A CLIMATE CHANGE –INDUCED DROUGHT RESILIENT FRAMEWORK DEVELOPMENT FOR RESETTLED WOMEN UNDER FAST TRACK RESETTLEMENT PROGRAMME: A CASE OF ZIMBABWE

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DECLARATION

I **<u>Moddie Nyahwo</u>** hereby declare that the work in this thesis is the original product of my own efforts. All sources used and discussions made have been acknowledged with complete references. This work is presented in accomplishment of a Doctorate degree in Disaster Management and I declare that this work has never been submitted in any form or anywhere else for any degree.

I Moddie Nyahwo, student number 2010005326, hereby declare that I am aware of university policy research ethics and I have adhered to the regulations. The University of the Free State Ethics Committee has cleared me, and my reference number is UFS-HSD2019/129.

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ABSTRACT

Strengthening the resilience of women farmers is necessary for the development and growth in a nation. The aim of the study was to develop a resilience framework for resettled women against the effects of climate change induced drought risk. The Vulnerability to Resilience framework was adopted in the study and the four dimensions (hazards and stress, future uncertainty, livelihood and governance) assisted in acquiring techniques to strengthen the resilience of the resettled women.

The Convergent parallel mixed method design was applied in the study; this directed the study to make use of both quantitative and qualitative methods for data collection. A multi sampling technique was used, for purposively selecting three out of seven districts in Mashonaland Central province, namely Bindura, Shamva and Muzarabani. This was followed by stratified random sampling and snowball sampling. A simple random sampling was used for the selection of interview participants. A structured questionnaire was used to collect quantitative data and a semi-structure interview guide was used to conduct face to face interviews. Qualitative data was analysed by extracting themes. The quantitative data was analysed using the exploration of demographics using PIVOT tables (MS excel), reliability test analysis (using SPSS V25 IBM), the Cronbach's alpha coefficient and descriptive statistics per latent variable. The researcher also used confirmatory factor analysis and a vulnerability analysis for the resettled women was established. The structural equation was also used to develop a framework for resilience.

The vulnerability analysis results indicated that the resettled women were vulnerable because of limited awareness, the women were not prepared for drought and lacked a drought plan. There was lack of coordination between the government and the community members. The government was unable to translate drought risk policies into the local drought risk reduction practices. The women had some form of capacities, they applied some adaptive strategies such as crop rotation and crop diversity, had access to good markets, they also had social networks such as farmers organisations, *mikando,* and church groups which were able to assist with financial and emotional support. The study recommended that the national drought policy should set up a clear regulated principle to administrate the management of drought and the associated impacts. One main recommendation

is that the government should work closely with the farmers and the local leaders to make sure that the community abides to the laws and policies of the country.

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LIST OF ACRONYMS AND ABBREVIATIONS

ARC   -Africa Risk Capacity

NNFI   -Bentler-Bonett Non-normed Fit Index

CPA   -Cattle Producers Association

CCAM   -Conformal Cubic Atmospheric Model

CRED   -Centre for Research on the Epidemiology of Disaster

DAPP   -Development Aid from People to People

DFID   -Department for International Development.

DRAMP   -Drought Resilience Adaptation and Management Policy

EMA   -Environmental Management Agency

ENSO El   -Nino Southern Oscillations

EU   -European Union

EWI   -Early Warning Information

FANRPAN   -Food Agriculture and Natural Resources Policy Analysis Network

FAO   -Food and Agriculture Organisation

FEWSNET   -Famine Early Warning System Network

FTLRP   -Fast Track Land Redistribution Programme

GCM   -Global Climate Models

GFI   - Goodness of Fit Index

GMB   - Grain Marketing Board

IPCC   -Intergovernmental Panel on Climate Change

MCEER   -Multidisciplinary Centre for Extreme Event Research

NADF   -National Association of Dairy Farmers

NCCRS   -National Climate Change Response Strategy

NGO   -Non-Governmental Organisation

PCA   -Principal Component Analysis

RMSEA   -Root Mean Square Error of Approximation

SAWS   -Southern Africa Weather Services

SoVI   -Social Vulnerability Index

TDRM   -Total Disaster Risk Management Approach

TLI   -Tucker-Lewis Index

TGT   -Tobacco Growers Trust

UN   -United Nations

UNDP   -United Nations Developmental Programme

UNEP   -United Nations Environment Programme

UNFCCC   -United Nations Framework Convention on Climate Change

UNICEF   -United Nations International Children's Emergency Fund

UNISDR   -United Nations International Strategy for Disaster Reduction

UNWFP   -United Nations World Food Programme

USAID   -United States Agency for International Development

V2R   -Vulnerability to Resilience

WARM   -Women Accessing Re-Aligned Markets

WISP   -World Initiative on Sustainable Pastoralism

ZAIP   -Zimbabwe Agriculture Investment Plan

Zim-Asset   -Zimbabwe Agenda for Sustainable Social-Economic Transformation

ZNEWU   -Zimbabwe's National Early Warning Unit

ZIMSTAT   - Zimbabwe National Statistics Agency

ZimVAC   -Zimbabwe Vulnerability Assessment Committee

ZTA   -Zimbabwe Tobacco Association

ZFU   -Zimbabwe Farmers Union

ZWRCN   -Zimbabwe Women's Resource Centre and Network

CHAPTER 1: STUDY OVERVIEW

1.1 INTRODUCTION

In general, disasters tend to affect those living in poverty and the most disadvantaged groups in the society, specifically women (Victorian Council of Social Service, 2014). Women living in disaster-prone areas and with ecologically insecure livelihoods have a greater chance of being exposed in the event of a disaster (Dankelman, 2012). The ability of vulnerable communities, particularly women to adapt to climate change must be strengthened to protect the world's food production and maintain developmental gains.

The vulnerability of a community to climate disasters such as drought depends on numerous factors such as technology, population, policies, social behaviour, water use, economic development, land use patterns and diversity of economic base and cultural composition (Wilhite Svoboda and Hayes, 2007). Women continue to face different challenges due to lack of government and stakeholders' support. Unlike men, female farmers still face many challenges both socially and economically (United Nations [UN], 2007). Women's roles are generally ignored and undervalued. According to the World Bank (2014), women farmers face numerous inequalities and constraints that are embedded in norms, practices and laws that in turn institutionalise their discrimination. Access to long-term affordable financing is a major obstacle for women farmers to pursue climate-resilient agriculture. Very few women in low-income countries as compared to men have bank accounts (Clement, 2018). Commercial banks usually work with commercial farmers who are already well positioned in value chains.

Even when women land rights are safeguarded, their plots or farms tend to be insufficient in size and quality to qualify as collateral for a bank loan or credit. Women's ability to access financing is further constrained by the lack of appropriate financial products and low financial literacy. Despite technological advancement in farming implements, many women in Africa continue to use hoes to till the land for crop farming. Funding should be available to women farmers; they must be able to use modern tools such as tractors.

According to United Nations Women (UN Women) in 2019, it has been estimated that gender-responsive investments and interventions in agriculture removes structural barriers. This presents an opportunity for women empowerment, economic development and societal resilience to climate change. Agricultural outputs could increase by up to 20 percent in Africa. Failing to address the issues that increase resilience of women farmers will lessen farming productivity. Female farmers according to Nowakowski (2014) make up 8 percent of the world's population and women contribute 20 percent of the agricultural labour force in Latin America and almost 50 percent East Asia and sub-Saharan Africa. Food and Agriculture Organisation (FAO) in 2005 stated that women's rights to land are not always considered by the institutional arrangements designed for land tenure in many countries. Most agricultural policies and investments fail to consider discrimination against women in agriculture. Interventions to facilitate access to finance, technology or markets should have the same conditions for men and women (UN Women, 2019).

Countries such as Honduras, Brazil, Nicaragua, South Africa and Zimbabwe among others, have adopted new legal regulations that recognize women as landholders and beneficiaries of land distribution programmes (FAO, 2005). The government of Zimbabwe has taken a long time to deal with gender disparities regarding access to resources (Zimbabwe Vulnerability Assessment Report, [ZimVAC] 2014). Even though there are more women than men in the agricultural sector, challenges still exist concerning issues such as access to assets and credit services. Regardless of cultural discrimination associated with ownership of assets and land, women farmers in Zimbabwe are still fighting to have their voices heard at policy-making level (FAO, 2005). However, the government of Zimbabwe has managed to allocate 20 percent of the farms to women and of the 146,000 smaller A1 Scheme farms, 18 percent were allocated to women-headed households (Zimbabwe Country Analysis Working Document, [ZCAWD] 2014). Women in Zimbabwe were able to inherit land due to campaigns that ensured that married couples had both names on the letters granting them ownership.

1.2 BACKGROUND OF THE STUDY

In Zimbabwe, most people depend on agriculture for their livelihood. Even though women managed to acquire land through the fast track land redistribution programme, they are faced with

several challenges. One of the major challenges that women in farming are facing is due to climate change. Brazier (2015) pointed out that climate change is projected to have a negative effect on Zimbabwe's water resources in relation to the quantity and quality of available water. Disasters that result from climate change aggravate hardship and poverty among the people of Zimbabwe. Women, especially those living in rural areas, are adversely affected. Women are more vulnerable to the negative effects of climate change because of their lower social status in most countries (Dattaro, 2015). Many disadvantaged women, especially those in the developing world are farmers and they depend on the natural environment for subsistence and income. By further restraining their already constrained access to physical, social, political and economic resources, climate extremes often burden women more than men. (Olsson, Opondo,Tschakert, 2014). The renowned resilience of Zimbabweans has been put to the test to develop effective coping strategies.

In 2016, Zimbabwe was affected by a drought that left over 2.4 million people in need of food aid. The President of Zimbabwe declared a state of disaster following extensive crop failure, and death of thousands of livestock (Action Aid, 2016). The country has a long history of droughts dating back to the pre-colonial times, which have affected people 's livelihoods as well as hampering the country 's economic development drive. Drought is associated with El Nino, a phenomenon that is causing global warming (USAID, 2016). In Zimbabwe and across Southern Africa, El Nino has wreaked havoc leading to reduced or delayed rains, leading to crop failure (Mutasa, 2010). Berginson (2015) indicated that Zimbabwe in 2016 was expected to have a short fall of one million tons of maize. The drought experienced in 2016 was compared to that experienced in 1992, when there was a severe drought in the country.

Disasters tend to have the greatest impact on women and drought in Zimbabwe is no exception. While drought in Zimbabwe has affected the entire country, the areas with the highest projections of food insecurity are in the southern parts of the country (Mutasa, 2010). Drought left farmers in serious financial trouble, as they were unable to fulfil their financial obligations (Ngoepe, 2008). Worsening droughts and difficulties in accessing water in Zimbabwe is a challenge for many farmers, especially women. This deprived women farmers and the country of economic growth. It is therefore important that the vulnerability to impacts of such hazards be explored so that

appropriate coping strategies can be applied and future resilience to the hazards is enhanced. Adaptation interventions must be pursued in tandem with development initiatives, especially for the poorest and most vulnerable (Jerneck and Olsson, 2008; Collier, Conway and Venables, 2008).

1.3 PRELIMINARY LITERATURE REVIEW

1.3.1 The resilience concept

Pasteur (2011) defined resilience as the ability of a system, community or society to resist, absorb, cope with, and recover from the effects of disasters, and to adapt to longer term changes in a timely and efficient manner without undermining their wellbeing. Resilience can take on different forms. In this study, resilient outcomes include the ability to manage risks and reduce the occurrence of disasters associated with drought and to move out of poverty. Even when a community is affected by several hazard events, or by long-term negative trends, they must be able to recover or adapt their livelihoods and continue to improve their lives and move out of a threatening situation. Increasing people's resilience means addressing the factors that underlie their vulnerability (Pasteur, 2011). To measure resilience, the interested party needs to know before a risk event takes place whether they have effectively balanced the risk and opportunity in building capacity to withstand and recover from the event (Keating, Campbell, Szoenyi, McQuistan and Burer, 2016). There are civil groups, authorities and Non-Governmental Organisation (NGOs) with activities that can be put into practice with the purpose of building resilience of a community. According to Keating at el (2016) making use of the 4R's approach (robustness, redundancy, resourcefulness and rapidly) is another way of dealing with disaster response towards resilience in a community.

According to the UN Women's experience, strengthening climate resilience calls for integrated actions from a coalition of partners in the following four priority areas. These include intensifying women's land tenure security by removing discriminatory legal, social and customary norms. Secondly, to improve women's productivity by ensuring equal access to information, technologies, inputs and decreasing their unpaid care work. The other priority area is removing financing barriers and eliminating discriminatory lending practices of public and private financial institutions to enable women farmers to invest in climate-resilient agriculture. The fourth priority area is

increasing the access of women farmers to higher-added value markets (Ngalame, 2015). Concerted efforts are needed to ensure that women farmers everywhere can contribute their expertise and knowledge to solving the challenges in agriculture of a changing climate.

1.3. 2 Climate change and drought

Many scientists have deduced that earth's temperature have increased by several degrees in the present century because of an increase in greenhouse gas concentrations in the atmosphere (IPCC, 2018) Based on the Intergovernmental Panel on Climate Change, IPCC (2014) observations, the rate and duration of warming during the twentieth century are unprecedented for the past thousand years. Increases in maximum temperatures, numbers of hot days and the heat index have been observed across the world in the course of the second half of the twentieth century (IPCC, 2014). While some uncertainties remain, the IPCC concluded that collective evidence suggests that the observed global warming over the past fifty years can be attributed to human activities (that is human-induced changes in atmospheric greenhouse gas concentrations and aerosols). Droughts that are affecting many states are linked to climate change.

The nature of a drought is covariate or widespread, it can overlap to national borders, making informal risk management measures fruitless (Vicente-Serrano, Beguería, López-Moreno, 2010). This has resulted in an escalation of the affected number of individuals, increased economic costs and rising humanitarian support for the increasing numbers of distressed populations (Gautam, 2006). The influence of regular climatic variability and drought conditions are further emphasised by the impending danger of climate change, which is anticipated to escalate extreme events and the frequencies of drought in many parts of Africa. Different agricultural investment alternatives, policy and institutional advances with variable profitability and success have been formulated to manage climatic risks (Shiferaw and Okello, 2011).

The United Nations Developmental Programme (UNDP) in 2008 defined drought as a natural phenomenon that occurs when precipitation is significantly lower than normal recorded levels, triggering serious imbalances that adversely affect land resource production systems. As temperatures rise due to global climate extremes, more moisture evaporates from land and water,

leaving less water behind. Zimbabwe has felt the effects of droughts because of climate change. There has been some speculation among experts regarding the impacts of climate change on agriculture in Zimbabwe (Rankomise, 2015). The poor harvests of recent years have been linked to the rise in temperature and to aridity of the climate.

Drought impacts can be regarded as ex post and ex-ante. Ex-post impacts refer to the damages that come after a climate shock whereas ex-ante impacts describe the opportunity costs connected with conventional approaches that risk-averse decision makers engage in advance to defend themselves against the likelihood of climate shocks (Adger, Adams, Evans, O'Neill1, Quinn, 2013). The most important conventional ex-ante responses of farmers to climate threats documented by Adger at el (2013) comprise the use of profitable crops or cultivars, using advanced production technologies and less fertiliser. The other ways include changing household labour away from farming to non-productive but liquid assets as preventative savings. Because of high relative risk aversion, poorer families are frequently affected more by ex-ante reactions to climate change as compared to the wealthier ones even in productive years.

The environmental and economic impacts of drought might be direct or indirect and can be conveyed in various forms (Hellmuth et al., 2007 and Bhavnani et al., 2008; Adger at el 2013). These may include productivity loss in crops, reduced water levels, rangelands and forests, and damage to wildlife. These effects may initially reveal themselves in the form of reduced income for farmers and agribusiness, increased food prices, unemployment, increased conflict, migration and displacement, malnutrition and famine, disease epidemics and spread of plant diseases and increased wind erosion. The impacts of drought has been felt in Zimbabwe and has affected the black farmers who obtained land through the land resettlement programme.

1.3.3 Land resettlement programme in Zimbabwe

The colonisation of the country by the British South African Company in 1890, led to the land issues in Zimbabwe following the Berlin Conference of 1884 that promoted further colonial acquisitions of Southern African countries (Mararike, 2018). At independence in 1980, Zimbabwe had a dual agriculture sector whereby white farmers and foreign owned companies dominated

commercial agriculture and the small-scale agriculture sector was dominated by blacks (Nyaya and Mazuru, 2010). The main goal of the land reform programme was to address the differences in land access, lessening population pressure in the communal areas, extend and increase the base for productive agriculture in the smallholder farming sector and bring under-utilised land into full production (Chilunjika and Uwizeyimana, 2015)

The land reform programme was divided into two phases. The first phase of land reform and resettlement programme was from 1980 to 1997, the main method used to obtain the land was through the market (willing seller-willing buyer principle) and compulsory land acquisition (Njaya, 2013). The second phase of the land reform was from 1998 to 2002. In September 1998, the government of Zimbabwe organised a Land Donor Conference, however this move was not successful (Nyaya and Mazuru, 2010). A referendum of the new constitution was held in February 2000 and the voters rejected the constitution (Chilunjika and Uwizeyimana, 2015). The dismissal of the draft constitution turned out to be a precursor to land occupations (Marongwe, 2012) and the subsequent launch of the fast track land reform programme.

1.3.4 Fast track Land Reform Programme

The fast track land reform programme was characterised by land invasions. Women were also involved in land invasions and occupations (Sadomba, 2008). However, it was not everyone who obtained land through invasion, some people applied to the government and they were allocated land. There were two models for resettlement under the Fast Track Land Reform Programme (FTLRP), namely A1 scheme and A2 scheme. The A1 model is the decongestion of communal areas, it provides for farms that are comparatively small but suitable to sustain a family and produce a surplus (Njaya, 2013). This A1 model can be either villages or self-contained plots. The A2 model allocates small-scale to medium scale commercial farms to people with experience in agriculture, preferably those trained to be master farmers (Chilunjika and Uwizeyimana, 2015). Eighteen percent (18) of female-headed peasant farmer households and 12 percent of female-headed commercial farmer households benefited from A1 and A2 land allocations in terms of total household beneficiaries (Zimbabwe Women's Resource Centre and Network [ZWRCN], 2007). The programme opened up some opportunities for women to become land owners. In order for the

resettled women to adapt to the challenges in farming, the government and Non- Government Organisations (NGO) provided support to the farmers.

1.3.5 The role of Non-Governmental Organisations (NGOs)

The (NGOs) can be characterised as either selflessly devoted to the needs of the poor or self-interested charlatans; giving support where government provision decreases or driving force of foreign powers. NGOs have earned a reputation for managing to promote development. Chitongo (2013) stated that NGOs have made significant efforts in supporting underprivileged individuals to tackle the causes and effects of food insecurity. According to FAO (2013), international organisations are usually the key benefactors, granting funds to assist land policy-making efforts in most countries as well as promoting and advocating gender equality. Many NGOs in Zimbabwe were involved in assisting with agricultural seeds for crop production in the newly resettled areas (Mujeyi, 2010). Thus, NGOs play a crucial role in the development of a country and transforming lives.

1.4 STATEMENT OF THE PROBLEM

Women were among the beneficiaries of the land redistribution programme in Zimbabwe. However, a small portion of women managed to acquire land, these women experienced several challenges. Despite women gaining access to arable land, the country has been experiencing a series of drought caused by climate change (Blazier, 2015). The Zimbabwe Department of Meteorological Services (ZDMS) in 2007 points out that Zimbabwe has experienced increased temperatures averaging two degrees Celsius in the last 30 years and precipitation patterns also show that rainfall has reduced by 30 percent. Climate change has resulted in erratic rains, giving rise to crop failure and perpetual food insecurity due to decreased rainfall. Drought has not only affected farmers' access to food, but also availability and accessibility of water. Farming seasons are no longer predictable (Anyadike, 2016).

The economy of Zimbabwe is largely dependent on the performance of agricultural sectors among other activities. Because of the series of droughts, the country is facing, the economy is not stable. Most of the women do not have enough capital to finance farming operational activities. IRIN

(2014) reported that most women who were given land were coming from poor backgrounds; they did not have enough capital to hire machinery and to hire people who can work on their farms. Most of the resettled women farmers rely on rain-fed agriculture, because of lack of irrigation facilities they cannot produce much as compared to their male counterparts who have irrigation facilities (Mutingwende, 2015).

Due to the challenges faced by resettled women, women are becoming more vulnerable to climate change-induced disasters. Women's livelihoods are jeopardised by the effects of climate change, reducing economic opportunities, especially for female-headed households (Dodman, 2016). To deal with the problem, the research will come up with ways to increase resettled women's' resilience. By increasing the resilience of resettled women, food production of the country will improve as well as the economic and social status of these women.

1.5 STUDY CONTRIBUTION TO BODY OF KNOWLEDGE

The primary aim of this study is to develop a unique framework for climate change induced drought resilience. Various studies have been conducted on the resilience of women to disasters globally; however, there is a gap in the existing literature regarding the strengthening of resilience of resettled women in farming. In this study, the researcher focused on the resilience of women to the adverse impacts of drought. The framework will be used as a tool that will serve, support and analyse issues that are related to drought resilience of women in farming. The current study is two-fold in terms of its contribution to science; (i) provision of useful knowledge on factors that might have impact and contribute to the successful adoption of drought risk reduction strategy. This accounts for the theoretical contribution of the study and (ii) a practical contribution that sets an avenue for the understanding of local coping strategies and innovations employed by local people. Vulnerability and impact assessment for the study might assist the government with mobilisation of resources. Furthermore, findings of this study will assist disaster management systems in the country to strengthen disaster management interventions and development of appropriate policies for climate change- induced drought risk reduction.

1.6 RESEARCH QUESTIONS

This research study asked the question; how can resilience of resettled women be strengthened? To narrow down the scope of the research to researchable magnitude, the question was rephrased in the following manner: does strengthening resilience help resettled women to alleviate the impacts of drought?

To answer the research question, the following secondary questions were asked:

i.   How vulnerable are the resettled women farmers to climate change- induced drought?
ii. What were the impacts of drought on resettled women?
iii. What strategies were applied to strengthen the resilience of women farmers?

1.7: AIM AND OBJECTIVES OF THE STUDY

1.7.1 Aim

The aim of this study is to uncover the underlying variables responsible for climate change induced drought and to develop a resilience framework for resettled women against drought risk in the study area.

1.7.2 Objectives

- To assess vulnerability and impacts of climate change induced drought on resettled women.
- To determine strategies applied by the government and different organisations to minimise the level of impacts
- To make recommendations on different ways that can be employed to increase resilience of resettled women, to the government authorities, private sector and all relevant stakeholders.

1.8 DELIMITATION AND LIMITATIONS

1.8.1 Delimitations

This study focused on resilience of women who obtained land through the fast track land resettlement programme. For the purpose of this study, only the impacts of droughts were addressed instead of all the impacts of climate change related disasters.

1.8.2 Limitations

The issue about the resettlement of farmers is very sensitive due to the way the programme was initiated. Participants were reluctant to take part in the study and express their views; they only agreed to participate after they were convinced that the study was for academic purposes. It was difficult to locate the resettled farmers especially the A2 farmers because the farmers live far from each other. Therefore, the views reported in this study are mainly from A1 farmers because it was much easier to locate them. The researcher selected three districts out of the seven districts of Mashonaland Central province. The study was limited to the three districts, hence the opinions of women resettled in other districts are not known.

1.9 DESCRIPTION OF THE STUDY AREA

The study was conducted in Mashonaland Central province. The province was selected because it has many women farmers who were beneficiaries of the land reform programme and it experienced a series of droughts. Mashonaland Central province is a highly productive farming province, and is one of the ten provinces in Zimbabwe. The province covers the northern part of Zimbabwe and goes as far as the Zambezi valley and to the border of Mozambique in the north-east (Environmental Management Agency [EMA], 2014). Figure 1.1 below shows the natural agricultural regions and provinces in Zimbabwe.
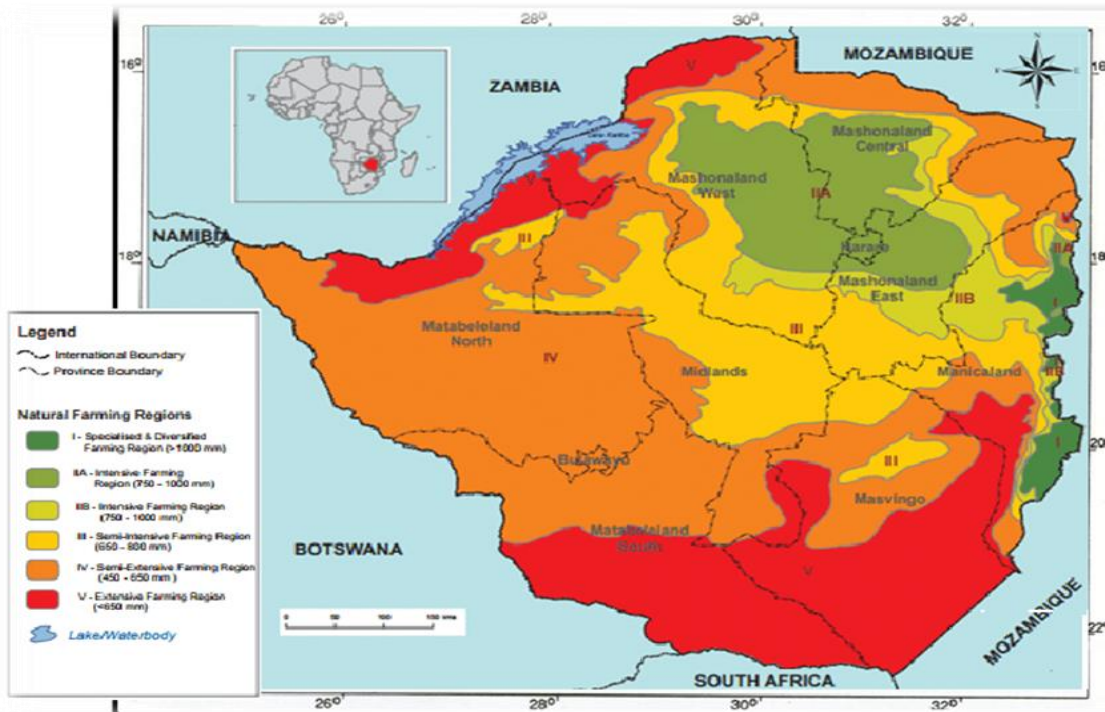
Figure 1.1 Natural agricultural regions and province map of Zimbabwe
Source: (Chivasa, Mutanga and Biradar, 2019)

Mashonaland Central province has an area of 28.347 km² and a population of 1.152 520, this represents about 8.5% of the total population in Zimbabwe (Zimbabwe National Statistics Agency [ZIMSTAT], 2012). ZIMSTAT (2012) also indicated that the male population of Mashonaland Central is 567 140 and the female population is 585 380.

Table 1.1: Distribution of Mashonaland central population by districts

District	Total population	Percentage
Bindura urban	43 675	3.8
Bindura rural	125 219	10.9
Guruve	124 041	10.8
Mazowe	233 450	20.3
Mbire	82 380	7.1
Mount Darwin	212 725	18.5
Muzarabani	122 791	10.7
Mvurwi	10 549	0.9
Rushinga	74 040	6.4
Shamwa	123 650	10.7
Total	1 152 520	100

Source: (ZIMSTAT, 2012)

Table 1.1 above shows the population distribution by district. According to Table 1.1, the most populated district is Mazowe and the district with the least population is Mvurwi. The province lies in the agro-ecological region II, this region is known for intensive livestock and crop production (Musemwa, 2011). Rainfall in this region is moderately high (750 to 1000 mm) and is more confined to summer (Zimfact, 2018). There are other small sections of the province that come under regions III and IV which are suitable for semi-intensive farming and semi-extensive farming respectively (Ministry of Lands Agriculture, Water, Climate and Rural resettlement. 2017).
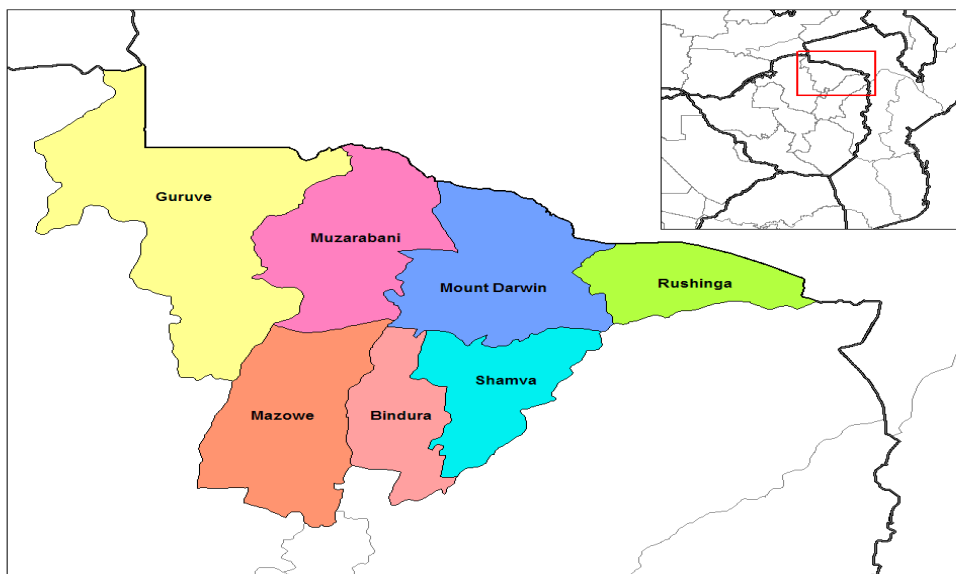
Figure 1.2: Districts in Mashonaland Central Province
Source: (Samwise, 2008)

Agriculture is crucial for the social and economic development of Mashonaland Central province. It contributes to poverty reduction by providing employment and affordable food for most of the population in the province (ZIMVAC, 2019). Figure 1.2 above shows the seven districts in Mashonaland Central province. Bindura is the provincial capital of the province and most of the economic activities take place in that district (Samwise, 2008). According to Zimbabwe Vulnerability Assessment Committee (ZIMVAC) in 2013, Mashonaland Central was the province with the highest improved source of drinking water for rural households. People from Mashonaland Central have different types of livelihood coping strategies, these include selling

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their livestock, borrowing money and using money from their savings. ZIMVAC (2019) pointed out that Mashonaland Central is on the top four provinces with half of its households that are involved in at least one livelihood-based coping strategy.

1.10 CHAPTER OUTLINE

The chapters of the research were organised as follows: Chapter 1 covers the introduction and the background of the study. The chapter also addresses among others, the research objectives, the research problem, research question, significance of the study and description of the study area. Chapter 2 reviewed the theoretical and conceptual frameworks used in the study. Chapter 3 focused on climate change, drought, resilience and different issues faced by women in farming. Chapter 4 reviewed the data collection methods, research design and methodology applied, and the ethical considerations applied in the study. Chapter 5 discussed the findings of the empirical study and the analysis of the data from the questionnaires, interviews and observations. Conclusions and recommendations were presented in chapter 6.

CHAPTER 2: COMMON THEORETICAL AND CONCEPTUAL FRAMEWORKS USED IN DISASTER MANAGEMENT

2.1 INTRODUCTION

There are several frameworks and theories that can be applied to determine the resilience of women to climate change induced drought disasters. The frameworks that were used include the PEOPLES resilience framework (Renschler, Reinhorn, Arendt, and Cimellaro, 2011), Drought Resilience Adaptation and Management framework (Crossman, 2018), the DFID resilience framework (DFID, 2011), The IPCC Climate Change framework (IPCC, 2007) and the Vulnerability to Resilience framework (Upton and Ibrahim, 2012). All the frameworks were discussed and analysed, however more emphasis was put on the Vulnerability to Resilience framework (V2R). For the purpose of the study, the Vulnerability to Resilience framework was adopted. The V2R framework was adopted because the framework clearly shows how a community can become resilient, the framework provided four key components needed to be addressed to achieve resilience. The framework was established to assist policy makers and practitioners to identify, analyse and attend to several issues that communities require to build resilience (Pasteur, 2011). The other frameworks discussed were used to support the V2R framework, the resilience components in other frameworks were combined with the V2R framework to bring about the best possible solution to strengthen the resilience of women towards drought. The V2R framework and concepts in other frameworks assisted in developing a resilience framework for women in farming, which is the main objective of the study.

2.2 THE PEOPLES RESILIENCE FRAMEWORK

The PEOPLES resilience framework is a framework that defines and measures disaster resilience for a community at a scale that ranges from individual structures, smaller communities to entire regions (Renschler et al, 2011). The framework is an expansion of the research done by the Multidisciplinary Centre for Extreme Events Research (MCEER), connecting the dimensions of

resilience (technical, organisational, economic and societal) (Bruneau, Chang, Eguchi, Lee, O'Rourke, Reinhorn, Shinozuka, Tierney, Wallace and Winterfelt, 2003). The seven dimensions of community resilience (Figure 2.1 below) were identified and denoted by the acronym PEOPLES: Population and Demographics, Environmental/Ecosystem, Organised Governmental Services, Physical Infrastructure, Lifestyle and Community Competence, Economic Development, and Social-Cultural Capital (EPICURO, 2018). The framework offers the basis to incorporate any qualitative and quantitative models, which measures the resilience of a system against any extreme event in one or a combination of the seven dimensions (Renschler, Frazier, Arendt, Cimellaro, Reinhorn, and Bruneau, 2010).

POPULATION AND DEMOGRAPHICS
Composition, socio-economic status, distribution, etc.

ENVIRONMENTAL/ECOSYSTEM

Air quality, biomass, air, biodiversity, etc.

ORGANISED GOVERNMENTAL SERVICES
Health services, legal and security services, etc.

PHYSICAL INFRASTURE
Lifeline, facilities, etc.

LIFESTYLE AND COMMUNITY COMPETENCE
Quality of life, etc.

ECONOMIC DEVELOPMENT
Production, financial, employment distribution, etc.

SOCIAL-CULTURAL CAPITAL
Child services, education services, elderly care services, etc.

Figure 2.1: PEOPLE resilient framework

2.2.1 Seven dimensions of the framework

The first dimension of the PEOPLES resilience framework is population and demographics, this dimension measures the social vulnerability of the community (Renschler et al., 2010). It also

measures the extent of functionality of a given population and demographics of a community and is quantified by making use of the social vulnerability index (SoVI) (Cutter, Barnes, Berry, Burton, Evans, Tate and Webb, 2008).

The first dimension focuses on issues such as the socio-economic status of the community. The second dimension of the framework is environmental/ecosystem. Ecosystem or ecological resilience is normally measured by the level of disturbance an ecosystem will absorb without considerably modifying its processes, functions and structures, or by the capability of the ecosystem to cope with disturbance (Renschler et al., 2011). In the framework, the environmental and ecosystem resources functions as an indicator for determining the capacity of the ecological system to return to or close the state it was before the event or a position that is defined by the community (Renschler, 2013). The third dimension in the PEOPLE resilient framework is organised governmental services. In this section, the levels of functionalities of governmental services are measured. Organised governmental services are designed to permit an orderly outcome (Renschler et al., 2010). The fourth dimension, physical infrastructure caters for lifelines and facilities. The fifth dimension is lifestyle and community competence, this dimension focuses on measuring the impact and recovery advancement of a community. In this dimension, the reality of community resilience is not being a simple bouncing back to conditions before disasters, rather it is a concerted and active effort, which depends on the ability to create and take steps to achieve a new future (Renschler et al., 2011). Economic development is the sixth dimension, this measures different services and products that are available in the community. The last dimension of the PEOPLES resilient framework is social-cultural capital. Communities that have a higher degree of social-cultural capital encourage the members to return and reinvest after an extreme event such as drought (Renschler, 2013). The drawback of the PEOPLES framework in this study is the framework does not clearly state how the dimensions are related, so it will be challenging to apply this framework only to achieve the goals of this research.

2.3 DROUGHT RESILIENCE ADAPTION AND MANAGEMENT FRAMEWORK

The Drought Resilience, Adaptation and Management Policy (DRAMP) Framework is an integrated method used for planning, to reduce the risk and impacts of drought. Practical actions

that countries can implement to prepare and respond to drought are identified in this framework. The framework will assist countries to implement drought policies. The framework consists of six cross-cutting goals that outlines practical and pragmatic actions that nations and communities can adapt to increase resilience to drought (Crossman, 2018). There are actions a country should take to strengthen its resilience to drought disasters. The goals of the framework are mapped in the three key pillars of drought risk reduction to establish the connections between the pillars and the framework (IPCC, 2012). The first key pillar of the DRAMP framework includes the implementation of drought monitoring and early warning systems, assessing vulnerability and risk of drought. The second key pillar is the implementation of measures that limit the impacts of drought and the action that can be taken to for effective response to drought (Crossman, 2018). The third key pillar in the framework is more aligned to resilience strengthening and the measures that are applied will assist the nation in dealing with drought risk.

The goals in the framework are not equally exclusive, there are various actions that can be employed to adapt and manage drought and actions can be applied for more than one goal.

- The first goal of the DRAMP framework involves reducing the exposure to drought, this entails that the government should come up with ways to minimise the risk of loss of lives, livelihood and other aspects that could be affected by a drought disaster (Crossman, 2018).

- The second goal is reducing the vulnerability to drought by lessening the tendencies that lead the community to be affected by drought.

- Goal number three of the framework is increasing the resilience to drought hazard through strengthening the capability of the community, economic and ecosystem to look forward to accommodating, absorbing or recovering from drought effects. This can be achieved quickly and efficiently when the relevant authorities ensure that there are preservations, and enhancements of the natural capital (UN, 2017).

- The fourth goal of the framework is transformation, this can be achieved by modifying the essential elements of economic, ecology and ecological systems. To manage drought

resilience in a community, the community should prepare for drought, respond and recover from the effects of drought. These can be achieved by planning and developing drought monitoring and early warning systems (Sivakumar and Wilhite, 2014).

