of the coastal zone and its resources

Biodiversity and ecosystems

- Conservation, utilisation and development of biological resources and maintenance of ecosystems to ensure environmental sustainability

4.1.2 Sustainable water resources

Water is important for all forms of life. The availability of water, amongst many factors, sets the limit to the amount of life that can exist in a landscape. Water is a vital resource for human survival and economic development. As human populations and economies grow, so does the demand water while the availability of the resource may remain relatively unchanged.

The major categories of water sources in Namibia are perennial surface water, ephemeral surface water and ground water (Republic of Namibia, 2002). The perennial wetlands of Namibia include the following rivers that form the northern and southern boundaries of the country; the Kunene in the northwest, the Okavango, Kwando/ Linyanti and Zambezi/ Chobe in the north east and the Orange/ Gariep in the south. Then only permanent natural wetlands that are within Namibia are the sinkhole lakes Otjokoto and Guana, the subterranean lakes in Aigamas and Dragon's Breath Caves and pools and streams associated with springs and seeps (Dirkx *et al*., 2008). Namibia also has several man-made dams that are scattered throughout the country, most of which are managed by Namwater and the

Department of water Affairs. The seasonal ephemeral rivers, scattered through Namibia, are dry for most of the year and only flow after good rains. Most of them flow westwards. The most important ephemeral system from a human use point of view is the Cuvelai delta system situated in the central north where about 25% of the people of Namibia live. This system comprises a network of natural channels and pools (Oshanas) that are seasonally flooded mainly by water from Angola which flows southwards ((Dirkx *et al*., 2008).

Water is a vital resource in Namibia. Water is used for agriculture, households, livestock, fishing, mining, manufacturing, and other services including government. The agriculture sector in 2002 was estimated to use up to 75% of all available water. Household use accounted for about 12.2% of water demand. The demand for government services and mining and manufacturing accounted for 8% and 6 % respectively.

Predicted rise in temperature, variability in rainfall due to climate change will adversely affect water resources. The combined effect of climate change and predicted water demand due to population growth and development indicate that water resource management needs special attention in order to safeguard the available water resources while meeting the demands of competing needs for water. The need for integrated water resources management therefore cannot be overemphasized. The Climate change strategy will therefore undertake the following regarding water resources:-

- Conserve and manage watershed / catchment areas
- Promote integrated development and management of water resources
- Promote conservation and sustainable utilisation of water resources
- Improve trans-boundary cooperation regarding water resources
- Support institutional and human capacity building in water resources management and use

4.1.3 Human health and wellbeing

One of the objectives of Vision 2030 is *"ensure a healthy, food-secured and breastfeeding nation, in which all preventable, infectious and parasitic diseases are under secure control, and in which people enjoy a high standard of living, with access to quality education, health and other vital services, in an atmosphere of sustainable population growth and development"*. Namibia's commitment to health and well being of its citizens was further evident when she signed the Millennium Declaration that compel Namibia to achieve Millennium Development goals which among the 8 include reduction of child mortality (MDG4), improved maternal health (MDG5) and combating HIV/ AIDS, malaria and other diseases (MDG6). The inclusion of health issues in the medium term national development goals (NDP3) under Key Results Area 5, Quality of life is further testimony of the importance which the Government of Namibia attaches to health and well being of Namibians. Protecting health from the impacts of climate change is an emerging priority for the public health community (WHO, 2009). Improved risk assessment is necessary to inform decision-makers about the broad range of health impacts due to climate change.

Climate change may increase the prevalence of some vector-borne diseases (e.g. malaria) and vulnerability to water, food or person-person borne disease (e.g. cholera) while predicted decline in quantity and quality of drinking water will affect good health (DFID *et al*., 2002). Poor sanitary conditions due to predicted floods in some areas as well as malnutrition due to reduced crop yields and reduced livestock productivity will increase child mortality. The strategy will therefore address the following:-

- Adaptation to climate change related health risks
- Assessment of impacts of climate change on human health and well being

- Expansion of health facilities and network to remote areas
- Improve capture, management, storage and dissemination of health information
- Improve access to sanitation and water
- Increase human resources capacity and improve efficiency
- Support action plans against HIV/AIDS

4.1.4 Infrastructure

Climate change is likely to affect infrastructure. Impacts may be caused by increases in temperature, more frequent and intense rainfall events, rising sea levels and sustained and extreme droughts. Buried infrastructure may be affected by changes in soil temperatures. More intense and frequent rainfall events can challenge water, wastewater and sewerage treatment systems for instance by increasing turbidity and sedimentation, or cause direct flood damage to above ground aquifers. These may increase corrosion of buried infrastructure. Predicted impacts of climate change in Namibia are likely to affect infrastructure including houses, buildings, roads, railways, dams, water pipes, electricity transmission, sewerage and communication and drainage systems. High sea level rise inundate coastal towns including Walvis Bay, Namibia's only deep water harbour and the diamond and fishing harbour of Lüderitz. In highly populated areas of north central and north east Namibia which are flood-prone, houses are frequently destroyed and roads flooded, restricting access to homesteads. Impacts of climate change on infrastructure will further be severe where housing and settlements are poorly planned and developed. The economic cost of impacts of climate change on infrastructure damage, insurance claims and repairs and reconstructions, though not easy to estimate, is likely to be very high. The strategy shall therefore need to address impacts of climate change on the coastal zone, transport sector and housing and settlement and shall therefore:-

Coastal zone

- Develop a climate change infrastructure risk assessment guidelines and methodology
- Improve drainage and sanitation facilities in rural and urban areas
- Adaptation to floods
- Adaptation against future sea level rise

Housing and settlement

- Improve infrastructure spatial planning and development in urban and rural areas
- Improve formal and informal settlement patterns and housing
- Climate-proof existing and future housing and other infrastructure

4.2 Mitigation

4.2.1 Sustainable energy and low carbon development

Namibia does not contribute significant amounts of greenhouse gasses to global emissions (du Plessis, 1999 and Harts and Smith, 2008). Although Namibia will be preoccupied with climate change adaptation because of its vulnerability to climate change, activities to mitigate shall be carried out to contribute to GHG reduction but more importantly to make positive contribution to the development path especially on energy use. The 2000 Namibia's

greenhouse gas inventory revealed that agriculture and energy sectors are the most important sources of emissions while the land-use change and forestry sector is most important with respect to removal of emissions (Harts and Smith, 2008). Hence the energy sector is a high priority for climate change mitigation in Namibia (Republic of Namibia., 2007). As a developing country, the development path that will be adopted especially with regards to energy (e.g. low carbon development path vs. high carbon path) and policies on developments in agriculture and the land-use change and forestry sector will influence the extent of contribution of Namibia to stabilising GHG and hence climate change mitigation. As Namibia becomes industrialised, in line with Vision 2030, it is most likely that we shall need to develop or transfer some technologies from developed countries to ensure that Namibia follows a low-carbon path growth. The Namibia strategy on climate change adaptation and mitigation will therefore:-

- Improve efficiency of energy production and use
- Develop and improve renewable energy
- Reduce GHG emissions from Agricultural sector (crops and livestock) sector
- Reduce GHG emissions from land use, land-use change and Forestry
- Reduce GHG emissions from Industries (e.g. construction, mining)
- Enhance GHG sinks
- Manage rural and urban waste

4.2.2 Transport

Transport is an important socio-economic sector in Namibia considering the sparse population and heavy reliance of importation of many commodities from South Africa. The transport infrastructure in Namibia is well developed and highly rated (Republic of Namibia, 2002). The transport sector includes railway, roads networks, sea and air travel. Railway engines are diesel powered. Namibia has recently intensified extension of the railway lines to the densely populated north-central regions of Namibia and to the neighbouring Angolan border. In addition, construction of railway line to connect the Walvis Bay harbour to neighbouring countries such as Zambia, Zimbabwe and northern Botswana. Passenger transport, mainly through taxi services (sedans) and minibuses and long distance buses is on the increase. Air travel, especially for tourists and business people, is also gaining popularity. There is high mobility of people in Namibia as reflected in the increasing number of cars registered in Namibia. The populations of vehicle in Namibia is dominated by passenger sedan and light commercial vehicles; these two comprised about 88% of the national registered vehicle population in 2007 (Republic of Namibia (2007).

Vehicles contribute their share to GHG emissions. In Namibia in particular, long haul national and international road transport of commodities and cargo as well as passengers within and without Namibia contribute to GHG through exhaust emissions of carbon. In 2004, transport was responsible for 23% of world-wide energy related GHG emissions and 74% of these were induced by road vehicle usage (Creutig and He, 2008). The spectre of increased vehicle ownership and usage in Namibia implies that there is a resulting increase in GHG emissions even if it may contribute little to the global GHG emissions. In addition, such increase may result from usage of old, used highly polluting vehicles. Wright and Fulton (2005) state that emissions from the transport sector represent the fastest growing source of GHG in the world. They argue that as developing nations quickly move to catch up with the motorisation levels of developed nations, the sheer number of private vehicles may overwhelm any advances made in cleaner fuels. It is not surprising that IUCN recommended to the COP14 that Parties should urgently plan and promptly implement policies and measures for mitigation, with special attention to land use, land use change, forestry, agriculture, livestock and from energy, transportation and urban and industrial sectors of their economies (UNFCCC COP14 agenda item 4).

In Namibia, transport fuels make up a large proportion of energy demands. Since the transport demand is closely linked to economic growth, petroleum products will continue to dominate energy use both now and in the future (Republic of Namibia, 2007), despite the polluting nature of these fossil fuels. Vehicle fuels such as Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG), ethanol and methanol and bio-Diels can be used but in Namibia, only LPG for petrol driven vehicles is available (Republic of Namibia, 2007). The advantage of these alternative fuels is that they are less polluting. The Namibia Climate change strategy recognises that the transport sector can contribute to climate change mitigation and therefore will:-

- Promote the development of alternative modes of service delivery that will reduce carbon emissions
- Promote development of climate change resilient transport infrastructure
- Diversify transport energy sources
- Improve motor vehicle fuel efficiency
- Promote use of public transport

4.3 Cross cutting issue for adaptation and mitigation

4.3.1 Capacity building, training and institutional strengthening

The complex nature of climate change requires the involvement of well-trained scientific, technical and managerial staff who will not only understand climate change but also be involved in adaptation to climate change (Mfune and Ndombo, 2005). It will also need institutional structures that are adequately equipped and able to provide facilities and finances to support programs and activities of climate change adaptation and mitigation. Section 2(d) of Article 9 of the UNFCCC calls on parties to provide advice on "ways and means of supporting endogenous capacity building in developing countries" while article 6 of UNFCCC states that parties shall promote and as appropriate, facilitate and cooperate on education, training, outreach and public awareness. Capacity building for climate change hence refers to the development or strengthening of personal skills, expertise and relevant institutions and organisations to reduce GHG emissions and / or reduce vulnerability to climate-related impacts or adaptation to such. Capacity building should involve multiple stakeholders, including the government, NGOs, research institutions, local communities and international organisations. Building human and institutional capacity to address climate change must be a fundamental component of the Namibia climate change strategy. For instance, Nangula and Zeidler, 2004) state that lack of competent technical experts poses a serious capacity bottleneck in specialised fields and climate change is such one field. Hence the strategy will:-

- Strengthen human resource capacity building for climate change
- Main-stream climate change in national, local and sector policies, development plans & program
- Strengthen institutional capacity for climate change management
- Mainstream climate change in the media
- Develop and implement educational program on climate change and its impacts
- Promote and facilitate development of educational materials on climate change
- Facilitate and support training of scientific, technical and managerial personnel in climate change
- Develop disaster risk reduction capacity building plans and programmes for climate change.
- Establish Climate Change Resource Centre and Climate Change database

4.3.2 Research and information needs

Although there is scientific evidence that indicate that climate has changed significantly over and above that caused by natural variability due to man-made (anthropogenic) interference in the climate system, (IPCC, 2001) climate change and its impacts are not well understood. Many stakeholders including scientists, policy makers and more especially the vulnerable people in rural areas of developing countries do not understand climate change. Little is known regarding the manner in which the climate system, its components and their interactions will respond to climate change. This may be due in part to the complex nature of the climate system. However, while some impacts of climate change are taking place now, most are impacts are predicted to occur in future decades where there is uncertainty in terms of variability and mean values of weather and other constituent factors. Predicting impacts of climate change is a subject of great research and modelling. Furthermore, there is need for clearer understanding of how GHG, human activities and the climate system interact to lead to global warming and how changes to these factors will influence climate change in future. Many impacts have been predicted to take place due to climate change yet these are poorly understood, for instance in terms of extent of such impacts, when they are likely to take place, mechanism of how impacts will occur and their magnitude. Little is known about how to estimate the cost of impacts of climate change adaptation and mitigation. Many local indigenous communities around the world have a wealth of knowledge on coping with disasters such as crop failure, flooding, etc. that can be enhanced to adapt to impacts of climate change yet most of this is not well documented. Since there are so many unknowns (too many to list here) in relation to climate change issues, there is need to undertake research especially in order to quantify the likely impacts and development of practical solutions for adaptation and mitigation.

- Collect data and model climate change an national, regional & local levels
- Monitor ecosystem and biodiversity changes and their impacts
- Conduct climate-proof research
- Undertake research on sea level rise
- Establish a centre for research and training on climate change
- Conduct inventories on traditional / indigenous knowledge and coping practices
- Undertake studies on the cost of adaptation and mitigation
- Study macroeconomic and sectoral impacts of climate change

4.3.3 Public awareness, participation and access to information

Climate change is likely to exert its greatest impact on natural resources and hence threaten the livelihoods of the majority of local people who live in rural areas in Namibia. Public awareness will empower stakeholders, especially local subsistence and commercial farmers to participate in adaptive response activities. One objective outlined in Vision 2030 is transformation of Namibia into a "*knowledge-based..... nation*" and a sub-vision of the same is to consolidate, improve and utilise the wealth of the country's so of reliable and accurate and current information on aspects of its population for the country's socio-economic development planning and programme management. It is for the importance of such objective that the theme of *'knowledge-based economy and technology driven nation'*, was included in NDP3. In order to effectively address adaptation and mitigation, the public needs to be aware and have access to accurate, up-to-date information in order for them to effectively participate in climate change issues. The strategy therefore will undertake the following:-

- Awareness raising and public education on climate change
- Promote and facilitate development of public awareness materials on climate change
- Facilitate access of climate change information to the public

- Promote public participation in addressing climate change and development of adequate responses

4.3.4 Disaster reduction and risk management

In the Bali Action Plan (paragraph 1(c)), UNFCCC Parties recognizing that climate change will lead to many disasters, included consideration of *"risk management and risk reduction strategies, including sharing and transfer mechanisms such as insurance, disaster reduction strategies and means to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change"*, as part of action for adaptation.

Namibia's economy and livelihood is depended on natural resources and agriculture. Namibia has lately experienced natural disasters such as floods and droughts. In 2009 for instance, many communities were severely affected by floods, in the north central regions, Kavango region and the Caprivi region with consequent severe damage to infrastructure, loss of crops and livestock as well as human life. The predicted impacts of climate change are likely to increase the frequency of such disasters. The majority of rural people in Namibia who are generally poor and vulnerable will be most adversely affected by such disasters.

The goal of disaster risk management in Namibia is to contribute to attainment of sustainable development in line with sustainable development in line with Namibia's Vision 2030 through strengthening national capacities to reduce and build community resilience to disasters by 2015. Namibia is also committed to international risk reduction initiatives such as the Hyogo Framework for Action and the Africa Regional Strategy for Disaster Risk Reduction. The disaster risk management strategy views disaster risk reduction as a frontline defence in adapting to impacts of climate change. Recently, a Disaster Reduction and Risk Management Policy has been developed.

In order for the Government and other stakeholders to adequately prepare for and respond to disasters and provide adequate support to disaster victims and for the local communities that live in disaster-prone regions to adequately prepare and respond appropriately, the strategy will ensure:

- Improvement of disaster forecasting and early warning systems
- Improvement of disaster preparedness and post-disaster recovery
- Manage risk against loss of income, property and livelihoods
- Develop climate change impact and risk assessment programme
- Institutionalise and strengthen risk disaster management, create mechanism and capacities at all levels of government and communities.

