AN INVESTIGATION INTO THE DISASTER RISK REDUCTION (DRR) EFFORTS IN GUTU DISTRICT (ZIMBABWE): A FOCUS ON DROUGHT EARLY WARNING SYSTEMS

By

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DECLARATION

I, the undersigned, hereby declare that this dissertation, submitted for the awarding of a Master's Degree in Disaster Risk Management at the DIMTEC, University of the Free State, is my own original work and has not previously been submitted in its entirety or part by me or any other person to this University or any other institution of higher education for the awarding of any qualification. All the sources that I have used or quoted have been indicated or acknowledged by means of complete references.

Signature: 

Shamano Nicholas

Date: 30 October 2010

THESIS DEDICATION

To my family and friends for the support, tips, encouragement and the interruptions that unwittingly made me take it easy.

RECOGNITION AND ACKNOWLEDGEMENTS

It is customary that we recognise and be grateful to all those who provide significant help towards accomplishment of something. Firstly, I thank the Creator, who is always there, for all his provisions. My immense gratitude is also due to the very many fellow spirits that have contributed to the disaster management field. From their contributions, so much was gained to serve as a starting point for this project.

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LIST OF ACRONYMS	
Acronym	**Definition**
ADB	African Development Bank
AGRITEX	Agricultural and Technical Extension Services
AIDS	Acquired Immune Deficiency Syndrome
CBO	Community Based Organisation
CEO	Chief Executive Officer
CFSAM	Crop and Food Supply Assessment Mission
CMI	Crop Mixture Index
CPC	Civil Protection Committee
DA	District Administrator
DEWS	Drought Early Warning System
DFID	Department for International Development (United Kingdom)
DM	Disaster Management
DRR	Disaster Risk Reduction
ECLAC	Economic Commission of Latin America and the Caribbean
EDI	Effective Drought Index
EIA	Environmental Impact Assessment
ESIG	Environmental and Societal Impacts Group
EW(s)	Early Warning(s)
EWC	Early Warning Conference
EWS(s)	Early Warning System(s)
FEWSNET	Famine Early Warning Systems Network
FGD(s)	Focus Group Discussion(s)
HFA	Hyogo Framework of Action
H/H	Household
HIV	Human Immunodeficiency Virus
M&E	Monitoring and Evaluation
NDMC	National Disaster Management Centre (University of Nebraska-Lincoln)
NEPAD	New Partnership for African Development
NEWU	National Early Warning Unit
NGO	Non-Governmental Organisation
NOAA	National Oceanic Atmospheric Association
NR	Natural Farming Region
OCHA	Office for the Coordination of Humanitarian Affairs (U.N)
Oxfam GB	Oxfam Great Britain
OVC	Orphans and Vulnerable Children
PDSI	Palmer Drought Severity Index
PLWHA	People Living With HIV and AIDS
RDI	Reclamation Drought Index
SADM	South African Disaster Management
SPI	Standardised Precipitation Index
SWSI	Surface Water Supply Index
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Emergency Fund
UN/ISDR	United Nations/International Strategy for Disaster Reduction
USAID	United States (of America) Aid
WMO	World Meteorological Organisation

ABSTRACT

The dynamic nature of vulnerability coupled with increasing volatility of climatic and environmental conditions, characterised by more frequent and extreme hazards, disaster management practitioners, decision makers and communities, especially those at risk, need to take action to protect vulnerable people and environments (UN/ISDR, 2002; 2006a; 2006b).

In recent years, poor communities have had to bear the brunt of the hazards. Gutu district in Masvingo Province of Zimbabwe, which is the study area of this thesis, has in recent times experienced more frequent droughts and floods.

This research aimed to determine the Disaster Risk Reduction activities, particularly Early Warning, existing and being implemented in Gutu District. From the findings, the research then ascertained if the utilisation of more and varied EW can improve DRR efforts in Gutu. The research focused on a rural and inherently drought-prone district.

In addition to review of existing literature, the research also collected primary data. This involved use of Participatory Rural Appraisal techniques such as Focus Group Discussions, In-depth interviews and simple observations. These techniques enabled the researcher to get insightful explanations into the prevailing situation, trends, processes and decisions that occur within the context of the study. The various data collection methods and multiple respondents enabled triangulation of the findings.

Merging the literature review and field research with the thesis proposition that more DRR efforts, especially EW, can significantly reduce disaster risk and impacts, it was found that there are DRR and EW established and ongoing activities in Gutu. However, these are not adequate and more DRR initiatives, including EWs are, needed to significantly reduce the vulnerability of the communities to hazards. The study established that the drought hazard remains the biggest hazard threatening the lives and livelihoods of the Gutu community. Other notable hazards include the HIV and AIDS pandemic, flooding which sometimes alternate with drought, diarrhoeal and water-borne diseases, crop and livestock diseases and environmental degradation.

There are also marked challenges in the quest to reduce community vulnerability. These need to be addressed while, at the same time, DRR efforts can be scaled up. EWs are one

of the key DRR strategies the community felt could be effectively and efficiently utilised in the district. In line with this, the study offers recommendations for DRR and Early Warnings for policy and practice as well as future research.

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CHAPTER 1: INTRODUCTION, BACKGROUND AND METHODOLOGY

'Disaster reduction is a responsibility of us all. Let us reaffirm our commitment…to this vital cause. Together we can protect lives & livelihoods today, & build disaster-resilient communities for tomorrow.'[1]

1.1 BACKGROUND TO THE STUDY

Due to climate change phenomena, the world over and Zimbabwe in particular, has been experiencing increased frequency and intensity of natural hazards. Drought and floods have been the major occurrences. The drought hazard, which is the focus of this research, has been having serious adverse consequences to the drought prone communities. The most vulnerable members of the society are the worst affected (Ogallo, s.a; Pawadyira and Ndlovu, 1998; Gwimbi, 2007; Oxfam GB, 2007; UN/ISDR, 2008b).

The devastating effects of drought from a disaster management perspective have been partly attributed to inadequate disaster risk reduction (DRR) initiatives particularly relevant Early Warning Systems (EWS)(Oxfam GB, 2007). The Global Information and Early Warning Systems for the Food and Agriculture Organisation (GIEWS/FAO) (2003:1) point out that early warning (EW) for DRR is a legitimate matter of public policy: a classic public good (Benfield Hazard Research Centre, 2006; UN/ISDR, 2003a; Samarajiva and Waidyanatha, 2007).

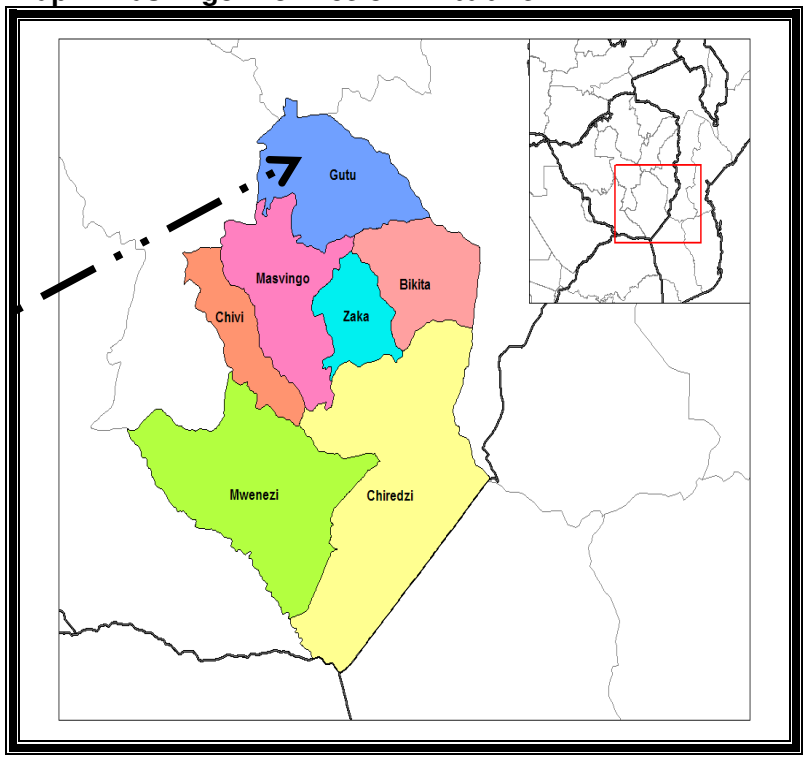
The use of EW is important in the enhancement of DRR. The Hyogo Framework of Action (HFA) under priority number two (2) stresses the need for identifying, assessing and monitoring disaster risks and enhancing early warnings. Investing in EW is not simple nor is it cheap but, in the long run, the savings accrued by investing in EW can far outweigh the investment (UNI/ISDR, 2006b). However, the existing EW in Zimbabwe is still subdued. According to Gwimbi (2007:159) the early warning system is currently centralised and one way: it involves issuing of warning but neglecting or not taking cognisance of the needs and priorities of vulnerable communities. Thus, the warnings are not responsive to the people's needs. The United Nations Environment Programme (UNEP), [s.a] highlights that this may happen against a background where the local communities have rich cultures drawn from vast experience of observing nature.

[1] Kofi Annan, Ex-secretary of the UN. (2005). Foreword to the book: Know risk.

It is also important to note that effective EWS are achieved by close cooperation among all stakeholders running the system so as to ensure the EWS focus on people rather than technology. This also ensures that EWS are based on needs, priorities, capacities to cultures of the people at risks (Chung, 2005; UN/ISDR, 2005b; Action Aid, 2006; Benfield Hazard Research Centre, 2006; Mena, 2006; UN/ISDR, 2006a; Wicklung and Raum, 2006; Nurhayati, 2007; Golnaraghi, 2008). The study will thus look into the disaster risk reduction measures currently in place in Gutu District and how the drought EWS are incorporated into the DRR process. The development and adoption of these EWS is investigated.

Map 1: Zimbabwe District Map

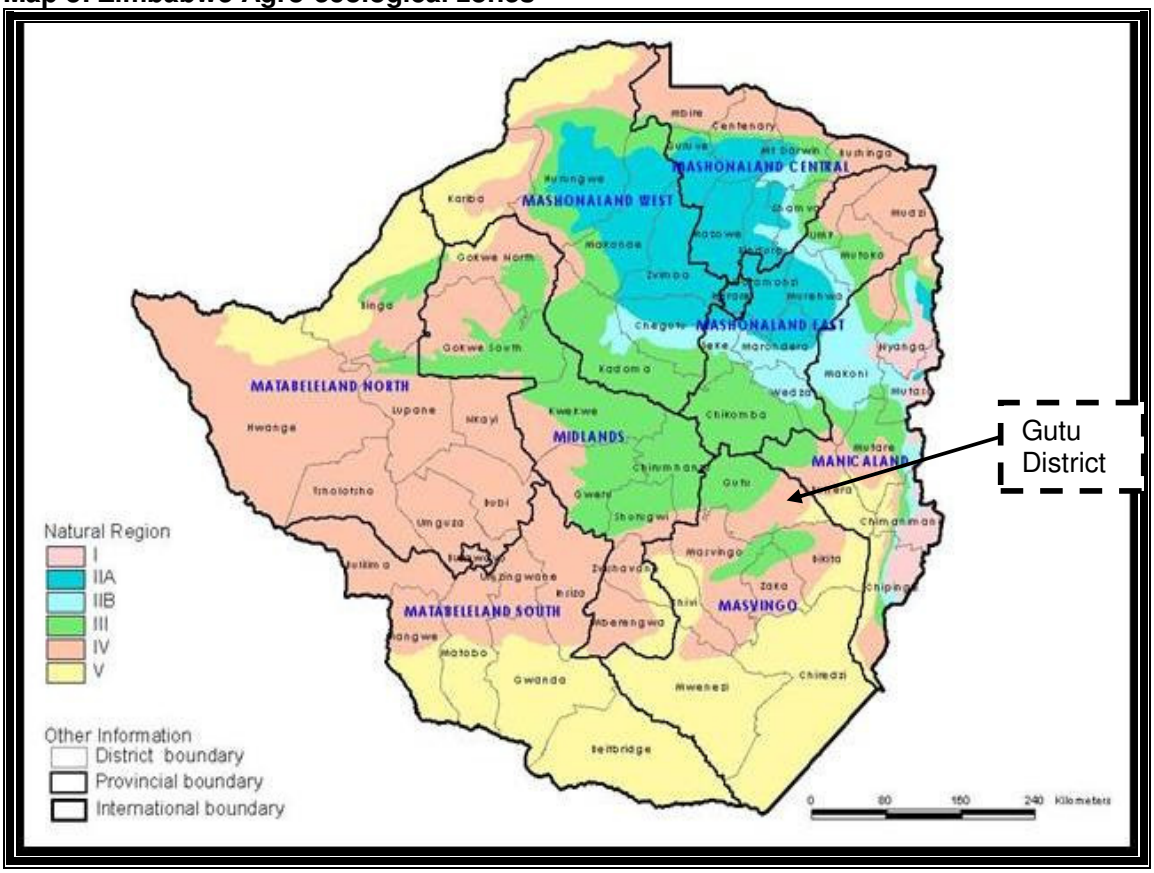
Map 2: Masvingo Province of Zimbabwe



Source: UNOCHA and Food and Agriculture Organisation (FAO), 2010.

Gutu District was selected after due consideration of a number of aspects. Zimbabwe, as a country, is divided into Natural Farming Regions (NRs) also referred to as Agro-ecological zones. These demarcations are based on average annual precipitation levels, soil type and other climatic factors. There are five of these regions with NR I receiving the highest precipitation amounts and favourable climatic for farming conditions while NR V is the most arid. Gutu falls in NR 3 (48%), 4 (42%) and 5 (10%). The main source of livelihood for the district's inhabitants is agriculture. For this reason, carrying out the investigation in these NRs may provide an opportunity for an objective assessment. Secondly, drought early warnings (DEWs) are very complex and therefore one of the least developed EWS worldwide including in Gutu (UN, 2006). A lot of effort needs to be invested to develop these EWs. Lastly, the researcher has good rapport with the key players in the district such that access challenges are minimal (Oxfam GB, 2007).

Map 3: Zimbabwe Agro-ecological zones



Source: FAO/WFP, 2010

1.2 ORIENTATION AND PROBLEM STATEMENT

Although Zimbabwe has a piece of legislation and an enforcement authority (The Civil Protection Act and the Department of Civil Protection respectively) to oversee disaster management issues, lack of effort in planning and enforcement of the legislation has been a major handicap (Oxfam GB, 2007). The lack of planning by relevant authorities and the communities at risk worsen the impact of hazards on vulnerable people and their assets (Gwimbi, 2007; UN/ISDR, 2007a; Golnaraghi, 2008).

The research was carried out in Gutu District in the drought-prone province of Masvingo in Zimbabwe. Although early warning systems are sometimes regarded as the cornerstone of DRR, in Gutu, limited early warning systems are in place to provide information for drought preparedness and mitigation (Oxfam GB, 2007). Moreover, the EWS, though at times technically credible, are not people-centred. There are both contemporary and traditional EWs in existence but their adoption and application for drought DRR has not been investigated in depth in Zimbabwe (World Meteorological Organisation (WMO), 2006).

The research thus investigated the DRR measures being used in Gutu with particular focus on the early warning systems. The issues of whether there are additional early warnings that are not being utilised and how they can be adopted to improve DRR were explored.

1.3 RESEARCH QUESTIONS

The study aimed to answer the following questions:

1) What are the drought disaster risk reduction efforts being practised in Gutu?

2) Is there a linkage between the development and utilisation of EWS in Gutu?

3) What are the challenges, if any, hindering the integration of DEWS into DRR measures and other policies in Gutu District?

4) Can incorporation of more EWS improve DRR in the study District?

5) What are the recommendations that can be offered for future DRR efforts, particularly from the EWS perspective?

1.4 RESEARCH AIM AND OBJECTIVES

1.4.1 Aim

The study's overall aim is to interrogate the DRR approaches utilised in Gutu and ascertain if development and use of more EW can improve DRR efforts in Gutu District.

1.4.2 Objectives

- To establish the drought DRR measures currently practised in Gutu.
- To establish the linkage between the development of early warning systems and their utilisation in the District.
- To identify the challenges in integration of EWS in DRR and policy measures in Gutu.
- To determine if incorporating more EWS can lead to improved DRR in Gutu.
- To offer recommendations for future DRR efforts based on findings of the study.

1.4.3 Hypothesis

The premise of this research is that there are EWs that have not been developed or are not being utilised. Once these are utilised, disaster risk reduction efforts against the drought hazard can improve in Gutu District and beyond.

1.5 KEY THEORETICAL CONCEPTS OF THE STUDY

Various terms and concepts are employed in this thesis. This section shall define and briefly discuss these terms and concepts so as to build a common understanding thereof hence their consistent use. The concepts to be discussed include disasters, vulnerability, risk, hazard, disaster management cycle, disaster risk reduction, Early Warning Systems and drought among other closely related concepts.

1.5.1 Hazard

A hazard is a rare or extreme event in a natural or man-made environment that adversely affects human life, property or livelihoods. It reflects a potential threat to humans and the impact of such an event to society and the environment. As long as such an event affects people it may lead to a disaster. The UN/ISDR, 2002 define it as a potentially damaging physical event, phenomenon and/or human activity which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Thus, a hazard is generally a potential threat to humans and their welfare, it can trigger a disaster.
Hazards have varying characteristics that differentiate them. These are outlined:

1. *Magnitude, location and extent*
2. *Frequency and probability*
3. *Duration*
4. *Predictability*
5. *Rate of onset (is it slow or fast onset)*
6. *Exposure*

(NOAA, s.a; Kent 1992; Benson and Twigg, 2007).

Hazards have different origins as they can be hydrological, climatic, seismographic, biological or even technological. Another contentious distinction is that some are natural while others are man-made (NOAA, s.a; OAS, 1991).

1.5.2 Vulnerability

Vulnerability refers to the extent to which an individual, household, community or area may be adversely affected by a disaster (South Africa Disaster Management Act, 2003). In other words, it is a set of conditions and processes resulting from physical, social, economic and environmental conditions that increase the susceptibility of communities to impacts of hazards (UN/ISDR, 2002).

1.5.3 Capacity and Manageability

Meanwhile, capacity and manageability counter-pose vulnerability. This is looking at measures which can improve understanding, specific abilities, coping mechanisms and management (of disasters) among the public, government and other disaster responders. Capacity also entails adaptation to disaster situations. Like vulnerability, capacity also depends on socio-economic, political, psychological, environmental, physical and even governance issues. Resilience is another term often used in conjunction with capacity and manageability. It is the ability to resist, absorb and recover from hazard impacts and it may include all strengths and resources available within a community, society or organisation that can reduce levels of risk. According to Blaikie *et al* , 2004, vulnerability and capacity are the characteristics of a person or group in terms of ability to anticipate, cope with, resist and recover from the impact of hazard. Vulnerability and capacity are context and subject dependent: one is vulnerable to or capable to cope with something (UN/ISDR, 2002; Sphere Project, 2004; White P *et al*, 2004; Kesten, 2006; Kumpulainen, 2006).

1.5.4 Risk

This is the expected loss to a community when a hazard event occurs. This normally includes lives lost, people injured, property damaged and the livelihoods disrupted. Risk is also articulated as the probability of harmful consequences or expected loss resulting from the interaction between hazards and vulnerable conditions. Thus, the likelihood/probability of a hazard event occurring pose a threat to communities and exposes them to risk. Risk is difficult to ascertain in monetary terms. In understanding risk, key issues may include knowing the acceptable level of risk from the international scene to district/municipal or community level. Conventionally, risk is expressed as hazard multiplied by vulnerabilities whilst capacity and manageability are factored in to counter vulnerability (NOAA, s.a; Sphere 2004; Kesten, 2006). Risk is therefore the likelihood of a disaster happening as illustrated by the equation below:

$$R = \frac{H \times V}{C \times M}$$

Where R=Risk, H=Hazard, V=Vulnerability, C=Capability and M=Manageability (*Sphere, 2004; Kesten, 2006).*

1.5.5 Disaster

The Oxford dictionary, 1998 defines a disaster as *"a sudden event, such as an accident or natural catastrophe that causes great damage or loss of life"*. From this definition, disaster practitioners have taken it further to define it as 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 to cope using their own resources. The South African Disaster Management (SADM) Act definition also encompasses the same components. A disaster is a function of the risk process: it is the actual realisation of risk. It results from a combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of being at risk. Disaster is therefore an interaction of vulnerability and hazard. Simply, there cannot be a disaster if there is a hazard but no vulnerability or vice versa (Stephenson,1994; Bethke *et al*, 1997; Reed,1997; UN/ISDR, 2002; SADM Act, 2003; Blaikie *et al*, 2004).

1.6 DISASTER MANAGEMENT AND THE DISASTER MANAGEMENT CYCLE

Disaster management (DM) implies addressing the underlying social, economic and environmental vulnerabilities thereby reducing the risk of disasters occurring. DM tries to address hazard risk as an integral part of the development process (UN/ISDR, 2002). According to the SADM Act, 2003 disaster management is a continuous and integrated multi-sectoral and multi-disciplinary process of planning and implementation of measures aimed at:

1. Preventing or reducing the risk of disasters
2. Mitigating the severity and consequences of disasters
3. Emergency preparedness
4. A rapid and effective response to disasters
5. Post disaster recovery and rehabilitation

The following illustration summarises the disaster management cycle.

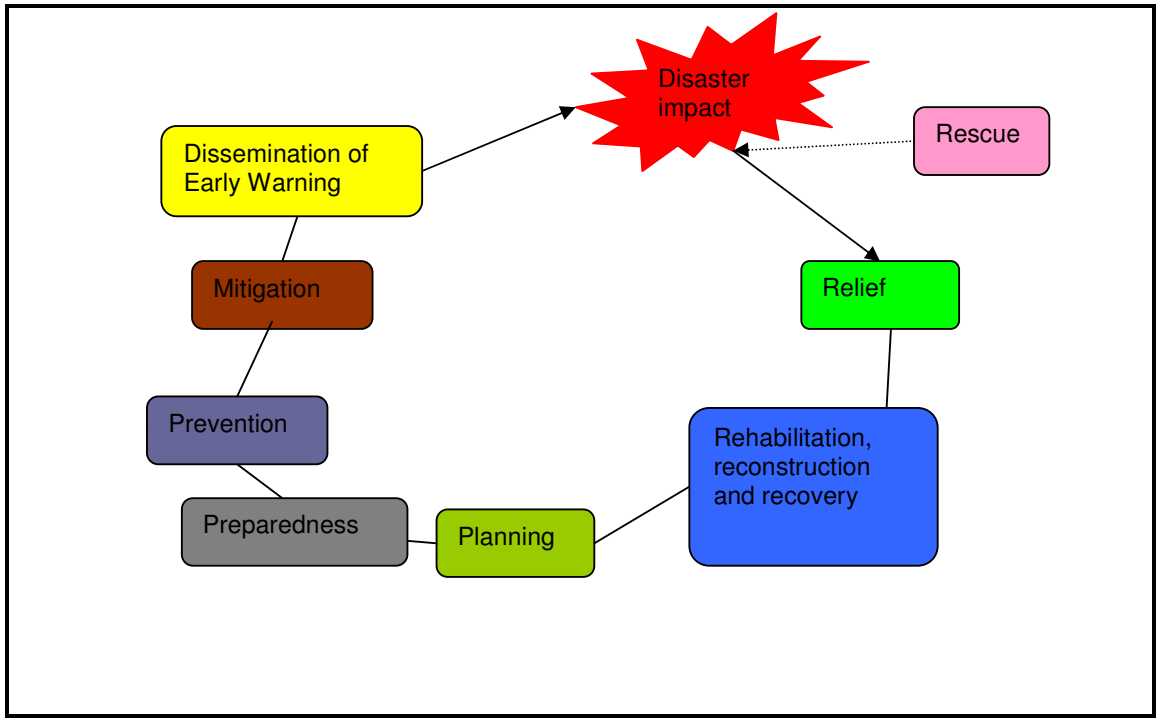


Figure 1: Disaster Management cycle/continuum

Source: Adapted from UNDP, 1992.

