NATIONAL DROUGHT PLAN FOR ZIMBABWE
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<td>------------------------------------------------------------------</td>
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<tr>
<td>AGRITEX</td>
<td>Agriculture Research and Extension Services</td>
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<td>CPU</td>
<td>Civil Protection Unit</td>
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<tr>
<td>DAT</td>
<td>Drought Assessment Team</td>
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<tr>
<td>DMC</td>
<td>Drought Monitoring Centre</td>
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<td>EMA</td>
<td>Environmental Management Agency</td>
</tr>
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<td>FGD</td>
<td>Focus Group Discussion</td>
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<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GMB</td>
<td>Grain Marketing Board</td>
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<td>GoZ</td>
<td>Government of Zimbabwe</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>HCT</td>
<td>Humanitarian Country Team</td>
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<td>HEA</td>
<td>Household Economy Analysis</td>
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<td>HRF</td>
<td>Humanitarian Response Forum</td>
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<tr>
<td>HWC</td>
<td>Human Wildlife Conflict</td>
</tr>
<tr>
<td>MALRR</td>
<td>Ministry of Lands, Agriculture and Rural Resettlement</td>
</tr>
<tr>
<td>METHI</td>
<td>The Ministry of Environment, Tourism and Hospitality Industry</td>
</tr>
<tr>
<td>MHESTD</td>
<td>Ministry of Higher Education, Science and Technology Development</td>
</tr>
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<td>MIPBS</td>
<td>Ministry of Information, Publicity and Broadcasting Services</td>
</tr>
<tr>
<td>MoHCC</td>
<td>Ministry of Health and Child Care</td>
</tr>
<tr>
<td>MPSLSW</td>
<td>Ministry of Public Service, Labour and Social Welfare</td>
</tr>
<tr>
<td>MSD</td>
<td>Meteorological Services Department</td>
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<tr>
<td>NDC</td>
<td>National Drought Council</td>
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<td>NDP</td>
<td>National Drought Plan</td>
</tr>
<tr>
<td>NDVI</td>
<td>Normalised Difference Vegetation Index</td>
</tr>
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<td>NEWU</td>
<td>National Early Warning Unit</td>
</tr>
<tr>
<td>NFNC</td>
<td>National Food and Nutrition Council</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>PDC</td>
<td>Provincial Drought Coordinator</td>
</tr>
<tr>
<td>PLDC</td>
<td>Provincial Level Drought Committee</td>
</tr>
<tr>
<td>POTRAZ</td>
<td>The Postal and Telecommunications Authority of Zimbabwe</td>
</tr>
<tr>
<td>RDC</td>
<td>Rural District Council</td>
</tr>
<tr>
<td>RLA</td>
<td>Rural Livelihoods Assessment</td>
</tr>
<tr>
<td>VCI</td>
<td>Vegetation Condition Index</td>
</tr>
<tr>
<td>WASH</td>
<td>Water Sanitation and Hygiene</td>
</tr>
<tr>
<td>WRSI</td>
<td>Water Requirement Satisfaction Index</td>
</tr>
<tr>
<td>ZIMVAC</td>
<td>Zimbabwe Vulnerability Assessment Committee</td>
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<td>ZINWA</td>
<td>Zimbabwe National Water Authority</td>
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1 Introduction
Drought is a prolonged dry period in the natural climate cycle. Its impacts vary and include decimation of crops and livestock, environmental degradation, socio-economic damage. The impacts of drought can be severe and have detrimental effects on livelihoods and as such authorities have to make decisions regarding the allocation of water and food, mitigation measures as well as preparedness strategies.

Zimbabwe like most Sub-Saharan countries experiences frequent and severe droughts (Benson and Clay, 1998) and is vulnerable to the prospects of an El Niño effect. Measures to address drought have been channelled to alleviating its impacts and these have been on an ad hoc basis. As with any natural disaster, addressing drought should not be focused solely on managing the crisis, but needs to encompass the full cycle of disaster management (Crossman, 2018). It is now evident that drought as a national hazard has to be prepared for and impacts dealt with before its occurrence. The National Drought Plan has been developed with the intention of providing a guideline to drought management, appropriate responses and communication actions for when drought occurs.

This document is based on a desk study of drought planning and mitigation measures in Zimbabwe. The purpose of this plan is to provide an organised program and a framework for integrating stakeholders in drought preparedness and mitigation. The plan is intended to serve as a working guide for stakeholders to develop effective response and mitigation programs within their areas of influence.

1.1 Understanding Drought: Meteorological, Agricultural, Hydrological and Socioeconomic Drought
There is no universally accepted definition of drought. Ideally, definitions should be related to the region under study and be specific to the particular application. Drought indicators can be either qualitative or quantitative. McMahon and Diaz Arenas (1982) define drought as a period of abnormally dry weather sufficiently prolonged for the lack of precipitation to cause a serious hydrological imbalance, carrying connotations of a moisture deficiency with respect to man's usage of water. Several general definitions have been proposed by hydrological authors for example Beran and Rodier (1985). Drought can be defined in terms of precipitation and temperatures, that is, meteorological and hydrological drought. It can also be defined based on the impacts of the reduced precipitation on the economy and social aspects of the lives of people, that is agricultural and socio-economic drought (FAO, 2004).

Meteorological drought
This is a reduction in rainfall supply compared with a specific average condition over some specified period. It is defined as a period during which less than a certain amount, for example 70%, of the normal precipitation is received over any large area for an extended period.

Hydrological drought
This is caused by the impact of a reduction in precipitation on natural and artificial surface and sub-surface water resources. 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 irrigation, hydro-electrical power generation and other household and industrial uses.

**Agricultural drought**

A reduction in water 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.

**Socio-economic drought**

The impacts of drought on human activities are 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 wider economy.

### 1.2 Goal, Objectives and Scope

**Goal**
Establish a framework for Zimbabwe to conduct an effective, coordinated and appropriate response to drought that minimizes potential adverse impacts.

**Objectives**
To be prepared for and mitigate against the impacts of future and occurring drought events in Zimbabwe.

**Scope**
The plan includes overview of drought characteristics, monitoring and forecasting, impact and vulnerability assessments, communication and response coordination and action, drought mitigation and preparedness strategies, organizational responsibilities and recommendations.

### 1.3 Background

Zimbabwe is located in southern Africa between latitudes 15° and 23° south of the Equator and longitudes 25° and 34° east of the Greenwich Meridian. It has a total land area of 391,757 km², of which approximately 43% or 16.8 million ha is under forests and woodlands. The country is landlocked borders Mozambique to the east, South Africa to the south, Botswana to the west and Zambia to the north and north-west. The Zambezi River in the north and the Limpopo River on the south, form Zimbabwe’s borders with Zambia and South Africa respectively.
The population of Zimbabwe is approximately 13.1 million people, with 67% residing in rural areas and the rest in urban areas (Zimstat, 2012). The major source of income for the rural population is derived from agricultural activities. Agriculture is the backbone of Zimbabwe’s economy and underpins the economic and social lives of the majority of the people of Zimbabwe.

The agricultural sector contributes 19% to the gross domestic product (GDP). Agricultural production in Zimbabwe is mainly rain-fed, and therefore crop production patterns follow rainfall patterns (FAO, 2004). In recent years rainfall amounts in most parts of Zimbabwe have been largely erratic and sub-normal resulting in reduced crop production. Over the past decade, the amount of rainfall the country receives has decreased from the multi-decadal mean on a regular basis (UNEP, 2010). In the later part of the 20th century, runoff in the country decreased by 20% to 30%.

### 1.3.1 Zimbabwe’s Agro-ecological Zones

Zimbabwe is divided into five agro-ecological zones (Vincent and Thomas, 1960). These classifications are mainly based on spatial distribution of average rainfall. Agricultural activities in these agro-climatological zones are based on soil type, and agro-climate. The best zone for agricultural suitability is Region 1 and the least is Region 5. However, the country regularly experiences inter- and intra-seasonal droughts that affect even those Regions that are better suited for agriculture. This affects water resources and in the end human activities and livelihoods. Thus, climate is a major factor that affects water availability and livelihoods of both rural and urban communities. Regions IV and V generally receive low rainfall and are therefore less suitable for arable crop production.

