

# LET'S ACT TO ADAPT

## Dealing with Climate Change

### *A community information toolkit on adaptation*

A resource package developed for farmers and natural resource users in rural, urban and peri-urban areas in the Erongo, Hardap, Karas and Khomas regions, Namibia

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# Contents

Why is climate change an important issue for farmers and natural resource users in rural, urban and peri-urban areas in the Erongo, Hardap, Karas and Khomas regions? ....	4
About this information toolkit.....	5
How to use this toolkit .....	6
<b>1. Introduction to climate change .....</b>	<b>7</b>
1.1 What is climate change? .....	7
1.2 What causes climate change? .....	8
1.3 Namibia's climate.....	10
1.4 Regional profiles .....	12
1.5 Climate change projections for the Erongo, Hardap, Karas and Khomas regions ..	13
1.6 Expected climate change risks for the Erongo, Hardap, Karas and Khomas regions .....	14
<b>2. What can we do about climate change? Adaptation! .....</b>	<b>20</b>
2.1 What is Climate Change Adaptation (CCA)? .....	20
2.2 Why is adaptation necessary? .....	20
2.3 The adaptation 'process' .....	20
2.4 Some adaptation options relevant to us in the Erongo, Hardap, Karas and Khomas regions .....	21
<b>3. Climate change adaptation: community planning tools .....</b>	<b>25</b>
Tool 1: Community – expert exchange discussions and introduction to climate change thematic .....	27
Tool 2: Understanding our context: natural resources and resource management practice mapping and the link to climate change .....	29
Tool 3: Root cause analysis using a 'Problem Tree' .....	33
Tool 4: Finding solutions through the Sun Ray Exercise .....	35
Tool 5: Gender screening tool .....	37
Tool 6: Developing our community-based CCA strategy and putting it into action.....	39
Tool 7: Example of an adaptation measure – grey water recycling .....	41
Tool 8: Example of participatory monitoring and evaluating.....	43

## Why is climate change an important issue for farmers and natural resource users in rural, urban and peri-urban areas in the Erongo, Hardap, Karas and Khomas regions?

Many people living in the Erongo, Hardap, Karas and Khomas regions depend on small-stock farming, small businesses, employment in various industries, especially the fishing industry and tourism for their daily livelihoods. All these natural resource-based livelihoods are vulnerable to climate change to some extent. Additionally, housing and infrastructure in these regions are vulnerable to disasters such as heavy flooding in ephemeral rivers as well as storm surges and coastal erosion along Namibia's inhabited coastline. Farmers especially, have already observed the ongoing natural variability of our climate and the changes in rainfall patterns, and that the past few years have been marked by extreme weather conditions.

Although it is sometimes difficult to distinguish between naturally variable climatic conditions and climate change, it is clear that climate change will have profound impacts on our lives in the near future. While it is not possible to predict what effect future climate will have, it is clear that farmers, resource users and ordinary people such as home owners need the tools to be able to manage associated extreme situations and risks.

Although our climate in Namibia, including Erongo, Hardap, Karas and Khomas regions, is variable with dry periods and droughts commonly experienced (see more information in Section 1), conditions for agriculture and fisheries are expected to become more difficult because of climate change. Impacts may be severe, leading to less water availability, higher temperatures and generally less predictable patterns, including in marine systems. As a result, there is an urgent need to be more flexible and strategic about practising more adaptive livestock management because of fluctuations in grazing availability, but also to manage fishery resources carefully to ensure that populations are more resilient to the changes. Water resources, which are already very limited in our coastal towns, will have to be even better protected and there may need to be investment in new sources. Alternative resource use and livelihoods may need to be explored and promoted to build resilience.

Frequent flooding along ephemeral rivers, as well as along the Orange River, has been a major challenge in the past years and the associated impacts go beyond farming – houses and belongings were destroyed, business income was cut for months at a time and water supply infrastructure in ephemeral rivers was damaged. Infrastructure developments and investments along the coast have been washed away by strong tides and storm surges – and insurance companies were unwilling to pay for the damage. In addition to the danger of floods and storm surges, droughts could increase or become more severe in some climate change scenarios. This also requires careful planning and preparedness among farmers and resource users.

Even if it is not possible to predict with great certainty what the weather in a particular year is going to be like, it is better to be prepared for any change in climate than to ignore potential threats. This is called '**adaptation**' – adapting to climate change – and every person in Namibia and elsewhere in the world will have to do their bit to ensure that they can react to and cope with the various challenges that could occur. It is clear that taking no action will come at a much greater cost than investing in being prepared.

## About this information toolkit

This information toolkit is based on the initial *Natse Otweya!* prototype that was developed with farmers in the Omusati Region in 2008, and has been tested and applied since then throughout Namibia, including in the Erongo, Hardap, Karas and Khomas regions. As part of the Africa Adaptation Programme (AAP-NAM), a project coordinated by the Ministry of Environment and Tourism (MET), the *Natse Otweya!* experience is now being scaled up to a regional approach, with five toolkits for the whole of Namibia.

Based on prevailing biomes, environmental and cultural backgrounds and of course the expected climate change risks, the following five initial toolkits are available in this series:

1. Oshana, Ohangwena and Oshikoto regions
2. Caprivi and Kavango regions
3. Kunene Region
4. Omaheke and Otjozondjupa regions
5. Erongo, Hardap, Karas and Khomas regions

The initial toolkit focused very strongly on farming issues but has now been extended to acknowledge that our livelihoods are more broadly affected by climate change. While the focus on farming remains, rural livelihoods are more comprehensively covered. Issues pertaining to urban and peri-urban communities are also covered in this toolkit.

Gender considerations are essential for successful adaptation – and it is very important that adaptation strategies and approaches do not perpetuate or increase discrimination against vulnerable groups such as women, youth or the elderly.

This is the first comprehensive and dedicated resource for farmers, natural resource users, people living in urban and peri-urban areas and their service providers in the Erongo, Hardap, Karas and Khomas regions to learn about what climate change is and what the expected impacts are for Namibia and these south-western regions in particular, and more importantly, it provides some preliminary ideas on options for adaptations that people can apply to start dealing with the threats.

The toolkit is available directly to local farmers and to extension personnel, especially from the Ministry of Environment and Tourism (MET), Ministry of Agriculture, Water and Forestry (MAWF), the Ministry of Health and Social Services (MoHSS), regional councils, teachers, church leaders, conservancies, NGOs and CBOs and many different individuals and organisations.

The material is designed to be used in working sessions to start discussions and explore the issues of climate change and to guide resource users in taking the first steps to collaboratively deal with specific regional climate change issues. Inputs from farmers in the Erongo, Hardap, Karas and Khomas regions have formed the basis of this toolkit, which includes art work that illustrates climate change topics of most concern to the resource users in the regions.

## How to use this toolkit

This toolkit comprises two integral and related key parts:

1. The toolkit book:
  - a. Information on climate change in general, risks that Namibia and the region could be exposed to, potential impacts on daily livelihoods and potential strategies to adapt – building resilience to the potential risks.
  - b. A series of eight tools that will assist farmers working with their service providers to understand the effects of climate change in their regions and strategically plan actions that will lead to appropriate adaptation. Optimally, the tools should be used in sequence to obtain the best results.
2. The toolkit poster:

Pictures from the book form a composite illustration of 'life without adaptation' and 'life with adaptation' options in the poster, which is designed as a discussion tool. Many other specific issues will emerge during discussions that will require flexible, sometimes specific and often novel climate risk management actions.

The expected key outcome of the application of the full toolkit would be the development of regionally specific climate change adaptation plans of action. These could apply to an individual farmer, a community e.g. a conservancy, or a community group working with a specific organisation such as such as MAWF, MET or MoHSS.

The plans should address practical adaptation interventions such as the installation of water harvesting technologies and domestic solar power, and the development of small home gardens where appropriate. Implementing guidelines for sensible building and settlement plans can be part of adaptation action. Financing options for the interventions identified should also be discussed.

At the end of the booklet some important contacts are given. There are opportunities to seek technical and financial support and various organisations are well positioned and willing to assist resource users in their adaptation efforts.

# 1. Introduction to climate change

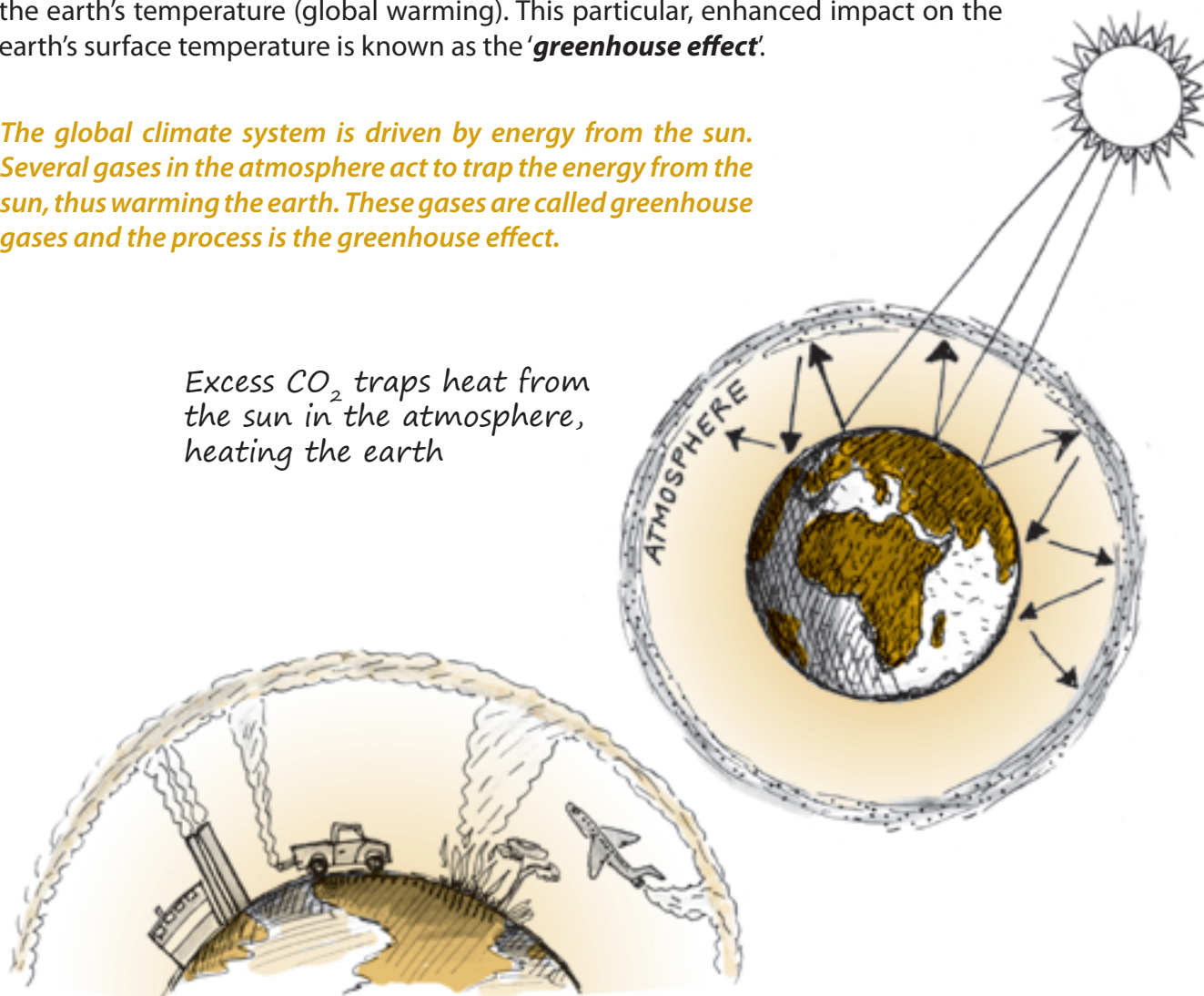
## 1.1 What is climate change?

Climate change refers to any changes of the 'average weather' in an area over time. It is a natural process that takes place over a very slow timescale and natural changes in climate have been observed over thousands of years i.e. long periods of cooling and subsequent periods of warming.

However, over the past 200 years, the climate has been changing faster than expected, mainly due to the fact that a sharp rise in the human population and subsequent industrialisation has led to an increase in carbon dioxide emissions into the atmosphere. This has led to an increase in the earth's temperature (global warming). This particular, enhanced impact on the earth's surface temperature is known as the '**greenhouse effect**'.

*The global climate system is driven by energy from the sun. Several gases in the atmosphere act to trap the energy from the sun, thus warming the earth. These gases are called greenhouse gases and the process is the greenhouse effect.*

*Excess CO<sub>2</sub> traps heat from the sun in the atmosphere, heating the earth*

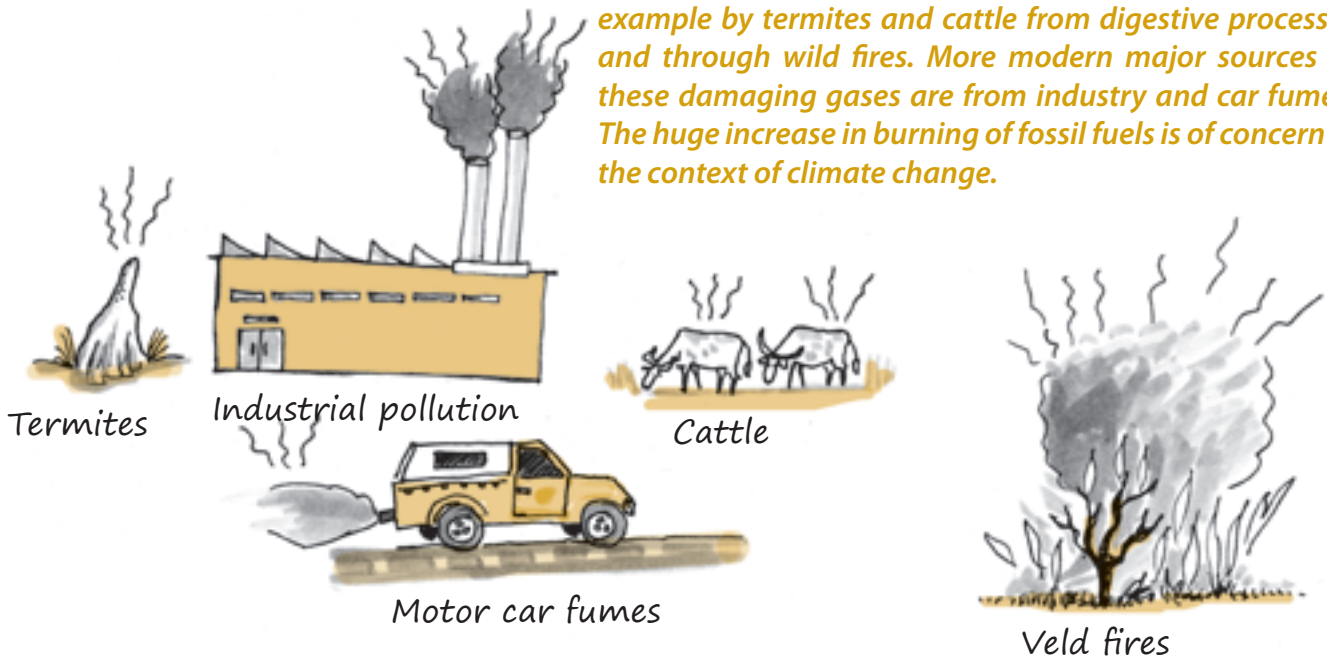


**Weather** refers to the day to day state of the atmosphere at a given time and place. Weather is described in terms of variable conditions such as temperature, humidity, wind velocity and precipitation.