1.7 DISASTER RISK REDUCTION

Classical disaster management focused on emergency management (response) rather than the whole disaster cycle. A relatively new focus on the other aspects has been emphasised hence the DRR thrust. DRR is the systematic development and application of policies, strategies and practices to minimise vulnerabilities and disaster risks throughout a society and to avoid (prevent) or limit (prepare against and mitigate) the negative effects of hazards within the sustainable development context (UN/ISDR, 2002). Writing along the same line, Department for International Development (DFID), 2006 and White *et al*, 2004, indicate that the aim should be having more resilience to future shocks and ensure sustainable development. DFID - *Reducing the risk of disasters-Helping to achieve sustainable poverty reduction in a vulnerable world: A DFID policy paper*, 2006 - point out that DRR aims to curb disaster losses through minimising the hazard, reducing exposure and susceptibility and enhancing coping and adaptive capacity.

DRR is aimed at tackling the fundamental elements of disaster risk: vulnerability, hazards and exposure. Good DRR continues after a disaster. Although DRR seeks to pre-empt a disaster, it should also be a feature of rehabilitation as well so as to build resilience to future hazards. Other disaster managers assert that the DRR framework comprises of three components, that is, prevention, preparedness and mitigation (Oxfam, s.a).

1.7.1 Prevention

These are activities designed to provide permanent protection from disasters. Prevention aims for outright elimination of the adverse impacts of hazards (UN/ISDR, 2002; UN/ISDR, 2009).

1.7.2 Preparedness

This is individual, community and administrative action to minimise loss of life and damage and facilitate effective rescue, relief and rehabilitation (Stephenson, 1994). UN/ISDR, 2002 state that these are activities and measures taken in advance to ensure effective response to the impact of disasters including issuance of timely and effective EWs and the temporary removal of people and property from threatened locations. So, these are measures that ensure the readiness and ability of a society to:

- Forecast and take precautionary measures in advance of an imminent threat.

- Respond to and cope with disaster effects by organising and delivering timely and effective assistance.

1.7.3 Mitigation

These are measures taken in advance of a disaster aimed at reducing its impact on society and the environment. The measures can be passive or active, structural and non-structural (Stephenson, 1994; Kesten, 2006).

1.7.4 Early Warning System (EWS)

There is no yet universally agreed definition of an early warning system. However, for the purposes of this study, an early warning system is simply a system of data collection that facilitates detection and monitoring of looming disasters so that actions can be taken to reduce the negative effects of disasters. The intention of this information is to provide those with power and ability to respond in a way that will ameliorate the adverse effects of the disasters (Monnik, 2000).

1.8 RESEARCH DESIGN AND METHODOLOGY

The study aims to cross-examine the DRR efforts in Gutu and determine whether more EWS can lead to enhanced DRR. This section outlines the research design and methodologies utilised to satisfy this broad aim. The research is an empirical study that endeavours to be backed by evidence. The research employed various methods to gather data and establish the prevailing situation. This assists to explain some phenomena and fulfil objectives of the study. Since a research is a logical model that guides the researcher in the process of collecting, analysing and interpreting data, the intention is to fuse theory with empirical evidence. The guiding principle was to collect data which are relevant, reliable, valid and up-to-date. The methods used were also based on applicability, budgetary and time considerations (Mouton, 2001).

Thus, the research employed both qualitative and quantitative research approaches to test the hypothesis and explore phenomena. The qualitative approach captured opinions, statements and perceptions from the respondents while the quantitative approach catered for the numerical observation or trends. These approaches are complementary (DFID, 2005).

The following methods were used to achieve the objectives and answer the research aim.

1. In- depth interviews
2. Focus groups discussions
3. Observations
4. Diary
5. Document review

1.8.1 Focus group discussions (FGDs)

FGDs are informal, guided discussions about a particular topic. This is a brilliant method of getting an indication of how pervasive an idea, value or behaviour is likely to be in the community. FGDs with 7-15 selected ordinary community members with similar backgrounds were held to gather opinions on DRR and EWS in the district. Four FGDs, one per ward, were held in four wards of Magombedze, Mazuru, Munyikwa A and Munyikwa B. The groups were deliberately kept small to ensure the participants would not feel intimidated and could express their opinions freely (Peninsula Research and Development Support Unit, s.a; Guijt and Woodhill, 2002). The FGD guide is Appendix I.

1.8.2 In-depth interviews

Sometimes referred to as semi-structured interviews, in-depth interviews comprise of open-ended questions to individuals selected for their knowledge and experience on the subject. These were used to gain information, face-to-face, from the individual key informants. The interviews were guided by a series of broad, instead of pre-determined, questions that allowed new questions to feature in the discussions (Appendix II). These were administered to twenty-six (26) respondents in the district including the 4 wards sampled: Magombedze (12)[2], Mazuru (13)[3], Munyikwa A (15)[4] and Munyikwa B (16)[5]. The interviews encouraged the respondents to express their views at length and this aided in developing in-depth understanding of qualitative issues with regards to this research (Family Health International, s.a; Peninsula Research and Development Support Unit, s.a).

[2] Ward Number
[3] Ward Number
[4] Ward Number
[5] Ward Number

1.8.3 Observations

Observations were used for formative cross-checking, validation and triangulation of data. This involved simple cross-checking opinions or perceptions against observations on ground with a checklist that was developed. The observations also assisted to understand the context in which information was collected and helped explain results. Five observation checklists were filled, one each for the 4 wards where FGDs were conducted and a district one (Leedy and Ormrod, 2001; Guijt and Woodhill, 2002). A copy of the observation checklist that was used is Appendix III.

1.8.4 Diary

This was used by the author to simply record day-to-day personal account of proceedings that were inclined to the research such as the events, discussions and interactions. This was just a way of ensuring that facts and opinions that could otherwise be missed were captured and help to explain the context in which data was collected. This did not take any format for recording (Peninsula Research and Development Support Unit, s.a; Guijt and Woodhill, 2002).

1.8.5 Document review

Relevant statistics and reports at district and national level were reviewed to complement primary data collected during the research. Data collected included demographic, human development, agricultural productivity and climate data. Key data was also obtained from vulnerability assessment reports and food supply assessment reports conducted in Gutu.

In summary, the methods employed were rapid appraisal ones: quick and low cost ways of gathering views of stakeholders. This posed the challenge of limited participation, which may affect objectivity and comprehensiveness. Additionally the sample size, in terms geographical spatiality and the population contacted is not the ideal one (DFID, 2005).

1.8.6 Respondents

Respondents interacted with were from four sub-groups of the district's population, which are:

1. Community members – the ordinary members of the community.
2. Government representatives – local and central government including the Department of Civil Protection.

3. Other key informants – businesspeople, extension workers, councillors, leading farmers, research institutes and any other groups or people knowledgeable in the field under study.
4. Civic society – representatives of Community-Based Organisations (CBOs), Non-Governmental Organisations (NGOs), UN and other civic society players.

1.8.7 Sampling

Researchers rarely observe the entire population but choose a representative group to share views on behalf of the whole population. The research team, led by the author, purposively sampled a total of 4 wards from the areas falling under Natural regions IV and V. The power of purposive sampling lies in selecting information-rich cases for in-depth analysis related to the central issues being studied. The research team conducted 4 FGDs attended by 7-15 people, ensuring all interest groups were represented in these discussions. This translates to 44 households (H/H) having been represented. Using the district average of 6 H/H members, about 264 people out of the district population of 203,316[6] were contacted, translating to 0.13% coverage.

The author and research assistants interviewed 26 key informants identified in the respective wards. These were from government departments and extension workers, research institutes, NGO and civic society and the business community. These were randomly or purposively sampled depending on the circumstances especially prior knowledge on the topic under research. A snowballing technique was used to find more key informants. This is whereby a respondent was utilised to refer the research team to other potential key informants (Oxfam GB, 2007).

Six research assistants and one senior research assistant were engaged. These were trained in administering the in-depth interview guide and conducting the FGDs and duly carried out most of this role. Pre-testing and translation of the data collection instruments was done to minimise ambiguity, rectify some errors and ensure a common understanding of all questions. The author assisted in the FGDs and in-depth interviews and he was solely responsible for recording the observations and diary accounts. For quality control, the researcher checked all the data sets on a daily basis and clarified unclear responses. The co-study leader assisted mainly with the administrative and logistical aspects such as observing the protocol, booking meetings and ensuring provisions were in adequate supply.

[6] FAO/WFP, 2010

1.9 DATA ANALYSIS

According to Cresswell, 1998, and Stake, 1995, cited in Leedy and Ormrod, 2001:150, data analysis characteristically involves five steps. These are the steps the study followed to analyse the data collected.

Organisation of details about the study.
Data obtained from the various respondents was arranged in a logical order.

Categorisation of the data.
The data was then categorised and clustered into meaningful groups, which provided a view of the trends as observed by the respondents.

Interpretation of single instances
The study then examined the questionnaires to determine relevance and application these have to the problem.

Identification of patterns
The data was examined to identify patterns to discover any underlying themes and patterns, which would possibly shed light on resolving the problem.

Synthesis and generalisations
The study then developed an overall picture of the data gathered from the study and drew preliminary conclusions, which guided the researcher with new insight into the data collected. The Predictive Analytic Software (PASW) Statistics version 18, formerly Statistical Package for Social Sciences (SPSS) and Excel computer packages were used to carry out these tasks for quantitative data analysis whilst manual analysis was done for the qualitative data.

1.9.1 Validity and reliability of data

The critical point is that the study followed sound research methods. Moreover, the triangulation of the methodology, that is, use of both quantitative and qualitative approaches to the study was useful in improving the validity, analytic power and relevance of the findings. FGDs actually cross-check or triangulate themselves. The mixture of informants also gave balanced perspectives: professionals, the public, the government and civic society. So, by combining multiple respondents, methods and sources, the researcher aimed to overcome the intrinsic bias that comes with a single source and single respondent research (Patton, 1990). It is also critical to mention that statistics from government sources were scant and outdated with the last census having been conducted in 2002.

Nonetheless, trustworthiness of the study was tested by sharing the draft document with experts in the field to critically consider the draft mini-dissertation, (Leedy and Ormrod, 2001, *7th ed*). The aim was to check if the preliminary conclusions reached are consistent with the general international understanding of the concepts of DRR and how EWS feed into the DRR practice.

1.10 ETHICAL CONSIDERATIONS

The research team urged respondents to participate on a voluntary basis, that is, participants freely offered the data. If they had reservations, they were kindly excused. Respect for the participants was cultivated in the research team (Family Health International, s.a; Leedy and Ormrod, 2001). To this effect, the following guidelines were proposed and adhered to during data collection:

1. No-one would be coerced into participating in the study against their will.
2. No financial disbursements would be promised and/or made to the participants.
3. The rights and interests of all participants would be protected and ensured.
4. Confidentiality of all information gathered from the participants would be maintained.

1.11 CONTRIBUTION OF THE STUDY

This is an empirical study, that is, one backed by evidence. Previous studies related to the study in the country have been mainly theoretical. The study attempts to fill this gap. The findings and recommendations offer wider options for DRR efforts against the drought hazard in the district and the country as a whole.

1.12 LIMITATIONS OF THE STUDY

The first limitation is that the study focuses on only one hazard and does not delve on multi-hazard DRR that other disaster management practitioners are already emphasising. The coverage is not the ideal. Precisely, a small sample of one district (Gutu) out of more than 60 districts in Zimbabwe was covered. Thus, only views of primary respondents from Gutu district shape the findings of the study. Additionally, the research, especially data collection was conducted in a relatively short period of time whereas DRR is a long-term developmental issue which may need tracking over longer periods. The topic and some concepts of the study are also technical and more time was needed for clarity and understanding of the concepts. Lastly, the prevailing unfavourable socio-economic conditions in Zimbabwe may have distorted/affected objectivity of the respondents and ultimately the study.

1.13 CHAPTER OUTLINE

To facilitate a logical debate, the research is arranged in a systematic form of sections/chapters. Chapter 1 identifies the research problem giving the background and introductory framework of the study. The chapter also defines and discusses various theoretical concepts underlying the study, highlights the research methods and approaches employed, their justification, ethical considerations and challenges encountered during the data gathering, analysis and dissemination processes. Chapter 2 sets out the theoretical basis of the research. The section covers one of the models around disasters and the EWS concept. A discussion on drought as a hazard is also part of this chapter. Chapter 3 gives a detailed analysis of the findings of the situation in Gutu. The final chapter focuses on summarising the findings and offering general conclusions. The chapter also draws conclusions about the achievement of initial objectives in the light of the research findings. Recommendations for the future exploration and adoption in the DRR field and DRR policy making based on the results of data analysis are expressed a way of concluding the study. A list of references and appendices are placed at the end of the document.

1.14 CONCLUSION

This chapter has provided the reader with background information to the study; the problem statement and the approach that was employed to collect information so as to answer the research questions and fulfil the study objectives. The contribution of the study to the body of knowledge has also been mentioned. The final section of this chapter provided the reader with a clear indication as to the chapter outline of this thesis. The following chapter provides the reader with sound theoretical knowledge of disaster risk reduction, early warning systems and the drought hazard.

CHAPTER 2: CONCEPTUAL AND THEORETICAL FRAMEWORK

'Disasters seek out the poor and ensure that they stay poor.' [7]

2.1 INTRODUCTION

This chapter shall elucidate on the disaster theory, the concept of EWS in the context of DRR and preparedness, the importance and application of EWs. The hazard under consideration, drought, shall also be explored to indicate what it is, its impacts and the justification as to why there is need for Drought Early Warning Systems (DEWS).The chapter further reviews the disaster management systems and approaches in Zimbabwe. Findings from around the world on EWS, droughts and other hazards are shared as part of the discourse. A conclusion wraps the chapter.

2.2 DISASTER THEORY: THE PRESSURE AND RELEASE MODEL

2.2.1 Pressure and Release (Crunch) Model

Propounded by Blaikie *et al* in 1994 and modified in 2004, this model is based on three major components, which are, root causes of vulnerability, the dynamic processes and the unsafe conditions. It says disasters occur when two opposing forces, that is, vulnerability and a hazard interact. Thus, a disaster is *'crunched'* between a hazard and processes generating vulnerability.

(1) *Underlying / Root causes* - are the deep rooted set of factors within a society that form and maintain vulnerability. These reflect the exercise and distribution of power in a society. An example are the political systems.

(2) *Dynamic processes* - are translating social macro-forces that channel the effects of a negative cause into unsafe conditions .This process may be due to lack of basic services or series of macro-forces such as urbanisation and population growth.

(3) *Unsafe conditions* - these express how a population is vulnerable to hazards. This is the vulnerable context where people and property are exposed to the risk of disaster. Examples can be low income levels and unstable economy which expose people to some hazards.

[7] Statement delivered by Eva Von Oelrich, Head of Disaster Preparedness and response Department, International Federation of Red Cross and Red Crescent, to the United Nations Economic and Social Council substantive session 2002, panel discussion on Natural Disasters, New York, *17 July 2002.*

The model postulates that one can reverse these tendencies by addressing root causes because disasters are remotely and indirectly rendered possible by the power system of a society ((Blaikie *et al*, 2004). Figures 3 and 4 depict the progression of vulnerability and progression of safety respectively.

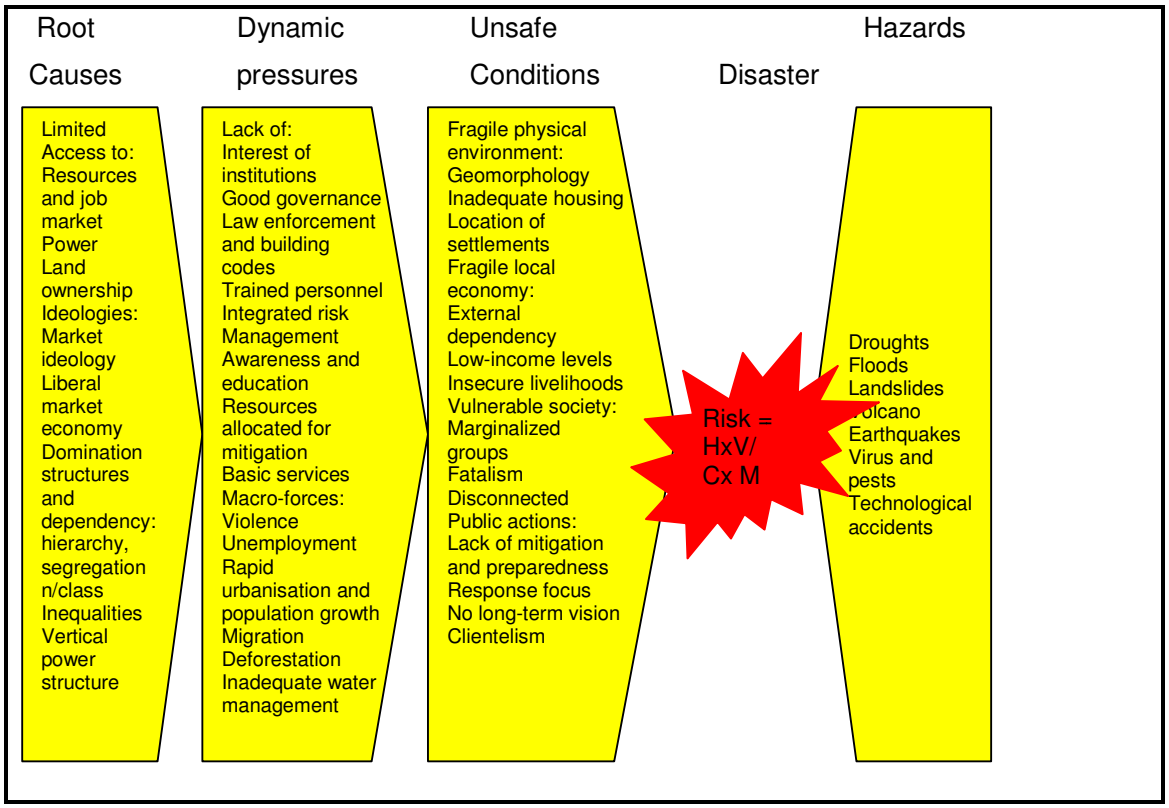


Figure 2: Progression of Vulnerability

Source: Blaikie et al, 2004

A discrete feature of the PAR model is its focus on the different factors and forces that drive people to unsafe conditions, thus putting them at greater risk. The progression of vulnerability seeks to explain the chain of explanations. It points to the need to ask the question *'why?'*. For instance, why:

- Poor people's crop production is vulnerable to the negative impacts of drought?
- People live in hazardous locations and why do people lack skills/education?

Meanwhile, the *'progression of safety'* points to transforming unsafe conditions into safe conditions by addressing root causes and dynamic pressures. The key idea is that while there could be interventions that could reduce the impacts of hazards, it is also critical to address underlying governance systems such as policies, laws and priorities that may be

part of the pressures or root causes that increase or promote people's vulnerability (Blaikie *et al*, 2004). This is depicted in the following figure.

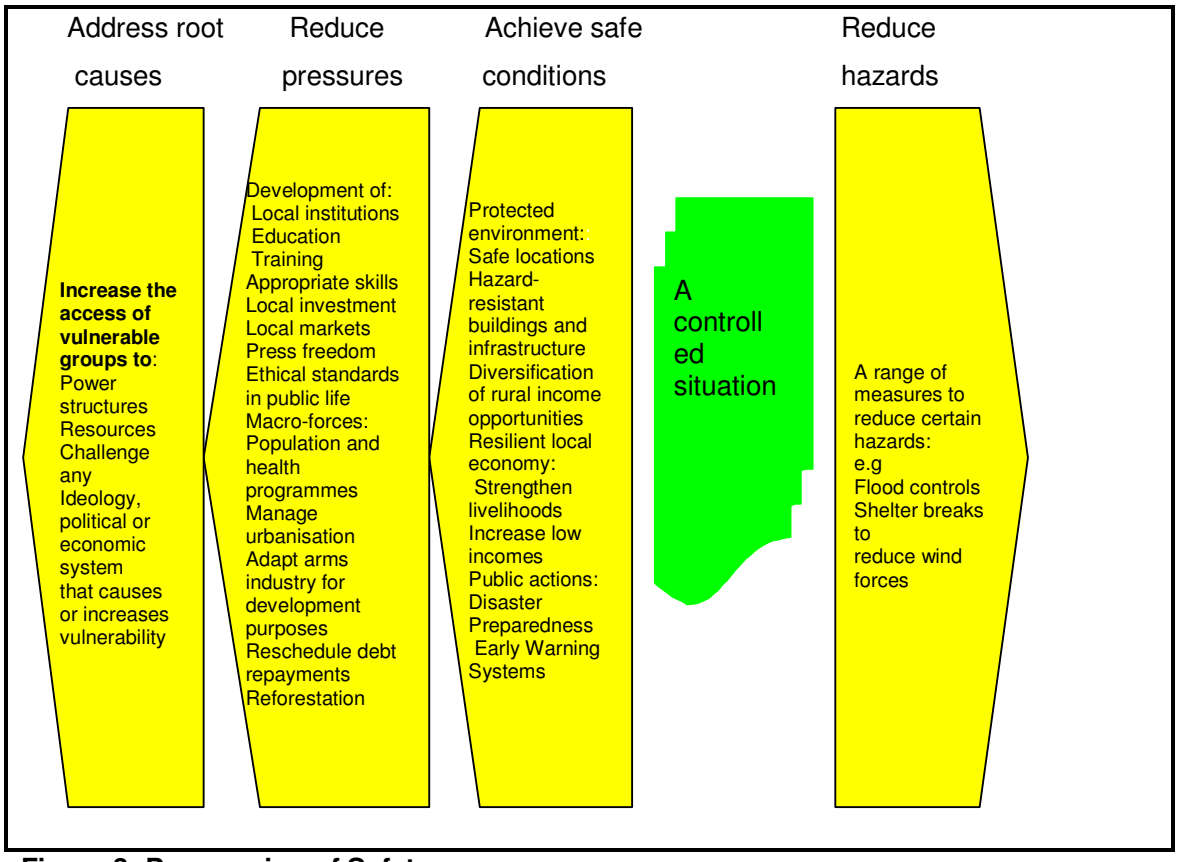


Figure 3: Progression of Safety

Source: Blaikie et al, 2004.

2.3 EARLY WARNING SYSTEM (EWS) CONCEPT

There is no universally agreed definition of EWS. However, in this document, an EWS shall be referred to as a system of data collection that facilitates detection and monitoring of impending hazards so that actions can be taken to reduce the negative effects of these hazards. It can be noted from the definition given in Chapter 1, section 1.7.4 that EW is a system of data collection to monitor people's access to resources and protection in order to provide timely notices when a crisis threatens and thus elicit appropriate responses (Stephenson, 1994; Buchanan-Smith, 2000; Monnik, 2000). EWS are therefore the procedures and actions through which information is produced in advance about the occurrence of hazards. EWS fall under the Disaster Risk Reduction framework as part of the preparedness strategies. And, significantly, the assumption must be that the normal systems

are not going to be available nor function during or soon after a disaster and therefore plan the EWSs around this assumption (Kent R, 1992). The following illustration, adapted from UN/ISDR, 2002, summarises the major aspects of the DRR framework depicting where EWs are located in the framework.

