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 the Ohangwena, Oshana and Oshikoto regions, Namibia

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The development of this toolkit involved a large number of consultations and reviews. Farmers and representatives of selected constituencies in each region of Namibia participated in the identification of key climate change related issues for the regions. For Ohangwena Region consultations took place in Eenhana Constituency. In Oshana Region consultations took place in Oshakati West, and in Oshikoto Region, constituency meetings were conducted in Olukonda and Omuthiya. All participants are thanked for their efforts and contributions.

Contents

Why is climate change an important issue for farmers and natural resource users in the Ohangwena, Oshana and Oshikoto regions?

The majority of people living in Ohangwena, Oshana and Oshikoto regions depend on small-scale farming, either with livestock or crops or both, for their daily livelihoods. All these natural resource-based livelihoods are vulnerable to climate change to some extent. People have already observed the ongoing natural variability and that there are changes in patterns of the growing seasons, and the last few years have been marked by extreme weather conditions. It is clear that climate change will have profound impacts on our lives in the near future. Although it is not possible to predict what effect future climate will have, it is clear that farmers and resource users need the tools to be able to manage associated extreme situations and risks.

Although our climate in Namibia, including in Ohangwena, Oshana and Oshikoto regions, is variable with dry periods and droughts commonly experienced (see more information in Section 1), conditions for agriculture 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. As a result, there is a great need to be more flexible and strategic about what to plant and when, and to practise more adaptive livestock management because of fluctuations in grazing availability. Alternative land uses may need to be explored and promoted to build resilience.

Frequent flooding has been a major challenge in the past and still is presently. The associated impacts go beyond farming – children couldn't attend school, houses and belongings were destroyed, business income was cut for months at a time and many people had to move to emergency camps, which created further challenges. Severe health risks from water-borne diseases and increased malaria were a reality, but were worsened by inaccessibility to health facilities.

However, in addition to the danger of floods, 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 Omusati Region in 2008, and which has been tested and applied since then throughout Namibia – particularly in the north. 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 toolkits are available in this series – beyond the initial *Natse Otweya* – at this stage:

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

Omusati already has its *Natse Otweya!* but people living in Omusati Region could also learn from other regional toolkits as the information contained therein is relevant to this region as well.

Others may be developed if, where and when needed.

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.

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, the youth or the elderly.

This is the first comprehensive and dedicated resource for farmers, natural resource users and their service providers in the Ohangwena, Oshana and Oshikoto regions to learn about what climate change is, what the expected impacts are for Namibia and these northern regions in particular, and more importantly, it provides some preliminary ideas on options for adaptation 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. The toolkit includes pictures that illustrate 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 specific organisations such as MAWF, MET, UNDP or MoHSS.

The plans should address practical adaptation interventions such as the installation of water harvesting technologies and domestic solar power, planting of fruit trees and the development of agro-forestry approaches to supplement or even replace traditional cropping methods. Financing options for the interventions identified should also be discussed.

At the end of the booklet there are some important contact details. 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.

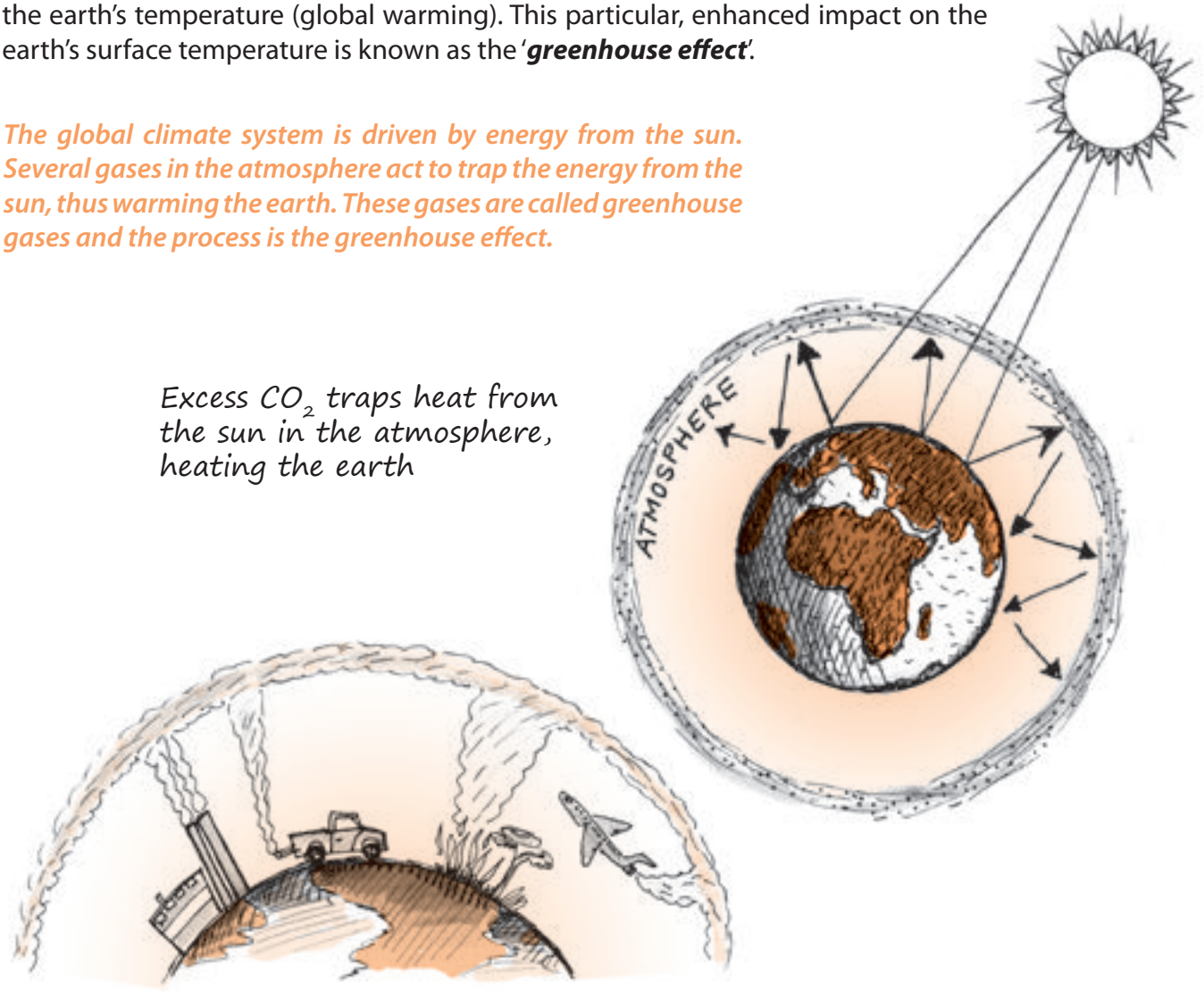
1. Introduction to climate change

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.

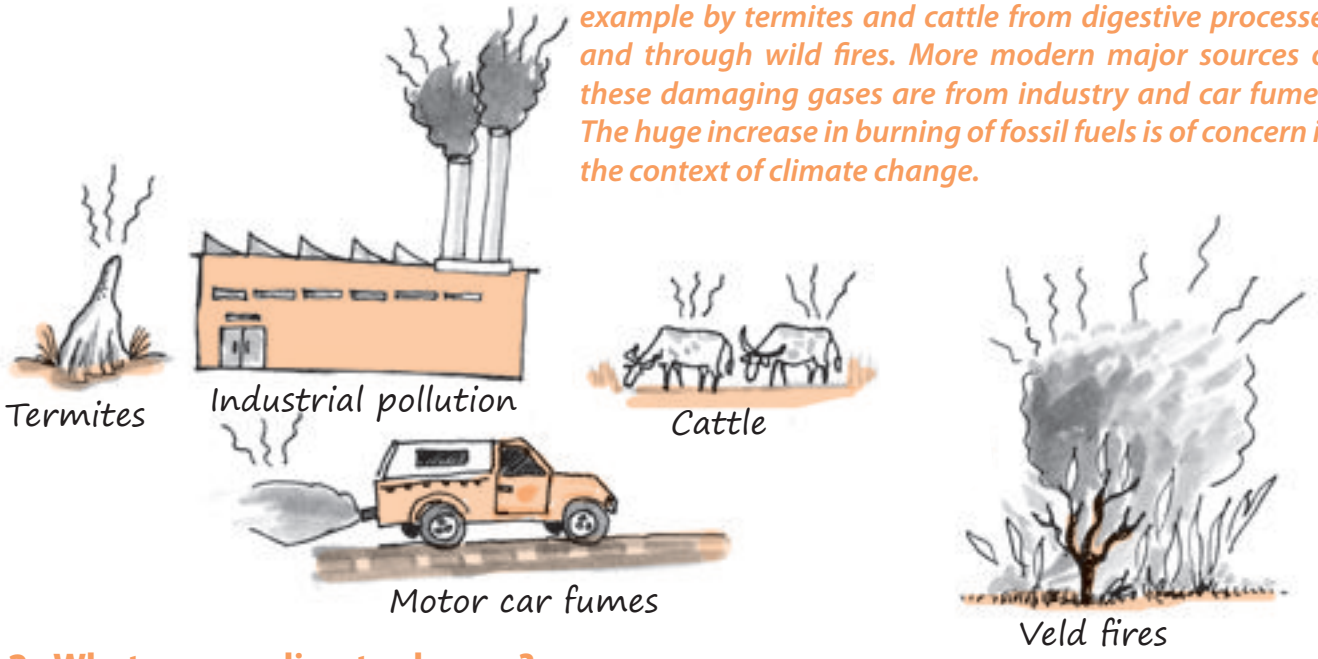


Weather refers to the day to day state of the atmosphere at a given time and place. Weather is described in terms of variable conditions such as temperature, humidity, wind velocity and precipitation.

