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National Drought Management Plan

South Africa



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Acronyms

AFASA	African Farmers Association of South Africa
ARC	Agricultural Research Council
COGTA	Department of Local Governance and Traditional Affairs
DARDLR	Department of Agriculture, Rural Development and Land Reform
DDMC	District Disaster Management Centre
DEFF	Department of Environmental, Forestry and Fisheries
DJDCC	District Joint Drought Mitigation Committee
DMU	Drought Mitigation Unit
DOH	Department of Health
DSD	Department of Social Development
DWS	Department of Human Settlement, Water and Sanitation
GCIS	Government Communications and Information Centre
JDMC	Joint Drought Mitigation Committee
KPA	Key Performance Area
MJDCC	Municipality Joint Drought Mitigation Committee
NAFU	National African Farmers' Union
NDMC	National Disaster Management Centre
NDMF	National Disaster Management Framework
NDMU	National Drought Mitigation Unit
NJDMC	National Joint Drought Mitigation Committee
NGO's	Non-Governmental Organizations
PDMC	Provincial Disaster Management Centre
PDoARD	Provincial Department of Agriculture and Rural Development
PJDMC	Provincial Joint Drought Mitigation Committee
SASA	South African Satellite Agency
SAWS	South African Weather Service
WMA	Water Management Agency
WSA	Water Service Authority
WUO	Water User Organization

Glossary of terms

The different concepts and definitions used in this report are discussed and explained in the following section: In order to remain in line with international concepts and definitions, the main source for definitions is the United Nations International Strategy for Disaster Reduction (UNISDR) (www.unisdr.org/eng/library/lib-terminology-eng, 2004). Definitions are discussed in alphabetical order.

Capacity:

A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability (UNISDR, 2004).

Capacity Building:

Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk. In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society (UNISDR, 2004).

Climate Change:

The climate of a place or region is changed if over an extended period (typically decades or longer) there is a statistically significant change in measurements of either the mean state or variability of the climate for that place or region. Changes in climate may be due to natural processes or to persistent anthropogenic changes in atmosphere or in land use (UNISDR, 2004). The definition of climate change used in the United Nations Framework Convention on Climate Change (UNFCCC) is more restricted, as it includes only those changes, which are attributable directly or indirectly to human activity (UNFCCC, 2008). According to the UNDP (2008) climate change refers to deviations from natural climatic variability observed over time that are attributed directly or indirectly to human activity and that alter the composition of the global atmosphere. Both the UNFCCC and the UNDP use the definition that attributes climate change to human activity. In the context of this study the UNFCCC and UNDP definitions hold.

Coping Capacity:

The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. In general, this involves managing resources, both in normal times as well as during crises or adverse conditions. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards (UNISDR, 2004).

Desertification:	<p>The process of land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities (UNDP, 2008).</p>
Disaster:	<p>A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources. A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk (UNISDR, 2004).</p>
Disaster (Drought) Risk Management:	<p>The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the adverse impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards (UNISDR, 2004). IDRM (2009) describe DRM as a development approach to disaster management, this focuses on underlying conditions of the risks, which lead to disaster occurrence. The objective is to increase capacities to effectively manage and reduce risks, thereby reducing the occurrence and magnitude of disasters.</p>
Disaster Management:	<p>The IDRM (IDRM International, 2009) explains DM by noting that there could not be a single organization solely responsible for all aspects of disaster management. The management task is to bring together, in an integrated organizational structure, the resources of many organizations that can take appropriate action in times of disasters. UNDHA (1999) defines DM as the body of policy and administrative decisions and operational activities which pertain to the various stages of a disaster at all levels.</p>
Disaster (Drought) Risk Reduction:	<p>The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.</p> <p>The disaster risk reduction framework is composed of the following fields of action (Living With Risk, 2002):</p> <ul style="list-style-type: none"> ● Risk awareness and assessment including hazard analysis and vulnerability/capacity analysis. ● Knowledge development including education, training, research and information.

	<ul style="list-style-type: none"> • Public commitment and institutional frameworks, including organisational, policy, legislation and community action. • Application of measures including environmental management, land-use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments.
Droughts:	<p>Early warning systems including forecasting, dissemination of warnings, preparedness measures and reaction capacities.</p> <p>A deficiency of precipitation from expected or “normal” that, when extended over a season or longer period of time, is insufficient to meet demands. This may result in economic, social, and environmental impacts. It should be considered a normal, recurrent feature of climate. Drought is a relative, rather than absolute, condition that should be defined for each region. Each drought differs in intensity, duration, and spatial extent (Knutson <i>et al.</i>, 1998). The UNDP (2008) defines drought as the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.</p>
Drought Contingency Plan:	<p>A document that identifies specific actions that can be taken before, during and after a drought to mitigate some of the impacts and conflicts that result. Frequently these actions are triggered by a monitoring system (Knutson <i>et al.</i>, 1998).</p>
Drought Impact:	<p>A specific effect of drought. People also tend to refer to impacts as “consequences” or “outcomes.” Impacts are symptoms of vulnerability (Knutson <i>et al.</i>, 1998).</p>
Drought Impact Assessment:	<p>The process of looking at the magnitude and distribution of drought’s effects (Knutson <i>et al.</i>, 1998)</p>
Dry period:	<p>Refers to a period of below mean precipitation where vegetation and water resources are impacted negatively. The dry period is not as serious as drought.</p>
Drylands:	<p>Areas with an aridity value of less than 0.65; they comprise dry sub-humid, semi-arid, arid and hyper-arid areas (Middleton and Thomas, 1997) The UNDP (2008) defines drylands in terms of water stress; as terrestrial areas where the mean annual rainfall (including snow, fog, hail) is lower than the total amount of water evaporated to the atmosphere.</p>
Early warning:	<p>The provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response. Early warning systems include a chain of concerns, namely: understanding</p>

	<p>and mapping the hazard; monitoring and forecasting impending events; processing and disseminating understandable warnings to political authorities and the population, and undertaking appropriate and timely actions in response to the warnings (UNISDR, 2004).</p>
Ecosystem:	<p>A complex set of relationships of living organisms functioning as a unit and interacting with their physical environment (UNISDR, 2004). The boundaries of what could be called an ecosystem are somewhat arbitrary, depending on the focus of interest or study. Thus the extent of an ecosystem may range from very small spatial scales to, ultimately, the entire Earth (IPCC, 2001).</p>
Environment:	<p>The combination of external physical conditions that affect and influence the growth, development and survival of organisms. This includes all of the biotic and abiotic factors that act on an organism, population, or ecological community and influence its survival and development. <i>Biotic</i> factors include the organisms themselves, their food and their interactions. <i>Abiotic</i> factors include such items as sunlight, soil, air, water, climate and pollution. Organisms respond to changes in their environment by evolutionary adaptations in form and behaviour (UNDP, 2008).</p>
Environmental Degradation:	<p>The reduction of the capacity of the environment to meet social and ecological objectives, and needs. Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards. Some examples are: land degradation, deforestation, desertification, wild fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise and ozone depletion (UNISDR, 2004).</p>
Farming System:	<p>A farming system is defined as a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household activities and constraints, and for which similar development strategies and interventions would be appropriate. Depending on the scale of the analysis, a farming system can encompass a few dozen or many millions of households (FAO, 2001).</p>
Forecast:	<p>Definite statement or statistical estimate of the occurrence of a future event (UNESCO, WMO).</p>
Geographic Information System (GIS):	<p>Analysis that combine relational databases with spatial interpretation and outputs often in form of maps. A more elaborate definition is that of computer programmes for capturing, storing, checking, integrating, analysing and displaying data about the earth that is spatially referenced. GIS is used in this study for hazard, vulnerability and resilience mapping and analysis (UNISDR, 2004).</p>

Hazard:	<p>A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity, frequency and probability (UNISDR, 2004). Hazard in the context of this study refers to drought caused by hydro-meteorological elements causing dry periods such as lack of precipitation, high temperatures, high winds and evapotranspiration.</p>
Hazard Analyses:	<p>Identification, studies and monitoring of any hazard to determine its potential, origin, characteristics and behaviour (UNISDR, 2004).</p> <p>Natural processes or phenomena of atmospheric, hydrological or oceanographic nature, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation (UNISDR, 2004). Drought is a hydro-meteorological hazard, but in the context of this study only the term “<i>hazard</i>” is used.</p>
Hydro-meteorological Hazards:	<p>A system is an organised set of detailed methods, procedures and routines created to carry out a specific activity. It is a purposeful structure that consists of interrelated and interdependent elements that continuously influence each other to maintain their activity and system existence in order to achieve the system main goal. An information system, together with knowledge and communication system, is a system with the capability to provide answers to questions of “where”, “who”, “when”, “what”, “how” and “why” (Business dictionary 2018:1; Banks 2002:195). The UNISDR (2013), termed the system an Information and Knowledge Management for Disaster Risk Reduction and defined it as a system that enables and sustains informed decision-making for managing disaster risk and an essential for coordinated action. The NDMF (2005:63) defines an information management and communication system as a system with geographical information systems for mapping and information display application and has capabilities to acquire, sort, store and analyse data for the purposes of targeting information for primary interest groups.</p>
Information Management and Communication System:	
Land degradation:	<p>The reduction or loss in arid, semi-arid and dry sub-humid areas of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest and woodlands. Land degradation results from a process or combination of processes, including those arising from human activities and habitation patterns that include: (i) soil erosion caused by wind and/or water, (ii)</p>

	<p>deterioration of the physical, chemical and biological or economic properties of soil and (iii) long-term loss of natural vegetation (UNDP, 2008).</p>
<p>Livelihood:</p>	<p>The means for securing the necessities of life so that individuals, households and communities can sustain a living over time, using a combination of social, economic, cultural and environmental resources (UNDP, 2008).</p>
<p>Mitigation:</p>	<p>Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards (UNISDR, 2004).</p>
<p>Natural hazards:</p>	<p>Natural processes or phenomena occurring in the biosphere that may constitute a damaging event. Natural hazards can be classified by origin namely: geological, hydro-meteorological or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing (UNISDR, 2004).</p>
<p>Natural resources:</p>	<p>Non-renewable resource such as minerals, fossil fuels and fossil water, and renewable resources such as non-fossil water supplies, biomass (forest, grazing resources) marine resources, wildlife and biodiversity.</p>
<p>Preparedness:</p>	<p>Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations (UNISDR, 2004).</p> <p>In the context of this study preparedness refers to the “<i>readiness</i>” of the agricultural sector or individual farmers or communities to overcome the negative impacts of drought. These include measures such as fodder banks, savings, insurance, alternative sources of income.</p>
<p>Relief/Response:</p>	<p>The provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration (UNISDR, 2004).</p> <p>In the context of this document relief refers to measures such as subsidies for fodder purchases, interest subsidies or soft loans, extension of debt repayments, or any other measure that support the agricultural sector, communities or farmers in order to financially survive the negative impacts of drought. Relief and response in this context does not include risk reduction measures for future droughts.</p>

Resilience/resilient:

The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures (UNISDR, 2004).

In the context of this study resilience refers to the capacity of agriculture, farmers or communities to withstand the negative effects of drought without any additional support. The term capacity is also used in the study in the same context.

Risk:

The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions (UNISDR, 2004).

Conventionally risk is expressed by the notation; Risk = Hazards x Vulnerability. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability. Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.

Risk Assessment/Analysis:

A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend. This study also includes resilience or coping capacity as part of risk (UNISDR, 2004). Knutson *et al.* (1989) define drought risk analysis as “the process of identifying and understanding the relevant components associated with drought risk as well as the evaluation of alternative strategies to manage that risk”.

The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios.

Small-scale farmers:

Small-scale farmers are by definition those farmers in transition between subsistence and commercial farmers. They are normally too small to apply modern technology and to mechanise and most of their inputs are labour intensive yet they already produce surplus food and fibre for the market (Jordaan & Jooste, 2003).

Subsistence farmers:

Individuals farming with livestock, horticulture or any system but they do not produce any surplus. Agriculture is a livelihood means and subsistence farmers utilise products only for personal and their own livelihood means. This group of farmers do not produce any surplus food for the market (Jordaan & Jooste, 2003).

Sustainable development:

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction (UNISDR, 2004).

The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards (UNISDR, 2004).

Vulnerability:

Distribution List:

- UNCCD
- Department of Environment, Forestry and Fisheries
- Department of Agriculture Land Reform and Rural Development
- Department of Human Settlements, Water and Sanitation
- Department of Higher Education, science and Technology
- Department of Tourism
- Department of Trade and Industry
- Department of Social Development
- National Disaster Management Centre
- ESCOM
- SALGA
- AFASA
- NAFU
- AGRISA

1 Introduction

Drought is a recurring hazard event that causes hardship to many livelihoods and economic sectors in southern Africa. Climate change projections of a warmer climate might result in increased dry periods of higher intensity. In spite of the large number of people affected on the African continent, we still do not have the capacity to accurately predict when the next drought will happen and how severe it will be.

South Africa has a well-developed economy with a strong agricultural sector and the citizens in South Africa are largely protected from the most critical effects of drought such as water and food shortages. However, the 2015/2016 drought in the grain producing areas and in KwaZulu-Natal and the 2016 – 2018 drought in the Western Cape created awareness of the critical effects of a prolonged drought and the danger of not maintaining water infrastructure properly. Whereas drought was mostly associated with agriculture in the past we now realise that densely populated urban areas will also suffer water shortages in future droughts if South Africa does not plan properly for the next drought.

Decision makers in all institutions and enterprises that depend on water need to prepare for dry periods and droughts. These would include:

- i. Government – All Departments
- ii. Agricultural sector
- iii. Wildfire managers (Disaster Management)
- iv. Municipal water suppliers, including water boards
- v. Tourism and recreation
- vi. Electrical power producers (ESKOM)
- vii. Industry
- viii. Mining

The Disaster Management Act (Act 57 of 2002) and the National Disaster Management Framework (NDMF, 2005) provide the legislative and policy frameworks for the provincial drought management framework. The drought plan is based on the National Disaster Management Framework and consist of the four Key Performance Areas (KPA's) and three Enablers:

- i. KPA 1: Integrated institutional capacity for drought management
- ii. KPA 2: Drought risk assessment
- iii. KPA 3: Drought risk reduction
- iv. KPA 4: Response and recovery

The three enablers of the drought framework are the following:

- i. Enabler 1: Information management and communication
- ii. Enabler 2: Education, training, public awareness and research
- iii. Enabler 3: Funding

The National Drought framework provides a template/guideline for the development of drought plans for all line departments and all levels of government, namely, district, metro and provincial. The development of drought plans should follow a process of consultation with all stakeholders. Also important however, is the alignment of national guidelines at all levels of governance. The drought classification, indicators and drought relief measures should be standardized for all government levels according to guidelines provided in this framework.

According to Wilhite *et al.* (2005) at the National Drought Monitor Centre in the USA, the implementation of a drought strategy should follow 10 steps, as follows:

- i. Appoint a drought Task Team
- ii. State the purpose and objectives of the drought plan
- iii. Seek stakeholder participation and resolve areas of conflict or duplication
- iv. Inventorise resources and identify groups at risk (risk assessment)
- v. Establish and write the drought plan
- vi. Identify research needs and fill institutional gaps
- vii. Integrate science and policy
- viii. Publicise the drought plan
- ix. Develop education and awareness programmes
- x. Evaluate and revise the drought plan

The drought plan template proposed in this chapter represents just one of the phases in the development of a provincial or national drought management strategy.

2 Drought

Drought has no universal definition as droughts are region specific reflecting differences in climatic characteristics with different socio-economic and physical variables. Some of the most common definitions are the following:

- The UNDP (2008) defines drought as *“the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems”*.
- Knutson *et al.* (1998) define drought as *“a deficiency of precipitation from expected or “normal” that, when a season or longer period of time extended over, is insufficient to meet demands. This may result in economic, social, and environmental impacts. It should be considered a normal, recurrent feature of climate. Drought is a relative, rather than absolute, condition that should be defined for each region. Each drought differs in intensity, duration, and spatial extent”*.
- The Director of Commonwealth Bureau of Meteorology during 1965 suggested a broad definition for drought as *“severe water shortage”*.
- Palmer (1965) states that *“Drought is an interval of time, generally of the order of months or years in duration, during which the actual moisture supply at a given place rather consistently falls short of the climatically expected or climatically appropriate moisture supply”*.
- Chopra (2006) defines drought as *“a period of rainfall deficiency, extending over months or years of such nature that crops and pastures for stock are seriously affected, if not completely burnt up and destroyed, water supplies are seriously depleted or dried up and sheep and cattle perish”*
- McMohan and Diaz Arena (1982) define drought as *“a period of abnormally dry weather sufficiently for the lack of precipitation to cause serious hydrological imbalance and carries connotations of a moisture deficiency with a mass usage to water”*.

All the above definitions only consider meteorological influences and have little reference to the socio-economic and environmental impact of drought and dry periods. Wilhite & Glantz (1985), Wilhite (2000) and Castillo (2009) recognized the challenge for a universally accepted definition and categorized drought into four different categories with specific definitions. The four most common definitions describing the different types of drought are (i) meteorological drought, (ii) agricultural drought, (iii) hydrological drought and (iv) socio-economic drought. These are illustrated in Figure 2.1.