- The fifth and last goal of the framework is transferring and sharing drought risk, this goal involves distributing risk between wider segments of the community and involves those who indirectly and directly benefit from robust drought management (Crossman, 2018).

The most important aspect of the DRAMP framework for this study is the goal that focuses on increasing resilience to drought. The framework is meant to address drought disasters and it gives guidelines that assist in a drought situation but the drawback of the framework to this study is that it does not clearly link the goals. Therefore, the study only adopted the goals of the framework, these are essential actions that can be taken to reduce the impact of drought.

2.4 DFID RESILIENCE FRAMEWORK

The DFID resilience framework was developed by DFID, this framework sets out three distinctive components of resilience which are sensitivity, exposure and adaptive capacity (Brooks, Aure and Whiteside, 2014). Figure 2.2 below clearly shows the major elements of disaster resilience.

The framework consists of four elements (context, disturbance, capacity and reaction) to deal with disturbances (Twig, 2017). These elements ought to be taken into consideration in encouraging resilience building (DFID, 2011). The elements of the framework can be used to explore various types of resilience such as the resilience of women in farming.
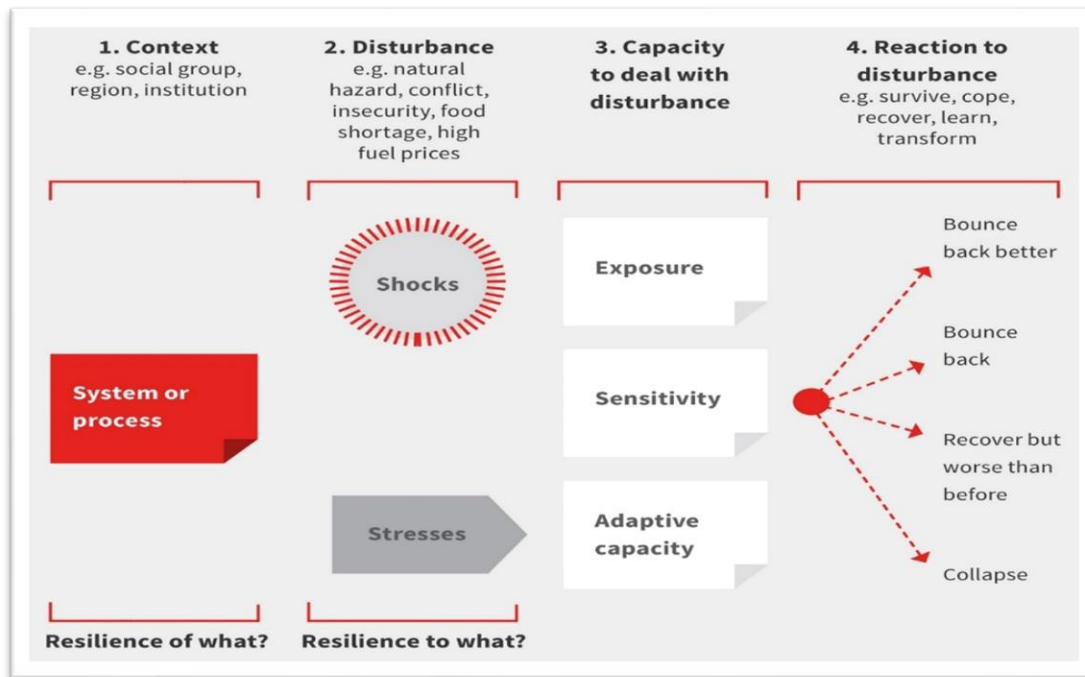
Figure 2.2: DFID Resilience framework
Source: (DFID, 2011)

2.4.1 Elements of the DFID Resilience framework

The four elements of the DFID resilience framework will be addressed in this section. These are context, disturbance, the capacity to deal with disturbance and the last element is the reaction to disturbance.

2.4.1.1 Context

There is need to contextualise resilience through permitting a comprehensible answer to the question 'resilience of what?' (DFID, 2011). It is possible to strengthen and identify resilience in a social group, political or socio-economic system, environmental context or institution (Combaz, 2014). The systems are likely to display lesser or greater resilience to man-made or natural disasters.

2.4.1.2 Disturbance

- **Shocks** are regarded as sudden outcomes that can affect the vulnerability of a system along with its components (DFID, 2011). There are numerous forms of disaster-related shocks, which can affect people.
- **Stresses** can be described as long-term trends which demoralise the capability of a system or process (DFID, 2011). This will in turn intensify the vulnerability of the actors that are within it (Combaz, 2014). Many countries frequently encounter multiple interrelated shocks and stresses.

2.4.1.3 Capacity to deal with disturbance

The capability of a system or process to deal with stress or shocks depends on the level of exposure, level of sensitivity and its adaptive capacities (DFID, 2011).

- **Exposure** is defined by UNISDR (2017) as the condition of individuals, infrastructure, production capacities and human assets that are tangible and are positioned in hazard-prone areas. Women farmers in Mashonaland Central are exposed to climate change induced hazards such as drought.
- **Sensitivity** is defined as the extent a system is going to be affected by, or responds to, a shock or stress (DFID, 2011).
- **The adaptive capacities** refer to how the people become accustomed to a situation if they are faced with any disturbance (Sanderson, 2012). Actors such as government, institutions or organisation adapt to a disturbance depending on their capability, relative possible damage, taking advantage of the opportunity and dealing with the outcomes of a transformation (DFID, 2011). Adaptive capacities permit the actors to anticipate, come up with strategies, respond to and learn from the shocks or stresses.

2.4.1.4 Reaction to disturbance

The capacities that individuals and communities have will affect how they react to disturbances. In some instances, the reaction to shock and stresses leads to positive results and better future resilience (Twig, 2015). In such cases, capacities are improved and leads to a reduction of

sensitivities and exposures. Sometimes the individual or community manage to revert to their previous condition, recover or worst-case scenario collapse (Sanderson, 2012). The worst-case scenario leads to a devastating reduction in capability to cope in the future (DFID, 2011). This is not a desirable condition for an individual or community to be exposed to. The DFID framework is capable of harmonising conceptualisation across different programmes and disciplines. However, the drawback of the framework is the framework is not clear on how resilience can change over a period, therefore the study will only focus on how the four elements of the framework help in dealing with disturbances and achieve resilience.

2.5 THE IPCC CLIMATE CHANGE FRAMEWORK

The Intergovernmental Panel on Climate Change (IPCC) has various scientists across the world, and contributes to climate change research. The IPCC Organisation came up with a framework that was developed in the course of their third assessment report in the year 2001 and the framework was refined later in 2007 in their fourth assessment report (Giorgi, Jones, Asrar, 2009). The framework shows the linkage that exists among climate process drivers (gases, greenhouse and aerosols) and climate change; it also shows the linkage to and from the socio-economic development (Figure 2.1). The framework goes on to illustrate the linkage between socio-economic development, vulnerability and climate change (IPCC, 2007). The framework is useful in identifying factors that contribute to climate change and identifying the climate impacts, which affects drought intensity and frequency. The IPCC framework explains the ways to reduce risk (mitigation and adaptation) such as markets, technology, governance and socio-economic development (IPCC, 2007).
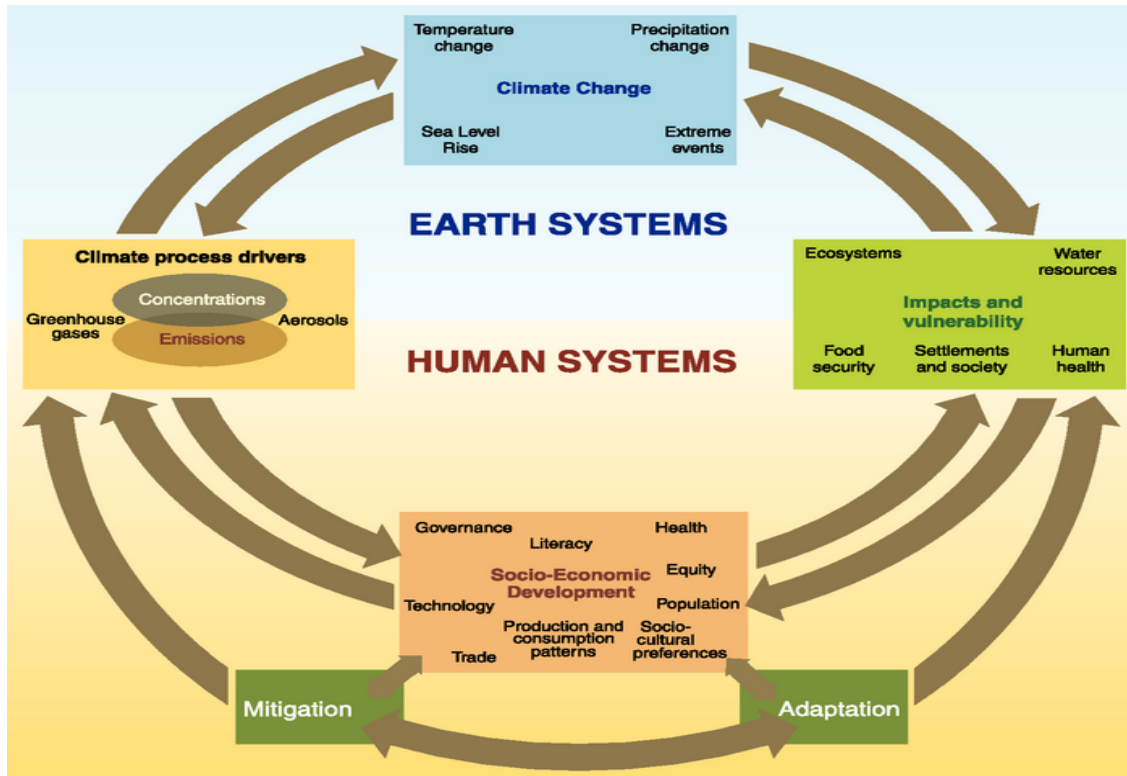
Figure 2.3: IPCC framework
Source: (IPCC, 2007)

The IPCC climate change framework provides some practical situations of how climate change can affect the world and the framework outlines the mitigation and adaptation measure that can be employed. The framework was incorporated in the study to support the V2R framework because the IPCC framework addresses issues of climate change which is one of the key elements of the study.

2.6 VULNERABILITY TO RESILIENCE FRAMEWORK

For a community or a nation to withstand the impact of a hazard, there should be some form of resilience. To identify ways to strengthen the resilience of women in farming a resilience framework must be applied. The Vulnerability to Resilience framework (V2R) was developed by practical action, the framework was established using some existing approaches such as the: sustainable livelihoods, climate change adaptation and disaster risk reduction (DRR) (Upton and Ibrahim, 2010). The framework was established to assist policy makers and practitioners to

identify, analyse and attend to several issues that communities require to build resilience (Pasteur, 2011). The V2R framework incorporated four key components, these are livelihoods diversity and security, hazards and stresses, future uncertainty and governance (EPICURO, 2018). The study applied the four key elements and this will assist the resettled women farmers to strengthen their resilience towards climate change induced drought hazards. The key components of the framework will assist in initiating development programmes that will take the community out of poverty by strengthening livelihoods, adaptive capacity, disaster preparedness and by addressing governance issues (Ibrahim and Ward, 2012). The V2R framework explains the relationships relating to the key elements, in addition to ideas for actions to strengthen resilience. The (V2R) framework will enable government officials, community members, and NGOs to distinguish pathways and employ actions to promote resilience (Ibrahim and Ward, 2012). The V2R framework objective is to address the multidimensional nature of poverty through an integrated approach that considers all underlying core issues. It pays special attention to integrating data about climate change and other long-term trends (economic, socio-political or environmental for example), impact on poor people's vulnerability over time by undermining their livelihoods and increasing their exposure to hazards or stresses.
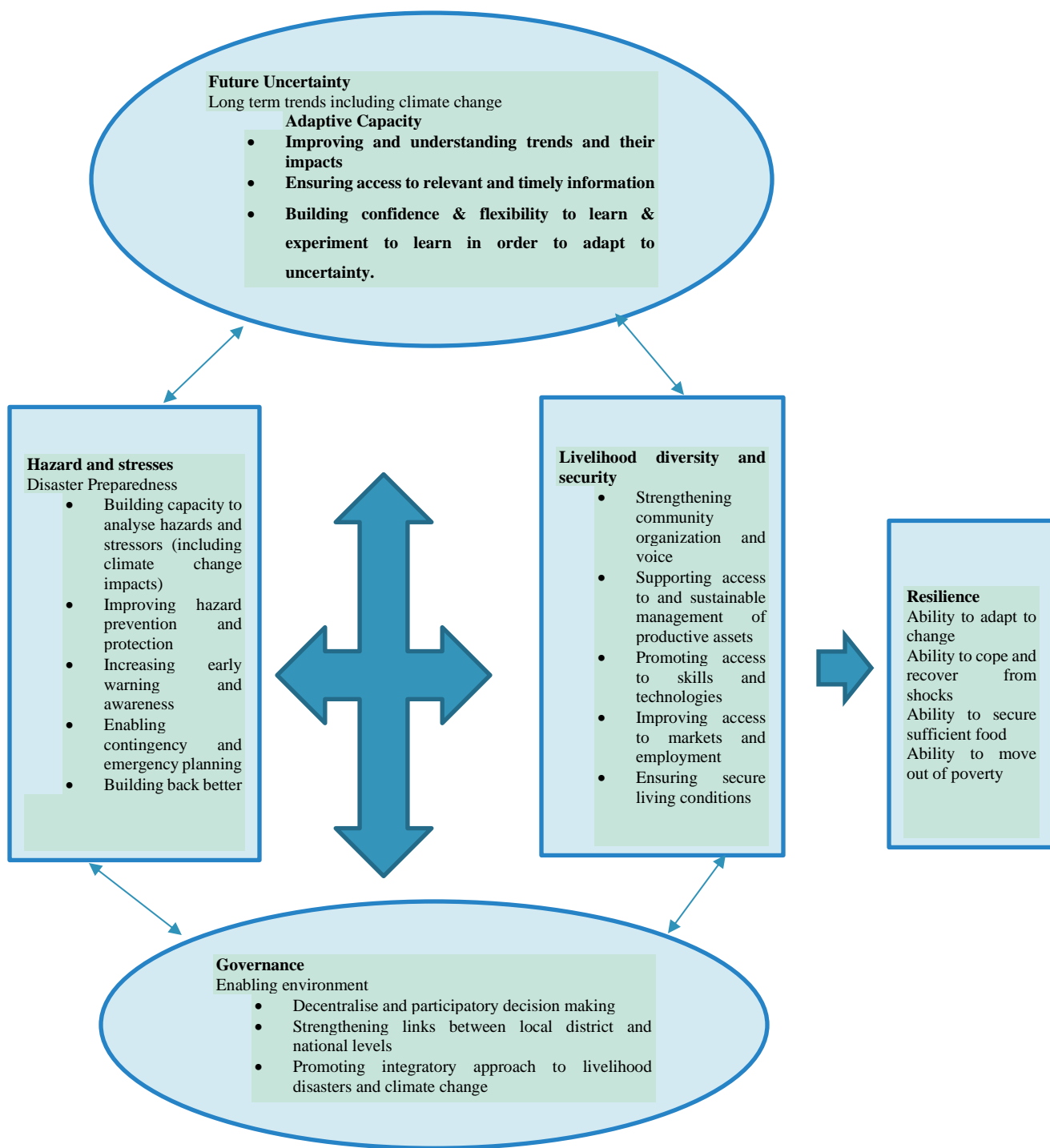
Figure 2.4: Vulnerability to Resilience Framework
Source: (Upton and Ibrahim, 2010)

The V2R framework approach highlights the importance of understanding and addressing the ways in which climate change should be addressed. The framework prioritises constructing the adaptive

capacity of vulnerable people to acquire assets, resources and capacities to counter existing threats and unknown future challenges (Pasteur 2011). Communities are becoming vulnerable to many hazards and stressors due to climate change. The unpredictability of future climate and economic patterns indicates that potential pathways out of poverty are less obvious (Ibrahim and Ward, 2012). Disasters that include the effects of climate change are more likely to compromise development progress and reduce the effectiveness of aid investments. Moreover, diverting aid resources to emergency response lessens the resources available for long-term development programmes (Pasteur, 2011). The Vulnerability to Resilience Framework (Figure 2.4) above is a practical tool that utilises existing approaches to help farmers and policy makers to understand, analyse and address the multiple factors contributing to vulnerability in order to build a nations' resilience. What is innovative about this framework is its dynamic element of looking at long-term trends and their effect on future community resilience (Upton and Ibrahim, 2010).

2.6.1 Resilience outcomes

The V2R framework strives to move people from vulnerability to resilience. According to figure 2.4, resilience is the outcome of succeeding in an integrated and holistic way. Resilience outcome in the V2R framework focusses on a dynamic approach and promotes holistic thinking (Bahadur, Ibrahim and Tanner, 2010). Positive coping strategies are considered as an essential aspect of resilience. Working through the four elements of the V2R framework (hazards, livelihoods governance and future uncertainty) leads to increased resilience (Ibrahim and Ward, 2012). Resilience is the core of this study; therefore, all the outcomes that assist in strengthening the resilience of women will be discussed.

2.6.2 The components of the framework

The V2R framework consists of four components; these are future uncertainty, hazards and stressors, livelihood diversity and security, governance. They all lead to resilience. These four components are interrelated, the relationship between the components and how these elements promote resilience will be discussed next.

2.6.2.1 Hazard and stressors

In most cases, people that have a few resources are the ones that are affected the most during disasters. The resilience of an individual or community needs to be built to withstand the impacts of a hazard or stressors. Building resilience of a community to hazards and stresses requires building capacity. Capacity is built by analysing hazards and stresses, enhancing hazard prevention and protection, setting up contingency and emergency planning and intensifying early warning and awareness (Upton and Ibrahim, 2010). A significant element of strengthening resilience is the building of community capacity for analysing and identify with the hazards and stresses that influence their lives. This is the first stage towards taking action to tackle the hazard (Pasteur 2011). There is need to work hand in hand with the communities by providing training to the leaders so that they can assist in facilitating community analysis. The community needs to understand the nature of the hazard and its impact on the community. Hazard prevention and protection may be achieved by enhancing the management of resource (Saygin, 2017). The livelihoods of people can be protected through various structural or other regulatory measures from the impact of drought. The community can access monitoring and warning information by developing a hazard monitoring system within their community or coordinating with other monitoring and early warning services that are outside the community (Buurman, Dahm and Goedbloed, 2014).

2.6.2.2 Livelihoods

A livelihood encompasses the resources (including skills, technologies and social networks) and activities required to make a living and have a good quality of life. A livelihood also consists of assets, capabilities (to include both social resources and material) as well as actions that are needed to sustain life (Chambers and Conway, 1991). The skills, resources and technologies that are accessible to a person and household determine the livelihood options available to them. Individuals that have poor livelihoods are forced by circumstances to live or work in places were there become more exposed to hazards and stressors (EPICURO, 2018). Developing livelihood resilience requires improving the security and diversity of the livelihoods of people so that they

have other options. These options include enhancing the community organisation and initiating some connections with service providers so that they can build capacities (Upton and Ibrahim, 2010). This can be achieved by building confidence, understanding, motivation and skills. Communities should be encouraged to work together to prepare for potential threats (Pasteur and McQuistan, 2011). The poor must be included in community organisation and their needs must be represented. Livelihoods can be developed by improving technologies, develop markets for improved production, security and income (Ensor, 2011). It is essential to support access to and the management of natural resources as well as making sure the living conditions are secure (Pasteur 2011). The community can prepare for the future and make use of their resources efficiently and sustainably if they have secure access to productive resources.

2.6.2.3 Future uncertainty

Long-term trends are more likely to cause unpredictable impacts on the physical, natural, economic, social, technological environment. This stimulates uncertainty about the imminent viability of livelihoods under new circumstances, and around the likelihood of changing risks (Upton and Ibrahim, 2010). The most recent trend to effect people is climate change; it has many negative effects on the poor. The V2R framework prioritises adaptive capacity. Adaptive capacity is a combination of assets, skills, networks and institutions and the policies that facilitate communities' continuous evaluation of conditions against current and developing situations. This allows for the implementation of suitable changes to their lives and livelihoods (Levine, Ludi, and Jones, 2011). Building capacity to tackle future uncertainty includes advancing local understanding of trends and their impacts (Pasteur 2011). There is a need to help communities to understand trends such as how climate change influences weather patterns. There is need for communities to enhance their knowledge and access information so that they deal with the uncertain future and develop responses to the developing impacts of climate change (Ensor, 2011). Building capacity to deal with future uncertainty also includes ensuring that they have access to relevant and well-timed information as well as flexibility to experiment and learn (Upton and Ibrahim, 2010).

2.6.2.4 Governance

Governance comprises of private and public, formal and informal organisations, processes and policies that are functioning at local, district, national and at international levels (Ibrahim and Ward, 2012). An enabling environment must be created where individuals can access and have an input on the decision-making process, resources and services (Upton and Ibrahim, 2010). Governance is important in strengthening resilience of people because it regulates how people access resources, technologies, skills. Individual and communities are taught how to protect themselves from hazards, how they can broaden their livelihoods and where they are able to find support to assist them to recover when affected (Pasteur 2011). The policy and institutional context can operate as an enabling environment. This will make it easy for the people to upgrade their livelihoods, minimising their chances of being subjected to hazards and adapting to climate change (Connolly, De Coning, De Carvalho, 2014). To successfully deal with the governance context and the receptiveness of the institutions and policy the following must be included: encouraging decentralised and participatory approaches in decision making and intensifying the links amongst the local, district and the national levels (Upton and Ibrahim, 2010). Governance also encourages integrated livelihood approaches and addresses the fundamental systemic matters that trigger vulnerability (Pasteur, 2011).

2.6.3 Critique of the VR2 framework

The V2R framework is relevant to the study because it clearly states how a community can move out from a vulnerability situation and progress to resilience. The framework can assist the community to develop a drought plan for the community and thus improving the resilience of the community. The framework acknowledges that there are future uncertainties such as climate change that need to be addressed to strengthen the resilience of the community. The emphasis of climate change makes this framework more applicable to the study, the study is focusing on climate change induced disasters, specifically drought. One of the strengths of the framework is it can be applied to a small community or to a nation. However, the shortcomings of the framework are that it is generic, it is not hazard specific and the framework is designed for everyone including men. One of the criticisms of the V2R framework is that the framework is too general, and it requires

many components to be addressed at once, making it difficult to concentrate on matters in detail. To address the drawback of the V2R framework, the research analysed the all the components however, application of Structural Equation Model assisted in identifying the component of the framework that needed more attention and to be addressed first.

2.7 SUMMARY

Frameworks that are linked to resilience, drought and climate change were discussed in this chapter. The V2R framework was adopted in the study. The framework will assist policy makers and practitioners in Zimbabwe to identify, analyse and attend to several issues that communities in Mashonaland Central require to build resilience. The key components of the framework will assist in initiating development programmes that focus on poverty reduction by strengthening livelihoods, adaptive capacity, and disaster preparedness and by addressing governance issues. The framework provides justification of the relationships between the key elements, in addition to ideas for procedures that can be taken in the study area to strengthen resilience. Another advantage of using the V2R is that the framework pays special attention to issues relating to climate change and other long-term trends (economic, socio-political or environmental for example). The following chapter will address issues that are related to drought and climate change and how women are affected by these effects. The strategies that can be employed will also be discussed.

CHAPTER 3: CLIMATE CHANGE, DROUGHT AND RESILIENCE OF WOMEN

3.1 INTRODUCTION

Scholars across the world have attempted to define drought hence, there are various definitions of drought. Several standards and classifications for example, hydrological, metrological, agriculture and socio-economic are used to define drought (Chae, Lee and Um, 2012). Different parts of the world have experienced drought. African countries have been affected by severe droughts, especially countries that are at the horn of Africa and countries in the Southern Africa. Zimbabwe has also experienced droughts that are attributed to climate change. Women as one of the vulnerable groups, they have been affected heavily by the impacts of climate change induced droughts (Neumayer and Plümper, 2007). Various organisations and governments have been working together to find mechanisms to the impacts of drought and to create resilient communities. Organisations have come up with strategies to strengthen the resilience of women to drought (FAO, 2014). Different policies, laws and legislations have been established globally and at national level. All these measures are initiatives to assist women in farming to become more resilient. The first part of the chapter focuses on the definition of drought and the different categories of drought. The impacts of drought on an international scale, in African countries and in Zimbabwe are discussed. The chapter discusses issues on drought and climate change, focusing mainly on the patterns and trends of climate change. Issues on women and climate change, specifically the vulnerability of Zimbabwean and African women to climate change and issues on women and resilience were discussed. Drought management strategies that were applied in other countries and in Zimbabwe are also addressed. The chapter concludes with a discussion on the policies and legislations that promotes resilience building.

3.2.1 Definitions and categories of drought

Droughts are defined according to the specific region; this reflects the variances in climate characteristics with different physical variables and socio-economic variables. Palmer (1968)

defines a drought as an *"interval of time"* which usually takes months and years, during which the supply of moisture in an area diminishes to an extent that the moisture is not climatically expected. UNDP (2008) went on to define drought as a phenomenon that occurs naturally, it occurs when precipitation is recoded below the standard levels, resulting in severe hydrological inequalities that negatively influence the land resources valuable systems. Drought is believed to be a severe diminution in availability of water, this is below the rate of what is being expected (Development Co-operation Report, 2016). Drought has a gradual onset, it does not have a clear start or end, drought can take place over one season or it can take up to several years, as compared to a storm that is more likely to occur over a couple of days (Clark, Mullan and Porteous, 2011).

Drought is defined according to different standards and it is classified into hydrological drought, metrological drought, agriculture drought and socio-ecological drought (Chae at el, 2012). The different categories of drought are highlighted in Figure 3.1 below.

3.2.1.1 Metrological drought

It is calculated by using precipitation or the consecutive days without precipitation for a specified period. Metrological drought is defined as a condition, which results when there is less water than what is required (OECD, 2016).

3.2.1.2 Agriculture drought

It is the insufficiency of soil moisture (generally in the root zone), stressing the accessibility of soil moisture to maintain growth of vegetation. Agriculture because of its dependence on water reservoirs is affected by drought (Castilo, 2009). Agriculture drought is associated with the imbalances that exist in the in-water content of the soil during the growing season. It is influenced by some variables like the water holding capacity, crop water requirement and the degree of evaporation, which depend mainly on rainfall distribution and amount.

3.2.1.3 Hydrological drought

Hydrological drought is determined by assessing the quantity of water resources that are usable such as reservoir, river and underground water by using standard values. The depth and frequency

of hydrological drought is defined in the drainage basin unit scale because of the effects extended through the hydrological system (Lee, 2012).

3.2.1.4 Socio-economic drought

This results from an extreme incident that gives rise to a water deficit that affects the economy, the people and the environment (OECD, 2016). Socio-economic drought relates to the relationship that exist between supply and demand for some economic goods or commodity that relays on precipitation.
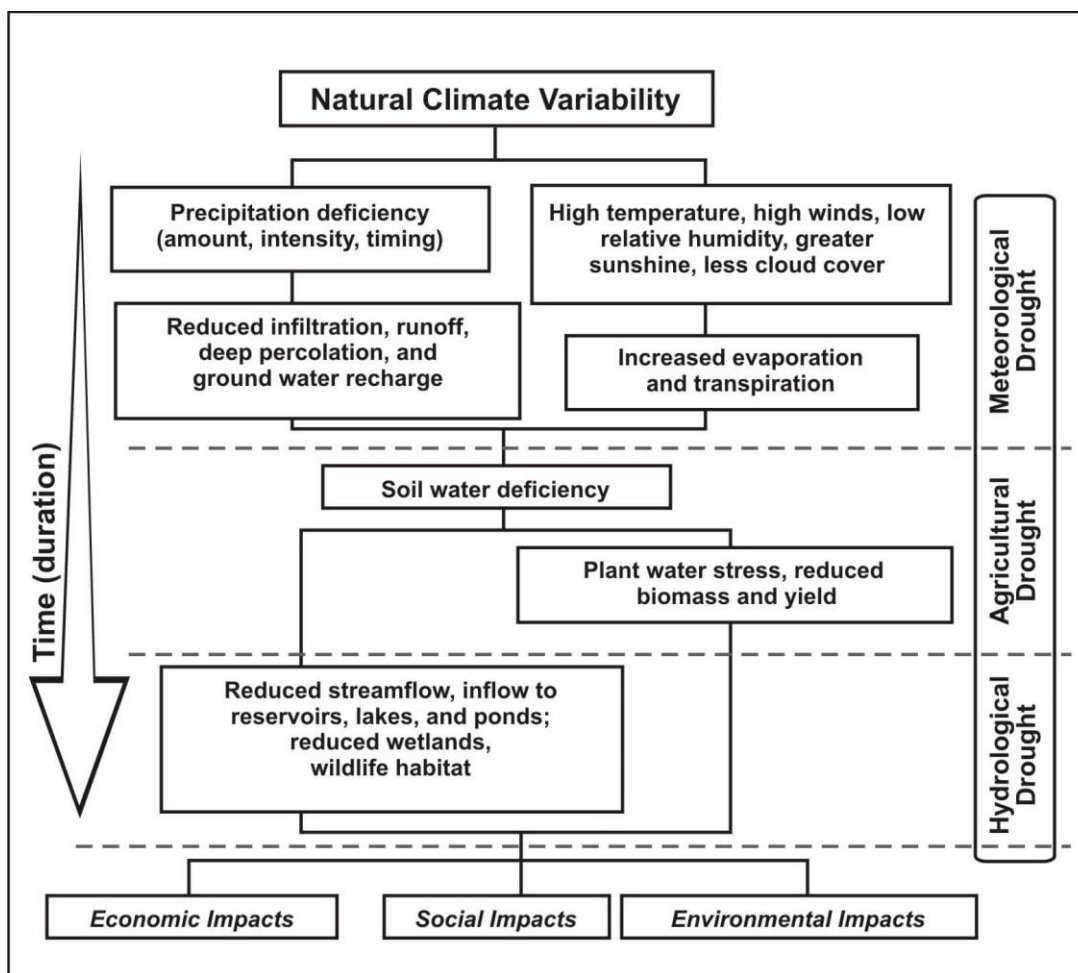
Figure 3.1: Categories of drought
Source: (Hlalele, 2016)

Due to climate change, drought may progress from one type of drought to another, agriculture drought can become hydrological drought, then it can proceed to socio-economic drought that has

a negative impact on economy and the society. Metrological drought takes place when precipitation decrease, this reduces the soil water content and affects the growth of plant and animals such as low production in crops, in this manner triggering agriculture drought (Lee, 2012). This will lead to hydrological drought, which results in the reduction of outflow a river or the reduction in reservoirs. However, the relationship between hydrological drought and metrological drought is not linear (Zammit, 2018). There are factors like land cover, geology and soil that have an influence (Van Loon, Gleeson, Clark, Van Dijk, Stahl, Hannaford and Uijlenhoet, 2016). Finally, it causes socio-economic drought, and it ends up disturbing the local economy and the environment. The impact of drought have been felt across the world and the next section will address the impacts of drought globally.

3.2.2 Impact of drought internationally

Drought has destructive consequences and affects peoples' livelihoods. Drought has negatively affected livestock production and agriculture in Brazil. According to Cunningham, Cunha, Brito, Marengo and Coutinho (2017), the 2013 to 2014 drought in Brazil led to economic losses that added up to US$1.6 billion worth of crops. In Brazil, the drought period from 2012 to 2016 was regarded as the worst period of drought in decades (Bretan and Engel, 2017). According to Marengo, Alves, Alvala, Cunha, Brito and Moraes (2017) from the mid-1990s to 2016, north-eastern parts of Brazil experienced rainfall that was below normal, the water levels in the reservoirs depleted and this led to a water crisis.

Other parts of the world that have been affected by drought are Australia and Asia. There are three common periods of drought experienced in Australia and these were the Federation drought (1895 to 1903), World War II drought (1939 to 45), and the Millennium drought (1997 to 2009) (Freund, Henley, Allen and Baker, 2018). These droughts resulted in a negative impacts on the agriculture sector and the economy of the country. The millennium drought badly affected the south-eastern and south-western Australia and it is said to be the worst drought that was recorded ever since the European settlement (Van Dijk, Beck, Crosbie, De Jeu, Liu, Podger, Timba and Viney, 2013). According to Mosley, Zammit, Leyden, Heneker, Hipsey, Skinner and Aldridge (2012), there was

a very low flow in the lower River Murray in the south of Australia, this lead to the lowest water level in more than 90 years of records.
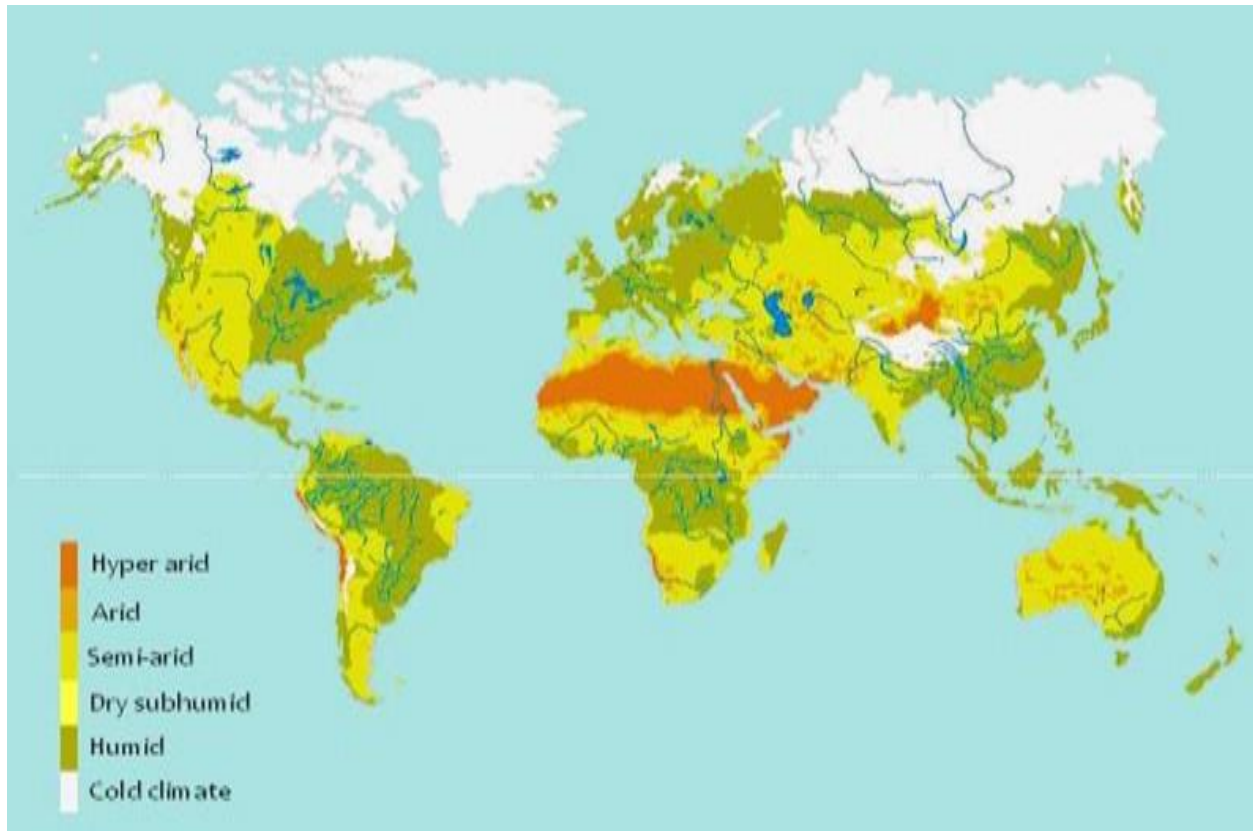
Figure 3.2: Locations prone to drought
Source: (Karim and Rahman, 2015)

Globally, some areas are more likely to be affected by drought and this is attributed to different factors. According to Karim and Rahman (2015) nearly half (47%) of terrestrial surface on earth, equivalent to 6.45 billion hectares consists of dry land and are distributed amongst different sections of the earth. According to Figure 3.2 above, nearly one sixth hectares of the earth land is hyper arid. Almost 70% (5.2 billion hectares) of land that is dry around the world is being utilised for agriculture and there is limited production in areas where crop yield is determined by the type of drought (UNEP, 2017).