4.3.5 Financial resource mobilisation and management

Adequate resources, including finances are required in order to undertake climate change adaptation and mitigation. The New Delhi Work programme recognises the need for adequate financial and technical resources to ensure effective implementation of activities of Article 6 of UNFCCC. Since Namibia contributes very little to greenhouse gas emissions, its preoccupation focuses on adaptation to effects of climate change. Financial and other resources are therefore needed. UNFCCC through the Bali Action Plan also recognised the importance of funds. The fourth pillar of the Bali Action Plan is adequate and timely flow of funds for investment within the framework of food, energy, water and livelihood security. Since all activities of climate change adaptation and mitigation will require financial and other resources, the national strategy will:-

- Identify resource requirements including funding to support implementation of climate change activities

- Facilitate access to and efficient management and use of resources(credit, education, decision-making) including funds for climate change adaptation and mitigation

4.3.6 International cooperation and networking

Climate change is a global problem and its effects cross national boundaries. For instance, Namibia though contributes very little to greenhouse gasses, yet it will suffer adverse effects of climate change. Hence the global nature of the effects of climate change necessitates exchange and sharing of data, information and expertise at regional and international level in order to enhance appropriate and effective responses. There is a wealth of data on climate change adaptation and mitigation programmes and activities as well as good case studies from different Parties to the UNFCCC which can be shared and some adopted and adapted. In order to tap into this wealth of data to benefit efforts by the Government of Namibia in its quest to address climate change adaptation and mitigation, the national strategy will:-

- Strengthen and enhance international collaboration, linkages and networking among stakeholders involved in environment and climate change related issues
- Participate in regional and international cooperation programs and activities on climate change
- Promote international North-South and South-South collaborative research that will facilitate generation of Climate change adaptation and mitigation evidence-based information.
- Facilitate achievement of UN environment international obligations under various Conventions especially UNFCCC and Treaties

4.3.7 Technology development and transfer

In order to address climate change mitigation and adaptation, the need for development of new technologies and transfer of technologies cannot be overstated. New and clean energy technologies need to be developed to reduce greenhouse gas emissions while technologies also need to be developed to address climate change issues related to water shortages for agricultural production, drought resistant crop varieties and livestock breeds and food security. The African Ministerial Conference on the Environment in May 2009 in Nairobi reaffirmed that the development and transfer of technology are critical to the achievement of both adaptation and mitigation programmes in Africa. Technology transfer (and development) is one of the four pillars of the Bali Action Plan. The role of technology in the socio-economic growth of Namibia is enshrined in both Vision 2030 and the NDP3 (one key Results Area of NDP 3 is knowledge based economy and technology driven nation). The Namibia strategy to address climate change mitigation and adaptation will therefore:

- Promote and support development of technologies for mitigation and adaptation
- Promote and support technology transfer for mitigation and adaptation

4.3.8 Legislative development

The government of Namibia has many legal and policy instruments that have been developed and are in use in order to achieve national development goals. Examples include the Constitution of Namibia, NDP3, the National land policy, the national drought Policy and strategy, the Agriculture Policy, the poverty reduction strategy of Namibia, the Desertification policy and the national policy and strategy for malaria control just to mention a few. Most of these sector specific policies were developed without due consideration of climate change because at that time, climate change was not an issue. However, at present it is known that climate change will affect some of these sectors and therefore it needs to be considered. For instance, climate change is expected to severely affect the

agriculture sector and so the Agriculture Policy needs to integrate climate change issue in order to address predicted impacts of climate change. While some sector policies may have elements of climate change, there is need to identify issues of climate change commonality amongst sector policies in order to enhance synergies to facilitate cost effectiveness and to avoid duplications of effort. A climate change strategy is overdue for Namibia which is under serious threats from climate change. A climate change strategy and action plan will help to integrate policies across sectors. On the other hand, new policies may also be developed to address climate change where they are not available. Namibia does not yet have a national policy that specifically addresses climate change. The need for a Namibia policy on climate change is overdue when one considers the vulnerability of Namibia to climate change. Hence the Namibia climate change strategy will:-

- Review and update existing legislation to reflect climate change issues.
- Develop new sector or national policies that address emerging climate change issues.

4.4 Proposed institutional framework for policy implementation

The Cabinet of Namibia is the Government agency responsible for decisions about policy. The Parliamentary Standing Committee on Natural Resources and Economics advises Cabinet and relevant policy matters. While the Ministry of Environment and Tourism (MET) is responsible for all environmental issues in the country it is not proposed as the agency responsible for Climate Change issues. Climate change is not only an environmental problem as it affect all sectors. It is proposed that a Climate Change Unit (CCU) is established in the Office of the Prime Minister (OPM) to; i) remove any emphasis on climate change as environmental problem and ii) to raise the profile of climate change as one of the biggest development challenges. The first five years of policy implementation (2010-2015) could focus on establishing the CCU in the OPM to ensure that functions are created, roles and responsibilities defined and a budget developed and implemented. Thereafter, the CCU can be relocated to serve as an independent Government agency responsible for climate change. The CCU shall be supported directly by a formalised multi-sectoral National Climate Change Committee (NCCC) for sector-specific and cross-sector implementation and coordination advice and guidance. The Subdivision for Climate Change, proposed under the revised MET structure, will assist directly with planning, development, implementation and coordination of climate change activities at the local, regional and national levels. Existing local and regional structures will be used for implementation at those levels. Where functions of line ministries have been successfully decentralised, these will be used to support local and regional level implementation and coordination.

At present a function exists within the Meteorological Services Division of the Ministry of Works and Transport (MWT) that carries out climatic monitoring, research and assessment. This unit will serve as national Climate Analysis Unit (CAU) that will support the CCU, MET, NCCC and line ministries with pertinent information and data for informed planning and decision making about climate change issues.

The implementation arrangements should cater for feedback loops through monitoring and evaluation to ensure that activities are relevant, appropriate and targeted at local and regional levels. Figure 1 below shows the proposed implementation arrangements.

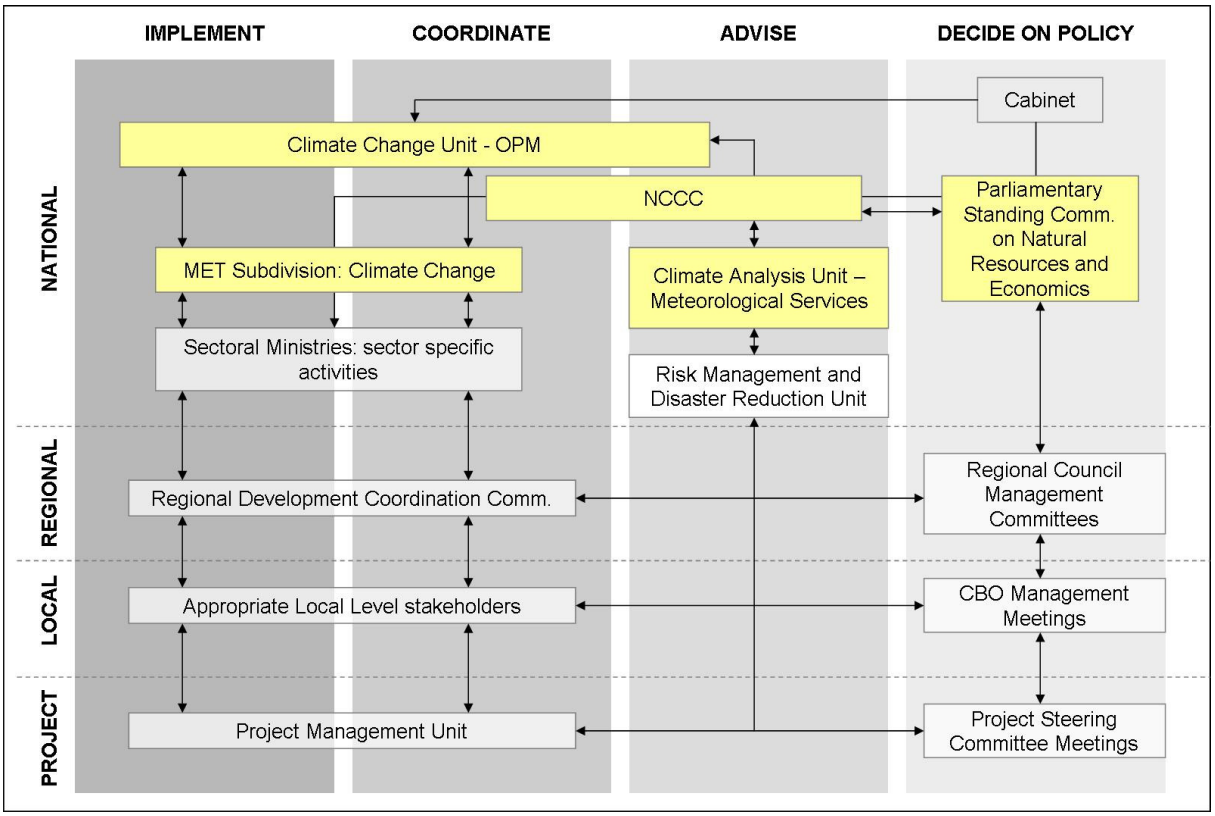


Figure 1: Proposed implementation arrangements for the policy

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ANNEX 1: PROPOSED CLIMATE CHANGE ACTION PLAN

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Strategic aim A1T1SA1

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA1: Development of climate resilient cropping/ agriculture / production systems
Objective	The development of climate resilient cropping / agriculture / production systems appropriate to different agro-climatic regions of Namibia
Rationale	It is predicted that climate change will result in increased frequency and severity of droughts in most parts of Central Namibia. In some areas, rainfall will be severely reduced and will be very variable and unpredictable due to climate change. These changes will require farmers to modify their current cropping systems or change to alternative systems. Research is required to develop and field test alternative systems, suitable to likely future conditions, to provide farmers with different options to choose from as impacts of climate change ensue. Seed supply and extension mechanisms should also be developed.
Action	A1: Identify likely changes in agro-climatic zones and probable climate parameters. A2: Develop climate resilient cropping patterns suited to different regions of the country A3: Field level trials of climate resilient cropping patterns and associated water management systems A4: Develop seed supply and extension mechanisms
Time frame	Medium to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, Namibia National Farmers Union, Namibia agriculture Union, Food and Agriculture Organisation (FAO),
Resources/ Estimated cost	

Strategic aim A1T1SA2

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA2: Development of climate resilient crop varieties / cultivars
Objective	To develop climate resilient crop varieties and cultivars to ensure food security in face of adverse impacts of climate change
Rationale	Local people in Namibia have relied on indigenous crops from times past. Many local crop varieties, though not high yielding compared to hybrids, are robust and resistant to periods of drought as well as extremes of climate. In the face of impacts of climate change, it is prudent that indigenous varieties be screened to identify those that can withstand adverse effects of climate change. These can then be multiplied and supplied to farmers in different agro-climatic zones in Namibia. In addition, with current advanced in breeding and molecular techniques, these climate resilient crop and non-crop varieties can be used in development of new varieties that can withstand, even partially, against negative impacts of climate change. Such varieties will make a contribution to food security and sufficiency.
Activity	A1. Collect, characterise, preserve and share climate resilient indigenous crop varieties and

	cultivars A2. Conduct research to develop crop varieties that are climate resistant and resilient e.g. wheat, mahangu, etc A3. Carryout field trials of developed climate resilient crop varieties and disseminate to local farmers A4. Provide conducive environment for and capacitate research scientists and institutions to undertake above and related research
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, Namibia National Farmers Union, Namibia agriculture Union, Food and Agriculture Organisation (FAO),
Resources/ Estimated cost	

Strategic aim A1T1SA3

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA3: Diversification of agriculture and other livelihoods
Objective	To diversify agriculture to increase sources of food and income
Rationale	Low productivity tied to a highly variable climate is characteristic of Agriculture in Namibia, as Namibia is one of the driest countries in Sub-Saharan Africa (INC, 2002). Agriculture productivity is predicted to fall due to adverse effects of climate change arising from predicted high temperatures, reduction of rainy (crop growing) season and erratic, but also heavy rains (Mfune and Ndombo, 2005). This will affect food availability and supply for the local as well as urban population. The adverse effects will be more pronounced for the majority (~70%) of local Namibians that live in rural areas and depend on subsistence, mainly rain-fed, agriculture. These predicted impacts of climate change therefore calls for a need to find other sources of food and income. In this regard, the example of research into production of Rice that is on-going in Caprivi region stands out as a best example. Rice production e.g. in oshanas as well as that grown through irrigation, will add to the food supply in Region especially north-central Namibia and country as a whole.
Activity	A1. Diversify sources of food, income and other livelihoods at household level. E.g. rice production, cultivation of high value vegetable crops and fruits A2. Develop integrated systems of agriculture that will contribute to food supply e.g. integrated aquaculture-agriculture systems, agro-forestry systems, etc A3. Improve crop yields through practice of conservation agriculture e.g. mulching, use of compost manure etc A4. Provide good marketing opportunities for small-scale farmers e.g. better pricing etc A5. Identify and enhance income generating activities that may arise due to impacts of climate change. E.g. heavy rains may increase population of birds after flooding. While these may destroy crops, they can also be harvested as source of income (short-term) as well as protein.
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, National Planning Commission, Ministry of Regional, Local Government, Housing and Rural Development, Non-Governmental organisations

	(NGO's), University of Namibia
Resources/ Estimated cost	

Strategic aim A1T1SA4

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA4: Development of climate resilient livestock breeds
Objective	To develop climate resilient livestock and poultry breeds and other options for adaptation in the livestock sector.
Rationale	Desertification defined as land degradation that is manifested by symptoms such as bush encroachment, overgrazing, soil erosion, salinization and deterioration of rangelands threaten livestock sector in Namibia. Climate change is an added stressor on the sector due to its effects on desertification. The commercial and communal sectors of livestock production in Namibia differ in their vulnerability and adaptability to climate change. Because livestock production is highly dependent among other factors, on rainfall, most livestock is lost during drought periods when water is scarce or not available in some areas. While Namibian farmers have struggled with this situation for many centuries, it is not known the extent to which their opportunistic management strategies they have employed so far (Kakujaha-Matundu, 2003) will still withstand the added impacts of climate change on livestock and poultry production. It is therefore necessary to investigate and document livestock breeds that are drought and climate resilient and other coping strategies which local and commercial farmers have employed in the past. Further development of livestock and poultry breeds that are climate resilient will add to adaptation to impacts of climate change of livestock sector especially for benefit of local farmers.
Activity	A1. Document and characterise indigenous climate resilient livestock and poultry breeds A2. Research and develop / breed new climate resilient poultry and livestock and disseminate to farmers. A3. Research on other options for adaptations in the livestock sector A4. Strengthen capacity of key research institutions and scientists to undertake the research A5. Strengthen veterinary services, including animal health measures to address likely increase in disease prevalence
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, Namibia National Farmers Union, Namibia Agriculture Union.
Resources/ Estimated cost	

Strategic aim A1T1SA5

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA5: Adaptation against drought
Objective	Develop drought management options for farmers

Rationale	Namibia is one of the driest countries south of the Sahara hence characterised by high natural climatic variability which is further complicated by decadal variability (Dirkx *et al*, 2008, INC, 2002). The predicted increase in temperature, erratic rains and recurrent droughts in most parts of Southern Africa and Namibia due to climate change will exacerbate extent of droughts in Namibia. These droughts will have adverse effects on agriculture (crops, especially irrigation and livestock), availability of water for human and uses in other sectors etc. It is prudent that appropriate adaptive measures to address negative impacts of droughts be developed. These may include but not limited to development of new cropping systems, improved water management practices, as well as development of new drought coping practices.
Activity	A1. Produce GIS maps of drought-vulnerable areas in Namibia. A2. Documentation of best-practice indigenous drought-coping mechanisms and disseminate to other drought-prone areas for possible adoption A3. Develop and test adaptive measures in drought-prone areas. A4. Develop measures to safeguard the vulnerable especially women and children from drought related problems.
Time frame	Medium to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, Namibia National Farmers Union, Namibia Agriculture Union, Ministry of Lands and resettlement
Resources/ Estimated cost	

Strategic aim A1T1SA6

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA6: Conservation, utilisation and sustainable development of forest resources
Objective	To ensure sustainable utilisation and development of forestry resources
Rationale	Forestry contributes to both ecosystem goods and services in Namibia. Forests are an economic resource that provide building and construction materials, provide conditions for agriculture, employment opportunities mainly through timber harvesting and other forest-based small-scale industries. Forests are an important source of fuel wood, materials for making baskets, and wood carving and crafts, traditional medicines and non-wood products such as mopane worms as well as wild fruits. All these are important sources of food as well as income in times of food shortages and difficult economic times. During times of hardship due to impacts of climate change, forest products such as wild fruits, bush meat, edible wild herbs, fodder, mopane worms, nuts, marula oil etc help reduce the risks of climate change. These serve as safety nets for local communities. Forests are an important CO_2 sink. Development of forestry sector will contribute to attainment of MDG7 (Environmental sustainability). Benefits derived from forests contribute to poverty reduction, hence important for MDG1 (eradicate extreme poverty and hunger). Forestry sector is not spared problems that arise due to the inherent aridity of Namibia. At present, Namibia has registered about 55 communal conservancies and 13 community forests. In some areas of Caprivi some communal conservancies have merged with community forests. The predicted impacts of climate change are likely to lead to reduced productivity, distribution of forests in response to drying trends. Predicted bush encroachment will be problematic in north-eastern Namibia, hence reducing livestock production, watershed protection as well as wild fruits and products such as mopane worms. It is therefore important to improve understanding of how climate change will impact forestry

	sector. In addition, ways must be developed to ensure benefits derived from climate-prone forested areas are sustained.
Activity	A1. Produce GIS maps of changes in areas covered by forests. A2. Develop and implement forestry management plans including sustainable utilisation at local and national level as applicable. A3. Encourage involvement of local communities in initiatives that empower them to conserve, wisely use and manage forestry products and other resources e.g. establishment of community forests A4. Facilitate initiatives that provide funding for local communities to improve forestry management. A5. Undertake Afforestation and reforestation programs A6. Increase awareness creation of the importance of forest resources and trees in the environment through community participation. A7. Identify drought resistant / tolerant and multipurpose trees for Namibia through research A8. Promote tree planting and agroforestry activities using multipurpose trees at house hold and farm level. A6. Empower women to take active role in management and utilisation of forest resources
Time frame	Medium to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, Ministry of Environment and Tourism, Namibia CBNRM Support Organisations (NACSO), Namibia Nature Foundation,
Resources/ Estimated cost	