**Climate** describes the total of all weather occurring over a period of years in a given place. This includes average weather conditions and regular weather patterns (such as winter, spring, summer and autumn).

**Climate change** refers to any changes of average weather in an area over time. Climate change may be due to natural changes or human induced changes.

*Greenhouse gases are naturally released into nature, for example by termites and cattle from digestive processes and through wild fires. More modern major sources of these damaging gases are from industry and car fumes. The huge increase in burning of fossil fuels is of concern in the context of climate change.*

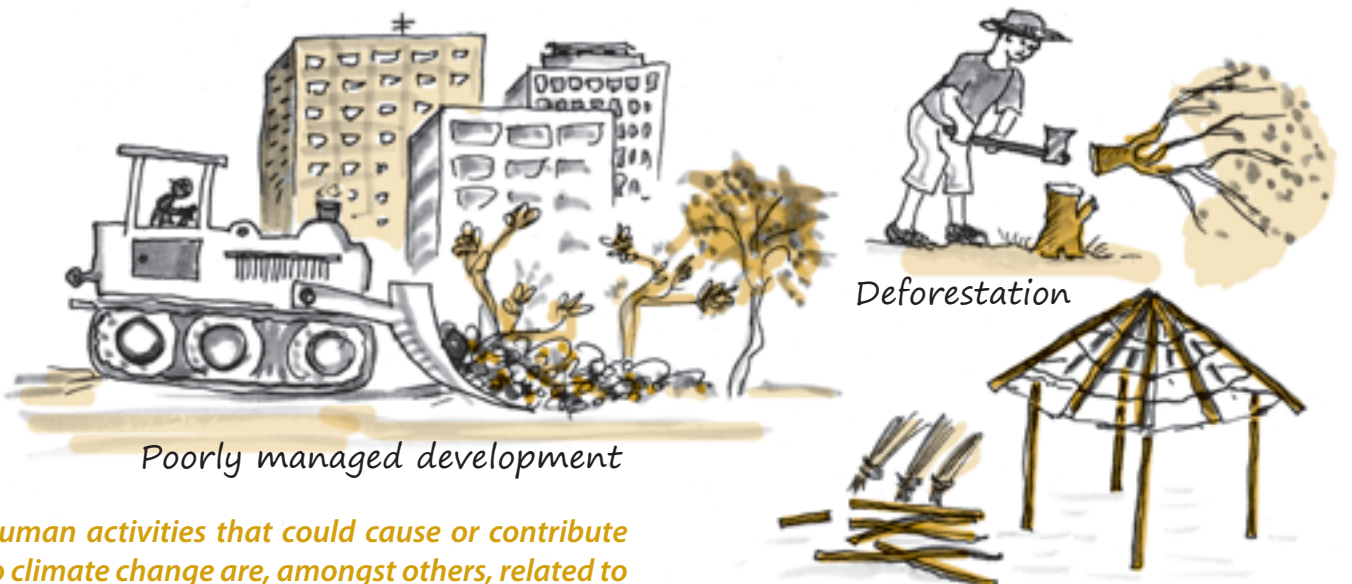


## 1.2 What causes climate change?

Climate change can be caused either by natural events or because of human activities. Natural causes of climate change can be activities such as the movement of continents, large eruptions of volcanoes and differences in ocean currents.

Human-induced activities include the burning of fossil fuels (e.g. coal and oil) for energy generation, which is in turn used for cooking, heating and lighting. Over the years people have moved to cities, which has led to the loss of vegetated land and large-scale land use changes for residential, agricultural and industrial purposes.

The decline in natural resources as a result of consumption and over-utilisation has contributed to the increase of **greenhouse gases** in the atmosphere. While development is an important and natural progress of humankind, some of these developments are harmful to the environment and affect the climate.



*Human activities that could cause or contribute to climate change are, amongst others, related to the unsustainable use of biomass, deforestation, habitat conversion and uncontrolled use of wood resources.*



**Greenhouse effect** is the rise in temperature of the Earth because certain gases in the atmosphere trap energy from the sun.

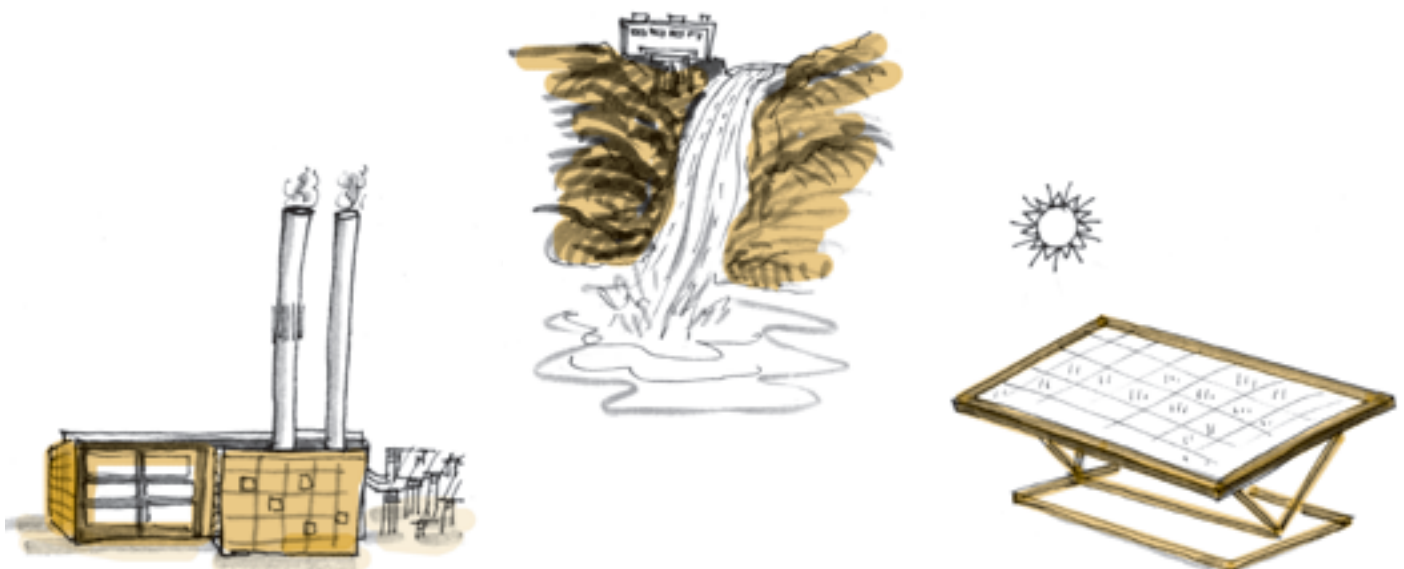
**Climate change mitigation** refers to ways of reducing the emissions of damaging greenhouse gases that lead to changes in the earth's atmosphere – a main cause of climate change.

**Sequestration** refers to the absorption of greenhouse gases from the atmosphere by trees or leafy vegetation. Re- or afforestation can aid this absorption.

It is important to find options and strategies for development that do not increase the greenhouse effect and do not affect the earth's climate e.g. design cars that use less fuel; develop environmentally friendly fuel and investigate alternative sources of energy for cooking, heat and industrial use, and avoid felling trees and deforestation. This is called '**mitigation**'.

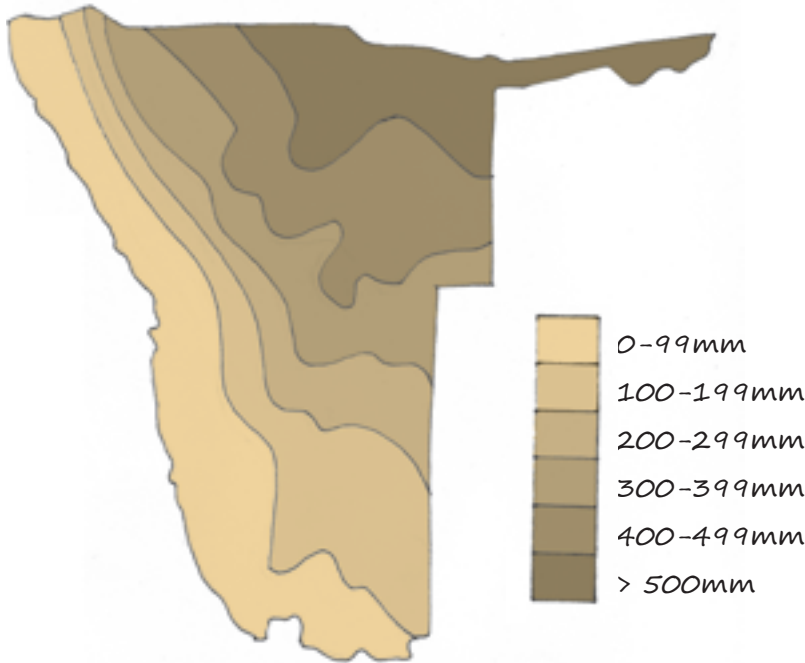


*There are options for improving human and industrial uses of resources, which are environmentally friendly and do not contribute to climate change so much and thus could contribute to 'mitigation' of climate change. For example, using solar instead of wood or fossil fuels is the best way of generating energy both for household and industrial uses.*



### 1.3 Namibia's climate

Namibia is the most arid country in sub-Saharan Africa. The weather in Namibia is hot for most of the year, and overall rainfall is low. Not only is rain very limited but also extremely variable from year to year and from place to place. This is called '**temporal**' and '**spatial**' variability. Namibia, with its arid and semi-arid climate, is already subject to large climatic variability, and this is likely to increase with the predicted changes to the earth's climate.

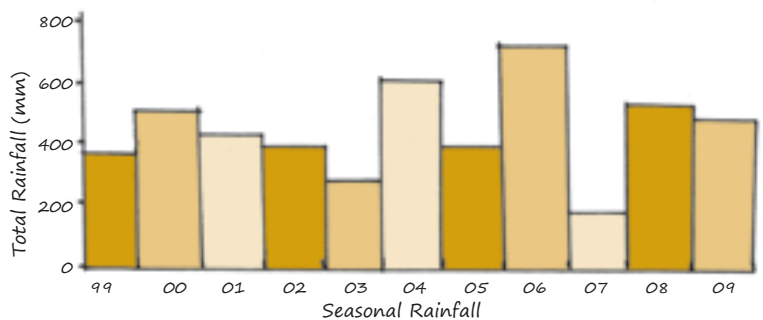
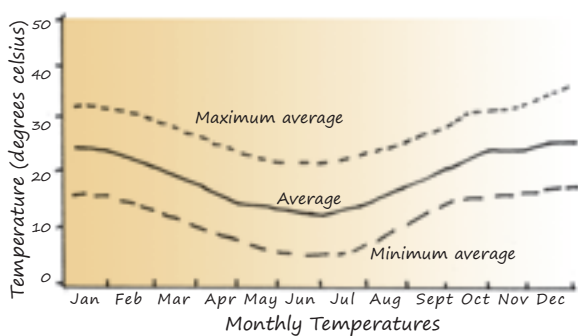


*Namibia is the most arid country in sub-Saharan Africa with a highly variable climate. Droughts are frequent and below average rainfall is common. In the south-western regions, the annual median rainfall ranges between 250 - 450 mm; as elsewhere in the country, this can be very variable. Temperatures range from a maximum average of over 20°C in winter to up to 36°C in summer.*

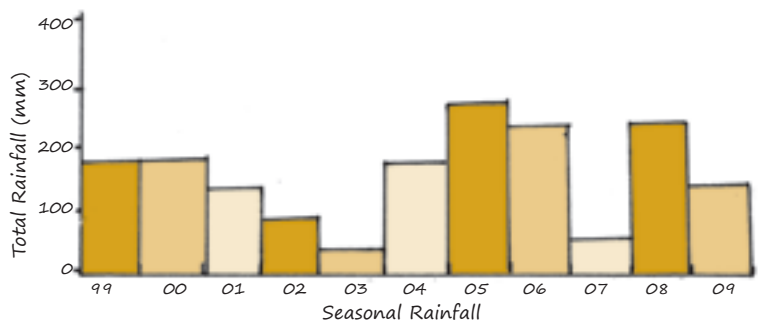
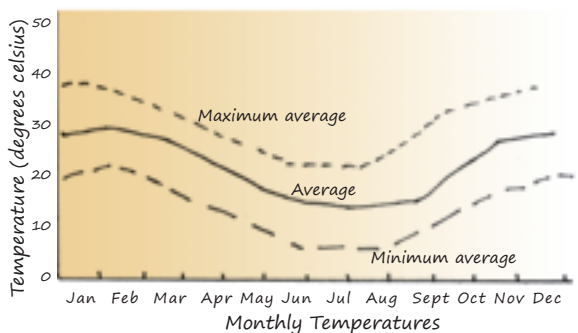
**Climatic variability** refers to 'normal' variations in climate on temporal or spatial scales beyond that of individual weather events.