Table 3.1: Drought at continental level from 1900 to 2011

		Number of events	Number of people killed	Number of total affected	Damage in US$
Asia	Drought	147	9 663 389	1 666 286 029	31 739 865
	Average per event		65 737	11 335 279	215 917
Africa	Drought	269	844 143	318 936 829	5 419 593
	Average per event		3 138	1 185 639	20 147
Americas	Drought	123	77	65 133 841	20 811 139
	Average per event		1	529 543	169 196
Oceania	Drought	19	660	8 027 635	10 703 000
	Average per event		35	422 507	563 326
Europe	Drought	38	1 200 002	15 482 969	21 461 309
	Average per event		31 579	407 447	564 771

Source: (CRED, 2012)

Table 3.1 above outlines a summary of droughts at continental level from 1900 to 2011. Asia has the highest number of people affected by drought, with more than 9.6 million people killed and the total damages adding up to $31 739 865. From the data presented in Table 3.1 above, Africa has experienced the highest number of drought events, however the damages from drought in Africa were very low as compared to Asia. This is an indication of how Africa is more prone to drought compared to all the continents, however, the impacts of drought in Africa were not as severe as the impacts experienced in Asia.
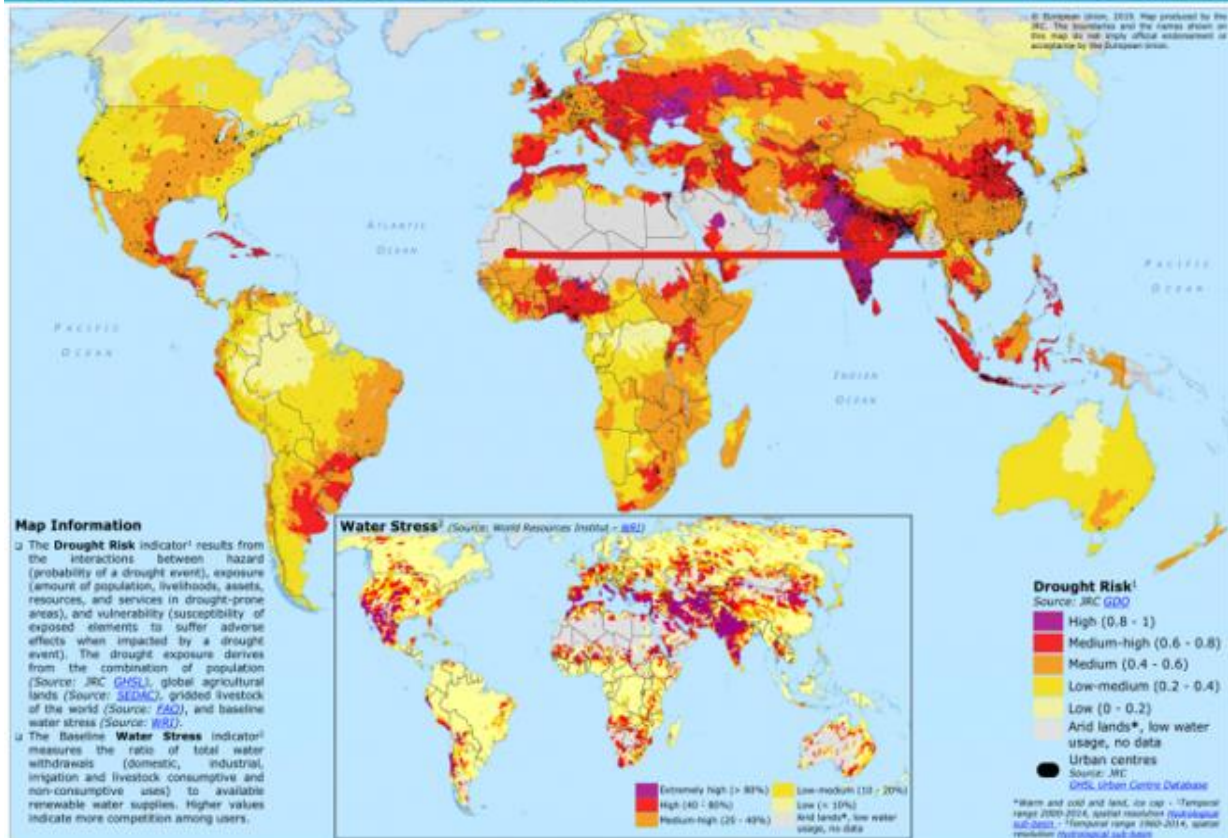
Figure 3.3: Map of areas at risk of water stress and drought
Source: (Emergency Response Coordination Centre (ERCC)-DG ECHO, 2019)

There are several countries that were at risk of experiencing water stress and drought in 2019. Figure 3.3 above shows how nations in different parts of the world experienced different levels of drought risk. Areas that had a high level of drought risk in 2019 include some parts of India, Nigeria, Morocco and Niger. In 2019, Zimbabwe experienced medium level drought risk and some parts of South Africa such as Cape Town experienced medium to high level of drought risk (Emergency Response Coordination Centre (ERCC)-DG ECHO, 2019). Drought and water stress are a threat in many parts of the world especially countries that are underdeveloped and not able to withstand the impact of drought.

3.2.3 Impact of drought in Africa

A great concern on the African continent is the number of drought events experienced on many dry lands in Africa. Africa is reported to have experienced some dry and wet periods since the eighth century (Jordaan, 2012). Countries on the western part of Africa have been affected by drought since the late 1630s. A terrible drought occurred that resulted in the death of many people and dislocation from the states of Sahelian. These severe droughts were experienced in the northern part of Nigeria, Mali and Niger and this was known as the "*great famine*" (Salliot, 2010). In the 1740s and 1750s there was a great drought in this region. A study conducted by Masih, Maskey, Mussa and Trambauer, (2010) revels that severe droughts were experienced in Sahel during the 1910s, 1940s, 1960s, 1970s and 1980s. From 1960 to 1980 there was an intense drought that killed about 100 000 people and left 750 000 people depending on food aid (Jackson School of Geosciences, 2009).

Countries at the horn of Africa that include Somalia, Kenya, Uganda and Ethiopia have been experiencing drought and famine more frequently. In the eastern part of Africa, at least 80 percent of the population are into subsistence farming (Bexter, 2019). In the year 2008, millions of people were facing starvation in the horn of Africa. The combination of three issues, drought, rise of global food prices and a failed harvest resulted in seven million people experiencing hunger in Kenya, Ethiopia and Somalia (Action Aid, 2008). The East African region experienced a drought in 2009, which resulted in the drying up of rivers and scorching of crops, this gave rise to starvation of millions of people in Kenya (Howden, 2009). This region experienced one of the worst droughts of the century in 2011 and about 260,000 people lost their lives (Goldberg, 2019). The 2011 drought experienced in Kenya, Djibouti, Somalia and Ethiopia was recorded to be the worst in 60 years, this drought affected approximately 9.5 million people (UN, 2012).
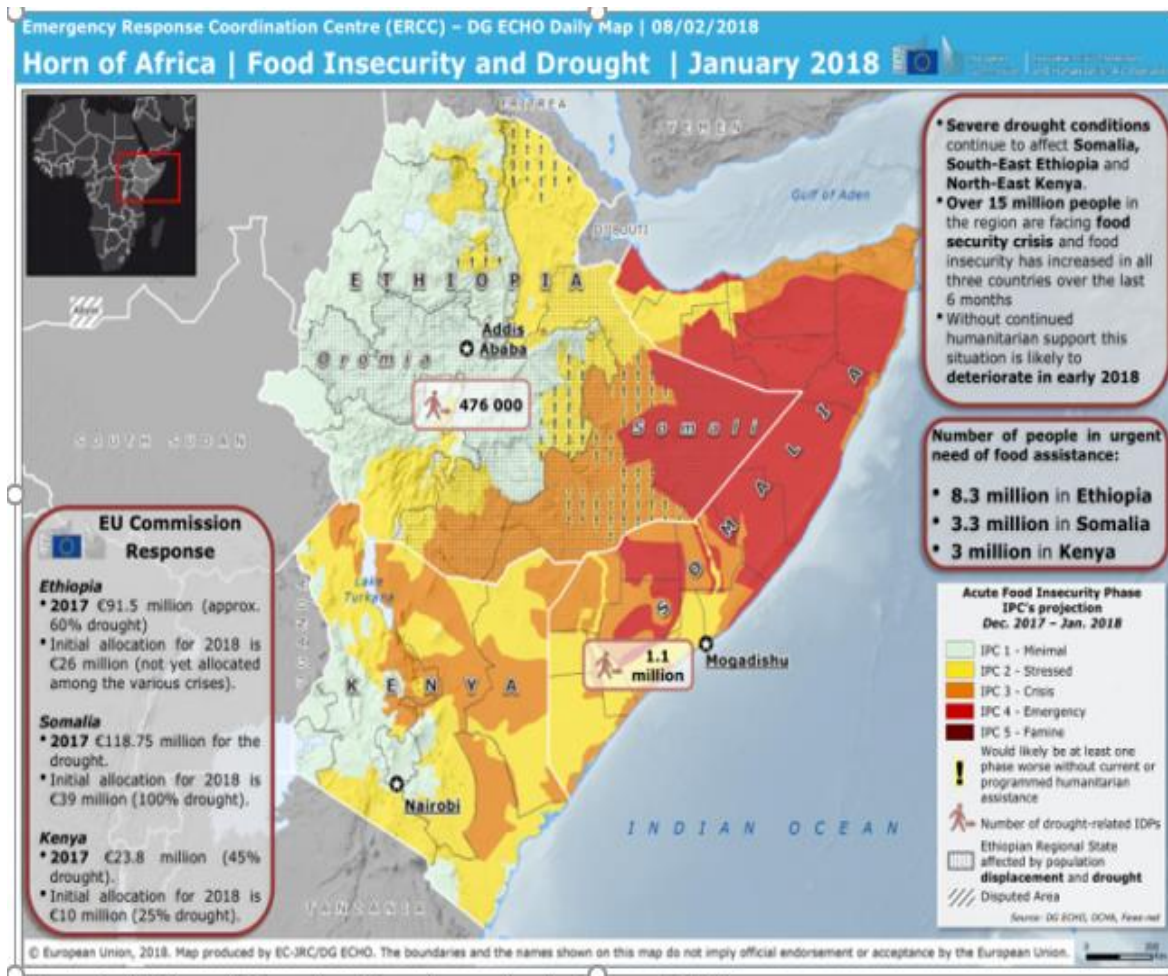
Figure 3.4: Map of drought affected areas in the Horn of Africa
Source: (Emergency Response Coordination Centre, 2018; Relief Web, 2018)

Figure 3.4 above shows the severity of drought conditions that affected South-East Ethiopia, Somalia and North-East Kenya. Nearly 15 million people in this region were facing food security crisis (Relief Web, 2018). Ethiopia has the highest number of people in need of food security (Figure 3.4). Drought in the horn of Africa is a major concern since the area is frequently affected by droughts.

The Southern African region is one of the high-risk drought prone areas, the region has been experiencing severe droughts and this can be attributed to sociological and metrological factors (Emergency Response Coordination Centre, 2019). The region normally receives rainfall around the months of November to March but there are some disruptions such as the El Nino that disturbs

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the annual rainfall patterns (Relief Web, 2018). The region is faced by a low level of economic development and it largely depends on agriculture; this makes the region more susceptible to droughts (Emergency Response Coordination Centre, 2019). According to FAO (2019) farmers in Southern Africa experienced the El Nino conditions for the second time in a period of three years. Some parts of the Southern African region experienced a severe drought during the 2015/ 2016 season, this negatively affected the capability to produce food.

In 1982, Mozambique experienced its worst drought in 50 years and there was an exodus of refugees to neighbouring Zimbabwe, which was also experiencing drought at that time (Masih, Maske, Mussá and Trambauer, 2014). The 1882 drought also affected Botswana, water bodies completely dried up and a lot of livestock was lost, nearly half of the total population relied on emergency food supplies from developed countries (ActionAid, 2008). The 1991/92 drought is considered to be one of the critical droughts on record in Southern Africa, this can be attributed to the extreme reaching impacts that were experienced across all sectors of the society (Mathivha, Tshipala and Nkuna, 2017).

In South Africa, three significant drought periods were observed from 1990 to 2005, in which the country experienced below-normal rainfall. The main drought years in South Africa were 1991/92, 1997/98 and 2001/02 (Austin, 2008). Another drought that affected the region was the 2002 drought, it affected over 13 million people (World Press Revie, 2002). The number of people in Southern Africa who were severely food insecure increased to 1.1 million people in Malawi (Relief Web, 2019). It was estimated that Malawi had 3.3 million people that were experiencing an emergency or crisis (IPC phase 3 and 4). Zimbabwe and two districts in Madagascar were in the emergency category (IPC phase 4) which is the highest phase in terms of severely food insecure people in the Southern African region (OCHA, 2018). There were also some few people experiencing emergency food security (IPC phase 4) in Lesotho, Eswatini and Mozambique.
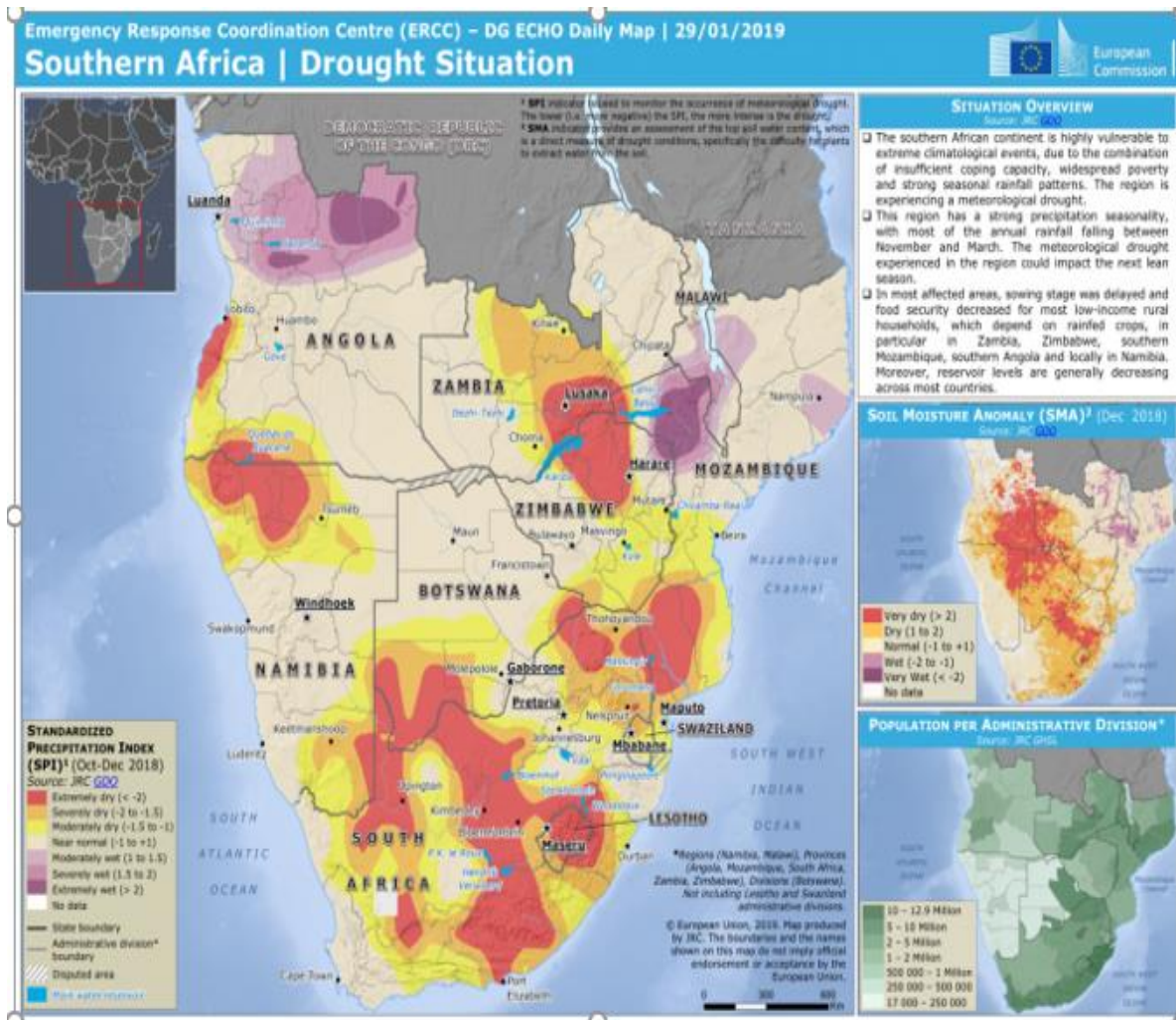
Figure 3.5: Map of areas affected by drought in Southern Africa
Source: (Emergency Response Coordination Centre, 2018; Relief Web, 2018)

Some countries in Southern Africa also experienced another wave of drought during the 2018/ 2019 season. Countries that were most affected include Zimbabwe, Zambia, the southern part of Mozambique, Namibia and Angola (Figure 3.5). Some provinces in South Africa were also affected by the 2018/2019 drought and it was extremely dry in some areas. Table 3.2 below shows the provinces in South Africa that were affected by drought between 2018 and the first quarter of 2019.

Table 3.2: South Africa drought outlook in the first quarter of 2019

Province	Current drought status	Rainfall status	Runoff status	Groundwater status	Dams status	Drought outlook
Eastern Cape	Severe	Very low	Very low	Moderately low	Low	Critical
Gauteng	Stable	Normal	Normal	Moderately high	Moderately high	Stable
Free State	Severe	Very low	Very low	Moderately low	Low	Critical
Limpopo	Moderate	Moderately low	Moderate	Moderately low	Moderate	Condition to worsen (if future rains are insufficient)
Kwa Zulu Natal	Below normal	Moderately low	Low	Moderately low	Low	Condition to worsen (if future rains are insufficient)
Mpumalanga	Moderate	Normal	Normal	Normal	Normal	Stable
North West	Severe	Very low	Very low	Moderately low	Very low	Critical
Northern Cape	Severe	Very low	Very low	Moderately low	Very low	Critical
Western Cape	Below normal	Low	Very low	Moderately low	Low	Condition to worsen (if future rains are insufficient)

Source: (Agri SA, 2019)

The Western Cape province experienced drought for a period of three years (2015 to 2018). The province received less than the average rainfall and the rainfall records show that it was the lowest recorded since the first written records in the 1880s (Wolski, 2018). According to the 2018/ 2019 Agriculture report for South Africa, the provinces that were experiencing critical conditions by the first quarter of 2019 were Northern Cape, North West, Free State and the Eastern Cape (Agri SA, 2019). The report also indicated that Limpopo province, Western Cape Province and Kwa Zulu Natal province more likely to have worsening conditions if there are insufficient rains in the future. While South Africa is experiencing drought, the situation is even worse in Zimbabwe were at least more than two million people are encountering starvation, this is after a severe drought affected food harvests (Chingono and Adebayo, 2019). It has been reported that about 5.5 million people in the rural areas of Zimbabwe are affected by drought during the peak of the hunger season and almost 2.6 million children need humanitarian assistance (UNICEF, 2019).

There are some areas that are more prone to drought than others. African countries experience drought at different levels. Figure 3.6 below shows the number of droughts African countries experienced from the period of 1970 to 2004 (EM-DAT, 2011). It is clear from the data provided in the map below that the countries that are more prone to drought are in the north- central and the east of Africa. The number of droughts that affect countries in the southern part of Africa are relatively high as compared to the countries in the central part of Africa.
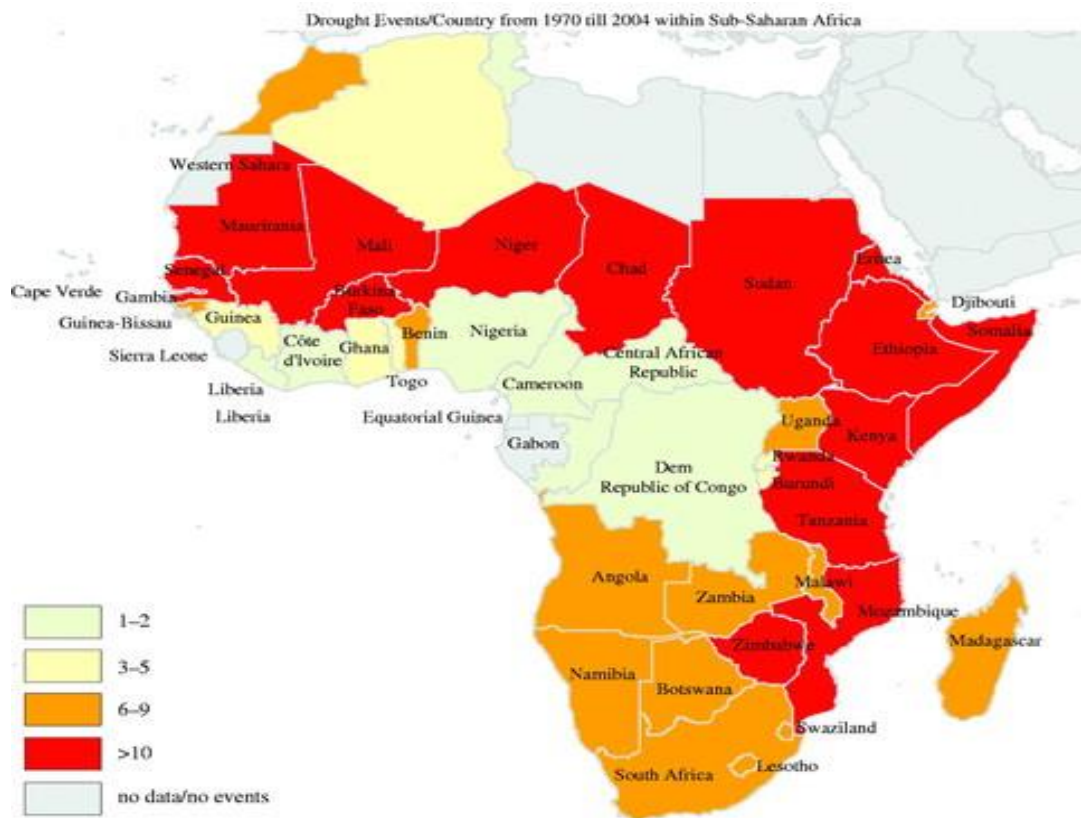
Figure 3.6: Drought events in Arica
Source: (EM-DAT, 2011)

Almost all the countries that are affected by drought are located within the arid and the semi- arid zones of Africa (WMO, UNEP, 2009). Zimbabwe is in the category of countries that have experienced the highest number of droughts (1970 to 2004), with at least 10 droughts (EM-DAT, 2011). Mashonaland Central is one of the provinces in Zimbabwe that has been experiencing drought and is likely to experience more droughts because of the effects of climate change that the

country is exposed to. In Zimbabwe, drought is regarded as a familiar hazard that constitutes six disasters out of ten disasters from 1982 to 2012. Some of the droughts are connected to the El-Nino Southern Oscillations (ENSO) in the Pacific Ocean, (Brown, 2014). According to Brown (2014), drought takes place at least once in every two years nation-wide, affecting more semi-arid regions.

Table 3.3: Top natural hazards in Zimbabwe

Year	Disaster	Number of people affected
1982	Drought	700 000
1991	Drought	5 000 000
1996	Epidemics	500 000
1998	Drought	55 000
2000	Cyclone induced floods	266 000
2001	Drought	6 000 000
2007	Drought	2 100 000
2008	Epidemic	98 349
2010	Drought	1 680 000

Source: (Centre for Research on the Epidemiology of Disasters (CRED), 2012)

The drought years, occurred at various intensities and severities, but the effects of the droughts were overwhelming as shown in Table 3.3 above. between 200 000 to a million individuals were disturbed every time drought affected the country. The severities of droughts in the nation were categorised as mild, extreme or severe. The worst droughts transpired in 1982 and 1983, and the terrible drought years took place in 1968, 1973, 1982 and 2004, the mild drought years occurred in 1951, 1960, 1964, 1965, 1970, 1984, 1987, 1991, 1995, 2002, 2003, 2005 , 2007, 2008, 2009, and 2010 (Drought Monitoring Centre, 2012).

3.3 DROUGHT AND CLIMATE CHANGE

Climate change involves change that is related directly or indirectly to some human action, that changes the components of global atmosphere and the natural climate variability detected over comparable periods . Climate change is a progression that is expressed in so many ways, including a rise in the average temperatures, variations in rainfall that leads to droughts, floods and in some cases, leading to desertification (Alam, Bhatia and Mawby, 2015). The warmer temperatures experienced due to climate change increases evaporation in plant soils, which also affect the plant life and decreases rainfall even more (Climate Reality Project, 2016). Climate change has affected

the rate of drought risk in most parts of the world. Over the previous decade, several studies were published about climate change and issues related to drought. Even though droughts have several causes depending on the section of the world and some natural factors, many scientists have associated more extreme droughts with climate change.

3.3.1 The patterns and trends of climate change

Climate Reality Project (2016) suggested that the increase in greenhouse gas emissions causes air temperatures to intensify and more moisture to evaporate from the land and rivers, lakes and other water bodies. The impacts of climate change affect the natural and the human systems, it depends on adaptability and one can make a distinction between the potential impacts and the residual impacts (IPCC, 2007).

Even though droughts can have various causes and it also it depends on the area of the globe as well as other natural factors, several scientists have linked more extreme droughts to climate change. This is because there is a lot of greenhouse gas emissions which are discharged into the air, and this causes an increase in air temperatures, a lot of moisture evaporates from lakes and land, rivers and other water bodies (IPPC, 2007). Table 3.4 below illustrates how climate change has influenced different regions in the world. Africa and Latin America have the highest rate of drought or water shortages (Spring, 2015). Climate change has been causing global drought risk for more than a century. Research on tree ring records has been carried out to establish the magnitude of human cause of climate change. The researchers used "fingerprinting" technique to observe the phenomenon. The scientists compared the rings of a tree and meteorological records to model the simulations of the climate from the year 1900 to 2100 (Dunne, 2019). The researchers concluded climate change is influenced by humans.

Table 3.4: Climate change effects per region

	Water shortages due to drought (percentage)	Severe weather like massive storms and floods (percentage)	A long period of remarkable weather (percentage)	Sea level rising (percentage)
Africa	59	18	16	3
Asia/Pacific	41	34	13	6
Europe	35	27	8	15
Latin America	59	21	12	5
Middle East	38	24	19	5
US	50	16	11	17
Global	44	25	14	6

Source: (Spring, 2015) Global concerns about climate change

There has been record-breaking intense weather witnessed in Africa and other parts of the world since 2016. The summer of 2015 and 2016 was coupled by the worst El Niño event ever recorded (Baraki, 2019). The warmest year to be recorded in history was 2015. This period of extraordinary high global temperature is attributed to systematic global warming under the heightened greenhouse effects, which combine with the natural variability in the form of extreme El Niño episodes. To prove that climate change has a great effect in African countries, the interior of Africa recorded an average monthly temperature of 5 °C beyond the monthly average atmospheric temperatures (Engelbrecht et al., 2016). The Southern African region is anticipated to become drier under the heightened anthropogenic forcing, leading to a rise in dry spells and droughts (Christensen et al., 2007 and Engelbrecht et al., 2009). East Africa and the tropical region of Africa are anticipated to turn out to be generally wetter (Christensen et al., 2007; Engelbrecht et al., 2009; James and Washington, 2013; Baraki, 2019).
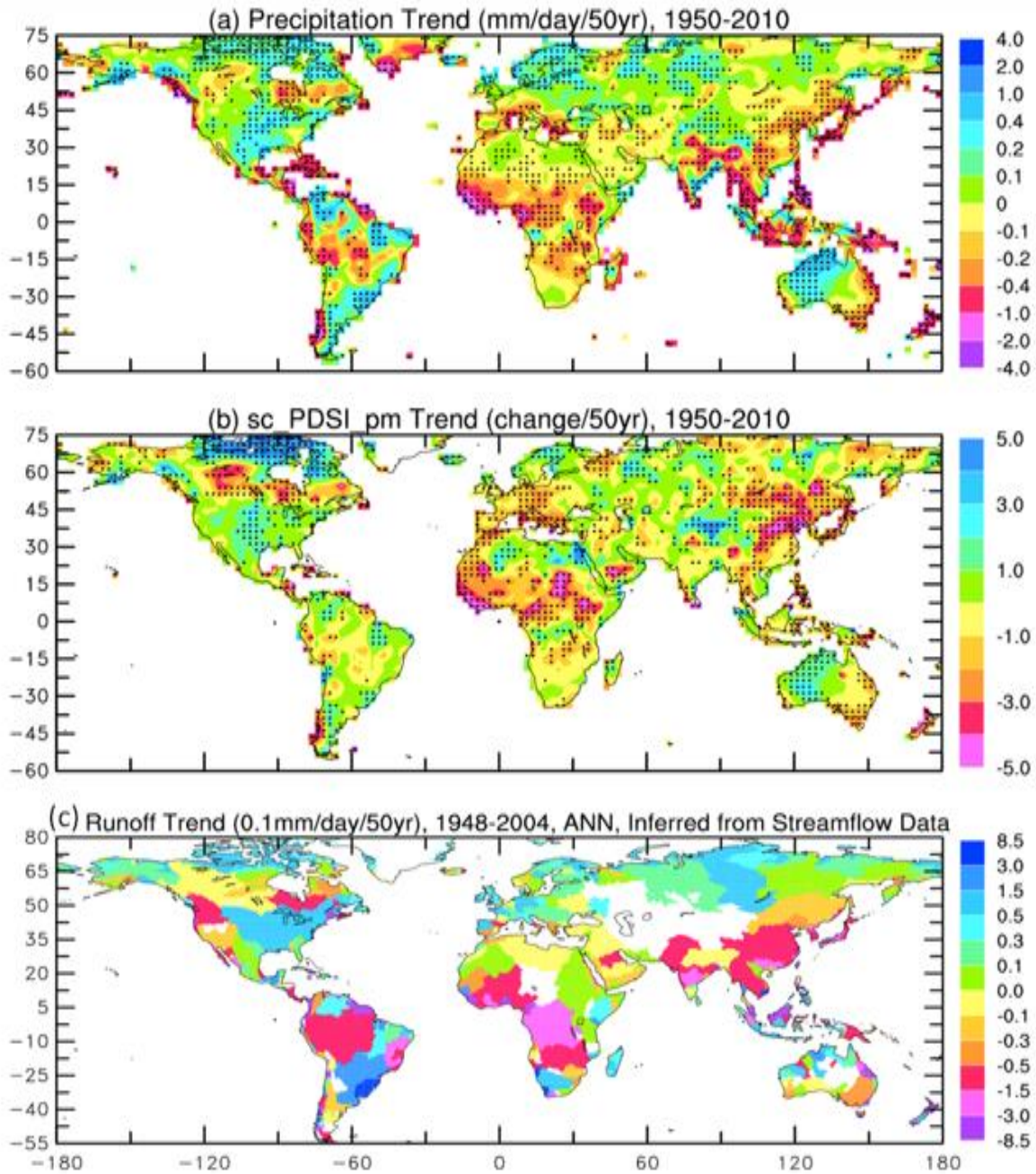
Figure 3.7: Map showing changes in climate over 50 years
Source: (Dai, 2014)

Figure 3.7 above illustrate the linear trends in (a) observed precipitation trends (b) calculated self-calibrated (PDSI) with Penman-Monteith possible evapotranspiration for the period of 1950 to 2010 (Dai, 2013; Nature Climate Change), (c) detected river runoff from 1948 to 2004 (Dai et al.,

2009). The major impacts of human induced climate change in the future decades are expected to come from a great percentage variation in climate extremes and weather. The extreme events are expected to change at a faster rate than the mean climate.

Significant drying trends might have previously transpired ever since the 1950s in many regions such as most of Africa, East and South Asia, eastern Australia, Southern Europe, and parts of Central and South America. Historical records of the stream flow, precipitation as well as drought index (Figure 3.7) illustrate this. The rising of temperature ever since the end of the 1970s has heightened dryness around many regions. Even though natural, decadal precipitation variations might have contributed significantly to the past drying trends in some regions such as South Asia, eastern Australia and USA (Dai, 2011).

During the 4th Assessment Reports of the IPCC (Alley et al., 2007) a summary of the observed variations in the hydro climatological variables was delivered. Records of global surface temperatures indicate that the period from 1995 to 2006 is classified amongst the twelve warmest years ever to be recorded in the last 150 years. Extensive variations in extreme temperatures were observed for a period of 50 years and it has been discovered that colder conditions are becoming less frequent, whereas heat waves and hot days are more frequent (IPCC, 2007). Extreme and longer droughts were witnessed over extensive regions ever since the 1970s, especially in the subtropics and the tropics (Van Lanen, Tallaksen, Rees, 2014). These droughts have been associated with a decrease in precipitation and higher temperatures. Droughts have worsened in some areas because of an increase in water demand. Global warming might also lead to a system modification in some certain regions that experience ice and snow, where these higher temperatures results in earlier melting of snow as well as extensive growing season. This kind of trend confirms observations that shows that the commencement of the growing season in the mid-latitudes has evidently advanced ever since 1989 (Chmielewski and Rötzer, 2002). Accordingly, this is likely to result in an increase in the severity and frequency of summer drought in these areas. Figure 3.8 shows the increase in temperature that has been experienced in each continent. The dramatic escalation of temperature ever since the 1990s is an indication that there is need to be concerned about climate change (IPCC, 2007).
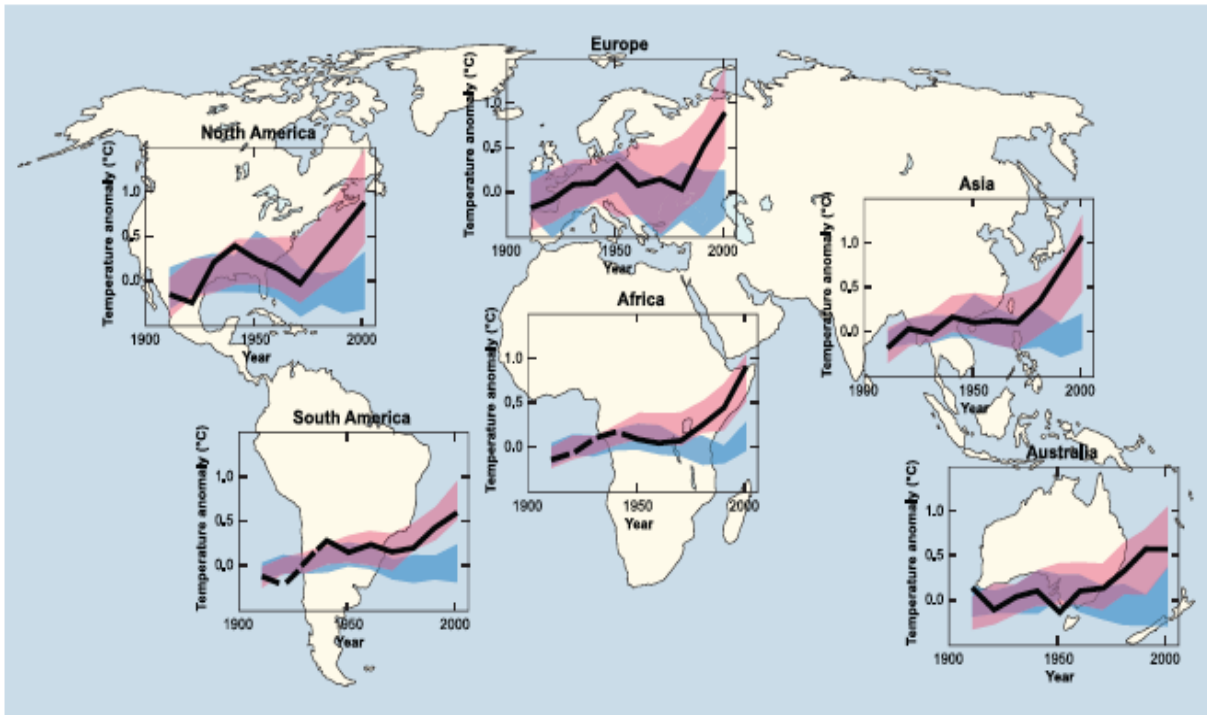
Figure 3.8: Changes in temperature at continental level
Source: (IPCC, 2007)

Summary of the IPCC report on global warming

Very high confidence:

- Timing early spring events such as bird migration and laying of eggs, leaf unfolding, poleward changes in animal species and plants.
- Distinct effects on biological and physical systems.
- Intensified run-off as well as earlier spring peak discharges in the snow-fed rivers and glacier.
- Natural systems that are linked to snow, frozen ground and ice are affected.
- Warming of rivers and lakes has a negative influence on the quality of water and thermal structure.

High confidence

- Changes in salinity, ice cover, circulation in the water system and oxygen level.

- Changes in ranges as well as the migration of fish in rivers.

- In spring, the vegetation turning green earlier is associated with a longer growing season.

- Changes in algae, fish and plankton and shifts in ranges as well as fish abundance in the oceans that are in the northern hemisphere.

- Changes in the marine biological systems and changes in freshwater.

Medium confidence

- Have an impact on humans' activities in the Artic.

- Changes developing in some parts of human health.

- Impact on human activities and development due to the sea level rise in regions with low altitude.

- Changes in forest management and agriculture such as planting spring crops beforehand in the northern hemisphere.

There are some uncertainties that the IPCC encountered in the climate change projections. The South African Weather Services (SAWS) (2013) agrees with the IPCC on uncertainties of the future values of precipitation in Southern Africa. However, Engelbrecht, McGregor and Engelbrecht (2008) applied the Conformal- Cubic Atmospheric model (CCAM), they came up with some prediction which indicated less precipitation in the western regions of South Africa. It is expected that in South Africa, temperatures will be higher (2-4 degrees more), this will affect agriculture and the ecosystem. Below are some of the changes expected in South Africa (SAWS, 2003; DEAT, 2009: Hewitson, 2010).

- More temperature inversion.

- The western part of South Africa will experience dryness.

- Regions in the east coast will be expected to become wetter.

- More drought and floods in the country.

- An increase in the entire country air temperature to about 3 to 4 degree.

Climate change and upcoming droughts enhancements in knowledge have strengthened the outcomes of the IPCC fourth assessment report, (IPCC, 2007) particularly intensifying risk of

abrupt, rapid and irreversible change as well as higher levels of warming. Such risks comprise increase in intensity of aridity, drought as well as extreme temperatures in so many areas of the globe (World Bank, 2012). Regardless of the uncertainties in the climate projections, several areas in the world are more likely to be subjected to an increase in drought frequencies and/or intensity in the 21st century. Countries that are likely to be affected are those in the Southern part of Africa, Central America, Mediterranean and South-Western North America (Orlowsky and Seneviratne, 2012). An increase in temperature of 3°C is expected to bring about existing 100-year droughts to about 30 percent of the highlighted areas on a 10-year basis (Naumann, Alfieri, Wyser, Mentaschi, Betts, Carrao, Spinoni, Vogt and Feyen, 2018). These kinds of scenarios propose that drought risk will likely increase for several regions and vulnerable sectors unless proper climate change adaptation and mitigation measures are taken.