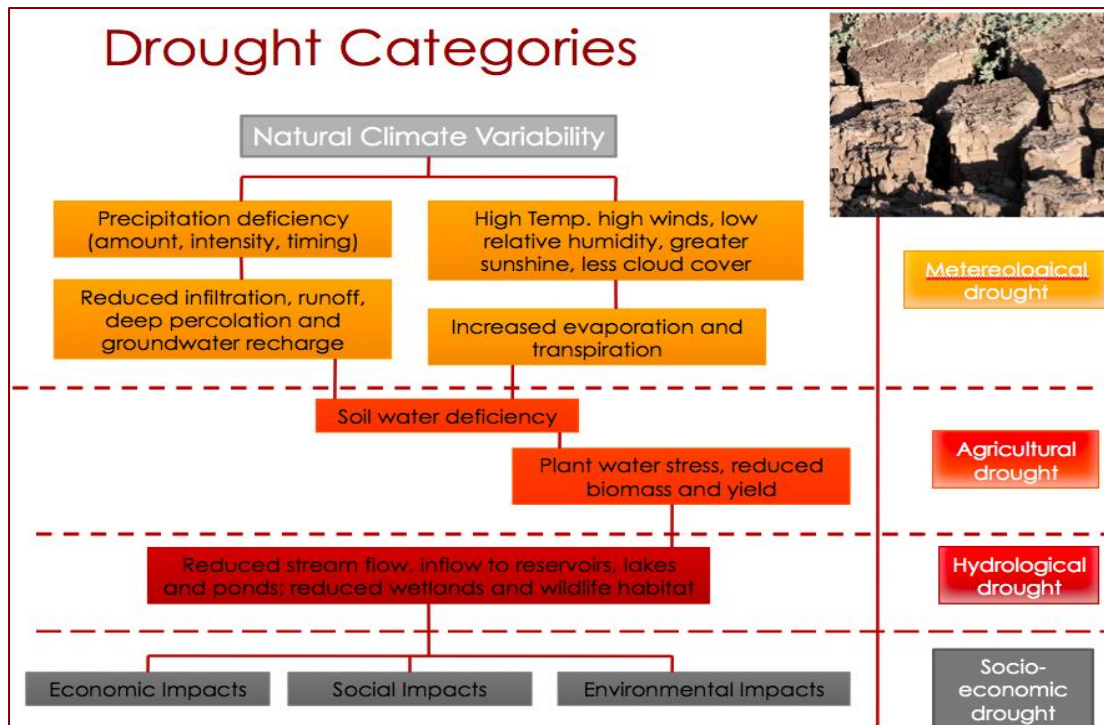


Fig. 2.1: Drought categories

(Wilhite and Glantz 1985; Wilhite, 2000; Castillo, 2009)

- **A precipitation deficiency threshold usually defines meteorological drought** over a predetermined period of time. This is a reduction in rainfall supply compared with a specified average condition over a specified period of time. Different indexes and methodologies are used to define the meteorological drought such as Standard Precipitation Index (SPI), the Standard Precipitation Evapotranspiration Index (SPEI), percentage of normal rainfall, etc. The SPI is currently the most sophisticated index used worldwide to measure meteorological droughts.
- **Agricultural drought** is commonly defined by the availability of soil water to support crop and forage growth. It is a reduction in water availability below the optimal level required by a crop during each different growth stage, resulting in impaired growth and reduced yields. Agricultural drought relates to an imbalance in the water content of the soil during the growing season which, although influenced by other variables such as the crop water requirement, the water-holding capacity and degree of evaporation, is also largely dependent upon rainfall amount and distribution.
- **Hydrological drought** is normally determined by a departure of surface and subsurface water supplies from some average condition at various points in time. It occurs when there is substantial deficit in surface runoff below normal conditions, or when there is a depletion of groundwater supplies. Hydrological drought reduces the supply of water for sewerage, household use, industrial use, irrigation, hydro-electrical power generation, and tourism.

- **Socio-economic drought** differs markedly from the other types of drought. It concerns the relationship between the supply and demand for some commodity or economic good that is dependent on precipitation. It represents the impact of drought on human activities, including both indirect and direct impacts. This relates to a meteorological anomaly or extreme event of intensity and/or duration outside the normal range of events taken into account by enterprises and public regulatory bodies in economic decision-making, thereby affecting production and the wider economy.

Van Zyl (2006) also provides some alternative and practical definitions for drought types usually experienced in South Africa. This terminology is commonly used by farmers:

- **False drought:** This type of "drought" occurs when rainfall is normally below the long-term average, but as a result of overgrazing the veld and fodder supply becomes prematurely depleted, giving the impression of a prevailing drought. In some cases, false droughts have been wrongly declared as disaster droughts.
- **Premature drought:** This type of drought occurs when a chronic dry situation is so aggravated by overgrazing that a disaster drought is prematurely declared. In many instances, adjoining farms may differ widely as the intensity of a drought is, in this case, a result of veld management practices and the exploitation of grazing capacity.
- **Prolonged drought:** A drought situation can be prolonged for months when high stock numbers are maintained. This results in a more or less chronic food shortage even after rains have fallen. Plants become severely damaged. It is also possible that areas which have been declared drought stricken, do not recover after moderate rainfall. After a few months the drought could be even worse.
- **Green drought:** Green drought occurs when excessive grazing pressure is maintained in semi-dry periods. This causes food shortages even though the vegetation appears green and soil moisture reserves are favourable, or where natural causes such as rain showers during a drought promote a short spell of green growth, but not enough for breaking the drought. A green drought can also occur where insects severely attack plants and deplete the fodder to such a degree that it takes on the appearance of a drought situation. There is thus a shortage of fodder in spite of favourable climatic circumstances. The most common pests are locusts, Karoo caterpillar and the commando caterpillar.
- **Financial drought:** Farmers exert pressure to obtain financial assistance in order to improve cash flow. Therefore, a region is sometimes declared drought stricken even though a drought does not prevail. The declaration of such a region as a disaster drought area has a negative effect on the interpretation of rainfall records because a drought is indicated when it does not exist

Climate variability is a given fact and the vegetation in a region is the result of a specific climate profile. It is important to remember that drought is a temporary anomaly, unlike normal arid and semi-arid climatic conditions, and one needs to distinguish between drought and aridity. Understanding the difference between these two concepts is important for the development of drought risk reduction plans, which are based on the assessment of drought risks (WMO, 2006). Water users should be conscious of the fact that weather fluctuates from wet periods to dry periods and they therefore must adapt their practices to fit within the two extremes.

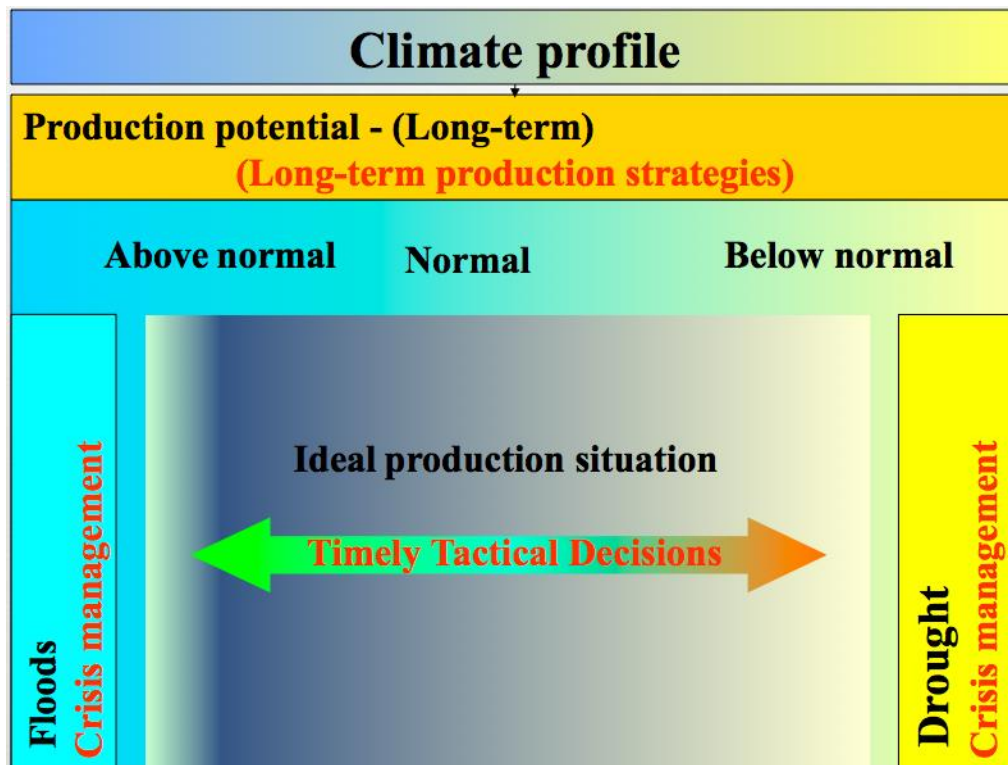


Fig. 2.2: Illustration of the relation between the climate profile, production levels and management decisions.
(Source: IPCC, 2001)

Figure 2.2 illustrates the interaction between long term production potential and climate profile in the agricultural sector. Within this climate profile certain years might receive above normal rainfall with potentially above normal production, whereas below normal precipitation in other years might result in lower than normal or below average production outputs (IPCC, 2001). Market forces (supply and demand) more often than not complement below average production outputs during dry years. The ideal production situation though, is located between the two extremes since farmers can then plan accordingly (See Figure 2.2). The international environment also has a large impact on local economy and global forces can become very important.

The purpose of drought risk assessment and drought early warning is to allow water users to make timely tactical decisions instead of reverting to crisis management during the extreme climatic situations (See illustration in Figure 2.2). Water users, inclusive of the private sector and government should include drought planning as part of the normal management process.

2.1 Drought in South Africa

South Africa is a water scarce country with annual precipitation that varies from less than 50 mm per annum in the far west up to 1500 mm per annum in some east coast regions. Precipitation in South Africa is characterised with great variability from extremely wet to extremely dry. According to South Africa Weather Service (SAWS) data, there have been 10 summer rainfall seasons with less than 80% of normal rainfall over the entire summer rainfall area between 1960 and 2016. A deficit of 25 % of normal precipitation is regarded as severe meteorological drought but a deficit of 20% of normal precipitation will cause water shortfalls and crop damage accompanied by social and economic hardship.

The availability of freshwater is a limiting factor in the economic development of South Africa. Freshwater sources are far away from centres of industry, mining and urban development. The seasonal cycles that drive the country between floods and droughts put huge pressure on the storage and water reticulation infrastructure in SA.

Most of South Africa is a summer rainfall with most rainfall between October and March. As a consequence most crops can only be grown during the summer rainfall season and with below mean rainfall during these six months serious crop losses are experienced. Groundwater recharge also happens during periods of high rainfall. Should these condition occur in succession as from 1064 – 1970, 1981 – 1982, 1991 – 1995, 2002 – 2005 and again 2014 – 2016 there is

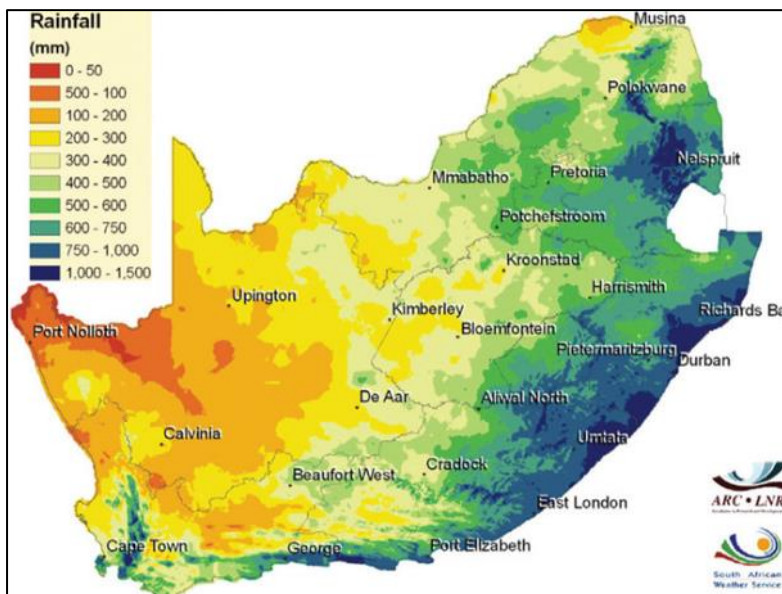


Fig 3.1: Annual precipitation for SA
(Source: ARC, 2015; SAWS, 2015)

not enough time for natural resources and the economy to recover from each rainfall deficit period. The Western Cape on the other hand is a winter season region with most precipitation taking place during the winter months and the period 2014 – 2018 was a below average winter rainfall period with near catastrophic impacts in the Western Cape and specifically City of Cape Town.

The annual precipitation for South Africa is illustrated if Figure 3.1.

Aridity and drought are two different concepts and one should not confuse aridity with drought, which a mistake is made by many. Figure 3.2 illustrates aridity in SA and it is clear that the western part of SA is much more arid than the eastern parts but that does not mean that the west is more

drought prone. The CSIR (2015) applied the De Martonne (1926) method to determine aridity index values for South Africa. Based on these values, the climate was zoned into six regions namely; arid, semi-arid, dry sub-h mid, moist sub-humid, humid and very humid.

Climate and ultimately drought is determined also by

temperature, and the CSIR (2015) developed a Köppen-Geiger classification for SA that quantify SA climatic conditions in a better way than only precipitation data. The Köppen-Geiger data combine temperature and precipitation and describe hot-dry, cool-dry, hot-wet, cool-wet summers

or winters and is valuable for planning purposes. The Köppen-Geiger map for SA is illustrated in Fig 3.3 and available on



Fig 3.2: Aridity map for SA
(Source: CSIR, 2015)

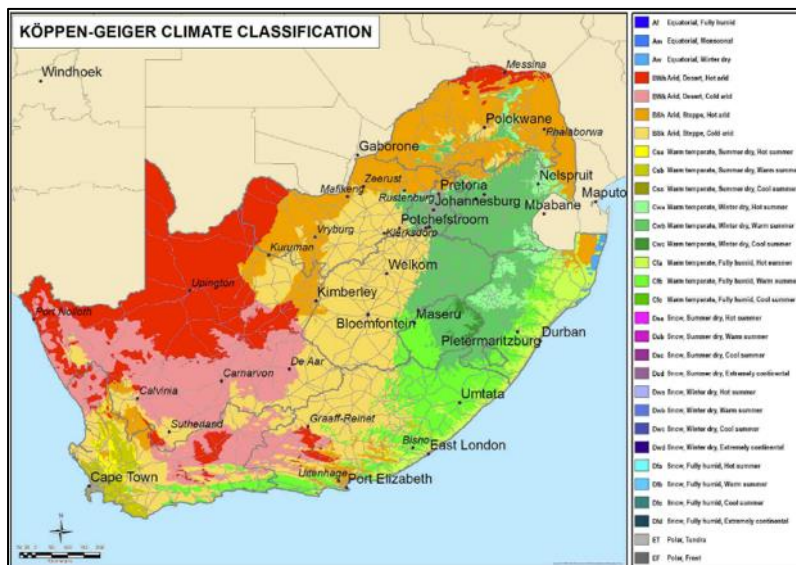


Fig 3.3: Köppen-Geiger climate classification.
(Source: CSIR, 2015).

http://stepsa.org/climate_koppen_geiger.html

Climate change models in forecasting global warming are much more reliable than precipitation forecasts and data in SA also indicate a definite change in temperature. Important for drought management is therefore temperature. The CSIR (2015) also developed temperature indicators for SA named cooling degree days and heating degree days, which has its origins in agricultural research where knowledge of the cumulative variation in outdoor air temperature is important. The heating and cooling degree days method is a summation of the differences between the

outdoor temperature and a base temperature over a specified time period. A key issue in the application of degree-days is the definition of this base temperature, which, in buildings, relates to the energy balance of the building and systems. Maps illustrating heating and cooling degree days is illustrated in figure 3.4.

Fresh water sources and storage capacity is critical in drought management. Only 8% of the land surface in SA provides 50% of fresh water in the country. When analysing the impact of dry periods and drought one need to consider the strategic importance of drought in a specific area. Drought in the water source areas will have a huge impact on water provision in other areas that depend on fresh water from the water source areas. The major water source areas are shown in figure 3.5.

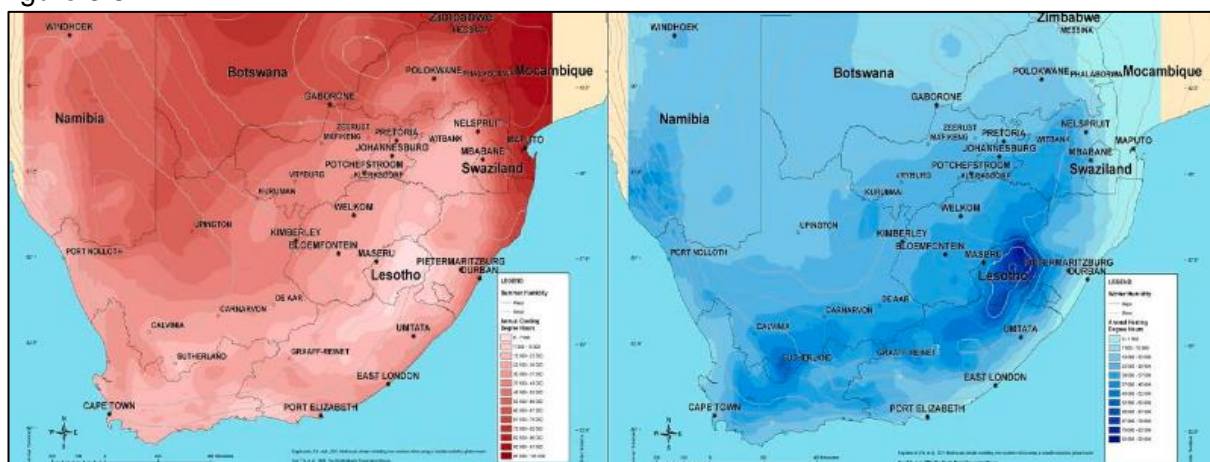


Fig. 3.4: Heating degree days and cooling degree days
(Source: CSIR, 2015)

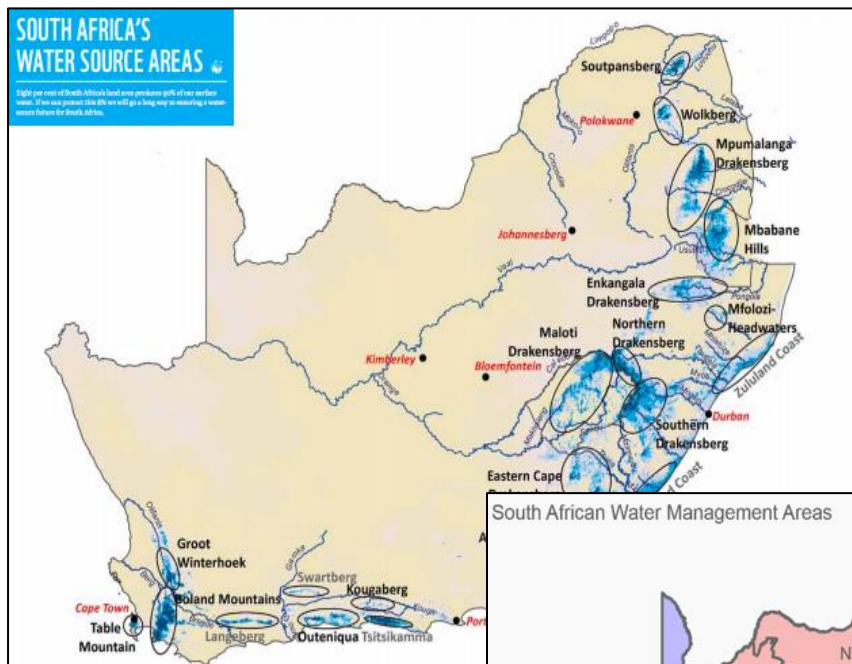


Fig 3.5: Major water source areas in SA
(Source: Prince et al, 2013)

Drought does not respect governance boundaries and in many aspects drought management should be coupled to catchment areas and at a national level linked to Water Management Areas (WMA's). Provincial drought plans should consider the boundaries of WMA's and must ensure proper MOU's with the respective WMA's. The map of WMA's (linked to primary catchments) is illustrated in Figure 3.6.