**Drought** is described as a long period of below average rainfall.

**Extreme events** could be either extreme floods or droughts, or even other phenomena like extremely cold spells.



#### Windhoek area



#### Keetmanshoop area

It is hard to predict in advance how much rainfall an area will receive. The occurrence of droughts is common, and in certain years, and sometimes for several years in a row (such as the droughts of 1982-87 and 1992-93 in southern Africa), rainfall is so low that crops fail and livestock die. In recent years (2007 and 2010), severe flooding occurred in northern Namibia, as well as in selected ephemeral rivers in the south-western regions and along the perennial Orange River. This had detrimental effects on housing and infrastructure developments along those river courses, with, for example, Mariental being severely affected again. Some people lost their livelihoods and daily life was disrupted for a long time. It is important be prepared, to avoid this sort of damage and disruption.

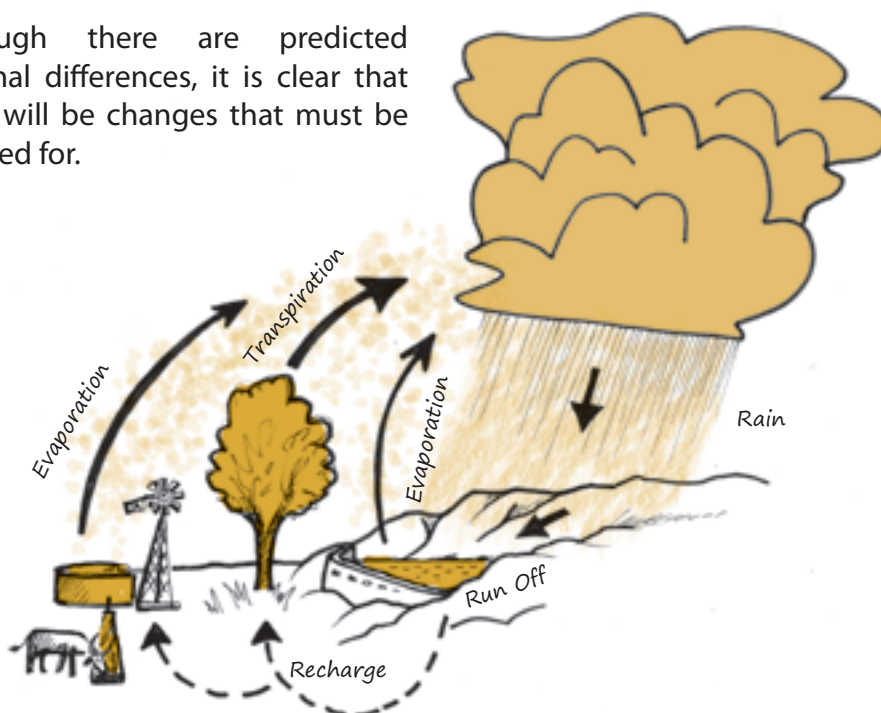


*In some years too little rain falls, in others too much. The occurrence of such extreme events is predicted to become more frequent under climate change scenarios for the area. Farmers need to be prepared to deal with unpredictable rainfall and variability.*

It should be noted that the available climate change projections for the coming 50 to 100 years indicate serious changes in rainfall and water availability throughout the country.

- Climate trends in Namibia from 1960 to 2006 show that the number of days a year with maximum temperatures have increased, while those with minimum temperatures have decreased.
- Rainy seasons have started later and lasted for a shorter period, leading to shorter growing seasons.
- These trends, combined with trends throughout Africa, lead to projections that in the next 50-100 years we will experience a marked increase in temperature and humidity and shorter seasons of more intense rainfall, especially in the northern and central regions of Namibia.

Although there are predicted regional differences, it is clear that there will be changes that must be planned for.



*This is a simplified diagram of the water cycle. Rainwater runs off and either infiltrates the soil, runs into the rivers, or fills dams. It refreshes the groundwater and allows plants to grow. Rainfall is the main element that makes our land productive – without rain no plants can grow, animals die of hunger and water sources remain dry. However, the high evaporation rate means that much of the rain returns to the atmosphere.*

## 1.4 Regional profiles

**Erongo Region** is a coastal region with its entire western border adjacent to the Atlantic Ocean.

The region is characterised by desert and further inland, escarpment and highland areas. Erongo Region houses many significant biodiversity hotspots. The region has a gradient of different climate zones which run parallel to the coastline: the cool, foggy coastal zone, foggy interior zone, middle desert zone, eastern desert zone, pro-Namib, the escarpment and the Namibian highlands. The mean annual rainfall in the region varies between 0 mm in the west and 350 mm in the east. Following a similar gradient, average maximum temperatures range from around 20°C at the coast to up to 36°C further inland.



About 80 percent of the population lives in urban areas and only 40 percent of the population of Erongo was born in Erongo. This indicates migration of young males from all over Namibia (mainly from the northern parts of the country) to the region, in search of employment in fishing factories among others. The region is also home to the Walvis Bay harbour, which is used for exporting and importing goods to and from Namibia. There is also a big fishing industry in the region. Water is a critically limiting factor to development along the coast, with almost all fresh water being extracted from the ephemeral river basins of the Kuiseb and Omaruru rivers. To allow for the high water consumption of the booming mining industry along the desert, especially for uranium, desalination plants are being established not only to allow for mining activities, but also to support the increasing population in this desert area.

**Hardap Region** borders the Erongo Region to the south-west. It extends from the Atlantic Ocean all the way across to the border of Botswana. Most of the region is characterised by arid adapted biomes, ranging from the hyper-arid southern Namib Desert through a dwarf shrub savannah to the southern Kalahari. Hardap Region, like the rest of Namibia, is an arid to semi-arid area. The average annual rainfall for the area varies between 0 mm in the Namib Desert to the west, to 300 mm towards the eastern parts of the region. The southern parts of Hardap receive an average rainfall of 100 mm, increasing to 300 mm for the Rehoboth area further north. Extremely high maximum temperatures above 36°C are recorded for this region – overall among the highest in Namibia. At the other extreme, the coldest average minimum temperatures are recorded for this region at below 2°C in eastern Hardap. With the exception of water provided from the Hardap Dam and the Oanob Dam, all water used for domestic and agricultural consumption is from groundwater. Eastern Hardap Region contains a productive porous aquifer, which allows for significant horticultural development around the Stampriet area. About 75 percent of the total land area of Hardap is privately owned. The westernmost 15 percent of the area is part of the Namib-Naukluft Park and in the central-southern area, 10 percent is communal farmland. Overall the region is one of the least densely populated in Namibia, with an average of 1 person per km<sup>2</sup>.



**Karas Region** borders Hardap to the south. The region stretches from the Atlantic Ocean to the west and forms the international boundary between Namibia and South Africa and Botswana to the south and east respectively. The southern border of Karas is delimited by the Orange River. The region occupies 19.6 percent of the country's total land area, however population density is less than 1 person per km<sup>2</sup>. Karas is the driest region of the country. The average annual rainfall varies from less than 50 mm in the

south west (Namib Desert) to 250 mm in the northeast of the region. Not only is the average rainfall low, rainfall is also very unpredictable and localised. Western Karas Region is part of a winter rainfall area, and is characterised by a climate regime that is quite different to the rest of the country. Notably this rainfall regime has led to the development of the distinct succulent Karoo biome, which is a global biodiversity hot spot of high conservation value. Temperatures are similar to those in Hardap Region, but less extreme.

People in Karas Region mainly practise small-stock farming with sheep, goats and cattle. The Sperrgebiet National Park occupies almost 15 percent of land area of the region. A trans-boundary conservation area with the Richtersveld in South Africa, and several private nature reserves and communal conservancies are also situated in the region.



**Khomas Region** is located in the central area of Namibia, and is situated north of Hardap Region. The region accounts for only 4.5 percent of the total land area of Namibia, but for over 15 percent of Namibia’s population. Namibia’s administrative, legislative and judicial capital Windhoek is situated in the region. Most of the land is under freehold ownership, and allocated to the City of Windhoek. Khomas Region is largely characterised by highland shrub lands, and cattle and game farming is prominent in the outskirts of Windhoek. The region has a rainfall range of 200 mm to 350 mm per year, with average maximum temperatures of between 28°C to 32°C and average minimum temperatures of 2°C to 8°C. Groundwater availability is moderately productive, and much of the water used in Windhoek is pipelined into the central region from northern Namibia.



### 1.5 Climate change projections for Erongo, Hardap, Karas and Khomas regions

The observed trends in climatic changes and future projections for Namibia are merely indicative. Although differences are expected regionally, these are described here on a general level.

For western, southern and central Namibia projections vary considerably. Apart from the overall trends of increasing temperature changes, changes in rainfall vary quite significantly. While the central areas i.e. Khomas Region, may benefit from a similar increased rainfall trend as the eastern parts of Namibia, with more intense events of summer rainfall, this region is also particularly drought-prone, linked to prevailing international El Niño events. Changes in winter rainfall in south-western areas i.e. in Karas Region are projected to experience significant declines in winter rainfall. Changes in temperature are projected to be most significant in the eastern parts of Hardap and Karas regions.

The observed changes in temperature extremes, the length of the dry season and rainfall intensity underscore the fact that the climate in Namibia is tending to become drier and that climate variability remains a significant phenomenon of long-term climate trends.

A significant increase in sea levels in line with international trends has been observed for the past three decades in the coastal regions.

What does this mean to people in the Erongo, Hardap, Karas and Khomas regions?

## 1.6 Expected climate change risks and how they will affect the Erongo, Hardap, Karas and Khomas regions

Expected climate changes that will occur are called climate change '**risks**'. Higher temperatures, which lead to greater evaporation, will, for example, lead to an overall reduction of water availability (even if there is higher rainfall).

Scientists expect that extreme weather events such as floods and droughts will become more common. During such conditions it is difficult to make decisions on what to plant and when, and whether to be prepared for flood- or drought-related pests and diseases. The onset of the rainy season will become more variable and prolonged dry spells will also affect the development of good grazing areas.

Most resource users in the Erongo, Hardap, Karas and Khomas regions rely on small-stock farming, other natural resource-based production systems and the fishing industry for their livelihoods, which makes them highly vulnerable to climate change. This is exacerbated by poor infrastructure, poor soil potential, poverty and thus fewer options for adaptation, high rates of HIV/Aids and other health constraints in many areas. Some people run small businesses, which are also negatively affected by extreme weather events, when local farmers have little income and purchasing power to spare. Other natural resources such as wild fruits, herbs and medicinal plants, wildlife, and nature-based tourism also make an essential contribution to the livelihoods of the people in the regions.

Climate change would have an impact on all these resources.



It is important to identify the potential impacts clearly to be able to plan for the most appropriate adaptation options. Not all impacts will necessarily be negative as opportunities may also arise, especially with careful planning. Over the past decades farmers and resource users have already started to react to increasingly difficult and highly variable climatic conditions.

The initiative to turn wildlife conservation into an asset and a community-empowerment strategy can be seen as a natural move towards climate change resilience. The departure from a largely livestock-based livelihoods system to that of diversifying into managing wildlife as a common resource in conservancies, producing biodiversity products such as *Hoodia* and ornamental plants, and engaging in nature-based

**Climate change risk** is the actual change in climate predicted for an area and the specific risks these changes pose.

**Climate risk management (CRM)** is an approach to climate-sensitive decision making. The approach seeks to promote sustainable development by reducing the vulnerability associated with climate risk. CRM aims to maximise the positive and minimise negative outcomes for communities and societies in climate-sensitive areas such as agriculture, food security, water resources and health.

**Climate change impacts** are the consequences of climate change on natural systems.

**Climate change adaptation** can be defined as a process by which strategies to moderate, cope with, and take advantage of the consequences of climatic events are enhanced, developed and implemented.

**Preparedness** is the state of being ready or prepared for action, which relates directly to adaptation.

**Coping strategies** are a range of climate sensitive actions put into place, with outcomes that are beneficial or negative but tolerable; beyond the 'coping range', the damages or losses are no longer tolerable and the society (or system) is said to be vulnerable.

tourism, are proactive land-use changes that already respond to climate challenges. Such strategies of diversification and sustainable land and resource use could be the starting point for further adaptation planning by communities.

Here are a few examples of expected climate change impacts relevant to the south-western regions, organised by sector 'themes'.

#### **a. Sporadic floods**

Flooding is a very real threat in some areas in the south-western regions, especially where ephemeral rivers flow downstream from inland dams and along the only perennial river in the regions – the Orange River. Run-off in smaller confluences may also lead to sizeable streams that can wash away infrastructure and threaten animal and human lives. A major impact on the livelihoods of families is that flood damage is not sufficiently covered by insurance schemes, which leaves people vulnerable and can push many households into severe poverty.

#### **b. Water resources**

Water is already the single most precious resource along Namibia's coast, and in much of southern Namibia. All coastal towns are supplied by groundwater that originates from the ephemeral rivers, extending from far inland and piped at huge cost to urban centres. In recent years, desalination investments have been made to provide mainly, but not only, industrial water. All climate change projections for southern Africa indicate a worsening of the groundwater situation – and any developments in Namibia especially along the coast, must take this into consideration. Radical water conservation and complete re-thinking about water use and generation must guide developers, municipalities, government as well as every single citizen.

The productive aquifer around Stampriet area in Hardap Region may become seriously threatened according to climate change projections for eastern Namibia, and currently some cross-border studies are being planned to assess the long-term viability of this aquifer, which currently allows for extensive horticultural development in that area of Namibia.

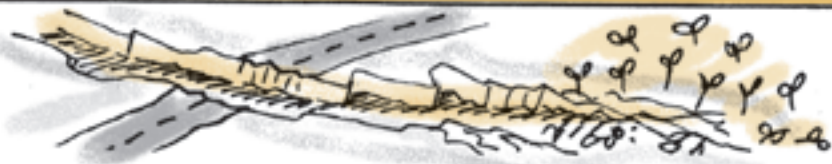







#### **c. Livestock farming**

The Erongo, Hardap, Karas and Khomas regions are among the most arid regions in the country and already experience naturally high variable conditions, which make these regions even more marginal when it comes to farming and food security. Large tracts of the land are covered by desert

– mostly by the enormous southern dune fields. Livestock farming is already problematic in these areas, and a major shift from livestock production to wildlife-based tourism can be observed in most of the fringes of the Namib Desert and the escarpment areas. In the south there is mainly small stock farming, but even here only species well adapted to arid areas are really productive. Overgrazing and water limitations render most areas unfit for livestock production – and these conditions are not likely to improve.