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.

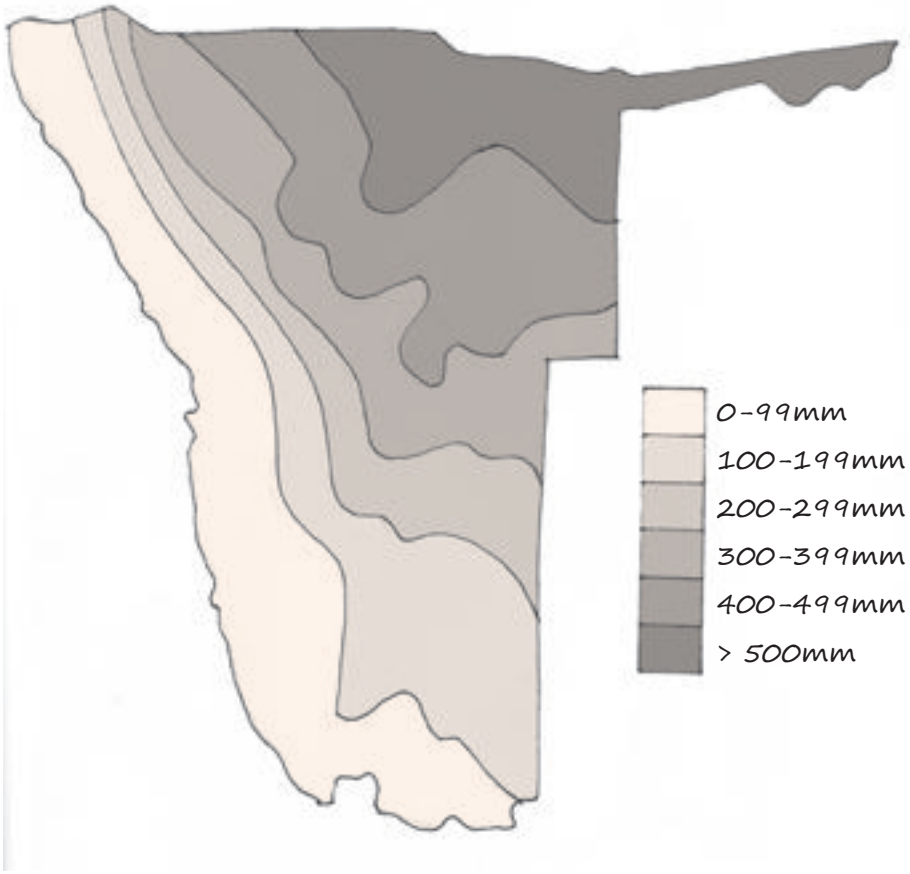
Sequestration refers to the absorption of greenhouse gases from the atmosphere by trees or leafy vegetation. Re- or afforestation can aid this absorption.

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

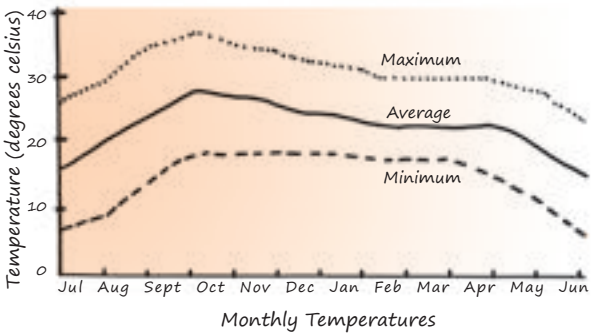
Namibia is the most arid country in sub-Saharan Africa. The weather in Namibia is hot for most of the year, and overall rainfall is low. Not only is rain very limited but also extremely variable from year to year and from place to place. This is called '***temporal***' and '***spatial***' variability. 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.



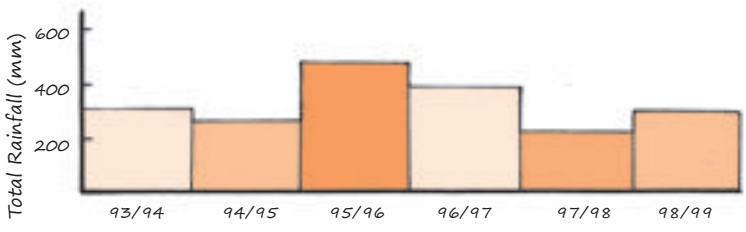
Namibia is the most arid country in sub-Saharan Africa with a naturally highly variable climate. Droughts are frequent, and below average rainfall is common. Mean annual rainfall ranges between 480–600 mm in Ohangwena Region, 350–550 mm in Oshikoto Region and much lower, with 400–500 mm in Oshana Region. Temperatures naturally vary with the seasons, and range between a maximum average of below 20°C in winter to over 35°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 abnormally low rainfall.



Monthly Temperatures

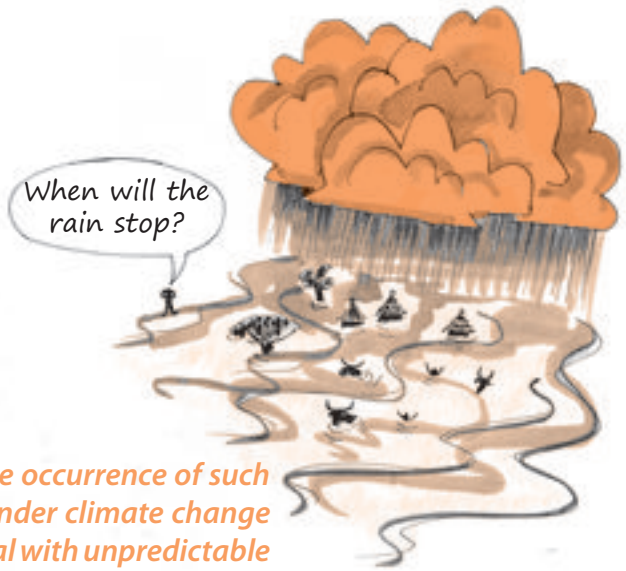


Seasonal Rainfall

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 1982–1987 and 1992–93 in southern Africa), rainfall is so low that crops fail and livestock die. In recent years (between 2007 and 2010), severe flooding occurred in northern Namibia including in Ohangwena and

Oshana and parts of Oshikoto regions. This had similar detrimental effects for livestock because of lack of grazing in flooded areas and the occurrence of water-borne diseases. Other problems related to the destruction of houses and huts that were built near the rivers and on the floodplains, and to roads and other infrastructure. Some people lost their livelihoods and daily life was disrupted for a long time. It is important to prepare for these situations to avoid such damage and disruption.

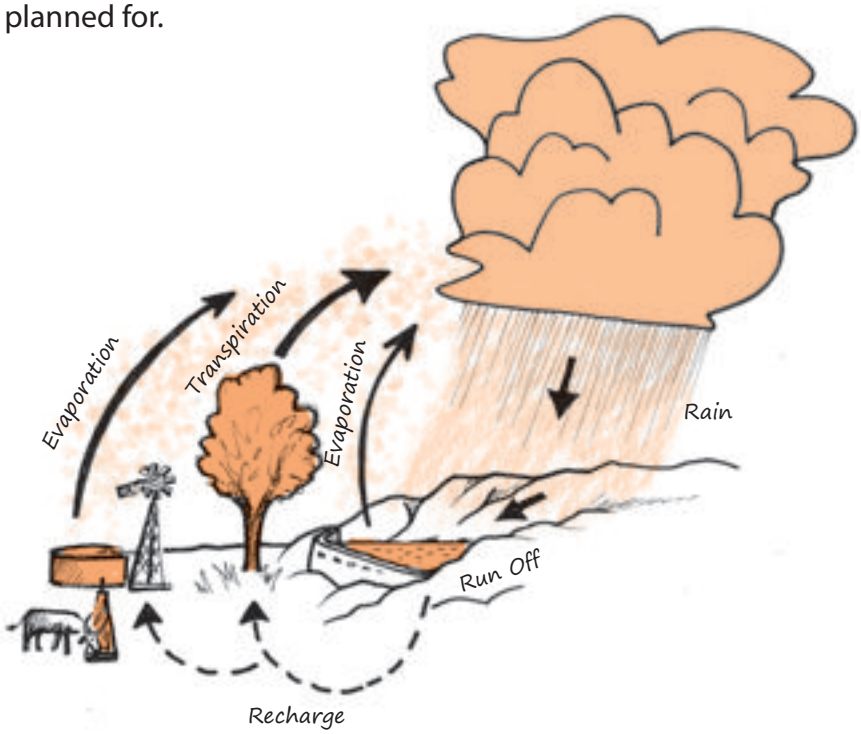
It should be noted that the available climate change projections for the coming 50 to 100 years indicate serious changes in rainfall and water availability throughout the country.