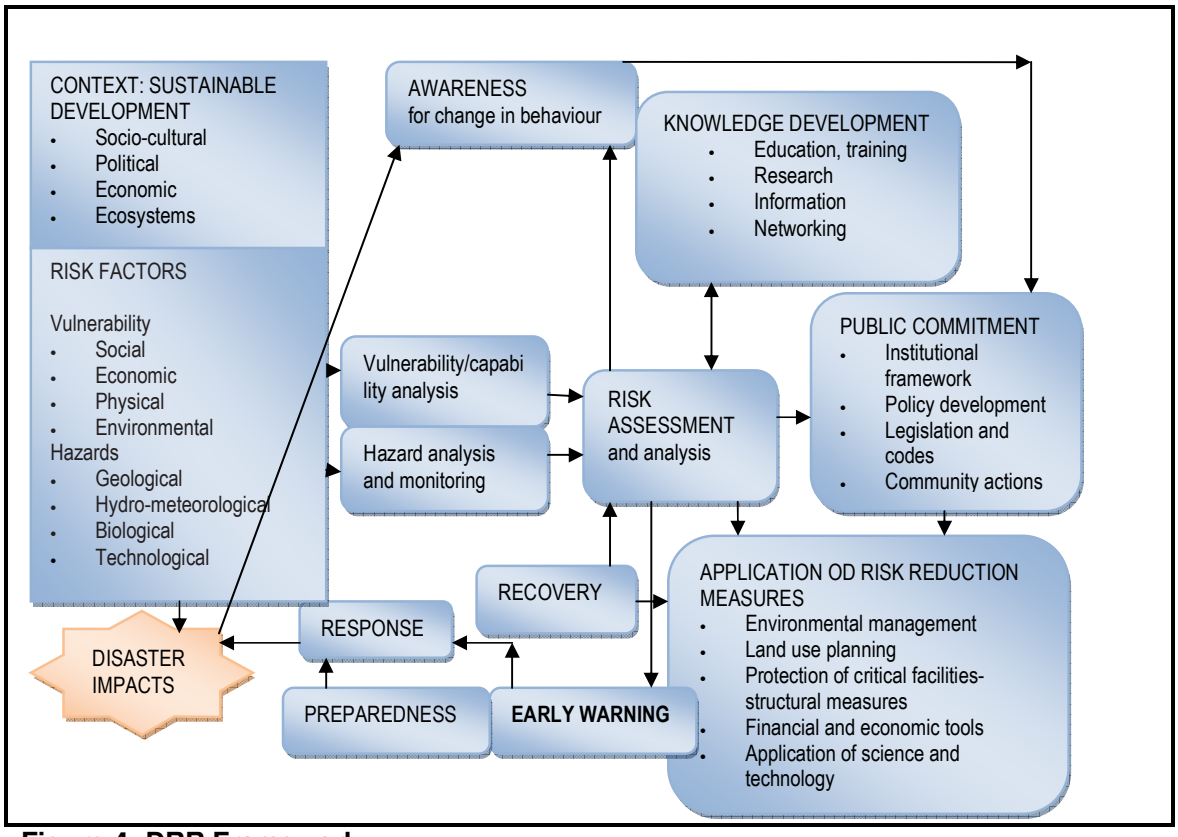


Figure 4: DRR Framework

Adapted from UN/ISDR, 2002:23

2.3.1 Preparedness strategies

Preparedness is the ability to predict, respond to and cope with the effects of a disaster. The following diagram shows the nine major components of the disaster preparedness framework followed by brief discussions on the components (UN/ISDR, 2009).

Vulnerability Assessment	Planning	Institutional Framework
Information Systems	Resource Base	Warning Systems
Response Mechanisms	Public Education and Training	Rehearsals

Figure 5: Disaster Preparedness Framework

Adapted from R. Kent, 1992.

Vulnerability Assessment: Information is essential for effective disaster management. Without information, the disaster manager would not know what the disaster risks are, where a disaster has occurred or to what extent disaster relief is required. Information concerning geographical areas or communities can be used to determine the nature of risk and consider appropriate actions in estimating what future losses might be.

Planning: Disaster preparedness planning comprises two sub-components. The first are the agreements negotiated between response and planning role-players while the second focuses on the documented agreed upon plans of action of stakeholders; for which their commitment and resources are assured.

Institutional framework: Horizontal and vertical management and functional structures need to be put into place in order to ensure that operational and managerial functions can be executed to respond to the consequences of hazards affecting communities. Without an institutional framework, disaster response will be uncoordinated as each responder makes independent decisions in their response efforts. The effect will be inefficiency resulting in poor use of resources and possible delays in response.

Information systems: Disaster preparedness requires information systems. Information about disasters and impending disasters is required in order to develop preparedness plans. Data collection strategies are required and should be tested to ensure that those strategies are functional. Communication systems provide data and information to enable the disaster manager to make appropriate preparedness plans and take appropriate response action. Information systems have data collection processes, early warning systems and monitoring processes as sub-components (Kent, 1992).

Resource base: The development of a resource base enables disaster relief workers to access human, material and financial resources to aid reaction to a disaster. The needs of the affected people as well as the resource needs of the emergency responders are catered for in developing a resources base. Some of these resources include emergency shelter, medicines, food, supplementary food, communication systems, logistics, funding, relief workers and equipment (Kent, 1992).

Warning systems: Drought is an example of a slow onset disaster, that is, a disaster that takes weeks, months or even years to develop. The South African Weather Service can be regarded as a warning system as they provide the South African populace with information concerning the development of droughts to aid in preparedness planning. Community actions which report rising water along a river and satellite systems which forewarn of impending hazard events are all part of the disaster management warning system. These systems provide disaster management teams with data which, when conveyed to stakeholders, may save lives.

Response mechanisms: Response mechanisms refer to the actions taken and to be taken for disasters between the community and the responding agencies. Response mechanisms allow for a structured response to different disasters and ensure that response actions and resources are not duplicated (Kent, 1992).

Public education and training: Public education and training are the actions taken before disasters which ensure that communities and stakeholders are trained and educated to take pre-planned steps in reducing the hazard threats on their lives and property and to evacuate out of harm's way. Public education and training also increases the capacity of a community to identify and respond to disaster hazards (Kent, 1992).

Rehearsals: Drills and rehearsals are fundamental to the preparedness process. Drills ensure that pre-planned actions are tested and that gaps in planning are revealed. The gaps exposed by rehearsals can be closed to ensure that response to disaster is more coordinated and decreases losses of human and material resources (Kent, 1992).

2.3.2 EW considerations

Early warnings are public goods and authorities must be seen to supply to people at risk so as to minimise future risks (Samarajiva and Waidyanatha, 2007). Important to note is that EWs are based on incomplete and probabilistic information which means judgement and community involvement is always vital in EWs (Samarajiva and Waidyanatha, 2007). Early warning should therefore comprise of data collection, information development, modes of dissemination and action triggering mechanisms. The EWs have to be regarded in the context of an integrated and holistic risk management framework (Hab *et al*, 2009).

Cross cutting themes such as good governance, institutional arrangements, multi-hazard approach to EW, involvement of local communities, gender and cultural diversity should also be considered in the development, use and termination of EWS (UN/ISDR, 2006a).

For any EWS to be effective, it must be able to trigger timely response, intervening before the crisis point has been reached. EWS must be able to protect livelihoods before lives are threatened, and must be geared to protect future capacity to subsist as well as ensuring current social well-being. EW should be able to detect localised pockets of severe stress (Buchanan-Smith, 2000).

An example of a EWS initiative is the Famine Early Warning Systems Network (FEWSNET). This USAID-funded initiative covers 17 countries in sub-Saharan Africa and Afghanistan in Asia. The network offers a range of information products, tools and services aimed at strengthening the abilities of the countries and regional organisations to manage threats of food security through the provision of timely and analytical early warning and vulnerability status. It also provides decision makers with up to date information to avert or mitigate the impacts of food security shocks. The challenge has been to ensure EW result in prompt responses by governments and, potentially, the international community. It also requires that the information is effectively disseminated down to the end user in accessible and comprehensible form (UN/ISDR, 2002; DFID, 2006; Galu *et al*, 2008; FEWSNET, 2010a).

2.3.3 Phases of EWs

In an EWS, four phases can be identified and followed. These are presented as below.

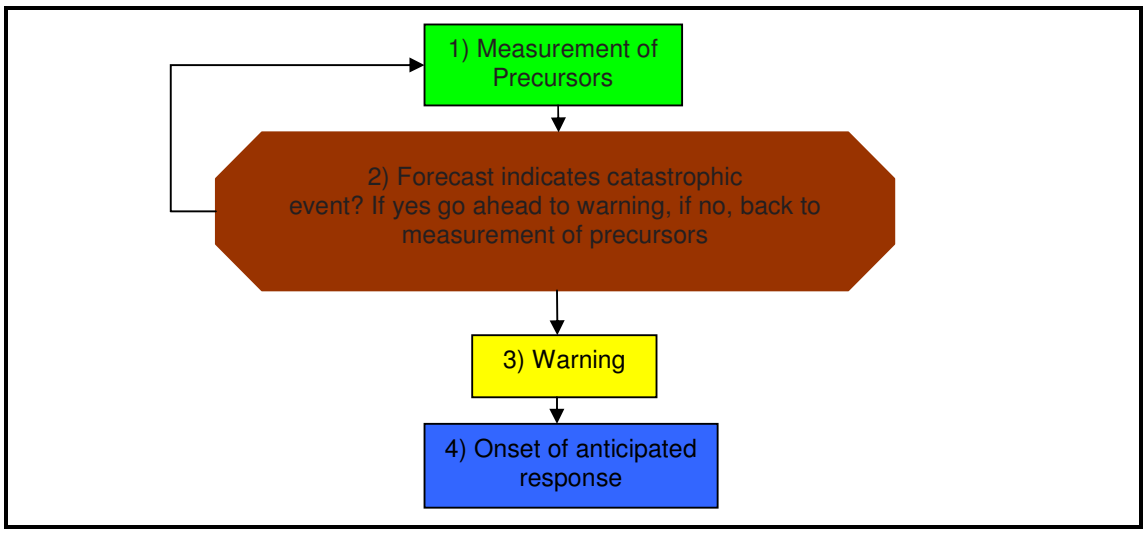


Figure 6: Four phases of EWS

Adapted from Wicklung and Raum, 2006.

Wong, s.a also identified five factors that can affect the design of EWS. These are:-

- State of meteorological science and forecasting capability
- Means of communication
- The environment - whether there are built up dwellings and nature of the roads
- Appropriateness of protective actions
- Expectations of the society/ community

Other considerations in the development of EWSs can be around the political will and responsibility to promote the system and strategies, public knowledge and participation in the system, and support at local, regional, national and international levels. Technical identification and monitoring of hazards, multi-disciplinary, multi-agency and inter-sectoral communications as well as and institutional services to react to warnings are also vital ((Environment and Societal Impacts Group (ESIG), 2004; UN/ISDR 2005b; WMO, 2006).

2.3.4 Importance and uses of EWS

The aim of early warning is to empower individuals and communities, predisposed to hazards, to act in ample time and in an apt manner so as to reduce the prospect of personal injury, deaths and damage to property, or surrounding environments.

Crucially, since EW is a major element of DRR, it is, accordingly, important in development endeavours. Besides preventing loss of lives and reducing negative impacts of disasters, EWs help people to deal with potential disasters and aid in the process of recovery and sustainable development (ESIG, 2004; UN/ISDR, 2006a). EWs should seek to provide decision makers at all levels with information on the onset, continuation and end of a disaster status. EW provides information on vulnerability factors and patterns and hazard forecasting. Better identification of risk and occurrence of hazard aided by strong monitoring of vulnerability levels can be achieved through EWS.

In the HFA 2005-2015, which is a roadmap negotiated by governments at the World Conference on Disaster Reduction in Kobe, Japan in 2005, priority number two is the EWS. In the framework, there are clearly spelt out activities under this priority, which are: Risk assessments, early warning, capacity enhancement and focusing on regional and emerging risks (Wong, s.a; Chung, 2005; UN/ISDR, 2005a; UN/ISDR 2005b). EWS products can include:

- Short to medium term weather forecasts
- Prediction of the onset and cessation of a rainy season
- Prediction of wet and dry spells
- Climatic forecasts and soil moisture monitoring
- Outlook for onset of drought (Akeh *et al*, 2000).

The effectiveness of the EW depends not only on technical capabilities but also on the preparedness of decision makers and their immediate response. Moreover, the warning message must be simple, understandable and should have instructions on how to react while timeliness of the message has to be guaranteed (Samarajiva and Waidyanatha, 2007; Hab *et al*, 2009). Below is an illustration of a typical EW chain.

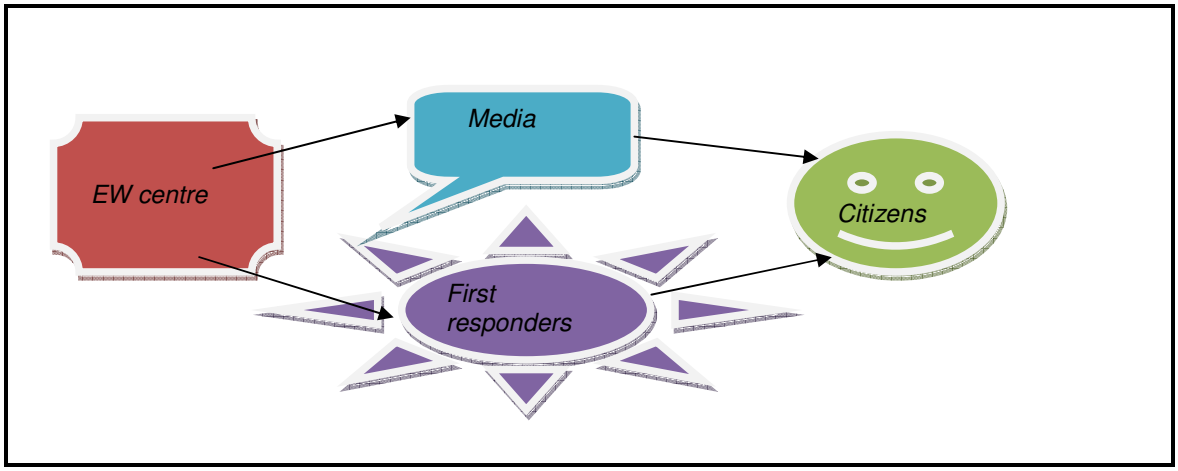


Figure 7: Early Warning Chain

Adapted: Hab et al, 2009, Samarajiva and Waidyanatha, 2007.

More often, the concept of managing disasters is reduced to hazard assessment and emergence response. Great value is placed to the scientific understanding of hazards and protective structures, while analysis of socio-economic impacts and risk assessment plays second fiddle. However, this is another domain where EW should play a role to better understand the communities under threat and how they are or can be prepared to respond (Hab *et al*, 2009).

An EWS should not be a process of data collection and analysis that is considered the end result. Rather, it ought to be part of a bigger system that is aimed at mitigating and responding to a crisis. Notwithstanding, EW also need to be sustainable through ingenuity and adaptive technologies, scientific knowledge and by review of their aims and performances (Monnik, 2000; Benfield Hazard Research Centre, 2006). EWs eventually pay off. A prerequisite for an effective EWS is the recognition of its benefits by the general public, policy makers and the private sector. It can therefore be noted that EWS have indeed become practical tools for implementing timely and appropriate responses to hazards (Aemun, 2006). The following three case studies illustrate how EWS can be designed and benefits derived from them.

Case study 1: Early Warnings through phones in Andhra Pradesh, India

Coastal communities in Andhra Pradesh are vulnerable to cyclones and storms. Ham radio sets have not always been a reliable form of communication for EWs. The European Community Humanitarian Aid Department (ECHO) funded a disaster preparedness programme in 2001 in which mobile phones were distributed to 120 villages along the stretch of coastline. The phones were programmed to have restricted dialling and were distributed to disaster management committees twice a year prior to the main cyclone season. This phone system has proved to be more reliable, for both receiving warnings from outside the area and to pass on messages to neighbouring villages about impending events. However, artisanal offshore fishers remain prone because they do not have the radios.

Source: White et al, 2004; DFID, 2006.

Case study 2: Community-based EWS and preparedness in Central America

Hurricane Mitch swept through Central America in 1998, causing severe impacts in Honduras, Nicaragua, El Salvador and Guatemala. The death toll from the high winds, flooding and landslides generated by this storm was about 27,000. Mitch destroyed or damaged about 80,000 homes, 2,000 drinking water systems and hundreds of bridges, and heavily impacted on the region's agriculture – causing damage to subsistence crops to the value of US$ 155 billion in Honduras alone. International Federation of Red Cross and Red Crescent Societies (IFRC) claims that the disaster put economic development in Honduras back by 20 years. The impacts of Mitch fell most heavily on the poorest, especially on those living and working in marginal lands on steep slopes and floodplains. But a few examples emerged from the region to illustrate how simple DRR rooted within communities in hazard-prone locations can play a major role in reducing local deaths. In contrast with neighbouring sites, there were no deaths among the residents of La Masica on the coast of Honduras, where external agencies had supported a local capacity-building programme for risk reduction featuring a community-based flood EWS linked to preparedness training. Similarly, the impact of the hurricane was substantially reduced and there was no loss of life along the Coyolate River in Guatemala, where communities had jointly worked to map flood hazard, establish a high-rainfall alarm system, monitor river levels and constructed evacuation shelters.

Source: UN/ISDR, 2002; UNDP, 2004; White et al, 2004.

Case study 3: Cuban success story against Hurricane Michelle

Hurricane Michelle formed in the Gulf of Honduras on the 2 November, 2001 reaching on Cuba 4-5 November, with wind velocities of up to 220 km/h. It was the most powerful storm to hit Cuba since 1944. But, in contrast to the 20,000 victims of hurricane Mitch in Honduras in 1998, just 5 people died and 12 were injured in Cuba. Successful civil defence and IFRC planning (12 provincial and 150 municipal headquarters for civil defence involving 87000 people were activated and more than 5000 vehicles were deployed for evacuation) ensured that 700,000 people were evacuated to emergency shelters in time and provided with basic needs. About 777,000 animals were also moved to safe areas. This success has been attributed to detailed preparedness training and planning, effective local personnel, effective communication of early warning and instructions which people trusted and acted upon and political commitment to risk reduction with attention to the most vulnerable people. Search-and-rescue and emergency health-care plans were activated. In the capital, Havana, electricity and water supplies were turned off to avoid deaths from electrocution and sewage contamination. Cuba's population had been advised in advance to store water and clear debris from streets that could cause damage. It was reported that the government's high level of disaster preparedness was key in the prevention of major loss of life.

Nevertheless, there were huge damages to building infrastructure, agriculture and communication facilities. The Cuban government uses public awareness of risk and a community-based messaging system to reach all areas. Preparedness exercises involve most of the population. Cuba's system allows for direct communication with government representatives in provinces and municipalities. Public service announcements are also disseminated on the state-owned television and radio stations. "The Cuban way could easily be applied to other countries with similar economic conditions and even in countries with greater resources that do not manage to protect their population as well as Cuba does," said the head of the U.N/ISDR, Salvano Briceno, in 2004. From an early age, all Cubans are taught how to react when hurricanes approach the island. The country holds an annual two-day training session to help people prepare for hurricanes.

Two days before a hurricane strikes, all communities - all versed in interpreting information from the Cuban Institute of Meteorology – activate emergency plans. Local authorities help the most vulnerable people. Transport is organised, and hospitals and schools are converted into shelters. Cuba's success in saving lives gives a model of effective government-driven disaster preparedness. Ben Wisner suggests that the secret of this success is that "one cannot 'fix' disaster risk with technology alone. It is also a matter of enacting and enforcing laws, building and maintaining institutions that are accountable, and producing an environment of mutual respect and trust between government and the population".

Source: UN/ISDR, 2002; White et al, 2004.

2.3.5 People-centred EWS

It is imperative to point out that EWS are not simple linear mechanisms. Besides the many scientific, institutional, technical and political stakeholders, EWS also require the collaboration of the communities they should serve. The HFA encourages EWS that are people centred, in particular, whose warnings are timely and understandable to those at risk including guidance on how to act upon the warnings (UN/ISDR, 2005a; UN/ISDR, 2006a).

An EWS has to be considered as a social system and has to make allowance for socio-economic, cultural and gender aspects among other dimensions of the community under consideration. The systems should innovate and adapt to be sustainable. Generally, the inter-linkage of the many different components of EWS at all levels, local to global, is essential (Benfield Hazard Research Centre, 2006; Hab *et al*, 2009).

Thus, EWS must be *"end to end"*; they must reach out to the communities at risk. EWS must be people centred, that is, they must support and empower the vulnerable to protect themselves. Wicklung and Raum, 2006: 24, emphasise that people centred EWS should send clear messages, dissemination systems that reach those at risk, be practised and ensure familiar responses by disaster managers. As EWS are developed, there is need to closely think around linking scientific and technical knowledge with organisational systems and structures and the communities at risk (Chung, 2005; UN/ISDR, 2005b; Benfield Hazard Research Centre, 2006).

In essence, an integrated approach to EWS based on needs, priorities, capacities and cultures of those at risk is called for. The systems must be user friendly and the people at risk must be partners in the system not controlled by it. This should be able to bring about real ownership, emanating from shared understanding of needs and purpose of the EWS hence production of acceptable and sustainable systems. Trust and confidence are also key elements in successful people centred EWS. Warnings must be credible and reliable while stakeholders should believe the messages and trust the messengers. EWS are multi-jurisdictional and multi-disciplinary since decisions to take action are frequently a product of consultations and compromises between different groups and their priorities. Patience and persistence are also required in setting up EWS (Benfield Hazard Research Centre, 2006; Hab *et al*, 2009).

Effective EWS require strong technical foundations and good knowledge of the risk but they must be understandable and relevant to the communities they serve (Wicklung and Raum, 2006).The effectiveness of EWS can only be achieved by close cooperation between agencies involved in running the system and the vulnerable people. Resultantly, informed citizens will make their own informed choices: they become consumers of EW information, selecting from various sources and different formats (Benfield Hazard Research Centre, 2006).

As Juan Murria in 2007, put it, no matter how sophisticated an EWS is in terms of its scientific and technical designs, if the warning message does not reach all the people at risk clearly, timely and efficiently, the system is rendered ineffective.

2.3.5.1 Elements of people centred EWS

The following diagram illustrates four key components of people-centred EWS

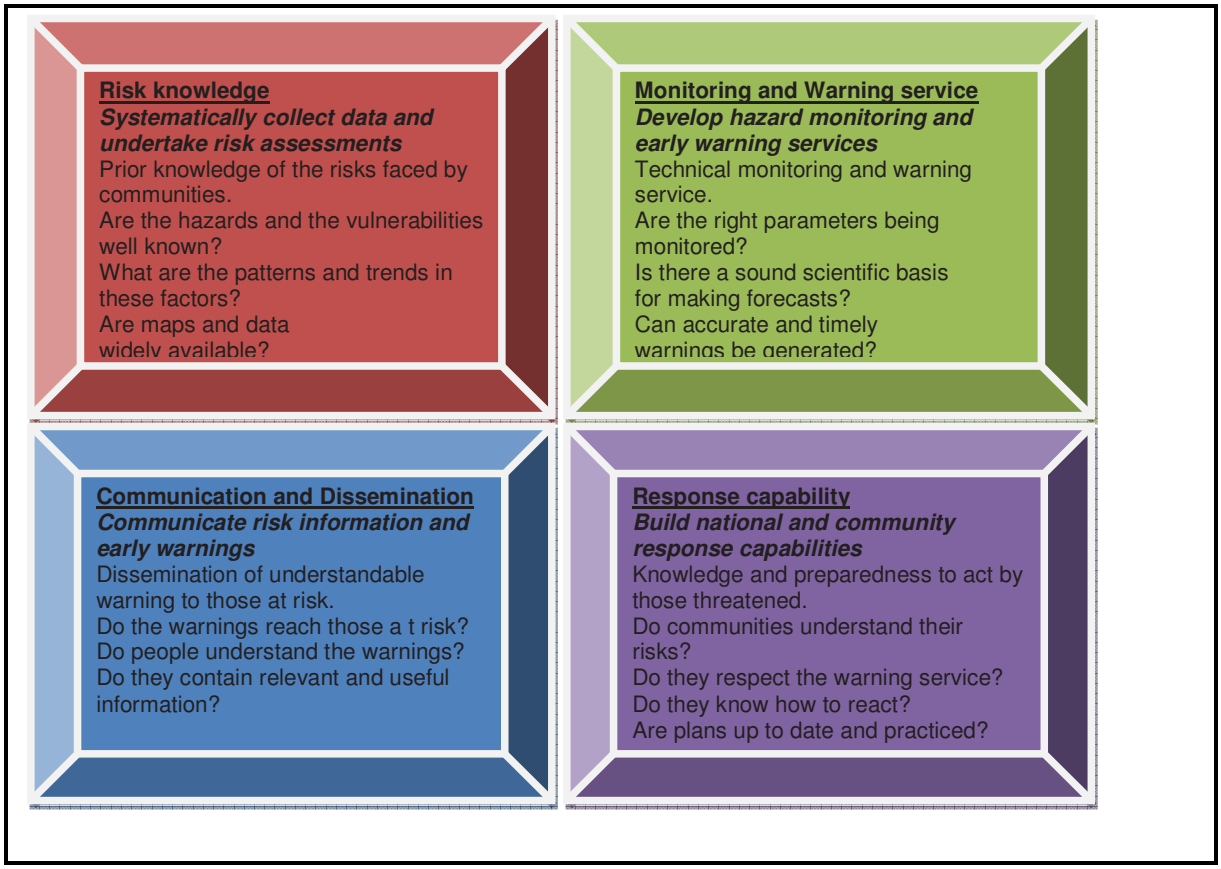


Figure 8: Elements of people centred EWS

Source: Basher, 2006; UN/ISDR, 2006b; UN/ISDR, s.a, Wicklung and Raum, 2006.