Drought is an insidious natural hazard that results from a deficiency of precipitation from the expected or normal in such a way that when it is extended over a season or longer period of time the amount of precipitation is insufficient to meet the demands of human activities or the environment (Iglesias et al 2009). Drought occurs in both low and high rainfall areas and have a negative impact on ecosystem functions, reduce social, political and economic stability and can increase vulnerability to other natural disasters, such as heat waves and floods (Crossman, 2018).

Drought is recorded the most common natural hazards occurring in Zimbabwe between 1982 and 2011 (Table 1), accounting for six out of ten top major natural disasters. Regions IV and V are most prone to drought and the major areas regularly affected are in Masvingo and Matabeleland provinces.
Figure 1: Zimbabwe’s Natural farming regions where Region 4 and 5 are drought prone (source OCHA)

Table 1: Top Ten Natural Disasters in Zimbabwe, 1982 - 2011

<table>
<thead>
<tr>
<th>Disaster</th>
<th>Year</th>
<th>No. affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought</td>
<td>2001</td>
<td>6,000,000</td>
</tr>
<tr>
<td>Drought</td>
<td>1991</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Drought</td>
<td>2007</td>
<td>2,100,000</td>
</tr>
<tr>
<td>Drought</td>
<td>2010</td>
<td>1,680,000</td>
</tr>
<tr>
<td>Drought</td>
<td>2010</td>
<td>700,000</td>
</tr>
<tr>
<td>Epidemic</td>
<td>1982</td>
<td>700,000</td>
</tr>
<tr>
<td>Epidemic</td>
<td>1996</td>
<td>500,000</td>
</tr>
<tr>
<td>Flood</td>
<td>2000</td>
<td>266,000</td>
</tr>
<tr>
<td>Epidemic</td>
<td>2008</td>
<td>98,349</td>
</tr>
<tr>
<td>Drought</td>
<td>1998</td>
<td>55,000</td>
</tr>
<tr>
<td>Flood</td>
<td>2001</td>
<td>30,000</td>
</tr>
</tbody>
</table>

Source: ('Zimbabwe National Contingency Plan’, 2013)

1.4 Plan Development: Introduction of the 10-Step Process

The 10-Step process towards establishing a National Drought Plan was initially put forward by the University of Nebraska and has since been modified to be more generic. The steps provide a framework to drought policy and preparedness planning. Steps 1–4 focus on bringing together competent stakeholders with a clear understanding of the process, what should be accomplished, and are supplied with adequate data to make unbiased and informed decisions when writing the actual drought plan. Step 5 describes the procedure of developing an organizational structure necessary to prepare the plan. Step 6 and 7 point out the need for continuous research and
coordination between scientists and policy makers. Steps 8 and 9 stress the importance of endorsing and testing the plan before drought occurs. Finally, Step 10 emphasizes revising the plan to keep it up-to-date and assessing its effectiveness in the post-drought period (Hayes and Svoboda, 2005).

Step 1: Appoint a Drought Task Force
Step 2: State the Purpose and Objectives of the Drought Plan
Step 3: Seek Stakeholder Participation and Resolve Conflict
Step 4: Inventory Resources and Identify Groups at Risk
Step 5: Establish and Write Drought Plan
Step 6: Identify Research Needs and Fill Institutional Gaps
Step 7: Integrate Science and Policy
Step 8: Publicize the Drought Plan—Build Public Awareness and Consensus
Step 9: Develop Education Programs
Step 10: Evaluate and Revise Drought Plan

Drought is one of many disasters that affect Zimbabwe. There is need to appoint a Drought Task Force as part of the overall disaster risk management effort or strategy in the country. The Task Force should be composed of representatives of various sectors including agriculture, environment, climate, energy, local government and the non-governmental and private sectors. The impacts of drought cut across various sectors in Zimbabwe. The purpose and objective of the Drought Plan must be clear to all stakeholders. These should be in the context of the overall National Disaster Management Plan. Drought affects a wide range of stakeholders from different sectors in Zimbabwe. There should be a comprehensive stakeholder analysis at the beginning and these should participate in consultation for the development of national drought plan.

2 RELATIONSHIP OF DROUGHT PLAN TO OTHER PLANS AND POLICIES

2.1 National Laws, Existing Drought Mitigation Strategies and Planning

The Civil Protection Act is the principal Act and regulatory framework that guides and regulates all disaster risk reduction (DRR) activities in the country (Government of Zimbabwe 1989). This Act establishes a civil protection organisation (CPO) and provides for the operation of civil protection services in times of disasters. The CPO is a national platform made up of line ministries/departments, state enterprises, private sector and NGOs whose regular activities are related to disaster risk reduction and community development (Mavhura, 2016). The responsibility for the administration and implementation of the Act lies with the Department of Civil Protection (DCP), which falls under the Ministry of Local Government Public Works and National Housing.

National Policy on Drought Management (NPDM) outlines government responsibilities in responding to natural disasters and reviews government capacities and structures to deal with drought preparedness, mitigation and response. This policy has however not been finalized and is not in the public domain.
The National Policy and Programme on Drought Mitigation provides a guide for local level structures (provincial and district) to obtain financial assistance from foreign organizations for early warning and drought monitoring sentinel sites. The Policy encourages green growth strategies that encompass planting early, choosing of drought-tolerant and early maturing seed varieties, water conservation measures, and cross-breeding and selling of livestock. The policy has however not been finalized.

The Water Policy provides guidelines for water use and management including for water, sanitation and hygiene (WASH). In times of drought, water management is critical as lack of water can lead to other disasters.

The Irrigation Policy provides guidelines for the country to increase its irrigation capacity so as to minimize risks including drought, to increase production and productivity and to enhance crop diversification.

A draft Disaster Risk Management Bill has been under development since the early 2000s with the intention to update and eventually supersede the Civil Protection Act.

National Climate Change Response Strategy provides a framework for a comprehensive and strategic approach on aspects of adaptation, mitigation, technology, financing, public education and awareness.

The Zimbabwe Drought Risk Management Strategy and Action Plan (2017–2025) was designed to provide a framework and guidance to support the implementation of suitable drought mitigation practices and interventions. In order to be able to provide an appropriate framework for mitigating the effects of drought, this strategy is based on a number of principles derived from the national policy on drought management and related national documents.

National Disaster Risk Management Policy has not yet been developed in Zimbabwe, however a “civil protection policy statement” exists, stating that “every citizen of Zimbabwe should assist where possible to avert or limit the effects of a disaster”.

The Food and Nutrition Security Policy (2011) informs the establishment and strengthening of national structures, mechanisms and capacities that move beyond narrow technical interventions to facilitate multi-disciplinary, broad-based collaborative approaches for addressing food and nutrition security in Zimbabwe.

The Second Science, Technology and Innovation Policy (2012) aims to develop innovative approaches that facilitates scientific and technological contributions to the country’s development agenda at micro and macro levels. The policy provides for the use of scientific early warning systems and breeding for specific needs such crop and livestock that are tolerant to climate risks such as drought. It also stresses the need to monitor and mitigate threats to the environment, such as pollution and carbon emissions.
The draft Comprehensive Agricultural Policy Framework (2012-2032) recognises that the country is susceptible to droughts and looks at the development of sound strategies for combatting the effects of climate change. These include research into the development of high yielding and drought tolerant crop varieties, and support the production of small grains especially in the drought prone areas (ZRBF, date unknown).

2.2 Importance of National Drought Plan

Zimbabwe has experienced regular droughts over the years with the most severe being the 1991/92 drought (Kinsey and Willem, 1998; Mutowo and Chikodzi, 2014). This was evident as the drought adversely affected groundwater resources. Rainfall in 1992 was just 30% of the average amount, and the water table in some areas dropped by 100–200 metres, traditional shallow wells and boreholes dried up, and a number of rivers, reservoirs and their related ecosystems disappeared (Gumbo, 2006). The impacts crippled the economy and other sectors of the country most severely rural livelihoods (Maia, Vivas and Serralheiro, 2015; Tadesse, 2016). It is in this vein that a National Drought Plan is vital as it gives guidance to all stakeholders on drought mitigation and preparedness (Hayes and Svoboda, 2005). On paper, Zimbabwe has a go-to procedure with regards to droughts as a disaster risk (Zimbabwe Drought Risk Management Strategy and Action Plan (2017–2025)) however there is lack of its implementation and coordination between the respective authorities and stakeholders. It is important to develop drought preparedness plans to deal with these extended periods of water shortage in a timely, systematic manner as they evolve.