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.

- 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

Ohangwena Region is situated on a flat plain and extends east to west along the Angolan border. In the west, the ephemeral wetlands of the Oshanas support an open landscape with palm and marula trees, while the eastern parts comprise woodlands. The region has no permanent rivers. Annual rainfall ranges from 480 mm in the west to 600 mm in the east. The rainfall normally starts from the end of October and ends early in April. The distribution is erratic. Temperatures in north-central Namibia are only recorded for Ondangwa on a longer-term basis. Average winter temperatures are just below 20°C and summer temperatures around 28°C. Maximum temperatures reach around 35°C in summer and recorded average lows are around 8°C in winter.

It has by far the highest population density in Namibia at 21.3 people per km^2 (the country average is 2.1). Ninety-nine percent of the population lives in rural areas, and depends almost exclusively on rain-fed subsistence farming. Rainfall in the Ohangwena Region supports dry land cropping, especially of pearl millet (mahangu) in western parts of the region, and grazing of livestock extending into the eastern woodlands. Use of non-timber forest products supplements farming.

Oshana Region is the smallest of Namibia's thirteen regions. Its southern section consists of an area bordering part of the Etosha National Park. The generally high salinity of soil and water renders this area largely unsuitable for grazing or cultivation, and it is thus sparsely populated. The northern part of Oshana Region is much more densely populated and includes the large, sprawling urban centres of Oshakati – the regional capital, Ongwediva and Ondangwa. Characterised by the oshana flood plains of the Cuvelai drainage, annual flooding is normal. The average annual rainfall is 400 mm to 500 mm, falling largely during the rainy season between November and March. Summers are usually hot, with average day temperatures above 33°C. Average night temperatures in winter can be as low as 6°C.

The region is densely populated with 18.7 people per km^2. However, a good portion of the population lives in urban areas. Although subsistence farming is common in the rural areas, low soil fertility and high levels of soil and water salinity make these areas poor for agricultural production. However, the oshanas do offer fishing opportunities. There are few woodlands in the region.

Oshikoto Region is characterised by extensive woodland areas. The region is 'divided' by two different land tenure regimes. The southern part of the region consists of large-scale farming areas under freehold title, while the north-western parts remain under communal land tenure (currently land titled for small land parcels is being granted by the Ministry of Lands and Resettlement in this area as part of a national land reform drive). Rainfall increases from an annual average of 350 mm in the south-west to 550 mm in the north-east. Usually most of the rain falls between November and April with a peak in February. Temperatures are similar to those reported for Ohangwena and Oshikoto

regions, with slightly less pronounced extremes in the southern parts. Livestock production is the most common land use in Oshikoto Region. However, some freehold farms use irrigation and produce citrus trees in areas where good quality groundwater is available. An estimated 70 percent of Oshikoto Region has less than one person per km^2, partially due to insufficient permanent water.

1.5 Climate change projections for Ohangwena, Oshana and Oshikoto regions

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

For northern Namibia, besides temperature changes, rainfall changes are predicted as increased length of the dry season, a decrease in the number of consecutive wet days, and an overall delayed start and earlier cessation of the rainy season. There has been a general tendency towards smaller rainfall totals in the north, although future projections suggest an increase of summer rainfall across much of the country, with high intensities over a shorter time period.

The observed changes in temperature extremes, the length of the dry season and rainfall intensity not only underscore that the climate in Namibia will tend to become drier, but also that climate variability remains a significant phenomenon of long-term climate trends.

What does this mean to people in Ohangwena, Oshana and Oshikoto regions?

1.6 Expected climate change risks and how they will affect Ohangwena, Oshana and Oshikoto regions

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

Scientists expect that extreme weather events such as floods and droughts will become more common. Under such conditions it is difficult to make decisions about 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 sowing time, making it difficult to decide on when to prepare fields.

Climate change risk is the actual change in climate that is 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.

Most resource users in Ohangwena, Oshana and Oshikoto regions rely on small-scale agriculture, or other natural resource-based production systems for their livelihoods, which makes them highly vulnerable to climate change. This is exacerbated by poor infrastructure, poor soil potential, lack of access to markets, poverty and thus fewer options for adaptation, high rates of HIV/Aids and other health constraints. 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, or when businesses are flooded.

Other natural resources such as fish, wild fruits, herbs and medicinal plants, wildlife, and forest-based products and 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.

Here are a few examples of expected climate change impacts specifically highlighted during the consultations in Ohangwena, Oshana and Oshikoto regions organised by sector 'themes'.

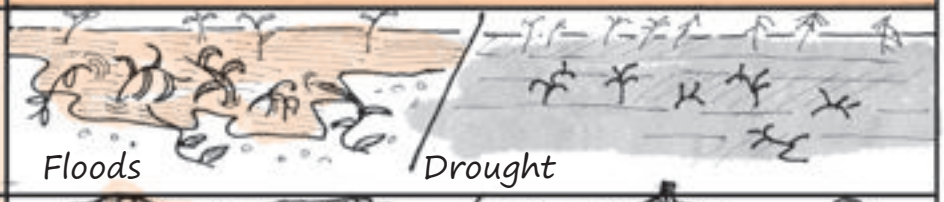
a. Crop farming

Crop production is mainly relevant in western Ohangwena and northern Oshana regions where rainfall, soil quality and water availability allow for production of dryland crops such as mahangu. In these areas fruit crops such as marula are also common. Increased temperatures and changing rainfall patterns, such as the late onset of the rainy season and higher rainfall during the shorter season, may adversely affect crop production. During the consultations, community members from these areas reported inundation of fields and poor performance of crops as a result of too much rain, often leading to mould and other damage. However, it is mostly the lack of rainfall and persistent drought that has devastating effects – leading to complete harvest failures.

b. *Pests*

Pests can cause damage under each extreme climatic scenario. Outbreaks of army worms, crickets and locust plagues are often linked to extreme weather, and birds raiding fields are described as major pests during these events. It is difficult to determine exactly why a pest outbreak occurs, but extreme climatic conditions seem to induce more frequent and severe pest outbreaks.

Stored crops and seeds for the following planting season may be adversely affected or even destroyed by pests as a result of adverse climatic conditions. Diseases such as mould may also have a detrimental effect on grains.

Sector Themes	Expected Climate Change Impacts
Crop farming	
Pests	
Livestock farming and animal health	
Water resources	
Fisheries	
Forest resources, wildlife and biodiversity	
Public health	
Infrastructure and public services	

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

c. *Livestock farming and animal health*

Although livestock, including cattle, goats and sheep are kept throughout all three regions, subsistence farmers in eastern Ohangwena, Oshikoto and southern Oshana regions specifically depend on livestock, as crop production is poor in these areas. Hotter and drier climates may have a negative impact on the productivity of specific livestock breeds and yields may be poor. Certain livestock species may not be able to cope with higher temperatures or could produce less meat and milk and have poor reproduction rates. On the other hand, increased rainfall could lead to improved pastures and an improved fodder situation.

Animal health may be affected by disease. A number of animal diseases were observed in the last rainy seasons, caused by extended and heavier rains and floods. Problems such as rotten hooves, heavier infestations of mosquitoes that are said to kill goats, tsetse flies and other pests were observed in northern Namibia, including Ohangwena, Omusati and Oshana regions.

d. *Water resources*

Groundwater quality in many areas in Oshana and western Oshikoto regions is poor and unfit for consumption by humans and in some cases even livestock, with very high levels of salinity. The expected climatic changes may aggravate this situation, with higher evaporation rates leading to increased salinity. Run-off from the oshanas will produce seasonal water resources, which may increase or decrease depending on rainfall in southern Angola. In eastern Ohangwena Region there is groundwater, but this is often only accessible from deeper than 60 m. Water is recharged from southern Angola and is considered to be of quite good quality – not sharing the problem of salinity with other areas in northern Namibia. Eastern and southern Oshikoto Region contains some hilly landscapes and water supply in the region is mainly accessed through deep boreholes. How aquifer recharge will be affected by the climatic changes is not yet fully understood, but Africa-wide studies indicate that southern Africa will be mainly affected by increased water scarcity.

e. *Fisheries*

Large parts of northern Oshana and the western areas of Ohangwena regions are situated within the Cuvelai Basin (oshanas) and benefit from seasonal floods, bringing with them fish and frogs, which are harvested during the rainy season. These resources can make significant contributions to food supplies and nutrition as well as household income. There is not much information available about how climate change could affect fish stocks in the long term, but water temperatures, silt, oxygen and biomass content are all ecosystem components that are vulnerable to climatic changes. Species as well as numbers of animals may be affected in the future. On a positive note, increased fish stocks may be available to people in the flood plains during the rainy season.

f. *Forest resources, wildlife and biodiversity*

Especially eastern Ohangwena and a part of Oshikoto contain large-scale forest areas or so-called Kalahari woodlands. These are considered to be in a healthy condition with limited deforestation. They are important for maintaining healthy grazing, to provide non-forest natural products and alternative foods and livelihood opportunities for the people living in this area. Presently, one community forest and one conservancy in eastern Ohangwena Region at Okongo support good governance of the forest and wildlife resources in the area. Oshikoto Region embraces most of Etosha National Park and contains conservancies such as the King Nehale Conservancy, which directly benefits from tourism and wildlife resources associated with the park. Omusati Region houses several conservancies, but Oshana, Oshikoto and Ohangwena have limited proclaimed conservancies in place.