Strategic aim A1T1SA7

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA7: Conservation, , utilisation and sustainable development of fisheries and aquaculture (incl. marine and freshwater aquaculture)
Objective	To ensure sustainable utilisation and development of fisheries and aquaculture through the adoption of appropriate adaptation and mitigation approaches.
Rationale	The primary source of food from the oceans is from capture fisheries and aquaculture. Climate change is

	one of numerous environmental and anthropogenic stresses faced by fisheries and aquaculture but is likely to exacerbate the difficulties of achieving sustainable practices (FAO, 2008). Over the past five years or so, Namibia's average annual fish catches amounted to about 572,460 metric tonnes, valued at N$3.6 billion, while marine aquaculture (oyster mari-culture) production during 2006 amounted to about 670 metric tonnes (Republic of Namibia, 2008). Revenue from fisheries is the second most important foreign exchange earner for Namibia after mining, contributing an average of about 4.8 percent to GDP over the last five years. Onshore fish processing contributed a further 1.7 percent to GDP. The sector's total direct employment is about 13,400, further demonstrating economic and socio-economic contributions. Since 2002/03 70 percent of the hake is processed onshore and 4,500 tonnes of large pelagic species, previously exported frozen whole, was processed onshore during the period 2002/03 and 2006/07. Domestic fish consumption rose to 12 kg per person in 2006. Namibia's marine fisheries sector is based on the cold Benguela Upwelling Current which is generally rich in nutrients and thus supporting demersal and pelagic fisheries. The warming of sea water due to climate change is likely to affect the Benguela Current and hence fish populations and food web dynamics. To date there is great uncertainty about the potential impacts on the fishing and aquaculture sectors from climate change. Although mariculture growth and development has been below expectations, this sub-sector contributed N$64 million in 2006 to the total fish and fishery sector contribution to GDP. Freshwater aquaculture and fishing are important activities along the northern perennial rivers of Namibia as they supply both food and income. *Oshanas* offer a seasonal 'fishing ground' during the rainy season which rural communities capitalise and rely on. Climate change is likely to negatively impact these subsistence practices that would leave rural people more vulnerable. Furthermore, severe losses in the marine capture industry due to climate change will have significant impact on the economies and lives of people of the coastal towns.
Activity	A1. Enhance the knowledge base and understanding of climate change impacts on fisheries and aquaculture through monitoring and research. A2. Adapt input and output controls (e.g. minimum mesh size, capture sizes, etc.) of the marine capture industry based on findings of A1 A3. Model sea level rise along with other oceanographic parameters to try determine the impact on the fishing industry, existing mariculture operations, identified mariculture development sites and infrastructure along the coast. A4. Determine the potential extent of climate change impacts on communities, infrastructure and resources along the northern perennial rivers. A5. Develop and test coping and adaptation mechanisms for rural communities relying on freshwater fisheries along the perennial rivers (aquaculture may be a suitable adaptation) A6. Identify key human resource capacity gaps and address these with targeted training programmes and/ or partnering with centres of excellence to provide technical assistance and skills transfer A7. Ensure that gender issues are adequately addressed in the fisheries and aquaculture sectors, especially in rural settings where women play a vital role in securing food and income. A8. Effectively integrate climate change mitigation and adaptation with the ecosystem approach to fisheries (EAF) and trans-boundary resource management. A9. Test existing early warning systems (EWS) and the State of the Ecosystem Information Systems (SEIS) indicators and amend as necessary to be responsive to climate change.
Time frame	Medium to long-term
Lead Delivering Agencies	Ministry of Fisheries and Marine Resources, NACOMA, University of Namibia, Sam Nujoma Marine and Coastal Resources Research Centre (SANUMARC), Polytechnic of Namibia, Ministry of Environment and Tourism, Namport, Coastal Environmental Trust of Namibia (CETN), Benguela Current Commission

	(BCC), fisheries and aquaculture industry representatives, Ministry of Mines and Energy (MME), Ministry of Works and Transport (MWT), Directorate of Maritime Affairs)
Resources/ Estimated cost	

Strategic aim A1T1SA8

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA8: Conservation, , utilisation and sustainable development of the coastal zone and its resources
Objective	To ensure the long-term sustainable contribution to food security through sustainable integrated coastal zone management (ICZM); i.e. sustainable utilisation and development of the coastal zone and its resources
Rationale	The coastal zone of Namibia forms the interface between the ocean to the west and borders with the Namib desert to the east. It is an area that has biological resources including many species of birds. The fog that forms along the coast contribute to maintenance of biodiversity as it brings moisture that is important for flora and fauna along the coast as well as the Namib desert. The important fishing industry and ever increasing tourism industry has lead to increase in human activities including settlement such as towns and construction of tourism facilities. During festive seasons, many people flood the coastal towns for holiday and tourism. These human activities threaten conservation of coastal zone resources. The predicted rise in sea levels due to climate change will be an added stressor to the pressure on biological and other resources in the coastal zone. Hence there is need to undertake activities that will contribute to conservation and utilisation of coastal zone resources.
Activity	A1. Ensure that the White Paper, being developed with support by NACOMA, addresses climate change issues adequately through Integrated Coastal Zone Management (ICZM) A2. Develop and pilot adaptive measures for coastal zone activities (consumptive and non-consumptive use) A3. Raise awareness along the coast about climate change in general, its causes and impacts and emphasis on specific risks and predicted impacts for the coastal zone A4. Build the capacity of coastal zone stakeholders to adequately respond to the threats and risks posed by climate change A5. Model sea level rise to predict the area size that will likely be impacted by a higher sea level and explore, develop and pilot adaptation measures (See A3 under A1T1SA8) A6. Model the potential social, environmental and economic impacts from sea level rise and develop and test appropriate adaptation measures. A7. Ensure the incorporation of climate change indicators for the coastal zone monitoring and establish quantitative baselines A8. Ensure that planning for mitigation and adaptation is done in a participatory way A9. Develop information and awareness generation material about climate change and ensure these are readily available and easily accessible for the public.
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Fisheries and Marine Resources, NACOMA, University of Namibia, Sam Nuyoma Marine and Coastal Resources Research Centre (SANUMARC), Polytechnic of Namibia, Ministry of Environment and Tourism, Namport, Coastal Environmental Trust of Namibia (CETN), Benguela Current Commission (BCC), fisheries and aquaculture industry representatives, Ministry of Mines and Energy (MME), Ministry

	of Works and Transport (MWT, Directorate of Maritime Affairs)
Resources/ Estimated cost	

Strategic aim A1T1SA9

ASPECT	A1. Adaptation
Theme	T1: Food Security and Sustainable Resource Base
Strategic Aim (Programme)	SA9: Conservation, utilisation and development of biological resources and maintenance of ecosystems to ensure environmental sustainability.
Objective	Develop climate change adaptation strategies to ensure environmental sustainability
Rationale	Marine and terrestrial biomes of Namibia have diverse ecosystems that provide many goods and services. Diverse rangelands, arable land and mineral deposits make up valuable natural resource base on which the economy of Namibia depends. Despite the aridity, Namibia boasts a high degree of biodiversity. The succulent Karoo biome is one of the world's 25 top 'global biodiversity hotspots (Republic of Namibia, 2002). It is the only area in Namibia that receives winter rainfall. Climate change will adversely affect biodiversity since the distribution and diversity of Namibia including plants and animals is largely influenced by the rainfall gradient (Mendelsohn *et al.,* 2002). Namibia has ascribed to the objectives of the convention on Biological diversity which is to conserve biological diversity and sustainable use of its components. In recognition of the important role of biodiversity, it is the goal of the government of Namibia to protect ecosystems, biological diversity and ecological processes through conservation and sustainable use in order to support livelihoods in order to achieve self-reliance and quality of life of Namibians (Republic of Namibia, 2001). Climate change threatens conservation and sustainable utilisation of biodiversity and maintenance of environmental sustainability. Detailed
Activity	A1. Strengthen conservation measures inside and outside protected areas A2. Promote community-based natural resources management especially through conservancies A3. Use indigenous knowledge systems for sustainable management of biodiversity and adaptive response to impacts of climate change A3. Promote conservation of biodiversity and ecosystems and responsible utilisation A4. Research to assess potential effects / threats of climate change on the biodiversity and ecosystems and develop adaptive measures. A7. Model and forecast future changes in biodiversity and ecosystems due to climate change and develop adaptive responses A8. Document economic benefits of biodiversity and ecosystems and how these are threatened by climate change and develop adaptive response A9. Identify priority species threatened by climate change and undertake focussed research and conservation measures A10. Study bush encroachment and understand its impact on Namibia's greenhouse gas profile
Time frame	Immediate to long term
Lead Delivering Agencies	Ministry of Fisheries and Marine Resources, Ministry of Environment and Tourism, NACOMA, University of Namibia, Sam Nuyoma Marine and Coastal Resources Research Centre (SANUMARC), Gobabeb Training Centre, National Botanical Institute, Polytechnic of Namibia
Resources/ Estimated cost	

Strategic aim A1T2SA1

ASPECT	A1. Adaptation
Theme	T2: Sustainable Water Resources
Strategic Aim (Programme)	SA1: Conserve and manage watershed / catchment areas
Objective	Ensure that watershed are protected and managed so that sources of water are sustained
Rationale	There is growing consensus that water should be managed within natural hydrological units such as the river basin, lake basin (UN-Water, 2008). Catchment areas are very important sources of water. Their protection is therefore very important in light of the increasing water scarcity and predicted aridity due to climate change. On the other hand, the demand for more water for various uses such as water for irrigation in the agricultural sector in Namibia. Dirkx *et al,* (2008) state that the projected demand for in Namibia anticipated for 2015 (555 Mm^3) will surpass the currently installed water infrastructure (422 Mm^3). In addition, Municipalities will also have a high demand for water due to population increase and urban migration. This calls for greater attention to protect sources of water. Measures should therefore be developed to protect catchment areas that will partly supply water needed.
Action	A1. Develop and implement watershed management plans A2. Promote soil and land conservation in priority areas such as watersheds A3. Restrict access to and use of other resources in the watershed areas e.g. prohibit deforestation in the watershed or establishment of arable fields A4. Afforestation of degraded watershed areas. A5. Decentralise management of water resources to catchment management zones
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, NamWater, Municipalities, Regional and local governments. Local Communities
Resources/ Estimated cost	

Strategic aim A1T2SA2

ASPECT	A1. Adaptation
Theme	T2: Sustainable Water Resources
Strategic Aim (Programme)	SA2: Promote integrated development and management of water resources
Objective	Facilitate integrated water resources management to ensure sustainable conservation and utilisation of water resources
Rationale	Integrated Water resources management (IWRM) is a systematic process for sustainable development, allocation and monitoring of water resources. IWRM is a cross-sectoral holistic approach to water management in response to growing competing water demands for finite freshwater supplies (UNDP, 2006). It is an approach that aims to ensure the coordinated development of water, land and related resources to optimise economic and social welfare without compromising the sustainability of environmental systems. Water is a vital resource in Namibia. Water is used for agriculture, households, livestock, fishing, mining, manufacturing, and other services including government. The agriculture sector in 2002 was estimated to use up to 75% of all available water. Household use accounted for about 12.2% of water demand. The demand for government services and mining and manufacturing accounted for 8% and 6 % respectively.

	Predicted rise in temperature, variability in rainfall due to climate change will adversely affect water resources. The combined effect of climate change and predicted water demand due to population growth and development indicate that water resource management needs special attention in order to safeguard the available water resources while meeting the demands of competing needs for water. The need for integrated water resources management therefore cannot be overemphasized.
Action	A1. Develop and invest in additional methods of water supply e.g. innovative storage of rain water, construction of dams, A2. Prepare against water disasters. Protect water resources from floods and develop emergency works or structures e.g. flood protection and drought protection structures. A3. Maintain water infrastructure A4. Monitor changes in water quality and quantity available for drinking A5. Model and forecast future water changes due to climate change. A6. Undertake integrated water and land use planning. A7. Improve water governance and increase coordination and collaboration amongst various water sectors such as drinking water supply and sanitation, irrigation and ecosystem maintenance. A8. Promote equitable access to and control over water resources, benefits, costs and decision making between men and women
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, NamWater, Municipalities, Regional and local governments. Local communities, Private sector
Resources/ Estimated cost	

Strategic aim A1T2SA3

ASPECT	A1. Adaptation
Theme	T2: Sustainable Water Resources
Strategic Aim (Programme)	SA3: Promote conservation and sustainable utilisation of water resources
Objective	To ensure adequate water supply especially in climate vulnerable areas of Namibia
Rationale	In Namibia, water is scarce and droughts exacerbate water shortage. Lack of water is likely to impede development in Namibia (INC, 2002). About 43% of water demand in Namibia is supplied from surface water sources. Since only about 1% of rainfall replenishes groundwater aquifers because of high evaporation due to high solar radiation, low humidity and high temperatures, ground water resources need careful management to ensure sustainability from ground sources (INC, 2002). Predicted higher temperatures due to climate change will only worsen water shortages and scarcity in Namibia. Target 10 of MDG7 (Ensure environmental sustainability) aims to halve the proportion of people without sustainable access to safe drinking water and sanitation by 2015. By 2006, the proportion of rural and urban households with to safe drinking water was 90.7% and over 95% respectively (Republic of Namibia 2007b and UNDP, 2007). Though Namibia is on course to achieve 2015 target for access to safe drinking water for rural and urban areas, predicted increases in extreme events such as drought, extreme weather etc, due to climate change will be an additional obstacle. Water is an important factor in many production activities (Bates et al., 2008) such as agriculture, animal husbandry, sustainable production of fish and other industries. Currently, about 60% of available water in Namibia is used for agriculture production. Most of Namibia's crops are rain-fed. Hence water contributes

	to MDG1 (eradicate extreme poverty).
Action	A1. Reduce pollution of water sources A2. Promote water conservation including water recycling and reuse and reduction of water wastage A3. Enforce wise use of water for various uses both in rural and urban areas using various penalties A4. Develop and or adopt water efficient technologies A5. Development of gender-sensitive water management programmes A6. Delegate responsibility for water use and management to the lowest possible level. A7. Involve the Youth and women in the decision making regarding water use and management at different levels including household and community levels. A8. Encourage establishment of community based water management e.g. establishment of community water points committees. A9. Identify and enhance positive outcomes from impacts of climate change. E,g, when there is too much rain, households and authorities can harvest the rain. Similarly, excess water can be used for vegetable growing etc.
Time frame	Immediate and ongoing
Lead Delivering Agencies	Ministry of Agriculture, water and Forestry, NamWater, Municipalities, Regional and local governments. Local communities
Resources/ Estimated cost	

Strategic aim A1T2SA4

ASPECT	A1. Adaptation
Theme	T2: Sustainable Water Resources
Strategic Aim (Programme)	SA4: Improve trans-boundary cooperation regarding water resources
Objective	Ensure that shared waters are utilised and managed in a manner that is respects international water laws
Rationale	The use of water by one state in an international river basin influences users in other states. If one state abstracts and use water in a manner that does not consider use of water by other states downstream, this can be a cause of suffering for other users. At its worst, this can be a cause of conflicts between nations. Hence the legal regulation of the interests and sovereignties of basin states is necessary. The perennial wetlands of Namibia include the following rivers that form the northern and southern boundaries of the country; the Kunene in the northwest, the Okavango, Kwando/Linyanti and Zambezi/ Chobe in the north east and the Orange / Gariep in the south. Since these perennial rivers flow into Namibia from Angola, Zambia and South Africa, there is need for Namibia to participate in Transboundary cooperation with these neighbouring countries.
Action	A1. Establish transboundary cooperation regarding water use and management A2. Share information on water use, demand as well as water resources development A3 Establish agreed procedure for conflict resolution regarding water use and management A4. Develop joint transboundary research as well as poverty-oriented water-related investments.
Time frame	Immediate
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, NamWater, Ministry of Foreign Affairs, Regional and local Government,
Resources/ Estimated cost	

Strategic aim A1T2SA5

ASPECT	A1. Adaptation
Theme	T2: Sustainable Water Resources
Strategic Aim (Programme)	SA5: Support institutional and human capacity building in water resources management and use
Objective	Promote skills and knowledge acquisition regarding water resources management and use at all levels of society
Rationale	Many stakeholders lack necessary knowledge and skills for full participation in integrated water resources management. For instance, community stakeholders may not be familiar with the concept of watershed management and corporate governance. In some communities, there may be need to acquire skills on how to repair or rehabilitate water resources infrastructure. There is also need for public awareness of climate change and how it will affect the water resources for different stakeholders.
Action	A1. Develop and undertake training programmes at different levels i.e. household, community and on watershed management A2. Promote stakeholder meetings to share experiences on water use and management
Time frame	Medium to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, NamWater, Municipalities, Regional and local governments. NGOs, CBOs
Resources/ Estimated cost	

Strategic aim A1T3SA1

ASPECT	A1. Adaptation
Theme	T3: Human Health and well being
Strategic Aim (Programme)	SA1: Adaptation to climate change related health risks
Objective	Reduce the impact of climate change related health risks
Rationale	Climate change will have health implications as a consequence of increased temperature and changes in rainfall patterns. Direct effects of climate change include increase in heat-related mortality and illness associated with heat waves (which may be balanced by less winter-cold related deaths in some regions). Climate may increase the prevalence of some vector-borne diseases (e.g. malaria), and vulnerability to water, food or person-to-person borne diseases (for example cholera and dysentery). Children and pregnant women are particularly susceptible to vector and waterborne diseases. Health is an important developmental element with productivity and resource distribution implications.
Activity	A1: Identify the implications of climate change on human health and well being A2: Disseminate the impacts of climate change on human health and well being to all health centres A3: Develop a preparedness programme to respond to the impacts of climate change A4: Build capacity through training at all health centres A5: Enhance access of women and children to health facilities
Time frame	Immediate to long term
Lead Delivering Agencies	Ministry of Health and social services (MoHSS), NGOs working in the Health sector, Namibia Medical Association, Private hospitals and clinics, medical doctors,