3 OVERVIEW OF DROUGHT IN THE COUNTRY

3.1 Definition and Contextualizing Drought

3.1.1 Historical Occurrences

Drought occurs in high as well as in low rainfall areas. It is a condition relative to some long-term average condition of balance between rainfall and evapotranspiration in a particular area, a condition often perceived as normal. Yet average rainfall does not provide an adequate statistical measure of rainfall characteristics in a given region, especially in the drier areas. Droughts are normal recurring climatic phenomena, occurring at many scales for periods varying from weeks to decades (Bayarjargal et al, 2006). Zimbabwe is a subtropical country which experiences frequent droughts. Even before the devastating droughts in the 1990s, the trend towards late rainy seasons, prolonged mid-season droughts and shorter growing seasons had already been detected (Brüntru and Tsegai, 2017). The rainy season in Zimbabwe, even in non-drought years, is characterized by mid-season droughts (Nangombe, 2015; UN, 2017). Using the Standardized Precipitation Index droughts in Zimbabwe were observed to have become smaller or less pervasive with extreme droughts appearing to inherit the coincidence of both very high values of spatial extent and intensity in a single event (Mutowo and Chikodzi, 2014).
Table 2: Droughts in Zimbabwe between 1950 and 2013

<table>
<thead>
<tr>
<th>Grade</th>
<th>Extreme Drought</th>
<th>Severe Drought</th>
<th>Mild Drought</th>
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<tbody>
<tr>
<td>Total</td>
<td>2</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>3.3%</td>
<td>6.7%</td>
<td>26.7%</td>
</tr>
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</table>

*Adopted from Nangombe (2015)*

Data for the period (1983–1996) shows that Zimbabwe experienced four major droughts, that is, in 1982–1984, 1986–1987, 1991–1992 and 1994–1995 (Figure 2). In three of the four droughts, state and nongovernmental organization (NGO) drought-relief schemes provided substantial support to help maintain household consumption levels. Zimbabwe

![Figure 2. Annual rainfall years in Zimbabwe between 1950 and 2010 (adopted from Sangombe 2015)](image)

3.2 Drought Impacts: By sectors

Although there are inconclusive findings on the specific impacts of climate change on regional water resources, many scientists have suggested that climate change is likely to increase the frequency and intensity of extreme climate events such as drought (IPCC, 2007). In addition to the risk to future water supplies brought on by climate change, population growth, urban expansion and requirements for environmental protection have been stressing local water supplies in many places, exacerbating competition for already scarce water resources. Zimbabwe has experienced at least 23 droughts between 1950 and 2013 (Sangombe, 2015). The increase in the frequency of these droughts and other natural hazards can be attributed to climate change.

The impacts from natural hazards, including drought, can be both direct and indirect. Direct and indirect effects are sometimes referred to as primary and secondary (or higher-order) effects in the literature. Identifying an adequate definition for direct and indirect impacts is important for economic impact assessments because the bounds set by such definitions dictate the scope of impacts that may or may not be included. In the manuals of Flood Hazard Research Center Parker et al., (1987), direct costs were limited to loss of land, houses and machinery; while indirect costs are related to business interruption as well as backward and forward multiplier effects in the economy.
3.2.1 Socio-Economic Sector
The socio-economic impacts of drought are varied, ranging from famines, food insecurity and a decrease in GDP (Adams et al., 2012). The impact of droughts can be felt directly in the agriculture sector. However there are some sectors that are also indirectly affected in a “snowballing” effect. Low agricultural productivity leads to reduced household incomes and lack of food. Agriculture is a major contributor to Zimbabwe’s gross domestic product. Droughts have a major impact on the socio-economic sector as the country has to import cereal when crops, especially maize, fail.

3.2.2 Agricultural Sector
Drought impacts are most eye-catching and direct in the agricultural sector. Dried crops, abandoned farmland, and withered and yellow pastureland are the common signs of drought. Prolonged soil moisture deficits due to drought can cause damage to crops and pastures. Crop failures and pasture losses are the primary direct economic impact of drought within the agricultural sector. Drought-induced production losses cause negative supply shocks.

Drought-induced losses are not completely borne by farmers; instead, a portion of the losses are passed on to consumers through increased prices. The higher the price increases, the more losses will be passed on to consumers. It is even possible that farmers are better off from the drought impacts, given that the price increases by a higher percentage than the supply decreases. Additionally, commercial farmers who purchase crop insurance will get part of their losses compensated by insurance companies, and some eligible farmers may receive direct disaster aid from the government. The ultimate losses borne by farmers could be very different from the actual impacts caused by drought. It is a common mistake to equate farmers’ income losses with the economic impacts of drought. Therefore, it is important to quantify overall drought impacts as well as identify the losses borne by different stakeholders.

Zimbabwe’s economy is agro based and any developmental hopes are pinned to a successful rainy season. Approximately 80% of Zimbabweans depend on rain-fed agriculture for their livelihoods (Madzwamuse, 2010). In drought years irrigation schemes have been known to fail completely and require more than just one season to recover. Studies have shown that following the 1991/2 drought the 1992/3 rainy season provided only 80% of normal rainfall and this was not sufficient to sustain river flow or raise the water table to safe levels. It took 3 rainy seasons for the system to stabilize again.

During the 1991/2 drought there were virtually no harvests in the country and that resulted in the depletion of the country’s grain reserves in the GMB. In a drought recorded in Ethiopia in 2015 about 435 000 children faced severe acute malnutrition and more than 1.7 million children, pregnant women and lactating women needed supplementary feeding.

3.2.3 Pastoral sector
In a drought year, together with crop failures comes livestock losses. In 2015 about 60% of cattle herd’s perished in some areas. In Zimbabwe the 1991/2 drought reduced the national herd by up to 50%. A fall in fodder availability due to low rainfall is the first main effect of drought on livestock
production systems. Low rainfall causes a drop in the availability of drinking water, precluding the effective grazing of certain pastures. Fertility levels and the timing of conception are strongly related to the nutritional status of female animals. In a drought year, animals suffer both a lower rate of conception, due to a tardy and incomplete return to peak bodyweight during the rains, and higher rates of miscarriage and stillbirth in the subsequent period of pregnancy and calving, due to the high level of stress experienced by animals as the dry season proceeds. Thus, drought in one year will lead to lower calving rates in the following year. This fall in the number of new calves entering the herd is further aggravated by high mortality rates among young stock. Milk output also falls as female animals’ access to fodder is reduced and, below a certain level of intake, lactation ceases completely. This fall in milk availability affects not only the calf’s nutritional status but also the consumption level of the herders’ families, which rely for part of their food requirements on off-take of milk from the animals. In normal years, humans are often in tight competition with calves for the small amount of milk available from females in the herd. A drought-induced milk shortage will intensify this rivalry.

Animal live-weight falls as grazing becomes scarce, reducing the value of stock as meat animals. This loss of condition also makes them less valuable for the transport of goods and pulling of loads, such as in ploughing, drawing water, etc. This worsens the drought impacts especially for the subsistence farmers who in good years invest in their livestock and in drought years want to sell off their livestock to purchase food for human consumption. The livestock are then sold at very low prices as their body condition will be very low but the farmer has no option as they need food for their families and also cannot sustain the herd. During the 2012 drought in Zimbabwe a lot of heat waves were experienced and many small domestic animals and fowl died of heat stress in areas like Kariba. Records of children fainting and failing to attend school due to heat related illnesses were also noted in the 2012 drought.