The use of wild fruits and plants as food, e.g. wild spinach (omboga – from which ekaka is made), wild berries (eembe) and marula is especially important during the dry season and during droughts. Additionally, numerous wild plants are used as traditional medicines. During climate change, the distribution of wild plants for both food and medicines may be affected and their occurrence in

specific areas and their ability to reproduce and grow there may not be guaranteed. The value we place on these products may be seriously affected and we need to investigate alternative products for their potential value.

On the other hand, different important wild species may become more abundant in the same area, although this potential change of distribution is not very well understood at present.

g. Public health

The impact of climate change on public health is a major concern of many of the people consulted in Ohangwena and Oshana regions, as well as in parts of Oshikoto Region. People who live closer to the oshanas are very concerned about the threat of water-borne diseases such as cholera and an overall increase of malaria during extreme flooding, particularly in highly populated areas and the big towns such as Oshakati, Ongwediva and Ondangwa, where transmission rates are high.

An additional concern is that during times of extreme flooding it is difficult for people to reach clinics and health services in rural areas. Some health facilities were reported to having been inundated during recent floods.

h. Infrastructure and public services

Impacts on infrastructure are generally caused by flooding and heavy rainfall, although increased temperatures may also have an effect. Over the past years the extreme floods in the oshanas has led to homes as well as public infrastructure such as schools and clinics being damaged. In the large towns such as Oshakati, Ongwediva and Ondangwa many houses in informal settlements and peri-urban areas were badly affected by the floods.

Many roads, especially gravel roads, were washed away and individuals and villages were cut off from the outside world for prolonged periods. Schools were closed and learners missed classes, hindering their performance in school exams.

There are a number of other sectors and sector themes that are very important in Ohangwena, Oshana and Oshikoto regions. 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 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 storage of grains (pearl millet or sorghum) in granaries for future use, especially during difficult periods, as well as actively moving livestock to cattle posts or 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 that address some of the key challenges
7. Implementation of strategy and priority adaptation measures
8. Monitoring and evaluation of implementation to test success.

2.4 Some adaptation options relevant to Ohangwena, Oshana and Oshikoto regions

This section provides examples of **adaptation options** concentrating on farming, agriculture and various natural resource uses, but is also applicable to other themes. Many other options may be available and need to be explored. This information toolkit only provides 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 a constituency level. The steps provided above may be helpful in developing such a strategy.

Land-use planning and promotion of climate-compatible land use and associated production systems: land-use options that are better adapted to the prevailing variable and dry sub-humid climates of northern Namibia should be promoted. A shift from rain-fed and even irrigated small-scale crop production or livestock production to wildlife-based production systems is an example that might be useful in the Ohangwena, Oshana and Oshikoto regions, as demonstrated by the creation of conservancies.

Conservation-agriculture and more diversified rural land-use systems, such as promoting agro-silvo-pastoral uses may provide practical coping mechanisms. Formal and collective land-use planning can help farmers manage resources better and reduce their vulnerability to climate change.

Improved crops, food security and nutrition: given the projected future climate scenarios, it is unlikely that Namibia will ever be fully food self-sufficient. Some areas, such as eastern Ohangwena, southern Oshana and most of Oshikoto are not suitable for crop production, and crop production in western Ohangwena and northern Oshana may become more difficult in future, especially with more variable and extreme climatic conditions. Farmers need to be flexible and able to adapt crops from season to season. Therefore, access to reliable weather and early warning information systems is important to allow timeous planting of the most suitable seeds for the specific seasons.

Pest and crop disease management are critical, as with extreme weather events pest and disease outbreaks usually worsen. For example, after recent floods in northern Namibia, an outbreak of army worm occurred and many crops went to waste. Adaptation can occur through investment into integrated pest management and improved veterinary services and care.

Additionally, promoting vegetable gardens for improved household nutrition can be a powerful strategy. Green leafy vegetables and fruit are important for healthy diets and contribute essential minerals and vitamins to a largely meat-based diet.

Water management: water conservation is a top priority of adaptation actions in regions where water is already a scarce resource. Appropriate water harvesting initiatives and storage capacities could be developed to take advantage of occurrences such as the large rainfall run-off from flood events and could potentially be used during lower rainfall seasons. Applying conservation tillage methods can help improve soil water content as well as soil nutrient status, in particular.

Integrated silvo-pastoral systems: in western Ohangwena and northern Oshana, fruit trees are interspersed on cropland and should be conserved in woodlands in other areas as well, as these natural resource products can provide additional or alternative food. This is especially important during times of drought. This strategy also promotes environmental sustainability. Investing in planting and rearing fruit trees is a very strategic adaptive measure and could potentially be extended into the eastern woodlands.

Flexible grazing areas: seasonal movement of livestock is generally advocated as an appropriate range management tool in dryland areas – but also applies to areas where seasonal flooding is common. Grazing areas in eastern Ohangwena, southern Oshana and much of Oshikoto Region are usually still considered to be in good condition. Devising well-planned, integrated animal husbandry and management systems throughout the regions will provide useful opportunities for climate adaptive grazing management. It is clear that the regions experience grazing shortages during periods of too much rain as well as during drought. It is important that the existing land be sustainably managed and rehabilitated to ensure that increasing livestock numbers of both small and large stock can be maintained. Groundwater availability for providing stock with drinking water is of particular importance.

During consultations, some farmers mentioned that they cut trees to feed their animals in years of need – this practice can lead to severe negative impacts on the natural vegetation and needs to be very carefully managed.

Prevention of land degradation and investing in rehabilitation: land degradation is a major problem in most of Namibia's regions, and is particularly pertinent in highly populated northern Oshana, western Ohangwena and along the main road in Oshikoto. Land degradation seriously undermines adaptive capacities. Any investment in sustainable land management (SLM) and rehabilitation of degraded areas will also have climate change adaptation benefits.

***Using appropriate livestock breeds and investing in animal health*:** different livestock types and breeds have different adaptive capacities. Farmers can select breeds that are better adapted to prevailing climatic conditions, i.e. warmer and drier climates or more humid situations. New breeds may be better adapted to increased temperatures (a crossbreed between Sanga and Brahman is currently being tested), or traditional breeds could be improved to yield better production levels. It is also important to investigate breeds that are more resistant to newly occurring animal diseases. Healthy animals perform better and thus focussed investment in animal health will be an advantage.

Setting up community-forestry areas or conservancies: in eastern Ohangwena a community forestry area as well as a conservancy have already been establishing at Okongo, and in Oshikoto the King Nehale Conservancy bordering the Etosha National Park is operational. These alternative land uses or land management forms potentially generate income and raise the value of non-timber forestry and biodiversity products and the sustainable use of wood as well as grazing. Some wildlife species, for example, can thrive in drier and hotter climates and may change their usual distribution ranges naturally with changing rainfall patterns. They are generally better adapted to the highly variable local conditions than livestock, and can be utilised commercially – as tourist attractions, meat sources and for commercial hunting.

Managing veld fires: the woodlands of eastern Ohangwena and much of Oshikoto regions are already prone to veld fires and drier and hotter climates may lead to increased fire occurrence and threats. Methods to prevent fires and improve management of wildfires when they do occur, can be highly effective and need to be investigated and invested in through strong community organisations such as community forests or conservancies.

Settlements and land uses outside of flood-prone areas: western Ohangwena and northern Oshana regions are particularly densely populated and some of Namibia's largest urban settlements, such as Oshakati, Ongwediva and Ondangwa are situated in flood-prone areas. Although it is common knowledge that the oshanas periodically fill up with flood waters from the catchment in Angola, people often expand activities and even settlements into these flood-prone areas. This makes people and their

belongings very vulnerable. Although there is increasing land pressure, partially due to an increasing population, alternative options need to be sought. If extreme rainfall events increase, run-off may also be more severe in the future with traditional flood lines shifting. Where people can safely settle today they may be at risk of flooding in a few years.

It is important to develop sound climate resilient settlement plans that can be enforced and adhered to. Even though population pressure is recognised as placing limitations on available settlement space in the urban and peri-urban hub areas, it is critical to find viable long-term solutions.

Flood resilient buildings: in flood-prone areas it may be necessary to re-think the way houses are constructed. For example, in southern Benin and in areas in Asia, people who live in flood-prone areas build houses on stilts, and move around in boats during the rainy season. Other ways of protecting houses from flooding would be to continue building on higher land areas, where available, and to build protective walls and stone dykes around houses. Important public infrastructure such as clinics and schools should undergo detailed flood safety checks and appropriate improvements should be made with community involvement. New buildings should undergo a 'climate risk' check, and be situated in appropriate areas with relevant building precautions.

At this point there are proposals to build flood protection infrastructure around existing urban and peri-urban areas around Oshakati and Ongwediva. This may be a solution, but may also be prohibitively expensive. Environmental side-effects such as off-site impacts of diverted flood water must be adequately considered to avoid problems elsewhere. Such diversion could potentially be converted into real benefits in terms of large-scale fresh water storage, for example.