**d. Sea fisheries**

Using marine fish as an additional resource for food is an effective strategy in the coastal areas, but even the well-established sea fisheries sector in Namibia may be severely affected by expected climatic changes, as a result of changes in the Benguela Current. Warming of the current may significantly change its productivity and the occurrence of fish and marine species, both in terms of

Sector Theme	Expected climate change impacts	
Sporadic floods	 eroded rivers causing damage	
Water resources	 water contamination & low recharge	
Livestock farming and animal health	 overgrazing and declining fertility	
Marine resources	 decline in marine species – sea temperatures rise	
Wildlife biodiversity and nature based tourism	 wild fruits scarce	 seabirds migrate
Public health	 poor sanitation	 new pests and diseases

*Expected climate change impacts on major sectors and some initial key 'themes' need to be understood and addressed.*



commercial fishing as well as local food security. Mariculture and aquaculture farms along the coast are extremely vulnerable to storm surges, red tides and different siltation rates – all of which may be affected by climatic changes along the coast in the future. Major investments are needed to make such economic activities climate proof.

**e. *Wildlife, biodiversity products and nature-based tourism***

A shift from livestock-based to wildlife-based production is considered a good adaptation strategy, given the projected climate for Namibia. Wildlife is generally better suited to highly variable climates and natural migratory patterns will place less stress on environmental resources such as soils, grazing/browsing and water. There are numerous conservancies and private game reserves in the south-western regions, which contribute towards the implementation of climate risk sensitive land-use strategies.

Tourism is already a flourishing sector in these regions, and, if well managed, can help build climate change resilience. However, threats such as the projected water crisis for Namibia will also pose difficulties for tourism, which is considered a water-intensive industry. Additionally, it will be important for Namibia to find ways of identifying itself as a carbon neutral destination – many international visitors will not want to further contribute to climate change by aggravating global CO<sup>2</sup> emissions. Namibia is a distant destination and long-haul flights are a major cause of global warming.

In the south-western regions numerous wild plants and biodiversity products are well-utilised. The distribution of local biodiversity is expected to change under current climate change projections, and even the quiver tree, a major Namibian icon, may not continue to grow where it is currently found. On the other hand, different important indigenous species may become more abundant in the same area, although this potential change of distribution is not very well understood at present.

**f. *Coastal zones***

There have already been impacts on buildings, houses, road infrastructure and energy supply amongst others, caused by coastal flooding during spring tides and extreme storm surges. Recovery and reinvestment are costly and insurance companies and banks are generally not geared towards assisting people and businesses affected by these circumstances. The coast between Walvis Bay and Henties Bay is particularly vulnerable to sea level rises and increased storm surges. Flooding of the salt pans, erosion of buildings too close to the high water mark and poorly conceived infrastructure developments contrary to existing guidelines may cause billions of dollars of loss to government, industries and individual investors. Lüderitz, built on rock, is generally much better protected than the low-lying Erongo coastal developments.

**g. *Public health***

An even hotter and more arid climate for Namibia, with more extreme weather events such as droughts and floods, would clearly have implications for the health of inhabitants. People who are already vulnerable, such as children and the elderly, or those who are ill e.g. from HIV/Aids, are particularly at risk.

Water-borne diseases will become a threat in years of flooding, with diarrhoea, cholera and malaria becoming particularly severe. Areas in Namibia that are currently considered to be malaria free may in future become areas in which the disease is prevalent. In drought years, respiratory infections and under-nutrition with associated side effects may cause serious health problems.

There are a large number of other sectors and sector themes that are very important in the Erongo, Hardap, Karas and Khomas regions, such as those relating to climate change impacts on education, off-shore diamond mining and health impacts from uranium dust. These could be examined and developed in future discussions.

*Adaptation aims to reduce vulnerability and improve the capacity of people, especially those who rely on agriculture for their livelihoods, to adapt. Generally it is believed that without adaptation, living conditions will severely degrade, while with good adaptation efforts, prosperous lives can be achieved even under the difficult climatic conditions expected.*

# CLIMATE CHANGE

Life without adaptation



# AFFECTS US ALL

Life with adaptation



## 2. What can we do about climate change? Adaptation!

### 2.1 What is Climate Change Adaptation (CCA)?

CCA is an accepted term and refers to the capacity to deal with climate change challenges by changing and 'adapting' lifestyles, farming practices and overall land use to address the expected changes.

Adaptation aims to reduce vulnerability and improve the capacity of people to adapt, especially those who rely on agriculture for their livelihoods. Generally it is believed that without adaptation, living conditions will degrade severely, while with good adaptation efforts, prosperous lives can be achieved even under the difficult climatic conditions expected.

### 2.2 Why is adaptation necessary?

While people often react to floods, storms or droughts as they occur, they have also used adaptation strategies based on available resources and prior experience and knowledge of past weather patterns for a long time. Current coping strategies could include building seawalls and other protective measures for buildings close to the coast threatened by storm surges, as well as actively moving livestock to cattle posts or areas where emergency grazing is available. However, these measures are no longer adequate for coping with the expected long-term impacts of climate change. This is particularly true with our rapidly increasing population.

Adaptation is necessary to prevent potential damage that can be caused by impacts of climate change. Through adaptation, threats to human health, economic development, property, infrastructure and ecosystems can be minimised. Lives will be saved and the cost of climate change can be reduced. There is a lot we can learn from past experiences and the adaptations used, and we should keep improving on them through planning and discussion.

### 2.3 The adaptation 'process'

Adaptation entails a planning and implementation process that would include parts or all of the following steps:

1. Understanding the climate change risk in the area
2. Identification of expected climate impacts
3. Identification of impacts already observed and existing coping mechanisms (e.g. what is being done 'naturally' to cope with existing climate variability and climate change)
4. Development of a joint strategy (e.g. community level or constituency level) on how best to address climate change through adaptation
5. Ensure that vulnerable groups are not further marginalised by gender insensitive planning (undertake a gender screening exercise and include women and youth empowerment activities)
6. Identification of potential adaptation options and specific measures/actions that address some of the key challenges
7. Implementation of strategy and priority adaptation measures/actions
8. Monitoring and evaluation of implementation to test success.



## 2.4 Some adaptation options relevant to the Erongo, Hardap, Karas and Khomas regions

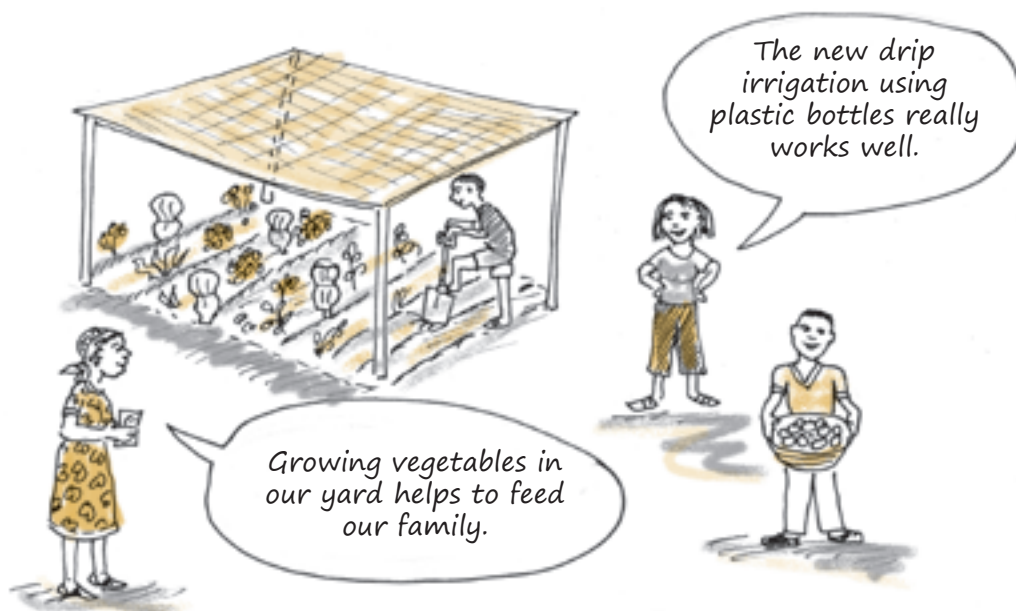
This section provides examples of **adaptation options** concentrating on farming and various natural resource uses, infrastructure, housing and settlements, but is also applicable to other themes. Many other options may be available and need to be explored. This information toolkit can only provide some initial ideas that communities need to develop together.

**Developing community or constituency adaptation strategies:** a first step in addressing climate change is to identify the problem and then develop a systematic plan of how to deal with the challenge. This is best done with community members or even at constituency level. The steps provided above may be helpful in developing such a strategy.

**Land-use planning and promotion of climate-compatible land uses and associated production systems:** land-use options that are better adapted to the prevailing variable and already naturally extremely arid climates of south-western Namibia should be promoted. A shift from livestock to wildlife-based production systems is an example that might be useful in the south-western regions, with tourism providing promising opportunities. Additionally, farming with species such as ostrich can be an opportunity. Formal and collective land-use planning can help farmers manage resources better and reduce their vulnerability to climate change.

**Wildlife management, tourism, biodiversity products and conservation:** co-management of larger tracts of land is a suitable land management strategy in arid areas. Wildlife populations are highly migratory in arid environments, and take advantage of good rainfall and associated grazing by moving enormous distances. Fences can be a major threat to migratory wildlife, causing the deaths of animals caught up in fences and wires. Conservation contributes greatly to Namibia's flourishing tourism industry, which markets the country as one of the world's leading nature and landscape destinations. Even though Namibia's arid environments seem vast and expansive, it is important to keep them healthy and resilient to be able to buffer the expected impacts of climate change. It will be expensive to forego long-term conservation goals for short-term economic benefits.





The formation of conservancies and establishment of co-managed conservation areas for management and utilisation of wildlife is an option that could be considered.

Income from biodiversity products such as the *Hoodia* plant and from the propagation and sale of indigenous succulent plants are examples of how local incomes can be diversified using natural products. Investments in developing markets and assisting local people to tap into these opportunities can help build adaptive capacities.

**Climate proofing industries – major sources of employment:** diversification of incomes, but also climate change-proofing existing industries – often the lifeline for many families – are important approaches to managing climate risks. The coastal areas between Walvis Bay and Henties Bay house a large section of Namibia’s overall population and these people must be able to earn a living. Climate change risks such as increased water shortages, storm surges and coastal erosion, flooding of low lying areas such as Walvis Bay Town, and potential health risks posed by uranium dust carried towards the coast are probable future threats.

Major investments have to be made to ensure that people can continue living along the coast. Existing and planned industrial developments must be screened for their potential climate or other environmental risks, and cost-benefit analyses should be applied to any future developments. Climate change-proofing existing industries now can help reduce future financial losses that usually mean laying-off people and pushing households into poverty.

**Water conservation:** water is the single most limiting factor to development, and this is particularly true for Namibia’s hyper-arid coastal environment. Water conservation practices must be applied as a matter of urgency by municipalities, any public institution, private industries and each and every household. This means that water leakages must be detected and treated as a matter of priority and activities that waste water be limited. Ornamental gardens consume excessive amounts of domestic water and should be prohibited along the coast. Water consuming industries such as the uranium mines stretching across the desert need to adhere to strict water laws, and alternative sources i.e. from desalination, must be sought. Desalination infrastructure should follow strict safety regulations and factor in future climate risks, such as those posed by increased storm surges, to prevent potential pollution and damage to the coastal environment.

Water conservation also plays a major role in the inland areas of the south-western regions. Dams need to be climate change-proofed and catchment management committees have to ensure that the water requirements of all stakeholders are considered. Groundwater resources should be considered for their real value and that responsible use is promoted. Water use that bring less return than the water is worth must be discontinued. Some adaptive measures include recycling of grey water, checking existing water infrastructure for leaks and ensuring that wasting water is prevented.

**Prevention of land degradation and rehabilitation:** land degradation is a major problem in most of our regions, and undermines efficient adaptive capacities. Proactive investment in sustainable land management (SLM) will have major climate change adaptation benefits. Rehabilitating degraded land can also make significant contributions towards capturing carbon, thus contributing to urgently needed mitigation. Many people consulted during the preparation of this toolkit stressed the importance of planting trees and combating deforestation, which is a problem throughout the country. In arid areas, plant growth and rehabilitation are extremely slow and any tree lost will take a long time to be replaced.

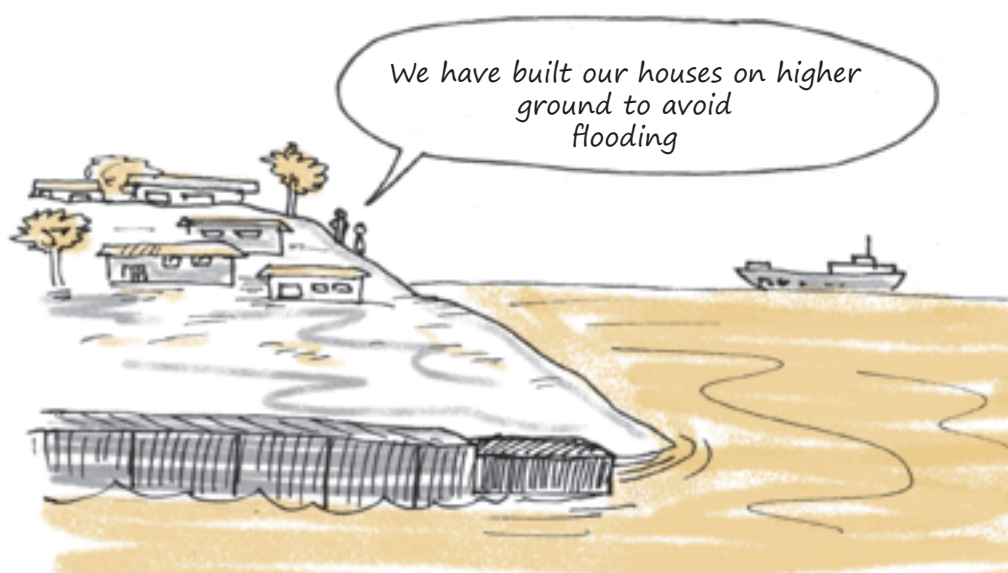
**Settlement plans, management of flood-prone areas and climate proofing infrastructure:** high risk flood areas need to be identified and settlement guidelines should be implemented. For example, people living along ephemeral rivers or along the perennial Orange River must adapt their building structures and be aware of the flood risk. This is a personal responsibility, which might be shared with government and non-governmental organisations, but it is important for people to initiate the planning themselves. Insurance schemes in Namibia should be developed in line with international best practices in catering for climate risk victims, to help them rebuild their livelihoods, businesses and homes. Flood victims in Mariental, for example, discovered that insurance premiums excluded their properties from coverage for flood damage, as their houses are situated below the flood line. This makes these people and property owners extremely vulnerable to flood risks. It is important to help affected people to find solutions instead of further marginalising them.