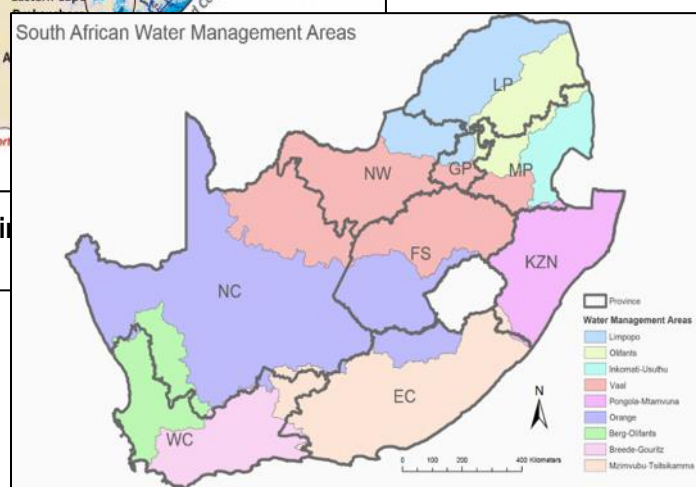


Fig 3.6 : Water Management areas in SA
(Source: DWS, 2015)

Drought conditions and drought impact different sectors in different ways; for example, Jordaan *et al* (2017) found that a normal dry period for commercial livestock farmers is already experienced as a disaster drought for small-scale communal farmers due to lack of resources and degraded land. The link between climate and natural resource potential is important in the calculation of drought impact and in drought management principles. The grazing capacity is therefore one of the most important indicators to be considered for drought management in the livestock farming sector. Grazing capacity in SA varies from 1,5ha per Livestock Unit (LSU) in the east to more than 100 ha per LSU in the west and mountain areas in the south. The updated (2018) grazing capacity in SA is illustrated in Figure 3.7.

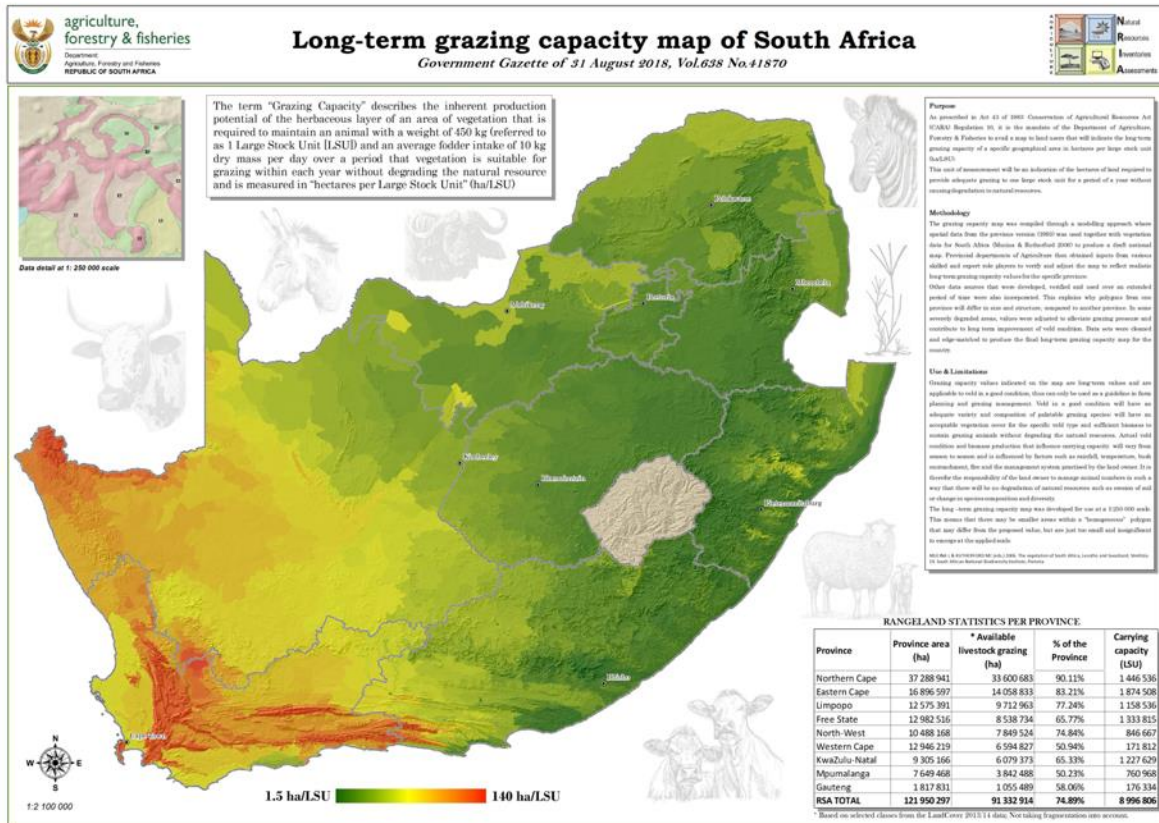


Fig 3.7: Grazing Capacity in SA

Source: DAFF, 2018.



3 Acts and Regulations

The South African National Drought Plan should consider the principles and guidelines contained in the following regulations, policies and acts:

- i. The Constitution
- ii. The Conservation of Agricultural Resources Act (43 of 1983)
- iii. The White Paper on Agriculture, 1995
- iv. White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity (1997)
- v. White Paper on Environmental Management Policy for South Africa (1998)
- vi. National Environmental Management Act (Act 107 of 1998)
- vii. Marine Living Resources Act (Act 18 of 1998)
- viii. National Forest Act (Act 84 of 1998)
- ix. The White Paper on Disaster Management, (1999)
- x. The Disaster Management (Act 57 of 2002)
- xi. National Environmental Management: Protected Areas Act (Act 57 of 2003) (Protected Areas Act)
- xii. National Environmental Management: Biodiversity Act (Act 10 of 2004) (Biodiversity Act)
- xiii. National Disaster Management Framework (NDMF, 2005)
- xiv. National Biodiversity Strategy and Action Plan (2005)
- xv. National Biodiversity Framework (2008)
- xvi. National Drought Management Framework (2008)
- xvii. National Protected Area Expansion Strategy (2008)
- xviii. The Strategic Plan for Agriculture
- xix. Provincial biodiversity strategies, and provincial protected area expansion strategies,

Important International agreements and policies are:

- i. UN Convention to Combat Desertification (UNCCD 2018)
- ii. UN Framework Convention on Climate Change (1997)
- iii. Hyogo Declaration (2005)
- iv. Sustainable Development Goals (2015)
- v. Sendai Agreement (2015)
- vi. Global Mechanism established under Article 21 of UNCCD

Important African and SADC agreements, treaties and protocols related to drought management are:

- i. Protocol on Transport, Communications and Meteorology (1996)
- ii. Revised Protocol on Shared Watercourses (2000)
- iii. Protocol on Forestry (2002)

- iv. Regional indicative Strategic Development Plan (2005)
- v. Regional Water Policy (2005)
- vi. Regional Water Strategy (2006)
- vii. Protocol on Science, Technology and Innovation (2008)
- viii. Protocol on the Development of Tourism (1998, amended 2009)
- ix. Treaty of the Southern African Development Community and its amendments (2015)
- x. Windhoek Declaration for Enhancing Resilience to Drought in Africa (2016)
- xi. Agreement on Cooperation on Investment – on the Protocols on Finance & Investment (Updated 2016)
- xii. Regional strategic action Plan for the SADC Water Sector 1 (RSAP I) – Lessons and Best Practice
- xiii. Regional strategic action Plan for the SADC Water Sector II (RSAP II)
- xiv. Regional strategic action Plan for the SADC Water Sector III (RSAP III)

Specific African and SADC programs and publications with an impact on the National Drought plan are the following:

- i. SADC Secretariat located in Gaborone, Botswana
- ii. Climate Services Centre located in Gaborone, Botswana
- iii. Water Programmes located in Gaborone, Botswana
- iv. Natural Resources Management Programme
- v. Agricultural Information Management System
- vi. Regional Remote Sensing Unit
- vii. Regional vulnerability Analysis and Assessment Program Management Unit
- viii. SADC-ICP Partnership Dialogue
- ix. SADC Water Sector International Cooperation Partner Portal
- x. SADC Groundwater and Drought Management Project
- xi. SADC Groundwater Grey Data Project
- xii. SADC Hydrological Mapping Project
- xiii. SADC Economic Accounting of Water Use
- xiv. White Paper Strategic Framework for Drought risk Management and Enhancing Resilience in Africa (DRAPA)
- xv. Limpopo Watercourse Commission (LIMCOM)
- xvi. Orange-Senqu River Commission (ORASECOM)



4 KPA 1: Integrated Institutional and Organisational¹ Capacity for Drought Management

KPA 1 deals with the different institutions responsible for drought management at all levels and also how to ensure coordinated action and implementation. This section provides guidelines for joint action and implementation for all stakeholders, inclusive of government, the private sector and individuals.

4.1 Objective

Establish integrated institutional capacity to enable the effective implementation of drought management that includes drought risk reduction and drought response and relief

4.2 Organisational Arrangements - International / Regional

Drought does not respect international borders and impact more than often more than one country in the SADC region. It is therefore important to mention International and regional organizations involved in drought management. Organizations contributing to drought risk management is listed in this section.

4.2.1 United Nations Convention to Combat Desertification (UNCCD)

The objective of the UNCCD is to build “a future that avoids, minimises, and reverses desertification/land degradation and mitigates the effects of droughts in affected areas at all levels in order to achieve a land degradation-neutral world consistent with the 2030 Agenda for Sustainable Development.

The DEA is the focal point Department for UNCCD in South Africa and is responsible for implementing international agreements and protocols in South Africa.

4.2.2 Southern African Development Community (SADC) Secretariat

The Southern African Development Community (SADC) Secretariat is the Principal Executive Institution of SADC, responsible for strategic planning, facilitation and co-ordination and management of all SADC Programmes. It is headed by the SADC Executive Secretary and is located in Gaborone, Botswana. The mandate of the SADC Secretariat includes:

- i. Strategic planning and management of the programme of SADC
- ii. Implementation of the decisions of the summit and council
- iii. Organisation and management of SADC meetings
- iv. Financial and General Administration
- v. Representation and promotion of SADC
- vi. Promotion and harmonisation of policies and strategies of member states.

¹ Institutional refers to the rules, regulations, agreements etc. Organisational refer to the organisations such as Departments, NGO's etc. Heading in National Framework refer only to institutional. Should read “*Integrated institutional and organisational capacity*”.

The Secretariat is a key organisation in coordinating drought risk reduction, early warning and regional drought response and food security. The Secretariat coordinate regional drought risk management issues and is therefore a key organisation in drought management.

4.3 Organizational arrangements - National

The primary responsibility for the implementation of the Disaster Management Act (Act 57 of 2002) lies with the Department of Provincial Government and Traditional Affairs (COGTA). The respective Provincial Disaster Management Centres (PDMC) together with the District Disaster Management Centres are therefore pivotal in the coordination and implementation of the Act within the Province. Drought management is complex with different line departments responsible for drought management at different sectors. It is important to recognise the mandate of the different disaster management centres to coordinate; NDMC at national level, PDMC's at provincial level and DDMC at district level.

The line departments responsible to develop drought management plans are the following:

- i. Prevention of land degradation and protection of our ecology falls within the mandate of **Department of Environment Forestry and Fisheries (DEFF)**. The DEA is mandated to give effect to the right of citizens to an environment that is not harmful to their health or wellbeing, and to have the environment protected for the benefit of present and future generations. Drought has a particularly devastating effect on the environment and the DEA therefore needs to develop a drought management plan with a focus on the protection of environmental resources.
- ii. Agricultural Drought: **Department of Agriculture, Land Reform and Rural Development (DALRRD)** is responsible for drought management at national level and must develop an agricultural drought sector plan. The **Provincial Departments of Agriculture and Rural Development (PDoARD)**, on the other hand, is primarily responsible for the development of provincial agricultural drought plans. The **District/Metro Disaster Management Centres (DDMC)** are responsible for the development of drought management plans at municipal level. Collaboration with extension officers and farmers (large and small) in the agricultural sector is essential in this regard. Other role players involved in agricultural drought management include the commercial farming sector as well as the small-scale and communal farming sector. That therefore includes the different farmers' organizations, commodity organizations and local municipalities as landowners of communal land.
- iii. Hydrological drought and bulk water supply is the responsibility of **Department of Human Settlements, Water and Sanitation (DHSWS)**. DHSWS is the custodian of South Africa's water resources and is primarily responsible for the formulation and implementation of policy governing the water sector. The DHSWS is responsible to ensure that all South

Africans have access to clean water and it promotes effective and efficient water resources management to ensure sustainable economic and social development. The provision of water to all sectors during extended dry periods remains a concern for DHSWS and the monitoring of major rivers dams and groundwater levels falls within the responsibility of DHSWS. Monitoring and early warning of water resource levels (dams, streamflow, and groundwater) is a particularly important responsibility of DHSWS. Monitoring is done through the national integrated water information system available on <http://niwis.dws.gov.za/niwis2/>. The DHSWS sector drought plan should focus on the management of all water resources and bulk water supply. This plan should follow the same format as proposed by the national drought plan.

- iv. Availability and distribution of clean drinking water is the responsibility at national level of the **Department of Cooperative Governance and Traditional Affairs (COGTA)** through the different municipal structures. Each municipality is therefore responsible for the development of drought management plans at the micro- and meso- level.
- v. **Department of Mineral Resources (DMRI)** is responsible inter alia for mainstreaming biodiversity considerations into the mining sector in order to mitigate impacts of mining on biodiversity.
- vi. **Department of Tourism** is an important Department in drought management in that drought and water shortages impact the tourism industry in a direct way

All the above-mentioned sector department plans overlap with each other and consultation and collaboration with all line departments are essential. Other organizations that is pivotal in drought management are:

- i. **South African Weather Service (SAWS)** is responsible for short term, medium term and long-term weather forecast and monitoring of weather and climate conditions. The SAWS should work closely with the different line departments and the different disaster management centres and must ensure efficient and effective dissemination of weather early warnings.
- ii. The **South African Satellite Agency (SASA)** is responsible for the provision of earth observation products that allows line departments, the disaster management organizations, research institutions and other to monitor the impact of dry periods and droughts.
- iii. **Research and supporting organizations** such as:
 - a. National Research Foundation (NRF)
 - b. Agricultural Research Council (ARC)
 - c. Water Research Council (WRC)
 - d. Council of Scientific and Industrial Research (CSIR)
 - e. South African National Biodiversity Institute (SANBI)

- f. South African Environmental Observation Network (SAEON)
 - g. South African National Parks (SANParks)
 - h. Human Sciences Research Council (HSRC)
 - i. Universities, and
 - j. other research organizations are responsible for research in order to improve the understanding of drought related challenges and solutions.
- iv. **Municipalities** must develop a municipal drought plan based on guidelines provided by the national drought plan and line department drought plans.
- v. **Water Users Organizations (WUO)** are established in terms of section 92 (1)(a) of the National Water Act (Act nr 36 of 1998) and their responsibility is to manage and regulate water at the micro level. Each of the WAU's is responsible for the development of a WAU drought plan based on guidelines provided in the national drought plan and the line department drought plan.
- vi. **ESCOM** utilise water for energy generation and water availability during dry periods might impact directly on national energy supply. ESCOM as a major water user in SA is therefore regarded as a key organisation in drought management planning.

4.3.1 Department of Cooperative Governance and Traditional Affairs (COGTA)

The mission of COGTA is to ensure that all municipalities perform their basic responsibilities and functions consistently by:

- i. Putting people and their concerns first;
- ii. Supporting the delivery of municipal services to the right quality and standard;
- iii. Promoting good governance, transparency and accountability;
- iv. Ensuring sound financial management and accounting; and
- v. Building institutional resilience and administrative capability.

The COGTA is home to the National Disaster Management Centre (NDMC) and Provincial Departments of Cooperative Government host the Provincial Disaster Management Centres (PDMC). The NDMC is established in terms of section 8 of the Disaster Management Act. The NDMC functions as a branch within the CoGTA.

4.3.1.1 National Disaster Management Centre (NDMC)

The NDMC is primarily tasked with disaster management coordination in SA. Key responsibilities of the NDMC are:

- i. Establish and maintain institutional arrangements
- ii. Implement measures that will provide for the development of progressive drought risk profiles to inform planning and implementation of drought risk reduction strategies
- iii. Monitor progress with the preparation and updating of drought risk management plans and strategies by organs of state involved in disaster risk management

- iv. Ensure the development, implementation and maintenance of drought risk reduction strategies, which will result in resilient areas, municipalities, communities, households and individuals
- v. Monitor the integration of drought risk reduction initiatives with development plans
- vi. Facilitate the development of drought response and recovery plans to ensure rapid and effective response to severe drought that are occurring or are threatening to occur and to mitigate the effects of those droughts that could not have been prevented or predicted
- vii. Provide support to provincial and municipal disaster management centres to implement awareness programmes for the purpose of drought risk reduction in communities exposed to specific hazards
- viii. Assist with the establishment of mechanisms for creating public awareness to inculcate a culture of risk avoidance
- ix. Guide the development of a comprehensive information management and communication system
- x. Make provision for a national education, training and research strategy with a focus on drought
- xi. Develop, implement and maintain dynamic drought risk management monitoring, evaluation and improvement programmes
- xii. Measure performance to evaluate effectiveness of drought risk management and risk reduction initiatives
- xiii. Monitor compliance with the Act, particularly sections 21, 56 and 57, as well as with the key performance indicators outlined in the national disaster management framework
- xiv. Make recommendations on the funding of drought management and initiate and facilitate efforts to make such funding available.

4.3.2 Department of Agriculture, Land Reform and Rural Development (DALRRD)

Due to its line function the DALRRD is primarily responsible for management and assistance with agricultural drought in close collaboration with Department of Human Settlement, Water and Sanitation (DHSWS), NDMC and other key role players. Key tasks linked to disaster management in DALRRD include the following:

- i. Early warning dissemination
- ii. Coordinating and developing of advisories
- iii. Monitoring and evaluation
- iv. Lead department for agricultural droughts
- v. Responsible for the implementation of the Veld and Forest Fire Act
- vi. Wild fire risk assessments, which is normally associated with dry periods
- vii. Development of climate change adaptation strategies and programs
- viii. Research and development

- ix. Guidance to provincial Departments of Agriculture and the Department of Rural Development regarding the implementation of drought risk reduction education and training programs amongst the farming community through extension services
- x. Drilling of boreholes or alternative water supply measures such as water tankers for agricultural communities, communal farmers and commercial farmers affected by prolonged and extreme drought disasters
- xi. Provision of emergency feed and fodder to farmers during disaster droughts
- xii. Determining of drought impacts on the agricultural sector
- xiii. Advise and support to the NDMC in the assessment of drought and declaration of drought disasters

4.3.3 Department of Environment Forestry and Fisheries (DEFF)

The DEFF is primarily responsible to mainstream environmental concerns in policy in all economic sectors. DEFF provides leadership and guidelines in environmental management and utilization, conservation and protection of ecological infrastructure. The DEFF is a key Department in building a drought resilience society and economy.