Resources/ Estimated cost	

Strategic aim A1T3SA2

ASPECT	A1. Adaptation
Theme	T3: Human Health and well being
Strategic Aim (Programme)	SA2: Assessment of impacts of climate change on human health and well being
Objective	Promote understanding of the impact of climate change on human health and well being to facilitate effective adaptive action
Rationale	Climate change is likely to affect human health and well being through impacts of shortage of food hence effecting nutrition, declining quantity of drinking water and poor sanitation due to flooding in some areas. The 4th IPCC report states that increased in vector borne diseases is one of the major impacts of global warming and climate change. Climate change will have health implications as a consequence of increased temperature and changes in rainfall patterns. Increases in temperature predicted in some areas may increase the incidences of heatstroke which may be worsened by the shortages of drinking water. Climate may increase the prevalence of some vector-borne diseases (e.g. malaria), and vulnerability to water, food or person-to-person borne diseases (for example cholera and dysentery). Children and pregnant women are particularly susceptible to vector and waterborne diseases. Sick people are not productive and are a financial burden for families and the government. Despite the above, there is still more that needs to be understood regarding how climate change will affect human health. Hence the need for evidence-based impacts of climate change cannot be overemphasized.
Activity	A1: Conduct a comprehensive assessment of the impact of climate change on human health and well being (including incidences of diseases such as malaria, diarrhoea etc). A2: Research on the cost of increased mortality, morbidity and consequent reduction in human productivity due to health impacts of climate change. A3: Identify health limitations in the current system to respond climate change associated health risks A4: Define infrastructural, human and financial resources needs to respond to climate change health risks A5: Make budgetary provisions to address the short comings in the health sector to respond to impacts of climate change A6. Undertake research to provide evidence of impacts of climate change on human health and well being
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Health and social services (MoHSS), NGOs working in the Health sector, Namibia Medical Association, Private hospitals and clinics.
Resources/ Estimated cost	

Strategic aim A1T3SA3

ASPECT	A1. Adaptation
Theme	T3: Human Health and well being
Strategic Aim (Programme)	SA3: Expansion of health facilities and network to remote areas
Objective	Improve access to health services and treatment efficiency.
Rationale	Climate change will have different impacts in different areas (Dirkx *et al*., 2008). Health impacts of

	climate change will not be an exception. With the majority of the population living in rural areas, and the sparse distribution patterns, many people do not have access to health facilities. imate change will have health implications as a consequence of increased temperature and changes in rainfall patterns. Direct effects of climate change include increase in heat-related mortality and illness associated with heat waves (which may be balanced by less winter-cold related deaths in some regions). Climate may increase the prevalence of some vector-borne diseases (e.g. malaria), and vulnerability to water, food or person-to-person borne diseases (for example cholera and dysentery). Children and pregnant women are particularly susceptible to vector and waterborne diseases. Health is an important developmental element with productivity and resource distribution implications.
Activity	A1: Review the outreach programmes to include areas that are vulnerable to climate change related health risks A2: Stock vaccines that would be needed to treat climate related health risks A3: Transport, medicine and human resources must be availed to reach vulnerable remote areas. A4: Improve health facilities in centres that are vulnerable to health risks to enable them to cope with the predicted health risks A5: Ensure women and children have access to health facilities and that they receive treatment
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Health and social services (MoHSS), NGOs working in the Health sector, Namibia Medical Association, Private hospitals and clinics, medical doctors.
Resources/ Estimated cost	

Strategic aim A1T3SA4

ASPECT	A1. Adaptation
Theme	T3: Human Health and well being
Strategic Aim (Programme)	SA4: Improve capture, management, storage and dissemination of health information
Objective	Capture and disseminate information about health risks and diseases to all stakeholders especially diseases that will be climate change related
Rationale	Climate change will have health implications as a consequence of increased temperature and changes in rainfall patterns. Direct effects of climate change include increase in heat-related mortality and illness associated with heat waves (which may be balanced by less winter-cold related deaths in some regions). Climate may increase the prevalence of some vector-borne diseases (e.g. malaria), and vulnerability to water, food or person-to-person borne diseases (for example cholera and dysentery). Children and pregnant women are particularly susceptible to vector and waterborne diseases. Health is an important developmental element with productivity and resource distribution implications.
Activity	A1: Strengthen and improve the collection of health records at health centres A2: Develop a system to collate and analyse the data A3: Develop an information dissemination framework A4: Provide training in data/records management and storage
Time frame	Medium
Lead Delivering Agencies	Ministry of Health and social services (MoHSS), NGOs working in the Health sector, Namibia Medical Association, Private hospitals and clinics, medical doctors.
Resources/ Estimated cost	

Strategic aim A1T3SA5

ASPECT	A1. Adaptation
Theme	T3: Human Health and well being
Strategic Aim (Programme)	SA5: Improve access to sanitation and water
Objective	Reduce the impacts of shortage of clean drinking water and increases in disease outbreaks due to inadequate sanitation.
Rationale	Sanitation will be adversely affected due to flooding, leading to unhygienic conditions which is a recipe for diseases and ill health. The change in rainy seasons with longer dry periods would affect the provision of sanitation especially in the urban settlements, where the urban poor struggle for basic sanitation services. This would put pressure on the cost of services provision as the Local Authorities (LA) maybe required to control or ration water during periods of shortage. Climate change will likely result in declining quantity and quality of drinking water, which is prerequisite for good health, and exacerbate malnutrition-an important source of ill health among children-by reducing natural resource productivity and threatening food security.
Activity	A1: Assess the water and sanitary services needs in areas that are vulnerable to climate related health risks A2: Assess the impact of floods and other climate change related disasters on the provision of sanitary services A3: Provide sanitary services or alternatives where there is lack of services A4: Develop a disaster management plan for the provision of sanitary services A5: Raise awareness about sanitation.
Time frame	Medium
Lead Delivering Agencies	Ministry of Health and social services (MoHSS), NGOs working in the Health sector, Namibia Medical Association, Private hospitals and clinics, medical doctors.
Resources/ Estimated cost	

Strategic aim A1T3SA6

ASPECT	A1. Adaptation
Theme	T3: Human Health and well being
Strategic Aim (Programme)	SA6: Increase human resources capacity and efficiency
Objective	Ensure that the human resources at health centres have the capacity to attend to climate change related sickness, with efficiency
Rationale	Climate change will have health implications as a consequence of increased temperature and changes in rainfall patterns. Direct effects of climate change include increase in heat-related mortality and illness associated with heat waves (which may be balanced by less winter-cold related deaths in some regions). Climate may increase the prevalence of some vector-borne diseases (e.g. malaria), and vulnerability to water, food or person-to-person borne diseases (for example cholera and dysentery). Children and pregnant women are particularly susceptible to vector and waterborne diseases. Health is an important developmental element with productivity and resource distribution implications.
Activity	A1: Vacancies in the health sector need to be filled in order to ensure efficient health service delivery. A2: Recruitment and training of new personnel including qualified women should be prioritised A3: Remote health centres should be provided with adequate human personnel

	A4: Working conditions should be improved to increase efficiency.
Time frame	Immediately
Lead Delivering Agencies	Ministry of Health and social services (MoHSS), NGOs working in the Health sector, Namibia Medical Association, Private hospitals and clinics, medical doctors.
Resources/ Estimated cost	

Strategic aim A1T3SA7

ASPECT	A1. Adaptation
Theme	T3: Human Health and well being
Strategic Aim (Programme)	SA7: Support action plans against HIV/AIDS
Objective	Minimise impacts of HIV / AIDS on the population in order to increase productivity and contribute to socio-economic development.
Rationale	Namibia has one of the highest HIV/AIDS prevalence in the world; ranked amongst the top 5 (Republic of Namibia 2003). Women account for more than 55% of adults estimate to have HIV/AIDS. The HIV/AIDS prevalence is highest among the people aged between 25 and 29. Loss of life resulting from HIV/AIDS will adversely affect the contribution of the sick to development. Climate change will further exert negative effects through its impacts on reduction in crop yields and livestock production. This will increase malnutrition and compound effects of HIV/AIDS. In addition, climate change may also lead to poor sanitation and increase unhygienic conditions leading to disease such as diarrhoea. Flooding and high rainfall will increase incidences of malaria. All these will reduce productivity and longevity of people living with HIV/AIDS. It will also raise the expenditure of the Government on HIV/AIDS antiretroviral drugs and other measures. There is need to take action against HIV/AIDS
Activity	A1. Increase public awareness of the causes, effects and prevention of HIV A2. Improve supply of condoms A3. Increase capacity for HIV/AIDS counselling especially the vulnerable segment of the population including women and children A4. Assess and quantify the proportion of morbidity and mortality that can be attributable to climate hazards and climate change. A5. Support activities that will enhance protection of women and children against contracting HIV/AIDS
Time frame	Immediately and long-term
Lead Delivering Agencies	Ministry of Health and social services (MoHSS), NGOs working in the Health sector, Namibia Medical Association, Private hospitals and clinics, medical doctors.
Resources/ Estimated cost	

Strategic aim A1T4SA1

ASPECT	A1. Adaptation
Theme	T4: Infrastructure
Strategic Aim (Programme)	SA1: Develop a climate change infrastructure risk assessment guidelines and methodology
Objective	To create awareness, understanding and preparedness of the risks posed by climate change to infrastructure.

Rationale	Namibia has well developed transport, water, electricity and telecommunication infrastructure. The infrastructure is important for the economic development of the country, and the government continues to invest in rehabilitation and new infrastructure. However, the infrastructure is vulnerable to climate change and the risks associated with climate change.
Activity	A1. Train sector specific experts in infrastructure, to review existing risk assessment methodologies A2. Develop climate change infrastructure risk assessment methodology for each sector A3. Develop a climate change infrastructure risk assessment programme for various sectors A4. Conduct climate change risk assessment studies, clearly defining the risk to various infrastructures. A5. Develop a climate change infrastructure risk preparedness plan and response
Time frame	Medium
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Mines and Energy, Ministry of Environment and Tourism, NamPower, Namwater, NamPort, MTC and Cell One, Telecom, TransNamib, Municipalities.
Resources/ Estimated cost	

Strategic aim A1T4SA2

ASPECT	A1. Adaptation
Theme	T4: Infrastructure
Strategic Aim (Programme)	SA2: Improve infrastructure spatial planning and development in urban and rural areas
Objective	Ensure that infrastructure planning and development consider climate change risks.
Rationale	The predicted climate change challenges facing Namibia are variation in rainfall patterns that result in prolonged drought period and short intensive rainfall period. Change in temperature will cause temperatures to increase that would contribute to heat waves. Evaporation would also increase because of high temperature. Wind storms are also likely to be prevalent in some parts of the country (Republic of Namibia, 2002). In order to address impacts of climate change on infrastructure to adapt to climate change, new ways of thinking for planning, design, and rehabilitation of infrastructure, repair or replacement should be undertaken. There will be need to use materials that can better withstand for instance temperature fluctuations as well as drier or wetter conditions as well as salty conditions in the case of coastal infrastructure.
Activity	A1. Develop climate change risk maps to show vulnerable areas and type of vulnerability A2. Disseminate climate change risks maps across all sectors and stakeholders A3: Integrate climate change risks in the design and implementation of infrastructure development plans A4. Develop a framework that regulates and guides infrastructure development. A5: Impose penalties against non-compliance to infrastructure spatial planning and development regulations and laws for rural and urban settlements
Time frame	Medium
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Mines and Energy, Ministry of Environment and Tourism, NamPower, NamWater, NamPort, MTC and Cell One, Telecom, TransNamib, Municipalities.
Resources/ Estimated cost	

Strategic aim A1T3SA3

ASPECT	A1. Adaptation
Theme	T3: Infrastructure
Strategic Aim (Programme)	SA3: Improve drainage and sanitation facilities in rural and urban areas
Objective	Reduce risk of flooding and drainage congestion and structural damage due to excess flood water
Rationale	The predicted climate change challenges facing Namibia are variation in rainfall patterns that result in prolonged drought period and short intensive rainfall period. Change in temperature will cause temperatures to increase that would contribute to heat waves. Evaporation would also increase because of high temperature. Wind storms are also likely to be prevalent in some parts of the country (Republic of Namibia, 2002).
Activity	A1. Assess drainage capacity of urban areas in major cities and towns such as Windhoek, Oshakati, Katima Mulilo etc, and investigate structural and non-structural causes of water logging A2. Design and invest in improvements in the drainage capacity of the city of Windhoek, towns and rural areas A3. Enforce town and regional planning and development regulations relating to drainage systems including sewerage A4. Facilitate development and improve sanitation facilities in rural and urban communities
Time frame	Medium
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Regional Local Government, Housing and Rural Development, Ministry of Environment and Tourism, Municipalities.
Resources/ Estimated cost	

Strategic aim A1T3SA4

ASPECT	A1. Adaptation
Theme	T3: Infrastructure
Strategic Aim (Programme)	SA4: Adaptation against floods
Objective	To improve resilience of flood prone areas
Rationale	Climate change is likely to affect infrastructure. Impacts may be caused by increases in temperature, more frequent and intense rainfall events, rising sea levels and sustained and extreme droughts. Buried infrastructure may be affected by changes in soil temperatures. More intense and frequent rainfall events can challenge water, wastewater and sewerage treatment systems for instance by increasing turbidity and sedimentation, or cause direct flood damage to above ground aquifers. These may increase corrosion of buried infrastructure The predicted climate change challenges facing Namibia are variation in rainfall patterns that result in prolonged drought period and short intensive rainfall period. Change in temperature will cause temperatures to increase that would contribute to heat waves. Evaporation would also increase because of high temperature. Wind storms are also likely to be prevalent in some parts of the country (MET, 2002).
Activity	A1. Conduct studies to estimate and model future flood levels and risks in flood prone areas of Namibia such as north-Central and north east Namibia A2. Produce a flood vulnerability map based on predicted levels of flooding A3. Design and construct flood management infrastructures based on models of future flood levels and

	risks A4. Regulate establishment of new settlements on basis of projected future flood levels and flood vulnerability map A5. Improvement of flood forecasting and warning A6. Design and implement non-structural flood-proofing measures
Time frame	Medium
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Regional Local Government, Housing and Rural Development, Ministry of Environment and Tourism, Municipalities, Meteorological Services
Resources/ Estimated cost	

Strategic aim A1T3SA5

ASPECT	A1. Adaptation
Theme	T3: Infrastructure
Strategic Aim (Programme)	SA5: Adaptation against future sea level rise
Objective	Reduce the impact of sea level rise on coastal infrastructure
Rationale	Climate change is predicted to lead to sea level rise. Coastal towns such as Oranjemund, and Walvis Bay may be severely be affected as significant parts of these towns may be inundated. In Walvis Bay, the port and the fishing factories immediately on the shores may be flooded with sea level rise. Walvis Bay, at about 0.3m above seal level is more vulnerable in that for instance any rise closer to 1m would inundate most part of the town during high season. Swakopmund and Henties Bay are regarded as less vulnerable to sea level rise, while Lüderitz because of its location on steep, rocky shore is relatively not vulnerable. Increased storm surges are predicted along the Namibia coastal line.
Activity	A1: Conduct a detailed engineering and environmental study to assess options that could be implemented for the protection of coastal infrastructure A2: Review and consult on the recommendation of the study with all stakeholders. A3: Develop an action plan with costs on the implementation of the preferred methods for protection of infrastructure. A4: Develop regulations and guidelines for protection of infrastructure. A5: Disseminate information and raise awareness about the guidelines and preferred protection options. A6. Develop and implement activities against impacts of sea level rise as well as impacts of other climate, sea related impacts such as storm surges and damage
Time frame	Medium
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Mines and Energy, Ministry of Environment and Tourism, NamPower, Namwater, NamPort, MTC and Cell One, Telecom, TransNamib, Municipalities.
Resources/ Estimated cost	

Strategic aim A1T3SA6

ASPECT	A1. Adaptation
Theme	T3: Infrastructure
Strategic Aim (Programme)	SA6: Improve formal and informal settlement patterns and housing

Objective	Reduce risk of destruction to houses during flooding and leaving people with shelter
Rationale	Destruction of houses (shacks) in informal settlements will be more severe as some are built on sloping landscape, while others are build in flood-sensitive and flood-prone low laying areas and so are not built to withstand the floods or heavy storms that have been predicted from climate change. The poor living in informal settlements will also lose their few possessions, thus plunging them into deeper levels of poverty (Karuaihe *et.al* 2007).
Activity	A1. Assess the threats to formal and informal settlements patterns and housing A2. Enforce town and regional planning and development regulations relating to housing in formal and informal settlements A3: Inform the communities of the risk and help develop preparedness programmes A4: Promote practice of integrated land-use planning
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Regional Local Government, Housing and Rural Development,, Ministry of Environment and Tourism, Municipalities.
Resources/ Estimated cost	

Strategic aim A1T3SA7

ASPECT	A1. Adaptation
Theme	T3: Infrastructure
Strategic Aim (Programme)	SA7: Climate-proof existing and future infrastructure
Objective	Reduce risk of damage and destruction to existing and future infrastructure including houses due to impacts of climate change.
Rationale	Most existing infrastructure were not designed and constructed with considerations of impacts of climate change. Climate change will affect infrastructure. For instance, since Namibia is arid to semi-arid with most of the country not receiving heavy rains, roofing materials and styles of most houses were not constructed for heavy rains. Hence leaking is and will be a problem when rainfall becomes heavy and persistent. Another example is development of potholes that develop on tarred roads in heavily used roads after frequent and sometimes heavy rains. Most tarred roads in Namibia were not constructed for heavy rains. Impacts may be caused by increases in temperature, more frequent and intense rainfall events, rising sea levels and sustained and extreme droughts. Buried infrastructure may be affected by changes in soil temperatures. More intense and frequent rainfall events can challenge water, wastewater and sewerage treatment systems for instance by increasing turbidity and sedimentation, or cause direct flood damage to above ground aquifers. These may increase corrosion of buried infrastructure Similarly, destruction of houses (shacks) in informal settlements will be more severe where these have been built on sloping landscape, while others are build in flood-sensitive and flood-prone low laying areas and so are not built to withstand the floods or heavy storms that have been predicted from climate change. The poor living in informal settlements will also lose their few possessions, thus plunging them into deeper levels of poverty (Karuaihe *et.al* 2007).
Activity	A1. Rehabilitate and improve existing infrastructure in areas where climate change is predicted to cause damage or destruction to infrastructure.