Death rates increase with the fall in live-weight and increased susceptibility to disease. Young animals, elderly stock and pregnant females are the most vulnerable. Death rates increase as the period of drought continues, as the period of nutritional stress lengthens and as the degree of stress intensifies. A number of surveys have been carried out on stock losses during times of droughts and these show that death rates vary widely from one livestock species to another and from one drought situation to another.

3.2.4 Non-agricultural Sectors
Drought also causes significant economic impacts in non-agricultural sectors through its effects on water supplies including stream-flows, reservoirs, wetlands, and groundwater. These non-agricultural sectors include, but are not limited to, tourism and recreation, public utilities, and landscaping services, navigation and other industries that have significant water consumption. Public water supply systems are designed to deliver clean water to the public on a continuous basis. If their water sources are from reservoirs or groundwater aquifers, they would not be subject to effects of short-term precipitation variations. However, the occurrence of severe and sustained droughts that deplete water storage can still cause water scarcity, deteriorated water quality, and even interruptions of supply. In Zimbabwe the 1991/2 drought depleted both surface and aquifer water leading to the shortage of water supply for both urban and rural consumers. In rural areas people have to travel very long distances to get water in drought years. Water shortages also result in water
related public health concerns. This causes the closure of schools and other public institutions like hospitals and clinics. Where these continue to run, strict water rationing measures will be put in place.

To manage water shortages in urban areas, water authorities can adopt adjustments that reduce water demand or adjustments that increase water supply. Demand-side measures include but are not limited to voluntary and mandatory use restrictions, price changes, conservation education programs, and investment in water-saving equipment and appliances. Supply-side measures can include finding alternative water sources, providing emergency supplies (drilling new wells, hauling in water), and recycling water. During the most recent drought in Zimbabwe the urban municipalities engaged in a program to drill boreholes in highly populated residential areas, for example Highfield and Mbare, in order to improve water supply for people. The losses caused by drought include: households’ welfare losses due to restricted water use and deteriorated water quality; lost production or sales for industries and businesses due to forced slowdown or shutdown; costs of emergency supplies; revenue losses and increased monitoring and treatment costs for water suppliers.

In the tourism and recreation sector, since many activities are water-related, droughts can bring critical losses to businesses in drought-stricken areas. Drought impacts exist for both winter and summer recreational activities. Reduced flows might result in fewer visits and a shorter rafting season in areas like the Victoria Falls which is an important tourism destination in the country. Other summer recreational activities, like fishing and boating, can be affected by drought as well, especially a multi-year drought that depletes water in lakes and reservoirs.

Zimbabwe is very vulnerable to drought with the economic impacts of major droughts extending well beyond the immediate impact of reduced agricultural production. The energy sector in Zimbabwe is very vulnerable to water shortages and reduced flows as 80% of the county’s energy comes from Lake Kariba Power station. In the most well documented drought of 1991/2 Lake Kariba levels dropped to about 40% of its full capacity, any further drop would have made the generation of electricity impossible. Electricity production was reduced to about 30% thus the country had to import electricity from the Democratic Republic of Congo.

Drought also affects the country’s disaster preparedness in general. It takes about three seasons for the system to fully recover from a severe drought as evidenced by the 1991/2 drought. During this recovery period the country will most likely be ill prepared to deal with any other shock that may come thus the impacts will be magnified.

3.2.5 Environmental impacts

Environmental impacts of drought range from loss of ecosystems, loss of biodiversity, loss of water bodies and desertification (Adams et. al., 2012). The reduced precipitation in drought years results in the disruption of ecosystems and death of wildlife species. During the notable 1991/2 drought a lot of animals had to be translocated from National Parks for example Gonarezhou National Park to private game reserves like Save Valley Conservancy where resources were available for artificial water provisions.

In rural areas people have to travel for longer distances in search of water for domestic use. Some end up digging in dry river beds to access water. During the 1991/2 drought in Zimbabwe, rivers
dried up and ground water was also depleted resulting in people having to travel longer distances to get water.

### 3.2.6 Secondary impacts

The secondary impacts of drought, as well as other natural disasters, are attributed to the interactions and transactions among industries and sectors. Outputs from one industry/sector become inputs into other industries/sectors. Therefore, the direct economic impacts on an individual industry would spread through the upstream or downstream linkages to other industries, causing secondary impacts. For example, farmers with crop losses will reduce their supplies to the downstream industries, such as food processors and ethanol plants. These consumers would have to bid a higher price for the inputs or otherwise reduce their production for the lack of inputs. In turn, their downstream customers may be forced to do the same. Such types of effects are called downstream or forward effects. On the contrary, farmers may reduce their input requirements like fertilizer from the upstream suppliers, which can cause upstream, or backward, effects. The upstream and downstream effects together are referred to as indirect effects. In addition, any income reduction caused by a disaster would force consumers to diminish expenditures, and thus generate another round of impacts. Such impacts are usually referred to as induced effects in the literature, and they are also part of the secondary effects.

Any welfare changes experienced by human beings should also be counted into the measures of drought economic impacts. For example, if drought causes damages to the habitat of endangered species, then the welfare of people who care about these species would be harmed and therefore should be counted as a part of drought incurred losses. Similarly, if drought causes health problems, like stress and anxiety to people, their lost welfare should also be counted as a part of drought incurred losses. Economists and other social scientists have developed various methodologies and techniques to evaluate non-market values. The three most commonly used ones are: travel cost, hedonic pricing, and contingent evaluation (Hayes and Svoboda, 2005)

### 4 ORGANIZATION AND ASSIGNMENT OF RESPONSIBILITIES

Agencies and stakeholders provide different goods and services towards drought management and their communication and coordination is essential. For efficient drought management there is need to establish drought management bodies and assign responsibilities to each as described in Table 3.

The National Drought Plan is proposed to serve as a “framework” through which the Zimbabwean government and local sectors can efficiently cooperate and implement mitigation measures and suitable response actions during periods of drought. Local and provincial synchronization within the drought organizational framework provide for participation of each respective stakeholder, as well as coverage of all phases of drought management. Coordination within the structures is greatly dependent on communication which involves sharing of drought-related information.

The Provincial Level Drought Committees (PLDC) as described in Table 3, would monitor and assess current and potential impacts of imminent or ongoing drought at local level. The PLDCs apply appropriate local government drought responses and advise the National Drought Council of any
partnership needs. The NDC comprises of members from CPU, GoZ, respective ministries and departments. Post-drought appraisal (e.g., impact assessments generated by the PLDCs) assists in the documentation of national drought impacts and response and mitigation measures effectiveness. The Provincial Drought Coordinator manages the exchange of information between the NDC, Provincial Drought Monitor and the PLDCs. The NDC and PLDCs will rely heavily on the PDM to provide drought monitoring and forecasting information. Likewise the NDC will depend upon the PLDCs to monitor and assess local impacts within each province during periods of drought.
### 5.1 Drought Indices

The Meteorological Services Department (MSD) uses the globally accepted Standardised Precipitation Index which qualifies the severity of droughts in drought monitoring whereas the