Personal health actions: there are a number of things that can be done for increased personal health. To guard against malaria, for example, it is important to be responsible about using mosquito nets and also invest in covering windows and doors with netting. Critical medication should be stored at home, to ensure that even in flood situations, when access to the nearest health facility may be cut off, sufficient supplies are available. Ablution facilities should be established and utilised. They must be built in such a way that they do not pose a health risk under flood conditions, increasing the potential of diseases such as cholera.

Relevant immunisations could be facilitated. For instance a cholera vaccination is available and could be more broadly implemented in risk areas.

At the other extreme, vulnerable people, the elderly, children, pregnant women and breastfeeding mothers can be seriously affected by difficult climatic conditions in times of drought, such as heat, dehydration and an overall food and nutrition shortage.

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 crops to plant. 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 Ohangwena, Oshana and Oshikoto 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 action 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.

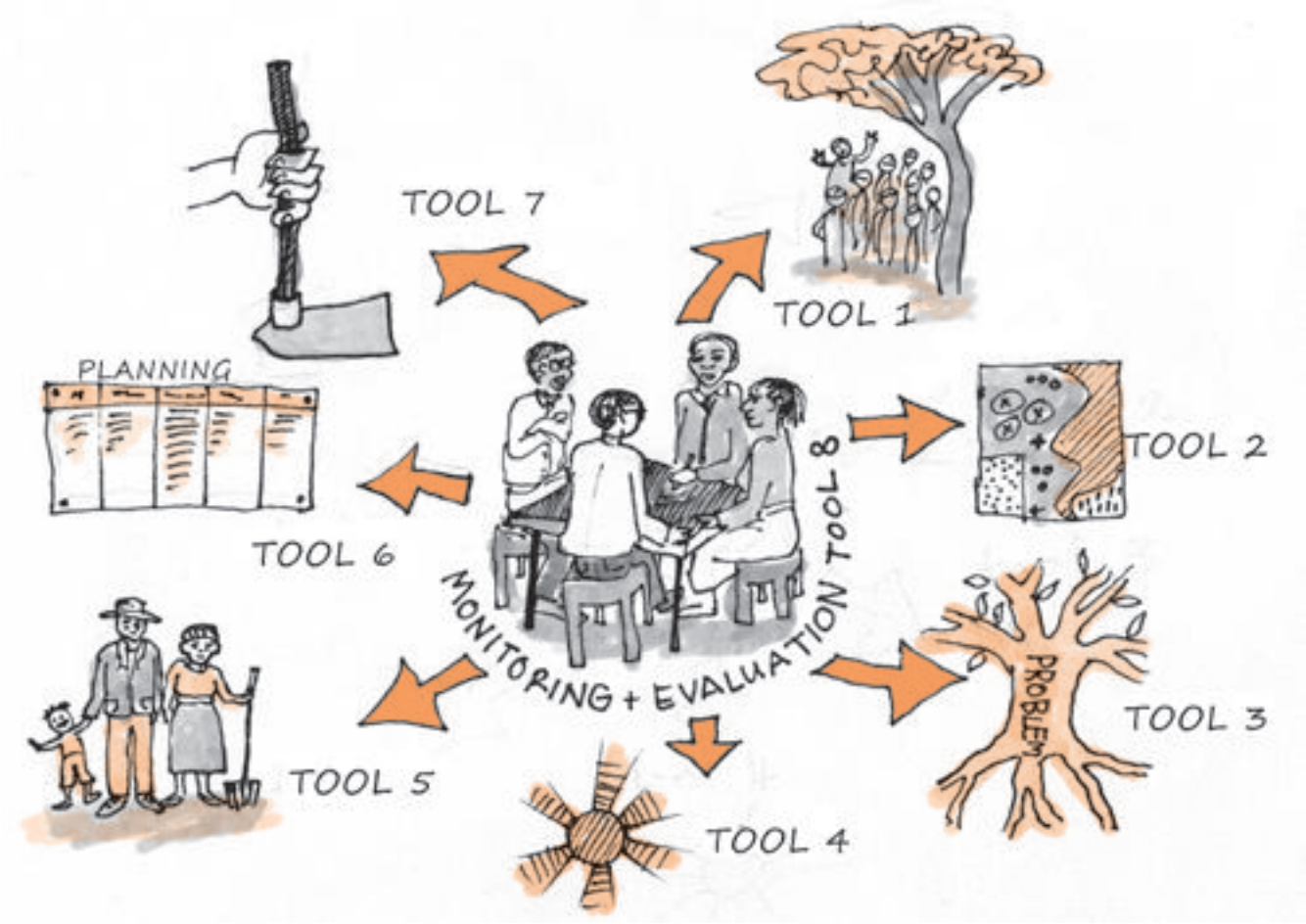
Step by step application of tools – how to!

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 were to 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 in 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 Ohangwena, Oshana and Oshikoto 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 CCA Project Management Units at MAWF regional offices, or 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

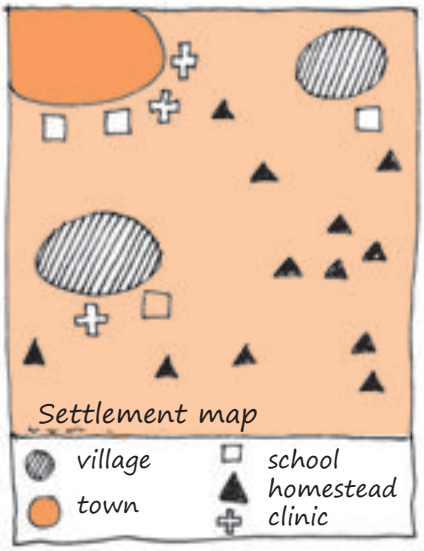
Addresses CCA planning Steps 1, 2, 3; forms basis for planning Steps 4, 5 and 6

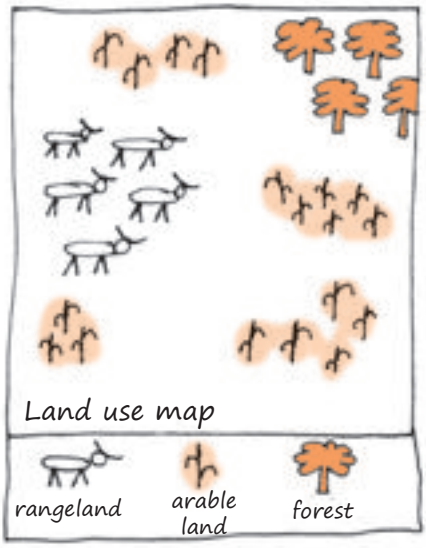
After a general discussion on climate and climate change, the focus should move to the context of the environment, farming and resource use and management practices of the community. This leads to identifying environmental challenges (frequent droughts, pests) and changes that need to be managed and 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 flood plains.

Time: 2 hours

2. Seasonal calendars

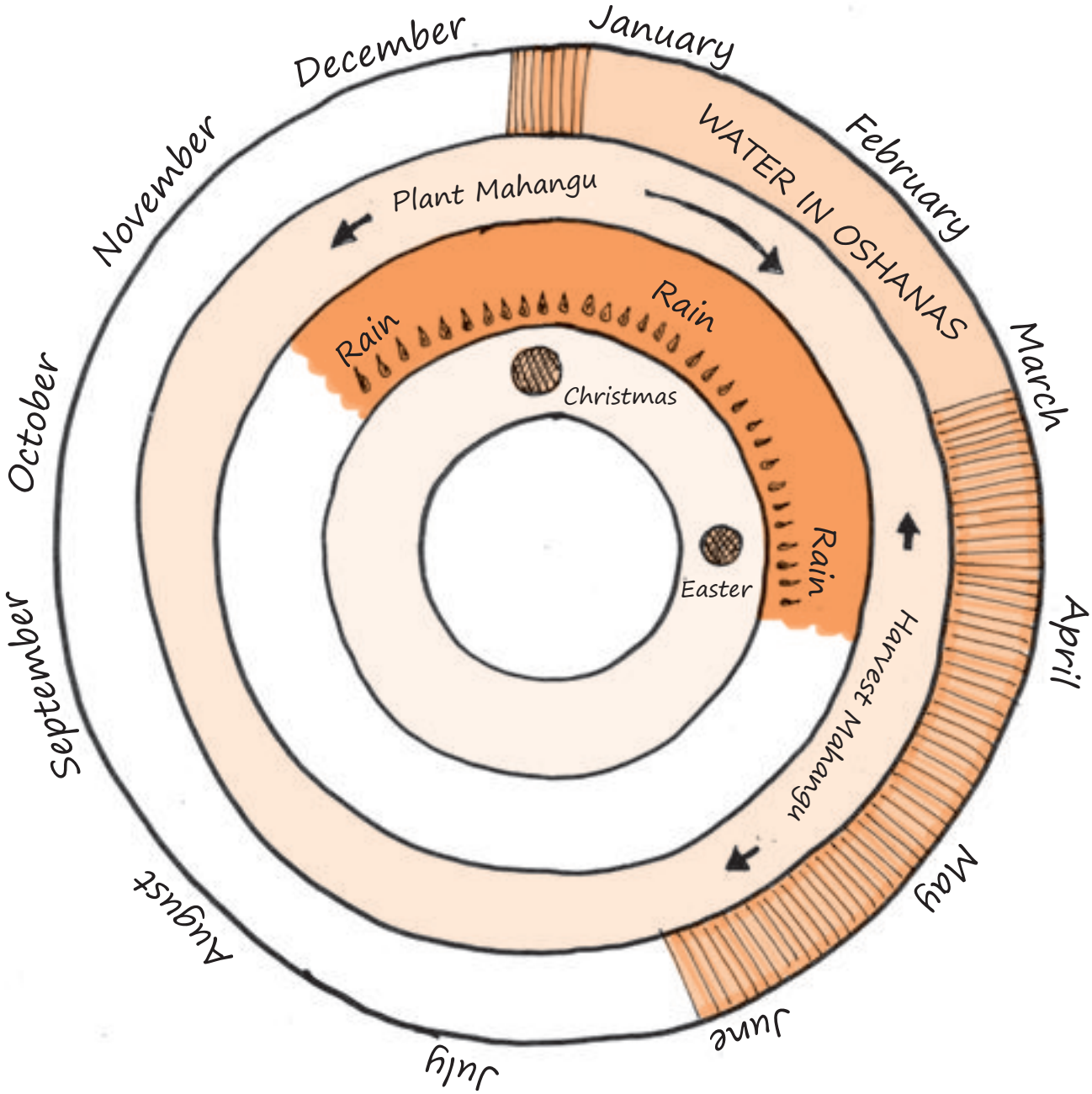
A seasonal calendar is a tool for documenting regular cycles such as seasons and significant events that occur during a year and influence the life of a community. It provides a general picture of important environmental, cultural and socio-economic periods throughout the year. The seasonal calendar 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 Ohangwena, Oshana and Oshikoto regions.