The strategic objectives of DEFF serve to increase drought resiliency in South Africa. Objectives directly linked to drought prevention and mitigation are:

- i. Legal Authorizations and Compliance Enforcement
- ii. Climate change and air quality management
- iii. Biodiversity and Conservation
- iv. Environmental programs. Important environmental programs directly increasing drought resiliency are:
 - a. Working for Water
 - b. Working for Land
 - c. Working for Ecosystems
 - d. Working for Forests
 - e. Working for Wetlands
 - f. Working on Fire
 - g. Maps on NRM Priority Areas
 - h. Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)
 - i. Man and the Biosphere Reserves Program
 - j. Transfrontier Conservation Areas

The DEFF is a key Department in the management of droughts at national level and should advise the NDMC and other role players regarding ecological impacts of drought. The DEFF is responsible for the ecological impact assessment of droughts. These assessments should accompany and support the socio-economical drought impact assessments to be completed by Agriculture, COGTA and Department of Social Development.

The DEFF is also the South African nodal point for the UNCCD and need to promote the international agreements on land degradation neutrality. Land degradation neutrality means “a state whereby the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales and ecosystems”. The development of a DEA drought plan would then have the land degradation neutrality theme as its core objective. See specific tasks for DEFF under KPA 2 and KPA 3.

4.3.4 Department of Human Settlement, Water and Sanitation (DHSWS)

DHSWS is responsible for management of SA water resources and national water management. DHSWS need to develop a drought management plans with a focus on groundwater, streamflow (rivers and streams) and potable water (dams). Key tasks of DWS directly linked to drought management includes:

- i. Monitoring and measurement of groundwater levels
- ii. Monitoring and measurement of stream flow in all major rivers
- iii. Monitoring and measurement of major dam levels
- iv. Control of water levels and discharge of major dams
- v. Monitoring of water use for irrigation, drinking water, mining and industry
- vi. Implementation of water use strategies
- vii. Drilling of boreholes or alternative water supply measures such as water tankers for communities and municipalities affected by prolonged and extreme drought

Government-owned Water Boards play a key role in South African water sector. They operate dams, bulk water supply infrastructure, some retail infrastructure and some wastewater systems. Some also provide technical assistance to municipalities. Through their role in the operation of dams they also play an important role in water resource management. The water boards report to the Department. There are 15 Water Boards in South Africa. The three Largest Water Boards- Rand Water in Gauteng Province, Umgeni Water in Kwazulu Natal Province and Overberg Water. All Water Boards should support DHSWS with drought risk reduction and drought early warning.

4.3.5 Department of Social Development (DSD)

DSD is focused on the social impact of hazards and disasters and they can provide emergency social relief: Examples are:

- i. Food parcels to the poor who are directly affected by drought
- ii. Support to farm labourers and farmers in cases of job losses as a result of extreme and prolonged drought

DSD should develop a drought social support and management plan that includes *inter alia* support to affected people during droughts. Job losses and food insecurity are the two major impacts on people as a result of drought. The drought social plan should provide for emergency funding and support to people directly affected by drought. Increased staple food prices are

regularly experienced during and after droughts and DSD should plan for these increased staple food prices for the poorest of the poor. DSD should also participate in drought coordinating structures at national, provincial and municipal level in order to determine real needs at grassroots levels.

4.3.6 South African Weather Service (SAWS)

The SAWS is primarily responsible for meteorological monitoring, forecasting and early warning of extreme weather conditions. Severe weather is an extreme meteorological event or phenomenon, which represents a real hazard to human life and property and has the potential to cause damage, serious social disruption, or loss of human life. The SAWS communicating several categories of information via various channels and these should be utilised as flood early warning mechanisms.

Some of the SAWS products are:

- **Special Weather Advisory:** an alert raising awareness up to 5 days in advance to either expected large scale **potential disruptive weather systems** that could later lead to specific watches/warnings with time, or to less urgent alerts of uncommon conditions.
- **Severe Weather Watch:** an alert calling for **preparedness** to weather hazards that most likely will occur within 1 to 3 days and that could lead to disruptive and disastrous conditions.
- **Severe Weather Warning:** an alert calling for **reaction due to a very high certainty** of a severe weather hazard that is already occurring or imminent within 24 hours and that could lead to disruptive and disastrous conditions.

Severe weather watches typically include the following:

- Disruptive snowstorms
- Heavy rain
- Flash flooding
 - Heavy rain leading to flash flooding (non-thunderstorms)
 - Localized flooding (non-thunderstorms)
- Severe thunderstorms
 - Hail, gusts, tornados, local flooding
- Strong winds (Gale force)
- Veld fire conditions (in collaboration with DAFF)

Special weather advisories typically include the following

- Intense large weather systems whose consequences could lead to warnings later
 - Tropical cyclones, tropical depressions, intense cold fronts, cut-off lows
- Extremely hot conditions
- High discomfort values
- Heat waves
- Strong interior winds

- Reduced visibility
- Widespread or coastal fog
- Frost – uncommon or first

The SAWS work closely with DWS who also monitor and control the larger dams for flooding. All the meteorological information and information regarding dam and groundwater levels and streamflow need to be communicated to NDMC who should perform the necessary analysis, monitoring and provide integrated early warnings.

4.4 National Intergovernmental Drought Management Structures

The NDMC is mandated to coordinate drought management in South Africa at national level with the provincial disaster management centres (PDMC) responsible for coordination at provincial level and district/metro² disaster management centres (DDMC) at district/metro level. The disaster management forums at national, provincial and municipal level are instituted to promote coordination and information sharing but have meetings once every quarter. Drought response and relief requires a more active and hands-on approach and the establishment of Joint Drought Coordination Committees (JDCC) at all spheres of government is therefore required during drought disasters. All line departments and role players in drought management should participate in the JDCC activities. The National Joint Drought Coordination Committee (NJDCC) should coordinate national droughts and should provide support during provincial droughts while the Provincial Joint Drought Coordination Committee (PJDC) have the responsibility for coordination of a provincial drought and support to district drought. The District Joint Drought Coordination Committee is responsible for the coordination of all drought relief and support activities within the district.

In order to ensure coordination of all sectors, *ad hoc* structures should be developed with the primary role of assisting the responsible departments with drought management in the province.

The following are proposed:

- i. National Joint Drought Coordination Committee
- ii. Provincial Joint Drought Coordination Committee at provincial level
- iii. District Joint Drought Coordination Committee at district municipality level
- iv. Drought Coordination Committee within each municipality
- v. Reference farms in each of the quaternary catchments. Reference farms are important for the management of agricultural drought
- vi. Drought Early Warning and Monitor Unit responsible for data capturing, analysis and early warning. Such a unit can be located within the Department of Agriculture or it can be outsourced to an institution with the capacity to maintain such a unit.

² District/metro is also referred to as municipal

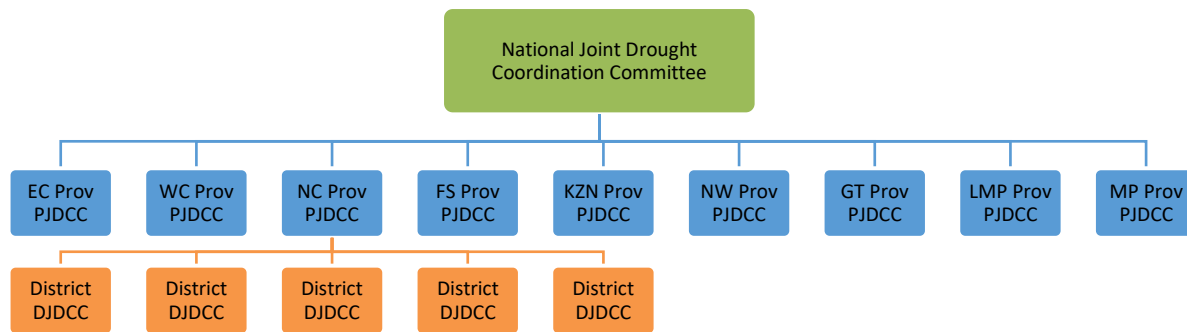


Fig 5.1: Drought Task Team structure

Organs of State participating in the NJDCC are the following:

- i. Cooperative Governance and Traditional Affairs (COGTA)
- ii. Department of Agriculture, Land Reform and Rural Development (DALRRD)
- iii. Department of Human Settlements, Water and Sanitation (DHSWS)
- iv. Department of Environment, Forestry and Fisheries (DEFF)
- v. Department of Health (DOH)
- vi. Department of Labour (DOL)
- vii. Department of Transport (DOT)
- viii. South African National Defence Force (SANDF)
- ix. Government Communication and Information Systems (GCIS)
- x. South African Weather Service (SAWS)
- xi. Provincial Disaster Management Centres (PDMC's)

Other members to be co-opted are:

- i. SALGA
- ii. AFASA
- iii. AGRISA
- iv. NAFU
- v. AGBIZ SA
- vi. Organised business
- vii. Co-opted experts as required

Membership and participation in the structures should be duplicated at provincial level.

4.4.1 Drought Mitigation Unit (DMU)


Since drought is the disaster in South Africa that impacted the most people and with the largest economic costs, a more specialised approach is required for drought mitigation. The NDMC should establish a Drought Mitigation Unit (DMU) within its own structures with the focus on drought management. The DMU should be established as a program or sub-program within the NDMC structures and staffed with technical experts. The DMU responsibility is as follows:

- i. Research on drought indicators for different droughts and propose the most relevant spatial and temporal drought monitor indicators
- ii. Continually monitor spatial and temporal drought related indicators
 - a. Design and develop software for data submission, data analysis and reporting
 - i. Develop e-based data submission system from reference farms to research unit
 - ii. Obtain inputs from other research stakeholders
 - iii. Process and analysis of data
 - iv. Report to different stakeholders
 - b. Integration of existing drought related indicators
 - c. Analysis of all drought related indicators
 - d. Compilation of integrated reports
- iii. Weekly drought advisories to relevant stakeholders such as NDMC, PDMC's, DEFF, DALRRD, PDoARD, DHSWS, organized agriculture and others regarding drought early warning and other related issues.

The Drought Mitigation Unit should provide the necessary early warning to the public and all stakeholders in case of a pending drought, based on the SPI and other indicators as well as feedback from reference farms and other sources. Once feedback is received conditions should be evaluated at quaternary catchment level or at municipal level for drought classification. The drought mitigation unit should have the capacity to analyse dry conditions and pending droughts in order to provide early warning in terms of food security, food prices, commodity expectations, drinking water risks, etc. This unit is also responsible for drought impact assessments. The DMU should be staffed with technical experts with a network of external experts who can provide advice and inputs from different sectors.

The proposed structure for the water/drought mitigation unit is illustrated in Fig 5.2

DMU as sub program within NDMC and PDMC



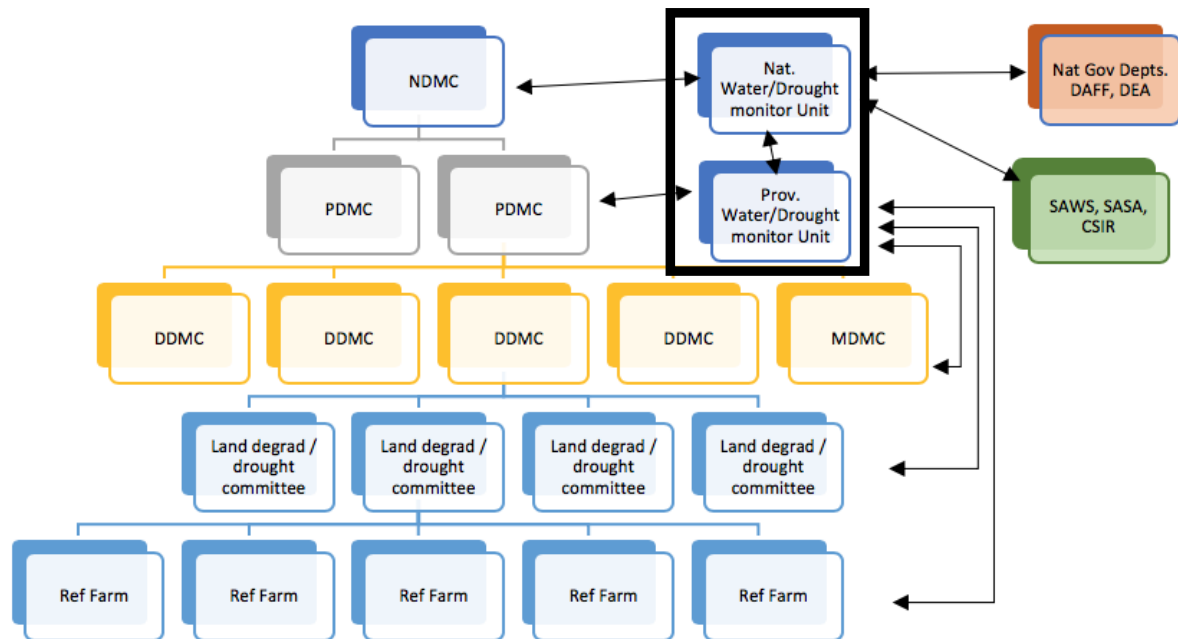


Fig 5.2: Drought Management Structure

The national drought mitigation unit is responsible for data gathering and consolidation of national based data while the provincial mitigation units will consolidate and assess provincial level data. Farm and municipal level data will also be analysed at the provincial drought mitigation units and consolidated at national level.

4.5 Organizational Arrangements - Provincial

This section deals with drought governance at provincial level. The proposed institutional organization and framework is illustrated in Figure 4.2. A Provincial drought strategy and plan is imperative for efficient drought governance in all Provinces. The Provincial Departments of Agriculture and the PDMC are the two key institutions responsible for drought governance and management in the province.

4.5.1 Provincial Disaster Management Centre

The role of the PDMC is mainly coordination and support to all provincial departments, district municipalities, local municipalities and the private sector in drought management issues. The role of the PDMC in the context of droughts is as follows:

- i. Coordinate and maintain drought early warning systems in collaboration with SAWS, DALRRD, DHSWS and provincial line departments
- ii. Coordinate drought relief and response in collaboration with municipalities and provincial line departments
- iii. Ensure inter-institutional collaboration and coordination
- iv. Develop and maintain an all-inclusive provincial drought management framework and plan
- v. Conduct an all-inclusive drought risk assessment for the province

- vi. Coordinate, maintain and implement drought risk reduction awareness, training and education programmes in collaboration with other role players
- vii. Include drought issues (drought early warnings, drought risk reduction, awareness, monitoring and drought relief) as a standing point on the agenda of the provincial disaster management forum
- viii. Execute administrative responsibilities for disaster declaration and relief activities

4.5.2 Provincial Departments of Agriculture and Rural Development (PDoARD)

The PDoARD deals primarily with agriculturally related droughts³ and is the leading agent for agricultural related drought issues. The PDoARD is responsible for the following:

- i. Development and maintenance of a provincial agricultural drought management plan that includes:
 - a. Drought risk assessment
 - b. Drought risk reduction plan
 - c. Drought response plan
 - d. Drought relief and recovery plan
- ii. Actively participate in the provincial interdepartmental working group on droughts (Provincial Drought Task Team)
- iii. Determine a research agenda and research needs on agricultural drought related issues
- iv. Assist district municipalities and the farming sector with drought risk assessments
- v. Develop and execute extension programmes with a focus on drought risk reduction and agriculture best practice in given climate zones
- vi. Promote conservation farming principles for drought mitigation and sustainable land use
- vii. Lead education and awareness programmes for drought risk reduction in collaboration with the PDMC and other role players
- viii. Provide additional extension services with focus on conservation farming and good agricultural practices to small-scale and communal farmers
- ix. Provide additional support to communal farmers in terms of markets and timely marketing of animals during dry periods
- x. Participate actively in disaster management forums at provincial and district levels
- xi. Develop and implement a system for drought monitoring and evaluation
- xii. Develop and implement an information management system
- xiii. Develop and maintain a drought early warning system in collaboration with the DAFF, SAWS, DWA and the PDMC
- xiv. Compile vegetation indicator maps by using technology available at national and provincial level as well as other research institutions

³ Note the difference between agricultural related droughts and agricultural droughts according to the definition.

- xv. Disseminate timely information amongst all clients
- xvi. Provide provincial guidelines for drought classification in line with national guidelines
- xvii. Apply and monitor dry periods according to agreed upon national guidelines
- xviii. Ensure and monitor timely destocking of animals during dry periods
- xix. Compile drought impact assessments and source funding for drought relief and response in collaboration with the PDMC. The following should be adhered to:
 - a. Coordinate drought relief applications
 - b. Evaluate and verify drought relief applications
 - c. Conduct the damage costs and a cost benefit analysis
 - d. Prepare reports
 - e. Maintain records
 - f. Verify impact assessments and prepare final reports for drought relief assistance at national level in collaboration with the PDMC
- xx. Coordinate and manage drought relief in collaboration with the relevant DDMC and the PDMC. The following should be adhered to:
 - a. Management and control of funds according to guidelines from Treasury and the Auditor General
 - b. Record keeping
 - c. Timely and efficient support to farmers according to drought relief guidelines
 - d. Appoint and pay service providers to deliver services to affected farming communities
- xxi. Ensure sufficient capacity for drought management
- xxii. Provide the necessary funding to develop and maintain an online facility for the capturing of farmer data
- xxiii. Provide funding for the development of a departmental or outside facility for the monitoring and maintaining of meteorological and on-farm data from reference farms

4.5.3 Provincial Joint Drought Mitigation Committee (PJDC)

The PDMC is responsible for the establishment and support to a Provincial Joint Drought Coordination Committee (PJDC). This group should be multi-disciplinary and should consist of the following representatives:

- i. Provincial Disaster Management Centre, PDMC (Chair)
- ii. Provincial Department of Agriculture and Rural Development
- iii. Regional representatives of DHSWS
- iv. Dept. Social Development
- v. Organized Agriculture (Provincial bodies of AGRISA, NAFU and AFASA)
- vi. Water User Associations
- vii. SAWS

- viii. Representatives from large water users in Industry and Tourism in the province
- ix. Specialists co-opted from Industry, Higher Education, and Research Institutes etc.
- x. District disaster managers

The role of the Provincial Drought Task Team is as follows:

- i. Assist the PDMC with the coordination of the development and implementation of a detailed drought plan at all governance levels in each province
- ii. Assist the PDMC with the updating and roll down of drought risk assessments at provincial and municipal level
- iii. Provide guidance and advise to the HOD of PDoARD and HOD of COGTA with regards to drought declaration
- iv. Provide guidance and advice to the HOD of PDoARD and HOD of COGTA with the application and approval of relief schemes
- v. Provide guidance and advise to the PDoARD and the HOD of COGTA with regards to mitigation and prevention programmes
- vi. Review and recommend on the effectiveness of early warning systems
- vii. Recommend on the improvement of drought plans
- viii. Assist in the province the agricultural sector, municipalities, industry, mining and tourism with drought impact assessments
- ix. Provide guidance and assistance in the province to agriculture, municipalities, industry, mining and tourism during drought relief and response

4.5.3.1 Provincial Drought Coordinating Structure

Drought coordinating structures allow different organisations to work together in mitigating the negative impacts of drought at local level. These structures are not permanent and is activated by the disaster management structures at all governance levels or by other organisations under special conditions. The coordinating structures shall play a critical role in drought risk reduction as well as in drought response.