<table>
<thead>
<tr>
<th>Zimbabwe Drought Programme</th>
<th>National Drought Council</th>
<th>Provincial Drought Coordinator</th>
<th>Provincial Level Drought Committee (PLDC)</th>
<th>Provincial Drought Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Coordination at government level to develop drought policy and implement the National Drought Plan.</td>
<td>Supports preparation and successful implementation of the National Drought Plan.</td>
<td>Recognize, implement and respond to drought at a local level and establish localized strategies and projects to implement provincial drought mitigation.</td>
<td>Collates drought-related information, provides technical assessments, and analyses drought forecast information whilst running the website.</td>
</tr>
<tr>
<td><strong>Membership</strong></td>
<td>Civil Protection Unit Ministry of Agriculture Ministry of Environment Provincial Officials AGRITEX Met Department ZIMVAC</td>
<td>This position resides within the Civil Protection Unit</td>
<td>Each PLDC should include representation from appropriate government agencies, stakeholders, and the private sector.</td>
<td>The officer coordinates with NDC, PLDC, CPU, ZIMVAC, Disaster Management Agencies, AGRITEX and others to assess drought conditions and impacts.</td>
</tr>
<tr>
<td><strong>Responsibilities</strong></td>
<td>-Informs Government on drought related issues -Implements and maintains National Drought Plan -Supports and facilitates PLDCs -Coordinates and reports drought vulnerability and impact assessments -Promotes drought mitigation activities and reduce drought vulnerability -Suggests legislation to State and provincial legislative bodies for drought program activities -Facilitates access to government and development partners for drought management program funding -Declaration of laws and/or rules as necessary to implement mitigation measures</td>
<td>-Maintains the National Drought Plan -Provides coordination with government and local assistance programs and acquires funding for program implementation -Develops and implements projects to facilitate drought mitigation -Provides administrative support to the National Drought Council and Provincial Level Drought Committees -Ensures timely distribution of drought forecasts to agencies, organizations and the public -Develops and implements public awareness and drought education</td>
<td>-Monitors, assesses, and reports drought conditions -Reports drought impacts -Executes drought mitigation and preparedness actions -Identifies and prioritizes emergency drought assistance projects -Develops long-term drought mitigation strategies to minimize the effects/impacts of drought.</td>
<td>-Contributes local knowledge and drought conditions to the database through monitoring of available data and weekly drought impacts -Communicates with local drought stakeholders and PLDCs to collect real time observations of drought conditions and impacts -Updates the Drought Information as needed on the website</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>Convene at least twice a year and more frequently during periods of drought or if drought funding becomes available.</td>
<td>Year round coordination and facilitates meetings at least once a year for NDC and PLDC. More frequent communication during drought or as funding becomes available.</td>
<td>Meets at least once a year and more frequently during periods of drought or if drought funding becomes available.</td>
<td>Evaluates drought condition weekly and updates site as conditions change.</td>
</tr>
</tbody>
</table>

### Table 3: Drought Plan Tasks and Descriptions

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Membership</th>
<th>Responsibilities</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>Supports preparation and successful implementation of the National Drought Plan.</td>
<td>This position resides within the Civil Protection Unit</td>
<td>-Maintains the National Drought Plan -Provides coordination with government and local assistance programs and acquires funding for program implementation -Develops and implements projects to facilitate drought mitigation -Provides administrative support to the National Drought Council and Provincial Level Drought Committees -Ensures timely distribution of drought forecasts to agencies, organizations and the public -Develops and implements public awareness and drought education</td>
<td>Year round coordination and facilitates meetings at least once a year for NDC and PLDC. More frequent communication during drought or as funding becomes available.</td>
</tr>
<tr>
<td>Recognize, implement and respond to drought at a local level and establish localized strategies and projects to implement provincial drought mitigation.</td>
<td>Each PLDC should include representation from appropriate government agencies, stakeholders, and the private sector.</td>
<td>-Monitors, assesses, and reports drought conditions -Reports drought impacts -Executes drought mitigation and preparedness actions -Identifies and prioritizes emergency drought assistance projects -Develops long-term drought mitigation strategies to minimize the effects/impacts of drought.</td>
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<td>Collates drought-related information, provides technical assessments, and analyses drought forecast information whilst running the website.</td>
<td>The officer coordinates with NDC, PLDC, CPU, ZIMVAC, Disaster Management Agencies, AGRITEX and others to assess drought conditions and impacts.</td>
<td>-Contributes local knowledge and drought conditions to the database through monitoring of available data and weekly drought impacts -Communicates with local drought stakeholders and PLDCs to collect real time observations of drought conditions and impacts -Updates the Drought Information as needed on the website</td>
<td>Evaluates drought condition weekly and updates site as conditions change.</td>
</tr>
</tbody>
</table>
Agriculture Research and Extension Services (AGRITEX) mainly use the Water Requirement Satisfaction Index (WRSI) in drought monitoring. Normalised Difference Vegetation Index (NDVI) is the most widely used index for monitoring drought at different spatial scales ranging from the landscape to the global. Information is gathered from the National Drought Monitor and other sources. Mutowo and Chikodzi (2014) found that remote sensing technologies using indices as the Vegetation Condition Index (VCI) can be used for drought monitoring in Zimbabwe.

5.2 Current Monitoring, Forecasting and Data Collection
Drought monitoring is a key component to effective drought risk management and profiling the history and occurrences of droughts in Zimbabwe is one of the first steps needed to achieve this (Mutowo & Chikodzi 2014). A number of drought monitoring methods have been used globally and these are continuously improving, much so in developed countries. Monitoring methods used in the African Drought Monitor include: 1) Monthly and seasonal precipitation in percentage of average for meteorological drought, 2: monthly soil moisture anomaly data for agricultural/ hydrological drought, 3) The NDVI (Normalized Difference Vegetation Index) data is used to measure agricultural drought, and 4) Lakes and rivers levels data for hydrological drought expected soon with sentinel suite of satellites. This data is used by the African Regional Climate Centre and the Monitoring for Environment and Security in Africa (MESA) for Long Range Forecasting. The seasonal forecast is generated by southern Africa regional climate experts together with the Southern Africa Regional Climate Outlook Forum and disseminated in August prior to the rainfall season (Nangombe, 2015). Each member state then downscale the regional forecast to their national level and continuously monitor to pick out intra-seasonal droughts.

The Ministry of Lands, Agriculture and Rural Resettlement through the Meteorological Services Department (MSD); and through the Agriculture Research and Extension Services (AGRITEX) are responsible for drought monitoring, systematic observation and monitoring of hydro-meteorological parameters; provision and publication of information, forecasts, products and services related to weather and climate. Also these departments are responsible for the supply of data related to drought-relevant parameters, indices and indicators (Nangombe, 2015 to the NDM).

5.3 Drought Severity in all relevant sectors
Hayes (1999) notes that, drought severity is dependent not only on the duration, intensity and spatial extent of a specific drought episode, but also on the demands made by human activities and vegetation on a specific region’s water supply. Mutowo and Chikodzi (2014) concluded that droughts occur annually in Zimbabwe, although the severity and spatial distribution varies. Matabeleland North and South, Midlands and Mashonaland Central Provinces are prone to moderate and severe droughts. Severe drought episodes have dire impacts on the socio economic sector and the environment and can lead to massive famines and migration, natural resource degradation and weak economic performance. It can exacerbate social tensions and fuel civil unrest.

5.3.1 Economic – the impact of drought shocks of similar severity will vary between economies, depending substantially upon the structure of the economy. Zimbabwe like most African economies relies on the natural resources and as such production would plunge (Benson and
Clay, 1998). The manufacturing sector would witness water and electricity shortages, input supply difficulties, reduction in demand due to the high cost of goods and macroeconomic conditions leading to unemployment increases. Other shocks include loss of forestry and wildlife production, loss of farmers, recreation and tourism industry, loss of industries dependant on natural resources production (Maia, Vivas and Serralheiro, 2015). Increased importation of food, revenue shortfalls, financial institution collapses and reduction in economic development are additional stresses to the economy due to drought.

5.3.2. **Agricultural and Pastoral** – Agriculture bears much of the impacts in developing countries absorbing 80% of all direct impacts with multiple effects on water availability, agricultural production, food security and rural livelihoods. Agriculture in Zimbabwe contributes to 19% of the country’s GDP and approximately 80% of Zimbabweans depend on this agriculture which is mostly rain fed for their livelihoods. The severity of drought in the agricultural sector cannot be ignored. Drought results in reduced crop productivity, insect and disease infestation, HWC, unavailability and high cost of livestock water and feed, high livestock mortality rate, disruption of reproduction cycles and land degradation (Benson and Clay, 1998; Hayes and Svoboda, 2005).

5.3.3. **Environmental** – Drought severity in the environmental sector will mainly affect water availability which in turn will lead to a number of effects such as damage to plant species and severity of fires, loss and degradation of wetlands including salinity level disruption, groundwater depletion as sources of water are used up. Biodiversity loss, water and air quality effects and reduction of water flow and stream levels.