	A2. Design and construct infrastructure that is climate-resistant and resilient (climate proofed) A3. Make provisions for local communities to access resources and finances that will enable them construct climate-proofed infrastructure
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Regional Local Government, Housing and Rural Development, Ministry of, Municipalities, local communities, private sector
Resources/ Estimated cost	

Strategic aim A2T1SA1

ASPECT	A2. Mitigation
Theme	T1: Sustainable Energy and Low Carbon Development
Strategic Aim (Programme)	SA1: Improve efficiency of energy production and use
Objective	Facilitate security of sustainable energy production and use and low-carbon development
Rationale	Energy is central in economic development of any country including Namibia. Hence provision of adequate, reliable and affordable energy is very crucial. Yet burning of fossil fuels as well as production of GHG emissions from agriculture sector continue to add emissions that fuel global warming. The Stern review suggest several ways of mitigating climate change including reduction of demand for emissions-intensive goods and service, increasing efficiency gains, increasing the use and development of low-carbon technologies and reducing non-fossil fuel emissions. Republic of Namibia (2007) state that the costs of saving energy through the large, untapped demand-side energy efficiency potential is cheaper than the cost of adding new supply capacities. They state that energy efficiency in Namibia has the potential to be an added potential part of future energy supply strategies. For instance, improved energy efficiency in buildings, fishing and mining industry, agriculture sector, transport sector and residential properties may contribute to overall lower energy use.
Activity	A1. Investigate future energy needs of Namibia and choose the most cost effective energy supply that will satisfy projected demand. A2. Ensure energy efficiency in power production, transmission and distribution through appropriate investments. A3. Improve energy efficiency in domestic and commercial sector through appropriate policies, investments and incentives. A4. Raise energy efficiency in agriculture and industrial processes through appropriate investments A5. Improve energy efficiency in the transport sector through appropriate policies and investments.
Time frame	Medium to long-term
Lead Delivering Agencies	Nampower, Ministry of Mines and Energy, Ministry of Agriculture, Water and Forestry
Resources/ Estimated cost	

Strategic aim A2T1SA2

ASPECT	A2. Mitigation
Theme	T1: Sustainable Energy and Low Carbon Development
Strategic Aim	SA2: Develop and improve renewable energy

(Programme)	
Objective	Maximising the use of renewable energy sources to lower GHG emissions and ensuring energy security
Rationale	The scope of developing renewable energy supplies (e.g. solar, wind, tidal and modern biomass technologies) has received poor research attention and investment in Namibia although there is current interest due to electricity power cuts in Namibia. However there is growing interest and use of solar power especially for domestic use. Capital cost is the major barrier to the expansion of the use of solar energy. Little has been achieved in harvesting wind energy in Namibia. The high initial capital cost has retarded progress in the use of wind energy. Despite the above economic, technical, social and institutional stumbling blocks to development and adoption of renewable technologies, they should be considered because renewable technologies for power generation or direct use are carbon-neutral.
Activity	A1: Investments to scale up solar power programmes A2: Research and investment to harness wind energy, particularly in coastal areas. A3: Feasibility studies for tidal and wave energy, geothermal energy A4: Study of the techno-economic, social and institutional constraints to adoption of improved biomass stoves and other technologies such as solar heating for domestic use.
Time frame	Immediate
Lead Delivering Agencies	Ministry of Mines and Energy, Nampower, Polytechnic of Namibia,
Resources/ Estimated cost	

Strategic aim A2T1SA3

ASPECT	A2. Mitigation
Theme	T1: Sustainable Energy and Low Carbon Development
Strategic Aim (Programme)	SA3: Reduce GHG emissions from Agricultural (crop s and livestock) sector
Objective	Raise productivity from agriculture sector while lowering GHG emissions
Rationale	Though Namibia produces very small amounts of GHG according to the 1999 and 2000 greenhouse gas inventory (du Plessis, 1999) and Hartz and Smith, 2008), the bulk of the little what is emitted comes from agriculture, followed by the energy sectors. Agriculture and land-use change contribute much to climate change even at global scale. IPCCC (2007) reported that agriculture (cropland, pasture and livestock production) and forestry), contribute about 13 % and 17 & respectively of anthropogenic GHG.
Activity	A1. Improve crop and grazing land management to increase soil carbon storage A2. Encourage and promote soil management practices that reduce fertiliser use and increase crop diversification A3.Promote low energy production systems A4. Improve the control of wildfires and avoid burning crop residues A5. Promote efficient energy use by commercial farming and agro-industries. A6.Initiate and support agricultural extension services to popularise new agricultural practices that will contribute to reduction in GHG at local and commercial farm level. A7. Improve livestock waste management A8. Collect and monitor accurate data regarding GHG emissions from agriculture
Time frame	Immediate to long-term
Lead Delivering	Ministry of Agriculture, Water and Forestry, Commercial Farmers, Farmers Union,

Agencies	
Resources/ Estimated cost	

Strategic aim A2T1SA4

ASPECT	A2. Mitigation
Theme	T1: Sustainable Energy and Low Carbon Development
Strategic Aim (Programme)	SA4: Reduce GHG emissions from Land-Use, Land Use Change and Forestry
Objective	Ensure reduction of GHG emissions from Land-Use, Land Use Change and Forestry sectors while raising productivity
Rationale	Land-use, land use change and forestry (LULUCF) together with the agriculture sector contribute significant amounts of GHG emissions. Though Namibia produces very small amounts of GHG according to the 1999 and 2000 greenhouse gas inventory (du Plessis, 1999) and Hartz and Smith, 2008), the bulk of the little what is emitted comes from agriculture, followed by the energy sectors. Agriculture and land-use change contribute much to climate change even at global scale. IPCCC (2007) reported that agriculture (cropland, pasture and livestock production) and forestry), contribute about 13 % and 17 & respectively of anthropogenic GHG. The Forestry sector however is also very important in is essential for carbon sequestration. LULUCF has been identified as one of the primary sources of emissions in Africa as affirmed recently at the African Ministerial Conference on the Environment in Nairobi. Namibia has also identified LULUCF as a key sector for climate change adaptation and mitigation as outlined in the issue paper by Zeidler (2008) on Namibia National Issues Report on land use, land-use change and Forestry (LULUCF) Adaptation.
Activity	A1. Provide support for afforestation and reafforestation of areas or rangelands that are now under furrow and are abandoned. Can encourage use of indigenous trees as well as fruit and shady trees as appropriate. A2. Support reforestation and rehabilitation of most degraded rangelands. A3. Initiate tree planting supported programme by the private sector. Private sector fund provision of tree seedlings to local communities. A4. Reduce land degradation including deforestation and desertification A5. Research on development of fast-growing indigenous trees for future supply to local communities. A6. Promote establishment of community forests A7. Conduct an assessment of investment and financial flows to address climate change adaptation in the LULUCF sector A8 Promote land use options that are better adapted to the extreme variable and arid climate. For example, shift from livestock to wildlife based production system A9. Empower local level and other land resource users including women to conduct land use planning A10. Collect and monitor accurate data regarding GHG emissions from LULUCF A11. Explore possibility of development of CDM projects under LULUCF
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, The private sector, Ministry of Environment and Tourism
Resources/ Estimated cost	

Strategic aim A2T1SA5

ASPECT	A2. Mitigation
Theme	T1: Sustainable Energy and Low Carbon Development
Strategic Aim (Programme)	SA5: Reduce GHG emissions from Industries (e.g. construction, mining, manufacturing)
Objective	Achieve reduction in GHG emissions from industry while increasing production in order to contribute to Namibia's economy.
Rationale	Though Namibia produces very small amounts of GHG according to the 1999 and 2000 greenhouse gas inventory (du Plessis, 1999) and Hartz and Smith, 2008), the bulk of the little what is emitted comes from agriculture, followed by the energy sectors. Some GHG can also come from mining which is a major sector that contributes to GDP, mainly through diamond-mining. In 2000, the mining industry contributed about 13% to GDP. Manufacturing sector largely depends on the processing of Agricultural product, food, beverages and fisheries products (INC, 2000). The Industrial Policy of Namibia aims to increase manufacturing activities to reduce dependency on the primary sector and add value to raw materials. Charcoal production has also increased over the past few years. All these collectively will emit GHG that must be reduced.
Activity	A1. Promote and support the development of Environmental Management Systems that integrates reduction of GHG emissions. A2. Promote development and implementation of practices that reduce GHG emissions from industries e.g. use of gas filters from industrial emissions A3.Promote energy efficient production systems. A4. Facilitate establishment of GHG emission targets to which each industry should adhere to.
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, Ministry of Trade and Industry, Ministry of Labour, Ministry of Fisheries, Ministry of Mines and Energy,
Resources/ Estimated cost	

Strategic aim A2T1SA6

ASPECT	A2. Mitigation
Theme	T1: Sustainable Energy and Low Carbon Development
Strategic Aim (Programme)	SA6: Enhance GHG sinks
Objective	Increase proportion of the country that is vegetated to facilitate carbon sequestration
Rationale	Carbon sequestration is the process of incorporating atmospheric carbon into plants, soils, and water. Those resources or processes that absorb atmospheric carbon are commonly referred to as "carbon sinks" because of their ability to absorb, as opposed to emit, GHG emissions. Growing vegetation absorb carbon dioxide. Forests are carbon stores, and they are carbon dioxide sinks when they are increasing in density or area. Carbon can also be sequestered through agriculture. While deforestation contributes loss of the standing biomass that act as carbon sinks, reafforrestation will contribute to increasing standing tree biomass that will serve as carbon sinks. Though Namibia does not contribute significant amounts of GHG into the atmosphere, we can contribute to carbon sequestration by enhancing GHG sinks. As a signatory to the Millennium declaration, Namibia is committed to achieving environmental sustainability (MDG7) by 2015. One of the indicators of environmental sustainability is the

	proportion of land set aside as protected areas including forest reserves and community forests. Namibia has made strides towards increasing proportion of land for protected areas. Any strategies and activities that facilitate increase in surface area with forests and reduction of deforestation will contribute, in whatever small way, towards enhancing GHG sinks in Namibia.
Activity	A1: Initiate and improve afforestation and reafforestation in Namibia A2: Reduce deforestation A3: Reduce uncontrolled bush fires A4: Increase land area left as protected areas A5: Promote establishment of community forests and improvement of forestry management A6: Promote conservation of riparian buffers A7: Promote conservation tillage on croplands A8: Promote grazing land management
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Environment and Tourism, Namibia Wildlife and Environment Society, Ministry of Agriculture, Water and Forestry,
Resources/ Estimated cost	

Strategic aim A2T1SA7

ASPECT	A2. Mitigation
Theme	T1: Sustainable Energy and Low Carbon Development
Strategic Aim (Programme)	SA7: Manage rural and urban waste
Objective	Improve management of rural and urban waste while lowering GHG especially methane emissions to make cities less polluted
Rationale	Although with a small population of about 2 million people rural urban migration is on the increase especially into Windhoek evident from the number mushrooming informal settlements at outskirts of the city. Urban population increase leads to increase in urban waste and hence increases the demand for more dump sites. It also creates heavy burden on the municipality to collect, transport and dump the waste. The city of Windhoek has the Kupferburg as the main waste open fill dump site. There is increasing pressure in terms of volume of waste dumped there. There is need to explore ways to manage urban waste in a manner that will minimise GHG especially methane emissions.
Activity	A1. Improve collection, transportation and dumping / disposal of rural and urban waste A2. Undertake studies to quantify amounts of methane produced at the waste dump sites in Windhoek and other cities and towns A3. Improve design of rural and urban waste dump sites and assess the potential of effective capturing, storage and use of methane produced at the dump sites. A4. Promote reduction, reuse and recycling of waste in urban and rural areas A5. Encourage income and employment creation from waste related activities A6. Support the development of better technologies, innovation and communication for all stakeholders in waste management
Time frame	Immediate to long-term
Lead Delivering Agencies	City of Windhoek, Private sector e.g. Rent A Drum, Ministry of Environment and Tourism, Namibia Wildlife and Environment Society
Resources/	

Estimated cost	

Strategic aim A1T2SA1

ASPECT	A2. Mitigation
Theme	T2: Transport
Strategic Aim (Programme)	SA1: Promote development of alternative plans for service delivery
Objective	Ensure that services continued to be delivered to resident during the disruptions caused to current infrastructure.
Rationale	Infrastructure management practices are not robust enough to cope with impacts of climate change to minimise damage due to rainfall variability (floods and drought), high temperatures (extreme heat and cold), and wind storms. Information incorporating current climatic variability and risk assessment should be core to current management strategies to assists with adaptation to longer term climate change impacts. To be able to deliver services during the disruption of services.
Activity	A1. Review current infrastructure service delivery against climate change risks A2: Develop alternative infrastructure service delivery plans for various towns and settlements A3: Test/pilot alternative service delivery plans under different conditions A4: Coordinate alternative infrastructure service delivery with other stakeholders A5: Provide training on alternative infrastructure service delivery A6: Promote
Time frame	Medium term
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Regional Local Government, Housing and Rural Development,, Ministry of Environment and Tourism, NamPower, NamWater, NamPort, MTC and Cell One, Telecom, TransNamib, Municipalities.
Resources/ Estimated cost	

Strategic aim A2T2SA2

ASPECT	A2. Mitigation
Theme	T2: Transport
Strategic Aim (Programme)	SA2: Promote development of climate change resilient transport infrastructure
Objective	Ensure development of transport infrastructure that can withstand or resist the negative impacts of climate change
Rationale	Namibia's transport infrastructure is well developed and highly rated (Republic of Namibia, 2007). Most of the transport infrastructure however were designed and constructed at a time when impacts of climate change were considered because it was not a threat. However, to date, predicted impacts of climate change such as increase in temperature and sea level rise are likely to damage some road and railway infrastructure. Where rainfall will be higher than normal and flooding occurs, some roads will be inundated and the roads may erode of bridges wash away. These will negatively affect the transport infrastructure. Rehabilitating such destruction will be costly.
Action	A1. Develop climate change resilient transport infrastructure A2. Develop and reinforce standards for construction of transport infrastructure A3. Promote the practice of subjecting transport infrastructure development to EIA and development and

	implementation of Environmental Management Plans A3. Budget for rehabilitation of transport infrastructure against climate change damage
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Mines and Energy, NamPower, Namwater, NamPort, , TransNamib, Municipalities
Resources/ Estimated cost	

Strategic aim A2T2SA3

ASPECT	A2. Mitigation
Theme	T2: Transport
Strategic Aim (Programme)	SA3: Diversify transport energy sources
Objective	Promote development and or adoption of alternative transport energy sources
Rationale	Vehicle fuels such as Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG), ethanol and methanol and bio-Diels can be used but in Namibia, only LPG for petrol driven vehicles is available (Republic of Namibia, 2007). The advantage of these alternative fuels is that they are less polluting. It is important that Namibia explores the possibility of using such alternative energy sources for the transport sector. Transport fuels form a significant portion of Namibia's energy demand. This in part is due to the fact that the economy of Namibia to a large extent depends on large volumes of imported commodities that come in by road or railway. Since there is a positive relationship between transport demand and economic growth, petroleum products will remain a dominant energy demand. Hence the need to use fuels that are less polluting. For instance, LPG is not only cheaper in the long run but it is also environment friendly. Compared to petrol, LPG has 75% less carbon monoxide, 85% less hydrocarbons, 40% less oxides of nitrogen and 87% less ozone (Republic of Namibia, 2007).
Action	A1: Set vehicle fuel standards A2: Encourage fuel switching, for instance to use of LPG A3:: Encourage production and use alternative fuels such as ethanol and methanol that can be produced from invasive bushy species A4: Promote the production of biodiesel which can be blended with diesel fuel A5: Set national framework for vehicle use.
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Mines and Energy, NamPower, Namwater, NamPort, , TransNamib, Municipalities,
Resources/ Estimated cost	

Strategic aim A2T2SA4

ASPECT	A2. Mitigation
Theme	T2: Transport
Strategic Aim (Programme)	SA4: Improve motor vehicle fuel efficiency
Objective	Promote reduction of GHG emissions through promotion of motor vehicle fuel efficiency
Rationale	The consumption of fuel constituted over 70% of Namibia's total energy demand for 2006 (Republic of

	Namibia, 2007). The main transport fuel used are unleaded and replacement fuel. These are mainly used in passenger and light load vehicles. On the other hand, heavy load and other special vehicles use diesel. These fuels contribute large amounts of carbon emissions especially when old vehicles are used.
Action	A1. Reinforce proper vehicle maintenance, use of engine oils and tyre pressure A2. Promote and encourage regular vehicle testing. A3. Undertake mandatory as well as random vehicle inspections and maintenance programs. E.g. Spot check for exhaust emissions A4 Establish and reinforce standards for motor vehicle exhaust emissions. A5. Institute an environmental levy on old, used imported vehicles.
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Mines and Energy, Namwater, NamPort, , TransNamib, NATIS, Namibia Police
Resources/ Estimated cost	

Strategic aim A2T2SA5

ASPECT	A2. Mitigation
Theme	T2: Transport
Strategic Aim (Programme)	SA5: Promote use of public transport
Objective	Increase the number of people that use public transport while reducing use of personal vehicles
Rationale	The increase in private vehicle ownership in Namibia (Republic of Namibia 2007) has also lead to a high demand and resultant high consumption of fuel. This will ultimately lead to an increase in the carbon emissions. This is especially the case if vehicles that are in use are old and hence not very efficient at combustion. Such emissions arising from high volumes of personal vehicles can be reduced by encouraging use of shared or public transport. Provision of efficient public transportation will help offset or reduce the high energy use and emission associated with the growth of private motorized transport.
Action	A1. Improve quality of services (especially in terms of duration of travel to desired destination, comfort, security and cleanliness). A2. Make public transport costs affordable A3. Construct segregated public transport pathways that enable uninhibited bus movements. A4. Discourage use of personal vehicle through zoning and associated levies in selected areas for instance in the central part of the city or towns.
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Works and Transport, Ministry of Mines and Energy, Namwater, NamPort, , TransNamib, NATIS, Namibia Police
Resources/ Estimated cost	