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

Methods:

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. Forests/birds – flowering of trees/migration of birds
    b. Agriculture – ripening of fruits/planting and harvesting of crops
    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 is a quick method of obtaining an inventory of plants and animals in an area and determining 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 –
    - Forest trees and plants, including fruit trees and medicinal plants
    - Agricultural plants
    - Wildlife and birds
    - Fish/aquatic animals and plants
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 (Oshiwambo, 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 agricultural areas, as well as forest areas. 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 trees etc. Record observed changes and discuss. It would also be possible to discuss changes during several years if a longer-term timeline was developed.

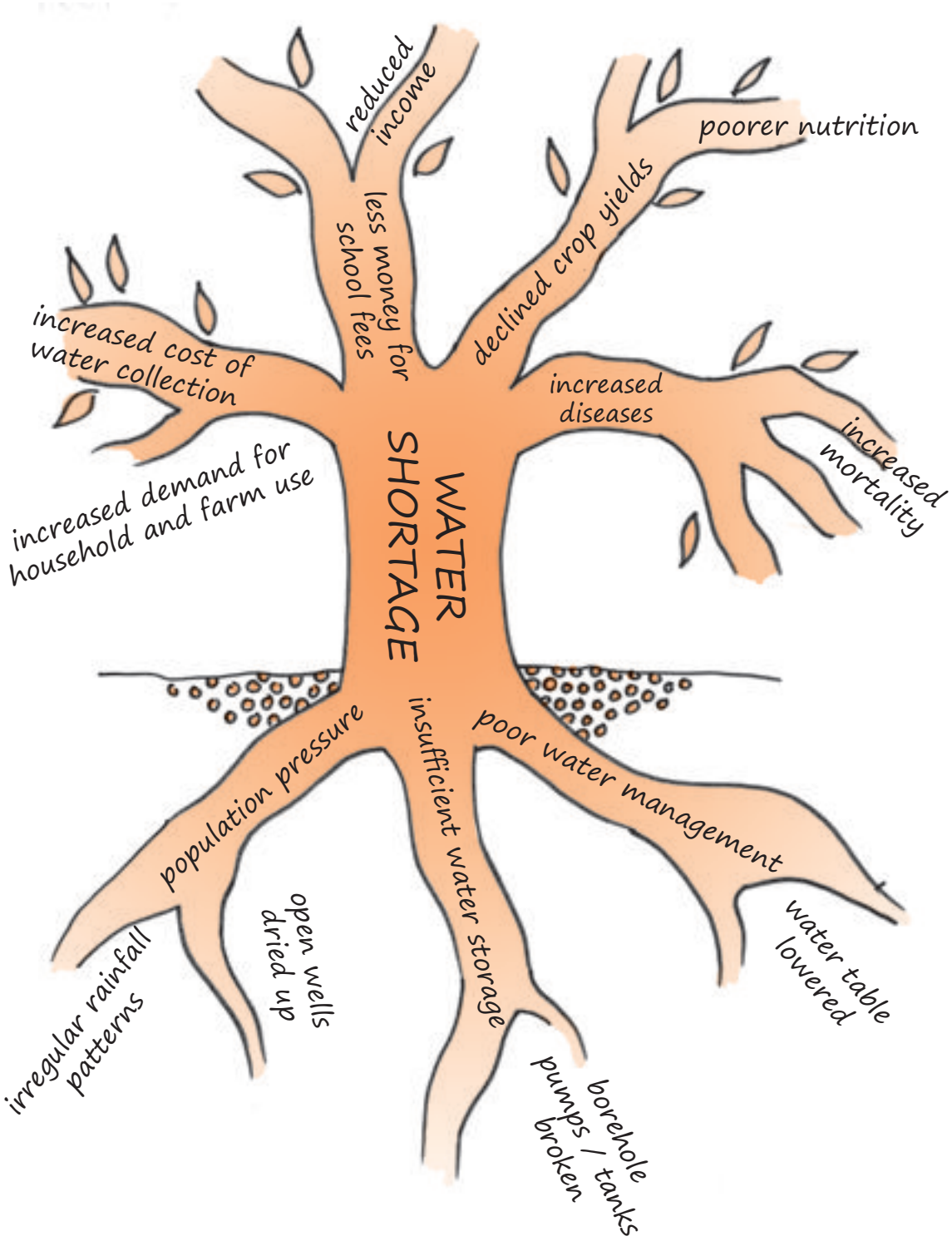
Resource Inventory

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'.

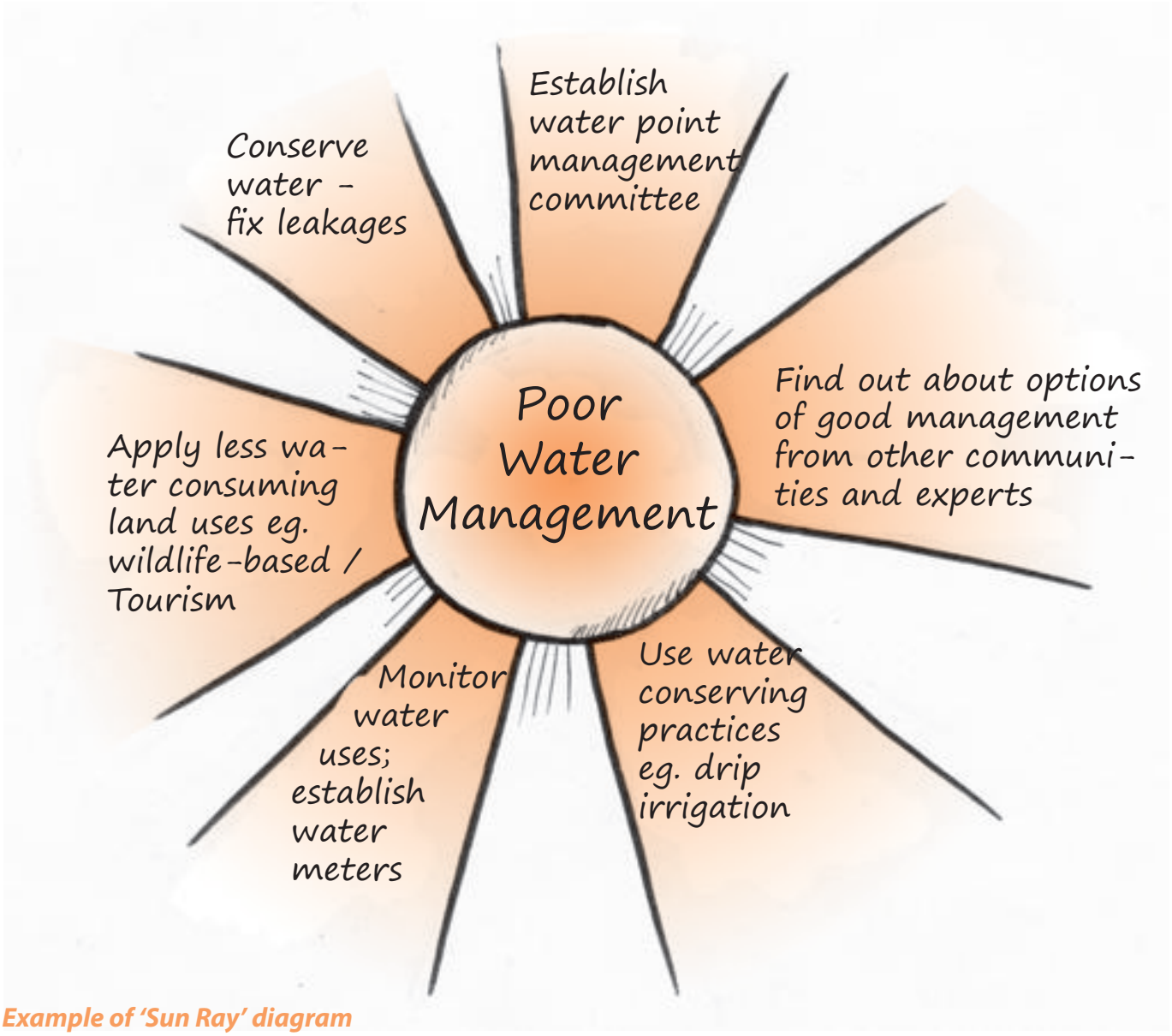
Time: 4 hours

Tool 4: Finding solutions through the Sun Ray Exercise

Addresses CCA planning Step 4; forms basis for planning Step 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