The IPCC fifth assessment report indicated that there are going to be uneven changes in precipitation, areas that are in the equatorial Pacific and high latitudes are expected to be subjected to an escalation in annual mean precipitation (IPCC 2014). In several subtropical and mid-latitude dry areas, the mean precipitation is expected to decrease, whereas in various mid-latitude wet areas, the mean precipitation is expected to increase (Coast Adapt, 2017). Extreme precipitation events over the wet tropical regions and most of the mid-latitude land masses has a great chance to become more frequent and more severe (IPCC, 2014). Figure 3.9 below shows the changes in the average precipitation (1986 -2005 to 2081-2100). According to the IPCC projections, areas in the Southern part of Africa including Zimbabwe are likely to experience more droughts.
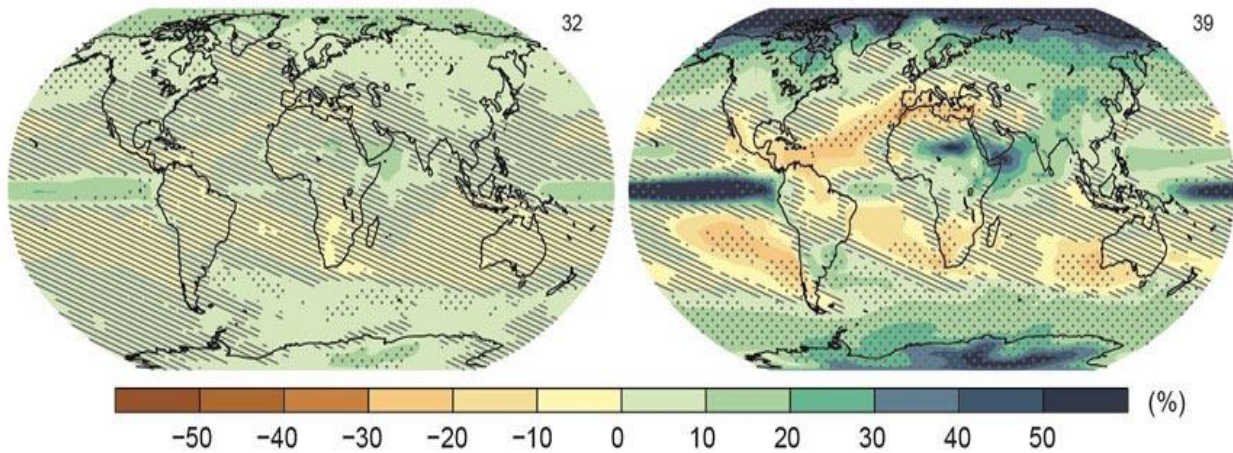
Figure 3.9: changes in the average precipitation (1986- 2005 to 2081- 2100)
Source: (IPCC, 2014)

Future climate will be determined by continued warming that is due to previous anthropogenic emissions, in addition to future anthropogenic emissions as well as natural climate variability (Coast Adapt, 2017). Figure 3.10 below shows the changes in the average surface temperature. Mean surface temperature change for the globe during 2016 to 2035 relative to 1986 to 2005 is the same for the four RCPs and is expected to be in the range of 0.3°C to 0.7°C (medium confidence) (IPCC 2014). By mid-21st century, the magnitude of anticipated climate change is substantively influenced by the selection of emissions scenario.
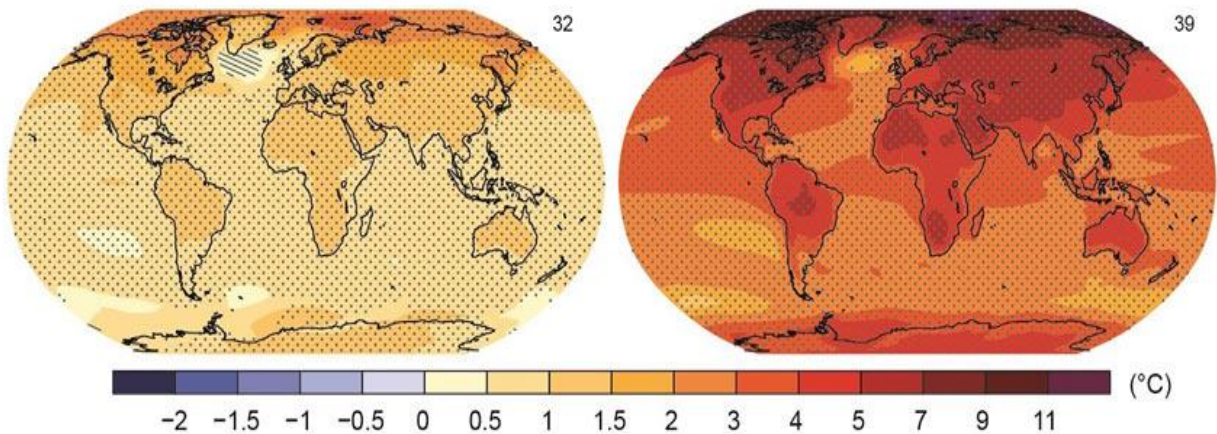
Figure 3.10: Changes in the average surface temperature (1986-2005 to 2081-2100)
Source: (IPCC, 2014)

The following are IPCC summary of the impacts of global warming of 1.5°C (IPCC, 2018)

- Human activities are projected to have triggered around 1.0°C of global warming beyond the pre-industrial levels, with a possible range of 0.8°C to 1.2°C. Global warming is expected to reach 1.5°C between 2030 and 2052 there is a continuous increase in the current rate (high confidence).

- Climate models anticipate vigorous changes in regional climate characteristics amongst present-day, global warming of 1.5°C, and between 1.5°C and 2°C. The dissimilarities consist of increases in: the mean temperature in most ocean and land regions (high confidence), hot extremes in several occupied regions (high confidence), intense precipitation in most areas (medium confidence), and also the possibility of drought and precipitation deficits in several regions (medium confidence).
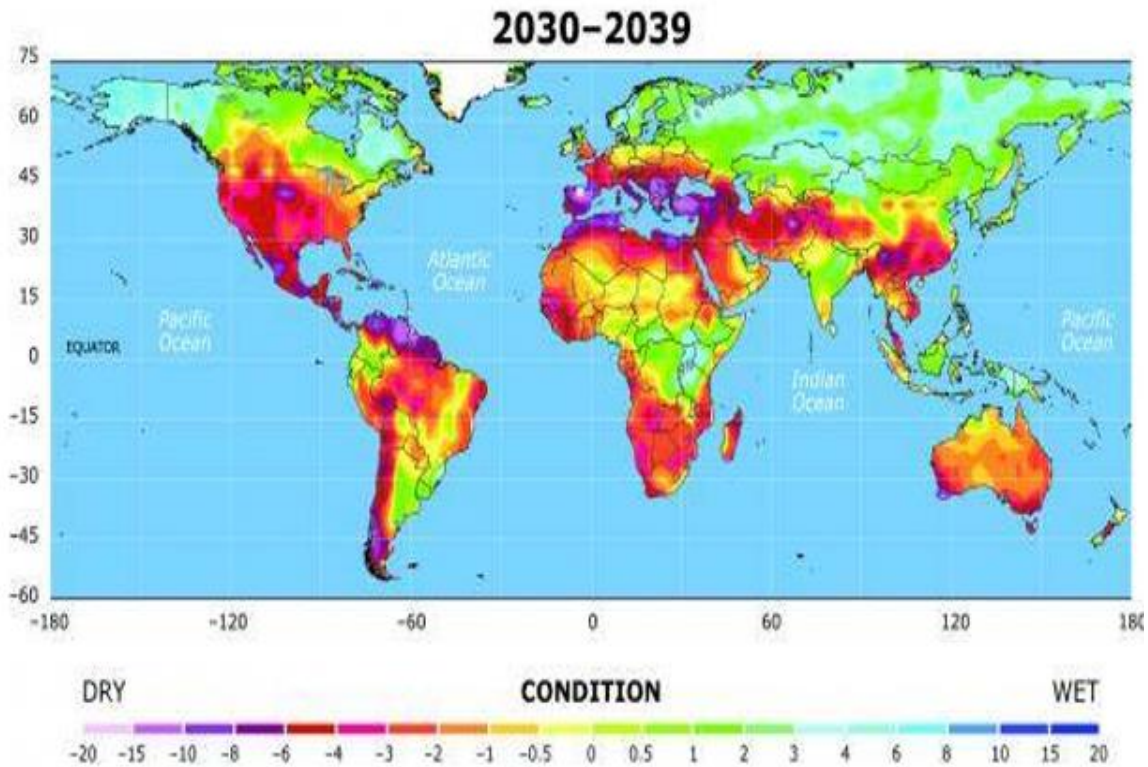
Figure 3.11: Map showing projected drought risk areas on the globe
Source: (NBC NEWS, 2010)

To understand the intensity of severe the droughts, scientists use the Palmer Drought Severity Index (PDSI). A positive score indicates that it is wet, a negative score indicates that it is dry and then a score of zero is neither excessively dry nor wet. The Sahel region in West Africa drought,

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recorded a PDSI of -3 or -4 in the 1970s, this was the most severe drought recorded (UNDRR, 2019). Figure 3.11 demonstrates the potential of experiencing drought by 2039, according to the data on the current predictions of future emissions of greenhouse gases. If the scale has, a reading of -4 or less, it is regarded as extreme drought. Regions that have green or blue are at lower risk, whereas those regions in the purple and red spectrum are likely to experience extreme drought (NBC NEWS, 2010).

The study conducted by the National Centre for Atmospheric Research in 2010 suggested that there are going to be serious impacts as we approach the 2030s. By the end of the century, the impact of drought is projected to go beyond what was historically recorded and the consequences for people across the globe will be enormous as indicated by Figure 3.12 below. As atmospheric carbon dioxide and some greenhouse gases will continue to increase, the impact of global warming will likely to turn out to be progressively more dominant over natural variations in the future decades (Dai, 2014). The changes in the mean shift can lead to higher increases for example projections are expected to double by the 2090s in the global drought regions, as shown by Figure 3.10.
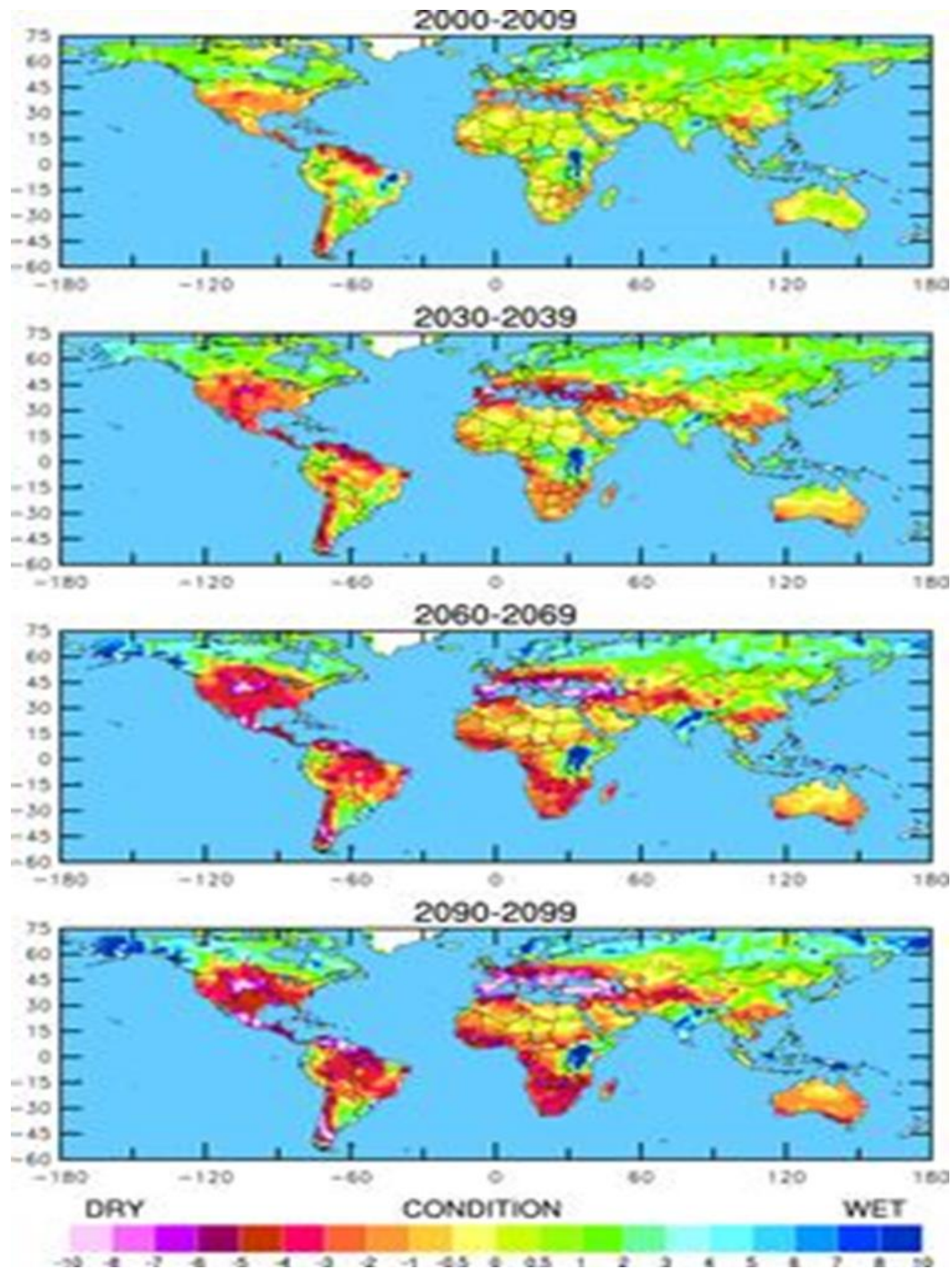
Figure 3.12: Map showing the projection of drought up to the end to century
Source: (National Centre for Atmospheric Research, 2010)

Apart from socio-economic characteristics and soil, temperature and rainfall generally account for national variations in rain-fed African agriculture (Kurukulasuriya and Mendelsohn, 2008).

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Zimbabwe is experiencing the impacts of climate change, there are many changes that are being experienced in this Southern African country. Some of the changes include raising temperatures and a decrease in precipitation in most parts of the country. Projections on the future of climate change were carried out using 10 out of 21 accessible Global Climate Models (GCMs) that were applied in the IPCC Fourth Assessment Report. They proposed potential impacts related to those changes. Future climate projections suggested that Zimbabwe would experience an increase in temperature of around 2.5°C by 2050 (Table 3.5).

Table 3.5: Climate projections

Climate feature	Key messages
Past climate variability	High variability, frequent drought years and flood events
Past climate trends	Increasing temperatures (~0.1°C/decade) No conclusive changes in precipitation
Future climate trends	Increasing temperatures of around 2.5°C by the 2050s Possible decrease in rainfall particularly during the onset stage of the rainy season (Sep- Nov)

Source: (Taylor, 2012)

Based on the historical climate conditions along with recent trends, the mean annual temperature of Zimbabwe has increased by 0.01 to 0.02°C per year from 1950 to 2002 (USAID, 2015). The Meteorological service of Zimbabwe revealed that the minimum daily temperature has escalated by around 2.6°C in the last century. At the same time, there was an increase in the daily maximum temperatures. These increased by 2°C in that period, while the number of cold days has reduced and hotter days have increased (Brown, Chanakira, Chatiza, Dhliwayo, Dodman, Masiiwa, Muchadenyika, Mugabe and Zvigadza, 2012). An increase in intensity in hot days and nights, as well as a decrease in cold days and nights in decades is the same as with the universal warming trend.

Table 3.6: Temperature projections for Zimbabwe

Projection	Possible Impacts	Confidence of the projection
2 to 2.75º C temperature increase by the middle of the century (the period 2046-2065)	Changes in forest biomes Diminished quality and supply of water Changes in crop yield Melting of tar on roads	High confidence

Source: (Taylor, 2012)

Taylor (2012) concluded that there is a high confidence level of agreement concerning the predictions of temperature generated by various Global climate models. The projected changes of temperature in Zimbabwe range from 2°C to 2.75°C and the temperatures are likely to raise between the year 2046 to 2026 (Table 3.6). The western side of the country is expected to have greater changes in temperature (Taylor, 2012).

Rainfall patterns in Zimbabwe were disturbed by climate change. The rainy season, that usually commences from the middle of November and ending by April has changed and in the current years, it begins in December and gradually becoming uncertain (Manyeruke, Hamauswa, Mhandara, 2013). The overall rainfall in the Southern African country has declined by 5% since 1901 and the country experienced the driest seasons in the 1990s (Manjengwa, Matema, Mataruka, Tirivanhu, Tamanikwa and Feresu, 2014). The timing and the amount of rainfall in the country is becoming more uncertain. The frequency as well as the length of dry spells has escalated even though raining days have reduced (Manjengwa et al., 2014). Figure 3.13 below indicates that rainfall is decreasing, meaning the country is more likely to be subjected to below normal rainfall for several seasons as contrasted to previous decades.
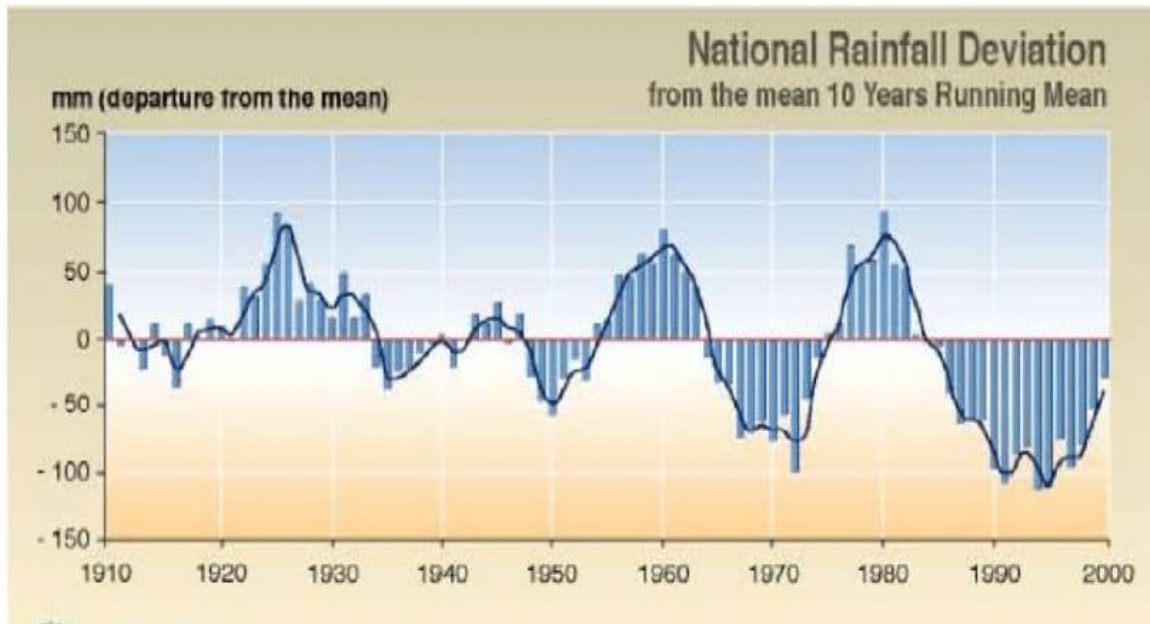
Figure 3.13: Zimbabwe rainfall deviation
Source: (Zimbabwe Department of Metrological Service, 2002)

The rainy season of 2007 to 2008, turned out to be different from other seasons in the past, there were heavy rainfall between November and December, and this broke the records and this was followed by a drought in the course of the last part of the rainy season (Jan to April). This is an indication that the rainfall seasons have become uncertain, unusual and unpredictable as they are characterised by floods, droughts and dry spells (Taylor, 2012).
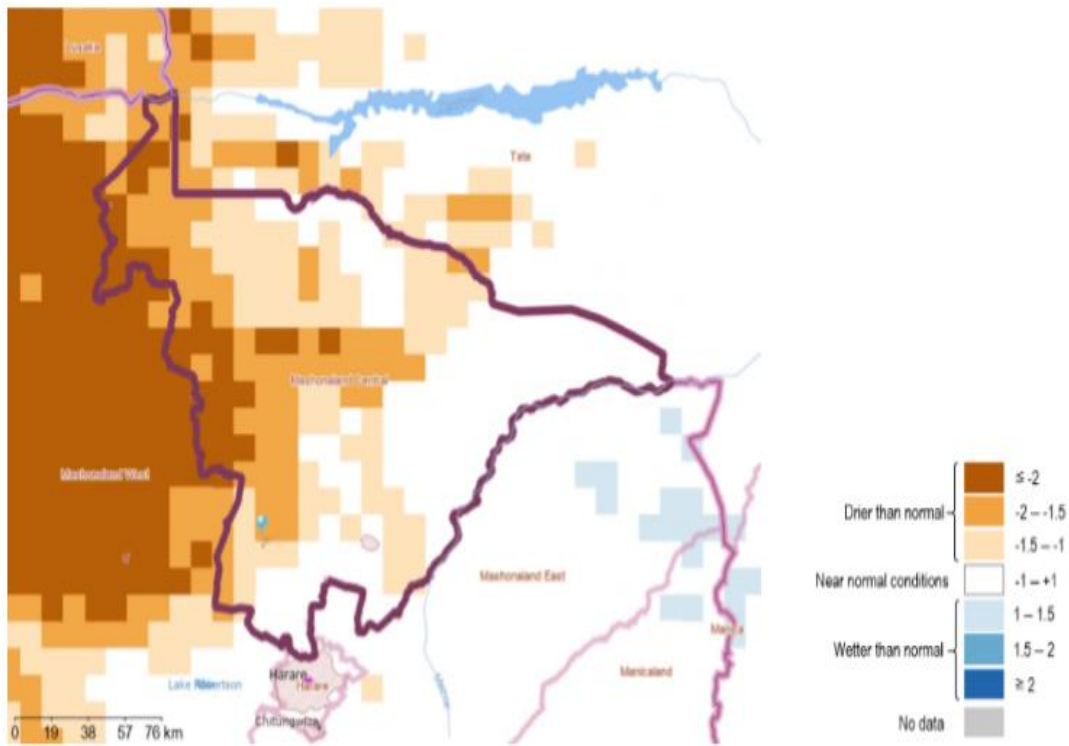
Figure 3.14: Map showing soil moisture anomaly in Mashonaland Central
Source: (Global Drought Observatory (GDO) Analytical report, 2019)

Soil moisture anomaly is one of the indicators and is used to carry out the assessment of topsoil water content. It is a direct measure of drought situations, especially when plants find it difficult to obtain water from the soil (Global Drought Observatory (GDO) Analytical report, 2019). Figure 3.14 above shows the soil moisture content in Mashonaland Central province. Areas shaded in dark brown shows that the soil moisture was very low, and these areas include some parts of Guruve district and Mazabani district. Some parts Mt Darwin district, Bindura district and Mazoe district indicated that the areas were drier than normal. In the whole province of Mashonaland Central between March and April 2019, there was no area which was wetter than normal. This is an indication that the area experienced a drought since these results were taken at the end of the rainy season (Taylor, 2012).

Table 3.7: Rainfall projections for Zimbabwe

Projection	Possible Impacts	Confidence of the projection
Decrease in early season rainfall in Sept to Nov and later onset of Dec-Jan rainy season is expected by the middle of the century (the period 2046-2065)	Changing crop patterns Increased erosion loss of soil water retention Wells and boreholes dry up Decreased water availability leads to poor sanitation and is associated health impacts Disruption to hydroelectric power	Low confidence

Source: (Taylor, 2012)

The rainfall projections (Table 3.7) shows that there is a slight agreement and that mean there is low confidence in the information that was presented. Several models have projected an increase in rainfall in the rain season around December to February, whereas other models indicated some drier conditions (Taylor, 2012). The pattern which shows some uniformity is a reduction in early season rainfall between the months of September to November, this is an indication that there is a later commencement of the rainy season in the future.

3.4 WOMEN AND CLIMATE CHANGE

When a drought strikes, poor communities are affected first. Since women are part of the estimated 70 percent of individuals who are living under the poverty line, women are highly likely to endure the viscous burdens (Oxfarm, 2018). In most cases, women are left out when there is a conversation regarding adapting to climate change, though they sometimes provide the best solutions. The differentiations in responsibilities and roles of women and men in farm households tend to affect their capability to adapt to climate change and the choices of adaptation strategies. On the other hand, governments, NGOs and development agencies usually do not have enough information desired to accelerate gender-sensitive adaptation to climate change (Kristjanson, Bernier, Bryan, Brngler, Dick and Ampaire, 2015). Women are not equally represented in decision-making or policymaking and programmatic design. Across the globe, women are side-lined from economic

and political power and they possess inadequate access to material and financial resources, this worsens their vulnerability to the impacts of climate change (Alam, Bhatia, and Mawby, 2015).

Women are more likely to be affected to by the impacts of climate change as compared to their male counterparts (Kristjanson et al., 2015). Climate change affects women since they are the main crop producers. In many poor societies, women are involved in dual roles, they provide for their families by working on the farms and they are expected to take care of their children and do some house chores. Because they bear all these responsibilities, women often possess invaluable knowledge regarding adapting to unpredictable environmental changes. On the other hand, socially constructed tasks and their responsibilities generally disadvantage them, when it comes to preparing for climate change (Oxfarm, 2008).

The United Nations Development Programme (2009) reported that women constitute 43 percent of the overall agriculture workforce in the world. Most women are involved in farming and most of the women farmers produce almost 90 percent of the food supply in Africa (Food and Agriculture Organisation, 2014). Most of the women are subsistence farmers with a few commercial farmers because most of the women do not own land. This restricts them from accessing resources such as market, finance, water and government facilities. The risks women face because of climate change lead to income and food insecurity and restrained decision-making capabilities result in undesirable impacts on the health of women. By not addressing the challenges women face in climate change policy this jeopardises the global food security (Maass Wolfenson, 2013). Women are directly affected by the impacts of climate change, therefore if their issues are not addressed then the agriculture sector will suffer a great loss because they will not be able to produce crops as before.

For some of the women who have survived the impacts of droughts and other climate change associated events, the ability to adjust to the new conditions might be very challenging. Women usually do not have legal assets as well as rights to property, this leaves them with few resources to re-establish their lives (Neumayer and Plümper, 2007). The scarcity of livelihood means women preside over households lacking the social stature or the material resources. Climate change exhibits in different ways. Some are rapid-onset events that may result in destruction of lives,

property and livelihoods in a day, others are slow-onset developments change to the surroundings over a period (Alam, Bhatia and Mawby, 2015). Customs and discriminatory laws hinder women from acquiring land, retaining land and some assets. Therefore, it will be difficult for women farmers to succeed in farming because of climate change and other general discriminatory issues that they are subjected to.

The 2030 Agenda incorporates 17 SDGs, 169 targets and a declaration version pronouncing the principles of incorporation, universality, transformation and a global corporation. The agenda was established over unique global procedures of an open working group that jointly established the 17 SDGs, which were successively adopted by every UN member states (Beisheim, 2015). The 2030 Agenda reveals the significance of climate change adaptation and mitigation for global sustainable development (Dzebo, Janetschek, Brandi and Iacobuta, 2019). Goal 13 of the sustainable development goals requires the countries to make urgent actions to fight climate change and the associated impacts. The goal emphasised on strengthening resilience and adaptive capacity to hazards that are climate related and natural disasters in all nations. The goal also laid emphasis on issues on improving education, raising awareness and institutional and human capacity on climate change adaptation, mitigation, early warning and impact reduction (UN, 2015).

Women have a crucial part to play in every SDG, most of the targets specifically distinguish women's equality and empowerment as objective, and part of the solution (UN Women, 2018). Goal 5 is regarded as a stand-alone gender goal since it is set aside to accomplish these ends. The goal emphasises the end of discrimination towards all women, women are encouraged to participate effectively and there must be equal opportunities for leadership position. There must be reforms for women, there is need to offer women equal rights to economic resources, in addition to access to ownership of land and other types of property, inheritance, financial services and natural resources, in agreement with the national laws (UN, 2015). The most vulnerable individuals are generally at risk from climate change, including poor women. For these women, the impacts are already a daily reality. Women can offer constructive information regarding effective handling of climate and associated risks (UN Women, 2018).

After the Sendai Framework for Disaster Risk Reduction, there was need to discuss the proceedings, therefore the Cancum agreement was initiated. The platform discussed issues on gender-sensitive and inclusive disaster risk reduction. They identified that there were strong persistent gender disparities in disaster risk reduction and calls to recognise and encourage women leadership, empowerment and engagement in decision-making, implementing and monitoring of gender sensitive (UNDRR, 2017). There was also emphasis on providing sufficient capacity building and education to permit women transformative responsibility as agents for change in disaster risk management. There were also requests for women in leadership positions in the private and public sectors at national and local levels to stand-in for gender equality in disaster risk management (UNDRR, 2017).

Countries decided to implement the Paris Agreement under the United Nations Framework Convention on Climate Change. The Paris Agreement acknowledges the necessity for an efficient and progressive reaction to the critical danger of climate change based on existing scientific knowledge (UN, 2015). The agreement recognises that climate change is a common concern for people. Actions should be taken to address climate change, promote, respect and consider obligations concerning human rights and individuals in vulnerable circumstances, gender equality, intergenerational equity and empowerment of women (UN, 2015). Women have the understanding and knowledge needed to develop the resilience of their societies to escalating natural hazards (UN, 2008). To experience community change and efficient development women must be included as planners, decision-makers, sources of knowledge and implementers.

3.5 VULNERABILITY OF ZIMBABWEAN WOMEN TO CLIMATE CHANGE

Climate change has presented a major threat to people's security, particularly for women since they represent 70 percent of the poor people in the world (Brown, Chanakira, Chatiza, Dhliwayo, Dodman, Masiiwa, Muchadenyika, Mugabe and Zvigadza, 2012). As reflected in Table 3.8 below, it was established that climate change is going to aggravate dimensions in gender vulnerability, which already exists due to the prevailing gendered divisions of labour and social inequalities (Alber, 2009; Brody et al., 2008; WEDO, 2008; Dodman, 2016). Adding to the unbalanced consequences of disasters on women's morbidity and mortality, climate change is estimated to

endanger women's livelihoods by decreasing economic prospects, particularly for households that are headed by women (Dodman, 2016).

Table: 3.8 Vulnerability of women to climate change

Climate impact	Underlying socio-economic risk factors	Vulnerability of women
Crop failure	• 70% of Zimbabwean women are small holder farmers	• Increased agriculture workload • Strain on food provision
Diseases	• Cultural constraints on mobility • Gender division of reproductive labour/care giving	• Women of all ages lack access to health care • Additional time required to care for young, sick and elderly
Disaster	• Women and children often lack skills and knowledge and resources	• Women and children are more likely to die than men during disaster events
Shortage of safe drinking water	• Gendered division of household labour	• Exposure to violence/sexual abuse when travelling to and from water sources
Migration	• Women who become de facto household heads may face difficulties in retaining control over land and other productive assets due to unequal property and land rights. • Males may contribute little to household income	• Decreased coping capacity and insecure tenure • Increased/ agriculture overload
Resource scarcity	• Women have lower levels of educational attainment • Women earn lower wages and have limited access to markets • 70% of women worldwide are poor • Women are over-represented in the informal sector	• Limited resources to invest in alternative livelihoods • Limited time and resources to invest in more resilient land and shelter
Displacement	• Problems in temporary housing/ relocation sites	• Women and young girls face higher rates of sexual abuse and violence

Source: (Brody et al, 2008; WEDO, 2008; Dodman, 2016)

Seventy percent of women who are farmers in Zimbabwe are smallholder farmers, depend on rain-fed agriculture and make use climate-sensitive resources (Madzwamuse, 2010). This makes women to be vulnerable to the knock-on consequences of climate change. In Shurugwi, one of the rural areas of Zimbabwe women recounted a change in their livelihood strategies by brewing beer, this resulted in higher rates of alcoholism which lead to domestic violence and an increase in abuse against women (Brown et al, 2012). In some instances, the impacts of extreme weather and drought

have resulted in adjustments in gender-recognised roles about collection of water, and this has created some additional responsibilities to women.

Even though women are known to be affected by climate change, they remain generally absent in decision-making procedures regarding climate disaster risk reduction and change adaptation. This is determined by a lack of gender issues in policy frameworks that involve the protection of the environment, and management of natural resources in Zimbabwe (Chagutah, 2010). This is counterproductive as women are usually at the centre of post-disaster recovery and adaptation. The Southern African Development Community (SADC) developed a gender-responsive disaster risk reduction strategic plan and action plan for 2020 to 2030, the plan emphasised that prevention of risk creation and stressed on efforts to reduce existing risks for everyone (SADC, 2020). The emphasis of the plan is to incorporate gender into every disaster risk management plans, policies and decision making procedures (SADC, 2020). When planning, governments must integrate gender sensitive perspectives that call for an understanding in the way's climate change can strengthen the preceding inequalities that exist between women and men (Chagutah, 2010). By addressing gender issues in the national and regional plans, the risk of experiencing the impacts of climate change related disasters is minimised.

3.6 WOMEN IN AFRICAN AGRICULTURE

Women play a crucial role in agriculture, and most of the women who live in the rural areas of Africa survive on agriculture. According to the FAO (2011), women in most African countries devote almost 60 percent of their time to activities that are agricultural related. Nelson (2013) pointed out that women make up most of the agrarian labour force. Women farmers constitute about 50 percent of labour on farms in the sub-Saharan Africa region (FAO, 2011). Of the women in the sub- Saharan region who are employed, 60 percent of these women are employed in the agricultural sector (Sibanda, 2012). Although women dominate the agricultural labour force, the laws that govern the ownership and handover rights over land do not favour women in Africa, Asia and Latin America (NEPAD, 2013).

Women Accessing Re-Aligned Markets (WARM) is a programme that was examined by the Food Agriculture and Natural Resources Policy Analysis Network (FANRPAN), there were indigenous associates in Mozambique and Malawi (Sibanda 2012). The programme concentrated on the difficulties women in agricultural was experiencing and policy-making procedures in sub-Saharan Africa. The programme was established to tackle agricultural market obstructions that are prevalent to women farmers in Africa. These include inadequate representation of women in policy developments, relegation in business interactions, and insignificant influence over access to elements of production such as land and inputs (Kameri-Mbote, 2006). Table 3.9 below shows some of the challenges and the possible solutions for women in Mozambique and Malawi outlined by the WARM programme (Sibanda, 2012).

Table 3.9: WARM programme in Mozambique and Malawi

Region	Challenge	Detail	Community solution
Boane, Mozambique	Access to credit facilities	Weak capacity of women farmers to articulate strategy for accessing credit	Mechanism of accessing credit must be simplified for the farmers
Boane, Mozambique	Producer spoilage	Produce spoilage due to distant markets, lack of dedicated markets, transport challenges	Creation of the local markets that serve farmers better, investment in value adding industries and development of road linking farmers to markets.
Boane, Mozambique	Low producer price	Weak farmer's organisation, price negotiations and advocacy skill.	Capacity development initiatives
Marracuene, Mozambique	Lack of appropriate seed	Lack of appropriate seed and inadequate knowledge of using improved seed and fertiliser.	Private sector support to invest in input distribution, increased extension support
Lilongwe, Malawi	Mismanagement of input vouchers	Malpractices are affecting access by women to inputs at Agriculture Development and Marketing Corporation (ADMARC) markets and access to voucher/coupons	Government must introduce mitigation measures at ADMARC
Lilongwe, Malawi	Women access to land	Very few women farmers own land in their communities	Introduction of appropriate empowering policies and bylaws

Source: (Sibanda, 2012)

In Kenya, women constitute around 42 percent to 65 percent of agricultural labour force (Ahearn,and Tempelman, 2010; World Bank, 2014) in addition to other domestic household tasks. Regardless of women's significant responsibility in the agricultural sector, empirical evidence suggests that women linger behind men when it comes to agricultural production in sub-Sahara

Africa. This is because, there are gender inequalities related to access of land, control over land and the operation of constructive resources for example land, livestock, extension and financial services, education and technology (Ahearn,and Tempelman, 2010; Zereyesus,2017; Oseni, Corral, Goldstein, Winters, 2015). In Kenya, only 0.5 percent of women have been able to obtain some financial services and only about 6 percent own land (FIDA 2009). There are a few women farmers who own land in Kenya, hence most female farmers find it difficult to access formal credit due to lack of collateral (Ellis, Manuel and Blackden, 2005).

Women farmers in Nigeria are involved in a number of agricultural practices and processes and play a huge role in improving the economy of the country (Adenuba and Raji-Mustapha, 2013) Despite their contribution to the domestic or subsistence sector, women are not recognised or valued (Akpan, 2015).

Research has revealed that women empowerment is more likely to result in improvements in women status including excessive management over household resources, improved mental health and improved access to financial provisions (Diiro1, Seymour, Kassie, Muricho, Muriithi, 2018). Women have made significant contributions in agricultural production, nutrition as well as food security (Seebens, 2011; Ross, Zereyesus, Shanoyan and Amanor-Boadu, 2015; Zereyesus, 2017). The push for gender equality is an issue in rural development policy that intends to attain lasting food security and alleviation of poverty in agrarian economies such as those found in sub-Sahara Africa (Doss, 2013; Akpan, 2015).

A declaration was made by African leaders at the African Union Summit in 2015 to promote women's empowerment and development by 2063. The declaration requested the AU member states to intensify technological inventions, mechanisation, education and skills development for women (FAO, 2017). Member states also committed to strengthening the financial involvement of women in agri-business and making modern technologies in agri-business and agricultural value chains available to women with skills and knowledge to use them (Zereyesus, 2017). Furthermore, they committed to upholding women's rights to own valuable possessions such as land and gaining access to community procurement developments in agri-business (NEPAD 2013). Better regional

incorporation will assist African agricultural divisions to utilise opportunities that are in regional markets.

In a research conducted by Ncube, Mangwaya and Ogundenji (2018), women in Zvishavane were involved in drought mitigation planning, planning of land use and planning of preparedness strategies. The results of this study shows that they women who are very active in DRR and the initiatives by these women in Zvishavane are commendable. Although women make most contributions in farming, their views are not usually accepted. Approximately 86 percent of Zimbabwean women depend on land for their families and their livelihood (FAO, 2017). The traditions of the country allowed all married male community members to have ownership of arable farms or plots. The privilege of apportionment lies with the local government authorities and the traditional leaders functioning with the authority given by the Rural District Council Act (1988) and the Communal Lands Act (1982). Women in farming need to be more resilient for them to overcome the challenges caused by drought.