Along the coast, sea level rise is a real risk and clear building codes should be enforced to prevent the 'common' person from falling victim to poorly conceived housing developments that will not be sustainable along the very active coast.

Wind damage – a key concern of interviewees during the consultation, can be avoided by implementing wind breaks e.g. made of natural vegetation. Buildings should follow minimum standards that cater for potentially worsening wind strengths.

**Managing food security, improved nutrition and health:** given the projected future climate scenarios, it is unlikely that Namibia will ever be fully food self-sufficient. However, promoting vegetable gardens for improved household nutrition can be a powerful strategy, in water restricted southern and western Namibia. Green leafy vegetables and fruit are important for healthy diets and contribute essential minerals and vitamins to a largely meat-based diet. Unhealthy people are particularly vulnerable to increasingly challenging climate changes. Local water recycling or rainwater harvesting techniques, as well as appropriate shading against radiation and evaporation through wind, may render such small-scale gardens suitable in south-western Namibia.

There have been reports that malaria would potentially spread into regions as far south as Khomas under the projected climate change scenarios. However, people living in southern and western Namibia are mainly challenged by the health impacts of droughts. Vulnerable people, such as the elderly,



children, pregnant women and breastfeeding mothers can be seriously affected by difficult climatic conditions, heat, dehydration and an overall food and nutrition shortage in times of drought. It is very important to focus on building the adaptive capacities of such vulnerable people and focus on the general improvement of their health to be able to cope with worsening climatic situations in the future.

**Small stock and game species/breeds and investments into animal health:** farmers can select breeds and species that are adapted to warmer and drier climates. New breeds may be better adapted to increased temperatures, or our traditional breeds could be improved to yield higher production levels. Wildlife species that usually occur in drier and hotter climates may change their usual distribution ranges naturally and are generally more adapted to the local conditions than livestock. There are several ostrich farms in southern Namibia, and karakul farming is becoming more lucrative again. It is important that suitable animals are farmed, and that market niches can be exploited. However, it is important to note that the carrying capacity of an arid environment is limited.

Investments into animal health ensure that animals remain healthy and productive, and that they can survive even difficult years of prolonged drought. Agricultural extension services are needed especially in communal areas and access to inoculations and vaccines would prevent unnecessary disease. It has been shown that keeping animals in shaded kraals significantly reduces heat stress.

**Alternative energy:** although not necessarily a climate change related problem, many people consulted in south-western Namibia mentioned that electrification using solar power would help households to build adaptive capacities, especially when linked to the use of fuel efficient stoves to reduce biomass consumption. Access to light and cell phone recharging facilities were placed high on the priority list of the rural farmers.

**Fire management:** fire is a key environmental issue mostly in northern and eastern Namibia, but has also been reported from areas in the Erongo and Khomas regions. Fires can be important for landscape management, but methods to prevent fires and improve management of wildfires when they do occur, need to be investigated. Fire management is the responsibility of individuals, and prevention is a key to fire management.

**Improved Early Warning Systems (EWS) and information on CC and CCA:** in all Namibian regions, as with most rural communities, it is clear that there is a need for basic information on climate change and adaptation. This would provide farmers with knowledge on when the start of the rainfall season could be expected or whether rainfall is expected to be higher or lower than average, allowing them to decide what adaptation methods they should consider. It would also allow resource users to better prepare for expected challenges such as floods or droughts.





### 3. Climate change adaptation: community planning tools

The 'adaptation process' consists of a number of key steps that will assist communities in dealing with climate change. The tools should be introduced to communities by facilitators who have been trained in the methodology.

#### A reminder of steps for adaptation (Section 2.3):

1. Understand climate change risks in the Erongo, Hardap, Karas and Khomas regions
2. Identify expected climate impacts
3. Identify impacts already observed, existing coping mechanism and root cause analysis
4. Identify potential adaptation options
5. Screen and adjust for gender sensitivity
6. Develop a joint strategy for adapting to climate change
7. Implement strategy and priority adaptation measures/actions
8. Monitor and evaluate implementation.

The following pages contain some practical **community planning tools** which could assist communities to develop adaptation actions within their constituencies. The proposed tools are examples of possible methods – although other, more familiar tools may be preferred and adapted to the needs and circumstances of specific communities. Agricultural technicians or health outreach staff in the area can work with communities on applying these tools and may even suggest additional tools.

The following tools can be applied to the eight steps mentioned earlier:

- Tool 1:** Community – expert exchange discussions and introduction to climate change thematic
- Tool 2:** Understanding the context: natural resources and resource management practices mapping and the link to climate change
- Tool 3:** Root cause analysis (Problem Tree)
- Tool 4:** Finding a solution through the Sun Ray Exercise
- Tool 5:** Screening tool for gender sensitivity
- Tool 6:** Developing a community based CCA strategy and putting it into action
- Tool 7:** Example of an adaptation measure
- Tool 8:** Participatory monitoring and evaluation.

#### Step by step application of tools – how to!

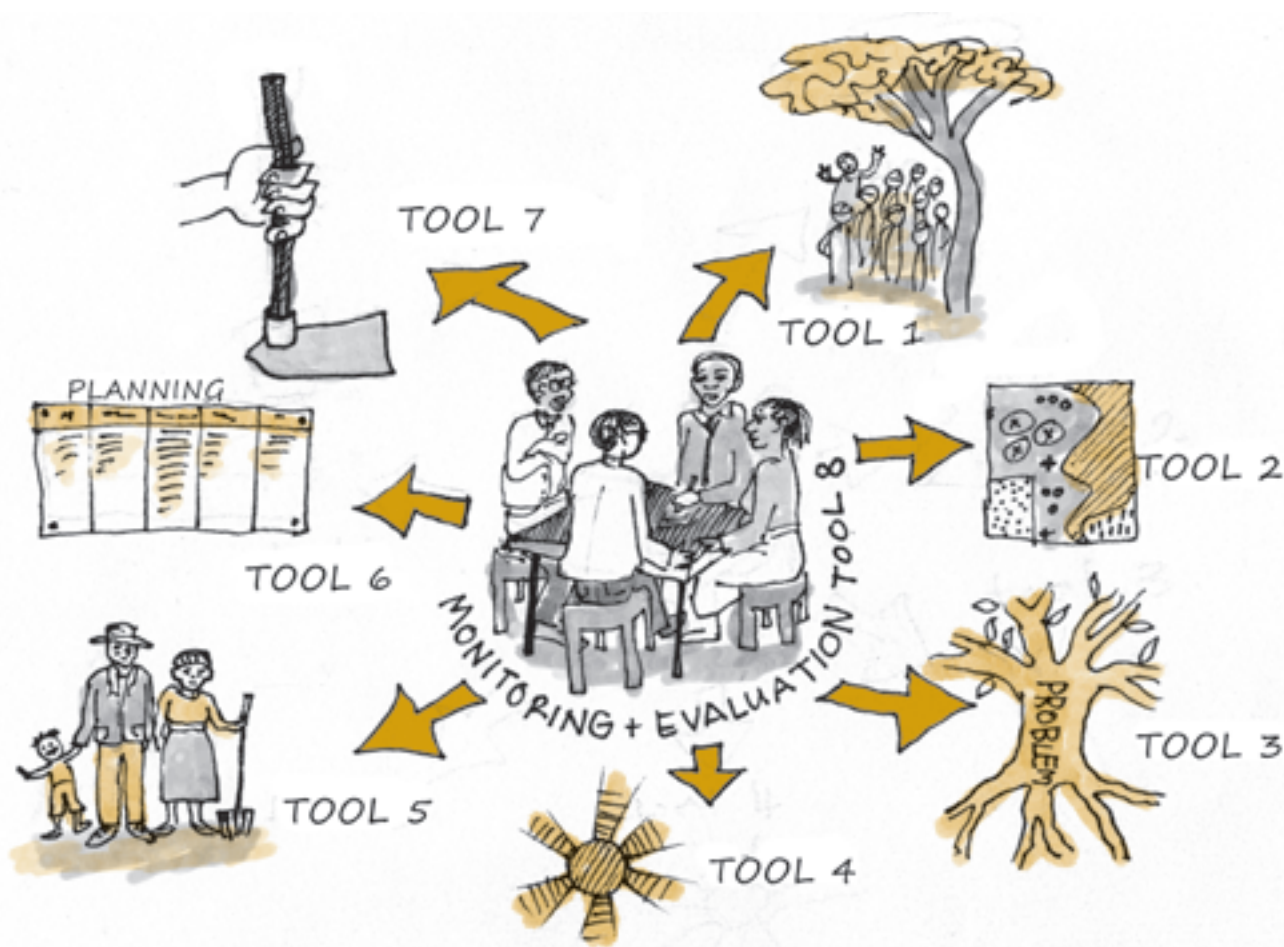
Tools 1 to 8 build on one another – and form a feedback loop. It is important to work through all of them in that order, as they are designed to help facilitate the identification of the complete problem, finding solutions and adaptive management processes with a participatory monitoring and evaluation component contributing to ongoing learning.

The tools can be used by a group, a couple or a community, or just by an interested individual.

Steps include:

1. Plan a community consultation on climate change issues; introduce the toolkit; read/introduce/discuss climate change context (**Tool 1**).
2. Discuss how climate change already affects the area and what the impacts are; draw a resource map (**Tool 2**).

3. Identify a key problem and analyse (the climate change related) root causes (**Tool 3**).
4. Brainstorm possible solutions to addressing the climate change related problem (**Tool 4**).
5. Screen whether the proposed adaptation measures are gender sensitive and take care not to introduce additional discrimination. Plan alternative measures or mitigation strategies if gender imbalances could be perpetuated by a planned action (**Tool 5**).
6. Develop an action plan for how to address all key climate change problems (**Tool 6**) repeating Tools 3, 4 and 5 as often as needed to address all key foreseen climate change related challenges.
7. Identify practical adaptation measures or solutions to the various action points. Many innovations are needed. **Tool 7** only gives one example of a possible adaptation solution. You probably have many of your own ideas.
8. Linked to the action plan (**Tool 6**), a monitoring and evaluation plan should be developed and implemented in a participatory manner. All community members should not only be involved in checking on the progress made on the implementation of the plan of action, but should also monitor and evaluate the usefulness of the adaptation innovations put into place (**Tool 8**). Any lessons learnt should be applied in the revision of the plan – and for an improvement of the innovations. It is important to incorporate gender issues at this level as well.





## Tool 1: Community - expert exchange discussions and introduction to climate change thematic

**Addresses CCA planning Steps 1, 2, 3; forms basis for planning Steps 4, 5 and 6**

As a first step it is important to create a platform for climate change and climate change adaptation as a discussion issue. This information toolkit could form the basis of information on what climate change is, why it is important, and what adaptation options are used already. People knowledgeable on the subject, e.g. from MAWF, MoHSS or MET, could join the discussions. During the preparation phase of this toolkit, a team visited Erongo, Hardap, Karas and Khomas regions and discussed some of these issues with farmers and other community members. So there are already 'sensitised' people in each of the constituencies, who can serve as useful resource persons.

**Purpose:** To establish awareness about climate change and sensitise community members to the issues of climate change.

**Materials:** This Climate Change Adaptation Toolkit is available as a prepared presentation. Copies can be obtained from the Regional Councils or the CCA Project Management Unit at the DEA/MET. See contacts in the list at the end of the toolkit.

### Methods:

1. *Invite a group of interested community members to a community meeting on climate change and adaptation; farmers but other stakeholders should also attend. Members of Water Point Management Committees or Conservancy Committees may wish to follow their organisations' usual procedures and only use the resource material for topical guidance.*
2. *Develop a meeting agenda; the overall purpose of the meeting(s)*

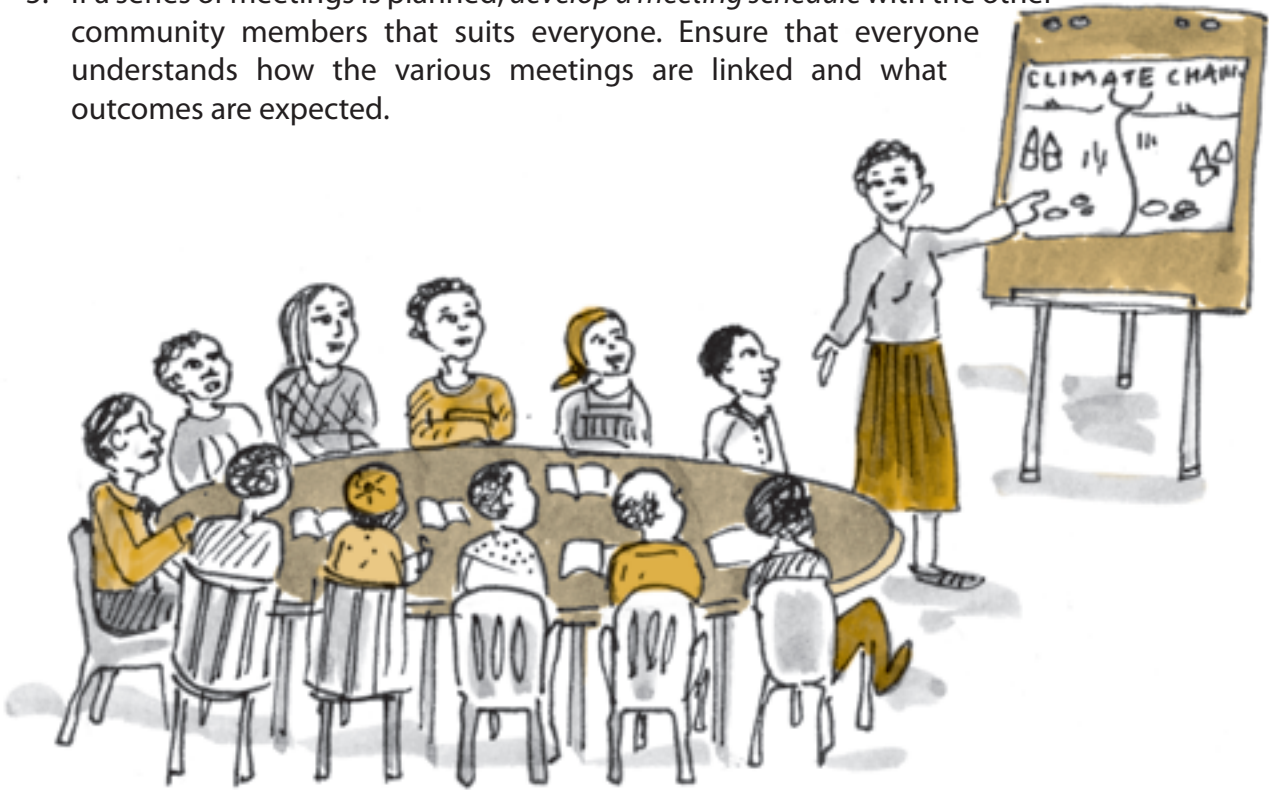


would be to develop a community Adaptation Strategy and put it into action. The tools presented in this toolkit, or other useful methodologies for joint planning and awareness-raising can be used.