Risk knowledge - Risk assessment and mapping should help to set priorities among EWS needs and to guide preparations for response and prevention activities. Risk assessment could be based on historic experiences and human, social and environmental vulnerability

Warning service - a sound scientific basis for predicting potentially catastrophic events is needed. Constant monitoring of possible disaster precursors is necessary to generate accurate warnings on time.

Communication and dissemination - must be timely, clear and understandable and should be able to reach those at risk.

Response capability - communities should know how to react. There is need for participation of formal and informal educational centres. This is critical because one challenge of EWS has been noted as weak linkage between technical capacity to issue warnings and the public's capacity to respond effectively to the warning (Chung, 2005; Wicklung and Raum, 2006; UN/ISDR, s.a).

Weaknesses or failure in one of these four components could result in malfunctioning of the whole system. Therefore the four components should be strongly interlinked. To these four components, one could affix aspects of good governance, which comprises of robust legal and regulatory frameworks and political commitments, and appropriate integrated institutional framework, for the system to work effectively (Wicklung and Raum, 2006).

Thus, to be effective, EWS need to actively involve communities at risk, facilitate public education and awareness of risks, effectively disseminate messages and warnings and ensure there is a constant state of preparedness (Concern Worldwide, 2005; UN/ISDR, 2006a).

This section underlines the need for locally based EWS that are focused on the local people to enable locals to anticipate disasters and therefore effectively respond (Monnik, 2000). An example of a multi-disciplinary and community-based EWS is shared in the diagram below.

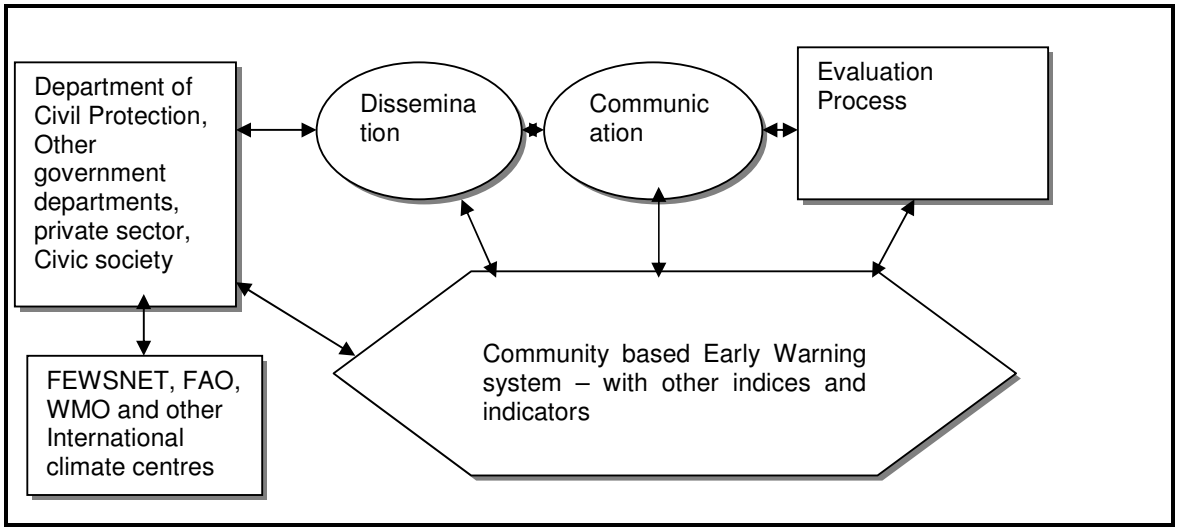


Figure 9: Example of a community based EWS

Adapted from Ogallo, s.a

2.3.6 Weaknesses and challenges in the use of EWS

A major challenge with EWS is the discontinuity resulting from shortages/gaps in funding and missing data between inter-hazard years. This makes the data less useful for understanding long term effects of hazards. Related to this is the question of coordination: who has the information and how is it used to prevent and/or reduce the impacts of hazards (Aemun, 2006).

Sometimes information delivered through EWS is too technical and detailed such that its interpretation and comprehension to the ordinary community member is limited resulting in little or no action. Better analysis could provide a concrete basis for designing strategies to integrate risk reduction into development processes at all levels (Buchanan-Smith, 2000; WMO, 2006).

Lack of ownership and subsequent low uptake prevails if the source/provider is unknown and probably not trusted (Buchanan-Smith, 2000). In some cases, besides the approach being technical, it is also short-term and oriented towards needs for humanitarian assistance. The EW become far less tailored for generating knowledge that would improve understanding of longer-term socio-economic and political processes responsible for vulnerability (or capacity), or eliciting action to counter that vulnerability (WMO, 2006).

There is also a tendency for some decision makers to be driven by downstream rather than upstream events; to be motivated by hard evidence rather than by predictions. They therefore wait for signs of the outcome of failure before they respond.

Lack of political will and bureaucratic rigidities may hamper the ability to positively respond thereby adversely affecting the use of EW information. Sometimes governments and decision makers downplay the scale of disasters to protect their reputation or gain mileage, for instance, when the focus or concern is on winning the next election. This result in limited or no resources availed, cooperation is absent and little or no measures are taken to protect livelihoods before lives are threatened (Buchanan-Smith, 2000). A vivid example was in Myanmar (also called Burma) in 2008 when Cyclone Nargis hit the country on May 2-3, 2008. The cyclone killed more than 140 000 people and severely affected about 2.4 million others. In the immediate aftermath of the cyclone, the Myanmar/Burmese military government delayed and obstructed the international relief efforts through its reluctance to allow foreign aid and aid workers into the devastated area. The ruling party, State Peace and Development Council (SPDC), even increased its repression as it pushed ahead with a controversial constitutional referendum within the same month of the disaster. The deadlock on international assistance ended on May 31, 2008, between the ruling party, the United Nations, and the Association of Southeast Asian Nations (ASEAN), only after several diplomatic negotiations (Rieff, 2008; *Msnbc*, 2008; Wikipedia, 2008; Human Rights Watch, 2009; *Mail & Guardian*, 2008).

Some authorities are inclined to look at the last disaster and forget the broader view. This hinders forward-looking and anticipatory EW. Occasionally, EWs are not cascaded right down to the last people in the chain. Those who do not receive the EW may fail to anticipate and cope with the ripple effects of a hazard (ESIG, 2004).

At times, one finds that the link between traditional systems and formal EWS is blurred or non-existent. But it is critical to understand indigenous knowledge. Indigenous communities have a very close relationship with nature and their view of the world is linked to the signs they have learnt to interpret. Their long experience in observing and interpreting nature needs to be tapped (Aemun, 2006; Oxfam International, 2008). It has also been noted that from time to time, EWS function at the national and international levels only, leaving the grassroots and remote communities in the cold (De Pauw, 2000; UN/ISDR, 2007b).

Information from around the Indian Ocean in the aftermath of the December 26, 2004 tsunami vigorously demonstrate that knowledge gained from experience or from education are critical to reducing disasters. The below case study may be useful to explain this.

Case study 4: Tsunami in Asia

Prior to the 2004 Tsunami, one of the few places with an operational local level tsunami early warning system was the island of Simeulue off Aceh. Simeulue community leaders in Indonesia received a prestigious U.N. award for saving tens of thousands of lives during the tsunami. Faith in their own knowledge of how the sea behaves and the reaction of buffaloes ahead of the tsunami enabled them to survive. They narrated that if animals started behaving erratically and the sea drained off beaches, a tsunami is likely to follow, an oral communication should be sent and everyone should flee to the hills. As such, the community, with about 80,500 inhabitants fled the shore for nearby hills on that fateful Sunday morning. Consequently, only 7 people died from the tsunami in this community, while thousands died across the rest of Indonesia's northern Aceh.

"The story of what happens to the sea before a tsunami and how the buffaloes rush towards the hills has been shared by families for years along with other stories about our ancestors" said Mohamed Ridwan, a leader in the community. This oral narrative had been shaped by the destruction that shook this when an earthquake followed by a tsunami hit the island in 1907, killing thousands. "Since then we have learned how to escape, and last December it took about 30 minutes to get to the higher ground", Ridwan, explained. The power of knowledge was also demonstrated at a tourist resort in Thailand, where a young British schoolgirl, Tilly Smith, recognised that the turbulent sea and loud noise of the waves meant a tsunami was coming She alerted her parents and other people present of the danger, which possibly resulted in saving of 100 lives. The girl was able to recognise the signs because she had recently learned about tsunamis at her school. Education, whether of formal or informal type, empowers people by providing a sound basis for understanding and effect appropriate response.

Source: DFID, 2006; Wicklung and Raum, 2006

In the developing world, in Africa particularly, the risk assessment is still very weak. Focus is still on the post disaster loss assessment than anticipatory risk assessment while most of the risk mapping exercises do not involve the people at risk but are top-down (UN/ISDR, 2004).

When early warning systems fail, the results can be catastrophic, as happened during the 2004 tsunami in Asia and east Africa. EWS failures typically occur in communication and response capability but in the Asian Tsunami (Indian Ocean), in some locations, all the four components of EWS failed, as illustrated below.

Case study 5: Failure of the 4 components of EWS during the Tsunami

A warning centre in Hawaii, the Pacific Tsunami Warning Center (PTWC) informed the American naval base in the Indian Ocean about the impending tsunami two hours before anyone else knew, but the information was not communicated to the other areas under threat even by phones. A host of other agencies responsible for assessing this risk and monitoring such hazards had the information or could have easily accessed the information on this impeding hazard but treated it casually when evidence pointed out the approaching tsunami. If all stakeholders had acted in the responsible way, people at risk could have been informed and evacuated well in time. Of course, there were also groups that did not have much knowledge on such an occurrence. And there were also people who could not help themselves, did not get assistance and therefore failed to run away from this impeding disaster.

Source: Chossudovsky, 2005; Basher, 2006; UN/ISDR, 2006b.

The synergy between issuing of warnings and the capability and willingness to respond has always been a flaw highlighted by many scholars and practitioners. Because, without the corresponding early response, EW information becomes *"a smoke alarm without fire extinguishers"* (Oxfam, 2006:4). EW is not enough if other areas such as institutional arrangements and political will are not present and complementing the EWS (Basher, 2006).

2.4 ROLE OF MEDIA IN EWS

Media plays an essential role in EW. Effective EWS are those that reach people using means which they are acquainted with. Mass media can warn the public effectively especially on slow onset hazards such as droughts. Television, radio, online databases and channels have potential roles in making and disseminating public information and education to help improve people's knowledge and responses in the face of hazards and risks (Buchanan-Smith, 2000; UN/ISDR, 2002; UN/ISDR, 2006b; Benson and Twigg, 2007; Samarajiva and Waidyanatha, 2007).

However, the traditional/indigenous disaster management systems in Zimbabwe including EWS were sidelined during the colonial periods resulting in crisis management characterised by poor coordination, poor targeting, unreliable and irrelevant information as well as being costly to maintain due to use of sophisticated technologies that were not affordable sustainable in poor communities. These are some components of EW that may warrant a revisit (Ogallo, s.a; UN/ISDR, 2002; UN/ISDR, 2004).

2.5 DROUGHT

Presently, there is no collectively accepted definition of drought. This is because droughts are complex in causes, patterns and impacts. However, it is widely accepted that drought is an insidious natural hazard characterised by lower than expected or normal precipitation, that, when extended over a season or longer period of time, is insufficient to meet the demands of human activities and the environment. It is a relative rather than absolute condition, therefore can vary in space and time. Drought occurs in both high and low rainfall areas thereby making it a normal part of the climate although its spatial extent and severity will vary on seasonal and annual timescales (Western Governors' Association, 2004; WMO, 2006).

Drought typically specifies a certain departure from average precipitation, stream flows, reservoir levels or some other index. It needs to be pointed out here that drought itself is not a disaster. It becomes a disaster depending on its impact on local people, economies and the environment and the in/ability of these to cope and recover from the drought (WMO, 2006; Verdin, 2007).

Drought has some unique characteristics that require different approaches to monitor its development and cessation and assess potential impacts on people and society at all levels. Common indicators of drought include meteorological variables such as precipitation and evaporation, hydro variables such as stream flow, ground water levels, reservoir/lake levels and soil moisture among others (UN/ISDR, 2003a). There are four (4) types of drought commonly recognised: hydrological, agricultural, meteorological and socio-economic (Wilhite, 2002).These are discussed below.

2.5.1 Types of drought

2.5.1.1 Meteorological drought

This drought is characterised by precipitation deficiency in terms of amount, intensity and timing. High temperatures, high velocity winds and less cloud cover can be other features. Resultantly, there is reduced infiltration, run off, percolation and ground water recharge. There are also high evaporation and transpiration rates. This describes a situation where there is a reduction in rainfall for a specified period, below a specified amount – usually defined as some proportion of the long term average of the specified time period. Its definition involves only precipitation statistics. The comparison must be region/area specific.

Rainfall deficiency, however, on its own does not always create a drought (Borton and Nicholds, 1994; Reed, 1994; Eljohra, 2006; WMO, 2006).

2.5.1.2 Hydrological drought

This is revealed by reduced stream flows, inflow to reservoirs lakes and ponds, reduced wetlands and habitats for wildlife for a given period of time. Definition of this drought involves data on availability and off-take rates in relation to the normal requirements of the system (domestic, industrial, irrigation, agriculture) being supplied. One apparent impact is competition among users of the storage systems (Nicholds, 1994; Reed, 1994; Eljohra, 2006; Verdin, 2007).

2.5.1.3 Agricultural drought

This is soil water deficiency. Typically, there is plant water stress, reduced yield and biomass (defined by availability of soil water to support plant growth than by departure from normal precipitation). It is the impact of hydrological and/or meteorological drought on crop yield and livestock production. Crops and animals have particular temperatures, moisture levels and nutrient requirements during their growth cycle to achieve optimum growth. If moisture levels fall below the required amount during growth, then crop and animal growth may be impaired and yields reduced. Yet, it is important to note that droughts have different impacts on different crops and animals; some crops such as sesame thrive in dry years. Famine drought can be regarded as an extreme form of agricultural drought (Nicholds, 1994; Reed, 1994; WMO, 2006; Verdin, 2007).

2.5.1.4 Socio-economic drought

This differs distinctly from other types of drought because it reflects the relationship between supply and demand for some economic good or commodity that is dependent on the other three droughts. For instance, when supply of some goods or services such as water, livestock forage/hay or hydro-electric power is dependent on weather, drought may cause shortages. The socio-economic drought concept recognises the relationship between drought and human activities. An example is where poor land practices exacerbate the impacts and vulnerability to future droughts (Reed, 1994; WMO, 2006; Dunkel, 2008). Nevertheless, these droughts are usually inextricably interrelated as shown in the diagram below.

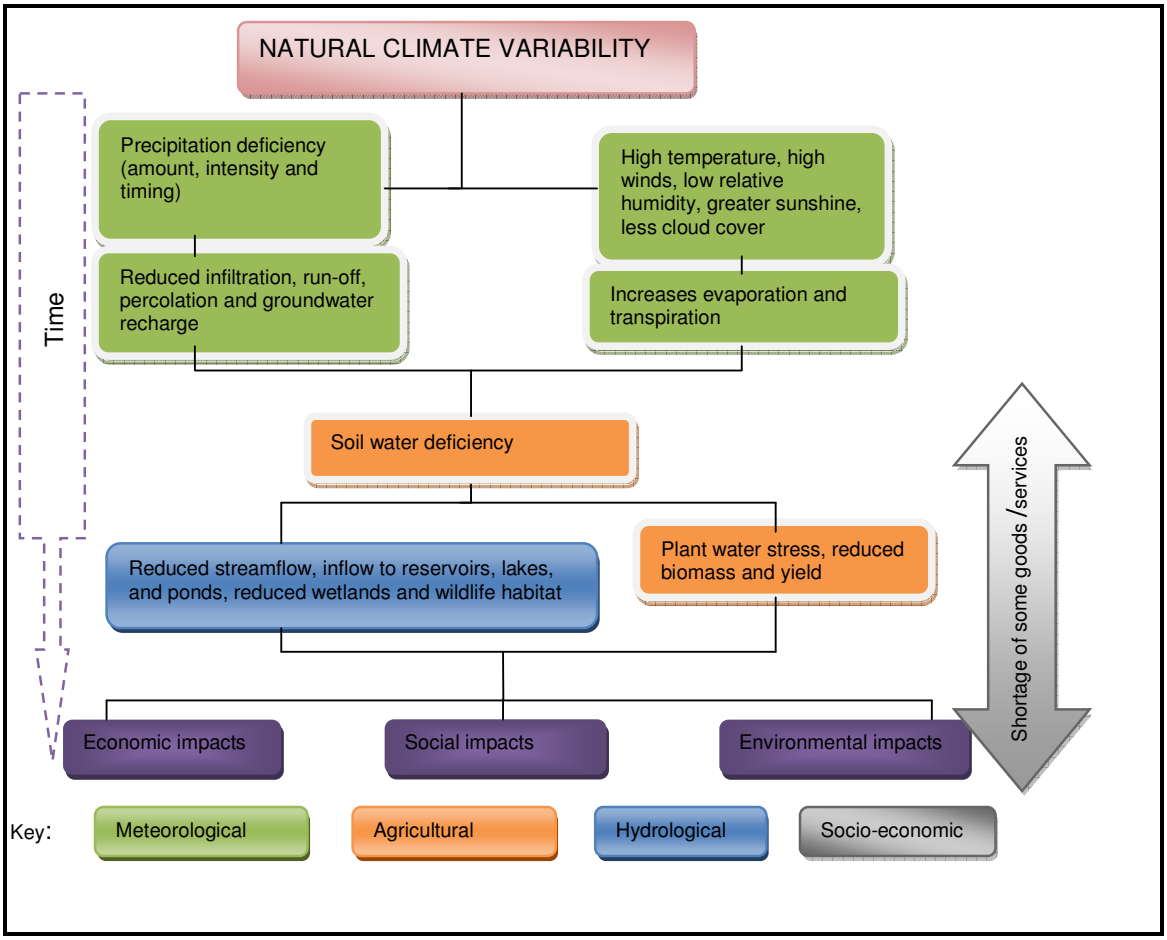


Figure 10: Relationships between the different types of drought

Adapted from National Drought Mitigation Center (NDMC) - University of Nebraska-Lincoln (2006): http://drought.unl.edu

2.5.2 Drought indices

The severity of a drought can be measured climatically, socially, and economically. A fundamental problem is determining the severity of a drought. Droughts affect people or communities in different ways. For example, one might feel the effects of a drought through reduced shower time. A farmer might measure drought conditions in tonnes/acre. To make the measurement of drought conditions more meaningful, various indices have been developed to help examine different meteorological and hydrological conditions (NDMC, 2006).

A drought index is a value, usually a single number, deduced after assimilation of lots of data on various indicators that can influence drought. This index is useful in decision making as it provides operational definitions of drought that enable the onset, duration severity and

potential impacts of drought to be quantified (NDMC, 2006). There are various indices that can measure how much precipitation for a given period of time has deviated from historically established averages. None of the indices is superior to the other ones but some indices are better suited for certain uses or locations than others (UN/ISDR, 2003a; NDMC, 2006; Niemeyer, 2009). Friedman in 1957 as cited by Heim (2002) says any drought index should meet four basic criteria:

a) The timescale should be appropriate to the problem at hand,

b) The index should be a quantitative measure of a large scale, long continuing drought conditions,

c) The index should be applicable to the problem being studied, and

d) A long accurate past record of the index should be available or computable.

Nine of the major indices are briefly discussed in the ensuing section.

2.5.2.1 Standardised Precipitation Index (SPI)

Standardized Precipitation Index (SPI) is a tool developed by McKee, Doesken and Kleist in 1993 for defining and monitoring drought. The tool allows the analyst to determine the rarity of a drought at a given time scale (for example 1, 3, 6 and 12 month periods) for any given rainfall station with historic data. It can also be used to ascertain anomalously wet events. SPI is an early warning of drought and the drought intensity level for each month in which the drought occurs. SPI is also designed to compute precipitation deficit for multiple time scales. It is however not a drought prediction tool. Thus, SPI can assist decision-makers with assessment of the cumulative effect of reduced rainfall over various time periods and can also describe the magnitude of the drought; compared with other drought events (Anon, s.a; McKee, Doesken and Kleist, 1993; South African Weather Service, 2003; Wilson Okamoto Corporation, 2005; NOAA, 2008).

The calculation of SPI is based on the cumulative probability of a given rainfall/precipitation occurring at a particular station at a given time scale. It measures the precipitation deviation from the long term mean. The long term/historic rainfall data is fitted to a probability distribution which fits precipitation distribution quite well. Thus, this process allows the rainfall distribution at the particular station to be effectively represented by a mathematical cumulative probability function, which will then be transformed into a normal distribution so that the mean SPI for the location and the desired period is zero (Edwards, s.a; McKee, Doesken and Kleist, 1993; Nationwide Publishing Company, 2006).

SPI can therefore effectively represent the amount of rainfall over a given time scale and provides not only information on the amount of rainfall, but it also gives an indication of what this amount is in relation to the normal leading to the definition of whether a station is experiencing drought or not. The longer the period used to calculate the distribution parameters, the more the reliable are the results likely to be (Hayes, 2006).

All the steps of transforming the distribution make the SPI independent of both the location and the range of values so that different seasons and climatic areas are represented on an equal basis. It is just dependent on rainfall data. While the SPI value is theoretically unbounded, empirical evidence show that it is extremely rare to observe values outside the +3 to -3 range. SPI is flexible and can be applied to other types of data such as stream flow, reservoir levels among others (Colorado Climate Centre, 2007). The following table summarises how SPIs value are interpreted.

Table 1: Interpretation of SPI values

SPI values and drought intensity	
2.0 and above	Extremely wet
1.5-1.99	Very wet
1.0-1.49	Moderately wet
-0.99-0.99	Near normal
-1.0-1.49	Moderately dry
-1.5-1.99	Severely dry
-2.00 and below	Extremely dry

Adapted from Nationwide Publishing Company, 2006.

Positive SPI values indicate above average precipitation (greater than median precipitation) while negative SPI values indicate below normal precipitation. The negative SPI values are the one of great interest with respect to drought. The departure from zero is indicative of the severity of drought: the larger the departure, the more severe the drought condition.

The proponents of SPI also indicate that a drought event occurs anytime the SPI is continuously negative. The event ends when the SPI becomes positive. Hence, each drought event has a duration defined by its beginning and end. The positive sum of the SPI for all months within the drought event is referred to as the drought magnitude. SPI identifies emerging droughts sooner than some indices, requires limited data and the calculations are flexible and fairly simple (Wilson Okamoto Corporation, 2005; Hayes, 2006).

2.5.2.2 Palmer Drought Severity Index (PDSI)

This index was developed by W.C Palmer in 1965 to measure the departure of the moisture supply. It is based on the supply-demand concept of the water balance equation, considering not only the precipitation deficit at a specific location. It is a meteorological drought index. This index is popular in the USA and it is more suitable for measuring impacts that are sensitive to soil moisture conditions such as agriculture and useful in trigger actions for drought contingency planning. The PDSI is preferred in some instances because decision makers can determine how abnormal the recent weather for a region has been. The index also provides an opportunity to place the current conditions in a historical perspective while historical droughts can be spatially represented.

The PSDI however has its limitations. It is used only in the USA as trials in other countries such as South Africa have shown it to be a poor indicator of short term changes in moisture status affecting crops (Du Pisani, 1990). The PDSI is a site specific index with low levels of accuracy derived from weighted differences between actual precipitation and evapo-transpiration. Smakhtin and Hughes, 2004, postulated that PDSI values may lag behind emerging droughts by several months. For these reasons, it is not suitable for mountainous lands or areas with frequent climatic extremes but homogeneous regions. Lastly, the calculation is complex as it requires a large amount of meteorological data and unspecified, built in time scale that can be misleading (Smakhtin and Hughes, 2004). The table below summarises the interpretation of PDSI.

Table 2: Interpretation of PDSI values

Palmer Classifications	
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient wet spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

Adapted: Palmer, 1965

Negative values indicate a dry period, whereas positive values indicate a wet period.

2.5.2.3 Crop Mixture Index (CMI)

This index was derivative of Palmer in 1968 to complement the PDSI. The index measures the extent to which crop moisture requirements are met. The CMI uses a meteorological approach to monitor week to week crop conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds faster to changes in moisture conditions and is most effective in measuring agricultural drought during the warm growing season. The major shortcoming is that the index was developed for short-term monitoring; it may be misleading over the long-term (Hayes, 2006).