Strategic aim A3T1SA1

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA1**:** Strengthen human resource capacity building for climate change

Objective	Develop adequate human capacity to effectively develop and manage climate resilient policies, plans and development programs and participate in international negotiations
Rationale	"Capacity building in education, training and public awareness is one element that is amenable to synergy among the Rio Conventions, other non-Rio Treaties and national development programmes and activities. The local/regional and national NCSA as well as the National Biodiversity Professional Training Framework for Namibia emphasise the importance of and observe the inadequacies in building capabilities of individuals, regions, organisations and institutions to address environmental issues as part of activities towards promotion of sustainable development. In Namibia, knowledge (Karuaihe *et al,* 2005)
Activity	A1. Support enhancement of capacity of Government staff for climate change policy, plans and program and project formulation / development and management / implementation. A2. Enhance capacity of key personnel of Government, NGOs and the private sector on accessing international carbon and climate change funds. A3. Enhance the capacity of personnel within and without Government for climate change negotiations
Time frame	Medium (5 years) to long term
Lead Delivering Agencies	Ministry of Education, Namibia Environmental; education Network (NEEN), Ministry of Environment and Tourism (NCCC Unit), University of Namibia, Polytechnic of Namibia, Windhoek College of Education,
Resources/ Estimated cost	

Strategic aim A3T1SA2

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA2: Mainstream climate change in national, local and sector policies, development plans & programs
Objective	Integrate climate change management in all areas of development
Rationale	Sector-based modes of operation in development and implementation of policies, programmes and action plans ignore or overlook the sectoral, cross-cutting nature of effects of climate change. Such operations miss out on benefits that accrue from co-ordinated and integrated planning and implementation of sector specific mandates. (Karuaihe *et al.* 2005).
Activity	A1. Mainstream climate change in local, national and sectoral policies, plans and programs of development action. A2. Support inter-ministerial and inter-institutional coordination at various levels of Government and other organisations on climate change related issues
Time frame	Medium (5 years) to long term
Lead Delivering Agencies	Ministry of Environment and Tourism, Namibia Climate Change Committee, Office of the Prime Minister, national planning Commission, ALL ministries,
Resources/ Estimated cost	

Strategic aim A3T1SA3

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA3: Strengthen institutional capacity for climate change management

Objective	Ensure development of new and strengthening of existing organisations that will effectively respond to climate change
Rationale	Capacity building in education, training and public awareness is one element that is amenable to synergy among the Rio Conventions, other non-Rio Treaties and national development programmes and activities. The local/regional and national NCSA as well as the National Biodiversity Professional Training Framework for Namibia emphasise the importance of and observe the inadequacies in building capabilities of individuals, regions, organisations and institutions to address environmental issues as part of activities towards promotion of sustainable development. In Namibia, knowledge and technical and scientific skills are generally low (Mfune and Ndombo, 2005)
Activity	A1. Undertake organisation restructuring and reform and strengthen Key Government (e.g. Ministry of Environment and Tourism) and other agencies that deal with climate change related issues. A2. Establish new organisations or sections in Key Government Ministries or departments that will address climate change adaptation and mitigation A3. Establish a new Climate change agency/ organisation that will coordinate all climate change issues in Namibia (this can be done on a pilot basis before either full or permanent establishment or discontinuation)
Time frame	Medium (5 years) to long term
Lead Delivering Agencies	Office of the Prime Minister, Disaster Risk management , Emergency management Unit (EMU) Ministry of Environment and Tourism (NCCC Unit), Ministry of Works and Transport (Meteorological services), Ministry of Agriculture, water and Forestry (Agro Climatology Section), University of Namibia, Polytechnic of Namibia, Windhoek College of Education.
Resources/ Estimated cost	

Strategic aim A3T1SA4

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA4: Mainstream climate change in the media
Objective	Train mass media journalists so they can participate in raising public awareness of climate change in Namibia through mass media
Rationale	Climate change is poorly understood by various categories including media (journalists), policy-makers (decision makers), natural resource managers, technicians, scientists as well as the general public and in particular, farmers. Yet it is likely to hinder efforts to achieve sustainable development. Target-specific actions to obtain relevant and timely climate change information (e.g. forecast of drought) and dissemination of such information to relevant stakeholders for appropriate action requires the development of a national strategy (Mfune and Ndombo, 2005).
Activity	A1: Capacity building and training mass media journalists in climate change issues and reporting. A2. Expose journalists to climate change global negotiations and agreements. A3. Invite media to attend and cover organised national and international scientific meetings on climate change and climate change public awareness campaigns A4: Expose journalists to climate change hotspots in different Regions of Namibia. A5. Improve interface between journalists and scientists A6: Develop and support Media networking strategy to inform public on climate change issues, workshops, projects, activities and general climate change information
Time frame	Medium (5 years) to long term

Lead Delivering Agencies	Ministry of Education, Ministry of Environment and Tourism (NCCC Unit), University of Namibia, Polytechnic of Namibia, Colleges of Education, Media Institute of Southern Africa-Namibia (MISA – Namibia), various media companies.
Resources/ Estimated cost	

Strategic aim A3T1SA5

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA5: Develop and implement educational program on climate change and its impacts
Objective	Ensure development of learners and students that are knowledgeable on climate change in schools in Namibia
Rationale	The youth are future leaders. In addition and perhaps more importantly, the youth are most likely to experience predicted future impacts of climate change in their adulthood. In addition, they are the future scientists, technical and managerial personnel and policy makers. It is therefore important to bring to their knowledge the causes and effects of climate change and how to respond to these. Such education should include influencing their attitude to responsible environmental management and sustainable development. To this end, in their formal education, the youth should not only learn about climate change and its effects but should also be involved in the development of educational materials to reinforce the importance of climate change. The youth or students should be actively involved in disseminating climate awareness messages and in climate change projects and activities. (Mfune and Ndombo, 2005)
Activity	A1. Mainstream climate change in school, tertiary and Vocational Training Centre curricula. A2. Establish environmental clubs or societies that include climate change. A3. Support annual activities on climate change issues or topics
Time frame	Medium (5 years) to long term
Lead Delivering Agencies	Ministry of Education, Namibia Environmental; education Network (NEEN), Ministry of Environment and Tourism (NCCC Unit), University of Namibia, Polytechnic of Namibia, all Colleges of Education and Vocational Training Centre, publishing companies and learners. National Institute of Education Development (NIED), Ministry of Education
Resources/ Estimated cost	

Strategic aim A3T1SA6

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA6: Promote and facilitate development of educational materials on climate change
Objective	Ensure availability of relevant climate change relevant materials and information for different target groups
Rationale	The youth are most likely to experience predicted future impacts of climate change in their adulthood. In addition, they are the future scientists, technical and managerial personnel and policy makers. It is therefore important to bring to their knowledge the causes and effects of climate change and how to respond to these. Such education should include influencing their attitude to responsible environmental management and sustainable development. To this end, in their formal education, the youth should not

	only learn about climate change and its effects but should also be involved in the development of educational materials to reinforce the importance of climate change. The youth or students should be actively involved in disseminating climate awareness messages and in climate change projects and activities. (Mfune and Ndombo, 2005)
Activity	A1. Promote development of models on climate change A2. Facilitate and support development of educational materials on climate change such as posters, fact sheets and charts A3. Adapt available educational materials on climate change and make them relevant to the local setting in Namibia.
Time frame	Medium term to long term
Lead Delivering Agencies	Ministry of Education, Namibia Environmental; education Network (NEEN), Ministry of Environment and Tourism (NCCC Unit), University of Namibia, Polytechnic of Namibia, Windhoek College of Education, publishing companies and learners. Namibia Institute of Education Development (NIED)
Resources/ Estimated cost	

Strategic aim A3T1SA7

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA7: Facilitate and support training of scientific, technical and managerial personnel in climate change adaptation and mitigation
Objective	Development of cadre of scientific, technical and managerial personnel that will effectively participate in and address climate change related issues
Rationale	The complex nature of climate change requires the involvement of well-trained scientific, technical and managerial staff that will not only understand climate change but also be involved in adaptation to climate change. Well-trained scientific, technical and managerial personnel will further be able to identify gaps and needs in implementation of Article 6. They will be able to link these to implementation of policies and measures to mitigate and adapt to climate change. Technical skills and knowledge therefore provide an opportunity to adequately address and respond to climate change issues. They may also be vehicles of technology transfer and the required continuing capacity building. It is therefore very important to develop and implement climate change-specific or focused training programmes (Mfune and Ndombo, 2005).
Activity	A1. Develop targeted, tailor-made professional degree courses or short-courses on climate change for professional / scientific, technical / extension staff and staff in managerial positions. e.g. Climate change modelling, Communicating environmental education and climate change adaptation and mitigation, Effective international negotiations on climate change and related issues. A2. Provide training for extension workers to acquire skills on use and interpretation of weather forecast data. A3. Conduct in-service public awareness workshops for extension / technical staff to update them on climate change issues and developments
Time frame	Medium term to long term
Lead Delivering Agencies	Ministry of Education, Namibia Environmental; education Network (NEEN), Ministry of Environment and Tourism (NCCC Unit), University of Namibia, Polytechnic of Namibia, Windhoek College of Education, publishing companies and learners.
Resources/ Estimated cost	

Strategic aim A3T1SA8

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA8: Develop disaster risk reduction capacity building plans and programmes.
Objective	Development of cadre of scientific, technical and managerial personnel that will effectively participate in disaster risk programmes implementation, design and preparedness.
Rationale	Increase preparedness of Namibians to respond to climate change related disasters and risk with the necessary capacity to manage the risks.
Activity	A1. Assess at all levels of government disaster risk reduction human resource capacity A2. Develop scientific and technical methods and capacities for risk assessment, monitoring and early warning, through training. A3. Develop training programmes for disaster risk reduction targeting specific groups of people, to improve preparedness A4. Develop learning and training programmes on disaster risk reduction in schools and institutions of higher learning. A5. Promote community based training on disaster risk reduction
Time frame	Medium term to long term
Lead Delivering Agencies	Office of the Prime Minister, Disaster Risk Management (DRM) and Emergency Management Unit (EMU), Regional Emergency Management Unit (REMU), Ministry of Environment and Tourism, Directorate Environmental Affairs (NCCC Unit), University of Namibia, the Polytechnic of Namibia.
Resources/ Estimated cost	

Strategic aim A3T1SA9

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T1: Capacity building, training, and institutional strengthening
Strategic Aim (Programme)	SA9: Establish Climate Change Resource Centre and Climate Change database
Objective	Ensure that climate change information that has been generated is stored in a manner that will enable access as well as distribution to various stakeholders including the general public.
Rationale	Climate change is very complex and poorly understood. Its impacts transcend national boundaries and sectors. Hence a wide range of stakeholders are affected. In addition, some climate change impacts are area specific. Different stakeholders are affected in a different ways. Hence many different stakeholders should be involved in addressing climate change adaptation and mitigation. The multi-sectoral composition of NCCC in Namibia is evidence of such wide range of sectors that are affected by climate change. Hence this implies that a wide range of climate change data and information is or shall be generated by stakeholders in different sectors. The need for a coordinate capture, storage, retrieval system or access and distribution of climate change adaptation and mitigation information cannot be emphasized
Activity	A1. Establish a Climate Change Resource Centre either as a stand-alone Unit in National Archives or the proposed Climate Change Agency A2. Establish a climate change data collection and central data base (storage system) A3. Mobilise capacity from different sectors to provide relevant climate change information for data storage. This should include research information generated on climate change adaptation and mitigation

	A4. Coordinate generation, processing and storage of climate change information. A5. Facilitate access of climate change information to interested stakeholders A5. Distribute / disseminate climate change information and research data to interested stakeholders
Time frame	Medium term to long term
Lead Delivering Agencies	Ministry of Environment and Tourism, Directorate Environmental Affairs (NCCC Unit), University of Namibia, the Polytechnic of Namibia, National Library, National Botanical Research Institute, National archives
Resources/ Estimated cost	

Strategic aim A3T2SA1

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA1: Collect data and model climate change an national, regional & local levels
Objective	Generate relevant data to enable modelling of climate change using climate models such as General Circulation Models (GCM)
Rationale	The 4th IPCC report established that global warming and climate changes are caused by increasing concentrations of green house gases caused by human factors. It predicted that temperature rises will vary in different parts of the world and used a number of global circulation models to generate future climate scenarios at global and regional levels. In Namibia, climate change impacts will differ in different regions and localities. In order to generate more accurate climate change scenarios for Namibia, it is important to develop appropriate GCM models that should be calibrated to regions and even localities to allow for better simulation of future conditions under different scenarios and assumptions. To achieve more precision, models should use small grids to predict climate change scenarios.
Activity	A1. Strengthen and improve collection of meteorological weather data and other relevant field data in various localities in Namibia to feed into climate change models to predict future climate change and its impacts A2. Build capacity for construction of climate change models at national, regional and local scale (small grids) A3. Link up regional climate change models to generate better boundary conditions
Time frame	Immediate and continuing
Lead Delivering Agencies	Meteorological Department, University of Namibia, The Polytechnic of Namibia, Ministry of Agriculture, Water and
Resources/ Estimated cost	

Strategic aim A3T2SA2

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA2: Monitor ecosystem and biodiversity changes and their impacts
Objective	Enhance understanding of changes in the ecosystem and how these will influence biodiversity changes and

	strategies for adaptation
Rationale	Climate change will also affect spatial shifts in ranges of some species due to changes in temperature and rainfall regimes. If climate change will make some habitats unsuitable, some species with poor dispersal or migratory ability may become locally extinct, leading to substantial losses to biodiversity. The succulent Karoo which receives winter rainfall is such a biome that is vulnerable to potential shift in rainfall patterns (Desanker, 2003). Drying trends are likely to make savannah and grassland ecosystems less productive. Along the coast, rise in sea level will lead to loss of food supply and availability of breeding sites of palearctic and resident sea- and shorebirds and other organisms due to sea levels rising.
Activity	A1. Set up monitoring system to evaluate changes in ecosystem and biodiversity especially sensitive ecosystems. A2: Support and promote activities of the Namibia Environmental Observatories Network (NaEON). A3. Develop and support participatory ecosystem monitoring systems by involving local trained people including academic researchers, school teachers, line Ministries personnel, extension workers as well as local communities A4. Report changes in ecosystems and biodiversity and assess implications, including those for the livelihoods of local people and recommend adaptation measures. A5. Study bush encroachment and understand its impact on Namibia's greenhouse gas profile
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Environment and Tourism, Ministry of Forestry, Ministry of Fisheries, Ministry of Agriculture, University of Namibia, Polytechnic of Namibia , DRFN,
Resources/ Estimated cost	

Strategic aim A3T2SA3

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA3:Conduct climate-proof research
Objective	Enhance understanding of impacts of climate change on various food resources and social issues
Rationale	More people will suffer from hunger due to reduced agricultural yield, livestock and fish supply as a result of impacts of climate change especially weather-related disasters and desertification. This will destroy livelihoods of many people in Namibia. Once these livelihoods have been destroyed, then what? How do local people cope when disasters that destroy their livelihoods strike? Local people have coping mechanisms which they employ during difficult times. These could be very instrumental to cope with adverse impacts of climate change. For example, dried mopane worms may be stored and consumes or sold out of season. In addition, in Omusati for instance, local people base the choice of millet variety on the basis of the weather forecast. When the rains come late they grow the fast maturing Okashana variety of milled (Mahangu).
Activity	A1. Conduct research on impacts of climate change on crops, livestock, fisheries, forests, pests and diseases A2. Conduct research on evolving adverse climate tolerant genotypes and land-use systems A3. Research on traditional knowledge for adaptation A4.Research on social issues including but not limited to:- migration and changing household composition, loss of labour due to HIV/AIDS, land tenure security, access to credit and technologies and household activities including water and fuel collection and food preparation

Time frame	Immediate and long term
Lead Delivering Agencies	Ministry of Agriculture, Water and Forestry, Ministry of Environment and Tourism, Directorate of Scientific Services, University of Namibia, Polytechnic of Namibia,
Resources/ Estimated cost	

Strategic aim A3T2SA4

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA4: Undertake research on sea level rise
Objective	Generate seal level data for monitoring and modelling to predict seal level rise and its impacts due to climate change
Rationale	The IPCC (2001) predict that the melting if the ice cap due to climate change will lead to global average sea level rise of up to 1.8 mm/year (1961-2003) and 3.1 mm/year (1993-2003). For Namibia sea levels of up to 30cm have been predicted. The rise in the sea levels will Increased damage to coastal ecosystems, Increased coastal erosion and damage to coastal buildings and infrastructure, Increased risk to human life, risk of infectious disease epidemics. It will also lead to loss of breeding grounds for sea birds and paleartic birds. However, little is known about the speed with which such level will rise as well as how local prevailing conditions including the Benguela current will be affected.
Activity	A1. Develop new and strengthen existing data collection stations to monitor sea level rises and salinity along the coast of Namibia together with other appropriate hydro-meteorological data A2. Model the inundation and salinity impacts of sea level A3. Model and predict the socio-economic, health and ecosystem impacts of sea level rise. A4. Develop a relocation plan for industries and local residents of coastal towns.
Time frame	Short, medium and long term
Lead Delivering Agencies	Department of Meteorology, Ministry of Fisheries, University of Namibia, Polytechnic of Namibia
Resources/ Estimated cost	