3. *Prepare for the meeting; have all materials in place and set up a meeting venue. If applicable, ensure that arrangements for lunches and other refreshments are made and well organised. Make sure that a visit from an outside expert, if required, is properly planned for.*
4. *Conduct the meeting according to an agenda; allow for extensive group interaction and discussion. What do fellow community members understand about*

climate and climate change? How do they feel it affects them – or will affect them in future?  
What are concerns and potential opportunities?

5. If a series of meetings is planned, *develop a meeting schedule* with the other community members that suits everyone. Ensure that everyone understands how the various meetings are linked and what outcomes are expected.





## Tool 2: Understanding our context: natural resources and resource management practice mapping and the link to climate change

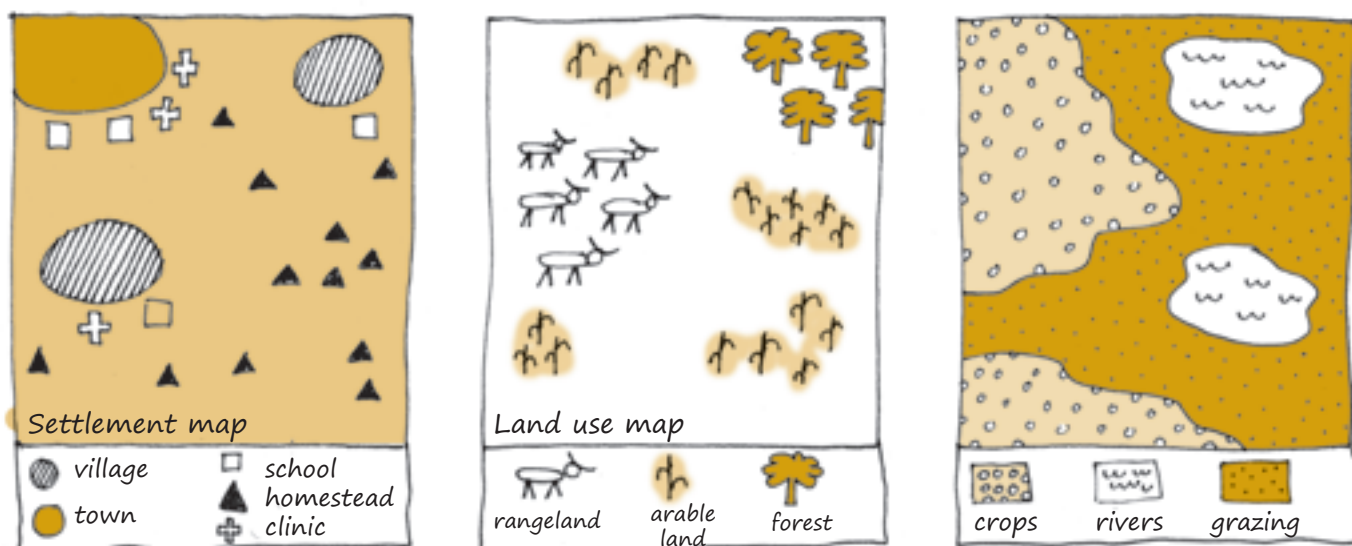
Addresses CCA planning Steps 1, 2, 3; forms basis for planning Steps 4, 5 and 6

After a general discussion on climate and climate change, the focus should move to the context of the environment, farming and resource use and management practices of the community. This leads to identifying environmental challenges (frequent droughts, pests) and changes that need to be managed and whether these are considered to be related to climate change. Participatory methods such as the Participatory Rural Appraisals as well as resource materials, such as those for conservancies and community forests can be used to extract this information. This toolkit presents only some selected methods. Many communities already have resource and land-use management plans which are invaluable tools for the adaptation strategy development process.

### 1. Mapping

**Purpose:** To collect and discuss information on land and resource use in the community or constituency including location of settlements and access to land and resources; additionally, to map environmental parameters such as the location of water channels, distribution of soil and vegetation types; to pinpoint the location of settlements, waterholes and other important infrastructure.

**Materials:** Flip chart paper, markers/pens, coloured pens, masking tape, Prestik, relevant and available maps (e.g. topographical maps, Google earth images of the area, existing maps from previous mapping exercises). 'Draft maps' can be drawn on the ground.



#### Methods:

1. Discuss the exercise with the group and identify the types of maps that they will need to develop a good story line that will aid the climate change adaptation planning process. These could be (i) village/settlement/infrastructure map, (ii) a land-use map, and/or (iii) a resource distribution map (soil types, vegetation types).
2. Based on the types of maps selected, form mapping teams whose task will be to develop the specific maps.

3. Explain to all participants that they will draw a map from their knowledge of their land, in their own way. Be clear about what the participants need to record.
4. Ask everyone to collect piles of objects such as sticks, stones, leaves, seeds and petals of different colours, to form about 10 piles of different objects.
5. Find a clear piece of ground in the area on which to draw the map.
6. Ask the group to identify a person to lead the mapping process; i.e. to use a stick to draw important landmarks. This will form the framework of the map onto which other items can be added. Landmarks may include roads or tracks, villages, mountains or hills or specific infrastructure such as water points.
7. The mapping team should think of other items that they can add to the map, for example hunting camps, spirit sites, airstrips and petrol stations or stores.
8. Choose a symbol from one pile collected in Step 4 to represent the item. For example, a white stone might represent a water point; a dark stone might represent the settlement. Place one of these symbols at each separate location. Allow the team time to check and discuss the accuracy of placements and to amend the map as necessary, until everyone is happy with it.
9. Ask the team to transfer the map onto a piece of flip chart paper. The team will need to devise alternative symbols to represent the mapped items and should draw them as a key down one side of the sheet of paper. Initially the map can be drawn by pencil to allow for correction, and later with coloured pens.
10. Where necessary, add names to places e.g. towns and features such as water channels, rivers and floodplains.

**Time:** 2 hours

## 2. Seasonal calendars

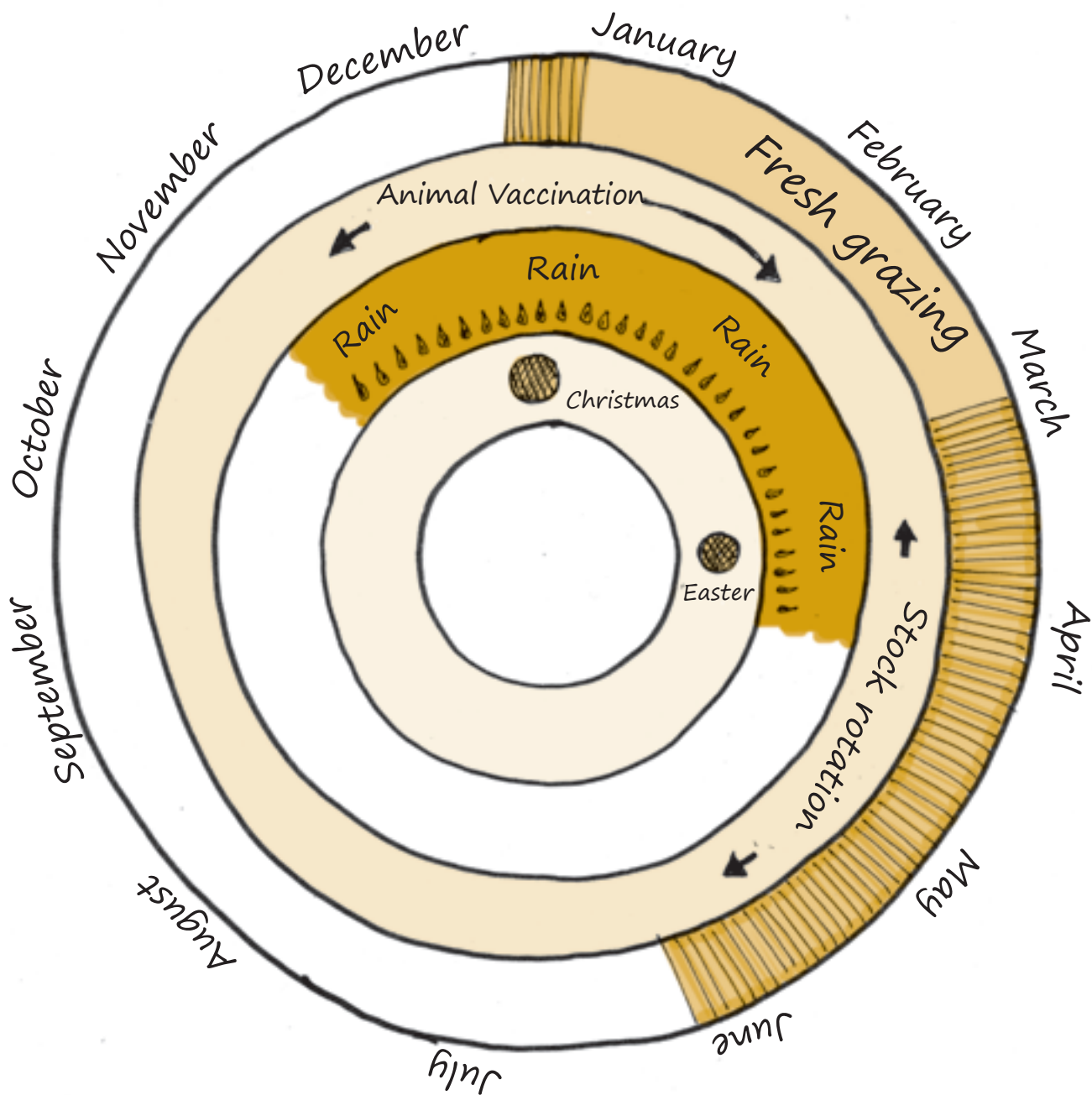
A seasonal calendar is a tool for documenting regular cycles such as seasons and significant events that occur during a year and influence the life of a community. It provides a general picture of important environmental, cultural and socio-economic periods throughout the year. The seasonal calendar is of particular value as it allows local farmers to represent their understanding of seasons from their cultural and environmental context. These are often different from 'official' seasons and the international calendar. A seasonal calendar is particularly valuable for assessing climate and climate change impacts, and could indicate changes in the timing of the onset of the rainy season or the growing season.

**Purpose:** To develop a local community seasonal calendar, focusing in particular, but not only, on the agricultural cycles observed in the Erongo, Hardap, Karas and Khomas regions.

**Materials:** Flip chart paper, markers/pens, masking tape, Prestik, coloured pens.

### Method:

1. Form seasonal calendar teams with a mix of old and young people. Provide each team with pens and paper.
2. Draw a large circle on the flip chart paper provided for each group. Mark the top of the circle to represent the beginning of the year, and then explain that the bottom of the circle is halfway through the year and the top is back to the start and a new year.
3. Have the groups divide the circles into 12 sectors and for each sector have participants discuss, identify and mark with different coloured pens (key) their local observations with regard to the following:
  - a. Veld food harvesting
  - b. Agriculture – ripening of vegetables/ vaccination of livestock
  - c. Weather – rainy periods/dry periods/floods/droughts
  - d. Social events – major village functions/celebrations



4. Once completed, have each group discuss their calendar and ask the other groups to comment and add to the chart.
5. Draw a copy of the combined calendars onto paper with coloured pens. Use local symbols to represent each item. Draw the key on one side.
6. You can adapt this method to draw events along a timeline. You could also map several years along a timeline to detect longer-term changes. You can adjust the method according to the information needs for your planning purposes.

**Time:** 2 hours

### 3. Resource inventories

Communities generally have an intimate knowledge of the plants and animals in their areas and have specialised understanding of the way plants and animals relate to other aspects of their environment.

This inventory is a quick method of obtaining an inventory of plants and animals in an area and what natural resources are commonly used.

**Purpose:** To collect information on biodiversity and natural resources use in the area.

**Materials:** Flip chart paper, books of plants and animals and other resource materials, pens.

**Methods:**

1. Divide participants into four groups or as appropriate –
  - Harvesting of veld foods and medicinal plants
  - Livestock
  - Wildlife and birds
  - Fishing
2. Ask each group to fill out the following in column format on the flip chart paper:
  - Name of plant/animal in an accessible language (Nama/Damara, Afrikaans and English)
  - Uses/significance
  - Abundance or scarcity
  - Locality
3. Once each group has finished entering their results, swap with the next group and continue until they have all had a chance to contribute to the thematic flip chart papers.
4. Get the groups to present their results and discuss.