5.3.4. **Social sector** – The severity of drought on the social sector cannot be ignored as this shows responses of individuals and communities to the impacts of drought. The mental and physical stress as well as health related low flow problems such as sewage flows reduce health standards. Nutrition reductions due to high cost of food and diet deficiencies increase susceptibility to diseases. General increase in poverty, Increased conflicts for resources and management, cultural and social value disruption, civil unrest, loss of aesthetic value, reduction in quality of life and lifestyle change and migration.

Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm the local economy. Such impacts include loss of fertile soils, mass migration, death due to famines and scarcity in water, economical loss, among others.

5.4. **Drought Impact Assessment Methodology**

Lack of impact assessment methodology hinders impact estimates and the activation of mitigation and response programs. Impact knowledge early in the season enables preparation of early estimates and warnings about the size of impacts. There is need for a **Drought Assessment Team (DAT)** that is solely focused and competent in drought data collection.

a) Household surveys and qualitative information generated from the key informants
The DAT utilises adapted tools for the Focus Group Discussion (FGD) and Key Informant Interview (KII) tools by a simplification of the standard Humanitarian Response Forum (HRF) rapid assessment tools infused with collection of Household Economy Analysis (HEA) key parameters.

The DAT collects and updates information on crop production, livestock production, commodity and food prices, labour wage rates and on-going food and cash safety nets. All this information is compared to selected baseline/reference years for the study zones to reflect the impacts of the current drought conditions on sources of food, cash income and basic expenditure. Parameters on water scarcity, impact on crop and livestock production, health and nutrition; and household coping are collected through use FGD and KII tools as well as field observations to validate the impact and severity of drought community level (Multi-Agency Drought Assessment Team, 2016).

b) Remote sensing and GIS (soil water content, vegetation condition)

Real time monitoring of droughts over large land sparse can be achieved through the use of geographic information system (GIS) and Global Positioning System (GPS). By engaging relevant authorities and GIS expertise this method of drought impact assessment can complement community survey data.

Indexes such as the Normalized Difference Vegetation Index (NDVI), Land Surface Temperature (LST), etc., have been used to monitor the agricultural droughts in the relation to the plant growth (Mutowo and Chikodzi, 2014) and can thus be employed in Zimbabwe. The Vegetation Temperature Condition Index (VTCI) can be used to effectively monitor the drought of an area in the real time.

6. DROUGHT RISK AND VULNERABILITY

Drought risk and vulnerability assessment and GIS mapping is a key element of drought management as it helps identify areas most at risk of drought, allowing communities to plan as well as prepare for and mitigate possible impacts.

6.3. The Drought Risk and Vulnerability Assessment and GIS Mapping

According to the Drought Resilience, Adaptation and Management Policy (DRAMP) Framework (Crossman, 2018), there are three pillars of drought risk reduction and these are:
   a. Implement drought monitoring and early warning systems
   b. Assess drought vulnerability and risk
   c. Implement measures to limit impacts of drought and better respond to drought

The following are the six goals of the DRAMP Framework and these may not mutually exclusive:
1. Reduce exposure to drought
2. Reduce vulnerability to drought
3. Increase resilience to drought risk:
4. Transformation - alter fundamental attributes of social, economic and ecological systems
5. Prepare, respond and recover from drought
6. Transfer and share drought risks - distribute risks among wider section of society to include those who benefit directly and indirectly from robust drought risk management.

6.3.1. Drought Risk Assessment
Drought risk refers to the potential loss of lives, reduced health status, livelihoods, assets and ecosystem services in connection with drought, which could occur to a particular community or a society over a specified time period in the future (UN-ISDR, 2009). Drought risk is calculated as the probability of negative impact caused by interactions between hazard, exposure and vulnerability. Hydro-meteorological or hydrological indicators for example NDVI and SPEI are common indicators used to assess drought risks that work by implementing remote sensing to determine potential drought hazards. The data can then be coupled with data on population and assets in an area, as well as the communities’ vulnerability to damage by drought, to assess the drought risk. It is important for data on drought risks to include data from both remote sensing and ground assessments.

To reduce drought risk, there must be an understanding of the hazard using climatology, improved operational monitoring, an analysis of vulnerability to understand what people and sectors may be most affected by drought, why these impacts occur, and if these relationships are changing over time. Because of the product relationship, if there is no chance for the hazard or there is no vulnerability, the drought risk for that location is zero. For drought, there are very few places, if any, around the world where either component is zero, but this is not necessarily true for other natural hazards. For example, the likelihood of a tsunami in Nebraska is zero, making the state’s tsunami risk zero according to the new equation.

6.3.2. Vulnerability Analysis
Vulnerability is expressed by the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of a community to the impact of hazards, including land degradation and desertification. Natural hazard researchers are most familiar with the hazard analysis component of risk assessment. However, many researchers stress that when evaluating drought risk, vulnerability needs to be considered with at least the same degree of importance that is devoted to understanding and addressing the frequency and severity of other natural hazards (Downing and Bakker 2000). Confusion over the concept of vulnerability and its role in determining natural hazard risk may come from the many variations in vulnerability definitions. Variations in terminology associated with the meaning of vulnerability, for example, sensitivity, resilience, susceptibility, resistance, capacity, potentiality arise from different theoretical schools. The definitions of vulnerability vary widely. However, most of them contain a common thread: they all agree that vulnerability shows the degree of susceptibility of society to a hazard, which could vary either as a result of variable exposure to the hazard or because of coping abilities (Wilhelmi and Wilhite 2002).
Vulnerability analysis can be divided into three components, that is, impact assessment, causal assessment, and a temporal understanding of these issues. An impact assessment is essential to inventory the social, economic, and environmental sectors that are susceptible to drought impacts in a particular region. This allows the broad range of drought impacts to be examined and possibly ranked as high and low priority needs. This analysis may be based on the effects of more frequent and less-severe droughts, a drought of record, or whatever level of severity is deemed appropriate, based on the initial hazard analysis. Impact assessment sub-committees are usually established to research the relevant impacts for a given planning area. To assist such endeavors, several researchers have done quantitative and qualitative research on the impacts of drought (Wilhite and Vanyarkho 2000), while others have also included geographic information systems (GIS) in this type of analysis (de Jager et al. 2000). In most drought planning efforts, GIS and historical information may be used when available, but an impact analysis is often based only on the collective memories of the participants. Table 4 below shows the mitigation measures, expected results and responsible stakeholders and agencies with regard to drought mitigation.
Table 4. Drought mitigation measures and expected results

<table>
<thead>
<tr>
<th>Drought mitigation measures</th>
<th>Expected results</th>
<th>Implementation agency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong> Upgrading and modernizing the Meteorological Services Department and Early warning system</td>
<td>Reliable and more detailed drought forecasts</td>
<td>MSD, NEWU</td>
</tr>
<tr>
<td><strong>2</strong> Drought monitoring at local and provincial levels through drought monitoring administrators and provincial drought coordinators</td>
<td>Drought alerting data and conditions</td>
<td>PLDC, CPU, AGRITEX, DMC</td>
</tr>
<tr>
<td><strong>3</strong> Accessible drought informing websites and information hubs</td>
<td>Easily accessible government website for stakeholders</td>
<td>PLDC, CPU, AGRITEX, DMC</td>
</tr>
<tr>
<td><strong>4</strong> Conducting Vulnerability Assessments and Risk Assessments to identify communities and regions prone to drought</td>
<td>Vulnerability and risk map highlighting areas of concern and priority</td>
<td>ZIMVAC, Red Cross, NGO’s</td>
</tr>
<tr>
<td><strong>5</strong> Plan and establish local, provincial and national response actions and strategies</td>
<td>Drafted drought response plans</td>
<td>CPU, RDC,</td>
</tr>
<tr>
<td><strong>6</strong> Framework for efficient drought coordination and communication between stakeholders</td>
<td>Synchronization and coordination between stakeholders</td>
<td>CPU, PDC, Relevant ministries</td>
</tr>
<tr>
<td><strong>7</strong> Legislation improvement on procedures of community participation in decision making process and access to drought data.</td>
<td>Legislative basis for controlling water utilization and management</td>
<td>GoZ, HCT</td>
</tr>
<tr>
<td><strong>8</strong> Empowering, encouraging and educating farmers on appropriate farming practices in drought prone areas</td>
<td>Adequate food security and reduction in agricultural loss</td>
<td>MALRR, AGRITEX, FAO, NFNC</td>
</tr>
<tr>
<td><strong>9</strong> Research informed and suitable land use practices and infrastructure</td>
<td>Appropriate land uses and environmental system utilization</td>
<td>MALRR, AGRITEX, NGO’s, MHESTD</td>
</tr>
<tr>
<td><strong>10</strong> Policy development at provincial and national levels on water resource allocation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11</strong> Establish water conservation and water efficient designs to reduce water consumption</td>
<td>Rational and effective use of water resources.</td>
<td>ZINWA, Municipalities</td>
</tr>
<tr>
<td><strong>12</strong> Develop and implement drought-related public awareness programs and campaigns</td>
<td>Household knowledge and understanding regarding drought</td>
<td>POTRAZ, Media, Schools</td>
</tr>
</tbody>
</table>
7. DROUGHT COMMUNICATION AND RESPONSE ACTIONS