Strategic aim A3T2SA5

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA5: Establish a centre for research and training on climate change
Objective	Increase human and institutional capacity on research and generation and management of information related to climate change related issues and to train climate change professionals
Rationale	Our current knowledge of impacts of climate change in Namibia has steadily improved due to Namibia's compliance with obligations of the UNFCCC. However the speed of generation of such climate change information, data and understanding is far slower than expected in order to obtain Namibia specific data and knowledge of climate change issues. One of the major reasons is that most information is based on that from other countries including South Africa. In order to develop comprehensive adaptation measures and mitigation, which must be supported by technology development and transfer and financial flows,

	there is need to establish a centre for research and training on climate change. This will generate Namibia area specific data that may be used to model various components of the climate change complex issues. These data will also enable development of Namibia area specific and appropriate interventions.
Activity	A1. Establish a research institute and / or network for research on climate change and impacts of climate change and adaptation A2. Develop and maintain a climate change data base on a web portal dedicated to climate change A3. Develop training programs for high and mid-level Government officials, NGOs and private organisations and provide training in collaboration with research centres and universities
Time frame	Immediate and continuing
Lead Delivering Agencies	Ministry of Environment and Tourism, University of Namibia, Polytechnic of Namibia, Desert Research Foundation of Namibia (DRFN)
Resources/ Estimated cost	

Strategic aim A3T2SA6

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA6: Conduct Inventories on traditional / indigenous knowledge and coping practices
Objective	To identify and document best practices, traditional knowledge and alternative practices for coping with climate and other extreme events
Rationale	More people will suffer from hunger due to reduced agricultural yield, livestock and fish supply as a result of impacts of climate change especially weather-related disasters and desertification. This will destroy livelihoods of many people in Namibia. Once these livelihoods have been destroyed, then what? How do local people cope when disasters that destroy their livelihoods strike? Local people have coping mechanisms which they employ during difficult times. These could be very instrumental to cope with adverse impacts of climate change.
Activity	A1. Undertake inventories of best practices, traditional knowledge and alternative practices for coping with climate variability and extreme weather A2. Disseminate best practices, traditional knowledge and alternative practices for coping with climate variability to different stakeholders in different parts of Namibia for possible adoption
Time frame	Immediate and long term
Lead Delivering Agencies	University of Namibia, Ministry of Environment and Tourism, Polytechnic of Namibia,
Resources/ Estimated cost	

Strategic aim A3T2SA7

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA7: Undertake studies on the cost of adaptation and mitigation
Objective	Ensure accurate estimation of the cost of climate change adaptation and mitigation with the view to facilitate resource mobilisation

Rationale	Climate change will cause many adverse effects on various sectors. The overall goals of the Namibian Government are human development and poverty reduction in order to raise the living standards of her people. Climate challenge poses great threat to these goals. Adaptation and mitigation measures are costly. However, it is not easy to estimate the cost of climate change adaptation and mitigation in Namibia because of inadequate human capacity. The Stern Review sent a clear message to the world that many developing countries would bear the brunt of the economic cost of climate change because of high poverty levels that make then vulnerable to impacts of climate change. Namibia is very vulnerable to impacts of climate change. In order to mobilise financial and other resources to address climate change, there is need to have be able to estimated cost of climate change impacts.
Activity	A1. Build human capacity and develop models that can be used to estimate the cost of adaptation and mitigation A2. Commission study to estimate the cost of adaptation and mitigation to climate change using models developed
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Environment and Tourism, University of Namibia, Polytechnic of Namibia,
Resources/ Estimated cost	

Strategic aim A3T2SA8

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T2: Research and information needs
Strategic Aim (Programme)	SA8: Study macroeconomic and sectoral impacts of climate change
Objective	Identify anticipated sectoral and macroeconomic impacts of climate change to facilitate formulation and implementation of strategies and action plans for adaptation and mitigation
Rationale	The Stern Review drew the attention of the world to the impacts of climate change on the global economy and that this cannot be ignored. The review sent a clear message that many developing countries would bear the brunt of the economic cost of climate change because of high poverty levels that make then vulnerable to impacts of climate change. Namibia it very vulnerable to impacts of climate change. In order to mobilise financial and other resources to address climate change, there is need to have be able to estimated cost of climate change impacts.
Activity	A1. Undertake sector- by sector analyses of impacts of climate change on major sectors of the Namibia economy such as agriculture, industry, health, transport etc A2. Assess and document the impacts of climate change on poverty and on people living in vulnerable areas such as flood-prone north-eastern and north-central Namibia, as well as coastal areas A3. Research on impacts of climate change on the macro-economy of Namibia including impacts on growth, employment trade etc
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Finance, Line Ministries, University of Namibia, Polytechnic of Namibia, Ministry of Education, MOE (NIED)
Resources/ Estimated cost	

Strategic aim A3T3SA1

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T3: Public awareness, participation and access to information
Strategic Aim (Programme)	SA1: Awareness raising and public education on climate change and its effects
Objective	Ensure communities at all levels of society are aware of climate change and its impacts
Rationale	The aim of the UNFCCC Nairobi Work Program is to assist all Parties to improve their understanding and assessment of impacts, vulnerability and adaptation. Since about two-thirds of Namibians live in rural areas and depend on natural resources and that climate change will affect sectors that local people depend on, in is important that all stakeholders and the public understand both causes and impacts of climate change and what they can do to adapt. Mfune and Ndombo (2005) identified farmers, natural resource managers, policy makers, the media, private sector, extension staff, scientists as well as technicians as stakeholders that need climate change awareness. It is therefore a priority that any climate change materials used for awareness should be developed for specific stakeholders and communicated in a manner that is easy to understand and culturally acceptable.
Activity	A1. Sensitise farmers and general public on what climate change is and how climate change affects their daily lives A2. Conduct climate change awareness seminars / workshops for various stakeholders such as policy makers (MPs), Permanent Secretaries, Directors of Government Departments and the Private sector / industry etc A3. Facilitate participation of various members of the communities and stakeholders at national and world environment days e.g. Ozone layer day, world water day etc A4. Invite media to attend and cover organised national and international climate change public awareness campaigns A5. Facilitate and support attendance of professionals at national and international climate change workshops / seminars and conferences
Time frame	Medium to long term.
Lead Delivering Agencies	CBOs, Ministry of Environment and tourism, NACSO, MOE (NIED), DRFN, MAWF, INFOCOM, Media,
Resources/ Estimated cost	

Strategic aim A3T3SA2

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T3: Public awareness, participation and access to information
Strategic Aim (Programme)	SA2: Promote and facilitate development of public awareness materials on climate change
Objective	Ensure adequate availability and supply of climate change information to communities at different levels of society
Rationale	Climate change is likely to undermine national development. Most climate change awareness programs have previously focused on pollution emissions. While these messages are relevant for climate change mitigation, Namibia will be preoccupied with adaptation because she emits little greenhouse gases into the atmosphere. Since climate change is relatively new and poorly understood, Namibia should develop targeted awareness and action Programs to address climate change impacts for instance on food security,

	human health. According to Mfune and Ndombo (2005), such awareness programs should be developed and adapted for different stakeholders because these need different information. In addition, not all stakeholders understand English. There is need to translate climate change information
Activity	A1. Translate climate change information (e.g. Initial national communication) into simplified version preferably in different vernacular languages in Namibia A2. Produce climate change public awareness materials such as posters, flyers, brochures, maps etc A3. Produce drama, stories and other visual materials to facilitate understanding of climate change messages A4. Produce videos and songs on climate change A5. Publication of scientific information on climate change and its impacts, adaptation and mitigation in different regions and localities in Namibia. A6. Fund (by Government, the private sector / industry etc) production of climate change awareness materials
Time frame	Immediate and continuing
Lead Delivering Agencies	Ministry of Environment and Tourism, University of Namibia, Polytechnic of Namibia , Media, DRFN, NBC, NIED, BP, SHELL, ENGEN.
Resources/ Estimated cost	

Strategic aim A3T3SA3

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T3: Public awareness, participation and access to information
Strategic Aim (Programme)	SA3: Facilitate access of climate change information to the public and other stakeholders
Objective	Ensure that all stakeholders including local communities have adequate access to climate change information to empower them to undertake appropriate action
Rationale	Stakeholders need climate change information that will aid understand of climate change issues and empower them take appropriate action whether for mitigation or climate change adaptation. Article 6 (a)(ii) of UNFCCC seeks to promote public access to information on climate change and its effects. Mfune and Ndombo (2005) identified the following as stakeholders that would participate in providing access of climate change information;- donors, policy makers, professionals, the media, private sector, libraries and resource centres, extension staff and farmers and the general public. Several activities can be undertaken to promote public access of climate change information.
Activity	A1. Supply / distribute simplified versions of climate change information such as Climate change convention, preferably in vernacular, to various target groups e.g. policy makers, managers, professionals, media private sector, extension staff, local communities through posters, fact sheets, flyers etc A2. Provide the media with handy information on climate change to facilitate effective communication of climate change messages A3. Invite various stakeholders (media, private sector and even general public) to climate change workshops / seminars and conferences A4. Publish newspaper articles on climate change for public awareness A5.Produce and air radio and TV programs on climate change A6. Increase availability of copy-right free materials in accordance with laws and standards related to protection of copy-righted materials A7. Libraries can acquire and make accessible climate change materials and information to different

	stakeholders
Time frame	Immediately, ongoing and medium and long term
Lead Delivering Agencies	MET, NPC, DRFN, UNAM, PON, NBC, Publishers, Resource Centres at line Ministries, NIED, Meteorological Services, and supporting partners (UNDP, UNESCO, GTZ)
Resources/ Estimated cost	

Strategic aim A3T3SA4

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T3: Public awareness, participation and access to information
Strategic Aim (Programme)	SA4: Promote public participation in addressing climate change and development of adequate responses
Objective	Ensure participation of the public in addressing climate change adaptation and mitigation
Rationale	Most governments have now put climate change adaptation and mitigation on high priority especially developing countries that are very vulnerable to impacts of climate change (Nairobi Work Program). There is growing wealth of scientific knowledge, practical experiences on how to respond to climate change as well as wide range of indigenous knowledge on coping mechanisms. All these knowledge need to be exploited. Hence stakeholders should be enlisted to participate in addressing climate change and development of adequate responses by undertaking several activities
Activity	A1. Provide relevant information to assist farmers and other stakeholders to adapt to effects of climate change data e.g. forecast of drought, or distribution of rainfall especially the timing of the onset, intermittency and end of rainy season or forecasting of crop yields. A2. Facilitate development and implementation of local / regional climate change specific strategies and actions by communities or stakeholders e.g. adoption of new climate change resilient crop varieties and livestock breeds. For example, Natse Otweya climate change community information tool kit on adaptation developed by and for farmers in North-Central Regions of Namibia. A3. Train local communities on responses to climate change effects such as disaster management. A4. Involve local farmers and other stakeholders to provide data on how they cope with effects of climate change
Time frame	Immediate to long term
Lead Delivering Agencies	Line Ministries through extension staff, Meteorological services
Resources/ Estimated cost	

Strategic aim A3T4SA1

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T4: Disaster Reduction and Risk Management
Strategic Aim (Programme)	SA1: Improvement of disaster forecasting and early warning systems
Objective	To facilitate availability and dissemination of information on disasters due to climate change in good time (longer lead time) to enable effective responses of different affected parties
Rationale	Namibian economy and livelihood is depended on natural resources and agriculture. Namibia has lately experiences natural disasters such as floods and droughts. The occurrence of natural disasters such as

	floods has become more frequent therefore people living in the vulnerable areas needs to be prepared for disasters, through sharing of information and early warning systems.
Activity	A1. Strengthen the metrological Department and improve its capacity (human resource, infrastructure and equipment) to capture and disseminate relevant climate data. A2. Train human resource to undertake climate change and disaster modelling and forecasting. A3. Improvement of dissemination of disaster forecasting and early warning information to affected parties using effective methods and media e.g. radio in vernacular A4. Undertake awareness building programs at community level on warnings produced and how to respond appropriately
Time frame	Immediate and continuing (Medium term and long term)
Lead Delivering Agencies	Ministry of Works and Transport, in particular Meteorological Services Department, Civil society organisations active in disaster management and the media, Office of the Prime Minister, Disaster Risk management Unit or Emergency Management Unit (EMU).
Resources/ Estimated cost	

Strategic aim A3T4SA2

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T4: Disaster Reduction and Risk Management
Strategic Aim (Programme)	SA2: Improvement of disaster preparedness
Objective	Improve preparedness and resilience of local communities and other affected stakeholders against climate-related natural disasters
Rationale	Namibia is prone to natural disasters such as floods and droughts. More communities have recently been affected by flood, in the north central regions, Kavango region and the Caprivi region. Communities living in these regions are exposed to natural disasters and need to be prepared to respond adequately to the challenges. In Namibia, the Directorate of Emergency Management (DEM) housed at the office of the Prime Minister (OPM) and Regional Emergency Management Units (REMU) are responsible for disaster risk Management. In addition, the National Drought Policy makes provision for establishment of emergency management structures at regional, constituency and village level in order to prepare for and respond to drought. The UNDP Namibia in collaboration with the OPM supporting an initiative to support capacity for disaster risk management at national and local level. There is urgent need to support more efforts that enhance disaster risk preparedness and risk Management.
Activity	A1. Undertake vulnerability mapping (using Remote sensing techniques and GIS). This will help delineate areas prone to disasters such as floods and enable identification of adaptation strategies by people that live in these areas A2. Undertake awareness raising programs amongst local communities and other stakeholders about impacts of climate change A3. Train local communities and other stakeholders and support organisations on shelter management, search and rescue, first aid and health issues related to disaster management A4. Improve capacity and preparedness of emergency services e.g. police, health personnel to respond effectively and in time. A5. Stock pile food, various emergency items such as tents, warm clothing etc for use during climate-related disasters
Time frame	Immediate to long term

Lead Delivering Agencies	Office of the Prime Minister, Disaster Risk Management (DRM) and Emergency Management Unit (EMU), Regional Emergency Management Unit (REMU), Ministry of Regional Local Government, Housing and Rural Development, Ministry of Environment and Tourism, Directorate Environmental Affairs (NCCC Unit).
Resources/ Estimated cost	NGOs, the Red Cross, CBOs working in climate-change related disaster prone areas such as coastal areas, north-central and north east on Namibia

Strategic aim A3T4SA3

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T4: Disaster Reduction and Risk Management
Strategic Aim (Programme)	SA3: Manage risk against loss of income, property and livelihoods
Objective	Establish effective systems e.g. insurance system, to manage loss of income, property and livelihoods due to impacts of climate change
Rationale	Namibia has lately experienced natural disasters such as floods and droughts. In 2009 for instance, many communities were severely affected by floods, in the north central regions, Kavango region and the Caprivi region with consequent severe damage to infrastructure, loss of crops and livestock as well as human life. The predicted impacts of climate change are likely to increase the frequency of such disasters. The majority of rural people in Namibia who are generally poor and vulnerable will be most adversely affected by such disasters. The goal of disaster risk management in Namibia is to contribute to attainment of sustainable development in line with sustainable development in line with Namibia's Vision 2030 through strengthening national capacities to reduce and build community resilience to disasters by 2015. Namibia is also committed to international risk reduction initiatives such as the Hyogo Framework for Action and the Africa Regional Strategy for Disaster Risk Reduction. Due to losses that are incurred from disasters, there is need to establish effective systems e.g. insurance system, to manage loss of income, property and livelihoods due to impacts of climate change
Activity	A1. Develop effective risk reduction systems e.g. insurance scheme for losses in property and infrastructure due to impacts of climate change A2. Develop effective insurance scheme for loss of income from various sources to persons, households and enterprises. A3. Establish insurance systems for lowering risk of adverse impacts of climate change
Time frame	Immediate to long term
Lead Delivering Agencies	Office of the Prime Minister (Disaster Preparedness), Ministry of Finance, other line Ministries, Insurance sector and NGOs.
Resources/ Estimated cost	

Strategic aim A3T4SA4

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T4: Disaster Reduction and Risk Management
Strategic Aim (Programme)	SA4: Develop a climate change impact and risk assessment programme
Objective	To create awareness and understanding of the risks posed by climate change to various sectors,

	organisations and business
Rationale	Each year there are climatic events that pose a risk to people, organisations and businesses. Most organisations and businesses in Namibia do not have programmes or strategies in pace to deal with climate variability and associated risks that have to be managed. To adapt to climate variability and associated risk requires awareness about the risks, and understanding the relative magnitude of the risks.
Activity	A1. Develop indicators of disaster risks and vulnerabilities at national and local level, which are user friendly for decision making. A2: Identify the potential risk to your organisation or operations and prioritise the risks A3. spell out the potential risk related to climate change likely to impact on your organisation A4. Prioritise the risk that requires further knowledge and understanding. A5. Establish process to ensure that the risks that are likely to impact on your organisations are managed effectively.
Time frame	Medium term (next 5 years) to long term
Lead Delivering Agencies	Office of the Prime Minister, Disaster Risk Management (DRM) and Emergency Management Unit (EMU), Regional Emergency Management Unit (REMU), Ministry of Environment and Tourism, Directorate Environmental Affairs (NCCC Unit), Namibia Chamber of Mines, Namibia Chamber of Commerce and Industry (NCCI).
Resources/ Estimated cost	