2.5.2.4 Surface Water Supply Index (SWSI)

The index was designed by Shafer and Dezman in 1982 to complement the PSDI in Colorado, USA where mountain snowpack is a key element of water supply. The objective of the SWSI is to incorporate both hydrological and climatological features into a single index value resembling the PSDI for each major river basin. These values would then be standardised to allow comparisons between basins. Four inputs are required for the SWSI, that is, snowpack, streamflow, precipitation and reservoir storage. Since this is dependent on the season, in winter, the snowpack is utilised instead of stream flow and in summer the stream flow replaces the snowpack. This index is easy to calculate and gives a representative measure of water availability across the river basin (Shafer and Dezman, 1982).

However, shortcomings have been noted. There is no consensus on the definition of surface water supply. Additionally, factor weights vary from place to place and in some instances from month to month resulting in indices with different statistical properties. Hydro-climatic differences that can characterise river basins can result in indices that do not have the same meaning and significance in all areas and all times. This makes it very difficult to compare drought severity in different basins for comparison (Hayes, 2006; NDMC, 2006).

2.5.2.5 Reclamation Drought Index (RDI)

A relatively recent index, this tool was developed by the Bureau of reclamation in USA for defining drought severity and duration and predicting the onset and end of drought periods. Just like the SWSI, RDI is calculated at the river basin level and it incorporates the components of temperature, precipitation, snowpack, streamflow and reservoir levels. It

differs from the SWSI in that it builds a temperature based demand component and duration into it. Its main strength is the ability to account for both climate and water supply factors. However, because the index is unique to each river basin, inter basin comparisons are limited. The RDI classification is depicted in the table below (NDMC, 2006; Nationwide Publishing Company, 2006).

Table 3: RDI interpretation

RDI Classification	
4.0 or more	Extremely wet
1.5 to 4.0	Moderately wet
1.0 to 1.5	Normal to mild wetness
0 to -1.5	Normal to mild drought
-1.5 to -4.0	Moderate drought
-4.0 or less	Extreme drought

Adapted: NDMC, 2006

2.5.2.6 Effective Drought Index (EDI)

Developed by Byun and Wilhite in 1999, this is a function of precipitation needed to return to normal conditions (PRN), that is, precipitation which is necessary for recovery from accumulated deficit since the beginning of a dry period. The index is also a daily effective precipitation and its deviation from the mean daily. EDIs are standardised and allow drought severity in various places to be compared even if their climates differ. The index can be used for drought monitoring over large regions. The main shortcoming is that it is based on daily precipitation data which is much less readily available (Byun and Wilhite, 1999).

2.5.2.7 Water Requirement Satisfaction Index (WRSI)

This index was developed by Frere and Popov in 1979. Vossen (1990) utilised the index in Botswana and it is still widely used in Southern Africa. WRSI indicates crop performance based on the availability of water to the crop during the growing season and is used to monitor crop moisture stress. The WRSI ranges from 0 to 100. An index below 50 indicates crop failure and a value of 97-100 shows good crop condition (Unganai and Bandason, 2005). One weakness of WRSI is that, to facilitate calculation, assumptions are made concerning a specific crop, replanting, evaporation and soil water holding capacity (Monnik, 2000). Furthermore, WRSI does not consider crop or stage specific sensitivity to drought stress; it only takes account of cumulative moisture deficits, not consecutive deficits; it can only partly accommodate actual evapo-transpiration and the index assumes equal soil

moisture availability over the entire range between field capacity and wilting point (Du Pisani, 1990).

2.5.2.8 Percent of Normal rainfall index

The percent of normal is a simple calculation for rainfall for a location. It is well suited to the needs of weather forecasters and general public. This is calculated by dividing actual precipitation by normal precipitation-normally considered to be a 30-year average - and multiplying by 100% where 100% indicates normal precipitation for a particular location. Analyses for percent of normal are very effective when used for a single region or a single season. Similar percentage of normal values may have different impacts at different locations. This is the most widely used index in Southern Africa (Unganai and Bandason, 2005).

The index has its drawbacks, it can be easily misunderstood: normal is a mathematical construct that does not necessarily correspond with what people expect the weather to be. Application problems noted in Southern Africa relate to the difficulty and cost of monitoring parameters such as soil moisture and the lack of data on potential evapo-transpiration (Byun and Wilhite, 1999; Unganai and Bandason, 2005).

2.5.2.9 Deciles

Deciles were suggested by Gibbs and Maher in 1967 as another drought monitoring technique, to counter some weaknesses in the percent of normal index. Monthly precipitation totals from the long term records, about 30 to 50 years, are first ranked from highest to lowest in a cumulative frequency distribution. These are then classified into 10^{ths} of distribution (deciles). Any precipitation value can be measured against the deciles. This index is simple and relies on precipitation data only. Fewer assumptions have to be made and the index is an accurate measurement of precipitation. Decile rainfall analysis is valuable since it is standardised over time and therefore regions with different climates can be compared. Major disadvantages of this index are its non-sensitivity to the distribution of rainfall within the period considered and its requirement for long climatic data (Monnik, 2000). Below is an illustration of the deciles interpretation.

Table 4: Deciles interpretation

Decile classifications	
Deciles 1-2: lowest 20%	Much below normal
Deciles 3-4: next lowest 20%	Below normal
Deciles 5-6: middle 20%	Near normal
Deciles 7-8: next highest 20%	Above normal
Deciles 9-10:highest 20%	Much above normal

Source: Gibbs and Maher, 1967

2.6 DROUGHT IMPACTS

Most disasters are of hydro-meteorological origin and poor people are the most affected. This is a major handicap to development as droughts and floods still threaten the basic livelihoods of the society (Basher, 2004). The drought hazard differs from other natural hazards in a number of ways. Due to its creeping nature, its effects often take long to appear. For instance, the precipitation deficit may build up over a period of time before the deficiency begins to appear in reduced stream flows and usually, the agricultural sector is the first one to be affected (WMO, 2006).

It is difficult, even when a variety of data is available, to determine the onset, development and end of drought (Wilhite, 2002). A range of indices have been proposed and utilised to determine these variables of drought. This emphasises the need for developing comprehensive EWS. Droughts occur frequently, have the longest duration, cover the largest area and cause the greatest losses in agricultural production. Impacts of droughts are cumulative and the effects magnify when events continue from one season or year to the next. Droughts have potential long term effects on other disasters (Li, 2000; UN/ISDR, 2003b).

It is also crucial to note that droughts are a common occurrence in Africa. Risk and vulnerability is increasing hampering poverty reduction and sustainable development efforts (Garanganga, 2003; Ogallo, 2005; WMO, 2006). According to WMO in 2006, drought has been affecting human welfare and food security. Verdin (2007) further asserts that it is the greatest natural hazard threatening food insecure groups. Drought impacts vary due to magnitude, timing, duration, frequency of rainfall deficits, soil types, flora and fauna. The impacts are non-structural and extend over a larger area than damages that result from other hazards. Combined with drought's creeping nature, this makes it taxing to quantify its impacts and respond adequately (Sinha-Ray, 2000).

Assessment and response is difficult while mitigation actions are less obvious (Wilhite, 2002; UN/ISDR, 2003a). Severity of drought is best described through multiple indices. The impacts can be area or sector specific. The specific sectors are, economic, environmental and social. They can be further classified as direct or indirect signifying the sequence in which they occur (Paul, 1998; Nagarajan, 2003). In countries where agriculture is a significant sector, reduced food production is likely to be one of the direct impacts. Indirect impacts occur since other sectors have linkages with the agricultural sector (Benson and Clay, 1998). The table below indicates the major impacts of droughts.

Table 5: Impacts of droughts

Economic	Environmental	Social
▪ Losses in production of crops, dairy and livestock, timber and fisheries	▪ Damage to animal and fish species and habitat	▪ Food shortage effects (malnutrition, famine)
▪ Loss of national economic growth and development	▪ Increased vulnerability to predation	▪ Loss of human life from food shortage or drought related conditions, heat, suicides, violence
▪ Income loss for farmers and others directly affected	▪ Wind and water erosion of soils	▪ Decreased public safety
▪ Losses from tourism and recreational businesses	▪ Damage to plant species-loss of biodiversity	▪ Conflicts between water users
▪ Loss of hydroelectric power and increased energy costs	▪ Increased stress and disease proliferation	▪ Mental or physical stress and political conflicts
▪ Increased energy demand and power outages	▪ Migration and concentration	▪ Health problems due to decreased water flow e.g. respiratory and diarrheal diseases
▪ Losses to industries related to agricultural production	▪ Effects on water quality (salination) and effects on estuarines	▪ Inequity in the distribution of drought impacts and relief assistance
▪ Decline in food production and increased food prices	▪ Effects on air quality (dust, pollutants, reduced visibility)	▪ Decline in living conditions /quality of life
▪ Unemployment from drought related production declines	▪ Lack of feed and drinking water	▪ Increased poverty, reduced quality of life
▪ Revenue losses to government and increased strain on financial institutions	▪ Increased number and severity of fires	▪ Social unrest, civil strife
▪ Insect infestations and plant diseases	▪ Loss of wetlands and ground water depletion	▪ Population migration for employment or relief assistance
▪ High livestock mortality rates	▪ Land subsidence	▪ Disruption of cultural beliefs and systems
▪ Delays in breeding of livestock	▪ Reduced flows from springs, rivers and dams etc	▪ Re-evaluation of social values/norms and practices
▪ Increased predation	▪ Increased desertification	▪ Reduction and modification of recreational activitie and loss of aesthetic values
▪ Range fires	▪ Visual and landscape quality	▪ Public dissatisfaction with responses from authorities
▪ Disruption of water supplies		
▪ Depletion of groundwater sources		
▪ Increase in food prices		
▪ Increased importation of food (higher costs)		
▪ Loss of navigability of rivers and canals		

Adapted from Benson and Clay, 1998; ECLAC, 2003; Nagarajan 2003; NDMC, 2006.

2.7 DROUGHT EARLY WARNING SYSTEMS (DEWS)

Drought monitoring and EW are major components of drought risk management whose goal is to increase the society's coping capacity. This should result in greater resilience and reduced need for disaster assistance (WMO, 2006). DEWS can be described as systems of data collection to monitor the environment and people's access to their water requirements, provide timely notices and elicit appropriate responses (UN/ISDR, 2003a).

A DEWS is designed to identify climate and water supply trends and thus detect the emergence or probability of occurrence, onset, development, persistence, alleviation, severity and the end of a drought. This information can reduce the impacts if delivered to concerned stakeholders timely and in appropriate formats. However, mitigation measures and preparedness plans need to be put in place in order to minimise the impacts (Li, 2000; Action Aid, 2006). A related aspect is the famine early warning, which is the process of monitoring the situation in areas known to be particularly vulnerable to the effects of drought, crop failures or changes in economic conditions, to enable remedial measures to be initiated before hardship becomes acute (Stephenson, 1994).

It is reiterated that drought is slow onset in nature and EWS must have the capacity to detect the early emergence of rainfall deficiencies, which is normally the best indicator of incipient drought periods (UN/ISDR, 2002). It is necessary for effective DEWS to integrate precipitation and other climatic parameters with water information such as stream flow and soil moisture into a comprehensive assessment of current and future drought and water supply conditions (WMO, 2006).

Before the drought monitoring and EWS are done, at least one objective and a practical drought index should be provided. However, as noted earlier, no single index is adequate to evaluate all the types of droughts and a range of indices can be used. Thus, a DEWS can be based on subsystems such as agro-climatic indices, satellite assessments, crop yield forecasts/production estimates, price trends of commodities especially food, availability of drinking water and household and community vulnerabilities. The subsystems contain several assessment tools derived from various data sources (Liu, s.a; Li, 2000; Monnik, 2000).

Thus, a DEWS needs simple but dynamic methods and empirical evidence. Since drought creeps in slowly, it is difficult to quantify and therefore needs multidisciplinary

variables/indices and the monitoring of the whole range of sectors: agriculture, water, health, energy among others (De Pauw, 2000).

2.7.1 Components of DEWS

The below illustration summarises components of a DEWS

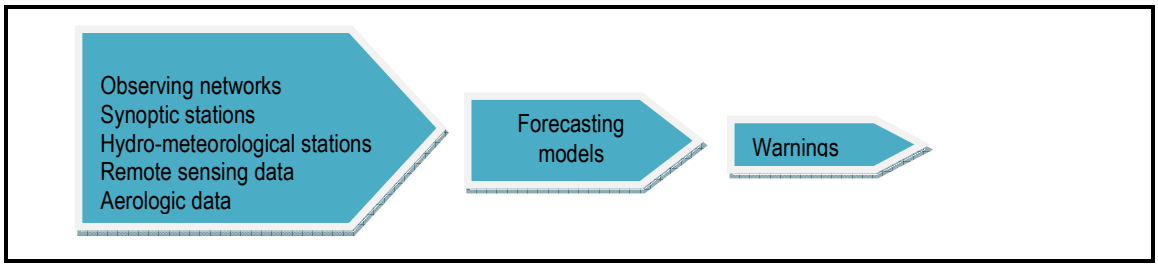


Figure 11: Components of a DEWS

Source: Eljohra, 2006.

Early warning in slow onset hazard such as drought can be a resilience-building tool. In many countries, particularly Africa, DEWS are also coupled with those developed for famine and food shortages and they generally become indicators of stress on lives and livelihoods.

"A DEWS must not only encompass mechanisms and procedures for the collection and analysis of information in a timely manner but also for dissemination of that information through locally appropriate channels to end users" (UN/ISDR, 2003a: 5: para 3). End users should be made aware of the essentiality of this information and continuous information flow should be encouraged once a drought is foreseen (UN/ISDR, 2003a). DEWS are an indispensable component of drought preparedness plans and policies and practitioners including disaster managers must work together to design products that better communicate information to decision makers in order to reduce the risks associated with drought. As always, input from end users should be solicited to better understand their information needs.

Due to drought's slow onset characteristics, monitoring and EWs provide the foundation for an effective and responsive drought mitigation plan. Typical drought plans normally contain three (3) basic components: a) Monitoring and EW, b) Risk assessment and c) Mitigation and response. The plan must rely on accurate and timely assessments to trigger mitigation and emergency response programmes (Wilhite and Svoboda, 2000).

Some DEWS focus on the hazard of the impending disaster and not on the vulnerability of systems and communities. Information on vulnerability is required to provide a focus or

drought interventions. A vulnerability profile can complement the EWS and aids decision - makers on how and where to respond for maximum effectiveness, for example, recent rainfall levels, prices, nutritional status, environmental status, soil fertility and household status (Monnik, 2000).

2.7.2 Importance of DEWS

In a nutshell, DEWS allow for early drought detection, proactive (mitigation) and reactive (emergency) responses, trigger actions within drought plans, provide information for decision support, provide response to drought well before famine indicators occur. The physical aspects of DEWS can provide information on spatial extent, duration, period of occurrence in relation to crop calendar and severity of drought (Reed, 1994; Western Governors' Association, 2004).

Li, 2000 indicates that for DEWS to be effective, the following should be available:

- A system that can capture, analyse and transfer drought information timely.
- Setting up criteria to confirm drought affected areas.
- Monitoring the status of and estimating future availability of water and soil moisture
- A department /unit to enforce criteria and issue/cancel warnings.

Incorporating local knowledge in drought monitoring allows potential victims to become active participants in the information gathering process whilst development agents and authorities would take proactive drought contingency for timely responses. Critically, local knowledge evolves and has the capacity to help communities to respond. From the knowledge of how local communities interpret and negotiate uncertainties, disaster managers can learn realities and symbolism of hazards (Aemun, 2006).

2.7.3 Shortcomings of DEWS

DEWS or their use has shortcomings as well. These are outlined below.

- There is often insufficient density of data networks and the data quality is poor.
- Inadequate data sharing between agencies and governments often occurs. There is also the high cost of data and data transfers that limit the application of data in drought preparedness, mitigation and response.
- EWS products are sometimes not user friendly and users are not trained in the application of the information in decision making
- Unreliable forecasts and lack of specificity of the information provided.

- Inadequate indices or indicators for detecting the onset and end of drought.
- Lack of integration of drought monitoring systems to fully understand drought magnitude, spatial extent and impacts.
- Lack of clear impact assessment methods and historical drought databases.
- Information from traditional means is slow to arrive though it can provide trends and critical pointers.
- Issues of inaccessibility, poor utilisation and general unacceptance of data also often crop up.

(Jupp, 1999; De Pauw, 2000; Wilhite, 2002; UN/ISDR, 2003a).

2.8 DISASTER MANAGEMENT SYSTEM IN ZIMBABWE

Zimbabwe gained independence from being a British colony in 1980.The country continued using some of the British laws including those for disaster management. In 1982, a Civil Defence Act was enacted and since then, Zimbabwe's disaster management initiatives have been run within the confines of this Act. However, the act was amended a number of times notably in 1989 to a Civil Protection Act, which stipulated that a Civil Protection Directorate should be in place to run the Department of Civil Protection. The Civil Protection Act is administered by the Ministry of Local Government, Rural and Urban Development, formerly Ministry of Local government, Public Works and Urban Development (MLGPW&UD). The Minister is assisted in administering the Civil Protection Act and its policy by a chain of administrative levels from the national to district levels. A clear example being the Department of Civil Protection housed within the same Ministry and coordinates this function at the national level. Below is a structure of the civil protection system in Zimbabwe.

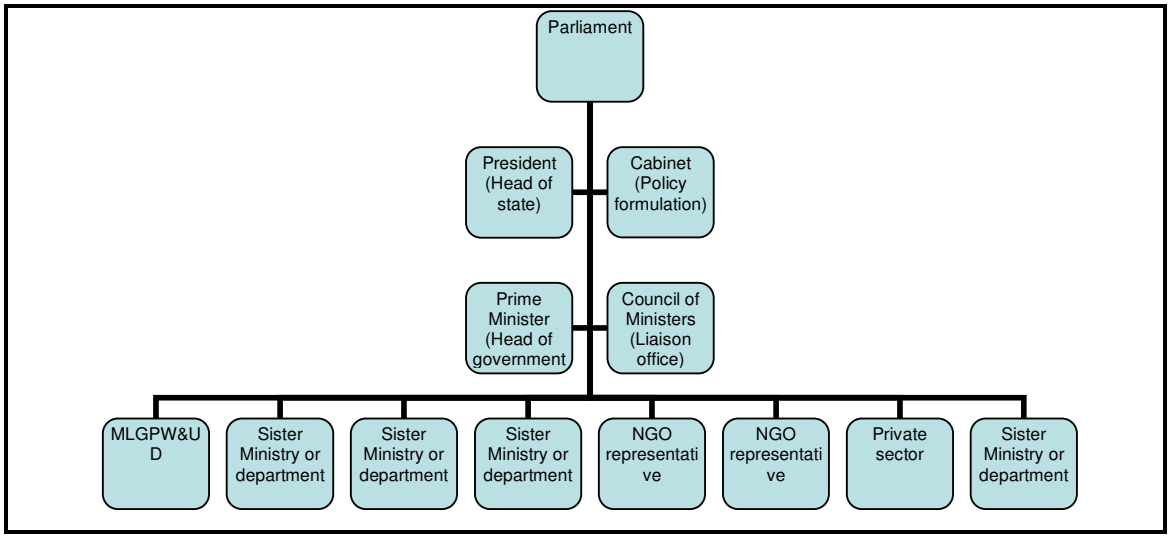


Figure 12: The Structural Model of Zimbabwe's Civil Protection System

Adapted from the Department of Civil Protection, 2006 but modified to reflect the status quo in the Government of National Unit formed in 2009.

The purpose of the Civil Protection Act is summarised by the mission statement which reads: *To provide for and ensure optimal emergency preparedness and disaster prevention at individual, community, sectoral, local authority and national level through regulatory mechanisms and coordinated strategic planning for emergencies* (Civil protection unit, 2003). This reinforces the National Policy for Civil Protection which states that *"Every citizen of Zimbabwe should assist where possible to avert or limit the effects of a disaster"* (Department of Civil Protection, 2006; Ndlovu, 2008).

Focus of the Act, according to the Director of the then Civil Protection Unit (now Department of Civil Protection), Mr Madzudzo Pawadyira, is on major hazards which are droughts, floods, epidemics, transportation accidents, industrial accidents, fires and environmental degradation (Southern Africa Development Community, 1999; Marjanovic and Nimpuno, 2003; Pawadyira, 2004).

The Act also provides for the establishment of a National Civil Protection Fund that receives money from the public and private sectors, individuals and NGOs through applications to enhance civil protection measures by means of research training, acquisition of materials among other uses (Government of Zimbabwe-Civil Protection Act, 1989).

2.8.1 The National Civil Protection Plan (NCPP)

The NCPP delineates the arrangement for the promotion, coordination and execution of emergency and disaster management in Zimbabwe by:-

- allocating responsibilities and duties to appropriate authorities on different levels so that organisations can prepare their own plans and make them operational when required;
- providing guidelines for the planning, execution and preservation of the civil protection system and its functions.

A National Civil Protection Coordination Committee (NCPCC) is liable for the implementation of civil protection functions. The NCPCC comprises of senior officers from government ministries/departments, parastatals and NGOs and coordinates the disaster management initiatives from the national level. Similar multi-sectoral representation is maintained at provincial and district levels. At the local level, there are community Civil protection committees. At all levels, subcommittees are established with responsibilities according to specialities. Thus, central government sets off disaster preparedness programmes through relevant sector ministries with local administration responsible for implementation and maintaining effectiveness. However, disaster management in Zimbabwe also utilises the private and civic sectors whose mandates contain community development and disaster prevention initiatives. These are adopted structurally, materially and technically so that they can be swiftly shifted from their regular activities to provide protective, relief and rehabilitation efforts in times of disaster or impending disaster without digressing from their operational ideals (Madamombe, 2004; Department of Civil Protection, 2006).

Besides having special responsibilities according to their specialities, members of the NCPCC, PCPCC and DCPC are also grouped into functional sub-committees, specifically:-

- Food Supplies and Food Security: chaired by Ministry of Public Service Labour and Social Welfare.
- Health, Nutrition and Welfare: chaired by Ministry of Health and Child Welfare;
- Search, Rescue and Security: chaired by Zimbabwe Republic Police;
- International Cooperation and Assistance : chaired by Ministry of Finance;

2.8.2 Emergency Preparedness and Disaster Management Bill

Fundamental gaps were noted in the Civil Protection Act. Firstly, it is deemed a war-related act and therefore not understood by many people especially those who are not in the security

forces (Pawadyira, 2004). Secondly, it is seen as centralising civil protection activities and lacking the public awareness and education components. Other shortcomings include structural and organisational gaps in fire and ambulance services and the poor enforcement of sectoral preparedness planning. This act was to be repealed in 2003/4 and pave way for the Emergency Preparedness and Disaster Management Act. A new bill, Emergency Preparedness and Disaster Management, was thus drafted in 2003 and considered in parliament in 2004. The bill has not yet been passed into an act mainly due to the debates and disagreements in the highly polarised Zimbabwean legislature. Observations from stakeholders on the proposed bill are still being considered (Ndlovu, 2010). In President Robert Mugabe's speech on opening the fourth session of the fifth parliament of Zimbabwe on July 22, 2003, he said the Civil Protection Act was to be renamed for better understanding of civil protection issues (Madamombe, 2004; Government of Zimbabwe/ Foreign Affairs Ministry, 2003; *The Herald*, 2007). The new Act would then allow for the establishment of an Emergency Preparedness and Disaster Management Authority whose major functions (purpose) would be to:

- Develop a risk reduction strategy in order to minimize vulnerability of both natural and man-made or technological hazards.
- Establishment of **integrated early warning systems** on crises and disasters.
- Promotion of training and research in matters relating to disasters.
- Integration of DRR into all developmental initiatives.
- Standardized training for emergency services.
- Establishment of a funding mechanism and capacity building for DRR at both local and national levels.
- Capacitating Local Authorities to manage emergence and disasters.

The sectoral focus of this proposed act is summarised below:

- Health: disease control particularly HIV and AIDS, cholera and malaria.
- Environment: strengthening the Environmental Impact Assessments.
- Transport: greater awareness and prevention of transportation accidents.
- Water: water harvesting and early warning system for floods and droughts.
- Food security: sustainable food security measures.