7.3. Drought Communication Protocol

There is need for official procedures of drought communication and systems between stakeholders in monitoring sectors, the state and local governments up to the general populace. Effective communications that engage users in a timely manner are essential to reduce severity of drought impacts and thus protect the environment.

Table 5: Stakeholder and drought communication protocol

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Communication</th>
</tr>
</thead>
</table>
| Regional Drought and Weather Forecast Forums, NEWU, MSD | • Climate and drought monitoring for region  
• Provide national long term and seasonal drought forecast for member states |
| METHI, MSD, ZIMVAC, NEWU, DMC | • Continuously monitor to pick out intra-seasonal droughts, early warning  
• Drought monitoring and advising government on country’s drought status |
| Farmers, AGRITEX | • Report on drought status to local authorities  
• Crop, livestock and natural environment status and condition |
| District Officers, Red Cross, Local authority | • Collate weather and environmental data from stakeholders  
• Advise relevant authorities |
| Civil Protection Unit, Ministry of Agriculture, Humanitarian organisations, ZIMVAC | • Declaration of Drought Conditions  
• Recommends drought declaration  
• Mitigation and Preparedness actions |
| President | • Declares **State of Disaster**, declares **Drought** |
| MET department | • Provides drought early warnings  
• Informs stakeholders on drought progress |
| AGRITEX, UN-FAO, ZINWA, MPSLSW, NGO’s | • Drought mitigation measures and practises  
• Preparedness strategies |
| Media | • Public awareness and education  
• Mitigation and preparedness strategies |
| Local Authorities, Education institutions, social groups | • Water conservation measures  
• Sustainable livelihood strategies |

The Meteorological Office, National Early Warning Unit (NEWU), Famine Early Warning systems Network (FEWSNET), World food Programme (WFP), Drought Monitoring Centre (DMC) and the Food and Nutrition Council in collaboration with ZIMVAC assess and monitor drought hazards and maintain early warning systems. The Agricultural Rural Extension Services (AGRITEX) and cooperating partners, particularly United Nations Food and Agricultural Organisation (UN-FAO), promote drought tolerant crops, grazing schemes, water harvesting, expansion of irrigation schemes and moisture conservation (GoZ and UN, 2013; UN, 2017). The Department of Social Welfare together with all partners who manage the food sector distributes grain to the affected populations.
7.4. Declaration of Drought conditions
The Department of Civil Protection, recommends for the President of the Second Republic of Zimbabwe to declare a “State of Disaster”. The department is guided by the Zimbabwe Vulnerability Assessment Committee (ZIMVAC) which conducts the Rural Livelihoods Assessment (RLA) report. The assessment is part of an inclusive information system that informs the Government and its Development Partners on initiatives necessary for saving and strengthening rural livelihoods in Zimbabwe. For the ZIMVAC to advise the government to declare a drought state of disaster they consider the Rainfall and Agricultural Season Quality, crop and livestock performance, rural food insecurity against base year standards. Also considered is the Global Acute Malnutrition (GAM) rate of children aged 6-59 months and The Severe Acute Malnutrition (SAM) rate for children aged 6-59 months which has a 2% threshold for emergency response in Zimbabwe (ZIMVAC, 2016b).

7.5. Communication and Coordination Guidelines
Communication and coordination between departments is essential for efficient drought management strategies. In terms of coordination, the Provincial/ District Civil Protection Committee are responsible for coordinating disaster risk management activities at district and provincial level. Civil protection committees form the backbone of the country’s preparedness and response coordination structures, with committees existing at national, provincial, and district levels (National Civil Protection, 2013; UN, 2017).

The National Food and Nutrition Council (NFNC), under the coordination of the OPC, oversee drought management and response. The NFNC works closely with the MSD, which provides early warning information, and the MALRR, which is the implementing arm of drought management and response activities.

A web-based Disaster Information Management System (www.dcpzm.org) has been developed with support from IOM to serve as the information management (IM) platform for the Government. At the moment (during the writing of this plan) the website is offline.

POTRAZ is in the process of setting up two dedicated emergency numbers that will be managed at the national level.

7.6. Drought Response Actions
At the top of the preparedness and response coordination structure stands the Humanitarian Country Team (HCT). The HCT consists of representatives of NGOs, the Red Cross Movement, development partners and UN agencies in Zimbabwe. The HCT meets at head of agency level to discuss issues related to preparedness and response coordination.

Water supply and demand management - the government initiated, District Development Fund is responsible towards sinking boreholes in drought prone rural communities. These boreholes are drilled before and during droughts and assist the people and livestock in providing water. However, prolonged droughts have a tendency of also drying up the boreholes in these areas. Once declared a
drought, a number of measures have to be taken for sustainable water usage by households and industries. **Local municipalities** in association with relevant authorities such as ZINWA embark on water use restriction and with an increase to water scarcity the restriction develop to water use bans and subsequently water rationing.

**Food security and livelihoods** - In some communities the **Rural District Council** (RDC) has partnered with NGOs such as CARE Zimbabwe and the **World Food Program** in using Marketing Board storage facilities for reserve grain stocks that will serve as relief, as a drought response preparation in case of moderate to severe drought. This would avoid delayed importation, since the responsibility for this exercise and provision of funds will lie in the hands of the RDC through the Local Government. The government also receives support from development partners (NGOs) through implementing food aid and water projects to different affected communities. The **Vet Field Services Department** also works in collaboration with FAO in providing supplementary feeds for livestock in affected areas.

**Communication and partnerships** - The MSD provides early warning information and AGRITEX plays an active role in getting farmers to adopt the necessary adjustments to their cropping. Public awareness activities are undertaken by a multitude of actors including DCP, the Red Cross Movement, national and international NGOs and development partners. The Postal and Telecommunications Authority of Zimbabwe (POTRAZ) has works with mobile network operators to dispatch early warning or early action messages to people at risk. Media and press play a significant role in educating and raising awareness on droughts but mostly keeping the public well informed.

**8. DROUGHT MITIGATION AND PREPAREDNESS**

To curb the impacts of droughts it is essential to build up resilience during the non-drought period and while interventions during the drought should be aligned to early response which focuses on the certainty of early warning systems and continuous monitoring of the prevailing drought conditions. The very first step in drought mitigation is identifying drought hotspots (National Civil Protection, 2013). The Zimbabwe Government plan is built around the key areas of grain importation, emergency irrigation rehabilitation, livestock destocking, emergency water supply, and school feeding and food security (ZIMVAC, 2016a). Drought interventions should include the preparedness measures for the next drought cycle thus integrating proactive and reactive measures (Brüntrup and Tsegai, 2017). Preparedness is required on all levels of government.

**8.3. Water management practices**

Water scarcity as a major impact of droughts intensifies the need for water management as a drought mitigation measure. **Water conservation** is a powerful yet underutilized drought mitigation tool that can stave off the severe water shortages, financial losses, and public safety risks (Hayes & Svoboda 2005). The practice preserves, controls and develops water resources both surface and groundwater. Mitigation measures include introducing appropriate water resources management and irrigation development schemes such as drilling of boreholes, construction of more dams,
conservation farming, rainwater harvesting techniques and supplemental irrigation and other irrigation resources development (FAO, 2004). There is need to invest in soil and water management practices, such as improved development and management of fragile catchment areas and river basins, including small-scale irrigation.