The proposed structure is illustrated in Figure 4.

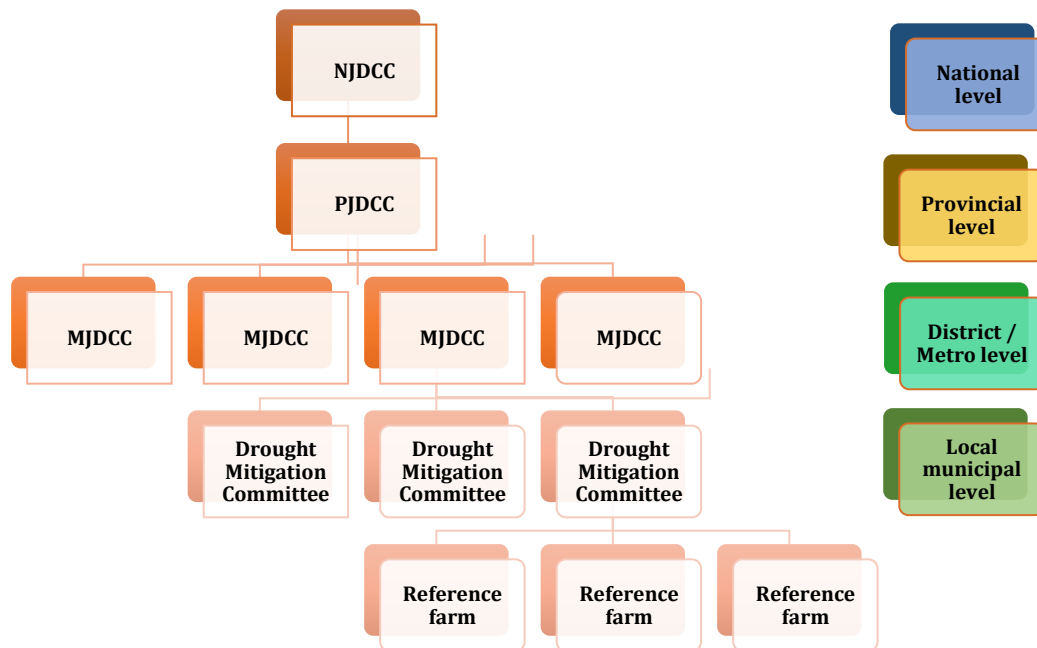


Fig. 5.2: Proposed provincial structure for drought governance

4.6 Organizational Arrangements – Municipal level

“Water Services Authorities (WSA) are defined as any municipality responsible for ensuring access to water service in the Act, may perform the functions of a Water Service Provider, and may also form a joint venture with another water services institution to provide water services. In providing water services, a water services authority must prepare a water service development plan (WSDP) to ensure effective efficient, affordable and sustainable access to water services. The WSDP should be in line with the catchment management strategy of that water management area. The plan provides a linkage between water services provision and water resources management.”

4.6.1 Municipalities

Municipalities and Water Service Authorities (WSA) are responsible for water distribution and water provision to its inhabitants and businesses within its municipal borders. Specific drought management tasks for municipalities include the following:

- i. Provide sufficient and clean water to business and all inhabitants
- ii. Monitor municipal bulk water resources
- iii. Maintain water infrastructure
- iv. Prevent and manage leakages
- v. Develop new water infrastructure according to developmental requirements
- vi. Develop municipal guidelines and by-laws for water management
- vii. Implement and enforce by-laws for water management during dry periods

- viii. Participate in drought relief activities coordinated by the MJDCC
- ix. On communal land owned by the municipality:
 - a. Provide drinking water for animals through the development and maintenance of a water reticulation system
 - b. Enforce by-laws and drought regulations as prescribed by DAFF and the PDoARD
 - c. Prevent over-grazing

4.6.1.1 Metropolitan municipalities

Metropolitan Municipalities are supported by the different Water Boards but drought risk assessment, drought management plans, drought contingency plans and drought relief remains the responsibility of the municipality. Water control mechanisms and by-laws dealing with water should be developed in collaboration with the Water Boards but enforcement of by-laws remain the responsibility of municipality. The following are some of the responsibilities of metropolitan municipalities:

- i. Provide information concerning drought in the municipal area
- ii. Conduct detailed drought risk assessments at municipal level
- iii. Develop municipal drought mitigation and drought disaster response plan
- iv. Provide management guidelines for business, industry, mining, tourism and water for domestic use for each drought category
- v. Assist the PDMC and other role players with dissemination of information
- vi. Assist business, industry, tourism, mining and communities with sector specific or local drought management plans
- vii. Coordinate and collaborate with the PDMC, DWS, DSD, NGO's and private sector on drought relief and response actions within municipality
- viii. Establish and lead the m municipal drought task team
- ix. Assists the PDMC and other role players with data gathering and data storage

4.6.1.2 District municipalities

District municipalities are mandated according to the NDM Act (Act 57 of 2002) to coordinate disaster management at district and local level. They should play a pivotal role in drought management as follows:

- i. Provide information concerning drought in the municipal area
- ii. Conduct detailed drought risk assessments at district level
- iii. Develop district drought mitigation and drought response plan
- iv. Provide management guidelines for business, industry, mining, tourism and water for domestic use for each drought category
- v. Assist the PDMC and other role players with dissemination of information
- vi. Assist local municipalities with local drought management plans

- vii. Coordinate and collaborate with the PDMC, PDoARD, DWS, DSD, NGO's and private sector on drought relief and response actions within district
- viii. Establish and lead the district drought task team
- ix. Assists the PDMC and other role players with data gathering and data storage

4.6.1.3 Local municipalities

Local municipalities as WSA's are responsible to provide clean drinking water to all people within its urban boundaries. Municipalities also own the communal land within its boundaries and as landowners they are responsible for the sustainable use of its resources. Local municipalities should contribute to drought risk reduction as follows:

- i. Maintain and upgrade water infrastructure within its boundaries
- ii. Ensure that all people within its area of responsibility have clean and safe drinking water at all times
- iii. Facilitate and update a municipal level drought risk assessment
- iv. Develop drought mitigation and prevention plans. These plans should include:
 - a. Monitor systems
 - b. Contingency plans for breakages in infrastructure
 - c. Water infrastructure maintenance plan
 - d. Water provision contingency plan during water shortage periods
- v. Develop and enforce water management rules and regulations for different drought categories
- vi. Ensure the existence of lease and usage contracts for the use of commonages (land belonging to municipality)
- vii. Maintain infrastructure such as fences and water provision on commonages (land belonging to municipality)
- viii. Ensure the sustainable use of resources by applying grazing capacity guidelines as provided by the PDoARD
- ix. Prevent overgrazing of commonages
- x. Ensure the application of good agricultural practices on all commonages
- xi. Provide support to extension officers in extension programmes directed at communal farmers
- xii. Assist the PDoARD in the control and distribution of emergency feed and fodder supplies
- xiii. Assist communal farmers with marketing channels for animals
- xiv. Develop drought management plans for commonages. These plans should include:
 - a. Drought risk assessment of commonages
 - b. Drought risk reduction plan
 - c. Drought relief plan

d. Drought recovery and rehabilitation plan

4.6.2 Municipality Joint Drought Mitigation Committee (MJDMC)

The Municipal Joint Drought Mitigation Committee (MJDMC) or Land Degradation Committees at local level will play an important role in monitoring drought through monitoring land degradation, soil erosion, invasive species monitoring, overgrazing etc. These committees will also ensure proper drought relief coordination at local level and they are the ones that will help in the identification of reference farms. The former soil conservation committees (Act 43, art 15 of 1983: Conservation of Agricultural Resources) used to play an important role in monitoring land degradation and the MJDMC might have similar responsibilities.

The MJDMC shall also assist the MDMC to coordinate all drought relief and response activities. Normal drought awareness programs, monitoring, education and training remains the responsibility of line departments and the municipality. The MJDMC is therefore an ad hoc team who, as individuals or collectively monitor drought at local level and is activated during dry periods and drought disasters in order to coordinate relief efforts from all line departments and the municipality.

i. Representatives

- a. Municipal Disaster Manager (Chair)
- b. Agriculture District Manager (Co- Chair)
- c. DEFF regional representative
- d. DHSWS regional representative
- e. DSD regional representative
- f. Extension Officer
- g. Organized Agriculture (District Farmers Association, AFASA, NAFU)
- h. Local Business
- i. Traditional leaders where applicable
- j. Water Boards
- k. Local Water Users Association
- l. Community leaders
- m. Experts as required

ii. Tasks

- a. Monitor drought for risk reduction
- b. Monitor land degradation
- c. Coordinate drought relief actions
- d. Support and advice to extension officers
- e. Local identification of reference farms in collaboration with District Farmers Associations

- f. Local coordination of reference farms in collaboration with District Farmers Associations
- g. Support the PDMC and MDMC during the process of drought declaration
- h. Support the PDMC and MDMC with coordination of all drought relief actions at district and local level
- i. Reporting to representing structures
- j. Monitoring of local conditions
- k. Validating local conditions
- l. Assist with coordination of drought relief actions (e.g. fodder distribution etc.)

4.6.3 Farming sector

Commercial agriculture is well organized with farmers associations, regional representative structures and Provincial Agricultural Unions at provincial level. The different commodity organizations are part of the commercial farming sector. Assistance to this sector is in accordance to the Disaster Management Framework.

Organized agriculture already plays an important role in agricultural drought planning and they are responsible for the following:

- i. Maintain and expand the reference farm scheme to ensure representatives from at least all quaternary catchments
- ii. Motivate all farmers to support the reference farm scheme
- iii. In collaboration with the PDoARD and PDMC, computerize the reference farm information system for easy analysis and as an early warning and drought monitor mechanism. The PDoARD and or the PDMC should provide the necessary funding to develop and maintain an online facility for farmers to submit the necessary meteorological and on-farm data.
- iv. Provide advice to government with drought declaration through the provincial and district drought task teams
- v. Provide support to government with administration of relief schemes. Data capturing regarding drought impacts remains a challenge and organized agriculture should assist the PDoARD with the capturing and verifying processes.

In order for the sector to be considered for drought relief and assistance, they should have:

- i. Adapted agricultural practices to climatic conditions with sustainable resources use in mind
- ii. Applied drought prevention and -mitigation strategies
- iii. Followed good agricultural production practices
- iv. Utilized early warning in their planning

The commercial farming sector is divided numerous agricultural systems, namely irrigation farming, which is highly intensive and depends largely on water from reservoirs, rivers or groundwater, the extensive livestock farming sector, which consists of small-stock, large-stock

and game farming, and rain fed farming which is mostly characterized by crop production. All sectors should treat water as a scarce resource and should adhere to the following:

- i. Introduce technology that introduces the efficient use of water such as drip irrigation, where possible
- ii. Maintain own water reticulation infrastructure to prevent unnecessary leakages and water wastages
- iii. Adhere to allocated water quantities according to DWS allocations
- iv. Adhere to the prescriptions of the National Water Act (Act 36 of 1998)

Extensive stock farmers should adhere to the following in order to be considered for drought relief and support:

- i. Updated and valid stock counts should be kept at all times
- ii. A register of all stock including purchases, sales, progeny and mortalities should be kept for at least 12 months prior to a drought application
- iii. Fences and water reticulation systems, whether privately owned and erected or erected with government subsidy, must be maintained and secured at all times
- iv. Good agricultural, including grazing, principles should be applied and adhered to. Overgrazing will lead to forfeiture of assistance
- v. Farmers must adhere to the national grazing capacity guidelines
- vi. Farmers must reduce animal numbers according to guidelines provided by DARDLR and PDoARD after drought early warnings issued by the PDoARD. Current guideline are a 30% reduction in animal numbers, but this should be phased in according to veld conditions of individual farms
- vii. The purpose of drought relief schemes must consider the sustainable use of natural resources
- viii. The maximum number of livestock to be considered for governmental drought relief schemes is 200 LSU. Drought relief and drought support is regarded as a safety net for farmers to maintain a minimum production capacity. Government recognizes the limitations of drought support in that not all farmers will be able to recover fully to the same state as before from the impacts of drought.

4.6.4 Reference Farms

Reference farms also called monitor farms is a key element of drought management in that it provides information and the opportunity to benchmark drought resilience. The next section deals with the characteristics and contribution of reference farms in a national drought management system.

4.6.4.1 Objectives

The objective is to formalize and implement a system of reference farms based on practical experience and research over a long period of drought management. Reference farms are those particular farms chosen in a catchment area, on the basis that a farmer is prepared to collect and supply data on rainfall, carrying capacity, veld condition and other scientific information according certain terms and conditions, in collaboration with the PDoARD. Data will be submitted on a regular basis via the Internet on a web-based system. This data will be analysed, processed and used as a source for drought early warning.

A service provider from a reliable research institution to be appointed will be responsible for the capturing, processing and analysing of the data and to advise decision makers as an early warning message on the deterioration of veld and drought conditions, and the declaring of drought as disasters as part of the Disaster Management Act, 2002.

Furthermore, the system of reference farms can contribute to an effective determination of carrying capacity for the different catchment areas, and could act as a stimulus for farmers to farm on a sustainable basis and to use risk mitigation measure.

4.6.4.2 Geographic selection

Reference farms must be as representative to a specific climate zone as possible. One acknowledges the fact that rainfall is not always the same on all farms within a specific region. In order to ensure proper provincial coverage the quaternary catchments should be used as the preferred region for sampling reference farms. At least one reference farm should be sampled from each quaternary

4.6.4.3 Profile of Reference farms

The natural resources on the reference farm must be representative of the specific catchment. The most notable natural resources are veld type, water supply, soil type, geographical features as well as the farming system.

The farmer (owner or lessee), called the participant, must be willing and able to keep records and provide data on at least a weekly basis. The participant must apply good agricultural practices according to the norms and climate conditions of the specific region. In addition, the participant must be connected or have access to the Internet in order to provide and upload data on a regular basis.

4.6.4.4 Responsibility of participants

Participants in the drought monitor and early warning project must:

- i. Supply daily meteorological data on at least a weekly basis. The possibility of automatic meteorological data capturing mechanisms should be discussed with SAWS.

- ii. Supply an inventory of all animals and movement of animals in terms of progeny, sales and purchases on the farm, i.e. sheep, cattle, horses, donkeys, ostriches and game (Values according to the present Meisner tables or as reviewed).
- iii. Adhere to the carrying capacity according to the norms of the PDoARD and DAFF over a twelve-month cycle. As a farmer who applies good agricultural practices he/she will under-graze some years and overgraze other years, depending the condition of the veld and climate conditions. Therefore the carrying capacity will be exceeded some years etc. The baseline veld condition on a specific farm differs from others and not all farms have the same carrying capacity, but good agricultural principles apply.
- iv. Comply with good farming practice (e.g. veld management system) as approved by the PDoARD.
- v. Comply with the protocols provided by the service provider and the PDoARD.

Extension Officers and the Soil Conservation Committees will play a vital role in the role-out of the scheme and overseeing measures.

4.6.4.5 Functioning

Participants will have to upload the prescribed information to the early warning research unit through a prescribed web-based programme. By default, the system will automatically remind participants of any non-compliance. This could have a detrimental effect on those farms coupled to the particular reference farm, as they are also dependent on the results obtained through the scheme and it might jeopardize the outcome of the advice to the decision makers as far as financial assistance is concerned in case of required drought assistance.



5 KPA 2: Drought Risk Assessment

The main objective of KPA 2 is to establish a uniform approach to assessing and monitoring drought risks that will inform drought risk reduction and drought response management by provincial organs of state and other role players. The first step in the development of a drought management plan is the drought risk assessment. Scientific drought risk assessment should be conducted at national, provincial level and also at micro level (District level at least)⁴. Drought risk assessment is not a once-off activity with the purpose of identifying priorities and sensitive indicators; it is a continuous process that includes monitoring and evaluation of drought risk indicators.

Drought risk is a function of the frequency of occurrence and the severity and duration of dry conditions and the vulnerability and capacity to manage dry periods, of the affected sectors (Knutson *et. al.*, 1998: Jordaan, et al, 2017). Following the notion that risk assessment starts by evaluating the hazard and its corresponding vulnerabilities and manageability's, potential impacts across drought types are discussed.

Drought disaster risk to any sector indicates the potential threat and direct endangerment to health and production. A drought disaster is not only the result of climatic elements such as precipitation, temperature, aridity, etc. Elements such as regional economic development, management systems, early warnings, water infrastructure maintenance, bulk water supply, land-use, vegetation composition, and a number of other indicators also determine drought risk. The extent of drought disaster risk is mainly decided by variables such as frequency, duration and intensity of dry periods, the spatial extent of damage caused by drought (i.e., the area affected by drought) and the regional economic activity (Zhao & Yao, 1992; Zhang, 1995). Many of the tools used to manage drought risk are enhancements of basic management procedures that have been carefully planned to reduce the likelihood of an adverse event. Examples of these risk management tools include (i) reduction of leakages in water reticulation systems through proper maintenance, (ii) water saving mechanisms, (iii) additional water provision techniques, (iv) reduction in pasture stocking rates, (v) adjustment of farming system in order to adapt to dry conditions.

Drought risk assessment can be defined as the process of identifying, quantifying, and ranking the vulnerabilities and capacities in a drought scenario (Jordaan, 2011). It involves the following:

- i. Assess potential drought hazard threats to all sectors
- ii. Undertake a vulnerability assessment (socio-economic and institutional analysis)

⁴ The absence of a scientifically based risk assessment is not an excuse for non-compliance to the development of drought management plans.

- iii. Estimate time of exposure (climate forecast)
- iv. Define capacities and measures to be taken.

The disaster risk assessment methodology as stipulated in the National Disaster Management Framework (NDMF, 2005) is shown in Figure 5. This model was used as a framework for calculating drought risks. Stage one provided valuable information for the Phase 1 assessment and included a drought hazard and vulnerability assessment, a literature study and a desktop review.