The proposed Emergency Preparedness and Disaster Management Act, as in the Civil Protection Act, requires planning for emergencies be done at various levels, namely sectoral, local authority, district, provincial and national levels. All these authorities would be required

to produce operational emergency preparedness and response plans which they should activate during emergencies/disasters. The local plans should dovetail into the national plan. Zimbabwe does not have a comprehensive database on DRR. The information is shared at institutional level through sharing of reports, minutes and any other documentation and conversations. The new bill proposes the establishment of a Disaster Management Centre for housing and disseminating DRR information as well as linking the relevant disaster management players.

2.8.3 Linkages of the Disaster Management legislation with other laws

To determine the disaster management approach in country, one may need to explore how the legislation links, or is complemented by other laws governing a country. It is of paramount importance that disaster management legislation in a country recognises and works in tandem with other existing laws and acts. The Zimbabwean Civil Protection Act and the Emergency Preparedness and Disaster Management bill of 2003 tried to incorporate this and this section shall concisely delve on that (Department of Civil Protection, 2006).

The act and the bill are closely related to the Regional, Town and Country Planning Act (29:13), Rural District Councils Act (29:12), Urban Councils Act (29:14), The Water Act, The Environmental Management Act (20:27), Defence Act (11:02) , Police Act (11:10) and the Public Heath Act (15:09) to mention a few. Since the Civil Protection Committees are decentralised to local governments (Emergency preparedness and disaster management authority is also proposed to be decentralised), disaster preparedness initiatives can come from anywhere but it is the local authority mandate to see to it that the implementation is done and effectiveness maintained. The District Administrator and Provincial Administrator are appointees tasked to coordinate all development initiatives at district and provincial level respectively as mandated in the RTCP and RDC Acts. These incumbents are also members of the Civil Protection Committees/Emergency preparedness and disaster management authority at those levels which simply means there are no gaps in roles and functions.

Zimbabwe National Water Authority (ZINWA) administers the Water Act. They have divided the country into management basins. As such these basins have to have a province in which they report to. Thus in cases of imminent disaster, such as floods experienced in recent times, these basin managements have to report to the provincial authority which in turn takes up the issue to the national level through Ministry of Local government, Public works and National Housing highlighting once again how the acts complement each other in fighting

disasters. When the water sector faced flood related disaster, government responded by setting up a disaster management framework with three committees namely:

- ZINWA and Meteorological Department who form the early warning unit and are responsible for weather and flood forecasts.
- Zimbabwe Defence Forces, Zimbabwe Republic Police, Civil Aviation and Ambulances which are there to search, rescue and relocate victims of floods and provide security during flood crisis.
- The Health sector which attend to the injured while Social Welfare looks at the needs of victims and provide psycho-social support to victims during and after the crisis. Social welfare may also give assistance in the form of clothing, blankets, shelter and food.

From this illustration, it can be inferred that the Police Act, Civil Aviation Act, Defence laws all have provisions to cater for Disaster Management and the Civil Protection Act may be used to remind the stakeholders of the roles they have to play in time of disaster. Another example is the NGO bill of 2003 which has provisions that in times of crisis, NGOs can assist even in areas which they do not normally operate (Gumbo, 2006; Madamombe, 2004).

It is also noted that the Environmental Management Act of 2002 complements the Water Act and provides legal foundation for custodianship of the country's environmental impact assessment policy among other duties. This means the act is indirectly related to the disaster management legislation. Or better still, EIAs are part of risk assessment and results from these EIAs by environmental managers can be utilised for risk and vulnerability assessments which may save resources including time. Disaster management in Zimbabwe aims to take a holistic approach which incorporates all at risk institutions / sectors of the country and the protection of each sector is supported and empowered by existing statutory instruments such as the Environment Management Act. The provisions of the act protect / avert environmental degradation in all circles such as mining and farming communities etc (Chinamora, s.a).

Despite the presence of good disaster management framework, one is also tempted to highlight that in the period 1997-2009, Zimbabwe has been experiencing political, economic and social upheavals such that funding for the administration of the legislation and response by the authorities has been very dismal. Madamombe, in 2004, noted that the funds budgeted for disaster management by the government are inadequate. Provincial and district structures end up not being provided with resources for disaster management activities.

Additionally, other infrastructure needed to enhance disaster management is poor. For instance, some rural areas still lack radio and television reception while communication (telephones) and road networks are poor. As such, disaster management has been poor and non-existent in some instances.

2.9 DROUGHT TRENDS IN ZIMBABWE

About 70% of Zimbabwe's population depend on subsistence agriculture and other rural activities whereas the bulk of crop and livestock production is rain-fed. However, this source of livelihood is under threat from climate change effects manifesting themselves in extreme weather conditions: more frequent and severe droughts and floods. The country, like the entire Southern Africa region, experiences cyclic fluctuations of wet and dry spells (Ogallo, s.a; Pawadyira and Ndlovu, 1998; UN/ISDR, 2008b).

Scoones in 1992 indicates that droughts in Zimbabwe have been frequent in the recent era. Between 1961 and 1980, the country experienced only three drought years, but between 1981 and 2001, there were seven drought seasons, four of them being extreme. CRED, 2010 indicates that drought occurrence between 1982-2008 averaged 19% (about one in every five years) and 94% of the population was in one way or another affected by the series of droughts. The following table summarises the major recorded droughts and the number of people affected in Zimbabwe in the period 1980-2008.

Table 6: Drought years in Zimbabwe, 1980 - 2008

Season	Description of the drought	Total No of people affected
1982/3	Extreme	700,000
1991/2	Extreme	5,000,000
1997/8	Severe	55,000
2001/2	Extreme	6,000,000
2006/7	Extreme	2,100,000

Source: CRED, 2010

Traditionally, higher precipitation is received in the northern and eastern areas of Zimbabwe, gradually declining in the southerly and westerly directions. Gutu district is located on the southern part of the country and is prone to more droughts than the northern and eastern areas (Environmental Software and Services, 2002).

2.9.1 Drought management in Zimbabwe

In the 1980s to 1990s, Zimbabwe's drought policy focused on the efficient use of water, increasing agricultural production, good land use management and conservation of the environment and natural resources (Poulton *et al*, 2002).

There were also a range of drought-related government and donor aided programmes such as food for work, drought relief food distribution, free agricultural input distributions, agricultural-related loan schemes and child supplementary feeding. Communities were encouraged to keep two-year supply of grain , stock dried vegetables, meat and indigenous fruits, breed multi-species livestock and supplement livestock feeding during the dry seasons and drought years. The thrust also highlighted the need for multi-cropping for spreading the risk and urged growing of drought tolerant crops (Poulton *et al*, 2002).

The 1991/2 drought prompted a drought administration structure to be put in place. At the national level, the drought task force was chaired by the Vice President. At Provincial levels, the Resident Minister/Provincial Governor coordinated the efforts and worked in close collaboration with the PCPCC. This structure was maintained at the district level, with the District Administrator and government departments taking the coordination function. The National Association of Non-governmental Organisations (NANGO) promulgated a Drought Relief and Rehabilitation Committee which met monthly to review and plan the NGOs' relief efforts (Thompson, 1993; Munro, 2006).

In 1999, a national policy on drought management was launched. The policy aimed at developing government planning capacities and provide comprehensive preparedness and mitigation at all administrative levels. The policy emphasised sustainable livelihoods for populations most at risk to drought induced shocks, sustainable management of natural resources, rural industrialisation, provision of water and irrigation, food security and nutrition. However, the inauguration of the controversial land reform programme by the government in 2000 and continued decline of the Zimbabwean economy characterised by short term, reactionary policy measures has somewhat blurred the agricultural policy. Currently, the 1999 policy is being utilised but it no longer reflects the changes the country has undergone and the current needs (NEPC, 1999; Xinhua News Agency, 1999; Oxfam, 2007).

2.10 CONCLUSION

This chapter has provided the reader with a theoretical background to the concept of EWS in the context of DRR. The hazard under consideration, drought, has been explored to indicate what it is, its impacts and the justification as to why there is need for DEWS. This chapter has also delved into the disaster management systems and approaches in Zimbabwe. Studies and findings from around the world in as far as EWS in relation to droughts and other hazards were shared during the discussion. The next chapter presents the findings from the data that was collected with the aim of proving or disproving the hypothesis and achieve the objectives of the study.

CHAPTER 3: FINDINGS, ANALYSIS AND INTEPRETATIONS

"The Lord does whatever pleases him, in the Heavens and on Earth.....He sends lightning with flooding and brings whirlwinds from His storehouses" (Psalm 135 verses 6&7)[8]

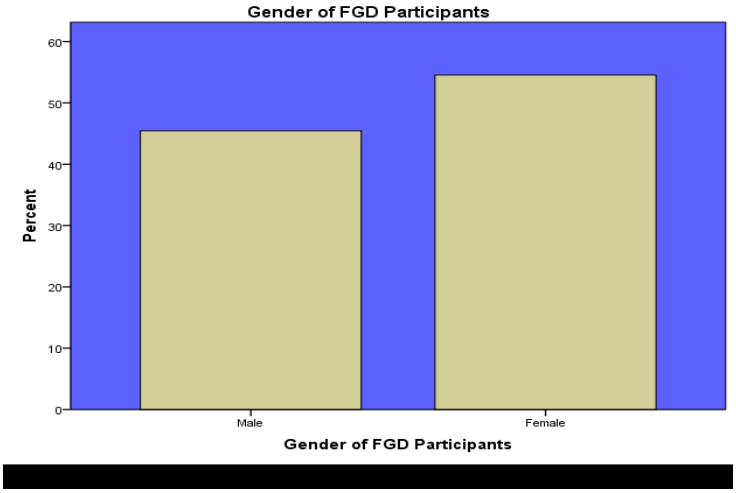
3.1 INRODUCTION

Chapters 1 and 2 covered the introductory component, research methodology and the theoretical framework. Chapter 3 presents the major findings of the analysed data that was collected from the study district. This is in relation to the hypothetical proposition informing them, the methods of data collection utilised as well as the conclusions that they point towards. The aim is to explain the phenomena and fulfil the objectives of the study. Data was collected from a representative sample of individuals and groups. The findings are generated from the responses shared during FGDs, in-depth interviews as well as the observations and diary recordings. Some of the findings are presented in tables, figures and charts for easy interpretation and analysis.

3.2 RESPONDENTS DEMOGRAPHICS

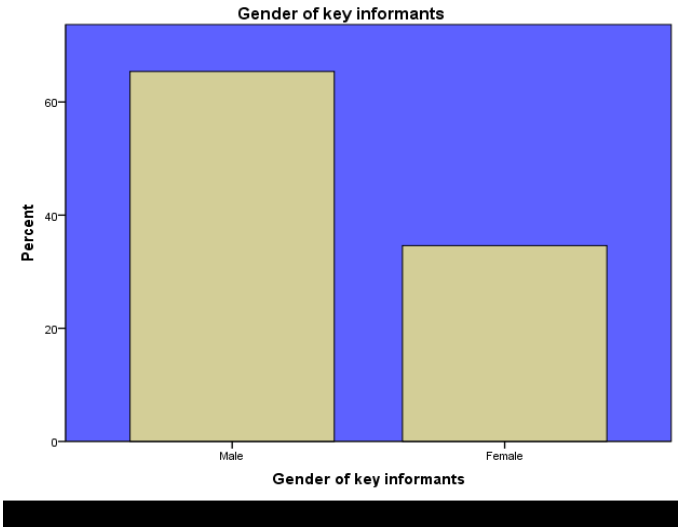
A total of 26 respondents were interviewed using the in-depth interview guide. These served as the key informants to the study. Furthermore, 4 FGDs were conducted in the 4 wards sampled. The attendance levels were managed to stay in the range of 7-15 participants per FGD. Since the methods of data collection were complementary, the findings are, in some instances, integrated and others separated to retain the meaning. The following 4 graphs show the gender and age groups of the key informants and FGD respondents.

[8] The Holy Bible, New International Version, 1984. USA: Biblica.



Graph 1: Gender of FGD participants

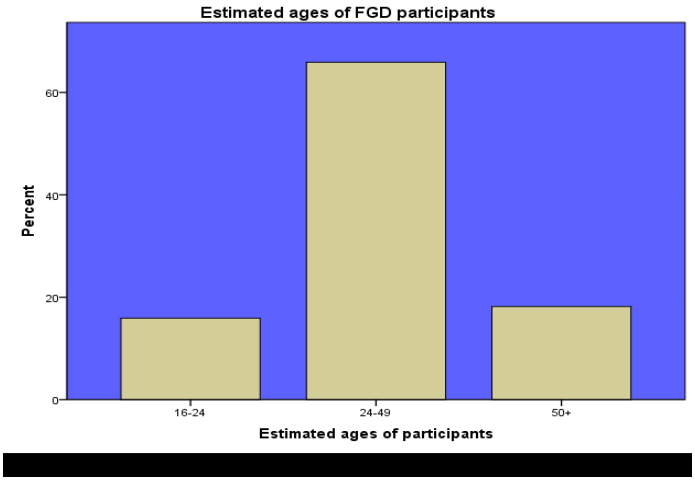
Source: Research data, 2010



Graph 2: Gender of key informants

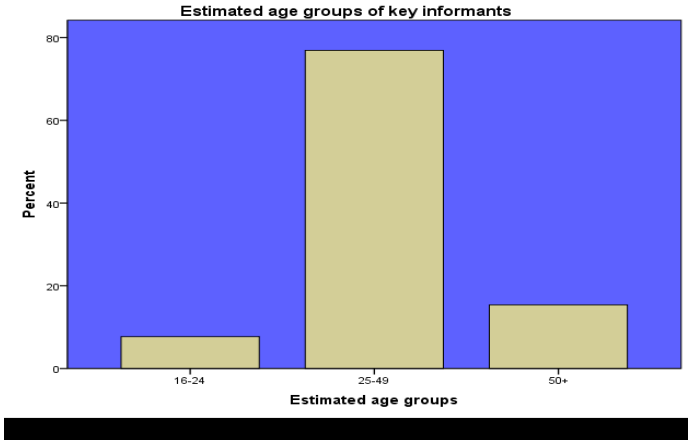
Source: Research data, 2010

Graphs 1 and 2 depict that women were the majority of participants in the FGDs at 54% while men dominated the key informant positions (69%). This could be attributed to the demographics and gender dynamics in the Gutu society, which this research will not delve on.



Graph 3: Age groups of FGD participants

Source: Research data, 2010



Graph 4: Age groups of key informants

Source: Research data, 2010

Graphs 3 and 4 show that the majority (70%) of the total respondents fell in the 25 - 49 years cohort while 13 % fell in the 16 - 24 age group. The remaining 17% were over 50 years of age.

3.3 HAZARDS, DISASTER MANAGEMENT AND DRR IN GUTU DISTRICT

3.3.1. Institutional arrangements and infrastructure

It was observed that the Zimbabwean government has established civil protection structures which filter down to the local levels. The Department of Civil Protection is relatively well defined and better resourced at the national level. In contrast, the functioning of the civil protection structures at the lower levels seem to be hampered by inadequate skills within the unit. In Gutu, the structure is chaired by the District Administrator and include other sector ministries and selected stakeholders. However, 17 key informants (65%) felt the structure is not well defined or mandated. Additionally, key informants and FGD participants generally felt that people in these committees lack skills in disaster management and risk reduction strategies. The structure says that below the district level, there should be visible community Civil Protection Committees (CPC). However, these are almost non-existent in Gutu as only the councillors and sometimes chiefs sit in the district committee. The community CPCs are only constituted when there is a mojor hazard and disappear once the threat is over.

Apart from poor skills base, the district units lack the resources needed as well as the resource mobilisation skills. There is a district DRR plan in Gutu. However, the civil protection structure at this level does not have a dedicated budgetary allocation in the district plans while funding from central government does not filter down nor meet the district disaster management requirements. Given the conditions in Gutu, any small shock can easily turn into a disaster.

There is also a Civil Protection Act, with other supportive legislation. Nonetheless, the Act has not evolved with the needs of disater management in Zimbabwe.The Act is still entrenched in the colonial priorities of defence, pure civil protection and emergency response instead of disaster risk reduction and preparedness. Critical shortcomings observed are:

- Lack of a risk reduction strategy in order to minimize vulnerability of both natural and man-made or technological hazards.
- Lack of an integrated early warning system on emergencies and disasters
- Poor promotion of training and research in matters relating to disasters.
- No integration of DRR into all developmental initiatives.
- Absence of standardized training for emergency services.
- No funding mechanism and capacity building for DRR at both local and national levels.

- No initiative to capacitate Local Authorities to manage emergence and disasters at the local level.
- No environmental impact assessments

The policies have also not transformed with the times and implementation depends on who prioritises which activities (Ndlovu, 2010).

Thirty-seven (37) respondents from both the FGDs and in-depth interviews, translating to about 53%, felt that there is no clear link between community decision-making bodies/committees and the district CPC. This poses a real challenge to rapid and effective EW and DRR. Moreover, 42 % of the key informants said the orientation of the structures is still on emergency response.

Lack of investment and repairs/maintenance of infrastructure and equipment that should aid DRR and EW efforts due to a decade long unfavourable socio-economic and political situation is also a major concern for EW. Besides a single tarred road that runs adjacent to the district growth point (district administrative and commercial centre), linking the capital city and other towns, all the other roads are gravel roads, most of them in very poor condition due to the effects of alternating droughts and floods as well as lack of proper maintenance.

Resultantly, the transport network from the growth point into the interior of the district is unreliable at best and unavailable at worst. Fixed telecommunication is limited to the growth point and a handful of clinics and schools. The district offices of the local authority do not have email and rely on internet/email services from other stakeholders or commercial providers. The continued deterioration of living standards has left people so hopeless and some barely surviving such that a culture of disaster reduction is not a priority to some.

One key informant indicated that DRR and EW were not explicit in the Civil Protection Act. Consequently, enforcement becomes very difficult. Only 9% of all the respondents referred to the Civil Protection Act and the inference is that awareness of the legislation is low. Perhaps this could also be due to low risk awareness levels.

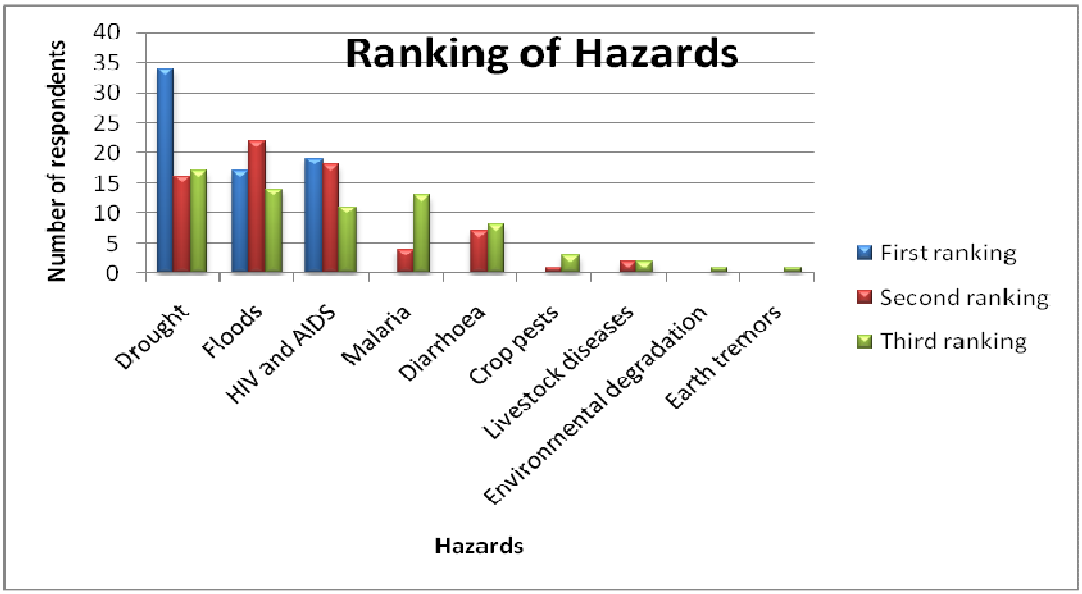
There are DRR and drought management plans, but their implementation is poor and uncoordinated. Drought management/coordination committees, composed mainly of government ministries such as agriculture, health and NGOs, are constituted largely to coordinate targeting, aid distribution and vulnerability assessment, the registration of

beneficiaries under NGO and government schemes such as seed and food distribution. Migration of human resources other areas within and outside the country have also compromised the ability of the community to engage effectively in EW. The HIV and AIDS pandemic has had similar adverse effects.

3.3.2 Major hazards

The respondents were asked to identify the major hazards affecting their communities. Drought was mentioned as the most frequent and biggest threat. About 49% of the respondents alluded to this. The second biggest hazard affecting them was indicated as the HIV and AIDS pandemic (27%). Floods came third (24%) with those residing in low-lying and hard clay soil areas pinpointing recent memories of the floods caused by cyclones in 2000 and 2003. Key informants indicated that the weather conditions have not been favourable in the district in the preceding five years. The bulk of Zimbabwe and Gutu's crop and livestock production is rain-fed and therefore vulnerable to droughts and excessive rainfall. Suboptimal rains were received in the four years from year 2002/03 to year 2004/05. Excessive rainfall was received in year 2005/06 while 2006/07 was an agricultural drought year (FEWSNET, 2010).

Diarrhoeal diseases, notably cholera which ravaged the country in late 2008 to early 2009, were also prominent hazards the communities are constantly worried of. Other water-borne diseases such as bilharzias, measles and malaria, which is the second biggest killer of under-five years old children in Zimbabwe after HIV/AIDS, were also mentioned in 2 wards (12 and 13). These are wards bordering a major dam in the district and its worthy to note that Gutu district lies within the endemic malaria belt of Masvingo province. Secondary statistics revealed that during an outbreak, more than 15 people with symptoms of malaria are treated per day at the local clinic serving these wards (Oxfam, 2007). The other hazards mentioned are environmental degradation, crop and animal diseases and pests and an earth tremor that was experienced in 2007.The following graph summarises the ranking of major hazards by the respondents.



Graph 5: Ranking of major hazards

Source: Research data, 2010.

3.3.3 Hazard, Vulnerability and Capacity Assessment

Knowing when to intervene depends on solid assessments. For determining the state of affairs around this topic, data from predominantly key informants was used as FGD participants struggled to have concrete information on this. In addition, the subject seemed technical to the ordinary person while both respondents and facilitators struggled to find appropriate vernacular terms. The key informants mentioned that there is a gamut of assessments that are carried out to determine hazards, vulnerability and capacity.

In collaboration with NGO partners, FAO is implementing a Crop Performance Monitoring System to periodically monitor crop performance of beneficiaries of NGO agricultural input programmes and to provide early warning information on the performance of a current season. The system collects data from selected wards in the district from both the beneficiaries and non-beneficiaries of NGO interventions. The assessment focuses on comparison of total area planted between beneficiary and non beneficiary households and the performance of their respective crops. FAO also occasionally integrates livestock assessments within their crop assessments.

There is also an Agriculture and Food Security Monitoring System led by FAO, FEWSNET, NGOs and the AGRITEX-NEWU. This takes the form of pre-planting, post planting and post-harvest assessments. The surveys are more focused on the crop and food security aspects

rather than the hazards and what happens before people plant. FEWSNET also use the normalised vegetation difference index (NVDI) for agro-climatic monitoring.

There is also the Zimbabwe Vulnerability Assessment Committee (ZIMVAC). This is an important co-ordination group as it assesses vulnerability in Zimbabwe on a quarterly[9] basis. Headed by the Government's Food and Nutrition Council, the committee brings together UN, NGOs, SADC and government technical staff to manage assessments in Zimbabwe. Currently, the emphasis of the assessments is on access to food, but it has been recommended that health, nutrition and HIV information should be included to give a stronger multi-sectoral perspective to issues of vulnerability in Zimbabwe. The findings of the committee have a direct bearing on WFP food interventions.

The Crop and Food Supply Assessment Mission (CFSAM) is a joint mission of FAO and WFP which conducts a verification exercise of the agriculture and food security situation in the country upon the request of the Government of Zimbabwe. However, the food needs assessments are viewed with as sceptism by a host of district stakeholders including the local authority.

AGRITEX officers from the Ministry of Agriculture, not meteorological officers, usually collect climatic and weather data from sentinel sites, which is then passed on to district Meteorological offices for onward transmission to the national office. On the other hand, large NGOs such as CARE International and Oxfam would do their own livelihood household surveys. They focus on their operational areas as and when it is necessary or convenient for them. The results of NGO assessments are more targeted to donors/funders than the people at risk.