**Time:** 2 hours

#### 4. Linking results to climate change

**Purpose:** To identify changes to the environment and community life in the area that may be linked to climate change.

**Materials:** Flip chart paper, results from previous activities, pens.

**Methods:**

**Mapping**

Ask the participants to review the sketch maps and mark changes that have occurred over the past five, ten or twenty years. The changes should be in terms of grazing areas, relocation of houses, changes in fishing and livestock grazing. As the participants mark these changes on the map, ask them to provide more details about them. Record the results.

**Seasonal calendar**

Ask the participants to review the seasonal calendar. Discuss changes or uncommon events that they have observed in the seasons or climate in recent years. These can be events such as prolonged drought, increased rainfall, early fruiting/flowering of veld food etc. Record observed changes and discuss. It would also be possible to discuss changes during several years if a longer-term timeline was developed.

**Resource inventory**

Ask the participants to look at the inventory and identify those plants and animals that are becoming scarce. Ask them to discuss and record possible causes for their decline and the likely impact of their loss on community life.

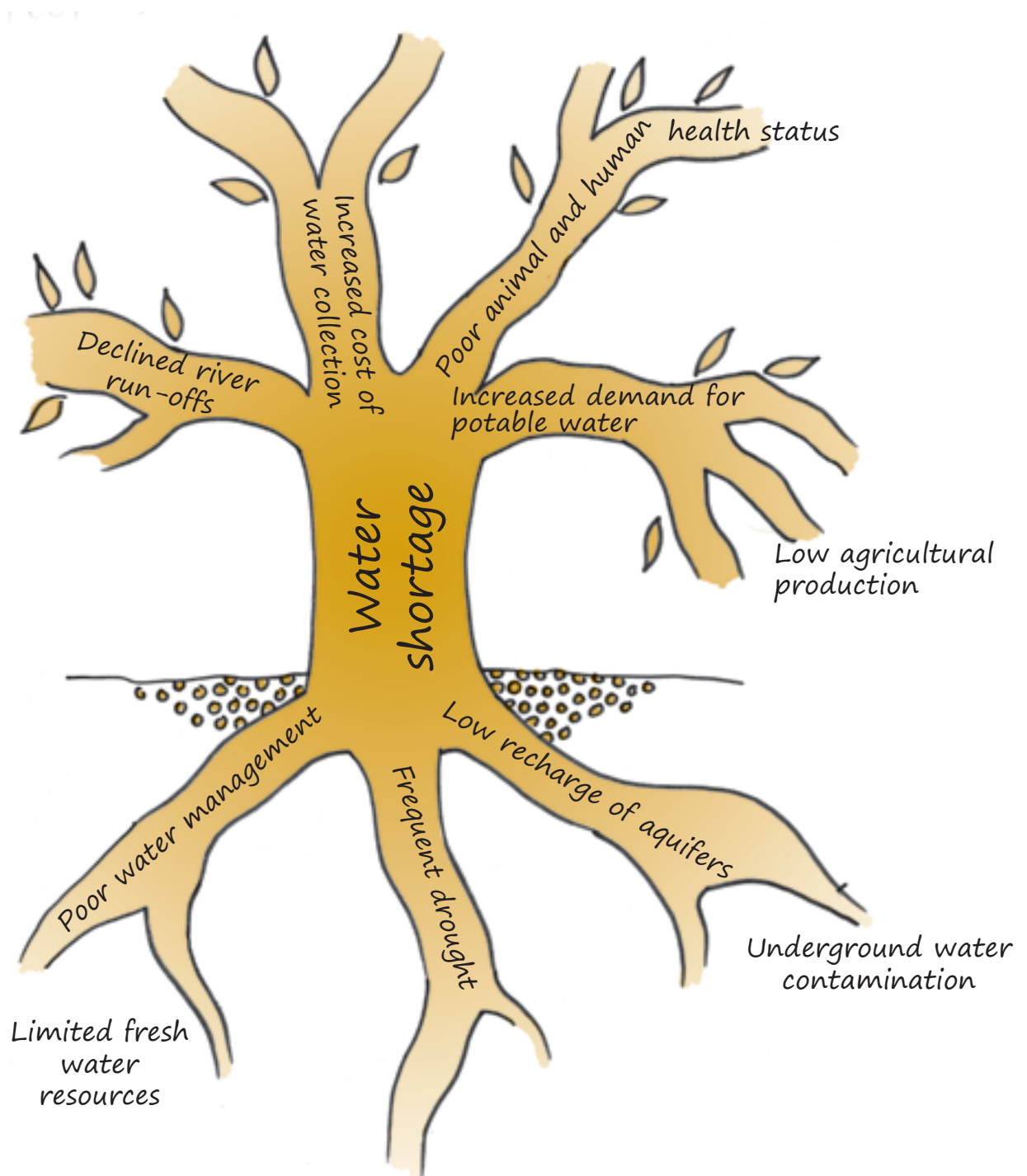




## Tool 3: Root Cause Analysis using a 'Problem Tree'

Addresses CCA planning Steps 1, 2, 3; forms basis for planning Steps 4, 5 and 6

In order to decide what effective actions are needed to resolve a problem, the problem itself needs to be clearly understood. A Root Cause Analysis is a useful tool that breaks down a problem into separate parts, identifies the dominant causes and clarifies the most effective areas for action. Climate change is a complex concept and in order to avoid it being seen as the underlying cause for all community problems, a broad overview of all contributing factors is necessary to determine whether it is indeed the dominant factor.



### Example of a Problem Tree

**Purpose:** To determine whether identified community problems are directly related to climate change.

**Materials:** Flip chart paper, markers/pens, an example of a Problem Tree, coloured cards, Prestik.

**Methods:**

1. Ask participants to form groups of approximately five people, and generate a list of current problems that they think are related to climate and climate change. Write the results from the groups onto one flip chart sheet, by having each group present their results to the plenary. Ask all community members to prioritise the problems by a show of hands or by 'vote'. To 'vote', each community member has 'three votes', which they indicate with a mark (e.g. a cross) behind the problems they identify as the most important.
2. Use one of the prioritised problems and discuss with the general meeting what the 'problem', 'cause' and 'effect' is, using the Problem Tree. The problem forms the trunk of the tree. Explain that the tree is sick and that this is often caused by problems that need to be identified in its roots. Encourage participants to brainstorm about the causes of the problem by asking the question 'why?' Draw a root for each cause identified and write it in the relevant root.
3. Repeat the question 'why?' for each cause mentioned in Step 2, to identify secondary causes. Write these lower down the roots, below the 'primary' causes identified. Allow participants to continue until they can identify no more secondary causes.
4. Ask participants to identify primary effects or impacts of the problem by asking 'what happened?'. Draw a branch for each effect, and write the effect on the branch.
5. For each effect identified, repeat the question 'what happened?' to identify secondary effects. These form the leaves of each primary effect branch. Allow the participants to continue until they can identify no more effects of the problem.
6. After one problem has been dealt with in this way, encourage each group to take a separate priority problem and follow the same process to discover its root cause and effects.
7. Once the groups have completed their Problem Trees, ask them to present the results for discussion. It is important to identify the relationship of the problem to climate and climate change very clearly at this stage.
8. Keep the Problem Trees as a basis for the identification of 'adaptation options' and the development of the 'Adaptation Strategy'.

**Time:** 4 hours

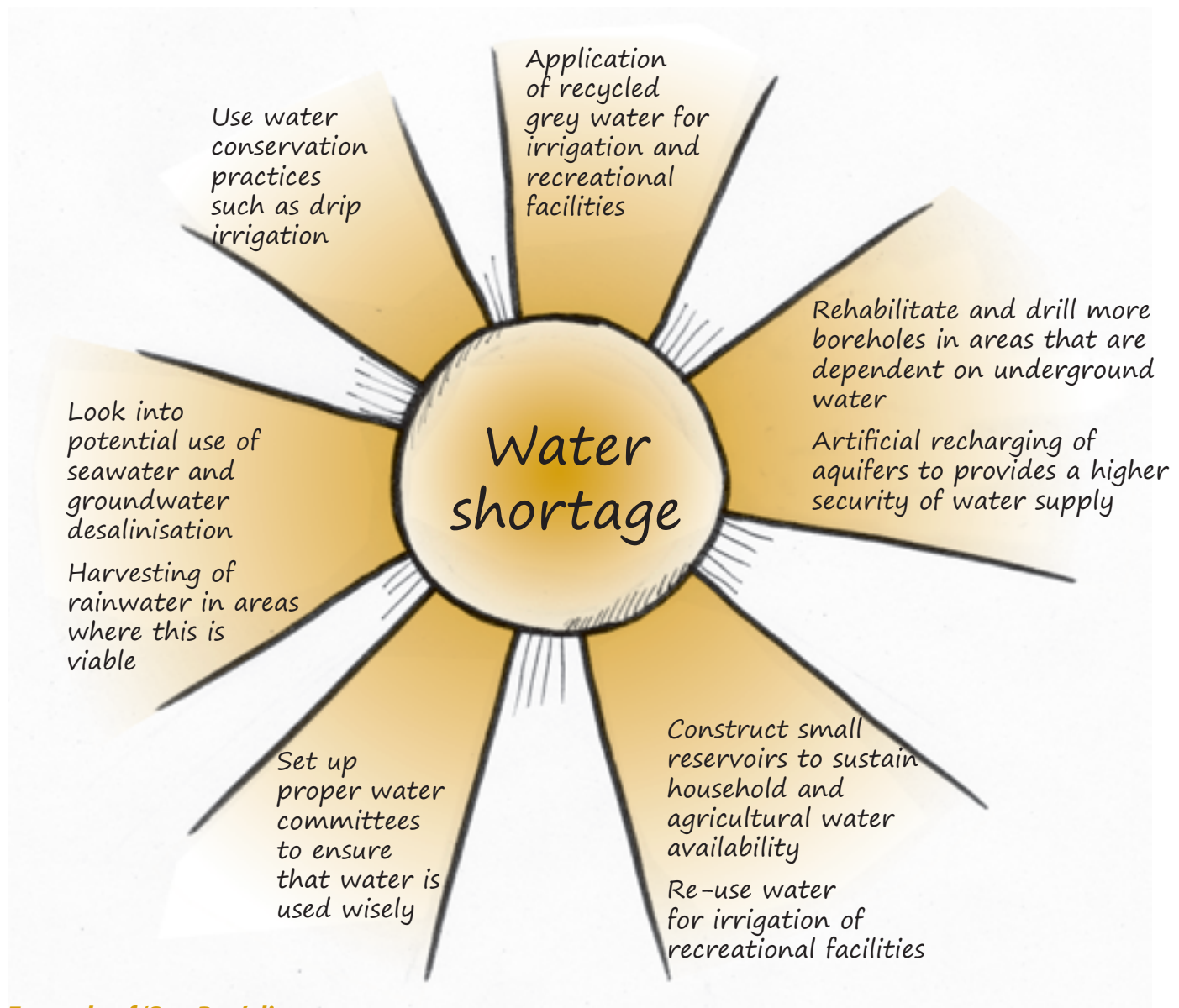


## Tool 4: Finding solutions through the Sun Ray Exercise

**Addresses CCA planning Step 4; forms basis for planning Steps 5 and 6; builds on Root Cause Analysis**

The Sun Ray Exercise is a participatory tool that allows brainstorming of ideas to solve a problem in an ordered and logical way. It is a visual method that develops solutions and breaks them down into achievable activities.

**Materials:** Flip chart paper, markers/pens, coloured cards or stickers, Prestik.



**Example of 'Sun Ray' diagram**

### Methods:

1. Form Sun Ray Exercise groups (can be the same groups as for the Root Cause Analysis).
2. Ask each group to draw the outline of the sun and rays coming out of it and choose a different primary root cause of a problem identified during the Root Cause Analysis to write in the face of their sun.
3. Ask each group to brainstorm general solutions needed to address their root cause. Each team should write the solutions on pieces of paper and stick them at the ends of the rays.

4. The group now needs to discuss methods of achieving each solution at the end of the rays and to write the answers on separate pieces of paper to stick below the specific solutions. These are usually potential adaptation options, or measures and actions. Add new rays for new solutions as they come up during the discussions.
5. Where the team has identified large or complex activities for achieving general solutions, break them down into smaller activities by adding more ideas next to the rays. Keep working on these until all possibilities are exhausted.
6. Check that all the rays add up to a full solution to the problem. Take out those that are unnecessary and add new solutions if more are needed. Rearrange items if necessary.
7. Nominate one person from each group to draw up the final Sun Ray on paper with input from their group.
8. In a plenary session, discuss which adaptation options, or measures and actions will be more effective than others. Discard those that participants consider ineffective or very difficult to implement, or include them as a low priority. Discuss why an action seems most appropriate for a particular problem/objective. Record specific details or information on how the action will work. Ask the participants to explain the reasons behind the chosen suitability assessment, as sometimes options may have been applied in the past and they may have insight into their effectiveness, which it is important to record.
9. Keep for further use/integration into the Adaptation Strategy.

**Time:** 2 hours



## Tool 5: Gender Screening Tool

Gender is a socially and culturally constructed definition of women and men. It is determined by perceived functions, responsibilities, and roles attributed to women and men in society and in public and private life. There is a perception that climate change impacts will be unequal due to cultural factors, norms and traditions, and also socio-economic status. In the past, women usually looked after the house while men were away at work earning an income. This gives rise to the perception that women are more vulnerable to climate change impacts than men. This is particularly so for rural women, who are often disadvantaged when it comes to getting income generating opportunities, and who, in some traditions, do not have direct land rights.

### Gender analysis

Gender analysis aims to thoroughly examine the differences in women's and men's lives, covering things that lead to economic and social inequity for women. It is concerned with the underlying causes of these inequalities, and also aims to achieve positive change for women. Men and women have different interests determined by their ethnic identity and social position. This is a crucial consideration for a clear understanding for policy development and thus service delivery. In the context of climate change, gender analysis provides a benchmark for understanding climate change impacts on different genders. It also highlights existing capacities or lack thereof that men and women have, to deal with climate change.

Gender analysis ensures maximum participation by women and increases benefits from women's skills to society. Gender analysis is applied in this tool to ensure that women and men are consulted equally and are involved in identifying adaptation options and measures to deal with the threats posed by climate change. This analysis will provide information about different impacts of climate change as well as how climate change may challenge the existing division of tasks, responsibilities and resources between men and women in any given community. It also aims to ensure that adaptation measures are put into place that do not further discriminate and disadvantage women in our society.