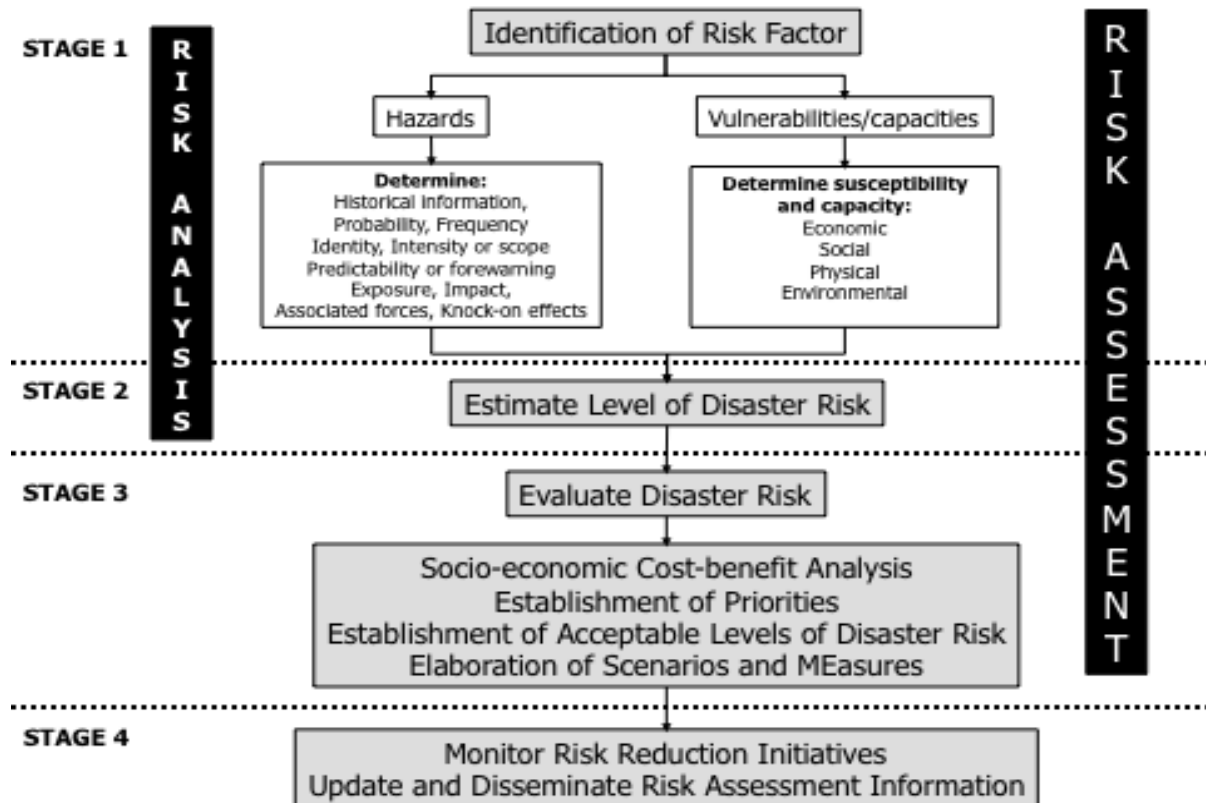


Fig. 5.3: Disaster Risk Assessment Methodology

(Source: NDMF, 2005)

In the case of drought, the main determinant for hazard assessment is a water deficit for normal production and water supply resulting from too little precipitation and evapotranspiration being too high. These factors are assessed by means of historical meteorological data, on-site inspections of affected areas or sectors, modelling of impacts and contributions from focus groups and stakeholders.

Vulnerability depends on the region's environmental and social characteristics and is measured by the ability to anticipate, deal with, resist, and recover from the drought. This background helps in bridging the gap between identifying the impact severity and the policy development process by focusing on the causes of this vulnerability, rather than the actual impacts (Knutson *et al.*, 1998).

Common drought impacts are categorised as (i) economic, (ii) environmental, and (iii) social. Economic impacts are wide-ranging and frequently include agriculture losses in crops and livestock, industrial losses in timber and fishery production, a geographically specific decline in the tourism and recreation industry, and the decline in relevant food production. Commonly observed environmental impacts include damage to animal and plant species, soil erosion and depletion, loss to wetlands, increased incidence of wild fires, and overall biodiversity losses (Commission on Water Resource Management, 2003). Social impacts also vary considerably, with the most pressing being health related problems including nutrition depletion, indirect increases in vector borne disease concentrations, and ultimately loss of human life (CWRM, 2003). Impact priorities depend on economic cost, the extent of impacted areas, immediacy, public opinion, size of impacted populations, and the ability of the impacted areas to recover. The following should be noted:

- i. **Economic vulnerability** to drought refers to the vulnerability of the economy of communities, towns, districts and different sectors to droughts. Direct economic loss during extreme droughts can be calculated by, for example, (i) reduction in tourism activities, (ii) reduction in income from tourism, (iii) production loss in industry depending on water supply, (iv) production loss in livestock farming (wool and mohair (kg/unit animal), meat production (kg/ lamb or calves weaned), progeny (number of animals born), mortality (number of animals died)), (v) additional feed and fodder purchases, (vi) crop production losses, and (vii) increased food prices especially staple food prices such as maize meal. Intangible elements such as progeny the following season are not visible immediately during and immediately after the drought disaster, but have a huge impact on farm profitability. Other intangibles include loss of markets due to under-supply during extreme droughts, creating opportunities for other suppliers to enter the market, or consumers possibly moving to alternative products when prices become too high during periods of under supply (NDMC [US], 2006; Jordaan, 2011). Other economic impacts of drought disasters include the possible loss of jobs, resulting in lower than normal turnover in small towns and communities (ECLAC, 2009; Jordaan, 2011). The economy of most rural towns depends on the agricultural sector, therefore agricultural droughts impact directly on businesses in those towns.
- ii. **Environmental vulnerability** to drought refers to the susceptibility of the environment, and more specifically the vegetation, to the impact of a severe drought. Severe droughts could result in soil degradation through wind and soil erosion, bush encroachment and the extinction of certain species. Locusts, in combination with drought, could damage the vegetation cover to such an extent that it takes many years to recover to its original state (NDMC [US], 2006).

- iii. **Social vulnerability** to drought refers to the vulnerability of individuals, farmers, farm workers and the local community to the negative impacts of a severe drought. Severe drought may cause high stress levels, affecting the health of people and might also influence sound decision making potential because of stress (NDMC [US], 2006). Furthermore, it may result in job losses and may ultimately affect the local community due to the economic slowdown of a small town.

After generating a priority list of impacts, the bulk of the vulnerability assessment can be conducted. The vulnerability assessment's focus is identifying the causes of the prioritized drought impacts, hence bridging the gap between impact identification and the policy formulation phase of drought risk assessment (CWRM, 2003). Knowing that a particular sector is vulnerable to drought impacts is only one component of understanding drought risk. Establishing drought event frequency is the other key component. Evaluation of the different capitals available to manage drought risk is a valuable tool for drought risk assessment. The ten capitals are the following:

- i. Human
- ii. Social
- iii. Cultural
- iv. Economical
- v. Natural
- vi. Infrastructure
- vii. Technology
- viii. Organizational
- ix. Institutional
- x. Political

Coping capacity, adaptation or resilience is as important as vulnerability and is included as major indicators for drought risk reduction.

6 KPA 3: Drought Risk Reduction

Drought risk reduction encompasses all actions that reduce the risk of dry periods or droughts to (i) communities, (ii) municipalities, (iii) business, (iv) mining, (v) industry, (vi) the energy sector, (vii) farming enterprises, (viii) livelihoods, (ix) tourism, (x) food security or (xi) the economy at large. Strategies or activities should include (i) prevention, (ii) mitigation, (iii) adaptation, (iv) avoidance, (v) adjustment, or (vi) consumption smoothing through insurance etc.

Most effort and funding should be allocated to risk reduction strategies. As a general rule one can expect a seven- to ten-fold saving on capital expenditure on risk reduction instead on relief and recovery.

The main objective of KPA 3 is to ensure that all drought management stakeholders develop and implement integrated drought risk management plans and risk reduction programmes in accordance with approved guidelines.

The focus of drought risk reduction is the prevention and mitigation of the potentially devastating impacts of drought. This should be achieved mainly through the application of good water management practices in all sectors. Drought risk management is the responsibility of each (i) individual, (ii) farmer, (iii) business, (iv) mine, (v) water management authority, (vi) municipality, (vii) land owner or any organization affected by water supply. Business, communities, municipalities, farmers and others should adapt to their local climatic conditions and ensure adequate adaptation and coping mechanisms. Resilience should be enhanced through the timely application of risk reduction measures such as insurance, water saving mechanisms, water management by-laws, and reserve inputs for dry periods and implementation of climate-smart conservation agriculture (CSCA)⁵. CSCA address food security climate changes and the restoration of natural resources. CSCA rest on five pillars namely (i) sustainable increase in agricultural productivity and income, (ii) sustainable use and restoration of natural resources, (iii) adapt and build resilience to climate change, (iv) reduce and or remove greenhouse gas emissions where possible, and (v) ensuring and providing a decent livelihood for those who work the land. Extension services play a critical role in the transfer of knowledge about drought management in the farming sector.

The following should be addressed in the drought risk reduction plan

- i. Early warning systems
- ii. Data gathering, analysis and dissemination needed for planning
- iii. Adaptation, mitigation and prevention strategies
- iv. Extension programmes
- v. Research programmes
- vi. Maintenance programs for water infrastructure

⁵ CSCA combines the principles of climate smart agriculture and conservation agriculture

- vii. Planning for water demand/supply ratios during dry periods
- viii. Mainstream gender in drought risk reduction programs

6.1 Early Warning and Monitoring

Drought is a slow onset disaster and should be managed according to a common classification system. Early warning is possible through several well-developed indicators, which are monitored by the SAWS and the ARC and should also be the responsibility of the Drought Mitigation Unit (DMU). The objective of drought early warning is to warn water users when there is a risk of dry periods or drought. Reliable drought early warning will allow water users to prepare and increase resilience to potential water shortages, crop losses and food shortages. Drought early warning is particularly important for agriculture and water resource management.

The drought classification and indicators with thresholds provide a sound basis for early warning strategy. Technical experts at the DMU should analyse (i) meteorological forecasts, (ii) drought indicators, (iii) available data, (iv) warning signals and (v) information from reference farms and prepare sector specific warnings to the different economic sectors and communities.

6.2 Drought Classification

Drought classification should rely on experts who synthesize the best available data from multiple sources and work with local observers to localize drought information as much as possible. Numeric inputs are the (i) Standardized Precipitation Index, and other climatological inputs, (ii) the drought Index for fire, (iii) satellite-based assessments of vegetation health, and various indicators of (iv) soil moisture from data assimilation systems and other models, (v) groundwater data, and (v) hydrologic data.

Drought is a slow onset disaster with long-term consequences. The first rain during a D3 and D4 drought might end the meteorological drought but not the agricultural drought and especially not the socio-economic drought. The end of the hydrological drought also only occurs during the fill-up of the reservoirs and increased stream flow. The declassification of droughts therefore needs to consider the lag effect of a particular drought; for example, grass can take 3 months to recover after the first rains and the socio-economic impact of drought are normally felt two or more years after the drought and in the case of D3 and D4 drought the impact can be seen on average five years after the drought. Livestock farmers reported that in the case of D4 drought most farmers do not recover fully especially when they have to sell breeding stock and when they lack the necessary resilience to withstand such a drought. In such cases government safety nets must be activated to support the agricultural sector. The 1992/93 drought is such an example where the South African Government supported the agricultural sector and Agricultural Cooperatives on a large scale. The different drought categories and duration of different types of drought is illustrated in Figure 6.1.

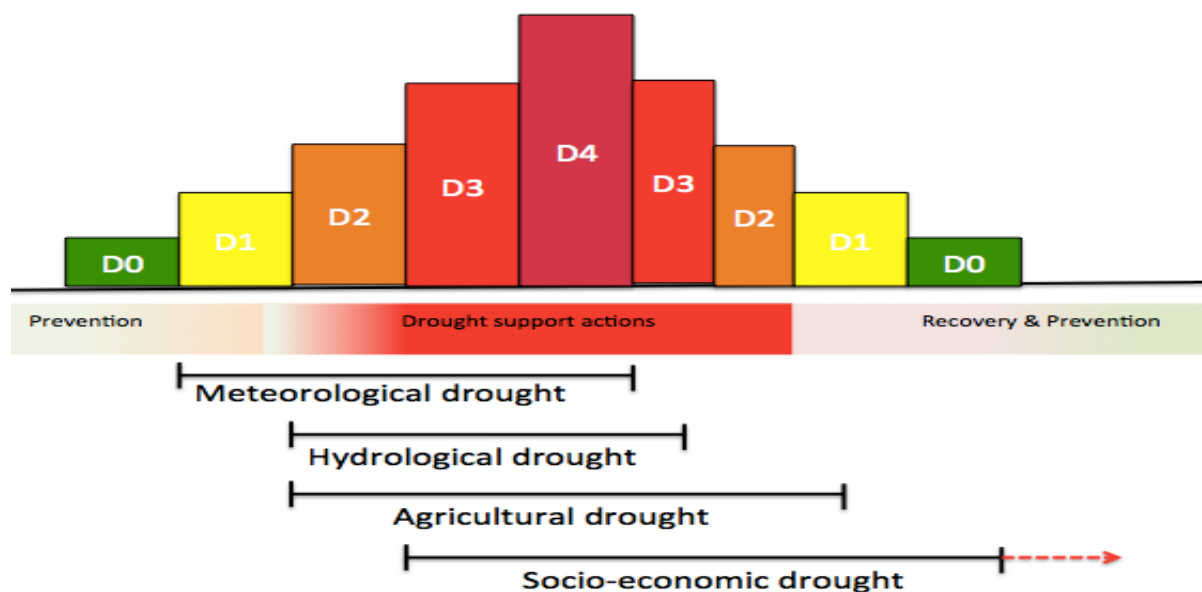


Fig. 6.1: Illustration of drought classifications

Disaster drought declaration is imminent during drought phase D2. During D2 the communal and small holder agricultural sector might already require external assistance. Disaster drought declaration is required for phases D3 and D4. Drought phase D4 might require extreme response and recovery measures in order to secure long-term sustainability of the agricultural sector. Towns and some communities might be without drinking water and government at all levels should impose extreme water restriction measures and initiate activities to supply daily water requirements.

Important for the determination of different drought categories are the indicators and thresholds to measure the different droughts. The following section deals with drought indicators and also highlights the indicators and thresholds proposed for South Africa drought monitoring. The different types of drought are linked to the different indicators with the primary indicators as follows:

- i. **Meteorological drought:** meteorological indicators such as percentage of rainfall and the Standard Precipitation Index (SPI) or the Standard Precipitation Evaporation Index (SPEI).
- ii. **Agricultural drought:** Remote sensing satellite indices such as the vegetation condition Index (VCI) and percentage of Average Seasonal Greenness (PASG).
- iii. **Hydrological drought:** Actual measurements of dam levels, stream flow and groundwater levels are used to measure hydrological drought. Measurement of agricultural droughts is also done through secondary indicators such as actual veld condition, grazing reserves, drinking water, and animal and crop condition.
- iv. **Socio-economic drought** is only measurable through secondary indicators such as impact on individual farmers and the regional and larger economy.

The different drought categories are:

- D0 Dry:
- D1 Moderate drought
- D2 Severe drought
- D3 Extreme drought
- D4 Exceptional drought

Drought monitoring and drought assessment require the integration of all information such as indices and impact indicators in a comprehensive framework. Drought monitoring through indices alone, does not constitute drought risk since the impact (vulnerability) of different sections (economic, social, environment) needs to be linked to the “*hazard*” or the lack of sufficient amounts of water, which are indicated through the different indices. The data used for the risk assessment should be statistically coherent and quantifiable, validated by feedback from users and functional for use as timely early warning and drought disaster declaration information. The description of the drought categories with potential impacts is summarised in Table 6.1.

Table 6.1: Drought categories

D0	Dry	<p>Going into drought:</p> <ul style="list-style-type: none"> ● Short term dryness <ul style="list-style-type: none"> ○ Limiting planting conditions ○ Limiting growth of crops or pastures ○ Smaller farm dam levels lower than usual ○ Some fountains stop flowing <p>Coming out of drought:</p> <ul style="list-style-type: none"> ● Some lingering water deficits ● Pastures and crops not fully recovered ● “<i>Green drought</i>” with young vegetation growth on pastures ●
D1	Moderate drought	<ul style="list-style-type: none"> ● Some damage to crops ● Streams, reservoirs or wells low ● Some water shortages developing or imminent ● Voluntary water restrictions requested ● Soil moisture deficit for planting crops ● Grazing conditions start deteriorating ● Animals start showing feeding stress
D2	Severe drought	<ul style="list-style-type: none"> ● Crop and pasture losses likely ● Water shortages is common ● Water restrictions imposed ● Grazing conditions deteriorated ● Animals show serious feeding stress ● Groundwater levels going down at selected places ● Disaster drought declaration imminent and required for certain sections of society
D3	Extreme drought	<ul style="list-style-type: none"> ● Major crop and pasture losses ● Severe shortages in natural grazing ● Some sales of productive assets ● Widespread water shortages ● Groundwater levels very low ● Negative impact on regional economy ● Disaster drought declaration required ● Not enough feed and fodder for animals ● Animals loose condition

D4	Exceptional drought	<ul style="list-style-type: none"> ● Exceptional and widespread crop and pasture losses ● Major sales of productive assets ● Forced liquidation of farming enterprises ● Shortages of water in reservoirs, streams and wells creating water emergencies ● Boreholes dried up with extremely low groundwater levels ● Rivers dried up ● Potential food insecurity ● Widespread economic impact - Impact on national economy ● Disaster drought declaration required with extreme response and recovery actions
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6.3 Drought Indicators

Drought indicators are classified as primary and secondary drought indicators. The primary indicators are those indicators that is easy to monitor quantitatively through meteorological data, satellite images and gauging stations while the secondary indicators represent drought impacts. Quantitative indicators should be monitored in real time. Not one single drought index fit all needs to determine the different types of drought. Once thresholds as indicated in Table 6.2 are reached, drought classification can take place based on the thresholds and evaluation of secondary indicators are then activated. The secondary indicators serve to “*ground-truth*” of the impact of the dry period.