Epidemiological surveillance/statistics are collected by clinics with the support of Environmental Health Technicians and the statistics are fed into the District Health Information System. OCHA led the assessments after the floods in 2008 while OCHA/UNICEF efforts in monitoring cholera outbreaks were well appreciated by the respondents. UNICEF also conducts bi-annual nutrition surveys. The district authorities are not known to carry out any assessments on vulnerability and hazards before disasters happen. They are seen on ground after a disaster to quantify the aid needs of affected people.

[9] Every 3 months

Ominously, the assessments are more pronounced on crop situation, livestock and food supply as well as health and nutrition status. This reflects a situation where the assessments are done a little too late and only help to shape response/aid instead of warning those at risk in time to take appropriate preparedness measures. Secondly, since the bias is towards yield/production levels and food (un)availability, the hazard monitoring and mapping, and environmental assessments are weak as there is little and fragmented information available to the communities around drought likelihood, expected severity at local and district levels on the people, infrastructure, property, economic activities and environment. The communities rely on national forecasts but these would vary with the district and local level actuals.

Generally, besides the climatic and geographic differences that determine vulnerability, the most at risk groups to drought were identified to be H/H with or headed by the following:

- Children particularly OVC (below 18 years)
- The Elderly (above 60 years)
- Chronically ill
- Disabled
- Women
- Widows and widowers

3.3.4 Preparedness and response

Despite the numerous shortcomings Gutu district has in EW, it has some capacities that can be harnessed for preparedness and response. In terms of the political constituencies, the district has three Members of Parliament from the major political parties in the Government of National Unity. There are also the following positions that can be utilised for political and administrative commitment to take EW forward:-

- DA's office
- Local Authority CEO and other local authority staff members
- Councillors- each ward has a councillor
- Central government line ministries and departments
- Local leaders-Chiefs , village heads and church leaders among other social groupings
- CPCs

UN arms, International and local NGOs and CBOs with running Memoranda of Understanding with the local authority also operate in Gutu. However, 37% of all the respondents mentioned that usually there is lack of coordination and discord between the

preparedness needs of the communities and these stakeholders. For instance, NGOs carrying out health promotion work continue doing so or take time to adjust when the urgent need on ground is to prepare for a looming drought.

The local authority is more visible at the growth point, ensuring service provision to the rate-paying residents in and around the growth point. Councillors are expected to take the issues to the constituencies but 39% of the key informants had reservations on whether the DRR issues are clearly articulated to the communities since the responses are usually poor or non-existent.

There is a private sector in Gutu comprising of small to medium businesspeople, small scale mining companies and branches/agents of nationwide and multinational companies. Their role in DRR is virtually non-existent as no one pointed out to the contributions in EW and DRR.

On the other hand, the respondents were in unison that the records/databases of hazards and related information are very poor. This was corroborated by the observations by the researcher. There seems to be reliance on oral history or narration of events than clearly documented disaster information at the district level.

3.3.5 External support

Besides the measures the Gutu District stakeholders and community members engage in when a disaster is imminent or has already hit the area, there are other players who usually come to assist. Central government, through the Civil Protection department and line ministries, support with human resources and physical materials such as food, agricultural inputs and shelter once a declaration has been made by the DA, Provincial Administrator/ Governor or the President. UN structures, International NGOs such as Care International, Oxfam, Red Cross and IOM were mentioned to be some of the players that come with support. SADC has also even assisted with agricultural inputs in the 2007-8 agricultural season (Made, 2010).

3.4 DEVELOPMENT AND UTILISATION OF EWS

3.4.1 Responsibilities and tasking

There is a certain level of government planning and coordination at higher levels and to some extent the district level. Numerous bodies and institutions could be listed here. Examples with relevance for the EW development and utilisation in Gutu are:

- Communities
- Central government: D.A, Department of Civil Protection and the Civil Protection Committees
- Local authority: Gutu Rural District Council , Councillors and MPs
- Drought Relief Committees
- District Development Committee, Ward Development Committees and Village Development Committees
- NGOs and CBOs

Although there are several players involved or expected to have responsibilities in the development, dissemination and ensuring response to EW, there is no clarity as to who leads this function. FGD participants merely said the government is, in the end, responsible but they could not pin-point the departments that are responsible. By inference, the communities are not aware who should be accountable to them to ensure they are safe from hazards. Respondents from the local government administration expressed concerns that NGOs often come with preconceived plans which do not necessarily match with the EW needs of the communities or the local authority. The local government respondents also perceived NGO assistance as too strict and not flexible enough (in particular during emergency situations where NGOs cannot use existing budgets for the emergency but have to wait for new funding or programmes to respond to the emergency) hence harnessing resources for EW becomes very challenging.

On the other hand, the involvement of the local authority and sometimes the chiefs, according to the NGOs, always poses the risk of politicisation of interventions. Political posturing by government departments normally takes over when it comes to delivering assistance to communities, the civic society said. The observation is that since the local government lacks its own resources to participate more actively in EW coordination, their role is often limited to dissemination of messages instead of leading the function.

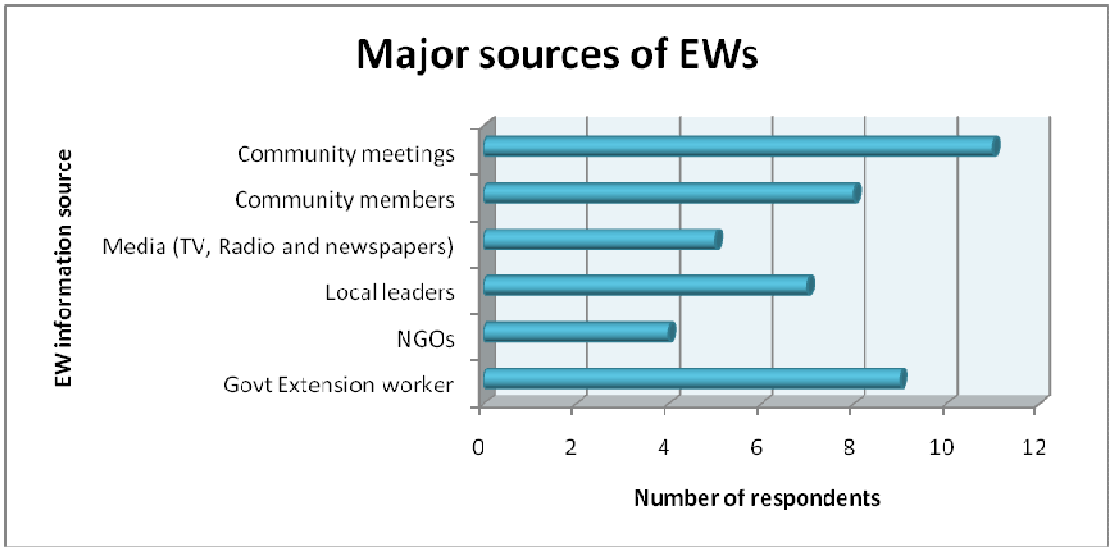
Although no responsibilities are tasked to them, traditional leaders such as chiefs, *nyusa* (rainmakers), soothsayers, *n'angas* (traditional healers and seers), prophets and older citizens, according to 19% of the respondents, still wield power in EW. A considerable population believes in what this group *'foresee'* and tell the people. Examples of traditional DEWS that the community rely on are listed:

- ***Flora*** such as flowering patterns, leaf shedding and fruiting. For instance, abundance of fruit such as Mangoes and *Makwakwa* symbolise a poor rainfall season ahead while good fruiting of Amarula indicates a good season is in the offing.
- ***Fauna***. Presence of some birds such as *Makora* (Hawks) and *Makunguwo* (Crows) signify impending drought while *Chapungu* (Bateleur eagle), *Dendera*[10] (African ground hornbill) indicate good omen, protection; that the rains are going to be good and a good harvest should be expected. Additionally, black termites carrying food indicate heavy rains or a serious drought. Low birth rates of livestock are an indicator of a bad year, in terms of precipitation levels.
- ***Astronomy***. For example, when a ring forms around the moon at night, it symbolises a good rainfall season ahead. They call it *'dziva remvura'* literally translated to - a pool of water.
- ***Wind*** direction and strength can help predict the type of rain season ahead.
- ***Conflicts*** over resources, for example, water and water-points and grazing land signify a socio-economic drought.

3.4.2 Communication channels for EWS

The channels for communicating EW are blurred. From the various assessments that are carried out, the EW messages flow from whoever leads a particular exercise, without the findings having been thoroughly discussed and agreed upon. Compartmentalisation of information is also an issue. For instance, epidemiological data is viewed on its own, separate from say food security findings. Media also pick data/information from the different sources, make their conclusions and disseminate to their audiences. This brews confusion and the responders have different perceptions and approaches in case of imminent disasters. The major sources of EW information mentioned by the FGD participants are presented below.

[10] Plural-Matendera



Graph 6: Major sources of EW information

Source: Research data, 2010.

It can be noted that there are various sources of EW information to the community members and the majority rely on the community meetings and government extension workers. The media is among the major sources but lags behind with only 11% of the FGD respondents getting EW information from it.

The respondents also revealed that there are several community meetings that are held, called and facilitated by various stakeholders. However, the information is usually packaged uniformly; there are no considerations of special interest groups such the disabled, elderly, and children and of course gender dynamics. It was highlighted during the FGDs that men are likely to receive early warnings earlier due to their movement in public space and access to formal and informal channels of communication; e.g. radio, TV, informal community networks and interaction with officials.

Although there were few success stories in EW that were shared verbally by some respondents, there was no documented evidence of this. The success stories are not publicised and marketed adequately to raise attention of other stakeholders.

Another observation is that information from authorities in the capital, Harare, does not seem filter down to provincial or district level quickly neither is it fully understood. Due to the limited capacity of the local administration, there are difficulties in dealing with sophisticated information from Harare; in particular Information Technology based information sources.

3.4.3 Reactions of EW receivers

How people access and interpret EW determine their reactions. From the responses, the older respondents: those with 55 years and above seemed to be more comfortable relying upon and responding to information coming from the traditional sources and packaged traditionally, for instance, observations and forecasting by *nyusa* (Rainmaker), the rainmaking ceremonies and their observations of nature. However, the younger generation and technocrats believed scientific data-assessments, if properly interpreted, is the one to base decisions on. They felt science has done well but it is the human factors that make some EW ineffectual.

Upon receipt of EW, the communities share the information in their social networks but the challenge is that the information sometimes gets distorted along the way. Eventually, the majority of the FGD participants (52%) said they then adopt a wait and see attitude and someone is bound to come and assist them. The 48% indicated that they share with family members, neighbours and fellow community members. Meanwhile, all the 26 key informants claimed that once they receive EW information, they share it within their organisations, other stakeholders and community members through their leaders and during meetings.

However, the response guidelines and recommendations from authorities are different and in some instances contradictory, lamented the FGD participants. An example is that while NGOs and several district stakeholders were advocating for minimum tillage in the face of drought in 2008, central government through the reserve bank embarked on a mechanisation programme distributing hi-tech agricultural equipment to selected farmers. This was more of a political move than rationality-driven.

There are some coping strategies or actions the communities engage in when EW messages on drought are passed on. These are summarised below:-

- Reduction in meals and meal portions with priority to children and the sick
- Food preservation
- Consumption of wild fruits
- Crop diversification and planting of drought – tolerant crops or varieties
- Disposal/sale of productive and non-productive assets
- Engaging in mineral panning(gold and diamond)
- Migration and engaging in casual labour
- Long distance purchases
- Borrowing and lending of food

(FEWSNET, 2010b).

3.5 INTERGRATION OF EW INTO DRR AND OTHER POLICIES

3.5.1 Level of integration of EW into policy

EW is still being served lip-service and it is more event-driven (after a major disaster) rather than a continuous process. Also, the legal framework and the practice on ground did not depict that EW and DRR are embedded in developmental and other poverty reduction policies. To compound this situation, EW from the community and other non-state actors are less recognised. The current legislative and institution arrangement does not augur well for promoting and integrating EW practice into policy. Levels of awareness on disaster risk, exclusion of social aspects in EW, deterioration of equipment, centralised EW and weak public participation were some of the challenges noted in integrating EW into policy. There are no clear review processes of the existing EW are in place and some of the EW because of their non-functionality, die a natural death.

3.5.2 Traditional versus Contemporary EWs

Traditional forecasting remains an important source of climate information in Gutu communities. There is an appreciation that traditional observations and outlook methods may have scientific validity and therefore need for increased interest in harmonising traditional and modern/scientific methods of climate prediction. To the elderly, EW is still the domain of spiritual leaders and it is often linked to omens. On the other hand, technocrats and the younger generation view the scientific innovations in awe and often neglect the traditional EW as archaic and a preserve of the older generation. Consequently, the two systems have different audiences/users and are not complementing each other as necessary.

A clear challenge is that there is still a strong sense of fatalism and disasters are viewed as rebuke for human misdeeds or simply acts from the above**.** General poverty also mean access to some communication modes of modern EW information is limited. For instance, buying newspaper or ownership of a TV is a preserve for the well-off community members yet this is a useful communication channel. Dissemination of information electronically becomes expensive without any guarantee of the target groups getting it. There is no organised system for collecting, discussing and sharing climate forecast information based on indigenous knowledge. Resultantly, this weak knowledge transfer or documentation results in intergenerational losses of indigenous EWs.

3.5.3 Useful and reliable EWs

Forty-four (44%) felt the EW messages from the radio and TV were helpful while 19% preferred the UN and NGOs EWs though both are less accessible than the other sources such as community meetings and extension workers. The remaining 37% said they would use warnings suiting their intuition at a given time regardless of where it is coming from. Below is a table summarising the popular/reliable EWS and justifications commanded by the respondents.

Table 7: Reliable EWS

EWS and Rank	Justification
1. Epidemiological (44%)	Have been carried out for a long time and the monitoring and data collection is done by health workers in collaboration with the community members. Some of the equipment at clinics is still functional.
2. Crop, food and livestock assessments (29%)	The monitoring and data collection is done by agricultural workers in collaboration with the community members
3. Traditional EWs on drought (27%)	The monitoring and interpretation is done by people with experience and some foreseeing powers.

Source: Research data, 2010

Climate variability over short distances sometimes reduces utility value of forecast information especially where provided at District and national levels.

3.5.4 Adequacy of EWs

Out of the sampled population, 76 % believed the EWs in Gutu are inadequate and from this proportion, 87% pointed out that the EWs are also inaccessible while the 13% of the respondents who believed the EW are inadequate said some of the EW apply at higher levels such as the province hence difficult to comprehend at their level. 21% thought the EW in place were adequate but it is the administrative arrangement that needs revision to ensure enforcement of action regarding EW. The remaining 3% were indifferent regarding this topic; this could be attributed to limited knowledge around this area of study. The following pie chart depicts this situation.

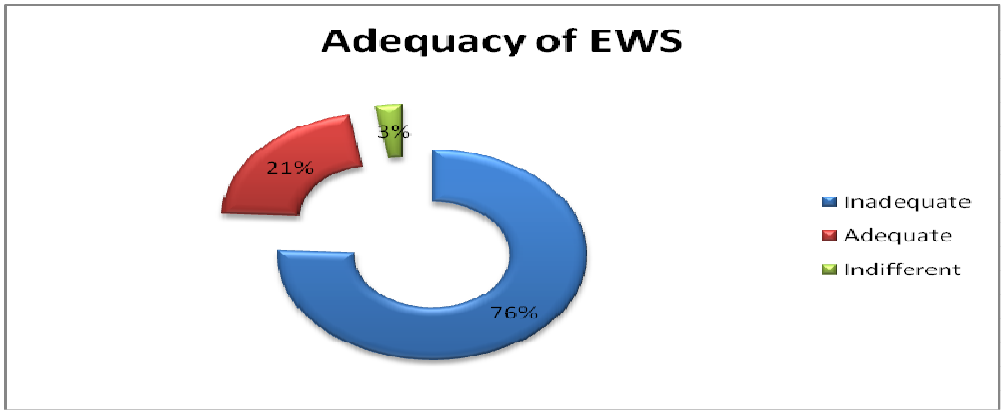


Figure 13: Adequacy of EWS in Gutu

Source: Research data, 2010.

The drought early warnings are focused on providing hard evidence that a drought has occurred and it is likely to adversely affect food availability. The DEWS do not provide information before the rain season has arrived. As much as 65% of the key informants admitted that although tasked to coordinate DM, they are not specialists in the area and this poses a challenge.

All the respondents who believed the EW are inadequate felt the areas of drought, floods and disease control will likely to benefit most from improved EW since they are the biggest threats of the livelihoods. They felt all hazard monitoring units will benefit and as much EW as possible are needed for preparedness.

3.6 CONCLUSION

This chapter has presented the findings and interpretations of the data gathered with the aim of satisfying the objectives of the study. The data analysis took both the quantitative and qualitative aspects into consideration. Generally the findings depict a gap in the DRR practice and the communities feel that much could be done in EW to reduce the devastating effects of hazards they face particularly drought. These findings shape the conclusions and recommendation presented in the last chapter.

CHAPTER 4: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

'Every night I go to bed, I keep a whistle and a flashlight by my pillow.'[11]

4.1 INTRODUCTION

This ultimate chapter presents a summary of the findings and conclusions from the data analysis presented in Chapter 3. It also offers recommendations that can be adopted for policy levels, practice and academia. The chapter also offers into areas related to the topic that can be further researched.

4.2 SUMMARY OF FINDINGS

There are existing disaster management structures in Zimbabwe, from the national to local/community levels. The structures are more defined, mandated and resourced at the higher levels. At the local level, the structures are more *ad-hoc* than permanent while at the district level, there are no clear guidelines and procedures on the composition and resourcing of the disaster management structures. The DM structures' human resources at district and local levels do not possess essential skills in DM and DRR to enable them to carry out these functions more effectively and efficiently.

The link between community decision making and the district and community DM structures is weak. Although at the national level there is some level of political commitment, at the district level, this is neither visible nor tangible. Furthermore, the existing legal instrument and framework on DM is more emergency oriented, hence silent on proactive disaster management which encompasses DRR and utilisation of EWs. This makes it challenging to enforce DRR and EW.

Lack of investment and maintenance of infrastructure and equipment and training of personnel critical for DRR and EWs hampers the carrying out of EW initiatives. There are some plans developed but their full implementation is weak.

The major hazard facing the study area's inhabitants is drought followed by the HIV and AIDS pandemic and floods in that order. Other hazards in the area include diarrhoeal and

[11] Teruko Nagaoka, 75, an elderly citizen narrating disaster preparedness levels in 'The Lessons from Kobe', Asia-Pacific Perspectives, Japan Plus, Volume 2, No.12, April 2005 cited in Oxfam International, 2008.

water-borne diseases, crop and livestock diseases and pests, and environmental degradation.

Several vulnerability and capacity assessments are conducted for the drought risk in Gutu. These are mainly done by the Government, UN agencies and NGOs operating in the area. Perturbing is the fact that these are usually uncoordinated and biased towards the assessing institution's preferences and mandate. Moreover, the risk assessments are more geared towards food security leaving out hazard monitoring. The direct consequence is that the DEWs are issued late because the assessments focus more on hard evidence than forecasting. Households with or headed by the following groups are generally deemed the most vulnerable in the district: Children, the elderly, chronically ill, disabled, women, widows and widowers.

There are various institutions and structures available for preparedness and response in Gutu. Again, it is the coordination which is lacking. The private sector is virtually playing no role in DRR and EW while the local authority is more visible at and around the district centre. The documentation of necessary DM information is poor with reliance on oral history. Central government, UN agencies and NGOs provide external support to Gutu District in the event of a drought disaster.

There is lack of clarity on who should develop and disseminate drought early warnings while the local authority and civil society players do not efficiently cooperate nor do they fully trust each other. Traditional DEWs are being utilised in Gutu, particularly by the older generation. However, the traditional and contemporary EWs are used by different people in different realms. Thus, the two EWs are not integrated or complementary.

The communication channels for EW information are varied and blurred without sufficient and/or clear instructions on how to act given a certain scenario. No single authority is either responsible or doing this. Furthermore, the EWs are compartmentalised; they focus on specific aspects or hazards without necessarily considering the other hazards that potentially affect the area. In the end, the reaction by receivers of EW is passive and risky. The majority usually adopt a wait and see approach. The epidemiological EWs were noted as the most popular and reliable ones chiefly because they have been in existence for a longer period, the monitoring is done by the communities and community-based technocrats while some of the equipment is still functional.

Generally, the majority said the DEWs in Gutu are inadequate for the community, policy makers and technocrats to make informed decisions before a drought hazard affects the communities. On the other hand, a considerable proportion of the respondents believed the EWs are adequate but it is the administrative arrangements that are weak at enforcing the EWs that make it challenging. The EWs are also not always contextualised to local levels. This makes it difficult for community members to comprehend and utilise the EWs.

4.3 CONCLUSIONS

This section recaps the objectives of the study and how they were met. This is coupled with major conclusions of the findings and how the research satisfied its aim and objectives:

Objective 1: To establish the drought DRR measures currently practised in Gutu.

The research managed to establish the DRR measures being practised in the study area. This objective was fully achieved and the conclusion is that there are some DRR activities ongoing in Gutu. But, these are insufficient and more could be done.

Objective 2: To establish the linkage between the development of early warning systems and their utilisation in the District.

This objective was fully achieved as the research established that the link between development and utilisation of EW is weak in Gutu. The research determined and concluded that there are no clear channels and responsibilities in EW development and dissemination.

Objective 3: To identify the challenges in integration of EWS in DRR measures in Gutu.

The objective was partially achieved. However, more could have been done to identify challenges of integrating EW into policy. This may need national authorities to provide information, of which they were not specifically part of the respondents as the research had a district focus. The general conclusion is there are challenges but some of them may need to be addresses on a national level through favourable policy frameworks.

Objective 4: To determine if incorporating more EWS can lead to improved DRR in Gutu.

The findings clearly demonstrate that more EWS are needed for the various hazards and if implemented effectively, they can improve DRR initiatives in Gutu. The objective was achieved and confirms the hypothesis of the study.

Objective 5: To offer recommendations for future DRR efforts based on findings of the study.

Based on the findings, the thesis offers plausible and practical recommendations for policy adoption and practice. And in an endeavour to satisfy the ever-present need for more knowledge, the research also offers recommendations for further research. The objective was achieved.

Overall, the research findings affirm that there are DRR efforts ongoing in Gutu. However, these are not adequate and more can be done in the EW and preparedness fields to ensure the communities can anticipate and cope with the effects of hazards hence become more disaster resilient. The institutional arrangements and infrastructure in place are also inadequate for the promotion of strong DRR initiatives. The research had limitations particularly the relatively small sample and findings should be used cautiously instead of unnecessarily projecting and generalising them to the national levels and beyond.

4.4 RECOMMENDATIONS FOR POLICY AND PRACTICE

This section offers some recommendations open for consideration and some possible implications of the findings on policy and practice.

4.4.1 Advocacy for integration of EW and DRR into policy and practice

The government has ultimate responsibility for managing disasters. Regular collaboration with national authorities and compliance with the local legal and procedural requirements is important in ensuring a coordinated response. The findings make it apparent that there is a strong need to raise awareness on EW in the communities researched. Generally, there is a risk perception gap (gap between recognised risk and actual risk). The gap needs to be closed. This could take the form of EW and DRR *'champions'* who at any given opportunity pass/share information on EW and hazards. Regular mock exercises/drills can also complement this initiative, empower the communities and cultivate culture of prevention and preparedness (UN/ISDR, 2006a).

However, for this to happen consistently and sustainably, the political and administrative commitment needs to be unwavering. The political leaders and other technocrats need to be educated on the importance and benefits of EW. This way, they can appreciate, get interested and they can thus be entrusted to drive the EW agenda from local to national and global levels. By so doing, they can also elicit support from higher levels as well as engender

public action. In essence, they will make EW and DRR one of the core tasks of national policy (DFID, 2006).

Coordination can be enhanced through working groups/clusters. For example, such clusters already exist in sectors such as health, nutrition, child protection and agriculture. These can be replicated in the DRR arena. This requires time and resources but they have proven beneficial in the long-run (UNHCR, 2007). The country disaster management authorities can also lobby for this with the UN/ISDR to be replicated on the global levels where similar clusters exist.

Importantly, the legislative framework particularly the Civil Protection Act and supporting/complementary pieces of legislation need to be reviewed to encompass DRR and EW rather than viewing disasters as interruptions to development. By default, any subsequent plans will therefore contain these elements. The focus will then shift from being predominantly emergency and post emergency to proactive anticipatory risk assessments, strengthening of the preparedness components of DRR and ensuring corresponding action well before hazards strike. A clear policy, legislation, strategic framework and capacity building plan on DRR is recommended. Harmonisation of concepts, terminologies and date also come in under this. This can build sustainability and continuity in the system.