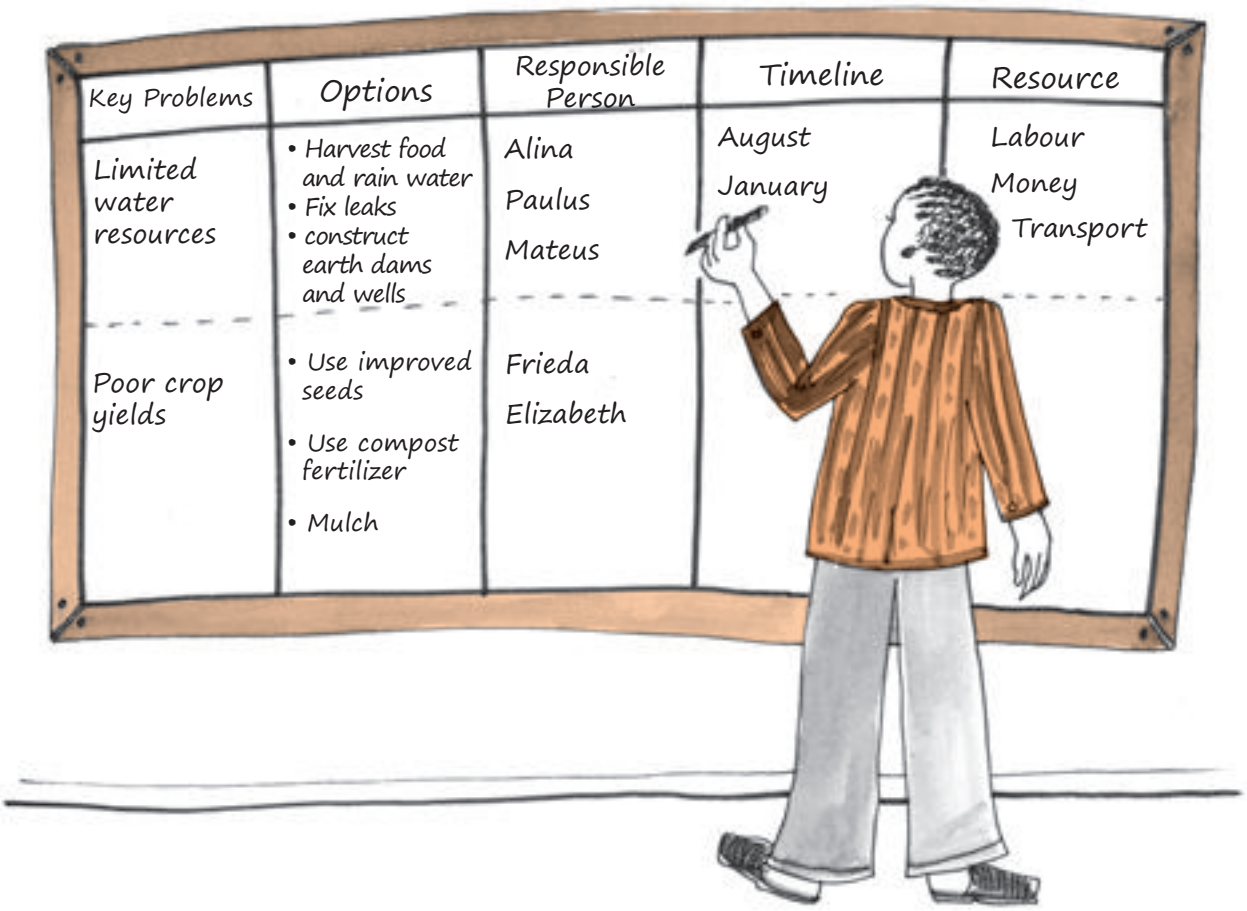
Tool 6: Developing our community-based CCA strategy and putting it into action

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.



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. However, 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 - rainwater harvesting and conservation

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.

1. Rooftop rainwater harvesting

The traditional practice of collecting rainwater where it falls has provided inexpensive drinking water for thousands of people in rural areas throughout arid areas in the world. Rooftop rainwater harvesting (RWH) involves linking together roofs via a network of pipes so that any rainwater falling on the surfaces is channelled into a temporary or permanent storage facility.

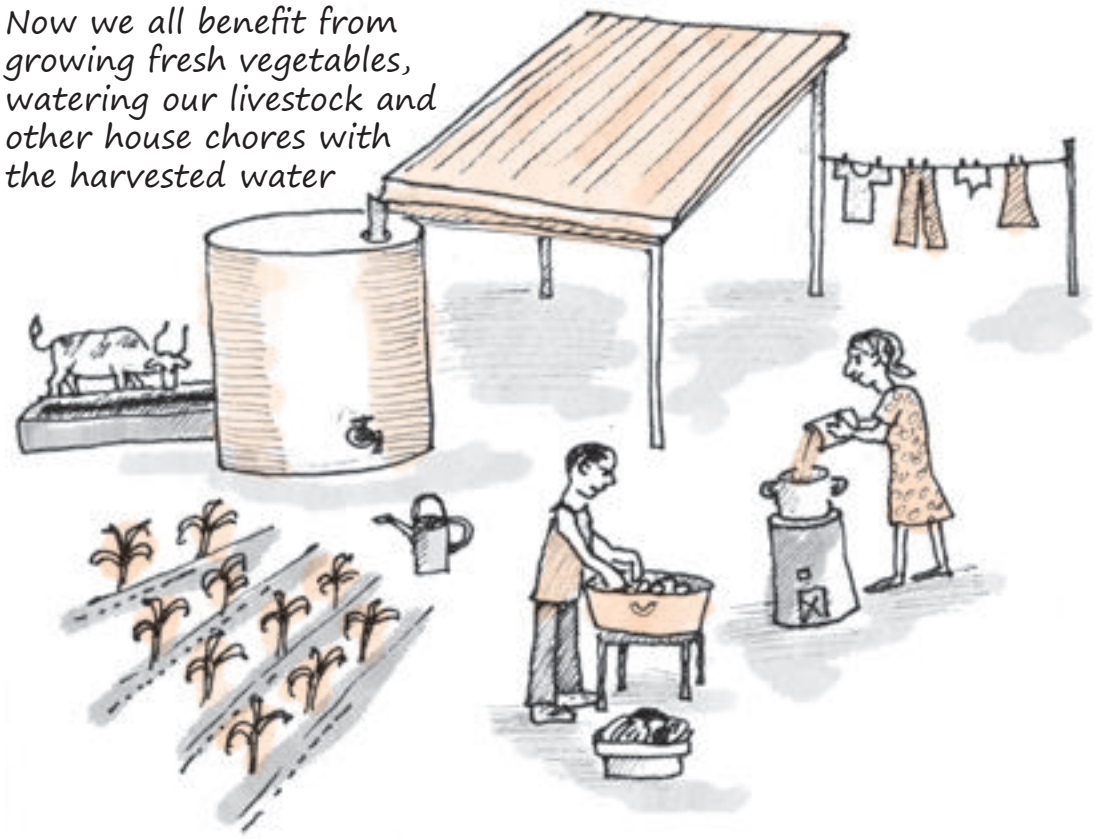
RWH is a necessity in areas where water is a major concern. There are four components that are crucial to the implementation of the technique:

1. rooftops
2. gutters
3. down pipes
4. storage units.

Rainwater is channelled into gutters attached to the bottom of the roof, flows into a down pipe and into the collecting or storage facility. In some rainwater harvesting systems, the initial rainwater flows through the down pipe and is discarded from the system to reduce the chances of collecting dirty, contaminated water. After this a valve in the down pipe allows the remaining rainwater to flow into the storage tank. Small-gauge mesh netting over the opening of the storage tank sifts out debris and eliminates mosquitoes.

2. Run-off rainwater harvesting

This technique allows the collection of rainwater flowing along the ground in tanks below the surface of the ground. Tanks are constructed from plastered bricks. Alternatively, wells are dug so that water can be stored and used for different purposes over a long period. During storage, it is important to incorporate water conservation methods to reduce evaporation. It is also important that the tanks or wells are properly fenced off , as otherwise they could pose a danger to members of the community.