3.7 WOMEN AND RESILIENCE

Resilience is a scientific word which relates to people who have the capability to go back to their original state after experiencing a negative situation (Ganter, 2015). Most women desire the capability to become resilient and this strength is regarded as an important aspect of life. Both men and women require resilience to handle life challenges (Brody et al. 2008). However, women usually require additional form of resilience than their male counterparts to overcome the traditional complications that are placed their way. So many women do not know the kind of resilience that they have. Ganter (2015) described the following five characteristics of resilient people:

- **A sense of purpose:** When you possess a sense of purpose, you are likely to live with a driving force. Being aware of their purpose gives women the ability to overcome challenges that they are exposed to. For instance, the driving force for women in farming should be to feed the family.

- **Perseverance:** People who are resilient usually demonstrate the capacity hold on to the goal that they want to achieve, they can face some challenges but they will not give up until they come out of the situation that is disturbing them. For instance, women farmers who are affected by drought will persevere in practicing farming until they manage to find ways to handle challenges brought about by drought.

- **Equanimity:** For one to become resilient, you should stay balanced. It is very important to be aware that irrespective of the circumstances it is certainly not completely bad. A middle ground exists, and it allows people to see all opportunities and this will give a person the optimism required to make things better.

- **Self-reliance:** A person who is resilient must believe in themselves and must also set realistic goals. Past difficulties strengthen a resilient person. The negative and positive experiences in the past will assist a person to deal with new problems, causing problem-solving skills to develop. For instance, women in farming who experienced drought in the past can develop the capacity to deal with the problem by applying some of the measures they applied in the past or new measures.

- **Existential aloneness:** For a person to become truly resilient, one needs to be capable to live with oneself. This is when a person is comfortable with what they possess or what you are. Women who are resilient are comfortable about their gender and cannot allow anyone to undermine their capability.

For women to become resilient to climate change induced disasters such as drought there are some initiatives that must be taken by the government, NGOs and other institutions that assist in disaster management (Brown et al, 2012). To assist in building resilience in women, there must be adaptive programmes, which incorporate gender differences in the context of exposure to climate change, the extent of vulnerability, as well as the capacity to adapt (Brody et al., 2008). There are important issues that affect women that need to be addressed. Issues such as gender specific barriers affect women in agriculture and in other sectors as well. Initiative that promotes gender equality, effectiveness and efficiency must be on the top of the agenda in developmental issues in the world (Terry, 2009). The UNDP encourages its partners to involve women as planners and stakeholders in up-and-coming actions on disaster resilience and climate change. It aims to ensure that women

are given equal access and control of the resources they need to adapt to and mitigate climate change effects (UNDP, 2009).

The United Nations think tank (2015), views resilience as an integrated system of adaptive, absorptive and transformative capacities that needs to be ingrained or embedded in community structures, institutions and social systems (Table 3.10) below.

Table 3.10: Resilience capacities matrix

Adaptive capacities	Absorptive capacities	Transformative capacities
• Human capital • Diversity of livelihoods • Access to information • Asset ownership • Social capital • Access to financial services	• Hazard insurance • Social capital • Ability to recover from shock • Access to informal community safety nets	• Formal safety nets • Social protection and social capital • Risk governance and leadership • Policy framework promoting equal access to basic services, natural resources, markets, infrastructure and agriculture services

Source: (UN, 2015)

A community that is resilient can take conscious steps to prevent, prepare and respond to the negative impacts of the phenomena, when subjected to drought (Kivaira, 2007). Steps that have been established and used in more than one way, include seed banks, irrigation schemes that are solar powered on different scales, community social networks, support systems from traditional leadership, using modern technology like conservation farming, zero tillage and drip irrigation schemes.

10 countries were assisted by the UNDP to include gender equality in their Nationally Determined Contributions (NDCs), which will assist them to reach the Paris Agreement goals. This incorporation assists countries to address the inequalities that inhibit women from contributing fully to climate-related policymaking, planning and implementation of climate change initiatives that will improve the resilience of women. The supporters of UNDP are encouraged to intensify the rate at which women are part of decision-making procedures on disaster risk reduction. This consist of creating capacities for women's organisation's to take part in the formulation as well as

implementation of programmes, policies and strategies and creating capacities of significant institutions to take part in gender perspectives. Women's participation in important disaster risk reduction programmes, contingency planning, early warning and long-term recovery programmes, are essential in building community resilience against disaster (UNDP, 2009). Since 2014, the model of climate change that is been led by women (WCRF) has repositioned women as farmers but also knowledge conveyers, this will enable women to make informed decisions related to which crops to grow and how much to sell (UN, 2015). This initiative seeks to promote resilience and empower women as change makers in the agriculture sector.

3.8 DROUGHT MANAGEMENT STRATEGIES

Drought management is associated with good governance and institutional capacity. To develop drought strategies, decision makers and leaders are required to shift from crisis to risk reduction (Wilhite, Sivakumar and Pulwarty, 2014). It is essential for governments, NGOs and other disaster management organisations to focus on mitigation, preparedness, prediction and prevention and early warning. It is also essential to strengthen the coping capacity of a community (Wilhite, 2000;Tadesse et al., 2009: Jordaan, 2012). Several countries have come up with drought management strategies, assisting communities to reduce the impacts of drought and improve people's resilience.

USA has established a ten-step drought planning process; this has been used by other countries. Below is the ten-step process (Wilhite, 2019):

- Appointing a drought task force
- Stating the objective and the purpose of preparedness plan
- Obtain participation of stakeholders
- Inventory some resources and come up with group at risk
- Developing structures for the organisation and formulate a drought plan
- Identifying research needs as well as filling up the gaps in institutions
- Integrating science and policy
- Publishing the drought plan and develop awareness

- Teaching individuals about drought

- Evaluating and revising the preparedness plan for drought

The drought management plan for the USA is comprised of the following key components

- Risk and impact assessment

- Monitoring and early warning

- Mitigation and response

The USA has incorporated all the components of the disaster management cycle in their drought management plan. (Wilhite, 2019). Philippians has established a detailed disaster management programme that was corroborated with the Total Disaster Risk Management Approach (TDRM) (Van Zyl, 2006). This approach makes use of prevailing knowledge, risk management, response and techniques on disaster reduction. The capability of achieving sustainable development objectives is very important to disaster risk management as it communicates valuable information at all stages. The disaster management cycle consists of various issues in all the different stages and the TDRM Approach focuses on those challenges comprehensively and proficiently (Van Zyl, 2006).

According to UNDP (2009), programmes for resilience building improve livelihoods, intensify productivity and promotes economic empowerment for troubled communities. There is a need for a comprehensive framework that comprises institutional and policy frameworks that strengthens transformative processes and structures. When faced with extreme weather and climate change, the government must take into consideration investing in developing ground breaking methodologies that develop the local economy (IPCC, 2018). Governments must also take note of the livelihood's generation and protection, and should understand food security, livestock production nexus and crop production, especially for poor communities in Africa. UNDP (2009) argues that the distinct contributor of vulnerability to climate change is poverty, hence, there should be an investment in economic empowerment, and particularly in the emancipation of women. This is likely to produce a solution that is sustainable to manage drought that is induced by climate change.

Majority of rural households depend on agriculture as the only source of food and the occurrence of drought in these communities affects the livelihood of the people (UNDP, 2005). The delay in the implementation of interventions strategies negatively affects the community, as people will end up depending on government assistance (Jordaan, 2012). It is essential to constantly monitor agricultural production and rainfall through the agricultural cycle, this will reduce the risk of experiencing a major drought .

3.8.1 Drought forecasting and monitoring

Climate forecasts assist in the prediction of numerous properties of the future climate in an area and it assists in lessening vulnerability through pro-active measures (Hao, Yuan, Xia, Hao, and Singh, 2017). The predictions are generally in relation to likelihoods of anomalies in climate variables for instance rainfall and temperature. The information that is given in climate forecasts include the anticipated averages, the occurrence of extremes or the frequency of event that are seasonal such as the beginning of the rains (Clay et al., 2003 and Reason et al., 2005). Seasonal forecasts refer to the nature of a particular season and the seasonal rainfall projections, normally refers to the anticipated rainfall anomalies. The anomalies consist of irregularities that are found in the average conditions and from information regarding specific events (Clay et al., 2003).

Drought is normally a slow-onset phenomenon and therefore it is possible to make some predictions or early warnings (Jordaan, 2012). Even if there are some early warning or predictions, people still suffer from the impacts of drought. The major goal of drought monitoring is to present some information that that will be used to persuade governments, people and institutions to take actions to reduce or prevent negative impacts of existing or forthcoming droughts (Sivakumar and Wilhite, 2014). Early warning and monitoring systems that are associated to agriculture are important for minimising vulnerability to drought. The extent of assistance that is needed to uphold a sufficient production sector and the level of food security that is likely to be disturbed by drought is also evaluated (Van Zyl, 2006). The food security of an area can be assessed better if there is combined information on rainfall, the agricultural sector and the food situation gathered from monitoring the economic situation. The rainfall variability usually activates the mechanism for disasters and must be incorporated in all the monitoring systems.

When a community is affected by drought, it is important for that affected community to fully understand and be aware of the early warning systems. They must be part of the early warning information dissemination and the information should be clear. An effective early warning system that is people centred must be clear to the vulnerable community so that they will be able to understand the risk they are facing (Ncube, 2007). The disturbed community should understand drought, trends, lead-times and the warning services must be real time and should be trusted by the concerned society. Early warning information dissemination channels should be known and significant in each context. Nevertheless, perceptions, traditional predictions and traditional beliefs mechanisms should be incorporated in the modern science of early warning systems (Musarurwa and Lunga, 2012).

Information about the climate has an important role in decreasing the extensive costs that are related to climate variability and this can transpire in three ways. Firstly, the seasonal climatic forecasting will create some improvements on decisions that foresee the magnitudes of extreme events and therefore reducing costs. The reduction in the public supplies of maize is an example of an aftermath that is likely to be anticipated (Clay et al., 2003). Secondly, the information ought to be published as real time events unfold. The administration of responses can be developed by making sure that farmers recognise weather changes and the growing conditions and available government assistance when reacting to emergencies (Wilhite et al., 2000). The third way is through investment choices for water-dependent systems, they must integrate an assessment regarding the likelihood of climatic anomalies (Clay et al., 2003).

When launching drought early warning and drought monitoring systems, they are some challenges that are likely to be faced especially in developing countries such as African countries. The World Metrological Organisation (2006) highlighted the following challenges:

- There is insufficient coverage and data quality in several regions in Africa and this is due to missing data or insufficient length of time series data and low station density.
- There is great cost for data sharing and data cost, this will result in limited data among the research institutions and government agencies.

- The people who are supposed to make decisions, in most cases fail to understand the technical language that is used in early warning bulletins.
- There is a lack of data that links several climates, water, and soil and socio-economic.
- Delivery and communication systems that are used to deliver information on drought and the data to the user are not established and effective.
- The drought indices are at times unable to detect drought in the initial phases.
- There are no standard methods of risk and impact assessment and they fail to consider the vulnerabilities that are important for regionally applicable response and mitigation programmes.

3.8.2 Social networks

Social network is one of the essential strategy rural farmers can apply to deal with the effects of any disaster especially drought (Bruschweiler and Gabathuler, 2006). These social networks are formulated based on relationships, associations and other sources; these networks permit some underprivileged people to access support regardless of low levels of interests (Wilkin, 2019). In a study conducted in the rural parts of Ethiopia during the drought of 1998 to 2000, around 50 percent of the money borrowed was informal money, and at least 40 percent of the sharecropping was among relatives (Little, Mogues, Stone, Castro and Negatu, 2006). In most cases material support is likely to decrease during the drought periods. Poor people will have little to share, as their resources are strained. Most of the poor farmers suffer during disasters however, they can recover when they get support from relatives or any close links (Little et al., 2006: Wisner et al., 2007). In some cases, social networks fail to provide a lasting solution for poor farmers who are affected by disasters. The coping mechanisms that are based on social networks offer a minimal solution to long term sustainable livelihood because there is a low obligation to commit to constructive resources to manage droughts (Wilkin, 2019).

3.8.3 Drought knowledge management and drought awareness

The most essential enabling aspects in resilience building and drought risk management include aspects such as education of the community members, drought awareness and knowledge

management (Wilhile, Sivakumar and Pulwarty, 2014). It is essential to be able to collect, compile and disseminate the appropriate information and knowledge on drought hazard and vulnerabilities the community is subjected to. The methods must be connected to community drought risk management programmes, projects and awareness campaigns (Switzer and Verdlitz, 2017). There must be an interaction amongst the generators and the people using the information, it is important when developing targeted messages and making sure that there is facilitation of useful information (UNISDR, 2014). In drought risk management, education is an interactive progression of reciprocal learning between the people and the institutions, this also includes knowledge of the local people and traditional wisdom (Wilhile et al., 2014).

There are several educational programmes that focus on drought risk management and programmes on disaster management. UNISDR (2014) pointed out the following guiding principles that can be used in knowledge drought management:

- Informed and motivated individuals minimise the effects of drought, people should be well informed and must be motivated to develop drought prevention methods and strengthen their resilience.
- Efficient information management and exchange demands establishment of a dialogue and networks between the researchers, stakeholders and practitioners, to promote reliable knowledge collection and dissemination.
- Extension services and public awareness programmes ought to be designed and executed with a perfect understanding of the local perceptions and requirements, this will encourage engagement with the media to promote a culture of community involvement in drought resilience.
- Training and education are important for all the stakeholders to make sure that there are effective efforts in drought risks reduction.

Even though drought risk management calls for an investment of human resources and financial resources, the crisis management method normally leads to consumption of more resources and an increase in the vulnerability of the community. Wilhite et al (2014) pointed out that educational programmes that promote awareness regarding short-term and long-term water supply matters can

assist in understanding ways to react in a drought situation. Those educational programmes will make sure that drought planning will not lose ground throughout the years where there is no drought in an area. Information on drought is also achieved through indigenous knowledge and innovation, education must be employed to develop a principle of safety and resilience. UNISDR (2014) stated that networks from regional and sub-regional meant for knowledge management need to develop traditional knowledge.

3.8.4 Government strategies in managing and mitigating droughts

When government makes decisions that are likely to affect the management of drought risk and the impacts of drought, it must take account of ways that decrease vulnerability and food insecurity (Wilhite et al., 2000). Governments should deal with the problems that are associated with drought management from a perspective that is multi-objective (Pulwarty and Verdin, 2013).. Every single government organisation involved requires a particular legislative obligation to administer and implement (Wilhite et al., 2014). Several mandates are more likely to influence preparedness, mitigation, recovery or response relating to drought. When a nation is faced with a disaster such as a drought, the government may come up with a multi-objective perspective that might fail. Valuable information from different governmental institutions and its responsibilities are then crucial in implementing an effective drought plan (Pulwarty and Verdin, 2013). There must be well-organised communication amongst the government and NGOs, and it is important for both. parties to be involved in policy formulation.

Post-drought evaluation evaluates the responses from the government, NGOs and other institutions involved in disaster management. Methods to implement recommendations for enhancing the system should be established (Wilhite et al., 2000). Since institutional memory can fade, post-drought assessments assist with information regarding past success and hindrances. The evaluations must comprise of a combination of climate and environmental analysis of drought and the socio-economic consequences (Wilhite et al., 2014). When a community is resilient and has effective coping mechanisms, the government and other organisations should develop some lessons and try to use the same strategies in other areas.

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The long-term strategies that can be used to reduce the impacts of drought and valuable responses should be considered in economic structure, resource capability and the existing economic position. A community that is resilient to drought is likely to be hunger-resilient and similar social and physical contributing factors have a lot to do with drought resilience (UNDP-BCPR, 2005). Crisis at national economic level of a nation is also affected by the impacts of drought. However, the capacity to comprehend and cope with the risks of droughts diminishes if mitigation programmes are implemented successfully (Wilhite et al., 2014).

3.9 DROUGHT STRATEGIES IN AFRICA

Most African countries have limited knowledge of drought awareness and institutional capability to develop. It is important to improve the capability of significant group of actors, such as policy makers, resource managers and state authorities at distinct levels (Wilhite et al., 2014). It is also essential to encourage public awareness of the impacts of drought and drought risk by improving and executing training and advocacy programmes (UN, 2014). African countries can incorporate a wide range of governmental and private insurance alongside with financial strategies in the drought preparedness plans. This will assist in reducing the fundamental influences of drought risk. The African Risk Capacity (ARC), a specific agency of the AU deals with weather insurance mechanism which countries in Africa can utilise to strengthen resilience and recover from natural disasters such as drought (ARC, 2016). The ARC instruments bring together present effective and improved early warning models regarding drought in Africa.

Integrated strategies bring together agricultural technologies used for drought management such as drought tolerant crops and variations, better-quality crop management systems, water conservation techniques, enhanced climate forecasting and early warnings systems (Shiferaw et al., 2014). African countries must put more emphasis on farming to increase food security and promote sustainable transformation in the agricultural sector. The World Initiative on Sustainable Pastoralism (WISP) Policy (2007) study, which was conducted in the Pastoralists in the Horn of Africa, established that the Pastoralists offered flexible and adaptive livelihood strategies. WISP, (2007), integrates a wide range of risk management strategies as well as resilience enhancement procedures.

The South African Weather Service makes use of two techniques that help to minimise the impacts of drought. Research on extended weather outlooks over a period of up to six months was conducted (Vogel et al., 2000; Klopper and Bartman, 2003). Numerical modelling makes use of predictions concerning the progression of the relations between the surface and the atmosphere and this was used for smaller periods. Statistical modelling makes use of historical data to foresee the climate for a longer period (Clay et al., 2003). The South African Weather Service circulates information on the impending weather conditions to a wide section of residents instead of commercial enterprises and the government (Vogel et al., 2000).

To ensure that African countries minimise the risk of and mitigate the level of drought impacts, Crossman (2018) instigated the following approaches:

- Institutionalise gender sensitive drought risk assessments, instigate gender sensitive early warning systems and make use of gender sensitive indicators to observe the gender mainstreaming developments. Encourage gender participation and consideration of young people in all issues that are drought related.
- Intensify partnership between African countries, regional organisations and international organisations in drought risk management and application of plans.
- Establishment of a mutual drought management programme for all African nations, assist in the negotiation of an obligatory drought and land deprivation protocol.
- Acquire an Africa-wide system as a fundamental fragment of the international network on drought preparedness.
- Designing and developing an African drought information centre.
- Develop and make use of national, sub-regional and regional preparedness networks for drought in capacity building, technology transfer, development, exchanging information as well as best practices.
- Mobilise adequate, secure and timely financial and technical resources to address drought issues at all levels.

3.10 DROUGHT MANAGEMENT STRATEGIES IN ZIMBABWE

Efficient disaster risk reduction strategy procedures require governance management procedures throughout the entire disaster risk management continuum. Leadership is defined as the procedure of motivating other people as well as institutions to achieve a defined goal (Hailey, 2006). Therefore, disaster risk reduction leadership can be perceived as a progression whereby combined and systems framework methodologies are implemented to mitigate or prevent the impacts of hazards. Zimbabwe has put in place measures to reduce the impacts of disasters, these measures were influenced by the disaster management continuum (Dube, 2015). There are systems that were established at national level, these influence institutional decisions and policies to reduce the impact of droughts. The government of Zimbabwe manages national institutions and organisations to examine drought early warning systems. This will assist people to cope and respond resiliently to disasters such as drought (Bongo, Chipangura, Sithole and Moyo, 2013).

Zimbabwe employs different ways to minimise the impact of drought and improve the resilience of the farmers in the country. To improve livelihood, communal farmers in Zimbabwe have implemented additional lines of business to expand their income (FAO, 2018). Most of the rural communities have resorted to making crafts and horticulture as ways of curbing the devastation of droughts. Some of the farmers sell their vegetables in markets that are close to their communities. Some of the communities have resorted to selling crafts in the nearby highways, this has become a means of survival as most of their crops and animals are affected by drought (Masendeke & Shoko, 2014). In previous years when the country was affected by drought, many individuals in the rural areas resorted to harvesting and selling wild fruits such as the wild marula nuts (Chenje, 1994) in Masendeke and Shoko, 2014). Some farmers managed the impacts of the drought by selling assets such as cattle during the peak of the drought and using the cash to buy food (Mukeredzi, 2016). They start with selling small assets but as the drought intensifies, they sell bigger possessions.

Besides selling assets, farmers in Zimbabwe make use of indigenous weather forecasting, this is a traditional way of predicting weather (Risiro, Mashoko, Tshuma and Rurinda, 2012). This is a way of assisting the farmers to get prepared for drought conditions. Some of the ways that the farmers

use to detect a forthcoming drought include studying the behaviour of bird's and celestial bodies to come up with proficient decisions regarding mitigating the harshness of effects of droughts (Shoko and Shoko, 2013). Communities affected by drought can manage the drought situation by receiving assistance from the government and other international organisations (Kuhudzayi and Mattos, 2018). There are some programmes that were initiated by the government, these include food for work project, supplementary feeding schemes, public works programmes and food aid programme (Masendeke and Shoko, 2014). Receiving food aid is one of the common drought mitigation strategies ever since the drought of 1991 and 1992, several farmers received food handouts during drought periods because food shortages were experienced (Mushore et al., 2013).

As a way of managing drought in Zimbabwe, early warning systems are used. Svoboda (2009) indicated the following importance of drought early warning system:

- It is essential in early drought detection
- It improves response
- It initiates actions contained by a drought plan
- It is an essential mitigation action
- It constitutes the foundation of a drought plan

Zimbabwe's National Early Warning Unit (NEWU) operates under the Ministry of Agriculture and Lands. The ministry provides information relating to drought monitoring and crop forecasting for all agriculture subsectors (Brown, 2014). NEWU works together with the Drought Mitigation Centre to determine the possibility of a drought occurrence. Madzamuswe, (2010), pointed out that the Ministry of Environment, Water and Climate in Zimbabwe is responsible for monitoring droughts in Zimbabwe. There are weather stations in all the ten provinces of Zimbabwe operated by Agriculture Extension service (Agritex) with the guidance of the Metrological Office. The Early Warning Information (EWI) is disseminated to numerous farmers' organisations by NEWU, they have the duty of distributing the information to the local communities. There are bulletins that contain information on any weather matter, these are distributed to different government departments, civil society organisations and the national newspapers (Brown, 2014). This is also supported by literature, which notes that National Early Warning Unit (NEWU) has an obligation

to carry out risk analysis, interpretation of information, dissemination of disaster forewarnings, and they offer some advance drought and food security information (Chagutah 2010; EMA 2010).

Besides government organisations in Zimbabwe, there are regional organisations that assist in providing early warning to the country. One of the organisations is the Famine Early Warning System Network (FEWSNET). It is a programme that was initiated by USAID, the programme covers seventeen countries in the region of Sub-Saharan Africa. FEWSNET arranges a variety of information products and services that are projected to strengthen the capabilities of countries and regional organisations, the organisation also assist in providing an analytical early warning and vulnerability status of a country (Shamano, 2010).

3.11 POLICIES AND LEGISLATIONS ON BUILDING RESILIENCE

Various policies, laws or legislation that promote resilience have been established at global and national level. These policies will assist nations to combat the impacts of disasters and reduce the level of risk among the people. The European Union implemented an action plan that will promote resilience and reduce the level of risk. The European Union action plan for resilience in crisis prone countries 2013-2020 advocates resilience of all nations within the union. The Commission targets to create a systematic and universal approach to developing resilience in crisis and risk prone situations, particularly by assisting people in danger to withstand, deal with, adapt and recover quickly from shocks and stresses. The EU does not want to compromise the long-term development projections, with a focus on effective interferences that have a long-term impact (EU, 2013).

The Sendai framework was established to complete the review and assessment of the completion of the Hyogo Framework for Action 2005–2015. The framework aims to develop the resilience of nations and communities to disasters (UN, 2015). In line with the precedence of the Sendai Framework, the government of Zimbabwe has devoted itself to updating policy frameworks and legislative in order to create a favourable environment for disaster risk reduction. The government of Zimbabwe has established some policies that regulate the country on the issues of disasters. The Civil Protection Act (Act 10:6 of 1989) controls the disaster management sector in Zimbabwe. The

act was established to curb the challenges disasters pose to the nation (Dube, 2015). The Civil Protection Act of Zimbabwe stipulates that the government of Zimbabwe is mandated to assist where possible to minimise the impacts of disasters (Betera, 2011). The Civil Protection Act (Act 10:06) 1989 is responsible for leading and coordinating all disaster management associated activities in Zimbabwe (disaster risk reduction, preparedness, response and rehabilitation).

The Ministry of Local Government, Rural and Urban Development initiated the Civil Protection Act of 1989. The Department of Civil Protection is responsible for carrying out the following responsibilities according to Act 10:06 of 1989.

- Coordinating all responses to disasters and emergencies
- Work with a team that is multi-sectoral and command emergency government needs assessment and response
- Offer technical recommendations to the president when it comes to the declaration of a disaster
- Mobilising all the financial and human resources intended for disaster and emergency response in the country
- Cooperate with some regional and international organisations on disaster management issues, and
- Defend and promote the establishment of legislations and policies on disaster management.

The Civil Protection Act falls short of building national and community resilience to disasters. Some of the key weaknesses of the Act include inactive community participation in DRR, unavailability of dedicated and adequate resources to implement DRR programmes. It also includes centralisation of power and resources, and the focus on 'natural' hazards rather than on vulnerability and resilience. As such, there is need for its revision to align it with international best practices in disaster legislations (Mavhura, 2016). The Act was later revised in 1992 and 2001, it establishes a civil protection organisation (CPO) and provides for the operation of civil protection services in times of disasters. The government of Zimbabwe, through the Civil Protection Unit, had plans to introduce a new bill in 2015, however the plans failed, in 2019, the government re-introduced a new bill on disaster management. The bill is set to restore the country's disaster

preparedness and response in line with existing emergencies including climate change-induced disasters (Nyamukondiwa, 2019).

As a way of preventing disasters and mitigating the impacts of disasters such as drought, the government of Zimbabwe established some policies and legislation since the country obtained its independence in 1980s up to date (CADRI, 2017). Various departments and government authorities implement these policies. The following are some of the legislations and policies that influence disaster management in Zimbabwe:

(i) Land apportionment Act of 1930 provided for 50.8 percent of fertile land to white farmers and chased black people to unfertile African reserves, these are non-productive lands that constituted 30 percent of land, and the other 20 percent of land was distributed to State and company properties

(ii) Environmental Management Act (Chapter 20: 27) of 2002, Part IX of the act focuses on environmental quality standards; it promotes the conduct of environmental impact assessments.

(iii) Public Health Act (Chapter 15:09) Part VI of the act, focuses on water related and food supply issues.

(iv) Police Act (Chapter 11:10). The act directs the police on ways to deal with disasters so that they can save lives.

(v) The Defence Act (Chapter 11:02) it outlines regulations on the ways to mobilise the defence forces to deal with disasters.

(vi) Land Acquisition Act (2000). The act as a guide in the re-distribution of land (to obtain eleven million hectares of land from the 16 million hectares available to large-scale commercial farms). The policy states that women must represent 20 percent of all individuals assigned large-scale farming land, identified as A2 farming land (GoZ, 2014). In addition, women were also permitted to apply for agricultural land under the A1 village schemes. Regardless of all these modifications in the policy, women's access to land continued to be limited because of many factors.

(vii) Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Zim-Asset) (2013-2018) guides Zimbabwe to accomplish economic growth and reposition Zimbabwe to become one

of the strongest economies in Africa. The policy advocated for poverty alleviation and initiated ways to reduce vulnerability of people (Government of Zimbabwe Archives 2015).

(viii) Zimbabwe Agriculture Investment Plan (ZAIP 2013-2017) is a sector investment plan for implementing the Agricultural Policy Framework. It is also responsible for development in the agricultural sector and medium-term plan.

(ix) Command Agriculture (2016). The government of Zimbabwe introduced the Special Maize Import Substitution Programme to improve domestic production as well as reducing food imports. The government contracted farmers (both the subsistence farmers and the new small-scale and the capitalist farmers) with funding provisions using domestic capital. (Mazwi, 2019).

Despite the presence of the Civil Protection policies and associated legislations, Zimbabwe remains affected by droughts that are always occurring, and the most vulnerable people are women in agriculture.

3.12 SUMMARY

Drought is considered a slow onset disaster, and yet the impacts are so massive. Scholars reviewed that women in farming are more vulnerable to drought than their male counter parts. Most parts of the world have been experiencing drought and the droughts are attributed to climate change. Evidence shows that the climate is changing, temperatures are rising, some areas are receiving a lot of rain and in some parts, droughts are increasing (Taylor, 2012). Other scholars have indicated that women are affected by drought since they comprise 70 percent of the poor people in the world (Brown et al., 2012). Some of the challenges experienced by women were revealed in the literature. Legislations that are governing the ownership and transfer rights of land do not favour women. The literature shows various policies and legislation drawn to assist nations to reduce the level of risk among the people and to build resilient communities. There is gap in the previous studies because none of the reviewed literature used the structural equation model to build resilience of women in farming to climate induced- drought. The resilience model shows the important variables to observe in measuring resilience. However, none of the models used showed how the

variables interact to bring about the optimal structural integration in the development of resilience to drought. Various studies have been conducted on the resilience of women to disasters globally; however, there is a gap regarding the study of strengthening resilience of resettled women. The next chapter will provide the methodology that was applied in this research.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter outlines the methodology used in the study. The first part covers the research approach, this study used the mixed method approach which is a combination of quantitative and qualitative method. The next section describes the research design that was applied, the convergent parallel/triangulation design was used. The composition of the population from which sampled respondents were selected as also discussed. It further discusses the data collection tools used in the study. The chapter also explained how data obtained from quantitative method was analysed by extracting themes and the quantitative data was analysed by exploring demographics using PIVOT tables (MS excel), reliability test analysis (using SPSS V25 IBM) and the Cronbach's alpha coefficient method Ethical issues are also addressed.

4.2 RESEARCH APPROACH

This study is based on a mixed method approach; this is a combination of qualitative and quantitative method. The mixed method was suitable for the study because it answered the questions from several perspectives. It also ensured that there were no gaps to the data collected and gave variation in data collection that led to greater validity (Tashakkori and Teddlie 2013). Mixed method was a powerful tool in this study because of the combination of qualitative and quantitative methods. The quantitative method gave a detailed description of resettled women experiences. Qualitative research assisted in deepening the understanding of complicated social and human aspects in ways that might not be understood with numbers (Strydom, 2011).

4.3 RESEARCH DESIGN

The study utilised one of the mixed method designs named convergent parallel design. In convergent parallel design, qualitative data and quantitative data is collected, and the interpretation is based on the results of qualitative and quantitative results (Heale and Forbes, 2013). Figure 4.1 below gives an illustration on how quantitative and qualitative was collected concurrently (Creswell, 2013). Data was collected separately, and the results were merged during the analysis

stage. The main purpose of using this design was to illustrate the quantitative results with the findings from qualitative results (Creswell and Clark, 2015). Both qualitative and quantitative methods were given the same priority in addressing the research problem.
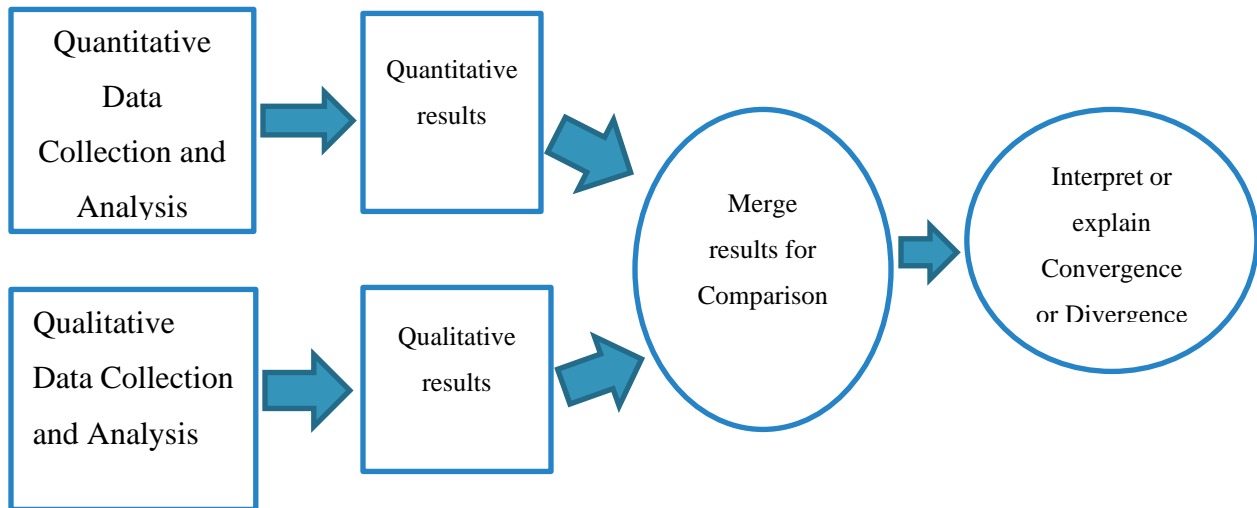
Figure 4.1: Convergent parallel design
Source: (Creswell and Clark, 2015)

4.4 POPULATION AND SAMPLING TECHNIQUES

The geographical area of the research study was Mashonaland Central province. The area was chosen because most women farmers were resettled during the Fast Track Land Reform Programme (FTLRP) were from this province. The total population of the study area was 1 152 520 (ZIMSTATS, 2012). The target population consisted of women who were involved in farming and they obtained their land through the FTLRP. Resettled women, extension officers, other experts such as the agronomists and local leaders from Mashonaland Central province were the target population. These groups of people were chosen because they have experience and knowledge of the nature of the problem.

Given the mixed nature of the research, a multi sampling technique was used, this technique encourages the researcher to make use of several methods. The first part of the sampling consisted of purposively sampling resettled women in Mashonaland Central province. Purposive sampling method entails that the research uses their judgement when selecting participates in the study

(Etikan, 2016). The major goal of purposive sampling is to focus on certain characteristics of the people under study, therefore the study focused on women who acquired land through the FTLRP (De Vos, Strydom, Fouché and Delport, 2011). A homogeneous sample was used, women in farming who shared similar characteristics were investigated. Purposive sampling enabled the researcher to extract a lot of information from the data that was collected.

Stratified random sampling involves the division of the population into lesser sub-groups known as stratum. These strata are designed based on people's shared attributes or characteristics (Singh, Singh and Adewara 2013). The entire population was divided into homogeneous groups and samples were selected randomly from each stratum. The advantage of using this method is that it generates characteristics in the sample that are comparative to the general population (Singh, 2013). A stratified sample offers a greater precision than a simple random sample that has the same size (Singh, 2013). This assisted the researcher in saving money. The strata used in the study was 260 resettled women farmers.

Random sampling was the last sampling method to be used and this method makes sampling more data oriented. Random sampling was selected because this sampling technique eliminates bias, everyone has an equal chance of being selected (Alvi, 2016). The formula below depicts how final sample size was obtained.

$$SS = \frac{Z^2 * (p) * (1 - p)}{c^2}$$

…………………………….......................................4.1

Where:

Z = Z value (e.g. 1.645 for 90% confidence level)

p = percentage picking a choice, expressed as a decimal

(.5 used for sample size needed)

c = confidence interval, expressed as a decimal

(e.g., .05 = ±5),

SS= sample size

$$SS = \frac{1.645*1.645*0.5*0.5}{0.05*0.05}$$

$$= \frac{0.6765}{0.0025}$$

SS= 271

Correction for finite population

$$SS = \frac{ss}{1+\frac{ss-1}{pop}}$$

…………………...4.2

Applying the correction factor

$$ss = \frac{271}{1 + \frac{271 - 1}{1\ 152\ 520}}$$

$$= \frac{271}{1.000234269}$$

=270

New and final sample size (SS) = 270 respondents in total.

Data was distributed as follows:

- 260 resettled women farmers.

- 4 extension officers.

- 3 local leaders.

- 3 agriculture experts.

4.5 DATA COLLECTION TECHNIQUES

To collect the necessary data, the study made use of secondary and primary data sources. Several policies and sources of legislation, newspapers articles government documents and research reports that are related to the study were used. A comprehensive literature study for the collection of secondary data was used. The reviewed literature provided the basis of the research used to build and comprehend more understanding of the outcome. The Rapid Rural Appraisal (RRA) technique was used to obtain the relevant primary data through the inputs from the resettled farmers, extension officers' local leaders and other agriculture experts. The method does not need to be exclusively rapid or rural, this is a cheaper way of attaining evidential data, particularly in an agricultural environment (Leedy and Ormond, 2010). The RRA puts emphasis on the importance and relevance of situational knowledge from the locals and focuses on attaining the correct general information. RRA allows the researcher to make use of several techniques to obtain the necessary data, this is another advantage of using the RRA technique.

The following techniques were used to collect data. A questionnaire survey was distributed and conducted with resettled women in Zimbabwe in Mashonaland Central province. Secondly, personal interviews were conducted with five resettled women, the local leaders of the area, agriculture experts and extension officers. Thirdly, observations were carried out in provinces and lastly extensive document review from public records and physical evidence.

4.5.1 Questionnaire

The researcher made use of structured questionnaires to collect data from women who are in farming and were beneficiaries of the FTLRP in Mashonaland Central province. On the questionnaire, the respondent, who is the unit of analysis, wrote down their answers in response to questions (Patel and Joseph, 2016). The questionnaires were hand delivered because the researcher deemed it necessary to meet the respondents and address every challenge that may occur in completing the questionnaires.

The questionnaire consisted of open-ended and closed ended questions formulated using the Likert scale. Most of the questions were closed ended, this is to give the respondent an alternative

response, from which the subject will choose the answer that is closely in line with the appropriate answer (Patel and Joseph, 2016). To give the respondents freedom and a chance to elaborate, the questionnaire comprised of a few open-ended questions.