The author recommends that besides the Civil Protection Committees, the Civil Protection unit structure must be decentralised and replicated at provincial, district and even ward levels[12]. As such, the local authorities would have a full time civil protection/disaster management unit with budgetary allocations to coordinate disaster management efforts. The committees can then be multi-disciplinary and play a more advisory role to the unit and local authority; the role similar to a board. The unit will also be expected to establish and forge linkages with other institutions and organisations involved in DM so as to bridge organisational gaps and build a common understanding.

The DM unit ought to have personnel with the requisite expertise in DM to effectively lead this function. These would also need to continue to receiving education and training in the field so that they can perform to the expected professional standards whilst generating new research and keeping abreast with the new DM approaches.

[12] Wards are several administrative units that constitute a district. They are headed by a councilor. In rural areas, they are normally composed of several villages. Gutu district has 35 wards.

The DM unit, through the local authority head, CEO, or the government appointee, DA will then become the single authority to issue EWs and coordinate other DM functions. Despite the numerous relationships that exist between the Civil Protection Act and other legislation, there are some areas of fragmentation that may be improved for the betterment of disaster management within the country. At national level, if key agencies for coordinating development are placed in the President or Prime Minister's office, it will result in close working relationship between policy formulating body and the operational agencies (implementers). This will also establish links from national to community levels for effective communication.

There is also need for close linkages between bodies responsible for relief and mitigation programmes to ensure risk reduction measures are introduced in the immediate post disaster situation and enhance future preparedness. Initiating EW soon after a disaster, when the effects are still visible and vivid can help to build commitment. The incorporation of EW in the United Nations Development Assistance Frameworks (UNDAFs), Poverty Reduction Strategy Papers (PRSPs) and other National Plans of Action (NPAs) is highly recommended (UN/ISDR, 2004; UNHCR, 2007).

Although some DRR initiatives have been envisioned by the various entities in the district, not much has happened and a plethora of sustainable livelihood options can still be pursued in conjunction with the relevant experts. These include:

- Expanding irrigation (there are dams and catchment areas that can be utilised) including borehole and dam rehabilitation.
- Rainwater harvesting for drinking and perennial agriculture
- Water and crop nutrients conservation farming
- Promotion of drought tolerant crop, for example, sweet potato and sorghum.
- Seed multiplication and crop diversification
- Communal gardening

Once unfavourable DEWS have been issued, budgeted safety nets that provide timely, adequate and guaranteed support to protect lives and livelihoods and negate indulgence in damaging coping mechanisms need to be in place. It is purely an issue of revival of this practice that needs to be advocated for (DFID, 2006)

Proper land use management policies and practices including counter-land degradation and desertification practices need to be enforced and support EW and DRR. Practices such as erosion control, tree planting and rotational grazing come to the fore.

Scenario analysis of disaster impacts on current and future policies and projects should always be done to ensure EW and DRR remain integrated in the public policies. Existing risk assessments should be reviewed and critical gaps in knowledge of risks identified such that efforts are initiated to cover these gaps (UN/ISDR, 2008c).

4.4.2 Infrastructure and capacity building

DFID, as quoted by Oxfam International in 2008, says for every $1 invested in DRR, there is a return of about $2-$4 in the form of avoided or reduced disaster impacts. It is therefore critical that considerable investment is channelled towards equipment and facilities that can contribute to EW, including their repair and maintenance. This is better achieved where the Public-Private sector Partnerships (PPPs) are inherent and strong. The private sector has corporate social responsibility which they should discharge whilst UN arms, NGOs, academic and research institutes among other players have responsibilities which encompass or are related to DRR. An example is the finding that there used to be satellite weather stations used for weather data collection in the district. The private sector and other players can channel funds towards reviving these. Station derived data collection seems more practical for a resource constrained district such as Gutu. Additionally, private sector and the other civil society players have strong logistical capacities and locally relevant equipment and technologies such as all-terrain vehicles, computers, mobile radios, sirens, internet connections including wireless. All this equipment and capacities can be harnessed for DRR.

Those involved in risk and insurance can also provide a buffer to the farmers and other community members who engage in activities that are affected by droughts and other hazards. The proposed DM unit or the existing structure can tap these strengths for risk assessments and communicating EW information timely and accurately. The private sector can engage in helpful activities such as sponsoring adverts in media, billboards and other communication material (UN/ISDR, 2008c).

The partnerships should not be locally concentrated only. Instead, they should permeate all the levels up to global. Besides the resources and professional support, the more the partnerships, the more the opportunities for policy advocacy and influencing around EW (Scott, 1997).

The infrastructure, nonetheless should consider *"the softer issues"*; the social, economic and environmental aspects of Gutu. For instance, a woman is rarely seen blowing a horn but when she does it signifies an emergency and this can be tapped or at least EW need to be sensitive to this. Staff to man and use the EW equipment must be properly trained in its use and basic maintenance to ensure efficient delivery of services even during an emergency. The unit should be able to interpret EW information, translate it into response requirements and express it in formats that the leaders and decision-makers need to trigger action. (UN/ISDR, 2006a).

In order to be people centred, DM authorities need to recognise those at risk as actors rather than victims as the EW are almost always prescribed from the top. A mixture of top down and bottom approaches are needed to enlist the buy-in of the primary stakeholders: those at risk. The focus ought to be on people rather than systems. Community-based planning trainings to reinforce local level understanding on DRR and EW can be helpful ((International Federation of Red Cross and Red Crescent Societies, 2002; Wicklung and Raum, 2006).

There are several telecommunication methods that can be suggested for further exploration for DM authorities in Gutu:

- Voice - Fixed phones, Cell phones, meetings, consultations and workshops.
- Data - Email, Internet, computerised data.
- Broadcast -Television and radio, High Frequency (HF), Very High Frequency (VHF) and Ultra High Frequency (UHF) radios.

All these are cheap, cover long distances and easy to operate. The authorities will need to lobby the government and responsible regulatory bodies such as Posts and Telecommunications and the Broadcasting Authority to issue the relevant licences and so that the DM structures can freely utilise these channels. Use of public space: churches, schools and other gatherings to push EW messages is encouraged (Scott, 1997).

On a higher technical level, the authorities, in conjunction with central government will need to consider or promote more quicker and accurate assessment and warning technology such as Geographic Information Systems (GIS), Global Positioning System (GPS), satellite communications and remote sensing. These technologies can promote multi-hazard assessments and better inform a holistic preparedness framework and enable one to store, manipulate, link together, analyse, update and present the remotely sensed geospatial data (Powell, 2003).

Whereas drought monitoring in Zimbabwe, and Gutu specifically, is generally based on the SPI, several indices are in place and need to be customised , tracked and piloted so that they complement each other for a holistic and improved early detection and warning and reliability of the DEWs. The following figure attempts how the DEWS system can be more comprehensive.

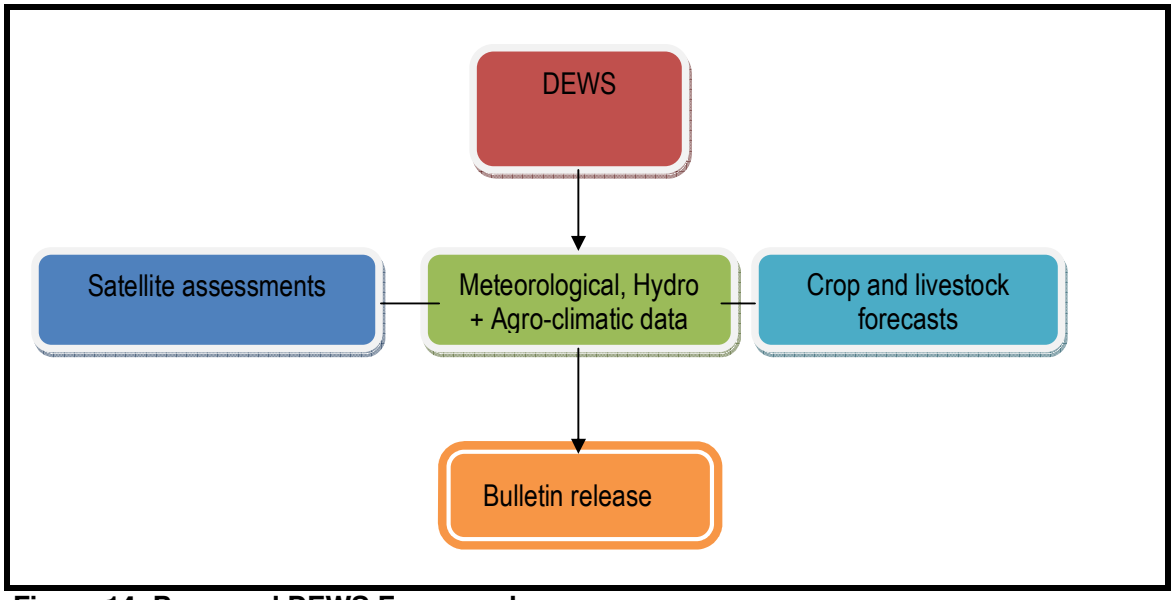


Figure 14: Proposed DEWS Framework

Adapted from: Liu, s.a

4.4.3 Performance monitoring and evaluation system

Although putting the requisite legal frameworks and instruments, policies, the favourable institutional arrangements, infrastructure and human resources in place is plausible, that could be only the basis. There is strong need to have clear and systematic plans accompanied by a well-thought performance monitoring, evaluation and review system to ensure compliance, and continual improvement (UN/ISDR, 2005b; DFID, 2006). The author proposes a simple EW evaluation criteria is put in place. An example is set out below.

Table 8: Example of EW evaluation criteria

Criteria	Weight (W)	Probability (P)	Score (WxP)
Accuracy of warning			
Timeliness of warning			
Coverage achieved			
Economic losses prevented			
Response measures taken			
User satisfaction			
Consistency of EW message			

Adapted from UN/ISDR, 2002.

In such an instance as presented in the table, the interpretation is simple: the higher the score, the better the EW.

The process need to be participatory such that the communities at risk would also need to feed into the development of the indicators, the targets, milestones, review of the system and related processes. The reports on the progress need to be availed to stakeholders including those at risk. This promotes ownership, sustainable participation, trust and accountability of the stakeholders.

The indicators need not be entirely physical or scientific; social indicators should be included. Participation of the primary stakeholders can solve this challenge as they are likely to bring in the traditional indicators which can help better understand factors that influence their decision making.

To make EW efforts more fervent, the local authority can even develop standardised/harmonised concepts, procedure and responsibilities for systematic data collection and sharing of hazard and vulnerability information. This will however need to be synchronised with the provincial, national, international and emerging standards and procedures.

4.4.4. Communication and marketing EW benefits

Media has a crucial role of informing and influencing. Where EW are working and there are tangible benefits, these need to come into the public spotlight. This can be done by raising media interest in such endeavours through press conferences and releases, teleconferences, media briefings and interviews. By doing so, the confidence levels of stakeholders are raised, others can learn and replicate whilst funders can feel incentivised to put more resources into similar undertakings. The realisation is that EW and DRR are often overlooked because they

are generally considered long term, low visibility issues with no tangible benefits in the short term. Hence, media interest is low. In contrast, disasters and post disaster response makes the headlines. This is what the local authority and communities ought to reverse (Chung, 2005; Basher, 2006).

The communication strategy for Gutu regarding EW needs to be clear and straightforward. Denial and keeping the public guessing sends the wrong signals. Resultantly, conflicting messages filter into the public realm while the recipients lose confidence in the authorities mandated to issue such information. EW debates including the failures should be raised at national and international fora to promote learning, stir useful debates and improve on them. Credible CBAs are therefore a must to justify the successful EWs. The good practices can be packaged in communication and media products such as videos, audios and pamphlets among others.

EW dissemination units need to send clear and simple messages. This could be in simple summary analysis such as the one presented in the table below.

Table 9: Example of EW summary analysis

OBSERVATION	COLOUR FOR WARNING PURPOSES
NORMAL	
ALERT	
ALARM	
EMERGENCY	

Source: Author, 2010.

The written EW messages can simply be indicated in the colours as indicated on the table above. The geographical and intervention targeting would then need to be as accurate as possible to ensure the right people get the right messages/assistance before disasters, in this case, drought strikes.

4.4.5 Learning, sharing and knowledge management

Reliable EW depends on strong risk knowledge. Secure, orderly, accessible and durable documentation of hazards, capacities and vulnerabilities needs to be promoted in Gutu. This is tied to the infrastructure recommendation. Reliance on oral history is unreliable as it is unsecure hence the need to documentation. This will not only encourage reliable knowledge

transfer but also creates the requisite institutional memory required for disaster management even for the indigenous EWs.

Fixed and online databases, maps and atlases of hazards, vulnerability and risk , disasters and role players including their coverage and responsibilities need to be in place and readily available for use. This can be part of the DM unit's role. Where possible, the information can be as decentralised as possible whilst the information needs to be in the simplest of formats for the users' comprehension. This may bring about efficiency, cost effectiveness, unified strategic framework and minimise duplication (UN/ISDR, 2007b).

From the HH level, platforms and events should be organised for a continuous sharing and learning culture, dialogue, feedback processes and networking. These are also good opportunities for clarifying of needs, perceptions and priorities in the face of hazards and consequent disasters. Review area meetings are one of the options whilst workshops, conferences and trainings can help avoid the confusion, contradictions and conflicts before, during and after crises. These can also be opportunities for recognising emerging and complex hazards.

4.4.6 Integrate traditional and modern/scientific EWS

Community level measures might include:

- Community based hazard / risk / vulnerability and capacity assessments and development of community level disaster management plans
- Setting up disaster committees with agreed membership, clear roles and responsibilities for preparedness and response
- Determining an EWS and necessary coping mechanisms for different groups
- Scenario planning and public awareness raising with communities on a continual basis
- Establishing community level communication systems

All the recommendations point out that the process must involve the people at risk. If this is achieved, the targets, indicators, milestones of EW efforts will naturally contain the traditional recognised and accepted aspects. The findings clearly showed that the community under investigation already have some traditional EW they utilise for preparedness efforts. The EWs would be sensitive to cultural, social and economic consideration such as language and literacy levels of the population. It is imperative to release pressures in the PAR model

presented in chapter 2, section 2.2.1. This can be done by changing institutions, structures of domination and ensuring improved access to resources and decision making.

Once traditional and modern EWs are used in complementary fashion, they should culminate in some contingency and preparedness planning thereby strengthening the community and authorities capacity for disaster response (UN/ISDR, 2008a).

4.5 RECOMMENDATIONS FOR FUTURE RESEARCH

The research identified possible areas for future research as outlined below:

- Public participation versus programmatic demands. The realisation is that there is always a trade-off between these two aspects and there could be need to determine the losses and gains from the choices made and how can best compromises be reached especially in the DRR realm.
- Coordination of EW with regional and global level efforts. The level of coordination of DRR efforts is always a bone of contention and could be further explored.
- The impacts of global warning/climate change and HIV and AIDS in DRR efforts and thinking. These are relatively new areas in which more research can be helpful.

4.6 CONCLUSION

The chapter provided a summary of the findings presented in chapter 3 as well as the conclusion drawn from these findings. The recommendations for policy and future research emanating from this research were presented.

4.7 GENERAL SYNOPSIS

The research set out to interrogate the DRR approaches utilised in Gutu and ascertain if development and use of more EW can improve DRR efforts in Gutu District. The thesis had five objectives as outlined in chapter 1. The aim and objectives were attained through the use of literature review and field research as presented in this thesis. The study determined the DRR efforts in Gutu, as well as the status of the EW particularly DEWS in Gutu. Some of the findings can be projected to the national level. Important recommendations were offered to the authorities in Gutu District and central government.

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APPENDIX I: FOCUS GROUP DISCUSSION GUIDE

BRIEF INSTRUCTIONS

Recruit about 10-15 members of the community who are knowledgeable about the community in general and the subject under consideration but who **are not** leaders or other influential people. Ensure a balanced mix of men and women and representation from various groups in the community.

INTRODUCTION

Introduce yourselves and explain the purpose and *modus operandi* of the meeting. Also highlight that participation in the meeting is voluntary and no incentives are offered. Ask if there are any questions.

Moderator/Facilitator:

Note-taker:

Date:

Start time: **End time:**

Location:

Number of participants by gender:

Any other notes regarding age groups of the participants and the setting of the meeting:

REF	THEME	QUESTION(S)	PROBES / PROMPTS	RESPONSES
1.	DRR status and practice in study area.	a) I would like to start by asking you to share the main hazards (disasters) that regularly affect this community. b) Are there any more? c) Now I would like you to discuss as a group which of these is the biggest problem. Is drought the major hazard?	▪ How frequent is each disaster identified say in the last 20 years? ▪ Which ones have the greatest negative impacts? ▪ How do you manage these disasters (before and after) internally? *(Focus on drought)* ▪ What external support do you get (before and after) to manage the hazards especially drought? ▪ Who is at most risk within the community?	
2	Linkage between development and utilisation of EWS.	a) Do you have any means you use to determine if drought is coming?	▪ Do you have any mechanisms (EWs) you use to forecast droughts? ▪ Who develops EWS? ▪ Who utilises the EWS? ▪ From whom do you receive the EW messages? Through which channels? ▪ How do you respond after receiving the messages? Are there any guidelines on how to respond? ▪ Do you share? How? ▪ Do you feel the EWS messages help you? Who benefits the most?	
3	Challenges in integration of	a) What are the challenges do you face in using the	▪ Whose opinions or views or EWs are usually taken into account ? Why?	

	EWS in DRR measures (traditional and modern EWS).	EWS-both the traditional and modern ones?	▪ Which EWs or EW messages do you find reliable? ▪ Which EW can be integrated into policies (DRR)?	
4	Determination of whether more EWS can improve DRR.	a) Do you think your community will be better off with more EW than you currently have?	▪ Which DRR activities will benefit? ▪ Which ones will not?	
5	Recommendations.	a) What can be done to improve DRR and EWS in this area?	▪ General DRR recommendations and responsible structures/stakeholders? ▪ EWS recommendations and responsible structures/stakeholders? ▪ DEWS recommendations and responsible structures/stakeholders? ▪ Which resources are needed?	

****Thank the participants for their participation and ask if they have any questions****

Researcher's check---------- Date----------
Co-Study leader's check---------- Date----------

Questionnaire Number:
_____/_____/_____

, ,

APPENDIX II: IN – DEPTH INTERVIEW GUIDE

INTRODUCTION AND BRIEF INSTRUCTIONS

Introduce yourself and explain the purpose of the interview. Also highlight that participation in the meeting is voluntary and no incentives are offered. Assure confidentiality. Ask if there are any questions.

Interviewer _____ Date: _____ Start Time: _____
Respondent's Name: _____ Gender: _____Age _____
Organisation and designation: _____
Geographical areas under respondent's jurisdiction: _____
Postal Address: _____ Tel No: Landline/s _____
Mobile_____ Fax: _____ E-mail _____

Can you please describe your role in this community and the role of your organisation?
_____
_____
_____
_____
_____
_____
_____

THEME	Question (s)	Response(s)
Disaster management and DRR practice.	▪ Major hazards in the area? And their frequency? ▪ How does drought rank amongst the hazards? ▪ Internal capacities used in the event of drought occurrence? ▪ External support usually received and from who? ▪ How is the vulnerability and risk assessed? ▪ How is hazard assessment done? ▪ What preparedness measures are put in place after the risk assessments?	
Linkage between development and	▪ Who develops DEWS? How are these reviewed? Who uses DEWS?	

utilisation of EWS.	▪ How are EW messages shared? By who? ▪ How do the receivers of messages respond?	
Challenges in integration of EWS in DRR.	▪ What are the challenges faced in using all the EWS that are available? At district and local levels? ▪ Which EWS are used more regularly and why? ▪ Which ones are not and why?	
Determine whether more EWS can improve DRR.	▪ Are the EWS in the district adequate? If not, which EWS need improvement?	
Recommendations.	▪ What can be done to improve DRR, EW and Drought Early warning in the district? ▪ Which stakeholders are critical in this process? What resources are needed?	

OTHER CONTACTS (SNOWBALLING FOR SAMPLE FRAME)

Are there any other people living and/or working around here who would be good sources of information for our assessment?
(RECORD NAMES, ORGANISATIONS, POSITIONS, AREA OF EXPERTISE, CONTACT DETAILS)

_____
_____
_____

Permission to associate any information with respondent? *(Tick as appropriate)*
Yes ____ No ____

****Thank the respondent for their participation and ask if they have any questions****

End Time: _____

APPENDIX III: OBSERVATION CHECKLIST

Serial Number: _____

/ /

(To be completed for the district and each ward sampled)

Observer _____ Location _____ Date _____

THEME	ASPECT(S)	OBSERVATIONS
DRR status and practice in study area.	▪ Legislation and policies ▪ Structures, roles and responsibilities ▪ Any stories around use of DRR, EWS and DEWS. ▪ Resources allocated for DRR, EW and DEWS.	
Linkage between development and utilisation of EWS.	▪ Disaster and drought management plans in place. Implementation rates ▪ Relationships between the various stakeholders	
Challenges in integration of EWS in DRR measures (traditional and modern EWS).	▪ Types of EWS in place ▪ Types of DEWS in place	
Determination of whether more EWS can improve DRR.	▪ EWS and DEWS that can be integrated into DRR activities. ▪ Is the community satisfied with the EWS they have and utilise?	
Recommendations.	▪ For overall Disaster management, DRR, EWS and DEWS.	

Other observations:
Check out for anything outstanding in the community that relates to Disaster management or DRR, Early Warning Systems and Drought management.

_____

_____

_____

_____

_____

_____

APPENDIX IV: LETTER OF INTRODUCTION

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

Disaster Management Training and Education Centre for Africa (DIMTEC)
Faculty of Natural and Agricultural Sciences

18 July 2010

TO WHOM IT MAY CONCERN

RE: RESEARCH FOR NICHOLAS SHAMANO

This note serves to inform that I am a student at the University of the Free State in South Africa. I am currently undertaking a research for my studies. I will appreciate if you can kindly assist with information as per request. Please be assured of the confidentiality of your responses.

If you have any queries or reservations, please do not hesitate to contact the undersigned on the following details:
Email: nshamano79@yahoo.co.uk or Telephone: +27 72 4300828. Alternatively you can confirm with DIMTEC at the University of the Free State on the details provided on this letterhead.

I am looking forward to your assistance.

Yours sincerely,

Nicholas Shamano

PO Box 339 BLOEMFONTEIN 9300
Republic of South Africa
Tel: +27 (0)51 401 2721
Fax: +27 (0)51 401 9336
E-Mail: dimtec.sci@ufs.ac.za
Website: www.uovs.ac.za/dimtec
Disaster Management Training and Education Centre for Africa

APPENDIX V: RESOURCE SHEET AND BUDGET

ITEM/RESOURCE DESCRIPTION	QUANTITY	UNIT COST (in ZAR)	TOTAL COST (in ZAR)
Personnel			
Co-study leader (Food and incentive)	1	2,000.00	2,000.00
Senior research assistant for 10 days @ R65/day	1	650.00	650.00
Research assistants for 10 days @ R50/day	6	500.00	3,000.00
SUB TOTAL			***5,650.00***
Supplies and Equipment			
Stationery (Printing, photocopying, binding and courier)	1	1,200.00	1,200.00
Communication and research (Internet research, library fees ,emails, telephone & fax)	1	700.00	700.00
SUB TOTAL			***1,900.00***
Travel and accommodation			
Fuel for 10 days @ R7.80/litre	10	150.00	1,500.00
Accommodation and food during data collection	10	250.00	2,500.00
SUB TOTAL			***4,000.00***
TOTAL			**11,550.00**

APPENDIX VI: TIME FRAMES

Activity \ Time period →	Oct '08	Nov '08	Dec '08	Jan '09	Feb '09	Mar '09	Apr '09	May '09	June '09	July '09	Aug '09	Sep '09	Oct '09	Nov '09	Dec '09	Jan '10	Feb '10	Mar '10	Apr '10	May '10	June '10	July '10	Aug '10	Sept '10	Oct '10
Proposal development																									
Literature review																									
Design of data collection tools and																									
Data collection																									
Data cleaning and analysis																									
Report compilation																									
Printing, photocopying, binding and submission																									

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