8.4. **Appropriate Land Use practices**
Drought preparedness is essential for the agriculture sector and appropriate crop production and farming systems have to be employed. Crop production has to be encouraged in areas that are climatically and topographically suitable for particular crops including farming of small grain drought tolerant crops and short season varieties. Farmers are encouraged to partake in Climate Change Adaptation projects such as bee keeping which can act as safety nets (FAO, 2004; Nangombe, 2015). Improving rangeland and livestock management by ensuring correct stocking rates of domestic livestock and establishment of grazing schemes and supporting programmes on reforestation are suitable mitigation measures. Facilitation of sustainable management of natural resources and reduction of land pressure through resettlement and proper land use practices mitigates the severity of drought impacts on the environment. With rural communities being the most drought vulnerable areas accelerating rural industrialization and promoting small-scale enterprises shifts livelihoods from agriculture dependence.

8.5. **Education, Communication, Awareness**
Effective communication among relevant stakeholders fosters efficient drought mitigation and preparedness strategies and actions. From the government to the public, each stakeholder plays a vital role in mitigating drought impacts however there has to be knowledge and information dissemination leading to efficient mitigation practices (Hayes and Svoboda, 2005; Tsegai, 2014). Education and research institutions should redirect research towards more appropriate farming systems and drought mitigation practices for all stakeholders and these should be compliment policy (Tsegai, 2014; Tadesse, 2016). Education and well executed awareness programmes foster local reality and behaviour oriented conservation leading to community participation, capacity development and sustainable livelihoods (Eludoyin, Eludoyin and Eslamian, 2017). Farmers, through AGRITEX, are advised to adopt more scientific based seasonal forecasts and farming practises whilst also in-cooperating indigenous knowledge systems (Nangombe, 2015).

8.6. **Legislation**
Effective drought mitigation and preparedness strategies are based on established policies and institutional capacity. Mushore et al. 2015 noted a lack in policy implementation, integration and coordination among Government departments, NGOs and other institutions in disaster management in Zimbabwe. Institutions face a number of challenges which include political interferences, lack of resources and lack of coordination in drought management. Policies have to be effected on all stages of drought management i.e. from monitoring to impact assessment (Brüntru and Tsegai, 2017) however policy coherence and coordination is difficult as it involves numerous sectors, various decision-making levels, time, socio-economic and technological transitions.
<table>
<thead>
<tr>
<th>Policy domain</th>
<th>Non drought period</th>
<th>Drought period</th>
<th>Responsible stakeholders</th>
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| Early warning systems/knowledge management | • Drought hotspots  
• Risk assessment  
• Vulnerability assessment  
• Drought planning  
• Knowledge dissemination | • On-going impact assessment  
• Monitoring and evaluation of mitigation and emergency measures | MSD, DMC, MIPBS, National Early Warning Unit, Ministry of Higher Education, Science and Technology Development |
| Water/Landscape | • Landscape/watershed management, water harvesting and conservation on- and off-farm  
• Water storage  
• (Water-saving) irrigation  
• Water contingency planning | • Household and industrial water restrictions, ban  
• Water conservation  
• On-going monitoring of environmental flows | MALRR, ZINWA, Local Authorities, Environmental Management Agency, WASH |
| Agriculture | • support of more intensified crop diversification programmes  
• Drought resilience breeding  
• Cropping system adjustment (new crops)  
• Fostering livestock markets  
• Seed (emergency) stocks  
• Managing pastoralism and crop/livestock integration | • Irrigation or stop according to drought severity and outlook  
• Livestock vaccination and reduction  
• Protecting key animals, recovery  
• Seed distribution (recovery) | MALRR, AGRITEX, GMB, Ministry of Higher Education, Science and Technology Development |
| Finance | • Crop and livestock (weather) insurance  
• Savings  
• Cash transfer facilities | • Ease disbursements  
• Use for emergency cash transfers (private and public) | Finance ministry and financial institutions, |
| Social protection | • Establishing social protection systems | • Scaling up to drought-affected populations, cash or in kind | Civil Protection Unit, ZIMVAC, NFNC |
| Food markets | • Fostering food crop markets (integration, storage, commercial linkages)  
• Establishing food price monitoring systems | • Facilitating commercial food inflows  
• Situation-sensitive regional food aid | Market associations, Finance ministry, MALRR, Ministry of Industry, Commerce and Enterprise Development |
| General economic development | • Income diversification  
• Migration as income diversification measure  
• Infrastructure (transport, storage, telecommunication, etc.)  
• Contingency planning | • Infrastructure-building as part of emergency aid and reconstruction (cash/food for work) | Ministry of Finance and Economic Development, GoZ, NGO’s |

Based on drought mitigation measures adopted from and suggested by Brüntru & Tsegai 2017, Wilhite, 2014).
Some provinces and districts in Zimbabwe, have updated preparedness and response plans in place while others need to have plans updated (UN, 2017). There is need for policies and plans directed to drought national disaster mitigation measures as the current encompass all natural disasters. These should also be directed at local, provincial and national levels.

9. RECOMMENDATIONS AND IMPLEMENTATION ACTIONS

Drought is one of the many disasters that occur in Zimbabwe. Although droughts have occurred regularly in the past, the government has responded to drought through its structures. The President, in terms of the Civil Protection Act can declare state of disaster’ due to drought. The last such declaration was in 2016.

The effects of drought straddles across various sectors whose responsibility is domiciled in different government ministries. Although when the government can declare a ‘state of disaster’ in case of extreme precipitation deficiency, the planning for such events still needs to be more coordinated and comprehensive. Cereal production which is the staple food for the majority of Zimbabweans is most vulnerable to droughts. The Ministry of Lands, Agriculture and Rural Resettlement is responsible for food production in the country. Drought planning for food security should therefore be a priority for this arm of government. For environmental impacts of drought, the Ministry of Environment, Tourism and Hospitality Industry actions by its parastatals mainly the Environmental Management Agency, the Parks and Wildlife Management Authority and the Forestry Commission.

Because of the cross-sectoral nature of droughts and the key government ministries being, the Ministry of Lands, Agriculture and Rural Resettlement; the Ministry of Environment, Tourism and Hospitality Industry; and the Ministry of Local Government Public Works and National Housing.

Ownership of the drought management plan is critical to its implementation. It is therefore important for comprehensive cross-sectoral consultations when crafting such a plan. The government of Zimbabwe is party to the UNCCD and the Environmental Management Agency in the Ministry of Environment, Tourism and Hospitality Industry is the focal point. Planning for drought should not only be responsibility of EMA but all sectors that are affected by drought. There has to be agreement in terms of who in principally responsible for coordination of implementation of any drought plan. This document therefore gives general guidance on drought planning and the need for coordinated approach to planning and implementation of national drought plan.

Below are some of the activities that are proposed as next steps.

1. Develop an agreed Drought Mitigation Plan that is mainstreamed into the operations of the Ministry of Environment, Tourism and Hospitality Industry; the Ministry of Lands, Agriculture and Rural Resettlement; and the Ministry of Local Government Public Works and National Housing.

2. Upgrading and modernizing the Meteorological Services Department and forecasting system and associated observation networks whilst also encouraging competent human and technical resources to maintain and operate them. There is dire need to improve monitoring, seasonal forecasts, and early warning and information delivery systems.
3. Enhancing cooperation and coordination between various stakeholders and sectors (hydro-agro-meteorological sector, government, education and research institution, NGO’s, public).

4. Training and capacity development in drought vulnerability and risk assessment, drought mitigation and preparedness including contingency plans at local and national level and creation of national drought policies based on the principles of risk reduction.

5. Improve drought awareness and education through public outreach.

9.3. **Future Updates and Revision**

The National Drought Plan, once agreed, should be continuously updated at specified intervals after evaluation and revision. Information should be sought from the government, NGO’s and the public sector with participation of all stakeholders.

**REFERENCES**


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