Strategic aim A3T4SA5

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T4: Disaster Reduction and Risk Management
Strategic Aim (Programme)	SA5: Institutionalise and strengthen risk disaster management, create mechanism and capacities at all levels of government and communities.
Objective	To facilitate the implementation of risk assessment programmes and the integration of risk reduction policies across sectors.
Rationale	The frequency of disasters associated with climate change such as floods and droughts have increased in Namibia. More communities lose their valuable assets and become poorer. There is need to assess potential impacts programs.
Activity	A1. Facilitates the coordination across sectors of risk disaster management programmes A2: Continue dialogue at all levels of government and society to raise awareness about climate change risks A3. Promote the integration of risk reduction approaches in all development policies and planning. A4. Promote community involvement in disaster risk reduction through awareness and capacity building. A5. Allocate resources for the development and implementation of disaster risk management policies and programmes
Time frame	Medium term (next 5 years) to long term
Lead Delivering Agencies	Office of the Prime Minister, Disaster Risk Management (DRM) and Emergency Management Unit (EMU), Regional Emergency Management Unit (REMU), Ministry of Environment and Tourism, Directorate Environmental Affairs (NCCC Unit), Namibia Chamber of Mines, Namibia Chamber of Commerce and Industry (NCCI).
Resources/	

Estimated cost	

Strategic aim A3T5SA1

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T5: Financial Resource Mobilisation and management
Strategic Aim (Programme)	SA1: Identify resource requirements including funding to support implementation of climate change activities.
Objective	Ensure identification of resources including funding to support implementation of climate change adaptation and mitigation
Rationale	It is widely recognised that adaptation and mitigation is expensive. Several sources of funding for climate change adaptation and mitigation are available. Under the UNFCCC Kyoto protocol for instance, the Adaptation fund was established to assist developing countries Parties to meet their costs for adaptation. Another additional source is the 'share of proceeds' that are contributed from the Clean Development Mechanism (CDM) projects that is contributed to the Adaptation fund. The importance of financing the cost of adaptation and mitigation are further affirmed in the Bali Action Plan where the need for adequate and timely flow of funds is reiterated. There is need therefore to identify resources including finances that are required to address climate change adaptation and mitigation. In addition, or improved access to adequate and sustainable financial resources and the provision of new and additional funding for developing country Parties.
Activity	A1. Take stock of key climate change adaptation and mitigation issues and list all resources needed to address these issues. These resources include human, capital as well as financial resources A1: Research and estimate cost of climate change adaptation and mitigation A3: Develop project proposals to target designated donors and sources of funding under the UNFCCC e.g. GEF/SGP, CDM etc A4. Budget for Climate change adaptation and mitigation and incorporate in annual budgeted organisations and Government Departments and Ministries A5: Develop projects to take advantage of the carbon market as a source of funding adaptation to climate change A6: Develop smart partnership with the private sector for climate change funding and investments. A7: Promote financial and technical support for capacity building in the assessment of the cost of adaptation
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Environment and Tourism, Line Ministries, CBOs, Private sector
Resources/ Estimated cost	

Strategic aim A3T5SA2

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T5: Financial Resource Mobilisation and management
Strategic Aim (Programme)	SA2. Facilitate access to and efficient management and use of resources(credit, education, decision-making) including funds for climate change adaptation and mitigation
Objective	Ensure availability of resources including funding to support implementation of climate change adaptation and mitigation

Rationale	The cost of adaptation and mitigation of climate change will vary widely at local, national, regional and global scale. Addressing climate change mitigation and adaptation will require various resources including funds. These resources may include equipment, technology, human resources as well as funds. The importance of financing the cost of adaptation and mitigation are affirmed in the Bali Action Plan where the need for adequate and timely flow of funds is reiterated. The poor, who are the most vulnerable to impacts of climate change, do not have easy access to resources that are required to mitigate or adapt to impacts of climate change. Even where some resources are available, there may not be capacity including human, to utilise such resources and funds to address climate change impacts. For instance, the poor may not have access to credit facilities to enable them respond to impacts of climate change. There is need therefore for improved access to adequate and sustainable financial resources and the provision of new and additional funding for climate change adaptation and mitigation at local, regional and national level.
Activity	A1: Provide opportunities for stakeholders to access funds and resources for climate change adaptation and mitigation. For instance, provision of insurance schemes for times of hardship or disasters such as flooding A2: Disseminate information to all stakeholders on sources and availability of resources, facilities and funds for climate change adaptation and mitigation. A3. Develop system that will facilitate effective and efficient management of resources and funds for climate change adaptation and mitigation. A4: Foster accountability regarding resources and funds for climate change mitigation and adaptation. A5: Provide financial and technical support for capacity building and management of resources earmarked for climate change mitigation and adaptation
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Environment and Tourism, Line Ministries, CBOs, Private sector
Resources/ Estimated cost	

Strategic aim A3T6SA1

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T6: International cooperation and networking
Strategic Aim (Programme)	SA1:Strengthen and enhance international collaboration, linkages and networking among stakeholders involved in environment and climate change related issues
Objective	Enhance exchange and sharing of climate change information
Rationale	The New Delhi Work Program for the implementation of Article 6 of UNFCCC recognises that international cooperation can enhance the collective ability of Parties to implement the activities of the convention. Such cooperation may also enhance synergies between conventions and improve the effectiveness of sustainable development. Namibia has participated (and still does) in many various collaborative research and exchange of environment, biodiversity and climate related ventures. These include for instance the Benguela Current Large Marine Ecosystem (BLIME) Programme. The programme involved Angola, Namibia and South Africa. It aimed assess environmental variability, ecosystem impacts and improve predictability and maintenance of ecosystem health. It also builds the capacity of staff involved. Such collaboration, networking and linkages should be forged for climate change.
Activity	A1. Increase availability of copyright-free materials in accordance with laws and standards related to protection of copyrighted materials. A2. Develop a directory of organisations and individuals, listing their experiences and expertise relevant to climate change.

	A3. Initiate and build an active network of interested stakeholders on climate change. E.g. In May 2009 a network for journalists that report bon formed on Environment, Agriculture and Sustainable Development was formed at the end of a workshop for journalists on "Climate change strategies for adaptation and mitigation in Namibia: The role of Journalists". A4 Support networks that are involved in climate change or climate related field. For instance the Namibia Environmental Observatories Network (NaEON) and the Long--term Ecological Research Network (ILTER)
Time frame	Immediate to long-term
Lead Delivering Agencies	Line Ministries, Research centres in line ministries, University of Namibia, Polytechnic of Namibia, DRFN, NNF, CBO,
Resources/ Estimated cost	

Strategic aim A3T6SA2

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T6: International cooperation and networking
Strategic Aim (Programe)	SA2:Participate in regional and international cooperation programs and activities on climate change
Objective	Facilitate capacity building, exchange of climate change experiences, information and learning of climate change adaptation and mitigation
Rationale	The global nature of climate change means that no single country can hold monopoly of climate change information and solutions to adverse impacts. As each country and sectors as well as stakeholders grapple with impacts of climate change and mitigation, a wealth of information is generated and available. There is need to share such information through collaborations amongst stakeholders as well as networking. Namibia should therefore take advantage of opportunities to share and obtain climate change information.
Activity	A1. Participate in conferences and workshops on climate change and related areas. A2. Encourage exchange of scientific and technical experts and secondment of personnel on climate change issues A3. Encourage various target groups to subscribe or join relevant regional and international networks on climate change and environment in general. A4. Develop and link website/national network to other websites and networks A5. Provide funding or seek support to enable scientific and other personnel to attend regional and international workshops and conferences on climate change A6. Support international collaboration
Time frame	Immediate to long term
Lead Delivering Agencies	Line Ministries, University of Namibia, Polytechnic of Namibia, Donors,
Resources/ Estimated cost	

Strategic aim A3T6SA3

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T6: International cooperation and networking
Strategic Aim (Programme)	SA3: Promote international North-South and South-South collaborative research that will facilitate generation of Climate change adaptation and mitigation evidence-based information
Objective	Facilitate capacity building, sharing of climate change information and joint research projects for climate change adaptation and mitigation
Rationale	The global nature of climate change means that no single country can hold monopoly of climate change information and solutions to adverse impacts. While climate change impacts may be locality/ area- or regional or national-specific, there are also many commonalities in impacts of climate change on various sectors even across areas, regions and countries. In addition, the disparity in capacity to undertake research on climate change adaptation and mitigation between North- South and even South-South countries, provides an avenue for international cooperation and collaboration. This is especially important in order to further understand the climate change system and its impacts but also the urgent need to generate evidence-based climate change impacts information or data. In addition, research information will assure development of solutions to climate change that are evidence based; i.e. based on scientific findings. Namibia should therefore take advantage of opportunities to generate and share climate change information through international collaborative research and networking. Namibia can team up with various researchers in North-South as well as south-south collaborative research
Activity	A1. Identify areas of potential North-South and South-South collaborative research in various sectors on climate change adaptation and mitigation A2. Develop and undertake collaborative research in various sectors on climate change adaptation and mitigation A3. Disseminate and use research findings to address climate change adaptation and mitigation
Time frame	Immediate to long term
Lead Delivering Agencies	University of Namibia, Polytechnic of Namibia, Line Ministries, CBO,
Resources/ Estimated cost	

Strategic aim A3T6SA4

ASPECT	A3. Cross-cutting issues for climate change adaptation and mitigation
Theme	T6: International cooperation and networking
Strategic Aim (Programme)	SA4: Facilitate achievement of UN environment international obligations under various Conventions especially UNFCCC and Treaties
Objective	Ensure that Namibia meets her international obligations under various UN Conventions especially UNFCCC
Rationale	Namibia has committed to achieving sustainable development through ratifying several UN environment conventions and other treaties. The 3 major ones are the UN convention on Biological Diversity (CBD), the UN Convention to Combat Desertification (CCD) and the UN Framework Convention on Climate Change (UNFCCC). The ultimate objective of UNFCCC and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the convention, ***stabilisation of greenhouse gas concentrations in the atmosphere*** at the level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved

	within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. Each member that accedes to the UNFCCC, as is the case of other UN Conventions, has obligations that they have to adhere to. For instance, each signatory to the convention is required to develop policies, strategies and action plans to address issues of climate change mitigation and adaptation. Each signatory must report on various specific issues e.g. GHG inventories. Namibia as a signatory therefore needs to adhere to and undertake all obligations of the UNFCCC
Activity	A1: Take stock of all obligations of the UNFCCC A2: Timely development and submission of various reports required for UNFCCC for example: the Second National Communication, National Climate Change Policy, Strategy and Action Plan A3: Attend meetings e.g. COP and contribute positively to these meetings A4: Implement Programmes, projects and activities that are obligatory under the UNFCCC for Namibia as a Party to the convention
Time frame	Immediate to long term
Lead Delivering Agencies	MET and other Line Ministries,
Resources/ Estimated cost	

Strategic aim A3T7SA1

ASPECT	A3: Cross-cutting issues for climate change adaptation and mitigation
Theme	T7: Technology Development and Transfer
Strategic Aim (Programme)	SA1: Promote and support development of technologies for mitigation and adaptation
Objective	Development of technology that will aid mitigation and adaptation to impacts of climate change.
Rationale	In our attempt to address climate change issues, humankind has turned to the role of technology to help stabilise GHG emissions while developing measures to adapt to climate change. The challenge of climate change offers opportunity for development and use of technology as a tool. For instance, what technology can be developed or improved to reduce GHG emissions? In areas where climate change will lead to reduction of crop yield or livestock losses or destruction of coastal infrastructure, interest will be directed at developing or adopting technology that will address these climate change problems. There is growing worldwide debate on how to enhance and upscale the development and transfer of technology for mitigation and adaptation to climate change (Chidiak and Tirpak, 2008). Use of energy contributes considerably to GHG emissions. Unless action is taken GHG emissions will continue to rise. It is therefore necessary to increase investment in clean energy technology development and deployment relative to current levels. Namibia though a net carbon sink, with very little GHG emissions must take its share to reduce GHG through development or adoption of clean technology and enhancement of clean technologies. However, technology should also be developed to adapt to impacts of climate change. Some of the major sectors that will need technology development include energy supply, transport, buildings (lighting, appliances), industry, forestry, waste management (maximise methane) and agriculture (improvement of crop yield).
Activity	A1. Develop technology that will ensure improved crop yields and livestock production A2.Develop technologies that will ensure efficient energy use A3. Support investment in development of renewable energy A4. Expand technology research, development and demonstration and promoting technology innovation

	A5. Create an enabling environment to facilitate development and financing of CDM projects A6. Support rural electrification A7. Promote development of technologies that will alleviate climate change problems for women and children. A8. Protect intellectual property rights in arrangements for technology development A9 Promote North-South and South-South cooperation / collaboration and partnership in technology Development.
Time frame	Immediate to long term
Lead Delivering Agencies	Ministry of Environment and tourism, Ministry of Mines and Energy, Ministry of Agriculture, water and Forestry, Chambers of Commerce, Ministry of Trade and Industry, Ministry of Finance, Renewable Energy and Energy Efficiency Institute (Polytechnic of Namibia)
Resources/ Estimated cost	

Strategic aim A3T7SA2

ASPECT	A3: Cross-cutting issues for climate change adaptation and mitigation
Theme	T7: Technology Development and Transfer
Strategic Aim (Programme)	SA2: Promote and support technology transfer for mitigation and adaptation
Objective	Ensure the relevant and appropriate technologies are adopted and in use, to address climate change mitigation and adaptation to its impacts
Rationale	Information and technology sharing will go a long way to facilitate mitigation and adaptation to climate change. New as well as indigenous technologies will contribute to mitigation and adaptation. Local people in many communities around the world have traditional technologies that they have used from time immemorial to cope with disasters such as crop yield failure, famine and floods. In some societies, vegetables are harvested, dried and stored for future use. In Namibia, mopane worms are dried and sometime semi-cooked and dried for immediate or future consumption or sale. A wide variety of irrigation technologies are in use and these can be adopted or modified for use in areas with adverse water shortages due to climate change. The growth of rice by irrigation in Kalimbeza is another example of technology transfer and adoption These illustrate the fact there are various existing as well and new technologies in different climate sensitive sectors that can be shared and adopted to address climate change mitigation and adaptation.
Activity	A1. Identify potential technology that may be adopted to address adaptation and or mitigation in key sectors impacted or likely to be affected by climate change. A2. Test the identified technology to be adopted and assess its performance before adoption. Assess its negative impacts. A3 Explore possibility of technology transfer through the Carbon market / CDM projects A4 Uphold protection of intellectual property rights in arrangements for technology transfer. A5.Promote North-South and South-South cooperation / collaboration and partnership in technology transfer.
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of mines and energy, Ministry of Agriculture , Water and Forestry, Ministry of Fisheries, University of Namibia, Chambers of Commerce, Ministry of Trade and Industry, Ministry of Finance, Renewable Energy and Energy Efficiency Institute (Polytechnic of Namibia)
Resources/	

Estimated cost	

Strategic aim A3T8SA1

ASPECT	A3: Cross-cutting issues for climate change adaptation and mitigation
Theme	T8: Legislative development
Strategic Aim (Programme)	SA1: Review and update existing legislation to reflect climate change issues
Objective	Ensure that sector specific policies and legislation integrate climate change
Rationale	Most national policies were developed at a time when climate change and its impacts were not an issue or an issue of concern. However, at present it is known that climate change will affect some of these sectors and therefore it needs to be considered. Some policies however by the nature of their coverage have inherent relation to climate change even though they were developed in the absence of a national climate change policy. For instance, the National Biodiversity Strategy and action Plan (NBSAP) was developed to operate in the context of vulnerability of the Namibian ecosystems, species and rural livelihoods to climate change (Republic of Namibia 2001). One strategic aim of the NBSAP (3.6) under objective 3 (to improve human well-being, livelihoods and environmental sustainability in Namibian through better proactive and adaptive management), is to raise awareness and strengthen capacity to adapt to climate change. In order to ascertain the extent to which climate change is integrated into sectoral policies, it is important to review existing legislation and update them to reflect climate change.
Activity	A1. Review existing legislation / policies to assess the level of relevant climate change content A2. Update existing legislation / policies and incorporate climate change in all sectoral policies and strategies through appropriate revisions in consultation with relevant stakeholders. A3. Enhance climate change synergies amongst sector policies an legislation
Time frame	Immediate to long-term
Lead Delivering Agencies	Ministry of Justice, National Planning Commission, line government ministries, University of Namibia,
Resources/ Estimated cost	

Strategic aim A3T8SA2

ASPECT	A3: Cross-cutting issues for climate change adaptation and mitigation
Theme	T8: Legislative development
Strategic Aim (Programme)	SA2: Develop new sector or national policies that address emerging climate change issues.
Objective	Ensure that emerging climate change issues are supported by relevant polices and legislation
Rationale	Addressing climate change requires actions that involve many sectors and stakeholders. Policy and legislation are necessary framework that guide actions to address particular issues in any sector. With the emergence of climate change as a challenging issue to national development goals, even non-climate national priorities and polices are being revisited to assess their role or how they will be affected by climate change (Tirpak *et al*., 2008). However, predicted impacts of climate change may also necessitate development of new policies to address both reduction of GHG i.e. mitigation as well as to address ways to adapt to climate change. Namibia has been identified to largely contribute very little to GHG emissions but will be a net carbon sink. Hence most efforts to address climate change will be given to adaptation than mitigation. This is likely to be reflected in the Namibia climate change policy, strategy and action plan.

	However, room must be provided for development of other policies to address climate change issue that may not have emerged at present.
Activity	A1. Identify and prioritise emerging as well as other existing priority issues to address climate change A2. Draft a consultative discussion paper on the National Climate change Policy A3. Draft a Climate Change White Paper and submit for endorsement by Policy makers A4. Develop relevant, sector specific policies on new or emerging climate change issues that are not covered by existing polices and legislation e.g. on energy and low carbon development path A5. Development of Rural Development Policy and strategy to address issues of infrastructure and human housing development and settlement
Time frame	Medium to long term
Lead Delivering Agencies	Ministry of Justice, National Planning Commission, line government ministries, University of Namibia,
Resources/ Estimated cost	