Table 6.2: Drought classification and Index thresholds

Cat	Descript.	Potential impacts	Freq.	Meteorological		Remote sensing			St V heal Inde SVH
				% Of normal precipitn.	SPI	NDVI	PASG	1-month VCI	
D0	Dry	Dry period: Short term dryness slowing plant Growth of crops and pastures; fire risk above average: some lingering water deficiencies: pastures and crops not fully recovered	1/3yr	<75%for 30days	-0,5 to - 0,7		3month PASG <90%	< 90%	36-4
D1	Moderate drought	Some damage to crops & pastures: fire risk is high: Levels of streams, reservoirs or wells are low: Some water shortages are imminent and developing: voluntary water restrictions requested: early warning	1/5yr	<70%for 30days	-0,8 to - 1,2		6-month PASG <90%	<80%	26-3
D2	Severe drought	Crop and pasture losses likely: Fire risk very high: Water shortages common: Water restrictions imposed: drought warning messages: Institutions to prepare for response mechanisms.	1/10yr	<65%for 180days	-1,3 to - 1,5		12- month PASG <90%	<70%	16-2
D3	Extreme drought	Major crop and pasture losses: Extreme fire danger: Widespread water shortages and restrictions compulsory: Extended duration with critical impact: Warning messages must be adhered to: disaster drought declaration: Institutions to implement active response actions.	1/20yr	<60%for 180days	-1,6 to - 1,9		12/24- month PASG <80/90%	<60%	6-1
D4	Exception al drought	Exceptional and widespread crop & pasture losses: Exceptional high fire risk: shortages of water in reservoirs, streams and wells creating water emergencies. Water restrictions compulsory: Warning messages must be adhered to: Active response mechanisms: Impacts critical to larger economy	1/50yr	<65%for 360days	-2 or less		12/24- month PASG <80%	<60%	1-5

The monitoring of indices should be a continuous process and a specific standard operating procedure (SOP) should guide the pre-disaster declaration process. The following process serve as guideline for drought monitoring and pre-disaster declaration.

- i. Monitoring of meteorological indices such as the % of normal, SPI and SPEI
- ii. Monitoring remotely sensed indicators such as NDVI, PASG, VCI
- iii. Soil moisture content monitoring
- iv. Monitoring of dam levels and stream flow levels
- v. Monitoring of groundwater levels
- vi. Reference farms in each quaternary catchment data sent in at regular basis and compared with primary indicators
- vii. Data being processed and analysed with weekly reports
- viii. Considering secondary indicators such as actual veld conditions, plant conditions, crop conditions
- ix. Reporting and ground-truthing at monitor farms. If monitor farm shows critical condition then drought disaster declaration for that quaternary catchment should be activated. Ground-truthing and final demarcation is the responsibility of the MJDCC
- x. Monitoring of water reserves for municipal water requirements
- xi. Ensure communication between NDJDCC, PJDCC and MJDCC
- xii. Develop weekly communiques about dry conditions in SA to public and all sectors
- xiii. Analyse and communicate potential impacts on food security and food prices as a result of dry periods and droughts
- xiv. Analyse and communicate potential impacts of drought in water provision to municipalities and impact on business, tourism and industry

Drought indicators serve as a methodology to quantify the onset and severity of dry conditions and droughts. Considering the different types of drought and the complexity of drought, a single indicator cannot be used to determine when a drought has occurred and/or when a drought should be declared a drought. The set of indicators easily monitored and available at present are (i) SPI, (ii) soil moisture, (iii) NDVI, (iv) percentage of average greenness (PAG) (v) vegetation condition index (VCI), (vi) groundwater levels, (vii) streamflows, and (viii) dam levels. Different sets of indicators are required for the crop producing areas during and outside the growing season. Important indices for the growing season are topsoil moisture index, the Keetch-Byran Drought Index, 3-month SPI and SPEI and the satellite vegetation condition index. The timing of heat waves and dry periods are also significant indicators for specific crops.

6.4 Data management

Data management and data sharing are key in the effective management of drought risk reduction and drought relief and support. All stakeholders are responsible for data capturing and data

management according to their own mandates, but data sharing must be controlled by means of inter-governmental and inter-organizational MOUs. Drought early warning, drought risk reduction and drought relief management is only possible when all potential sources of data are considered and combined. Coordination and processing of data is the responsibility of the Drought Mitigation Centre, which is responsible for daily updates, processing and dissemination of results.

6.5 Adaptation mitigation and prevention strategies

These include:

- i. Macro level impacts on adaptive capacity
- ii. Culture, ethics, knowledge, perceptions
- iii. Farm level adaptation
- iv. Adjustment strategies
- v. Drought avoidance strategies
- vi. Alternative livelihood activities (casual labour and informal trade)
- vii. Food management strategies
- viii. Sale of non-productive items and productive items
- ix. Social networks
- x. Animal feeding strategies
- xi. Drought insurance
- xii. Coping strategies

6.6 Drought Risk Reduction Programs

Numerous governmental programs support drought risk reduction. These programs are executed and funded under different themes such as climate change adaptation or development. Drought risk reduction requires a coordinated effort already explained in Chapter 3.

The following programs should be supported as part of drought risk reduction:

6.6.1 Government Priority Investment and Flagship Programs

National Government identified thirteen climate change priority investment areas as illustrated in Fig 6.1. All of these programs support drought risk reduction in some ways. Responsible Departments should identify drought risk reduction elements from these programs and strengthen those in sector specific drought management plans.



Fig 6.1: National Climate Smart Investment Programs

The different flagship programs with corresponding projects are summarized in Table 6.1.

Table 6.1: Flagship programs and projects

Department Responsible	Program	Projects
DEA DAFF	Climate Change Response public Works Flagship Program	Working for Water
		Working for Wetlands
		Working for Land
		Working on Fire
		Working for Energy
		Working for Ecosystems
		People and parks
		Greening and Open Space management
		Working on Waste
		Working for the Coast
		Working for Fisheries
		Comprehensive Agricultural Support Program

DWS	Water Conservation and Demand Management flagship program	Landcare	
		Development and Implementation of WCWDM strategies	
		War on leaks Project	
		Accelerated Community Infrastructure Program	
		National Rainwater Harvesting Program	
		WC/WDM target setting for metropolitan municipalities	
Dept Energy ESCOM	Renewable Energy Flagship Program	The No Drop Assessment and Certification Program	
		Renewable Energy Independent Power Producer Procurement Program	
		National Solar Water Heating Program	
		Eskom Renewable Energy Projects	
		Off-grid Household Electrification	
		Green Industries Development	
		Green Accord	
		Strategic Environmental Assessment for RE Resources and RE Development Zones	
		Energy Efficiency and Energy Demand Management Flagship Program	Integrated Demand Management Program
			Industrial Energy Efficiency Program
Residential Energy Efficiency program			
Government Building Energy Efficiency Program			
Energy Efficiency Labelling Standards			
Dept Transport, TRANSNET; COGTA	Transport Flagship Program	Biofuels	
		Integrated Rapid Public Transport Networks	
		Non-motorised Transport Networks	
		Promote Fuel Efficiency Measures	
		Transport Modal Shifts	
		Taxi Recapitalization Program	
DEA DWS COGTA	Waste Management Flagship Program	Integrated Urban Planning and Transportation Planning	
		Solid Waste Management	
DEA	Carbon Capture and Sequestration Flagship Program	Municipal Wastewater Management	
		National CCS Roadmap Development, Implementation and Oversight	
DEA	Long-term adaptation Scenarios Flagship Research Program (DEA)	Pilot CO ₂ Storage Project & Pilot CO ₂ Capture Project	
		Phase 1: Climate Modelling, sector-based impacts and Adaptation scoping	
		Phase 2: Development of Adaptation Scenarios for Future Climate conditions	
Disaster Risk Reduction (DRR) and Management	Health	Drought risk reduction projects	
		Drought risk reduction projects	
		Drought risk reduction projects	
Low Carbon Climate Resilient built Environment, Communities and Settlements	Low Carbon Climate Resilient built Environment, Communities and Settlements	Drought risk reduction projects	
		Drought risk reduction projects	

The Working for programs have a specific contribution to drought risk reduction and the following programs require special attention and funding as part of a national drought risk reduction program.

- i. **Working on Fire** addresses the prevention and control of Wildland fires to enhance the sustainability and protection of life, poverty and the environment through the implementation of Integrated Fire Management (IFM) practices.
- ii. **Working for Water** considers the development of people as an essential element of environmental conservation. Short-term contract jobs created through the clearing activities are undertaken, with the emphasis on endeavouring to recruit women (the target is 60%), youth (20%) and disabled (5%). This program should be utilised to assist

- municipalities and water management authorities with the cleaning and monitoring of water ways.
- iii. **Working for Wetlands**, a joint initiative of the Departments of Environmental Affairs (DEA), Water and Sanitation (DWS) and Agriculture, Forestry and Fisheries (DAFF) focus on the rehabilitation, the wise use and protection of wetlands in a manner that maximises employment creation, supports small businesses and transfers relevant and marketable skills to beneficiaries. This project needs to be strengthened with continuous support in that it is a key contributor to drought risk reduction.
 - iv. **Working for Land** is an essential program of the Natural Resource Management Program (NRMP). The key objective of the program is to ensure that degraded ecosystems are restored to their formal or original state wherein they are able to maintain or support the natural species of that system. This program need to be intensified in drought stricken areas also as a drought rehabilitation program.
 - v. **Working for Ecosystems** aims to reverse environmental degradation through ecological restoration and maintenance programs. It aims to regain natural habitat composition, structure and function and thereby enhance ecosystem services, such as: carbon sequestration, water regulation and purification, reducing the risk of natural disasters by improving landscape/catchment stability and resilience. This program is a key program for drought risk reduction as well as rehabilitation of ecosystems after dry periods.
 - vi. **NRM Programs** ensure that South Africa addresses its responsibilities relating to water resource management, biological diversity and the functioning of natural systems whilst ensuring meaningful livelihood opportunities are supported for those employed on these programs.
 - vii. **People and Parks** program is to address issues at the interface between conservation and communities in particular the realization of tangible benefits by communities who were previously displaced to pave way for the establishment of protected areas. This program is particularly important in building drought resilience for protected ecosystems and areas and communities living in or near those systems.
 - viii. **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services** strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human wellbeing, and sustainable development. They should include drought risk reduction as a key focus area as part of its mandate.
 - ix. **Man and Biosphere Reserves program** proposes an interdisciplinary research agenda and capacity building initiative aiming to improve the relationship of people with their environment globally. Drought management should be included as a core focus area of this program.

- x. **Transfrontier Conservation Areas** is a vehicle for conservation and sustainable use of biological and cultural resources and has the objective of facilitating and promoting regional peace, co-operation and socio-economic development based on sustainable ecosystems management. Cross-border drought risk reduction and drought response programs should be included as a key element of this program.
- xi. **Green Economy for Sustainable Development** addresses the interdependence between economic growth, social protection and natural ecosystem. The approach is to ensure that green economy programs are to be supported by practical and implementable action plan therefore importance of building on existing best processes, programs, initiatives and indigenous knowledge in key sectors “*towards a resource efficient, low carbon and pro-employment growth path*”. Drought management should be included as a key focus of this program.
- xii. The **Green Passport Campaign** is an initiative of the International Task Force on Sustainable Tourism Development, firmly rooted in the move to accelerate a global shift towards sustainable consumption and production (SCP). This campaign should be utilised to create awareness about water scarcity and droughts in SADC.
- xiii. **Effective Environmental Improvement Interventions (2E2I)** should play a key role in drought risk reduction. The program is defined as a discrete, intentional and recognised intervention that has the measurable and sustainable improvement of degraded natural environments or environmental media as its principle objective. It deals with interventions that are specifically aimed at rehabilitating and/or restoring our ecological infrastructure and the three basic natural resources for a good human life – good air, good water and good earth.
- xiv. The Department of Environmental Affairs (DEA), provincial environmental departments and other provincial and municipal organs of the state employ **Environmental Management Inspectorates**, a network of environmental enforcement officials from various national, provincial and municipal government departments created by National Environmental Management Act (NEMA) of 2008. The reference farm system should play a key role in providing examples of good practice in different catchment.

6.6.2 Extension Programmes

Extension is the frontline for any drought mitigation and drought risk reduction programme in the agricultural sector. The drought risk assessment highlighted the importance of extension programmes especially amongst communal and small-scale farmers that cannot access the services of the private sector.

Extension officers need to liaise closely with land care officials, disaster management officials as well as officials from DEA and DWS at municipal level in order to utilise the technical expertise

from each of these organisations to develop and implement extension programs with a focus on climate smart conservation agriculture (CSCA)

6.7 Mainstream Gender

Mainstreaming gender and the role of women in society is also applicable in drought management. Women play a pivotal role in food security and in agriculture, particularly in traditional agricultural areas. Women face many obstacles to own land while also having the responsibility to manage households. Women in traditional and communal areas are not allowed to make financial decisions, for example when to sell livestock before the onset of a drought. Conservation programs, land care programs and extension programs must have a special focus on women in that women can play a pivotal role to convince men to also apply CSCA in rural traditional areas.



7 KPA 4: Response, Relief and Recovery

Response, relief and recovery are important activities during dry periods and droughts. Planning and development of contingency plans are essential for timely and efficient relief actions. Pre-approved contingency plans are a pre-requisite for efficient relief actions. All role players must pre-approve contingency plans; that includes Treasury at all government levels.

The different indicators and thresholds will play an important role in the activation of contingency plans. Plans must be designed in such a way that the plan can be activated with immediate effect once a certain threshold is reached for specific indicators; that includes activation of funding for pre-arranged activities as agreed upon in the contingency plan.

The main objectives of KPA 4 are to ensure effective and appropriate drought response and relief by:

- i. Implementing a uniform approach to the dissemination of early warnings,**
- ii. Providing an economic safety net for the agricultural sector to avert or reduce the potential negative drought impacts on the regional economy and prevent the out-migration of farmers from the agricultural sector,**
- iii. Implementing immediate integrated and appropriate response and relief measures when significant drought occurs or is threatening to occur, and**
- iv. Implementing differentiating indicator thresholds that consider the unique circumstances of the different agricultural systems.**

National and Provincial Government has a responsibility to provide safety nets in the form of relief and recovery support after extreme exogenous shocks such as drought. Most of South Africa is a semi-arid to arid area with relatively low rainfall coupled with regular dry periods. Municipalities, communities, industry, mining, tourism and the farming sector should therefore adapt water use and production practices to climatic conditions and should take pro-active measures themselves to mitigate the impacts of drought. Regular dry periods within category D0, D1 and D2 drought should be dealt with by the respective sectors themselves. The affected sectors may apply for drought support once the thresholds for D3 drought is reached according to the national drought classification system. Different line departments and municipalities should develop its own sector and geographic specific drought plans. Indicators are not the same for all sectors; for example, the 3-month SPI during October, November, December might have a catastrophic impact on maize production, which is the staple food in SA. On the other hand, it might not impact on the livestock sector or affect water resource management.

Governmental assistance schemes are not designed to replace drought losses; they are designed to enable sectors to continue with production and recover sufficiently to continue with business despite the negative impacts of drought. In many cases the drought relief schemes are the only

livelihood survival mechanism for subsistence and communal farmers; therefore, the need for specific tailor-made schemes for these communities.

7.1 Drought Disaster Declaration

The Disaster Management Act (Act 57 of 2002) provides for the declaration of disasters through national, provincial and local government. When a dry period develops into a drought and municipalities, the farming sector, the PDoARD, or other stakeholder's highlight the need for a drought declaration, the Provincial Interdepartmental Drought Committee (PDTT) (Provincial Drought Task Team) should be activated and they should adhere to the following:

- i. Initiate efforts to assess the current and potential magnitude and severity of the drought
- ii. Inform all relevant departments of the findings and potential impact
- iii. Alert all disaster management role-players in the province who might be of assistance and affected
- iv. Ensure in collaboration with COGTA, DHSWS and SALGA that municipalities in affected areas implemented water saving mechanisms
- v. Ensure, in collaboration with PDoARD and the PDMC through the structures of organized agriculture, that affected farmers have reduced stock numbers in time.

The involvement of local government or extension services in a province's assessment is crucial so as to advise the DAFF, DWS and the NDMC on the scale and extent of the losses caused by droughts. Food prices and food security is directly influenced by drought in the agricultural sector and the DSD should also be involved in almost all droughts. Provincial departments should determine the financial assistance required to normalize the situation. Key determinants will be considered during the assessment, available water for drinking and sanitation, water for industry businesses and tourism, livestock crop and vegetation conditions so as to ascertain whether the drought was beyond the control of local municipalities or farmers.

Not all dry periods are droughts and the impact of dry periods is different between different sectors. The use of the prescribed indicators without the consideration of the sector specific characteristics will be foolish. Factors to consider before drought declaration are the following:

Primary indicators: At least three of the indicators must have a threshold for at least a D2 drought at which stage one can expect secondary indicators also to indicate a drought.

Secondary indicators: Grazing on the reference should display definite dry conditions and the farmer should reduce animal numbers with 30%. Crops should reveal definite signs of water stress with potential crop losses of at least 40%.

Time of monitoring: The three-month SPI during the growing season can lead to a disaster drought for crop farmers whereas the same SPI value outside the growing season might only be regarded as a dry period with little impact. Reservoir levels is also linked to seasonality; for example, reservoirs with low water levels at the beginning of the rainy season is not a problem

compared to empty reservoirs at the end of the rainy season which then could lead to water shortages. One needs to consider the seasonality and growing season of different crops and grazing on livestock farms with the classification of drought; therefore, the use of secondary indicators to ground-truth the impact of a dry period.

Sector differences: The difference between the communal farming sector and the commercial farmers in terms of drought vulnerability and resilience is significant. Communal farmers and the small-holder farming sector are extremely vulnerable to drought. Communal farmers experience normal dry periods as droughts and they report significant drought losses every one in three years. A D0 and a D1 drought could be disastrous for them while, on the other hand most commercial farmers are able to manage a D2 drought. Drought safety nets should be activated for communal farmers already at D2, which is characterized by SPI $-1,2$. Drought declaration and activation for commercial farmers is at drought D3 with SPI $<1,5$. For livestock farmers one should use the 12- and 24-month SPI while the 6-month SPI during the growing season became relevant for crop farmers.

7.2 Drought Relief

Drought relief is the joint responsibility of all municipalities, water authorities, national and provincial line departments and the private sector. The DARDLR and provincial departments of agriculture are the lead agents for agricultural drought relief with the organised agriculture organisations such as AFASA, AGRISA, and NAFU in support. The Land bank and agricultural businesses also played an important role in drought relief. That includes monitoring, record keeping and evaluation of the relief action.

The disaster management structures at national, provincial and district level shall coordinate all relief actions. Detailed documentation should be prepared for drought relief, taking cognisance of the following:

- i. Drought relief should follow a process as stipulated in a *Drought Contingency Plan*.
- ii. The drought report template should be used.
- iii. Guidelines for the implementation of drought relief template should be followed.

The enablers are in support of the key performance areas and are similar to those prescribed in the National Disaster Management Framework.

7.3 Drought Contingency Plans

Contingency plans should address all the W's namely:

- i. Who is doing
- ii. What
- iii. With
- iv. What
- v. Where
- vi. When, and
- vii. Why.

Contingency plans differ from preparedness and operational plans in that it can be compiled before the flood incident and it also provide an opportunity for exercise. Contingency plans should be pre-approved by all role players – including treasury – and it should be exercised in order to implement efficient deployment and response. An important aspect of contingency plan development is the need of active involvement from the decision makers. Contingency plans should be agreed upon prior to the expected action. This is not a plan that can be sub-contracted to junior personnel. The decision makers themselves should agree and work out the plan.