**Purpose:**

1. To determine the groups most vulnerable (women or men) to climate change impacts and variability
2. To determine who climate change has been and is affecting and whether one group is affected more than another
3. To determine differences in capacity (between men and women) required to deal with the impacts of climate change
4. To ensure that women – and other vulnerable groups – are not further disadvantaged and discriminated against.

**Materials:** This Climate Change Adaptation Toolkit, flip chart paper, marker pens, coloured cards, Prestik.

**Methods:**

1. Select up to ten participants, using gender as one of the criteria in selecting these people (five women and five men) from the group present.
2. Ask the group to draw rough pictures of how they were affected by climate variability and change in the past twenty years or so. They should keep in mind the people (women or men) who were most affected by these events and draw what sort of impacts they experienced. This could be the effects of floods, droughts, loss of stock, failing crops or other impacts on the people in question.
3. Open up the debate for all participants to comment on the drawings.
4. Choose another group of about ten people (equal numbers of women and men).
5. Ask the new group to draw rough pictures about how they perceive climate change is currently affecting them.
6. Ask the group to present their drawings to the general meeting for discussion and comment (if necessary).
7. Once all the drawings are complete and have been discussed, count the number of women and men drawn in the sketches. Keep a note of the separate numbers.
8. Select another group of equal numbers of men and women.
9. Ask this group to draw pictures of skills and resources present in their community. These should directly relate to the impacts mentioned during Steps 2 and 5 of this exercise. Count the skills and resources drawn that reflect women and those that reflect men.
10. Based on the total women and men counted in Step 7 above, determine which group is more vulnerable to climate change impacts. Similarly, based on the skills and resources that women and men have as illustrated in Step 9, determine which gender has more capacity and access to resources than the other.
11. Now check the proposed solutions in the Sun Ray Exercise (Tool 4) and discuss whether they do indeed cater for the needs of women and men, and if there are adaptation activities that specifically address the needs of women.
12. Discard or re-plan proposed adaptation measures that further disadvantage or discriminate against women, or other vulnerable groups.

**Time:** 2 hours



## Tool 6: Developing our community-based CCA strategy and putting it into action

**Addresses CCA planning Step 6; forms basis for planning and implementation of Steps 7 and 8; builds on Root Cause Analysis, Sun Ray Exercise and the Gender Screening Tool**

This tool builds on the results of the previous exercises to arrange their results in a systematic way. The development of a log frame or table of action is central to the exercise. A log frame identifies what and how solutions can be achieved, who is responsible, by when they are to be achieved and what resources will be required.

The far left column lists the key problems identified during the Root Cause Analysis (water scarcity, food insecurity) or the objectives that have arisen from them (responsible water resource management, forest protection). The second column lists the 'options/actions/measures' developed for each of the problems during the Sun Ray Exercise. Across the remaining columns of the table, add 'Responsible person', 'Timeline' and 'Resource required'. An extra column labelled 'Indicators', which will help you monitor the implementation of your strategy can also be added and links to Tool 8.

It is very important to incorporate the findings from the gender sensitivity analysis to ensure that the planned actions do not further marginalise already vulnerable groups. On the contrary, to achieve it is critical to specifically promote and support such vulnerable groups, so it would be beneficial to include specific women and youth empowerment components into community climate change adaptation plans.

Key Problems	Options	Responsible Person	Timeline	Resource
Water shortage	<ul style="list-style-type: none"> <li>• Use sealed water storage tanks</li> <li>• Recharge aquifer</li> <li>• Drill more boreholes</li> </ul>	Jane Bruce Melvin	December January April	Finance Personnel Labour
Contamination of ground water	<ul style="list-style-type: none"> <li>• Monitor water on a regular basis</li> <li>• Recycle water for potable use</li> </ul>	Ndeshi Piet		



**Purpose:** To systematically process the information from the previous exercises and include them in a community Adaptation Strategy (action plan/work plan).

**Materials:** Flip chart paper, markers/pens, and coloured cards or stickers, Prestik, blank log frame table prepared beforehand (see example).

**Methods:**

1. Explain the purpose of the activity to the general meeting; present the blank log frame table and explain how it should be used.
2. Decide on and write the problems/objectives in the far left column and the measures/actions that were identified in the column next to them.
3. Carefully examine the table together and make additions/changes if they seem to be important. Ensure that all options are explored and reflected in the table, as this will form the backbone of the community adaptation plan.
4. Ask participants to form smaller working groups which each select one or two of the problems/objectives to work on.
5. Ask each group to go through their chosen measures/actions and work and agree on what should be written in the remaining columns.
6. Ask each group to present their log frame tables and recommendations to the general meeting. The community needs to discuss the proposals of each presentation and find consensus, as this will be their community adaptation strategy and everybody needs to be comfortable with it.
7. The plan should now be transferred onto A4 paper, if possible on computer, so that copies can be reproduced and made accessible to as many community members as require it. If there is no computer available, try to make photocopies.
8. Now for the important implementation of the strategy and plan. It would be best to appoint a responsible person to follow through the planned actions. The presence of a formal Community Based Organisation would make the task easier, but traditional leadership structures or structures established through e.g. MET, MAWF or MoHSS extension services would also be suitable.
9. Monitoring and Evaluation (see Tool 8) is very important and provision for it should specifically be made in the Adaptation Strategy. Each community meeting should contain a section to discuss progress made on the implementation of the strategy/plan and to re-plan, if needed. Planning and implementation are usually ongoing and 'adaptive' processes. Measures/actions that were unsuccessful, for example, should be discontinued and better solutions found.

**Time:** 4 hours





## Tool 7: Example of an adaptation measure - grey water recycling

***This is the final output of Tools 1, 2, 3, 4, 5, and 6 and is called Community Adaptation Plan (CAP) or Community Adaptation Strategy (CAS). Based on what you (the community) have discussed, you can implement the adaptation strategy you have designed during Tool 6. An example of an adaptation strategy is given within this section.***

Water in semi-arid Namibia is very scarce and there is an urgent need to develop strategies to use available water sources as efficiently as possible. One of the adaptive measures that can be instituted is recycling of grey water. This supplements scarce fresh water sources for use in gardens and crops, thus conserving fresh water. Grey water refers to waste water generated from domestic activities such as laundry, dishwashing and bathing, which can be recycled and re-used if it contains low contaminants.

Grey water is a relatively stable water source that has uses in agriculture, industry, recreation, gardening and recharge of groundwater. It can replace saline water, which if used in agriculture, results in low yields and salt accumulation in the soil – especially in the coastal areas.



### **Why grey water re-use?**

Re-using grey water serves two purposes: it reduces the amount of fresh water needed to supply a household, and reduces the amount of waste water.

### **How to use grey water**

- Use biodegradable soap, the ingredients of which are less harmful to the environment, and limit the use of detergents.
- Use grey water only on well-established plants, not seedlings or young plants.

- Use a cleaning tank to eliminate floating and sinking items when bathing or washing clothes.
- If grey water is dispersed over a large area e.g. lawns, rotate with fresh water to avoid a build up of contamination.
- When re-using laundry water for irrigation, do not use liquid fabric softener or strong detergents.

### **Benefits of grey water recycling for irrigation**

- Reduces fresh water use – especially for domestic water supply
- Groundwater recharge – grey water recycling for irrigation replenishes groundwater, helping the natural hydrological cycle to keep functioning
- Plant growth – grey water can support plant growth in areas that might normally be too dry
- Maintains soil fertility – the nutrients in the grey water are broken down by bacteria in the soil and made available to plants
- Enhance water quality – the quality of groundwater and surface water are much better preserved by the natural purification processes which grey water undergoes in the top layers of the soil.

### **Precautions for using grey water**

A few points to consider with regard to health and environmental risks associated with grey water:

- Recycled grey water is never safe for human and animal consumption.
- Apply grey water only to flat areas where run-off is not likely to occur.
- If it contains high level of contaminants such as powdered and liquid detergents, grey water re-use presents health and environmental pollution risks.
- If using on gardens, do not over irrigate and do not use on food crops that are eaten raw.
- Grey water should not be used if it has been left standing for too long.
- Remember to wash your hands after gardening or any contact with grey water.
- Keep children away from garden areas irrigated with grey water.

### **Reducing water use and water conservation**

Recycling allows for a reduction in fresh water demand, thus reducing water bills and saving energy. It is also important to conserve the existing water sources.

- Use a dam cover to cut down on evaporation.
- Ensure no taps are dripping or not closed after use.
- Check all pipes and water storage for leakage and get them fixed.
- Use shade netting over gardens to protect from strong sunlight and wind.
- Place animal troughs further away from water sources to prevent contamination.
- Develop borehole/water point management plans and establish water point committees to discuss and plan water use as well as maintenance.



## Tool 8: Example of participatory monitoring and evaluating

***Further develops CCA planning Step 6 and builds on Step 7; it forms the basis for adaptive management of the interventions that have been implemented and the improvement of the innovations; it leads to the reiterative planning –implementing – monitoring and evaluation (M&E) process.***

This monitoring and evaluation activity tool checks that all activities included in the action plan are actually being implemented and followed up on successfully. It also ‘tracks’ and assesses whether the actions and innovations that have been implemented have the desired effects and truly help build adaptive capacity and climate change resilience. ‘Maladaptive’ practices, would lead to more vulnerability and the practices that generally perform poorly under the climatic conditions will be identified, reviewed or discontinued.

After the ‘resources required’ column of the action plan in the log frame, an indicator of progress or success for each planned activity and/or innovation was included. Progress towards the indicator can be assessed through research by the community or farmers. Community learning can thus be facilitated – and a systematic follow-up on the action plan can be set in place.

The gender sensitivity tool should remain an underlying concept in this participatory M&E exercise so that any negative impacts of the adaptation interventions observed on already vulnerable groups such as women, youth and the elderly can be reported and rectified. Frequent update meetings and events are needed for formal reviews of progress. Actions that do not bear the intended results should be replaced by new interventions.



**Purpose:** To systematically track and assess (i) progress towards the action plan, and (ii) the performance of the adaptation action/innovations that were implemented for their adaptation value. Periodic replanning of the action plan should take place, based on participatory farmers learning and assessment.

**Materials:** (i) Flip chart paper, markers/pens, and coloured cards or stickers, Prestik, blank log frame table prepared beforehand (during planning and formal plan assessment process, linked to Tool 6). (ii) Potentially, specific research tools and materials to initiate farmers' action research on the performance of adaptive innovations.

**Methods:**

**(i) Progress assessment on action plan**

1. Explain the purpose of the activity; present the action plan previously developed.
2. Look at the indicators of each planned measures/actions one-by-one, and ask community members to provide their information on the performance of the indicators (preferably based on real data/tracking information).
3. Carefully examine the table and review poorly implemented activities. Identify the causes for the poor performance (e.g. action not followed through on, or adaptation measures that do not generate the intended adaptation benefits) and make recommendations for additions/changes to the plan.

**(ii) Performance of the implemented adaptation action/innovation**

1. Identify a relevant indicator during the plan of action development.
2. Develop a few basic steps for how best to monitor and track the performance of the adaptation action/innovation (e.g. develop example in line with Tool 7).
3. Identify responsible community members to follow through on monitoring activities.
4. At community meetings share progress and if available, demonstrate tracking data.
5. Make recommendations towards improvement, continuation or discontinuation of interventions and integrate relevant steps into iterative planning of plan of action.
6. Share lessons learnt with other communities and practitioners; also try to solicit outside advice.
7. Monitoring and evaluation is very important and provision for it should specifically be made in the adaptation strategy. At each community meeting you may wish to discuss progress made on the implementation of the strategy/plan and re-plan, if needed. Planning and implementation are usually ongoing and 'adaptive' processes. Measures/actions that were unsuccessful, for example, should be discontinued and better solutions found.

**Time:** 1 hour during planning; ongoing throughout adaptive measure implementation.

# My checklist

CHECK LIST	
TOOL 1	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
TOOL 2	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
TOOL 3	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
TOOL 4	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
TOOL 5	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
TOOL 6	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
TOOL 7	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
TOOL 8	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>



## Useful contacts

### MINISTRY OF ENVIRONMENT AND TOURISM (MET)

**MET Head Office**

P/Bag 13346, Windhoek  
Tel: (061) 284 2111  
Fax: (061) 229 936

**Hardap Regional Office**

P/Bag 2116, Mariental  
Tel: (063) 240 361  
Fax: (063) 242 643

### MINISTRY OF AGRICULTURE, WATER AND FORESTRY (MAWF)

**MAWF Head Office**

P/Bag 13352, Windhoek  
Tel: (061) 208 7111  
Fax: (061) 229 961

**Mariental Forestry Office**

P/Bag 659, Mariental  
Tel: (063) 242 613  
Fax: (063) 240 885

**Office of Rural Water Supply**

P/Bag 13193, Windhoek  
Tel: (061) 208 7555  
Fax: (061) 208 7774

**Walvis Bay Forestry Office**

P. O. Box 94, Walvis Bay  
Tel: (064) 203 350  
Fax: (064) 200 809

**Office of Veterinary Services, (Hardap)**

P.O. Box 28, Mariental  
Tel: (063) 242 171  
Fax: (063) 242 576

**State Veterinary Office, Karasburg**

P.O. Box 112, Karasburg  
Tel: (063) 270 109  
Fax: (063) 270 342

### MINISTRY OF REGIONAL AND LOCAL GOVERNMENT AND HOUSING AND RURAL DEVELOPMENT (MRLGHRD)

**Erongo Regional Council**

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### MINISTRY OF HEALTH AND SOCIAL SERVICES (MoHSS)

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### MINISTRY OF FISHERIES AND MARINE RESOURCES (MFMR)

**MFMR Head Office**

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## OTHER IMPORTANT CONTACTS

### United Nations Development Programme (UNDP)

P/Bag 13329, Windhoek

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### Integrated Environmental Consultants Namibia (IECN)

P.O. Box 86634, Eros, Windhoek

Tel: (061) 249 204

Fax: (061) 249 205

### Small Grants Programme (SGP)

P. O. Box 245, Windhoek

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