4.5.2 Interviews

A semi-structured interview was formulated to collect information from few resettled women farmers, extension officers, the local leaders and other agriculture experts in Mashonaland Central province. Interviews are used to cover up the disadvantages of a questionnaire in that the respondents are given a chance to explain in detail (Leedy and Ormod, 2010). Semi-structured interviews were the suitable method to use in this study because it gave the researcher an opportunity to explore, define and obtain data. The researcher can obtain useful information by taking note of the non-verbal expressions the respondents will be making during an interview. Interviews assisted the researcher to follow up, lead and thus obtain more data and clarity, this is essential when building a rapport with respondents (Leedy and Omod, 2010).

4.5.3 Observations

The standard type of data collection in naturalistic or field research is observation of participants or physical observation of the physical environment in the context of a natural scene. Observational data collection was carried out to describe settings, activities, people, the physical environment. Observations assisted the researcher to have a deeper understanding than questionnaires and interviews, because they provided knowledge of the context in which events occur. It also permitted the researcher to see things that participants were not aware (Jamshed, 2014). The researcher formulated an observation guide that assisted the researcher on the issues to be observed. During the data collection process, the researcher was taking notes on the general overview of the situation with the resettled women farmers in Mashonaland Central province.

4.5.4 Document review

Document review is a method of collecting data by reviewing existing documents, this includes printed and electronic material (Bowen, 2009). The documents the research focused on were public

documents (official ongoing records) such as annual reports, strategic plans, and policy manuals; personal documents (first person account of an individual action) such as newspapers, journals, blogs and incident report. In document analysis, data is examined and interpreted to obtain meaning, gain understanding and develop empirical knowledge (Corbin and Strauss, 2008). The research made use of this method because it is a cost effective and an efficient method that is less time consuming, available data is readily used.

4.5.5 Data collection procedure

The researcher obtained an ethical clearance letter from the University of the Free State and obtained a permission letter to conduct research from the Mashonaland Central office of provincial minister. The researcher and two research assistants started to collect data on the 6th of December 2019, and it took a month to collect the data. Three out of seven districts in Mashonaland Central were randomly selected for data collection purposes. To determine the women who could participate in the study, purposive sampling was used. The snowball sampling method was also used because it was difficult to locate some of the farmers especially the A2 farmers. The researcher managed to get referral from other women who were beneficiaries of the FTLRP. The respondents who successfully completed the questionnaire were 267, the researcher managed to get more 6 more respondents because the target sample for resettled farmers was 260. The actual sample per district was Bindura 120, Shamwa 67, and Muzarambani 80 respondents. The researcher and the research assistants assisted respondents who were not able to complete the questionnaire. However, few respondents were not able to complete the whole questionnaire. The researcher managed to visit the respondents in their homes, and some were in the field. For those who were busy and could not answer the questionnaire, the researcher had to organise those respondents to complete the questionnaire at a time convenient to them. The researcher managed to conduct interviews with 5 of the resettled farmers who further elaborated about issues that they were experiencing.

Face to face interviews were conducted with extension officers, agronomist, agriculture manager and the local leaders. A random sampling method was used to select the participants who were interviewed. The researcher intended to interview four extension officers but due to some work

commitments other extension officers was not interviewed. Three local leaders were able to share their experiences, they also provided information on where the A1 and A2 farms were located and they introduced the researcher to people in the area. The information obtained from three agriculture experts provided extensive knowledge of the province and the subject matter. During data collection, the researcher observed all the relevant information. The researcher was taking down notes during visits to all the three districts and pictures were taken unfortunately the researcher lost the phone were the photos were saved.

4.6 DATA ANALYSIS AND PRESENTATION

Qualitative data was organised from question to question, the researcher looked across all the answers, and the answers were organised so that the researcher could identify consistencies and differences.

4.6.1 Qualitative data analysis

Thematic analysis was used in qualitative data analysis, this is a process where patterns or themes are identified within qualitative data. Qualitative data was grouped together into themes and was organised into coherent categories. Qualitative data analysis involved a 5-step process. The first step involved preparing and organising the data, in this step the data was written in a book and the recordings were listened to and the information was also written down. The second step involved reviewing and exploring the data: this is when the data was read, several times, this was to have a sense of what it contains. Notes about the ideas, thoughts or any question the researcher had was kept as specified by (Mswazi and Nhamo, 2013). The third stage involves creating initial codes: at this stage, the researcher used highlighters, sticky pads, notes in the margins, or anything else that could help the researcher to connect the data. In the fourth stage, the researcher reviewed the codes and combined them into themes: at this stage, the researcher identified recurring themes, options, beliefs and language. The final stage of the analysis was the presentation of themes in a cohesive style. The purpose of the study and the content should be included so that it relates the story of the data presented (Nobel and Smith, 2013). The analysis of qualitative data and

quantitative data (in the next section) have assisted the researcher presenting how the resettled women farmers have reacted to climate change- induced drought.

4.6.2 Quantitative data analysis

For quantitative data analysis, the exploration of demographics was carried out using Microsoft Excel, pivot table to be specific. The advantage of using Microsoft Excel pivot table is the researcher can compare the mean and other descriptive statistics and get the overview of the data of the respondents (Rose, Sprinks and Canhoto, 2015). These pivot tables assisted in visually comparing different groups of resettled farmers that participated in the study. Additional variables were added to the pivot tables to create cross tabulation that assisted in further examining the differences that exist within the resettled women farmers in Mashonaland Central.

A reliability test analysis was conducted using the SPSS V25 IBM version. For the statistics, the researcher used the Cronbach's Alpha coefficient. Tavakol and Dennick (2011) described the Cronbach's alpha as a test reliability procedure, which involves just a single test provision to come up with an estimate that is acceptable for the reliability for a specific test. Tavakol and Dennick (2011) went on to specify that the Cronbach's alpha is the average value of a reliability number that can be acquired for all the potential combinations of items if there are fragmented into two half tests. The Cronbach's alpha coefficient range from 0 to 1 and a reliable score is a higher score. Tuber (2018) has specified that a score of 0.7 is an acceptable reliability coefficient. The Cronbach's alpha helped in determining the reliability of the data for resettled women under investigation.

Descriptive statistics includes summarising and organising of data so that it can be understood easily (Nakhede, 2018). It provides simplified summaries of a certain sample as well as the measures. The advantage of using descriptive statistics is that it reduces large amount of data into a summary that is simple and can be easily understood (Trochim, 2020). The researcher made use of descriptive statistics to obtain the mode, mean and the standard deviation. Descriptive statistics per latent variables were also used in the study, these unobserved variables (hazard and stress, future uncertainty, livelihood, governance and resilience) were essential to the research.

Inferential statistics were used in the study. This technique makes use of probability techniques to analyse the information about a population known to make improvements on the knowledge of the population that is not known (Asadoorian and Kantarelis, 2005; Trochim, 2020). Out of inferential statistics, the researcher adopted the use of Confirmatory Factor Analysis (CFA). Gallagher and Brown (2013) pointed out that CFA is a multivariate statistical technique that models the relationship between manifest (observed) indicators and the fundamental latent variables (factors). This was useful because the researcher was able to check if variables belonged to the factors/latent variables as guided by the selected framework. The probability value or p-value was used to judge the fit of variables/questions to their latent variables.

4.6.2.1 Vulnerability analysis

A vulnerability analysis was also conducted, it is essential to conduct a vulnerability analysis because when building resilience, the vulnerability level must be determined first. Therefore, the level of vulnerability of the resettled women farmers in Mashonaland Central was analysed. To analyse the vulnerability level of the resettled women, the researcher used the Iyengar-Sudarshan method. In 1982, Iyengar and Sudarshan established a technique that can be used to calculate the composite vulnerability index from multivariate data in categorised regions (Kumar, Solmon and Vishnu-Sankar, 2014) and (Hlalele, 2019).

There are two main methods the vulnerability index construction methods can be developed from, these are methods that have equal weights and methods without equal weights (Bhattacharjee and Wang, 2010). The method developed by Iyengar and Sudarshan contains some weights that are not equal. Drought vulnerability indicators allow several units, and because of this reason, every indicator's values should be standardised according to the working relationship that every indicator holds with vulnerability (Hlalele, 2019). To increase or decrease the functional connection with vulnerability, normalisation was carried out by making use of the formulae (Hlalele, 2019) respectively.

$$\text{Xij} = \frac{\text{Xij} - \text{Min (Xij)}}{\text{Max (Xij)} - (\text{Xij})} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..4.3$$

And

$$Xij = \frac{Max\ (Xij) - XIJ}{Max\ (Xij) - Min\ (Xij)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\ 4.4$$

Where Xij is the value of indicator j. Following the indicator value standardisation, the Iyengar Sudarshan vulnerability index equation was presented as.

$$V1 = \sum_{j-1}^{k} wjXij \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .4.5$$

Where w's ($0 < w < 1$ an $\sum_{j-1}^{k} wj = 1$) are the weights. The weights are anticipated to be different inversely with the variance in different areas in the indicator on vulnerability. The weights are hence presented as.

$$wj = \frac{c}{\sqrt{variance\ (x1)}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .4.6$$

Where c, is the standardising constant, therefore.

$$c = \frac{1}{\sum_{j-1}^{j=k} \frac{1}{\sqrt{variance\ (Xij)}}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots ..4.7$$

$$f(Z) = \frac{z^{a-1}(1-z)^{b-1}}{\beta(ab)}\ 0 < z < 1 \text{ and a, b} > 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .4.8$$

In this technique, appropriate probability distribution is desirable which takes the values in the [0, 1] range and that type of distribution is called Beta probability distribution this is normally skewed. The density function of the function is shown as.

Where β(a , b)) is a beta function expressed as.

$$β(a, b) = \int a^1 x^{a-1}(1-x)^{b-i}\ dx \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .4.9$$

Given the skewness of the beta distribution, the next fractal intervals could be employed in the vulnerability stage categorisation. Following the vulnerability index calculations for the resettled women farmers' as in equation (5), k-means grouping using the IBM Statistics SPSS V.24 was useful in classifying the latent variables corresponding to their vulnerability indices. An index was achieved for every group in order to match into the stages of vulnerability (Hlalele, 2019).

4.6.2.2 Structural equation modelling

The Structural Equation Modelling (SEM) was used to develop a framework for resilience. The SEM is known as a statistical methodology, which uses hypothesis- testing approach on the multivariate analysis (Brayne, 1994). SEM makes use of a confirmatory factor analysis to estimate the latent constructs. The SEM consists of the structural model and the measurement model, a measurement model gauges the composite variables or latent variables whereas the structural model tests each of the hypothetical dependencies established by the path analysis (Kline, 2010; Chen, Shirkey, John, Wu, and Shao, 2016). To avoid some errors when using SEM, there is a need to examine the best fit indices that can be used. These include Model chi-square ($\chi2$), Root mean square error of approximation (RMSEA), Goodness-of-fit statistic (GFI) and the adjusted goodness-of-fit statistic (AGFI) and Root mean square residual (RMR) and standardised root mean square residual (SRMR) (Hooper, Coughlan and Mullen, 2008). SEM involves five logical steps: model specification, identification, parameter estimation, model evaluation and model modification (Kline 2010; Hoyle 2011; Byrne 2013; Chen at el, 2016). These five steps were followed in the study and the drought resilient framework was developed. Quantitative data was presented in the form of cross tabulation, tables, graphs and figures. Qualitative data was presented in the findings discussions to represent the themes as suggested.

4.7 ETHICAL CONSIDERATION

Ethical issues were taken into consideration by the researcher. Before the study was carried out, the researcher obtained an ethical clearance letter from the University of the Free State, the ethic clearance number is UFS-HSD2019/1299. The researcher managed to obtain a permission letter to conduct research in Mashonaland Central province. Permission was granted from the office of the provincial minister of Mashonaland Central (refer to Appendix D). All the rights of participates were observed. All participants were given a choice of whether to participate or not and were given a choice to withdraw from the research at any stage. The participants were informed of the nature of the research before they participated in the study. The researcher had to make sure that the right of privacy of the respondents was upheld. Confidentiality of participant's information was exercised, and all the records of the participants kept safe.

4.8 SUMMARY

This study utilised the mixed method approach, which is a combination of quantitative and qualitative methods. The convergent parallel/triangulation design was used to carry out the study. The population and the sampling techniques used were discussed. The multi sampling technique was used. The study made use of the Rapid Rural Appraisal together with questionnaires, interviews, observations and document review. The chapter explained how data collected from the qualitative method was analysed through the extraction of themes. The quantitative method used the exploration of demographics using PIVOT tables (MS excel), reliability test analysis (using SPSS V25 IBM) and the Cronbach's alpha coefficient, descriptive statistics per latent variable, to collect and analyse the data. The researcher used inferential statistics, confirmatory factor analysis to be specific, a vulnerability analysis, and the structural equation to develop a framework for resilience. The chapter ends by explaining the ethical issues that were taken into consideration. The next chapter focuses on data presentation, analysis and interpretation of the research findings.

CHAPTER 5: DATA PRESENTATION AND ANALYSIS OF RESULTS

5.1 INTRODUCTION

This chapter presents the data obtained from the study and the analysis of the results. Qualitative data was merged with quantitative data and was presented as stipulated by the convergent parallel design. The major themes in qualitative data were presented in text form. The quantitative data was presented in the form of cross tabulation, tables, graphs and figures. The first section dealt with the demographics of resettled women farmers who participated in the study. The next section focused on the presentation and analysis of the hazards and stress that affected women farmers, the future uncertainties, the livelihood of these women, the role of governance and the resilience of these women. A reliability test was conducted using the Cronbach's Alpha. Then the confirmatory factor analysis was carried out, followed by the vulnerability analysis for the resettled women. The chapter also focused on the model building for resilience using the structural equation. The next step was to determine the parameter estimates, analysing the additional model fit indices for the model of resilience and demonstrating the modifications for the indices. The last part of the chapter focused on the building of the resilience model for women in farming.

5.2 DEMOGRAPHICS

The demographics of the resettled women farmers were a determining factor in assessing the resilience of women to climate change drought induced disasters. Different aspects of the demographics of women farmers in Mashonaland Central were discussed. This includes the age of the respondents and their marital status, their household size and land ownership, level of education and the age of the respondents and type of farming and the farming model.

Table 5.1: Age group vs marital status

Row Labels	18-29	30-39	40-49	50-59	60+	Grand Total
Divorced	0	2	3	0	0	5
Married	27	52	39	40	12	170
Separated	0	1	9	3	3	16
Single	5	6	12	7	1	31
Widowed	0	5	5	11	24	45
Grand Total	32	66	68	61	40	267

Source: (Survey, 2019)

Women of different age groups and different marital status respond differently to disastrous situations. The respondents were asked about their age groups and their marital status. Table 5.1 above shows the relationship between age group of the respondents and their marital status. All the respondents were above the age of 18, this is because in Zimbabwe an 18-year-old female is considered an adult therefore at that age you can make decisions such as getting married (The Zimbabwean, 2016). In the 18 to 29 age group categories, most (27) of the respondents indicated that they were married and in this age group there were no respondents who are divorced, separated and windowed. The respondents who indicated that they are between 30-39 were 66 in total and most of the respondent being married people. The least number of divorced women respondents were between the ages 40-49; however, most of the respondents in that age group are married.

Among the respondents that were between 50-59 years, there were 40 out of 61 respondents who indicated that they were married. The highest number of respondents who were 60 years and above was widowed and there were no respondents who indicated that they were divorced. The age group that had the highest number of respondents were married women between the ages of 30-39. This is because this is a productive age group and most of these women assist their husbands to farms. The least number of respondents were 18 to 29 possibly because most young women are not into farming and prefer to be employed in the cities.

The results indicate that most women in A1 and A2 farms in Mashonaland Central are between the ages of 30 to 59. This age range is made up of middle-aged women who have families to feed and agriculture is also their source of income. The total number of women who are married was 170 and if we combine the number of women who were single, widowed, separated and divorced it will give a total of 97. This is an indication that most of the respondents are farming together

with their husbands and 36.3 percent of the respondents are independent women farmers. The resilience of married women between the ages of 30 to 59 is more likely to be greater than female headed household. Married women are likely to depend on their husband when it comes to ideas and other farming inputs.

Table 5.2: Household size vs marital status

Household size	Divorced	Married	Separated	Single	Widowed	Grand Total
<2	2	4	0	1	3	10
2 to 5	2	62	0	12	12	100
5 to 9	1	75	4	12	22	114
9 to 12	0	18	0	2	2	22
>12	0	11	0	4	6	21
Grand Total	5	170	16	31	45	267

Source: (Survey, 2019)

It is essential to know the household size and the marital status of the respondents to determine the resilience of women in farming. Table 5.2 above shows the household size and the marital status of the respondents. The total number of respondents who have a household size of less than 2 is very small. This is an indication that most of the respondents do not have small families. None of the respondents that are separated indicated that they have a household size of 2 to 5 and married women recorded the largest number for a household size of 2 to 5. Most of the married respondents (75) had a bigger family with a household size of 5 to 9. This is common for people who practise farming especially small-scale farmers. Most small-scale farmers prefer to have large families and one of the reasons is for labour purpose (FAO and UNICEF, 2019). Almost 42.7 percent of the respondents have a household size of 5 to 9, this shows that most of the families have a bigger household size. None of the respondents who are divorced have a household size 9 to 12 and more than 12 and only married people have the highest number of household size of 9 to 12 and more than 12.

Table 5.3: Marital status vs land ownership

Marital Status	Land Ownership		
	Yes	No	Grand Total
Divorced	3	2	5
Married	158	12	170
Separated	16	0	16
Single	25	6	31
Widowed	39	6	45
Grand Total	241	26	267

Source: (Survey, 2019)

The respondents were asked if they own the land they farm on. Table 5.3 above shows the marital status and land ownership of the respondents. Out of the 5 divorced respondents, only 2 respondents indicated that they do not own land and 3 divorced respondents owned land. For married respondents, only 12 respondents indicated that they do not own land and 59 percent (158) respondents said they own land. There are so many married women who own land because most of them share land title deeds with their husband. Most of the women who are married under chapter 37, have the legal right to own property together with the husband (what belongs to the husbands belongs to the wives). All the 16 respondents that are separated indicated that they own land. Some of the separated women acquired the farms on their own since they had children to feed. The total number of respondents who are single was 31 and only 6 respondents indicated that they do not own land. More than three quarters (25 out of 31) of the single respondents own the farms. Table 5.3 above also reviews that the number of widowed respondents who own farms were 39 and only 6 out of 45 widowed respondents do not own the land they are farming. The total number of women who own land is 241, this is a large number considering that women were once disadvantaged, they were not able to own a piece of land, especially a farm. These results show that women have legal rights to farms although most of the women are married and sharing title deeds with their husbands.

Table 5.4: Land acquisition method vs education levels

Land acquisition method	Education Level						Grand Total
	No schooling	Primary school	'O' level	'A' level	Diploma	Degree	
From government	32	64	107	10	10	2	225
Land grabbing	10	2	8	1	0	0	21
Other	0	5	6	1	3	2	17
Purchased land	0	1	3	0	0	0	4
Grand Total	**42**	**72**	**124**	**12**	**13**	**4**	**267**

Source: (Survey, 2019)

Women across Zimbabwe managed to obtain land through various mechanisms. Women farmers in Mashonaland Central province who obtained land during the FTLRP indicated how they obtained their farms. Table 5.4 above illustrates how the women managed to acquire the farms and their level of education. The majority (107) of women with 'O' level managed to obtain land from the government. Evidence from the literature suggests that education plays an important role when it comes to managing a disaster Frankenberg, Sikoki, Sumantri, Suriastini, Thomas (2013). Women with 'O' level have basic education therefore it is important because these women are more likely to understand basic farming requirements. However, the number of women with no schooling and primary school level is slightly higher. It is an advantage for these women to obtain land from the government because they are not qualified for any other formal employment. But having many women with no schooling or limited education will impact on the resilience of women because they might not understand and practise good farming methods.

Only 2 respondents who obtained land from the government indicated that they have a degree and 10 respondents who obtained land from the government have a diploma. This is an indication that very few women with a higher level of education obtained land from the government. The highest number of women with no schooling indicated that they were involved in the land grabbing. They managed to grab land from former commercial farmers. None of the highly educated women with diplomas and degrees were involved in land grabbing. The total number of women respondents who obtained land from other means was 17 in total. Most of these women indicated that they managed to get the land from close family members and some from close friends. The least number of respondents (4) indicated that they purchased the land. This number is very low because the government of Zimbabwe was not selling the land, however the people who purchased land

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specified that they bought the land from other people who obtained land from the government and from land grabs.

Table 5.5: Age group vs education level

Age Group	Education Level						
	No schooling	Primary school	'O' Level	'A' Level	Diploma	Degree	Grand Total
18-29	2	10	19	0	1	0	32
30-39	7	8	37	7	5	2	66
40-49	7	16	35	4	4	2	68
50-59	11	22	26	0	2	0	61
60+	15	16	7	1	1	0	40
Grand Total	**42**	**72**	**124**	**12**	**13**	**4**	**267**

Source: (Survey, 2019)

The level of education and the age of the people can be an indication of the lifestyle of the community. Table 5.5 above shows the age group of the respondents and their level of education. The highest numbers of respondents (19) with O level were among the age group of 18 to 29. Respondents in this age group had the highest number of farms because the government of Zimbabwe encourages everyone to acquire at least O level. Among the women who were between the age of 30 to 39, 37 respondents indicated that they had O level and 7 respondents did not receive any form of formal education. The number of women with post school qualification is 7 and this is a low figure. The numbers of women who are in the age group of 50 to 59 with primary level education are 22. The reason could be in the past women among that age group were not encouraged to go to school rather they were encouraged to do household chores and practise farming. Most of the older women (from 50 to 60 plus) could not attend school or they only reached primary level because women were regarded as less important than men. Parents chose to take a male child to school rather than educating a female child who would later get married.

Table 5.6: Type of farming vs farming model

Type of farming	Farming Model		
	A1	A2	Grand Total
Arable farming	62	11	73
Mixed farming	148	20	168
Pastoral farming	23	3	26
Grand Total	**233**	**34**	**267**

Women in different faming models practised different farming types, some women practised arable farming, and some practised pastoral farming while others practised mixed farming. Table 5.6 above illustrates different farming models and different types of farming. The respondents consisted of women who obtained land through the FTLRP and these women were settled in A1 (small scale farms) and A2 (large farms). The total number of women who are practising arable farming is 73 and much of the A1 farmers (62) indicated that they practised arable farming. However only (11) A2 farmers indicated they practised arable farming. The main crops that are produced are maize, tobacco, soya beans and some of the farmers practiced market gardening. These crops are suitable for Mashonaland Central province. The number of A1 farmers who practised mixed farming is very high (148). The reasons for having such a higher number is most farmers plant crops but also kept animals for selling purposes and some A1 farmers used the animals such as cattle for ploughing. Most of the A1 and A2 farmers kept cattle, goats, sheep, chicken and pigs. At least 63 percent (168) of the respondents practised mixed farming, this is an indication that mixed farming is the most common farming method in Mashonaland Central. Only (3) A2 farmers indicated that they practiced pastoral farming. A2 farmers have large plots of land and the soil and the water content in Mashonaland Central province makes farmers to focus more on planting crops rather than pastoring animals.

Table 5.7: Household position vs land ownership

Household position	Land Ownership		
	Yes	No	Grand Total
Sole breadwinner	76	10	86
Wife	156	12	168
Grandmother	8	1	9
Relative	1	3	4
Grand Total	241	26	267

Women involved in farming have different family positions and their position and land ownership status can influence their farming activities and their resilience to drought as well. Table 5.6 above illustrates the household position and land ownership of the respondents. The number of women farmers who were sole breadwinners and owned a farm were greater than those breadwinners who

did not own a farm. Although the number of respondents who owned a farm (76) is not much, it is an indication that the government is changing some past beliefs that a woman cannot own land. Independent women can farm in their own farms and take care of their families just like their male counterparts. Most of the respondents (156) indicated that there are wives, and they own the farms. This shows that there are married women who are practising farming together with their husbands and those women have an equal share of the land as the husbands. The number of grandmothers that indicated they own the land is 8 and it is much greater than those who do not own the land (1). Out of the 4 respondents who indicated that they are relatives, 3 of the respondents said they do not own the farm. These relatives are either leasing or were given a piece of land to farm by their relatives who are the owners of the farm.

The demographic profile of the resettled women farmers has revealed how the women farmers acquired land and how their educational background, age and marital status has influenced their productivity in farming. The next section deals with the hazards and stress that is affecting the resettled women.

5.3 HAZARDS AND STRESSES AFFECTING RESETTLED WOMEN

Women in farming are likely to face many challenges as compared to their male counterparts. They are more vulnerable because they have been disadvantaged in the past. Women were not able to own land and they could not make decisions without consulting a man. Resettled women farmers in Mashonaland Central are also affected by the impacts of drought. These women were asked about their experiences with drought and what they have lost due to drought.

To address the first objective of the study: To assess vulnerability and impacts of climate change induced drought on resettled women. Participants were asked questions that were related to drought hazard and the stresses that they encounter when they are exposed to that drought hazard. Descriptive statistics was used to determine the vulnerability and effects of drought experienced by resettled women.

Table 5.8: Hazards and stresses affecting resettled women

	Knowledge of climate change/ drought impacts	Loss of livestock	Loss of crops	Awareness of drought preparedness strategies	Personal drought management plan	Drought early warning systems	Involvement in drought risk reduction
Valid	267	267	267	267	267	267	267
Missing	0	0	0	0	0	0	0
Median	2.000	2.000	1.000	2.000	2.000	2.000	2.000
Mode	2.000	2.000	1.000	2.000	2.000	2.000	2.000
Standard Deviation	0.487	0.499	0.307	0.439	0.361	0.474	0.378
Shapiro-Wilk	0.637	0.643	0.351	0.545	0.431	0.597	0.457
P-value of Shapiro-Wilk	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Minimum	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Maximum	3.000	3.000	5.000	2.000	2.000	2.000	2.000

Source: (Survey, 2019)

The respondents were asked if they have knowledge of climate change and drought impacts. According to Table 5.8, the mode is 2.000, this is an indication that most of the respondents did not have knowledge of climate change and drought impacts. Wilhile at el (2014) emphasised that the most essential enabling aspects in resilience building and drought risk management include aspects such as education of the community members, drought awareness and knowledge management. Lack of awareness among the communities could be one the reasons the people did not know the impacts of droughts. The resettled farmers were not be aware of how climate change and drought could affect their lives. Another reason could be due to a low level of education among some respondents. Some of the respondents did not attend school and some went as far as primary school, so it is difficult for them to understand the impacts of climate change. The lack of knowledge of climate change and drought poses a serious threat to these women farmers. The resettled women should be aware of the dangers they are likely to face in order to deal with the dangers posed by the climate and drought. A few respondents had knowledge of the impacts of climate change. These are probably women who have acquired basic education or heard about the impacts from other people or attended workshops on climate change. Those respondents who indicated that they knew the impacts seemed to be very informed of the dangers of climate change and drought impacts.

The respondents were asked if there had lost any livestock because of drought. From the data presented on Table 5.8, most of the respondents did not lose their livestock due to drought. The reasons for having few respondents lost livestock could be there are few resettled women who indicated that they were practising pastoral farming. This number influenced the response of the number of people who lost livestock. However, the farmers that indicated that they lost their livestock during drought also indicated that they lost the livestock through selling. The results are in line with the findings documented by Tau (2015). The researcher indicated that selling livestock during drought is a common practice, some farmers sell their livestock to buy food. There were, however, a small number of women farmers who indicated that their livestock died as a result of drought. From the observations conducted during the study, most of the resettled women prefer to keep cattle, goats and indigenous chicken. Women farmers who lost their livestock because of

death indicated that they were devastated because they lost their source of income and draught power.

In many cases, when an area experiences drought, crops are more likely to be affected. In the study, the respondents were asked if they have experienced loss of crops because of drought. The majority of the respondents said they have lost their crops due to drought. Most of the respondents were arable farmers and mixed farmers. These farmers were greatly impacted by drought because they survive on agriculture. Loss of crops means they had to struggle to feed their families due to lost income since most of the farmers sell their crops. From the observations conducted, most farmers in the province were growing maize, tobacco, soya beans and some were involved in market gardening. Loss of crops has a serious impact on the province and the country as well. In the absence of drought, Mashonaland Central province is one of the top provinces that produce a lot of crops. Loss of crops has a negative impact on the food security of the country and the economy since Zimbabwe is an agriculture-based economy.

The agriculture experts and local leaders were asked to outline the challenges that women farmers face because of drought. The following were common responses:

- *There is inadequate food in the province, women farmers are losing their crops and livestock, so women are finding it difficult to feed their families.*
- *In worst cases some women are resorting to immoral activities such as prostitution, just to find a way to survive.*

Women farmers find it difficult to survive during drought as they do not have the resources to farm. One of the experts interviewed indicated that *some women farmers are selling their livestock to compensate for the lack of income due to bad harvests.* The expert went on to say that *if the drought worsens, there is a danger of these women farmers ending up in debt and some of the women are likely to give up farming.* There is need to strengthen the resilience of these women farmers to minimise the impacts of drought.

Women farmers that participated in the study were asked if there were aware of any drought preparedness strategies. The response from Table 5.8 above shows that the mode was 2.000, this

indicated that the majority of the women farmers were not aware of drought preparedness strategies. The results contradicts the findings of the study in Zvishavane, Zimbabwe were women famers had knowledge of the preparedness strategies and involved in planning (Ncube at el, 2018). Not knowing drought preparedness strategies means these women do not have mechanisms or strategies to implement in an event of a drought. The resilience of the farmers towards drought is likely to be weakened if they fail to prepare for a drought disaster. The possible reason why most of the respondents were not aware of the drought preparedness strategies was lack of knowledge. Women farmers are at great risk, failing to prepare for a drought event makes them more vulnerable to drought. Few respondents indicated that they were aware of drought preparedness strategies. These were women who had experience in farming and some of them indicated that they were informed by experts and some said it was through indigenous knowledge. Being aware of the preparedness strategies of any disaster or event would assist women farmers to put in place some measures to deal with disasters.

A drought management plan is used to inform farmers on the measures that can be taken to minimise the risk associated with drought impacts. Women farmers who participated in the study were asked if they had a personal drought management plan. Table 5.8 above shows that the majority of the respondents did not have a drought management plan. These were women farmers who had little knowledge on how to plan for a drought event. One of the respondents further explained that she did not have a personal drought plan because she did not know how to plan for drought. The respondent went on to say, she would like experts in agriculture to teach the farmers on how they can make a personal drought plan. Women farmers are more at risk of drought if they fail to plan for a drought disaster. They will not have the capacity to deal with the impacts of drought and are likely to lose most of their crops and livestock. Nevertheless, a few women farmers indicated that they had a drought management plan. These women were adequately informed about the impacts of drought and had learnt from past experiences how to curb the impacts of drought. Most of the women who indicated that they have drought management plan stated that their plans were informal, they were not written. The women with drought management plans were asked to briefly describe their plans and these were some of the responses:

- *I stock the yields from the previous season, so if there is a drought in the next season, I will be able to have food for my family.*
- *If there is a drought, I plant short seasoned crops and drought resistant crops.*

Those women farmers who had a drought management plan were less likely to suffer the impacts of drought because they had guidelines to follow.

The presence of effective early warning systems will assist the farmers with information about a forthcoming drought so that they would be able to prepare for a drought event. The respondents were asked if there were aware of any early warning system. Table 5.8 above reveals how the respondents felt. The majority of the respondents said that they were not aware of any drought early warning system. However, there were a small number of respondents who had knowledge of drought early warning systems. These respondents pointed out that they made use of indigenous knowledge. An elderly woman said that *"I know that there is a drought approaching when there are a lot of wild fruits, this is how we were able to predict drought in the past and I am still using this method"*. Musarurwa and Lunga, (2012) pointed out that perceptions, traditional predictions and traditional beliefs mechanisms should be incorporated in the modern science of early warning systems. Using indigenous knowledge for early warning is a common method used throughout the province and the respondents believed it works. A few of the respondents said they got to know about the predications of drought through the weather forecast. They were able to tune in to the radio stations and television and find out about an approaching drought.

Local leaders that were interviewed stated that community members did not know the early warning systems because the systems were too technical and advanced for the women farmer to understand. The leaders also emphasised that *it is difficult to predict the occurrence of drought because drought is a slow onset event. It is difficult to see when it is approaching and when it ends.* Experts were interviewed and asked if there were early warning systems in the province and they said "*there are no early warning systems in place in most areas. The province relies on the metrological department and weather information is sent from the nearest stations. Small towns such as Centenary and Shamva do not weather stations so they rely on bigger towns with weather stations such as the one in Mvurwi and Bindura"* The agriculture experts were also asked what

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could be done to improve the early warning systems in the country. One of the experts said, "*The government and other relevant organisations should develop advanced technologies for monitoring and early warning systems.*" The country is facing an economic crisis therefore it is difficult for the country to be well advanced in early warning technologies that give accurate weather information.

Women farmers who participated in the study were asked if there are involved in the processes of drought risk reduction. The responses on Table 5.8 shows that majority of the women were not involved in drought risk reduction activities. The answers by most of the respondents show that women are at great risk of drought because they were not taking the responsibility of mitigating and preparing for drought. The responses show that the women farmers were not taking responsibility for minimising the impacts of drought, they rely more on government and other organisations to assist them. It is essential for these women farmers to work together with the government, NGOs and the community leaders to reduce the impact of drought. Women farmers should be involved in planning and participating more often in the processes of drought risk reduction.

5.3.1 Impact of drought on water sources

The lack or reduction of rain in an area has a great impact on the water sources. Water bodies in different areas react differently in the event of drought. Wetlands are likely to experience less effects unlike dry areas. The level of water in the water bodies can greatly affect the people in that area especially when there is a drought. Water that can be used for drinking, cooking, bathing, irrigating and feeding the animals is stored in these water bodies. Water sources that were identified in Mashonaland Central include boreholes, wells, rivers and ponds.
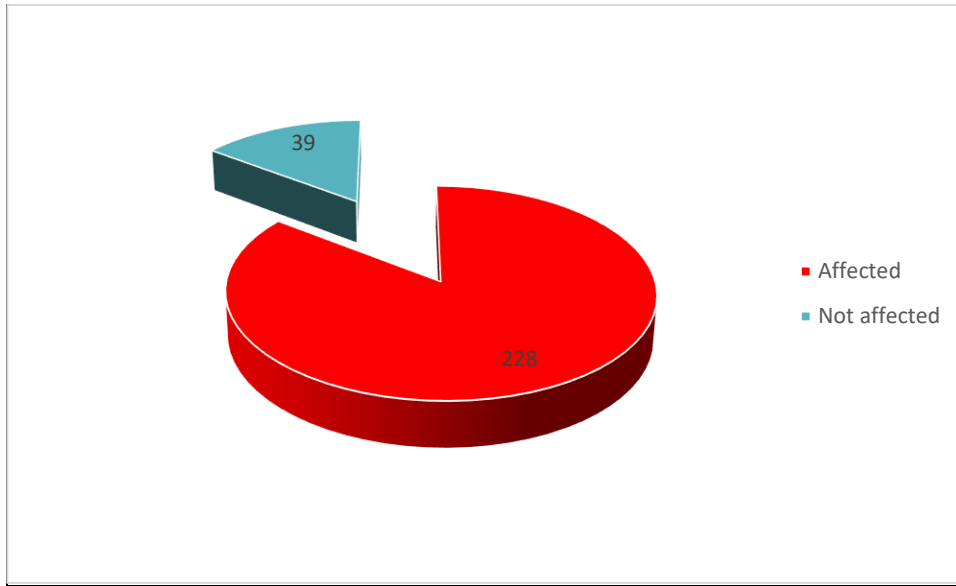
Figure 5.1: Boreholes affected by drought
Source: (Survey, 2019)

Boreholes are essential when it comes to storage of ground water. Borehole water is considered as one of the safest water sources. Figure 5.1 above shows that there was a significant difference between the respondents who indicated that drought is affecting borehole water and those who said their borehole water is not affected by drought. Only 39 respondents indicated that drought is not affecting their boreholes. From the observation, these women were staying in areas that are much wetter than the rest of the province. Most of the respondents indicated that drought had affected the level of water in their boreholes. Since borehole water is considered safe for drinking in rural areas where water purification is hardly practised, it is risky for people's health if borehole water is not available. People are likely to resort to unsafe water sources thus the risk of experiencing waterborne diseases such as diarrhoea, typhoid and cholera is very high.
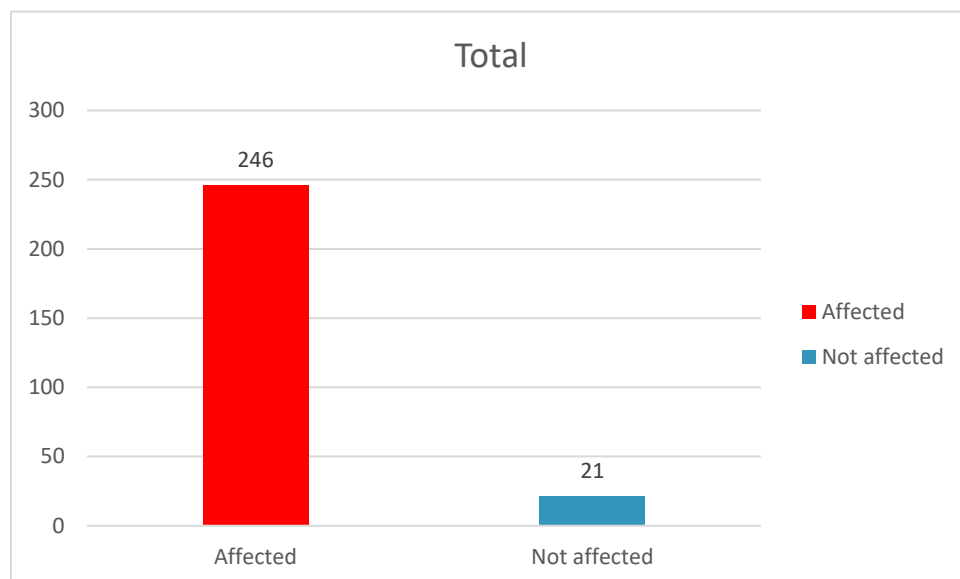
Figure 5.2: Wells affected by drought
Source: (Survey, 2019)

Most of the households in farms and rural areas have wells. Water from wells is used for various domestic uses such as drinking and cooking although it is not safe for those purposes. The persistence of drought in an area can result in a negative impact of wells. Figure 5.2 above shows how drought had affected the wells in the province. More than 90 percent (246) respondents indicated that drought had affected their wells. The researcher conducted some observations in the areas of Muzarabani district, Bindura district, Shamva district and it was observed that the water levels in the wells were very low and some of the wells were totally dry. The few cases of respondents that indicated that their wells were not affected by drought are farmers who are in areas that had a higher water table.