The operational plan is an adjustment of the contingency if required during the operation. The main differences between the different plans is illustrated in Table 5.9. The contingency plan assisted in the speedy and efficient application of resources while the operation plan allows for flexibility to adjust the contingency according to operational needs.

Table 5.9. Contingency planning compared with other plans

Aspects	Preparedness planning	Contingency planning	Operational planning
When	Planning phase	Before emergency	During emergency
Scope of plan	General	Time-frame specific	More specific
Involved partners	Everybody within system	People knowledgeable	People actually involved
Focus	All types	Specific/Projected	Specific/Actual
Planning style	Long term/Global	Specific time-frame	Actual
Allocation	Estimated	Quantified	Precise
Planning level	All levels	Managerial level	Operational/field level
Time frame	Annual (1 year)	Specific but uncertain Developing	Executed right time fixed
Relationships	Long term	Developing	Utilizing

7.3.1 Objective of Contingency Plans

Contingency Plans for droughts are comprehensive, documents that provide for a full range of activities in the event of a drought. Provinces, municipalities and affected organisations directly affected by drought, within or across Provincial boundaries, should agree on when, where and to what extent resources will be utilised during droughts. To achieve a collaborative response to droughts, each organisation must have an understanding of the systems, structure, resources, capabilities and statutory obligations of the other organisations. The objective of a contingency plan is the establishment of the operational procedures for drought. The contingency should be;

- i. Developed in line with the indicative drought risk profile of the region and must ensure a coordinated management approach.
- ii. Provide a framework for partnership working, and
- iii. Ensure that all partners are able to contribute to an integrated approach including; recording of resource application, resource utilization, strategy for drought relief, funding, impact assessment and debriefing

The contingency plan should support the efficient provision of drought relief from all organisations in an equitable way to all affected by drought.

7.3.2 Role Players

The NDMC at national level, PDMC at provincial level and MDMC at municipal level are primarily responsible in the coordination of drought relief. The drought task teams at different levels are *ad hoc* teams consisting of all stakeholders. The drought task teams are activated during dry periods and droughts when collaborative action is required.

The development of contingency plans is the responsibility of decision makers and leaders of organisation; it cannot be delegated to junior staff. Decision makers should agree with each other on exactly who will do what and who will pay for what (All the W's should be answered and agreed upon). All role players should then also sign the contingency plan and obtain approval from higher level of management to implement the plan.

7.3.3 Principles for contingency planning

Contingency planning promotes rapid response from immediately available resources and might require action from people not necessarily in the appropriate decision-making positions and therefore the need for detailed planning and preparations. The following principles should guide the development of contingency plans at all levels of governance:

7.3.3.1 Information

Good information is the foundation of any contingency plan. The drought risk assessment is potentially the most important source of information provided that a detailed and scientifically based risk assessment precedes the contingency plan. Most risk assessments are generic in nature and does not provide the detailed information needed for contingency planning. Information is also not static and should be updated on a regular basis. The type of information needed for the development of a contingency plan includes the following:

- i. Drought management structures.
- ii. Organisations involved in drought response
- iii. Persons responsible plus contact details.
- iv. Activities to be executed by affected groups eg. Municipalities enforcing water saving mechanisms, industry to implement water saving measures, farmers reducing animal numbers, etc.
- v. Resources required for drought relief

- vi. Location of resources.
- vii. Capacity and contribution of each of each role player.
- viii. Funding arrangements.

7.3.3.2 Clarity

The aims and objectives of the contingency plan must be clearly stated. Plans must be simple and easily understood by people and practitioners, who, in most cases are not involved in the early planning process. People should easily comprehend the plans and act without doubting the intention and implications of all actions.

7.3.3.3 Flexibility

Droughts seldom unfold as expected and planning and assumptions will never be accurate. Plans should therefore allow for the unexpected and the flexibility to adjust if needed. Plans should not be rigidly designed and should also not be slavishly followed in implementation. This should be addressed in the plan and people should be allowed to deviate from original plans if needed. The purpose of contingency plans is to facilitate sound decision making during droughts and it cannot be separated from common sense and the influence of people. Checklists are valuable instruments that should accompany all contingency plans.

7.3.3.4 Continuity

One of the basic principles of integrated management is that each organisation operates according to own SOP'. This might be confusing if the different organisations did not plan together. The principle for contingency planning is that wherever possible, each organisation should adhere to existing organisational structures and SOP's. Streamlined procedures might be needed during drought relief, but the worst possible time to rearrange an organisation is during a crises.

7.3.3.5 Coordination

Unified management is key to the successful execution of any drought response and relief process where coordination between role-players might become a problematic if not planned properly. Coordination starts right from the beginning with the decision to develop drought contingency plans, the planning process itself and execution. Coordination also goes beyond the response phase when evaluation and re-planning is conducted after the drought. The participation of different organisations with different tasks and capabilities increases the importance of proper coordination. Each role-player must know exactly what is required from themselves as well as from the other role-players.

7.3.3.6 *Optimal use of all resources*

Effective drought response calls for collective efforts with the optimal use of resources. It is important to define role clarification right from the beginning of the planning process and allow role-players to perform tasks that is familiar to them and falls within their own sphere of speciality. This can go beyond the task allocation of agencies; it can also include individuals. One should ask “*Who is good at doing what?*” Utilise available expertise optimally and stress self-reliance, meaning that each organisation should be able to focus on own responsibility.

7.3.3.7 *Evaluation and Monitor*

Monitoring and evaluation of drought relief is an essential part of any emergency and relief operation. All actions should be reviewed in terms of relevance and efficiency and recommendations made to improve on future planning. Monitoring meaning that actions can be adjusted if possible while the response is taking place while evaluation could be regarded as a review of what was done. Again, all organisations should be involved during the monitor and evaluation process.

7.3.3.8 *Pre-approval*

Contingency plans must have pre-approval and signed by all role players at different levels. That includes treasury approval at all levels for the activation of response and relief actions according to specific guidelines.

7.3.4 **National and Provincial Contingency**

Drought classification and monitoring should be implemented as per the classification and indicator thresholds. One can expect advocacy and pressure from farmers, water users, municipalities, politicians and/or others for drought disaster declaration during dry periods in a specific region. The classification and thresholds discussed in Chapter 6 provide for a quantitative system to classify drought. Disaster declaration shall be implemented as per the Disaster Management Framework and guidelines provided by NDMC. The National Drought Task Team shall be activated in case of provincial state of drought disasters and national state of drought disaster. The provincial drought task team shall be activated in case of local state of drought disaster. The drought monitor committee at local level shall coordinate all drought relief efforts at local level and ensure efficient application of resources. The drought monitor committee will also monitor and report activities in order to avoid unnecessary duplication of relief efforts. The task teams are constituted as explained under KPA 1.

The NDMC, PDMC and MDMC will continue with coordinating of response, relief and recover activities depending on the severity and special impact of the drought.

8 Enabler 1: Information Management and Communication

Disaster risk reduction and disaster relief requires up-to-date and reliable information in a format ready for decision-making. Information systems could involve remotely sensed information, GIS, early warnings, demographic information, market information, hazard information, information about coping capacity and many more. Enabler 1 seeks to address the information needs as well as the processing and storage of data. In addition, communication is equally important and this enabler also deals with communication systems.

The main objective of Enabler 1 is to guide the development of a comprehensive information management and communication system and to establish integrated communication links with all drought management role-players.

Information and the analysis and dissemination of information are key elements in drought management. Information in most cases is based on data gathering and analysis. All role-players should contribute to the process of data gathering and the following guidelines are applicable:

8.1 Weather Related Data

The SAWS is primarily responsible for weather related data and information. The ARC also has access to weather data and both data sets should be combined and made available to the NDMU on a weekly basis. The NDMU will process data and made it available to the relevant role players as required.

The need for rainfall data in each catchment is imperative for future drought declarations and land owners and the private sector should be motivated to participate in the provision of rainfall and other climate data. Modern-day drought early warnings are fairly accurate and are communicated well on most of the national media. The interpretation and implications of dry periods and pending droughts, however, are not well communicated and the NDMU can play a vital role in this regard.

8.2 On-site and on-farm data

On site data and information available to local municipalities, individuals, communities and farmers should be captured and made available to the NDMU. On-site data include (i) localised weather data, (ii) dam levels, (iii) stream flow, (iv) groundwater levels (v) water demand and supply balance, (vi) expected amounts of available water, (vii) condition of water infrastructure. On-farm data are data such as (i) farm level meteorological data, (ii) animal numbers, (iii) farm sizes, (iv) grazing capacity, (vi) veld condition, (vii) planting conditions, (viii) crop condition and (ix) potential production yields.

Data for municipalities should be captured by Municipalities themselves, CoGTA and DWS. Municipal level data should be analysed at provincial level and made available to the NDMU.

The extension services and the PDoARD should work jointly to gather, and analyse the farm level data and made that available to the DMU. The monitor farm systems should be computerized in order to ensure up-to-date analysis. Provincial organised agricultural structures can also assist to

ensure that all quaternary catchments are represented by at least one monitor or reference farm. Data obtained from the reference farms should be updated regularly in order to ensure up-to-date calculations of SPIs and other indicators.

8.3 Data storage and analysis

The NDMC, DAFF, DWS and DEA are primarily responsible for drought related data gathering and analysis and should provide systems for data storage and analysis. Research institutions and Higher Education Institutions can assist with the analysis of data and the development of systems that automate data analysis.

Data regarding the reference farms should be computerised and automated at provincial level. Consolidated data and information per province should be communicated to the DMU at the NDMC. Meteorological data and remote sensing products from the SAWS, ARC and SASA should be made available for research and early warning.

The DMU at the NDMC should develop the capacity to capture all provincial level data, capture and analyse the data and made it available on a weekly basis to the public and all role players.

8.4 Information dissemination and communication

Extension services are primarily responsible for the dissemination of information regarding agricultural related droughts and that should be coupled to a communication strategy. The private sector and organised agriculture should cooperate and provide own resources for increased communication and information dissemination. Municipalities are also responsible to communicate drought related issues to communities within their areas of responsibility.

9 Enabler 2: Education, Training, Public Awareness and Research

The main objective of Enabler 2 is to promote a culture of drought adaptation and drought risk avoidance among stakeholders by capacitating role-players through integrated education, training and public awareness programmes that is informed by scientific research.

All line departments at national and provincial level and municipal structures together with the private sector are responsible to create awareness for proper water management and droughts. Education, training and public awareness are the cornerstones for drought risk reduction. The different disaster management centres should play a key role in coordinating education, training and awareness programs.

The agricultural sector is served by extension officers as the “*foot soldiers*” with direct contact with farmers and should be well trained and equipped to provide training and information to the farming community. Proper extension programming and planning is necessary in order to educate and train farmers. It is acknowledged that extension programmes for commercial farmers differ from programmes to emerging, small-scale, subsistence and communal farmers. Programmes with a focus on the specific needs of the different farming sectors should be designed and implemented.

9.1 Education and Training

Drought risk reduction starts with a water and drought conscious society. Managing water resources also required trained managers and personnel. Education and training in water management and drought risk reduction is the responsibility of each municipality, business, and farming enterprise and government department. All organizations should ensure that personnel working in the water sector or drought risk reduction sector are adequately trained and educated. The commercial farming sector in general uses sophisticated technology and successful farmers apply sound agricultural practices, yet a large group of these farmers experiences droughts regularly. The over-exploitation of the natural resources is of concern and the DAFF, DEA, PDoARD together with organised agriculture should identify areas of overgrazing and land degradation and institute measures to stop the continued degradation of the land. The DAFF, PDoARD and NDMC should work closely with DEA on land degradation and climate change adaptation programs.

The private sector, through agricultural businesses, is currently the primary source of information dissemination to commercial farmers and they should also be sensitized to the importance of drought management as an integral part of the management system on all farms.

Special emphasis should be placed on support to communal farmers who currently tend to over-exploit the natural resources. The land owners (municipalities and the state) should collaborate with extension services to educate land users and, if necessary, to enforce the application of

sound agricultural practices. Extension programmes with an emphasis on drought risk reduction should be developed and implemented by the PDoARD.

9.2 Research

A large number of drought related research gaps exist. Continued research should be coordinated and the all government departments, organised business and agriculture and the private sector should mobilize funds and task research institutions such as the ARC, Universities, the Water Research Commission (WRC) and others to conduct drought related research with an emphasis on climate resilience, adaptation, mitigation, prevention and coping capacity.

10 Enabler 3: Funding Arrangements for Drought Management

The main objective of Enabler 3 is to establish mechanisms for the funding of drought risk reduction and drought response and relief.

Funding for each of the KPAs are discussed separately:

10.1 Funding for institutional arrangements

Government departments responsible for drought management should cover own costs while the non-governmental individuals or organisations are the joint responsibility of all departments depending on the contribution or involvement to integrated drought management. Private sector and organizations such as organised business and organised agriculture should also contribute to joint actions as per agreement for the direct costs and per diems of non-governmental individuals contributing to the different drought task teams.

10.2 Funding for drought risk assessment

The different line departments at national and provincial level are primarily responsible for the funding and development drought risk assessments (Act 57, 2002) while district municipalities have the responsibility for district disaster risk assessments. The NDMC and PDMC's are responsible for coordinating final assessments and guidelines. Drought risk assessment is closely linked to food security and the different departments of agriculture should also involve departments such as DSD during the assessment. Funding responsibilities are as follows:

- | | | |
|------|--|-------------------------|
| i. | National drought risk assessment | NDMC |
| ii. | Agricultural drought risk assessment | |
| | a. National | DAFF |
| | b. Provincial | PDoARD' s |
| | c. District | District Municipalities |
| iii. | Ecological/Natural resources drought risk assessment | DEA |
| iv. | Bulk water supply risk assessment | DWS |
| v. | Municipal water supply risk assessment | Municipalities |
| vi. | Metro drought risk assessments | Metros |
| vii. | | |

10.3 Funding for drought risk reduction

Farmers themselves best support drought risk reduction through the application of good agricultural practices. The primary role of extension services is the transfer of technology and knowledge that should empower farmers to apply sound agricultural practices. The PDoARD is therefore instrumental in the achievement of increased drought resiliency. Apart from the role of extension, specific targeted programmes and projects also serve as mechanisms to increase awareness and resiliency against droughts. These projects are funded on a project-to-project

basis through the Mitigation and Prevention fund from DAFF called the Conditional Grants scheme.

The NDMC and PDMC are mandated and obliged by the Disaster Management Act (Act 57, 2002) to implement and fund disaster risk reduction efforts. Drought being the most prominent disaster in South Africa, the NDMC and PDMC must also provide funding for drought risk reduction programmes and projects.

Funding responsibility for drought risk assessment and drought reduction plans are as follows:

- | | | |
|------|--------------------------------------|--|
| i. | National Guidelines and framework | NDMC |
| ii. | Agricultural drought risk assessment | |
| | a. National | DAFF |
| | b. Provincial | PDoARD's |
| | c. District | District Municipalities |
| iii. | Ecological/Natural resources | DEA |
| iv. | Bulk water supply | DWS |
| v. | Municipal water supply | Municipalities ⁶ and Water Boards |

10.4 Funding for disaster relief and response

See Chapter 6 on the Disaster Management Act (Act 57 of 2002):

The affected sector must firstly be able to prove that they did everything within their own capacity to mitigate, manage and cope with dry periods. The different sectors, municipalities and farmers should adapt to climate conditions and continually work with the relevant departments and other research institutions to implement new drought mitigation and avoidance strategies. Under extreme drought conditions, government will provide relief as a safety net.

Municipalities and provinces should first explore own reserves to support vulnerable sectors such as the communal farmers farming on municipal land. If municipalities have no funding, the relevant departments must first utilize own emergency funding to support farmers and only when they can prove that they have no resources of their own, are they allowed to apply for funding from the disaster management structures at provincial and national level.

Funding models should adhere to the following principles (From the *National Disaster Management Framework*):

- i. **Adequacy.** Both the Agricultural Departments and disaster management structures and municipalities should have adequate resources to perform their functions effectively. In relation to drought management, all organs of state should have access to sufficient funding to be able to discharge their legislative responsibilities.

⁶ Include metropolitan , district and local municipalities

- ii. **Equity.** Funding mechanisms should ensure that legislation is implemented equitably across municipalities and affected agricultural systems. This would help to avoid inter-jurisdictional spill-overs arising from uneven and inequitable implementation.
- iii. **Predictability.** Any funding mechanism that includes intergovernmental transfers should ensure predictability by making allocations from national to provincial and local organs of state over the term of the Medium-Term Expenditure Framework (MTEF). Any allocations to municipalities should be disclosed timeously so that municipalities are able to take cognizance of these allocations in their annual budgets.
- iv. **Administrative efficiency.** The cost of administering the funding mechanisms should be kept to a minimum. Ideally, the funding mechanisms should not impose new reporting obligations on any organ of state. Rather, the reporting process should be integrated into the existing reporting cycle.
- v. **Incentive effects.** Funding mechanisms should be designed in such a way that they provide incentives for sound fiscal management and reduce the likelihood of inefficient fiscal practices. In this way, perverse incentives in the system may be minimized and the risk of moral hazard behaviour by recipients of the funds is discouraged.
- vi. **Autonomy.** The assignment of functions or the transfer of funds between spheres of government should not undermine the constitutionally mandated autonomy of provincial and municipal organs of state. The autonomy criterion should be viewed within the context of co-operative governance.
- vii. **Risk pooling.** The cost of droughts can become so substantial that no single provincial and municipal organ of state is able to fund recovery efforts on its own. In such cases, funding mechanisms should make provision for post-disaster recovery costs to be shared across the widest possible population rather than being a burden on the affected population.
- viii. **Timely funding.** Contingency plans and funding mechanisms should consider the timely drought relief to farmers. Emergency funding for drought relief should be made available immediately during the drought and not months after the funds are required.

Funding models depend on the amount of funds available as well as on national guidelines. In addition to funding guidelines, the following should also be considered:

- i. Feed and fodder suppliers must be carefully selected.
- ii. Tender processes for the supply of feed and fodder must be controlled and the interest of the beneficiaries must always be considered
- iii. Mark-up and profits to the middle man must be controlled
- iv. Credit management through businesses must be responsible. The private sector should have pre-agreements with government organizations with regards to drought relief schemes

Funding responsibility for drought disaster response and recovery plans are as follows:

- | | | |
|------|--|-------------------------|
| i. | National Guidelines and framework | NDMC |
| ii. | Agricultural drought risk assessment | |
| | a. National | DAFF |
| | b. Provincial | PDoARD's |
| | c. District | District Municipalities |
| iii. | Ecological/Natural resources drought risk assessment | DEA |
| iv. | Bulk water supply | DWS |
| v. | Municipal water supply | Municipalities |
| vi. | Metro water supply | Metros |



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