Selection of the sites on which to build run-off rainwater harvesting structures is very important. Natural vegetation may reduce the amount of water available for collection.

Some of the key considerations when introducing harvesting/storage structures are:

1. To observe the direction of the surface flow of rainwater
2. To avoid placing the tank close to large trees, as their root development may cause them to crack
3. Not to place the tanks near houses or paths, to prevent children or even negligent adults from falling into them
4. To construct fences around tanks/wells as additional security measures.

Why rainwater harvesting?

Water should never be wasted and allowed to flow out of any village or community facing a shortage of drinking water.

- It costs less to collect rainwater than to exploit groundwater.
- Collecting rainwater is the only way of recharging water sources and revitalizing dry wells (ensuring that water will be available during dry spells).
- Traditional knowledge, skills and materials can be used to collect water and no technical assistance is required from the government for the repair and maintenance of the system.
- Rainwater is relatively clean, falls from the sky for free and the quality is usually acceptable for many purposes with little or even no treatment.

3. Reducing water use and water conservation

While it is important to collect and utilise rainwater as far as possible, it is also important to conserve other existing water sources.

1. Ensure no taps are dripping or that they are closed after use.
2. Check all pipes and water storage (canisters, drums, and even dams) for leaks and fix them.
3. Think about ways to reduce water use.
4. Water animals according to a set management plan.
5. Develop a borehole/water point management plan and establish a water point management committee 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.

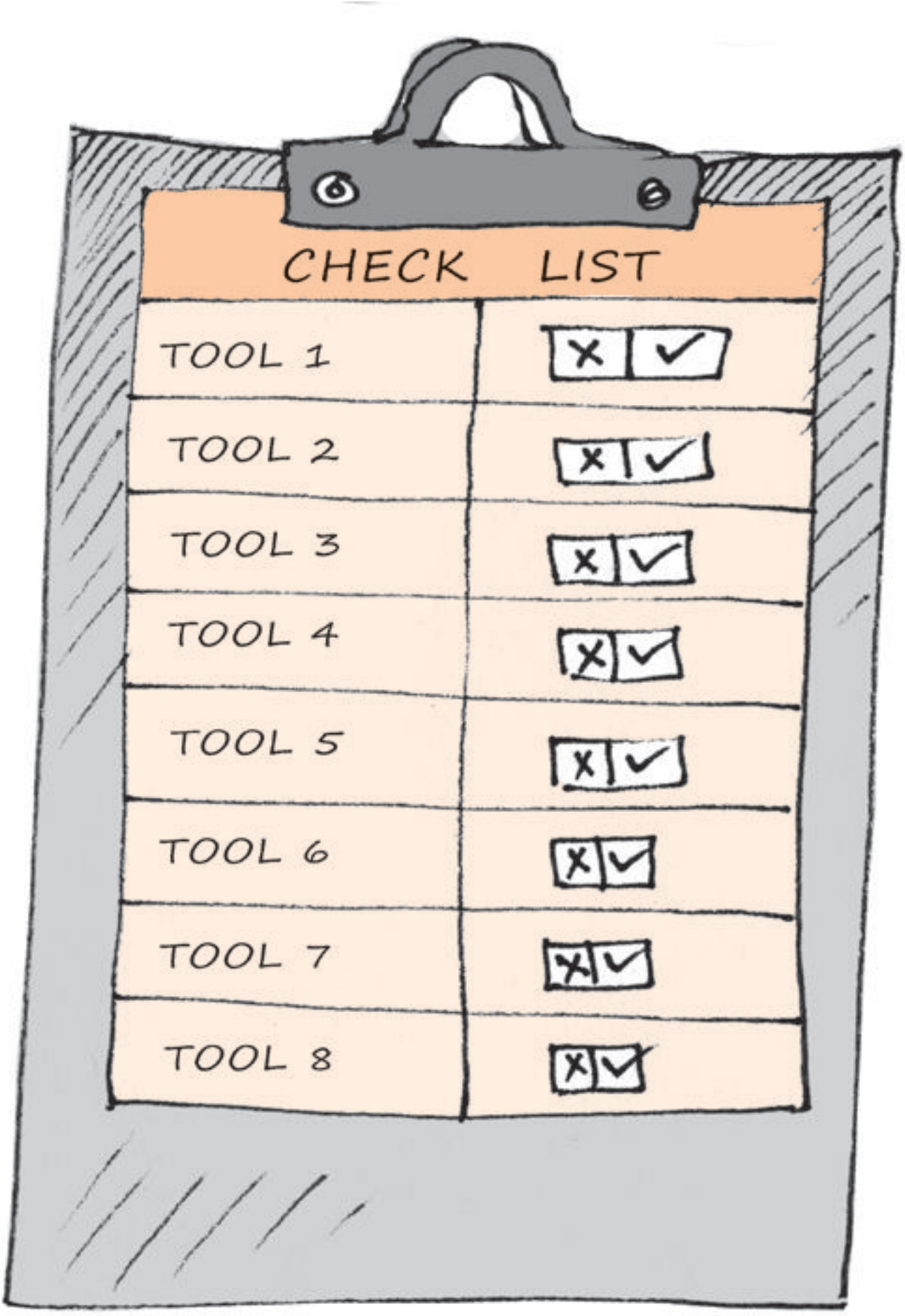
Time: 1 hour during planning; ongoing throughout adaptive measure implementation.

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 specific organisations such as MAWF, MET, UNDP or MoHSS.

The plans should address practical adaptation interventions such as the installation of water harvesting technologies and domestic solar power, planting of fruit trees and the development of agro-forestry approaches to supplement or even replace traditional cropping methods. 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.

My checklist



My notes

Useful contacts

MINISTRY OF ENVIRONMENT AND TOURISM (MET)

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

Eenhana District Office
P/Bag 88014, Eenhana
Tel: (065) 263 175
Fax: (065) 263 332

Ongwediva District Office
P/Bag 5558, Oshakati
Tel: (065) 231 468
Fax: (065) 230 552

MINISTRY OF AGRICULTURE, WATER AND FORESTRY (MAWF)

MAWF Head Office
P/Bag 13352, Windhoek
Tel: 061-208 7111
Fax: 061-229 961

Directorate of Agricultural Research and Training (DART), Outapi
P. O. Box 646, Outapi
Tel: (065) 259 057
Fax: (065) 259 079

Directorate of Extension and Engineering Services (DEES), Ongwediva
P/Bag 5556, Oshakati
Tel: (065) 233 821
Fax: (065) 230 447

Directorate of Forestry (DoF), Ongwediva
P/Bag 55558, Ongwediva
Tel: (065) 230 947
Fax: (065) 230 552

Directorate of Water Supply Sanitation & Co-ordination
P/Bag 5540, Oshakati
Tel: (065) 221 448/843
Fax: (065) 221 449

Directorate of Forestry (DoF), Okongo
Okongo Forestry Centre
Tel: (065) 288 472

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

Oshana Regional Council
P/Bag 5543, Oshakati
Tel: (065) 220 441
Fax: (065) 221 292

Ohangwena Regional Council
P/Bag 2032, Eenhana
Tel: (065) 263 039
Fax: (065) 26 3033

Oshikoto Regional Council
P.O Box 19247,Omuthiya
Tel: (065) 244 800
Fax: (065) 244 071

MINISTRY OF HEALTH AND SOCIAL SERVICES (MoHSS)

Ohangwena Region
P/Bag 88006, Eenhana
Tel: (065) 263 260/3023
Fax; (065) 263 225

Oshana Region
P/Bag 5538, Oshakati
Tel: (065) 223 3119
Fax: (065) 220 303

Oshikoto Region
P/Bag 2007, Tsumeb
Tel: (067) 224 050
Fax: (067) 220 793

MINISTRY OF LANDS AND RESETTLEMENT (MLR)

Oshana Regional Office
P/Bag 5571,Oshakati
Tel: (065) 223 850
Fax: (065) 220 477

Ohangwena Regional Office
P/Bag 88009, Eenhana
Tel: (065) 264 100
Fax: (065) 263 220

OTHER IMPORTANT CONTACTS IN REGION

DAPP Tree planting
P. O. Box 135, Outapi
Tel: (065) 250 063
Fax: (065) 251 558

Creative Entrepreneur Solution (CES)
P. O. Box15314, Oluno-Ondangwa
Tel: (065) 241 977
Fax: (065) 241 977

Etunda Irrigation Scheme
P/Bag 503, Ruacana
Tel: (065) 228 828
Fax: (065) 258 704

Seed Cooperative, Outapi
P. O. Box 591, Outapi
Tel: (065) 259 056
Fax: (065) 259 056

Omahenene Research Station
P. O. Box 646, Outapi
Tel: (065) 259 057
Fax: (065) 259 079

UNAM Ogongo Campus
P/Bag 5520, Oshakati
Tel: (065) 223 5000
Fax: (065) 223 5294

OTHER IMPORTANT CONTACTS

United Nations Development Programme (UNDP)
P/Bag 13329, Windhoek
Tel: (061) 204 6111
Fax: (061) 204 6203

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
Tel: (061) 248 345
Fax: (061) 248 344