Table 5.9: Effects of drought on water sources

Water source	Affected	Not affected
Rivers	235	32
Ponds	250	16

Source: (Survey, 2019)

Rivers that were identified in the study were Mazoe river, Ruya river, Pote river and Nyaure river. Women farmers in Mashonaland Central use water from these rivers for irrigation purposes, feeding animals and domestic purposes. Women farmers who stated that the rivers were affected by drought were 235 and only 32 women believed that the rivers were not affected by drought.

The observations conducted show that the rivers were affected by drought although the degree was different. During the time of study, the level of water in all the rivers was lower than the normal capacity. The province is known of receiving high to moderate rainfall but the drought of 2018 and 2019 affected the province. Therefore, water sources such as rivers contained little water or in extreme cases, the rivers dried up completely.

The existence of natural and manmade ponds in Mashonaland Central province is a great advantage since ponds can store large quantities of water that can be used in dry periods. The majority (250) of women farmers indicated that ponds were affected by drought (Table 5.9), and only 16 respondents indicated that ponds were not affected by drought. Ponds in the area assist the farmers with water for irrigation and drinking water for livestock. The drying up of ponds pose a serious problem for women farmers since they rely on water from these ponds. In some regions, water bodies have been seriously affected by drought. The 1882 drought also affected Botswana, water bodies completely dried up and many animals were lost, nearly half of the total population relied on emergency food supplies from developed countries (ActionAid, 2008). This is an indication that drought has a negative impact on the water bodies, the community and the livestock.

5.3.2 Losses that occurred because of drought

The occurrence of drought in an area can lead to several losses. Emerging women farmers are largely affected by drought because they lack some resources and experience that other farmers possess. Women farmers in Mashonaland Central have recorded financial loss because of drought. Drought directly and indirectly affects women farmers. The losses that these women farmers have recorded ranges from crop failure, loss of animals, lack of crop insurance and lack of labour.
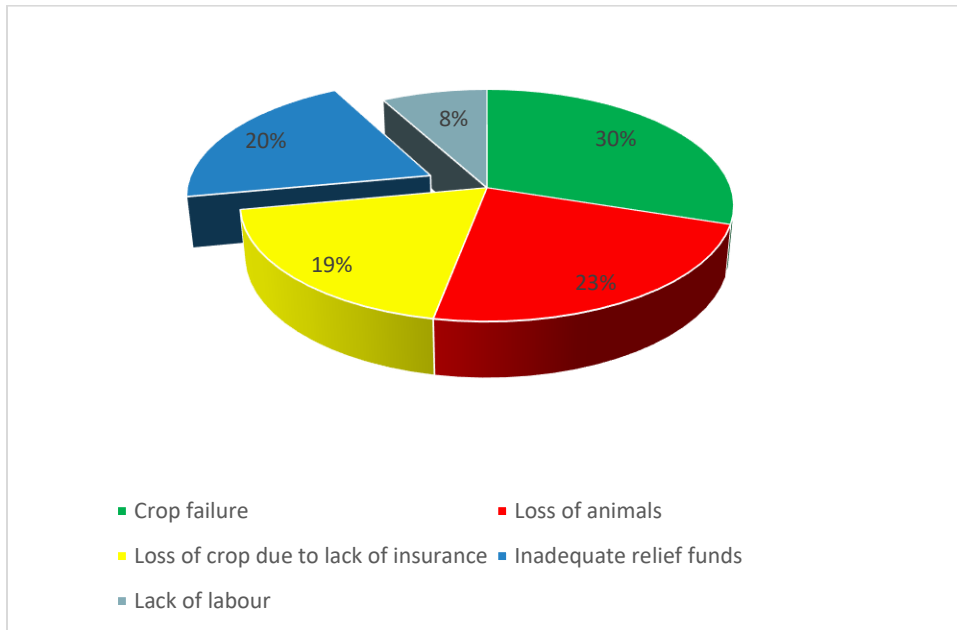
Figure 5.3: Losses as a result of drought
Source: (Survey, 2019)

Women farmers who participated in the study were asked to indicate the reason behind their financial losses due to drought (Figure 5.3). The majority (30 percent) of the women farmers said that they encountered some financial losses when their crops failed because of drought. The farmers were hoping to sell their crops after harvest but when drought occurred, these women farmers were left with few and some did not have any crop to sell. Twenty-three (23) percent of the women farmers indicated that they experienced some financial losses because they had lost their livestock. These women recorded some financial losses because some of their livestock died and they sold the remaining livestock for a very low amount.

Nineteen (19) percent of the respondents indicated that they experienced some financial losses because they did not have insurance. This insurance would assist farmers against weather related challenges such as drought. Most of the women farmers do not ensure their crops, so in the event of a drought, farmers without crop insurance will not get any compensation. It has been observed that most of the small-scale farmers such as the A1 farmers do not have insurance. Some of the women farmers attributed their loss of finances due to inadequate relief funds. There were 20% of the respondents who made financial losses due to inadequate relief funds. These women emphasised that they made financial losses because they did not get enough seeds and fertilisers

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from the government. Some of the women further explained that *if they had enough relief funds, they would have planted more crops and if there was also enough fertiliser from the government and other organisations, they would have produced more crops.* Few respondents recorded some financial losses because they did not have enough labour. Very few women farmers related their financial losses to labour because most the farmers especially the A1 farmers indicated that they do not need extra labour. They can plant and harvest their crops as a family and only a few indicated that they would need to hire few people to assist them. Most of the respondents that indicated that they recorded losses because of labour were A2 farmers. Labour is normally needed in A2 farms because the farms are bigger in size.

5.4 ADDRESSING FUTURE UNCERTANITIES OF RESETTLED FARMERS

Uncertainties are caused by long term trends such as climate change. To address those uncertainties there must be some form of adaptive measures that are put in place. Adaptive capacities assist in managing the livelihood of the community. There is need to improve and understand drought and its impacts so that adaptive measures are identified. Women famers applied different adaptive strategies to deal with the effects of drought. Brody et al. (2008) pointed out that in order to assist in building resilience in women, there must be adaptive programmes which consider gender differences in the extent of exposure to climate change, the extent of vulnerability, as well as the capacity to adapt. The adaptive measures applied by the resettled women farmers helped in the resilience building of the community. To address future uncertainties the researcher examined issues such as the adaptive strategies applied by the women farmers, awareness programmes that are in place and how the women farmers' access information related to drought.

5.4.1 Adaptive strategies applied by women farmers

To address the objective regarding determining strategies applied by the government and different organisations to minimise the level of impacts, the strategies that women farmers used will be assessed. It is very important for a community to apply some strategies, which can assist them in adapting to the dangers that they are exposed to. Women farmers in Mashonaland Central province

applied different adaptive strategies such as crop diversity, crop rotation, improving irrigation systems and buying insurance.
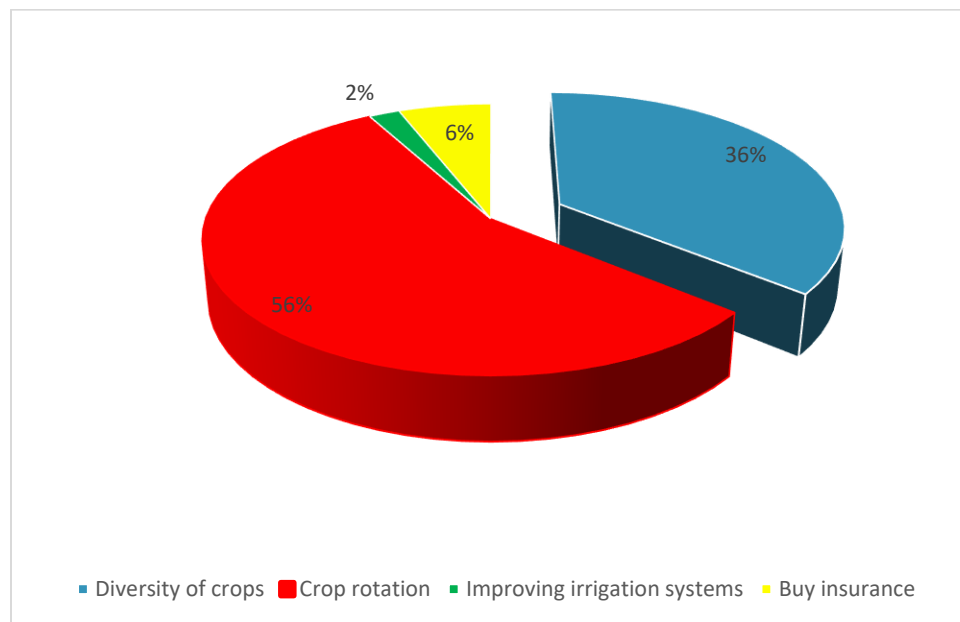
Figure 5.4: The adaptive strategies that were applied
Source: (Survey, 2019)

The study suggested that 36 percent women farmers diversify crops as an adaptive strategy. Women farmers in Mashonaland Central applied this strategy as it gave them a variety of choices, they could increase production by focusing on various crops. The agriculture experts emphasised that *the method is essential because it helps the women farmers with nutrient security, and it plays a crucial role in poverty alleviation*. The observations showed that the women farmers were having different crops such as maize, soya beans, vegetables and sorghum on a single farm. If the women farmers have diverse crops, they are likely to encounter fewer impacts in the event of drought. The agriculture experts went on to say the *diversifying crops such as vegetables, maize and sorghum are an advantage because if there is a drought in the area, drought resistance crops such as sorghum will survive the drought therefore a farmer will remain with some crops instead of losing all the crops.*

The majority of the respondents (56 percent) indicated that they apply crop rotation methods as an adaptive strategy. Crop rotation method is an effective method used by these women farmers; this

method increases the soil fertility, the soil organic matter will increase due to micro-organism that are left behind by each of the plants that are planted in that specific area (Thierfelder, Cheesman and Rusinamhodzi, 2012). The other advantages of using this method is it increases the crop yields, it reduces soil erosion, it also limits the concentration of diseases and pests, improve the structure of the soil and it also diminishes the stress weeds (Thierfelder, Cheesman and Rusinamhodzi, 2012). Therefore, using this crop rotation method women farmers strengthen their resilience to drought. The drought has less impact unlike when they do not use this adaptive measure.

The study results in Figure 5.4 above reveal that the least adaptive strategy applied by these women farmers is using improved irrigation systems. Only 2 percent of the women farmers indicated they apply this method. Those farmers who are used improved irrigation are A2 farmers, none of the A1 farmers indicated that they use this method. The reason why there are few women farmers who use this method is that the method requires machinery that is too expensive especially for small-scale farmers. One of the A2 farmers who is using irrigation systems pointed out that "*I was just fortunate to be given a farm that had an irrigation system and a dam close to the farm*". This farmer indicated, "*the former white commercial farmer is the one who placed those irrigation systems, otherwise if not for the former farmer I was not going to afford to have an irrigation system at the farm*". Irrigation systems are very effective especially when there is a drought, farmers make use of irrigation instead of waiting for the rains.

Having farming insurance is an advantage because when weather related events such as drought strike, farmers can claim from the insurance company. Only 6 percent of participants indicated that they have insurance. Most of the participants that had insurance were A2 farmers. These were farmers who were financially stable, and they know the importance of been insured. The agriculture experts also indicated that *most of the tobacco farmers have hail and storm insurance and farmers with livestock have insurance that covers lightning and natural diseases.* The insurance covers their crops, animals and the equipment that they use for farming. Other women farmers who indicated that they do not have insurance pointed that they knew the importance of having an insurance, but they said they cannot afford paying the insurance. Most of the women

farmers did not have any other sources of alternative income besides receiving money from selling crops or livestock, so they cannot pay for the monthly insurance subscriptions.

5.4.2 Adaptive measures to deal with future uncertainties

For the future uncertainties to have no or few effects there are some measures that can be implemented for a community to become resilient to a negative event. Descriptive statistics are used to describe future uncertainties that affect the resettled women farmers in Mashonaland Central province. Table 5.10 below shows the descriptive statistics for future uncertainties that resettled women are subjected to. To find out how the women farmers dealt with future uncertainties, the following issues were addressed: adaptive strategies leading to a stronger resilience, the strategies allowing the community to cope with the changes, the existence of climate change awareness campaigns and the ability of the resettled women farmers to access climate change and drought information.

Table 5.10: Future uncertainties

	Adaptive strategies lead to stronger resilience	Strategies allow the community to cope with changes	Climate change awareness campaigns	Access to climate change/drought information
Valid	267	267	267	267
Missing	0	0	0	0
Median	1.000	2.000	2.000	2.000
Mode	1.000	2.000	2.000	2.000
Shapiro-Wilk	0.624	0.580	0.548	0.629
P-value of Shapiro-Wilk	<.001	<.001	<.001	<.001
Minimum	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	2.000	2.000

Source: (Survey, 2019)

Participants were asked if the strategies that they applied led to stronger resilience. According to Table 5.10, the mode of the question about the strategies leading to stronger resilience is 1.000. The study shows that the participants agreed that applying strategies such as diversifying crops, crop rotation, using improved irrigation systems and having insurance strengthened their resilience to drought. These women apply different strategies depending on what method is convenient to them. However, most of the resettled women used crop diversity and crop rotation. These methods have been used in the past and they have proved to be cheaper than using advanced irrigation systems. Using advanced irrigation systems applies to be the best method when there is a drought but only few women farmers can afford it.

Strategies can be put in place, but the community can react differently to the strategies they use. Some people may feel the strategies can help them cope with the changes and trends, but some have a different perceptive. The resettled women farmers that participated indicated that even though the strategies lead to stronger resilience, these strategies do not allow the community to cope or respond to the trends and changes. The reason why the community cannot cope is probably because some of the strategies such a crop diversity and crop rotation are not applied by the whole community. Some of the community members might be not using any adaptive strategy therefore, when drought occurs the community might suffer because those farmers with no adaptive strategies will lose most of their crops. Some of the strategies such as having insurance and improved irrigation systems will not work for the community as a whole because those adaptive strategies require a lot of money and most of the resettled women farmers especially the A1 farmers do not have enough money to apply these methods.

It is essential to conduct some awareness campaigns so that the community is informed of the challenges that they are likely to face, and how they can overcome those challenges. According to Table 5.10 above, the majority of the resettled women indicated that there were no awareness campaigns in their area. Most of the respondents feel that they are not getting enough awareness on climate change and drought, this is also supported by the responses of the participants when they were asked about the impacts of climate change and drought. Most of the respondents indicated they do not know the impacts. The level of education for most of the resettled women

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farmers is low and most have basic knowledge. These people need to be taught about the impacts of drought and what they can do to minimise those impacts. The other reason why the farmers do not receive awareness is the farms especially the A2 farmers are far from each other. It is difficult to gather farmers who are living far from each other. A few respondents indicated there are awareness campaigns. These women said *there are awareness campaigns but some of the farmers do not show up in those meetings.* They indicated that *there are farmers who have houses in the city, they come to the farms during the planting and harvesting seasons therefore they miss some of the campaign*s. The local leaders were asked if there are awareness campaigns and they said *there are awareness campaigns, the ward-based officers train the farmers. However not every farmer attends the meetings and there should be more awareness campaigns to educate the farmers*.

The resettled women are likely not to be prepared for any drought event if there are not aware of the forthcoming dangers. The resettled women are at great risk from drought because they do not receive enough information. This is the case with most of the developing countries. Most African countries have a limited degree of drought awareness and institutional capability to develop. The most essential enabling aspects in resilience building and drought risk management include aspects such as education of the community members, drought awareness and knowledge management (Wilhile, Sivakumar and Pulwarty, 2014). The resettled women lack adequate education and do not receive enough awareness. They have little knowledge on drought as a disaster, therefore these areas must be addressed for them to build their resilience. Awareness campaigns are an effective method because people will pass on the information to other people in the community.

Participants were asked if there have access to relevant and timely information relating to climate change drought disaster. The results in Table 5.10 reveals that the resettled women farmers do not have the information on climate change induced drought. The reason why these women do not have the information is probably that these women farmers lack agriculture knowledge. Most of the women got the farms based on political grounds and some were connected to people in the government who were issuing farms. Most of the people who have agriculture diplomas and degrees were not resettled therefore the ones that have farms do not have enough knowledge about

farming and the threats that affect farmers such as climate change. Information relating to climate change and drought is normally published in climate magazines, journals and on the internet. Most of the resettled women farmers do not have accesses to these forms of media.

5.4.3 Sector experts informing women farmers

Experts from different organisations work together with farmers. These experts educate the farmers on various issues such as climate change and drought. Resettled women in Mashonaland Central province indicated that they got information on drought from sectors such research organisations, government, water management experts, agriculture extension officers and the private sector.
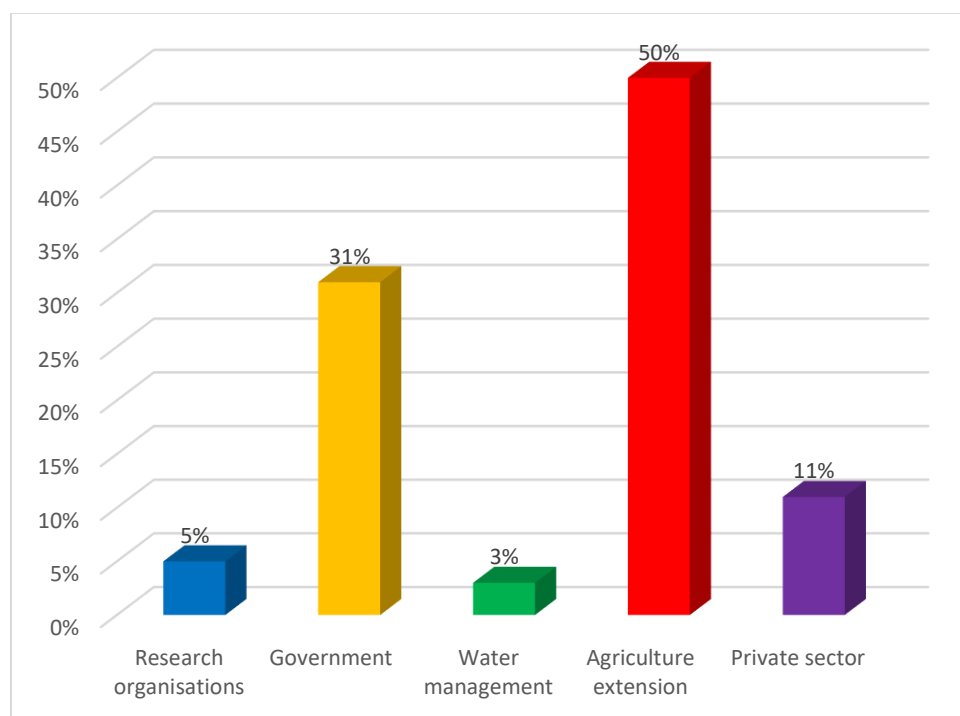
Figure 5.5: Sector expert informing the farmers
Source: (Survey, 2019)

The study reveals that resettled women farmers receive most of their information from agriculture extension officers. Agriculture extension officer usually relate with the farmers, they go into the farms and identify challenges the farmers are facing. Extension officers indicated that they normally conduct meetings with the women farmers and the farmers will be educated on the time

of the season to plant and if there is drought, they inform the farmers to plant drought resistant crops. The government of Zimbabwe sends various experts to the resettled farmers to inform them about the programmes they are conducting. Thirty-one (31) percent of the resettled women farmers indicated that they got information about intervention programmes such as command agriculture and the presidential inputs from various government representatives. Only 3 percent of the respondents indicated that they got information on drought from water management. Private companies are also involved in dissemination of information related to climate change and drought. However, their involvement is relatively low probably they do not have the capacity to work with many farmers.

5.5 LIVELIHOOD OF THE RESETTLED WOMEN FARMERS

For the majority of people in Zimbabwe, farming is not just an occupation; it is the only means of survival. Small-scale farmers such as the A1 farmers grow variety of crops to take care of their families and the community. Resettled women farmers in Mashonaland Central province gain livelihoods through production on the land they obtained. A drought event can affect the livelihood of the farmers and there are many initiatives that can be put in place to strengthen their resilience to drought.

5.5.1 Livelihood strategies

There are various ways of improving the resettled women farmers' livelihood. These include access to markets, having other sources of employment, having programmes that advocate for women empowerment and having other organisations that assist women in farming. Table 5.11 below shows the description statistics for the livelihood of resettled women famers in Mashonaland Central province.

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Table 5.11: Livelihood strategies statistics

	Community access to markets	Other sources of employment for the community	Cultural practices and value that discriminates women in farming	Programmes that advocates women empowerment
Valid	267	267	267	267
Missing	0	0	0	0
Mode	1.000	2.000	2.000	2.000
Standard Deviation	0.474	0.457	0.372	0.368
Shapiro-Wilk	0.597	0.573	0.447	0.457
P-value of Shapiro-Wilk	<.001	<.001	<.001	<.001
Minimum	1.000	1.000	1.000	1.000
Maximum	2.000	2.000	2.000	3.000

Source: (Survey, 2019)

The majority of the respondents indicated that they do have access to good markets. The women farmers indicated that they sell their produce in their local markets, to the government and some of the farmers supply farm produce to supermarkets. For farmers who are involved in market gardening expressed that they sell most of their produce at the local markets and most of the women farmers sell their produce at one of the biggest markets in the country (*Mbare musika*). The local leaders revealed that *farmers that obtained their fertilizers and seeds from command agriculture and the presidential scheme are required by the government of Zimbabwe to sell their maize to state- owned Grain Marketing Board. The farmers are required to sell their maize at a fixed price determined by the government.* The resettled women farmers believed that they have good markets because they can sell their produce at a fair price and they are able to support their families.

The few respondents who were not happy about the markets said, *"They normally travel for long distance and they need to hire trucks for them to reach the marketplace."* Those who are not happy are probably those farmers who stay in areas that are far from the marketplaces. The women farmers expressed that they want to export their produce to international markets. In Mashonaland Central province there are various marketplaces, these marketplaces are placed at growth points and town centres. Farmers can sell their products to the local people and some of the local traders buy directly from the farmers. Theses traders buy in bulk and they get a discount from the farmers. From the interviews conducted with one of the local leaders, the leader said, *"We have so many A1 and A2 farmers in this area and these farmers depend on agriculture and most of them are making a living from farming. We are happy that women have their farms, and they can take care of their families, they can sell their farm produce at Manhenga growth point and some sell along the major roads."* The resettled women can improve their lives and the lives of the community by selling them farm produce.

The presence of other income sources in a community is an advantage to the community because the community can have another source of income. Table 5.11 above shows that the majority of the resettled women indicated that the community does not have other sources of employment. The reasons for not having alternative employment are probably that these communities are in

rural areas and in most of the rural areas in Zimbabwe there are no industries. Most of the industries are in large cities and bigger towns. There are few shops available in rural areas therefore people have very few employment opportunities. The chance of a person to get a job is very low so most of the farmers rely on agriculture. One of the local leaders said "*It is very tough for the community because the community suffers the most when there are harsh weather events such as drought, the farmers will lose their crops and they will not have any other alternative jobs to support their families.*" One of the participants was very emotional as she explains how frustrated she is with the situation, this woman said, *"I am a widow and I have raised my children through farming, I have taken my children to school but I don't see the benefit of that. My first born has a degree, the second born has a diploma and the last one has just finished A level, all my children are not employed. They are helping me at the farm instead of them doing their jobs. I was hoping that my children will take me out of poverty, but they are just working here at the farm. If only my children would find employment because relying on farming only is dangerous because if there is drought we will suffer as a family."* Being unable to find employment has a very negative impact on the resettled women farmers.

Even though most of the resettled women farmers indicated that there are no other sources of employment, a few individuals indicated that there are other sources of employment. These respondents were asked to state the other sources of employment, these are highlighted below:

- *Brick molding*
- *Gold panning*
- *Fishing*
- *Trading*
- *Sewing*
- *Shop assistant*

Most of the employment positions they mentioned are informal employment since there is a high unemployment rate in Zimbabwe. Most of the farmers do not have other sources of employment and most people are employed in the informal sector in line with what the BBC NEWS (2017) reported. The BBC NEWS (2017) pointed out that more than 90 percent of Zimbabweans are

unemployed and the majority of the employed are employed in the informal sector. Participants who indicated that they had other sources of employment were from Bindura district. Bindura is the provincial capital of Mashonaland Central province so farmers who are close to the town can work in Bindura. Some farmers in Shamva indicated that the community is involved in illegal gold panning and illegal fishing. In Centenary, one of the towns in Muzarabani district, the community also depends on trading. Some of the people sell vegetables, second-hand clothing and some are employed in the shops that are at the town centre of Centenary.

There are some cultural practices and values that will either positively or negatively affect people's way of life. Most of the respondents indicated that there are no cultural practices and values that discriminates women from farming. The rights of women are being observed, and the resettled women farmers feel that they have gained some respect from the society. Most of the cultural practices that discriminates women from farming have been abolished by the government of Zimbabwe. Women farmers were not allowed to own any piece of land, according to the cultural practices, women were supposed to allow men to oversee the land even if their husband dies. A woman would lose a piece of land she owned with the husband because the culture and beliefs regarded women an outsider who had no right over the piece of land.

According to past cultural practices and beliefs women were regarded as helpers and they could not make decisions in the home, only men could make decisions. Social norms influence decision-making processes in the home, which in turn affects the ability of women to access training opportunities, as seen in seed potato multiplication and potato production in Malawi (Njuguna, Liani, Beyene and Ojiewo, 2016). Most of the cultural practices that discriminate women from farming have been abolished by the government of Zimbabwe. This is also supported by the representation of women in crucial positions such as the parliament of Zimbabwe, the number of women representations has increased (Tshuma, 2018) unlike in previous years. The government of Zimbabwe has changed some of the cultural beliefs that discriminated against women in farming. During the Fast Track Land Redistribution Programme, women were allocated their piece of land. This is also confirmed by the number of women in this study who own farms, especially those who are single and widowed. There were few women who mentioned that they are some

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cultural practices and beliefs that discriminate against women farmers. The cases were few and it is usually abusive men who use old cultural practices and beliefs to justify their behaviour. One of the respondents said that she was not allowed to decide what to farm, the husband decided what he wanted, and she was supposed to agree with whatever the husband decided. That was just an isolated case, but resettled women farmers were happy that they can manage the farms and make some critical decisions regarding farming.

Resettled women farmers in Mashonaland Central province were asked if there have knowledge of the programmes that advocate for women empowerment. Table 5.11 reveals that the majority of the respondents did not know of programmes that advocates for women empowerment. The reason why most of the respondents do not know of the programmes is there are few awareness campaigns that alert women farmers of available programmes. Some of the respondents indicated that there are no programmes because they are not part of these programmes. Most of the women indicated that if there are programmes for women empowerment then they are in some areas not in their community. However, there were some respondents who indicated that there are programmes that advocate for women empowerment, these women were asked to mention the programmes and they mentioned the following skill development projects:

- *Bread making project- women are encouraged to make bread and sell the bread to the community*
- *Detergent making project- women are taught to make detergents and they use the detergents and they also sell some of the detergent*
- *Sewing and knitting cooperatives- women join cooperatives and they are taught to sew clothes and knit, and they will sell their produce.*

These programmes have assisted women farmers with much-needed skills. These women have gained skills that they can even pass the knowledge to other people in the community.

5.5.2 Social networks as adaptive mechanisms

Resettled women farmers in Mashonaland Central province made use of various social networks, these social networks advocate for drought risk reduction. Network and networking of the resettled

women assists them in adapting to the drought events. According to Coleman (1998), social networks are utilised by people to accomplish their goals and interest. It is in the interest of the resettled women to minimise the risk of drought; therefore, they are part of social networks. Social networks can be formal or informal and the resettled women indicated that they make use of the following social networks:

- *Farmers organisations*
- *Church members*
- *Mikando (society)*
- *Family networks*
- *Political connections*
- *Friends*

The women farmers indicated that they find emotional support from these networks but in few cases, they can get financial support. Literature suggests that social networks are one of the essential strategy rural farmers can apply to deal with the effects of any disaster especially drought (Bruschweiler and Gabathuler, 2006). The involvement of these social networks lowers the vulnerability of the resettled women to drought impacts. The farmers' organisation safeguards the interest of the farmers. They offer support and assist the farmers with information on how to reduce risk of events such as drought. These organisations include the Zimbabwe Farmers Union (ZFU), Tobacco Growers Trust (TGT), Cattle Producers Association (CPA), Zimbabwe Tobacco Association (ZTA) and National Association of Dairy Farmers (NADF). Women farmers can get spiritual and emotional support from church members. This kind of support will give strength to the farmers to continue farming and women farmers get some advice from church members on ways to reduce the risk of drought. Literature also reveal that community organisations as social networks in drought issues would assist in reducing the vulnerability and increase the resilience (Kuhlicke et al, 2011). Churches are found in every community in the province and most of the people tend to trust the support that they get from church leaders and members. There are other social network either than church that offer support to the farmers. The *mikando* (society) groups that women farmers are involved offer some financial support, they can contribute money and they

will use the money to buy inputs such as drought resistant seeds. Family networks, political connections and friends assist the women farmers with emotional, financial and advice on how to minimise the impacts of drought.

5.5.3 Making informed agriculture related decisions

It is essential for women farmers to make the right decisions concerning agricultural related issues. The decision-making process can be influenced by several factors. Women farmers may fail to decide because of their nature, the farmer might prefer to avoid risk or is risk averse, or the farmer can decide because she is a risk taker. There is need to make the right decisions and failure to do so has some negative consequences attached.
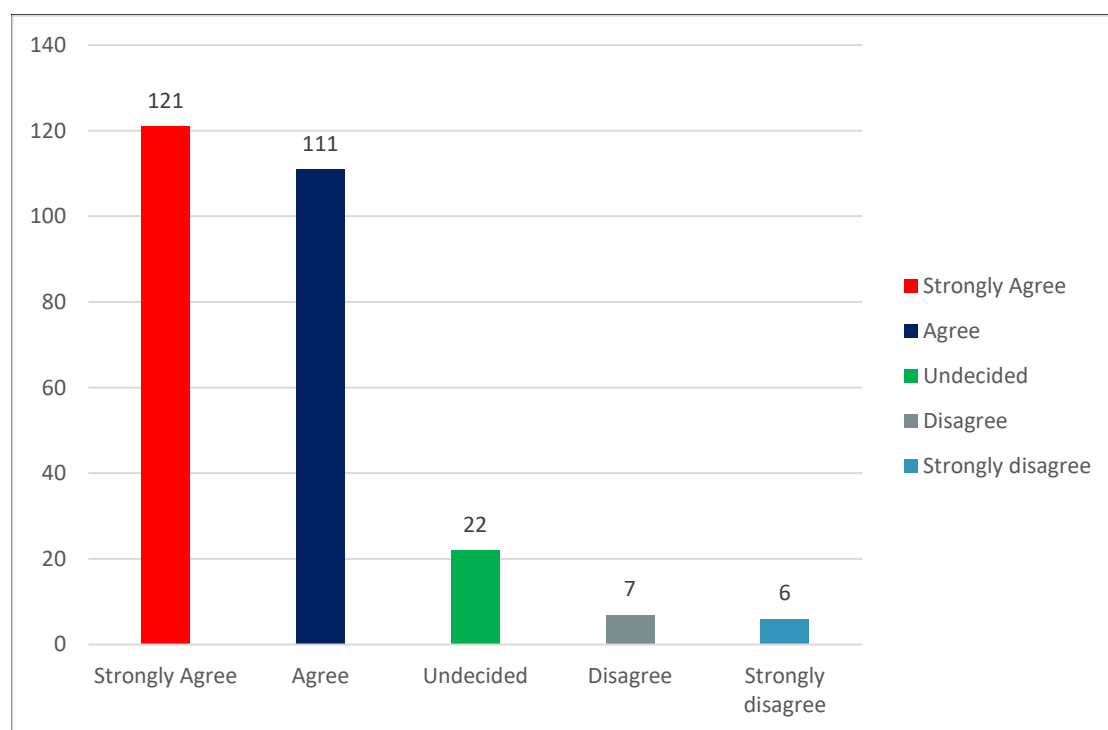
Figure 5.6: Agriculture related decisions
Source: (Survey, 2019)

The respondents were asked how they feel about making a decision that is agriculture related. The majority of the respondents indicated that they strongly agree that as a woman they are able to make decisions that are agriculture related. This shows that the resettled women in Zimbabwe have the power to make decisions, they no longer rely on men to decide for them. The Ministry of

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Women Affairs, Community, and Small and Medium Enterprises Development has worked tirelessly to make sure that some of the rights of the women farmers are observed. A total of 111 respondents agreed that they can make decisions on agriculture matters. The reasons for having a huge number of women who are making decisions is because there are several single women, widows and those who are separated. These women are not obliged to consult anyone, they can make independent decisions. There are, however, some women who were unsure of their abilities, these are women who can make decisions at times, but there are times when they feel like they need to consult someone on agriculture related decisions. The number of women who disagree and strongly disagree is very low. These were few married women who felt they cannot make any agriculture related decisions without consulting their partners, they feel not consulting their partner's shows that you are disrespectful. According to the Shona culture and beliefs a woman is under a man therefore, the women must consult the husband first then the husband makes the final decisions since he is the head of the house.

5.5.4 Ability to get financial assistance from the bank

Farmers can ask for assistance from the bank in the form of a loan and the farmers are required to pay the money back. The banks normally verify if the farmer is eligible to get assistance from the bank. For a farmer to get a loan, the bank needs collateral security, and a farmer must pledge assets for security purposes. When the farmer fails to pay the amount borrowed the bank will repossess the farmers' assets. If the farmer does not have any tangible assets to pledge, the farmer will not be able to get a loan. Figure 5.7 below shows how the resettled women farmers feel about getting a loan or any assistance from the bank.
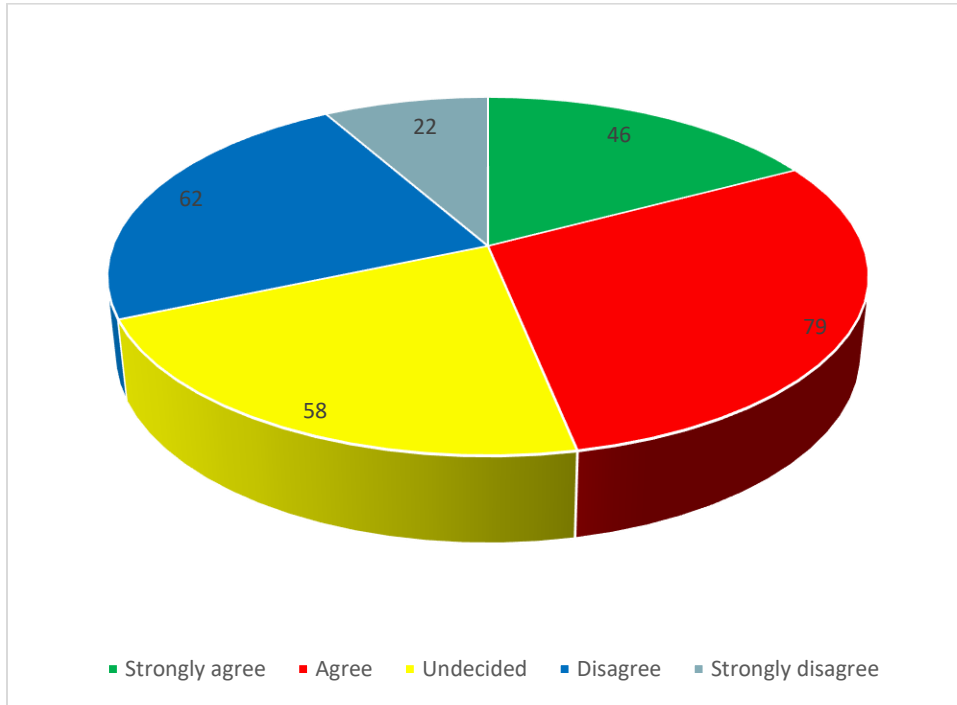
Figure 5.7: Getting a loan or any assistance from the bank
Source: (Survey, 2019)

Resettled farmers had different views about the ability to get a loan or any financial assistance from the bank. The highest number of responses was 79, and these are women who agree that it is possible to get a loan as a female farmer. The number of resettled women who strongly agree that it is possible to get a loan were 46. Clement (2018) emphasised that very few women in low-income countries as compared to men have bank accounts, commercial banks usually work with commercial farmers who are already well positioned in value chains. The respondents who strongly agree and those who agree emphasised that it is only possible for them to get a loan if they have valuable assets, these women said the banks do not discriminate based on gender but the bank only wants collateral security. Some of the women who agreed and strongly agreed mentioned that they can get a loan from banks such as Agribank and Women's Micro-finance bank. Besides other banks, these are the banks that can assist women farmers with loans and they also fund some agriculture projects. At Women's Micro-finance bank, women farmers can apply for micro farming loans which are meant for inputs, tillage and harvesting. Women farmers can also apply for micro leasing/asset, finance loans which assist women farmers with farming implements and machinery. From the observations noted during the study, most of the A2 farmers

agreed and strongly agreed that they can get loan. This is probably because they have valuable assets that can be used as collateral; therefore, it is not difficult for them to get loans. This is a different case for most of the A1 farmers who are small scale farmers and most of them lack resources.

The number of women who disagreed is 62 and those who strongly disagreed are 22. This is an indication that some of the resettled women do not access to loans from the banks. Some of the respondents said," *they have been turned away by some banks when they wanted to borrow money.*" These women were told that they do not qualify to get loans from the bank. However, some of the women indicated that they did not attempt to get loans, they were informed by other people that it is difficult to get a loan, so they believe it is difficult to get a loan. Fifty-eight (58) respondents were undecided, these are women who are not quite sure if they can get a loan from the bank or not. Some of the women in this category said they were times when a woman can apply for a loan and get the loan and there are times when you cannot get the loan. It is important for resettled farmers to get loans from the bank so that they upgrade and maintain their farms to run efficiently. The agriculture experts expressed that," *it is important for farmers to get loans because loans can be used for repairs and upgrades to infrastructure or land and this will in turn improve the farms value, make the farm business more efficient and this can also improve the products on the farm.*"

5.5.5 Financial assistance from government for women farmers

Women farmers can get assistance from the government to boast agriculture supplies of a country. Governments usually offer financial assistance to farmers during critical times such a drought event that affects whole country or some sections of the country. Farmers usually expect financial support from the government, but it is up to the government to provide the support. Some governments fail to give all the farmers support but there are some categories of farmers that might get assistance. Figure 5.8 below shows the response by resettled farmers regarding getting some financial assistance from the government of Zimbabwe.
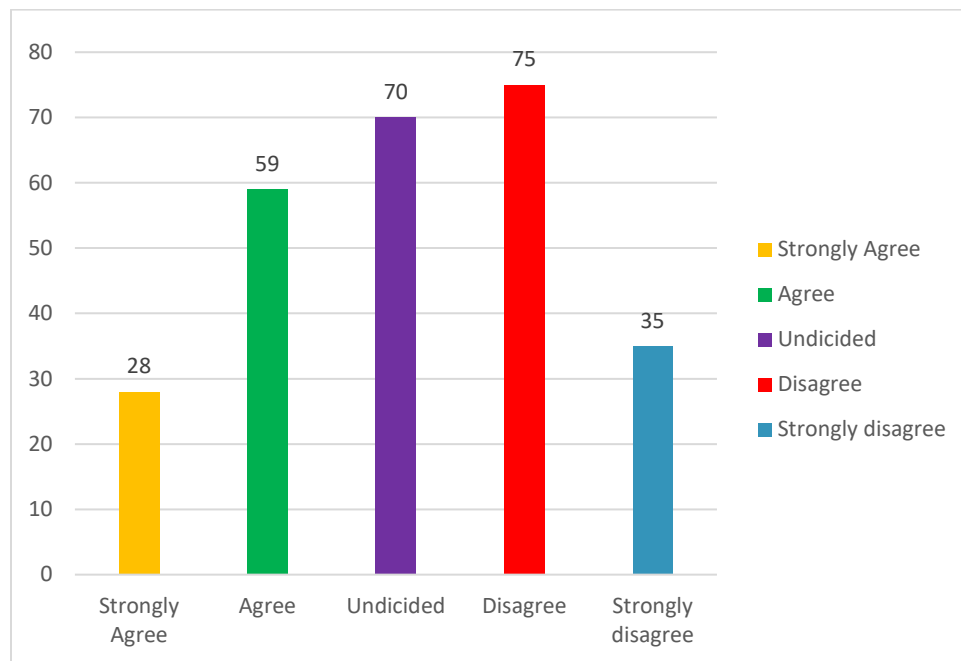
Figure 5.8: Ability to get financial assistance from the government
Source: (Survey, 2019)

The majority of the respondents (75) indicated that they disagree that they are able to get financial assistance from the government of Zimbabwe. Some of the women farmers believed the government of Zimbabwe does not have the capacity to assist farmers because the country is facing some economic challenges. The number of respondents who strongly disagreed that they could get financial assistance from the government is 35. Some of the respondents who strongly disagreed pointed out that, "they *will not be able to get financial assistance from the government because they are not politically connected."* The number of respondents who were undecided was high. These were not sure if the government is providing financial support to farmers. It is more likely that these are emerging women farmers who are not sure of the measures that the government is taking to assist farmers.

There are few respondents who strongly agreed that the government financially assists women farmers. The researcher further questioned these respondents and they indicated that *they get financial assistance from the government in the form of subsides*. In agreement with the response from the resettled women farmers who agreed and strongly agreed that government gives assistance to farmers, Mazwi (2019) indicated that the government of Zimbabwe has been assisting

farmers through command agriculture. This is a specialised import substitution programme that at the onset only covered maize, however this has been extended to other sub-sectors. From the interviews conducted, agriculture experts emphasised that, "*The government provides finance to the agriculture sector under the command agriculture programme, the Ministry of Agriculture provides seed, fuel, irrigation and essential mechanised equipment for the small-scale farmers. The farmers in turn, sell the produce to the Grain Marketing Board. The government does not provide loans directly, but it will arrange for guarantees for the loans presented to farmers of oil seeds and grains.*" The reason for have different options from the respondents are some of them expected to get direct loans from the government, while other respondents are aware that the government is indirectly providing financial support to the women farmers.

The respondents were asked to indicate the type of assistance they require for them to improve their livelihood and increase their farming production. Most of the resettled women indicated that they would like the government and any other organisations to provide them with the following:

- *Machinery such as tractors, combine harvesters and sprayers*
- *Drought tolerant seeds so that they will produce crops when there is a drought*
- *Fertilizers and pesticides*
- *Irrigation machinery*
- *Financial assistance to establish community projects and develop their farms*
- *More training programmes for them to learn about farming some of the resettled farmers do not have formal education that is agriculture related.*

The resettled women believed if they have more support from the government and other organisations, they can produce more.

5.6 GOVERNMENT INVOLVEMENT IN REDUCING DROUGHT IMPACTS FOR RESETTLED WOMEN FARMERS

There are many measures that the government can implement to assist its citizens. When a country is faced with disasters such as drought, the government is usually involved in different initiatives to curb the impact of the disaster. Table 5.12 below shows the descriptive statistics for government

involvement in the affairs of the resettled women. The respondents were asked if there are some organisations or institutions that are involved in assisting women in farming and how the government is involved in planning for drought risk reductions. The resettled women farmers revealed how they are relating with the government and other organisations. The women farmers also indicated the type of assistance they require from the government to reduce the impacts of drought and strengthen their resilience towards drought.

Table 5.12: Government interventions regarding drought risk reduction

	Organisations/institutions assisting women	Government engaging community in planning for drought risk measures	Government involvement in planning disaster risk reduction	Effectiveness of the current legislations, institutions and policies on climate change/drought
Valid	267	267	267	267
Missing	0	0	0	0
Mode	2.000	1.000	2.000	2.000
Standard Deviation	0.397	0.471	0.474	0.361
Shapiro-Wilk	0.499	0.571	0.597	0.431
P-value of Shapiro-Wilk	<.001	<.001	<.001	<.001
Minimum	1.000	1.000	1.000	1.000
Maximum	3.000	3.000	2.000	2.000

Source: (Survey, 2019)

Organisations and institutions play a pivotal role in community development. Most organisations are involving in the affairs of the community as they are part of the community. In Table 5.12 most of the respondents revealed that there are not getting support from organisations or institutions that are supposed to assist women in farming. These women revealed that there are few organisations that are helping women farmers. There is also evidence that in Zimbabwe about 5.5 million individuals in the rural areas of Zimbabwe were impacted by drought during the peak of the hunger season and nearly 2.6 million children required humanitarian support (UNICEF, 2019). Most of the women farmers are not getting support from those organisations because the number of women who require assistance is very high therefore the organisations are not able to assist all the women farmers. The situation is even worse when there is a drought event in the area, the organisations and institutions will not have the capacity to accommodate most of the women farmers. The organisations normally work with the local leaders to identify people who need relief support. In some situations, the women farmers fail to get the relief from the organisation because of some corrupt leaders who steal from the people.

There were some respondents who pointed out that they are getting assistance from NGOs such as the Development Aid from People to People (DAPP), United Nations Development Programme (UNDP) and United Nations World Food Programme (WFP). These are some of the organisations that are working with women farmers who need assistance. Women farmers receive food aid especially when there is a drought. The agriculture experts revealed that the women farmers normally get assisted by organisations and the government. The experts said the women farmers receive seeds and fertilisers and the farmers also receive some training from these organisations. One of the local leaders said, *"We normally receive tobacco seeds and fertiliser from the Mashonaland Tobacco Company (MTC), they send some extension officers who regularly come and check our progress. These extension officers educate us on how we are supposed to manage our tobacco. In return, we sell our tobacco to the company and this is assisting use because we had little knowledge on the management of tobacco."* From the observations, there are some organisations that are assisting women farmers in Mashonaland Central, but the number of women farmers outweighs the organisations so most of the resettled women do not get that assistance.

Most of the respondents indicated they strongly agreed that the government should engage the community when there are planning for drought risk measures in their area. They believe that if the government works hand in hand with the community, they will be able to minimise the risk imposed by drought. Community members felt involvement in planning would ensure the government understands the challenges and is able to provide with the relevant assistance that the community needs. There are general impacts of drought, but communities react differently, therefore joint planning of drought risk measures ensures that the community and the government come up with measures that are fit for that community. The women farmers indicated that they want to be engaged in planning because their past experiences of drought will help the government to identify the type of resources that will be needed in the future when that community is subjected to a drought event.

The respondents were also asked if the government of Zimbabwe is engaged in implementing effective drought disaster risk reduction strategies, most of the respondents do not think the government has effective strategies. The reason for not believing that the government is effective is probably because the women farmers have bad experiences in the past. The government of Zimbabwe is experiencing some economic challenges and the country lacks some of the resources that can be used to implement effective drought risk measures. Appropriate governance is crucial for maintaining and building essential drought policies and for incorporating drought risk matters into sustainable development and processes of disaster risk reduction (UNSDR, 2017). From the observations, it was noted that there was lack of coordination between the government and the community members. The government failed to assist the local government and the community to come up with some coping capacities. The government has failed to translate drought risk policies into local drought risk reduction practices. The resettled women farmers felt the government has not yet developed effective preparedness and mitigation measures.

For the government of Zimbabwe to implement drought risk measures, there is need for the government to have effective early warning systems. Early warning systems ensures the decrease of economic damages and mitigate the number of people affected by the disaster by presenting information that will allow farmers to safeguard their lives and their property. The presence of

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early warning information encourages the farmers to act prior to a drought event. The respondents gave suggestion on how the government can build comprehensive drought monitoring and early warning systems. Most of the respondents indicated that, *"The government should have improved and advanced metrological systems to increase accurate weather forecasts."* Some of the respondents said, *"The government should allow the weather experts to educate the community so the community will be able to know what to do when they are about to face a drought event."* The respondents believed that if there are comprehensive drought monitoring and early warning systems will reduce the impact of drought. Vogel et al. (2000) pointed out that if there is a delay in implementing interventions strategies the community will be negatively affected as this will make the community depend on the government for assistance. Therefore, there is need to initiate drought risk reduction measures to avoid a dependency syndrome.

The respondents were asked if they were aware of some of the policies that promote poverty reduction at national and local level. The policies that the respondents were familiar with include the land policy, the new grain policy, the national gender policy and food and nutrition security for Zimbabwe in the context of economic growth and development. The land policy covers issues on land redistribution, the resettled women were beneficiaries of this land policy as it was used for land reform. Farmers are given seeds and fertilisers in the new grain policy and mandated to sell their grain to the state-owned Grain Marketing Board. The gender policy aims to achieve gender equality through eradicating any form of gender discrimination in the cultural, social and political sphere. The gender policy assisted women to be involved in many projects and to be in influential positions therefore reducing the level of poverty among women. The poverty alleviation strategies have assisted women farmers with ways to improve their lives. The government of Zimbabwe has put in place some more measures to alleviate poverty.

The majority of the respondents did not agree that the current legislations, institutions and policies on climate change and drought in the country are affective. Despite the government formulating laws and policies, the respondents did not see the effectiveness of them because they have not experienced many positive results. One of the respondents went on further to explain why she thinks the policies and legislations on climate change and drought are not effective. The respondent

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said, "*The policies, laws and institutions on climate change and drought are not known by so many people, especially the resettled women. The government should make the farmers aware of these initiatives so that the farmers abide by the rules of the country.*" The government should work closely with the farmers and the local leaders to make sure that the community abide by the laws and policies of the country. The agricultural expert elaborated more by saying *Zimbabwe does not have any specific legislation or policy on climate change beyond the National Climate Change Response Strategy (NCCRS). The drought policies are the National Policy and Programme on Drought Mitigation and the Disaster Risk Management Policy and Strategy*. Besides the policies mentioned, the Civil Protection Act is also used as the main guideline to combat disasters such as drought. These policies stipulate strategies to curb the impact of drought in the country.

The resettled women farmers were asked about how the government of Zimbabwe can improve on drought risk reduction; their responses were as follows:

- *The government should make sure that there are more supplies of drought resistant seeds*
- *The government should educate and conduct workshops that women farmers can attend*
- *The government should supply them with more seeds, fertiliser and pesticides*
- *The government should construct many dams*
- *The government should control the price of all agriculture products*
- *Law officials should be strict on criminals who steal agriculture products such as irrigation equipment*
- *The government should give more support to women cooperatives*
- *The government should make sure that government workers are doing their jobs properly*

The resettled women farmers want the government to assist them to become better farmers and they will be able to provide for their families and the nations at large. The resettled farmers' belief is that if the government gives them extra support, they will be able to strengthen their resilience and lessen the impacts of drought.

5.7 ASSISTANCE TO IMPROVE RESILIENCE OF WOMEN FARMERS

The community needs to bounce back even better after they have been subjected to a disastrous situation. Farmers that have been affected by drought need some assistance in the form of relief to move on with their lives and be able to support their families. The relief that farmers receive saves life of the farmers and their families reduces the level of suffering posed by drought and it helps to protect human dignity. Table 5.13 below shows the descriptive statistics of the level of assistance that the resettled farmers received.

Table 5.13: Assistance to build resilience

	Awareness of relief programmes	Benefiting from drought relief funds	What type of relief do the women farmers get	How satisfied are the resettled women with the relief they are getting
Valid	267	267	267	267
Missing	0	0	0	0
Median	2.000	1.000	3.000	4.000
Mode	2.000	1.000	3.000	4.000
Standard Deviation	0.484	0.484	0.828	0.1014
Shapiro-Wilk	0.612	0.612	0.838	0.762
P-value of Shapiro-Wilk	<.001	<.001	<.001	<.001
Minimum	1.000	1.000	1.000	2.000
Maximum	3.000	3.000	4.000	5.000

Source: (Survey, 2019)

Drought poses a great threat, and farmers who depend on agriculture are likely to be greatly affected because they do not have another form of livelihood. To ease the burden, farmers receive some assistance in the form of relief. The respondents were asked if there are aware of the relief programmes that are in place. Most of the respondents indicated that they are aware of the programmes. Most of the relief programmes that the women farmers were aware of include the presidential aid, command agriculture and relied aid that is provided by some NGOs. The reason why most of the respondents are aware is some of the respondents are beneficiaries of the programmes. Some of the respondents indicated that they once benefited from the programmes in the past but because of some reasons they no longer benefit. It is important that the respondents are aware of the relief programmes. The women farmers can apply for these relief programmes and they will get assistance thereby reduce the impact of drought. Although most of the respondents are aware of the relief programmes, some resettled women were not aware of the relief programmes. Those who did not know about the programmes was maybe because they did not stay close to other farms and are likely to miss some of the activities in the community.

It is essential for farmers to benefit from relief programmes especially when the farmer has lost most of the produce due to drought. Table 5.13 above shows that most of the farmers get relief in the event of a drought. Relief aid assists farmers to survive even when they have lost some of their produce due to drought. They will be able to boost their farming production and able to secure food production. The women farmers have benefited from different programmes that were initiated by the government under the social development department and from different local and international organisations. Organisations that have assisted the resettled women with relief include WFP, DAPP and UNPD. There are some respondents who were not able to get relief aid, this is because there are many people who have been affected by drought in the country so the government is failing to provide relief aid to all the people. Some of the respondents further explained that they failed to get relief assistance because they are some corrupt leaders who receive aid for the farmers, but those leaders use the aid meant for the farmers. This is also supported by what was reported by (The Standard, 2016). This is unfortunate because those farmers depend on the leaders and they feel betrayed.

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There are various ways farmers can get relief, this includes relief in the form of cash, cattle care, subsidies, food for work and employment generating schemes. The respondents that indicated that they managed to get relief were asked the type of relief that they get. Most of the women farmers indicated that they managed to get relief in the form of subsidies. Subsidies that women farmers received were predominantly from command agriculture. This is a government intervention measure to assist farmers with relief in the form of seeds, fertiliser and other agriculture products. These subsidies help to increase the resilience of the resettled women. Some of the women farmers indicated that they received relief from the presidential input scheme. The president to support farmers in need initiated the relief support programme in the form of seeds and fertilisers. The local leaders were asked about the type of assistance resettled women were getting and they said, " *from the presidential input aid scheme farmers are provided with 10kg of maize seed, 5kg of sorghum seeds, 1 bag of top dressing fertiliser and 1 bag of compound D. For farmers who grow cotton, they get 20kg cotton seeds, chemicals for pest and disease control, 1 bag of top-dressing fertiliser and 2 bags of compound L fertiliser.*" With the relief that the farmers were getting, the women farmers could feed their families.

Participants were asked how they felt about the relief that they were getting. The results on Table 5.13 above, indicates that the majority of the respondent are not satisfied with the relief that they are getting. This is probably because the resettled farmers are expecting more relief from the government and other organisations that provide relief. The relief was not sufficient because the women farmers had a large piece of land and they needed a lot of seeds and fertiliser on their farms. Some of the resettled women have large families of 6 and above, so they felt the drought aid they were receiving will not take them until the next season. They were also resettled women who indicated that they had not received any relief, these are some of the people who were not satisfied with the relief that is being given to the women farmers in the province. Another group of respondents who were not satisfied were resettled women who used to get inputs under command agriculture, presidential input scheme and other relief programmes and these women failed to qualify for relief assistance because of different reasons.

5.8 RELIABILITY OF THE RESULTS

Reliability of the results was prioritised because it shows the overall consistency of a measure. A measure is said to be reliable when it produces the same results under consistent situations. A reliability test analysis was conducted, and the results of the test are shown in Table 5.14 below.

Table 5.14: Reliability test analysis

Reliability statistics	
Cronbach's Alpha	N of Items
.754	33

Source: (Survey, 2019)

The Cronbach Alpha was used to measure reliability of the data. The Cronbach's Alpha measures internal consistency, which closely connects a set of elements in a group. The Cronbach's Alpha is 0.754 and the number of items shows the questions that were analysed. The results show that the data is reliable because the Cronbach's Alpha is above the threshold of 0.7, this number is above the minimum acceptable value. The general rule of Cronbach Alpha is any number that is above 0.7 is good, so this means that the collected data was reliable.

5.9 CONFIRMATORY FACTOR ANALYSIS (CFA)

To ensure that the data has agreeable factors and variables, factor loading from confirmatory factor analysis (CFA) was used. This helps to find the correlation coefficient for the variables and factors. It also helps to understand the fundamental nature of a specific factor. Table 5.15 below illustrates the results of the factor loading

Table 5.15: Factor loadings

Factor	Indicator	Symbol	Estimate	Std. Error	z-value	p	95% Confidence Interval	
							Lower	Upper
HAZARD AND STRESS	Q11-Knowledge of climate change	$\lambda 11$	0.289	0.030	9.660	< .001	0.231	0.348
	Q12- Lost some livestock due to drought	$\lambda 12$	0.102	0.033	3.047	0.002	0.036	0.168
	Q13- Lost some crops	$\lambda 13$	-0.039	0.021	-1.876	0.061	-0.079	0.002
	Q16- Awareness of any drought preparedness strategy	$\lambda 14$	0.203	0.028	7.222	< .001	0.148	0.257
	Q17- Availability of a personal drought plan	$\lambda 15$	0.239	0.022	11.065	< .001	0.197	0.282
	Q18- Awareness of drought early warning systems	$\lambda 16$	0.323	0.028	11.469	< .001	0.268	0.378
	Q19- Involvement in drought risk reduction	$\lambda 17$	0.255	0.023	11.281	< .001	0.210	0.299
FUTURE UNCERTAINTY	Q21- Adaptive strategies applied leading to stronger resilience	$\lambda 21$	0.155	0.035	4.392	< .001	0.086	0.225
	Q22- Strategies allowing the community to cope with the changes	$\lambda 22$	0.315	0.030	10.558	< .001	0.257	0.374
	Q24 Climate change awareness campaigns	$\lambda 23$	0.306	0.026	11.920	< .001	0.256	0.357
	Q25- Access to relevant and timely information related to climate change	$\lambda 24$	0.375	0.028	13.274	< .001	0.320	0.431
LIVELIHOOD	Q26- Access to good markets	$\lambda 31$	0.099	0.034	2.930	0.003	0.033	0.165
	Q27- Other sources of employment in the community	$\lambda 32$	-0.249	0.035	-7.194	< .001	-0.317	-0.181

Factor	Indicator	Symbol	Estimate	Std. Error	z-value	p	95% Confidence Interval	
							Lower	Upper
	Q28- Cultural practices and values that discriminate women from farming	λ33	-0.039	0.027	-1.454	0.146	-0.091	0.013
	Q29- Programmes that advocates for women empowerment	λ34	-0.175	0.027	-6.494	< .001	-0.227	-0.122
GOVERNANCE	Q33- Organisations and institutions that assist women in farming	λ11	0.176	0.029	6.130	< .001	0.120	0.232
	Q34- Government engaging the community in planning	λ12	0.114	0.034	3.372	< .001	0.048	0.180
	Q35- Government involvement in implementing disaster risk reduction activities	λ13	0.275	0.037	7.515	< .001	0.203	0.347
	Q38- Legislations, institutions and policies on climate change/drought	λ14	0.289	0.032	9.036	< .001	0.226	0.352
RESILIENCE	Q40- Relief programmes in place	λ11	0.176	0.029	6.130	< .001	0.120	0.232
	Q41- Availability of relief in times of drought	λ12	0.114	0.034	3.372	< .001	0.048	0.180
	Q42- What type of relief do women farmers get	λ13	0.275	0.037	7.515	< .001	0.203	0.347
	Q43- The level of satisfaction with the relief	λ14	0.289	0.032	9.036	< .001	0.226	0.352

Source: (Survey, 2019)

The factor loadings table shows the different factors (hazards and stress, future uncertainty, livelihood, governance and resilience), the indicators, symbols, estimates, standard error, z- value, p- value and the upper and lower confidence interval. The results for the CFA (factor loadings) show that the p value for the indicator (loss of crops) and the p value for the indicator (cultural practises and values that discriminate women from farming) is greater than 0.05. This means variable Q13 (loss of crops) does not load very well under the hazard and stress variable and variable Q28 (cultural practises and values that discriminate women from farming) does not load very well with the livelihood variable. The variables that load very well have a probability value that is less than 0.05, this means all the other questions have loaded very well accept the two that are mentioned above. Most of the variables that loaded very well had a probability value of less than 0.01, which means the other questions loaded extremely well. This is a confirmatory factor analysis conducted to confirm whether these variables belonged to the mentioned factors/latent valuables.

All the questions used in this study (indicators) are referred to as variables. Hazards and stress, future uncertainty, livelihoods, governance and resilience are the latent variables/factors, this means they cannot be measured directly but they can be measured using other variables. The aim was to check if the variables belonged to the latent variables as per the framework used. The question on loss of crops and the question on cultural practises and values that discriminates women did not do very well because their p- values were both above 0.05 significance level. Therefore, there is need to explore the variables more instead of removing these questions. The researcher can either delete these questions from future analysis or run what is called exploratory factor analysis to check were these questions belong. By removing the variables that did not load very well from further analysis, the researcher is ensuring reliability and validity of the results. The next step is to run an exploratory factor analysis to get a new bundle of latent variables.

5.10 VULNERABILITY ANALYSIS

Resilience and vulnerability are two sides of the same coin therefore it will be inappropriate to measure resilience without knowing the level of vulnerability. The V2R framework allows the researcher to measure the level of vulnerability so the researcher can develop a model for

resilience. Conducting a vulnerability analysis assisted the researcher to determine how vulnerable the resettled women farmers were and in which area.

Table 5.16 Vulnerability analysis

Vulnerability index	Hazard & Stress					
	Q11	Q12	Q16	Q17	Q18	Q19
Vulnerability index per indicator/question	0.344569	0.297753	0.741573	0.846442	0.662921	0.827715
Vulnerability index (Hazard & Stress)	**0.620162297 (62%)**					
	Future uncertainty					
	Q21	Q22	Q24	Q25		
Vulnerability index per indicator/question	0.108614	0.178839	0.737828	0.569288		
Vulnerability index (Future uncertainty)	**0.398642322 (39.86%)**					
Vulnerability index (Study area)	**0.50940231 (50.94%)**					

Source: (Survey, 2019)

Table 5.17: Fractal stage of vulnerability

Low vulnerability	0 < VI < 20
Moderate vulnerability	20 < V1< 40
Vulnerability	40 < V1< 60
High vulnerability	60 <V1 < 80
Extreme vulnerability	80 < VI < 100

Source: (Hlalele, 2019)

Table 5.16 above shows the vulnerability analysis for resettled women farmers in Mashonaland Central province. There are two questions that did not load very well on confirmatory analysis, they were eliminated from the vulnerability analysis, these were: Question 13 which was removed from hazards and stress and Question 28 which was removed from future uncertainty. The Iyengar-Sudarshan method was used to calculate the level of vulnerability for the resettled women using the hazard and stress and future uncertainty variables per latent variable. The Iyengar-Sudarshan states that vulnerability is calculated in such a way that it will range from 0 to 1.

Table 5.17 above was used to determine vulnerability level; it ranges from low vulnerability to very extreme vulnerability. When the values increase, vulnerability increases (Table 5.17). Question 11 and Question 12 has the lowest numbers therefore, they do not contribute much towards the vulnerability under hazards and stress factor. Question 18 (Awareness of drought early

warning systems) has a vulnerability index of 66 percent and Question 16 (Awareness of any drought preparedness strategy) has a vulnerability index of 74 percent; these questions lie in the high vulnerability stage. From the data presented on Table 5.16, Question 17 has 84 percent and Question 19 has 82 percent, these questions lie in the very high vulnerability stage. Question 17 (Availability of a personal drought plan) and Question 19 (Involvement of the resettled women farmers in drought risk reduction) created problems in terms of stress because the vulnerability indexes are very high. Since four of the variables contributed heavily on hazard and stress factors, the overall vulnerability index is also influenced. The overall vulnerability index for the hazard and stress factor is 62 percent. As far as hazard and stress is concerned, the resettled women are highly vulnerable.

The vulnerability analysis for future uncertainty shows that the vulnerability index for Question 21 (Adaptive strategies applied leading a stronger resilience) and Question 22 (Strategies allowing the community to cope with the changes) were very low, this means these questions do not contribute towards vulnerability of the resettled women. Question 25 (Access to relevant and timely information related to climate change) has a vulnerability index of 56 percent, which means it is in the vulnerable stage. Under future uncertainty, the variable that has the highest vulnerability is Question 24 (Climate change awareness campaigns), the vulnerability index is 73 percent which is in the high vulnerability level. The overall vulnerability index for future uncertainty is 39 percent. This shows that future uncertainty has moderate vulnerability while hazards and stress have high vulnerability. Therefore, the overall vulnerability of the resettled women is approximately 51 percent (0.50940231), which lies in the vulnerable stage as depicted in Table 5.17. This is an indication that resettled women farmers are vulnerable to climate change induced drought that is affecting the area. It was essential to conduct a vulnerability analysis because the analysis enabled the researcher to determine the level of vulnerability to set a basis for the development of a resilience model or framework.

5.11 MODEL BUILDING FOR RESILIENCE (USING STRUCTURAL EQUATION MODELLING

Since the level and areas of vulnerability for resettled women were established, concerning the effects of climate change induced drought, there is need to build a model for resilience. The resilience model was built using the structural equation modelling technique. Table 5.18 shows the reiterative syntax or procedure that was used in the determination of the structural model using the JASP computer software. JASP is an open-source computer software programme for structural equation modelling. The measurement model shows the relationship of three latent variables: Livelihood, governance and resilience and their manifest variables. The results from regression show that resilience is equal to livelihood and governance.

Table 5.18: Latent Variable Analysis (Lavaan) Syntax: Structural equation modelling

#Measurement model
LIV=~Q26+Q27+Q29
GOV=~Q33+Q34+Q35+Q38
RES=~Q40+Q41+Q42+Q43
#Regressions
GOV~LIV
RES~LIV+GOV
#Residual correlations
Q33~~Q40
Q34~~ Q38+ Q41
Q35~~ Q42
Q38~~ Q43
Q41~~ Q43

Source: (Survey, 2019)

5.11.1 The Chi Square test

The Chi Square test is a tool that was used to check the fitness of the model, it is necessary to check if the model fits well with our data. The Chi Square test was the first statistic tool that was used to check the model.

Table 5.19: Chi Square test statistic

	df	AIC	BIC	χ^2	$\Delta\chi^2$	p
Saturated	0.000	.	.	0.000	.	.
Model 1	35.000	3157.582	3229.424	38.125	38.125	0.329

Source (Survey, 2019)

When using the Chi Square, the focus is on the p- value, when the p- value is less than 5 percent then the results are significant. The results for the Chi Square are said to be good when they give insignificant results, that is when the p – value above 5 percent, this will prove that the model is good, however this statistic is influenced by the sample size. Table 5. 19 above show that the p value is 0.329, this shows that the p- value is insignificant. The results that were obtained were good because the Chi Square is influenced by the sample size. Therefore, there is need to look for other test statistical indices to check the fitness of the model.

5.11.2 The parameter estimates

The parameter estimates for the variable's livelihood, governance and resilience were established. A correlation coefficient of above 50 percent is strong, the higher the value the stronger the correlation. The p- value of less than 5 percent significance level, this is an indication that the correlation is very strong. The data presented in Table 5.20 below shows that the p value for the variable's livelihood, governance and resilience is less than 5 percent significance level. The variables correlated very well to their latent variables under considerations. To supplement the results, the standardised correlations coefficient was significantly strong, and all were above 70 percent.

Table 5.20: Parameter estimates

label		est	se	z	p	CI (lower)	CI (upper)	std (lv)	std (all)	std (nox)	group
LIV =~	Q26	1.000	0.000	.	.	1.000	1.000	0.670	0.920	0.920	
LIV =~	Q27	2.180	0.139	15.742	< .001	1.909	2.452	1.460	0.973	0.973	
LIV =~	Q29	1.819	0.152	11.967	< .001	1.521	2.116	1.218	0.872	0.872	
GOV =~	Q33	1.000	0.000	.	.	1.000	1.000	2.223	0.850	0.850	
GOV =~	Q34	1.257	0.182	6.889	< .001	0.899	1.614	2.794	0.717	0.717	
GOV =~	Q35	1.058	0.151	6.987	< .001	0.761	1.354	2.351	0.722	0.722	
GOV =~	Q38	1.265	0.145	8.722	< .001	0.981	1.549	2.812	0.846	0.846	
RES =~	Q40	1.000	0.000	.	.	1.000	1.000	2.103	0.808	0.808	
RES =~	Q41	1.186	0.169	7.024	< .001	0.855	1.517	2.493	0.746	0.746	
RES =~	Q42	1.280	0.160	8.002	< .001	0.966	1.593	2.691	0.824	0.824	
RES =~	Q43	1.266	0.158	8.007	< .001	0.956	1.576	2.662	0.828	0.828	
GOV ~	LIV	1.483	0.399	3.715	< .001	0.701	2.265	0.447	0.447	0.447	
RES ~	LIV	0.572	0.221	2.586	0.010	0.139	1.006	0.182	0.182	0.182	
RES ~	GOV	0.837	0.098	8.514	< .001	0.645	1.030	0.885	0.885	0.885	
Q33 ~~	Q40	0.624	0.358	1.741	0.082	-0.079	1.326	0.624	0.296	0.296	
Q34 ~~	Q38	1.313	0.702	1.871	0.061	-0.063	2.689	1.313	0.273	0.273	
Q34 ~~	Q41	2.153	0.734	2.934	0.003	0.715	3.591	2.153	0.356	0.356	
Q35 ~~	Q42	0.795	0.608	1.308	0.191	-0.396	1.986	0.795	0.191	0.191	
Q38 ~~	Q43	0.348	0.442	0.787	0.431	-0.519	1.215	0.348	0.109	0.109	
Q41 ~~	Q43	1.356	0.568	2.386	0.017	0.242	2.470	1.356	0.338	0.338	
Q26 ~~	Q26	0.082	0.019	4.184	< .001	0.043	0.120	0.082	0.154	0.154	
Q27 ~~	Q27	0.120	0.070	1.718	0.086	-0.017	0.256	0.120	0.053	0.053	
Q29 ~~	Q29	0.467	0.090	5.177	< .001	0.290	0.643	0.467	0.239	0.239	
Q33 ~~	Q33	1.891	0.444	4.256	< .001	1.020	2.762	1.891	0.277	0.277	
Q34 ~~	Q34	7.373	1.374	5.366	< .001	4.680	10.066	7.373	0.486	0.486	
Q35 ~~	Q35	5.067	0.952	5.324	< .001	3.202	6.933	5.067	0.478	0.478	
Q38 ~~	Q38	3.148	0.739	4.261	< .001	1.700	4.596	3.148	0.285	0.285	

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Table 5.20: Parameter estimates

label		est	se	z	p	CI (lower)	CI (upper)	std (lv)	std (all)	std (nox)	group
Q40 ~~	Q40	2.351	0.480	4.895	< .001	1.410	3.292	2.351	0.347	0.347	
Q41 ~~	Q41	4.954	0.914	5.419	< .001	3.162	6.746	4.954	0.443	0.443	
Q42 ~~	Q42	3.431	0.713	4.814	< .001	2.034	4.829	-3.431	0.322	0.322	
Q43 ~~	Q43	3.254	0.695	4.685	< .001	1.893	4.615	3.254	0.315	0.315	
LIV ~~	LIV	0.448	0.087	5.173	< .001	0.279	0.618	1.000	1.000	1.000	
GOV ~~	GOV	3.956	0.921	4.295	< .001	2.151	5.762	0.800	0.800	0.800	
RES ~~	RES	0.172	0.215	0.803	0.422	-0.249	0.593	0.039	0.039	0.039	

Source: (Survey, 2019)

5.11.3 The model fit additional indices

Since the Chi Square values were 32 percent and the value were insignificant, there is need for additional indices. The additional indices help to judge if the model is fit for the purpose. The Chi Square was insignificant because it was affected by the sample size and other parameters. The tables below show the additional indices used to supplement the Chi Square test results. The Tucker-Lewis Index (TLI) shows good fit when the index is 0.95. According to Table 5.21 below, the TLI is 0.993, this is above the threshold therefore, the index perfectly showed a good fit for the model. The Bentler-Bonett Non-normed Fit Index (NNFI) is another index that can be used to judge the fitness of the model. For the (NNFI) is said to be good when the value of the index is above 0.95. The result of (NNFI) on Table 5.21 below is 0.993. This is above the minimum value and this is an indication that the NNFI is very good for the model.

Table 5.21: Model fit additional indices

	Model
Comparative Fit Index (CFI)	0.995
Tucker-Lewis Index (TLI)	0.993
Bentler-Bonett Non-normed Fit Index (NNFI)	0.993
Bentler-Bonett Normed Fit Index (NFI)	0.948
Parsimony Normed Fit Index (PNFI)	0.603
Bollen's Relative Fit Index (RFI)	0.918
Bollen's Incremental Fit Index (IFI)	0.996
Relative Noncentrality Index (RNI)	0.995

Source (Survey, 2019)

The other index that can be used to determine the fitness of the model is the Root Mean Square Error of Approximation (RMSEA). The index for the RMSEA is said to be good when the value is less than 0.7. According to Table 5.22 below, the RMSEA for the model is 0.035 which is below the threshold. The results for RMSEA are an indication that the RMSEA can perfectly fit the model.

Table 5.22: Root Mean Square Error of Approximation

	Model
RMSEA	0.035
90 Percent Confidence Interval	0.000 - 0.092
p-value RMSEA <= 0.05	0.611

Source: (Survey, 2019)

There are other fit indices that can be used to determine the fitness of the model. These include the Goodness of Fit Index (GFI), Parsimony Goodness of Fit Index (GFI) and McDonald Fit Index (MFI). Table 5.23 below shows the other fit indices that can be used. The results of the other indices show that the value for GFI is 0.923. These are good results because the minimum acceptable threshold for GFI is 0.923.

Table 5.23: Other Fit indices

	Model
Hoelter Critical N (CN) alpha=0.05	98.970
Hoelter Critical N (CN) alpha=0.01	113.804
Goodness of Fit Index (GFI)	0.923
Parsimony Goodness of Fit Index (GFI)	0.854
McDonald Fit Index (MFI)	0.979
Expected Cross-Validation Index (ECVI)	1.335

Source: (Survey, 2019)

For the purpose of the study, the indices that were selected to check the fitness of the model were the Bentler-Bonett Non-normed Fit Index, Tucker-Lewis Index, Root Mean Square Error of Approximation and the Goodness of Fit Index, therefore all of them showed good fit for the structural model for resilience.

5.11.4 The modification of the indices

Since the fitness indices were established, there was a need to modify the indices. Table 5.24 below shows the series of modifications that were carried out to arrive to the optimal structural model where once denote questions or observed/manifest variables were used.

Table 5.24: Modification indices

			mi	epc	sepc (lv)	sepc (all)	sepc (nox)
LIV	=~	Q38	4.796	0.862	0.577	0.174	0.174
LIV	=~	Q40	4.456	0.835	0.559	0.215	0.215
RES	=~	Q38	4.260	1.420	2.986	0.898	0.898
Q33	~~	Q35	3.771	0.849	0.849	0.274	0.274
Q26	~~	Q34	3.040	-0.155	-0.155	-0.200	-0.200
GOV	=~	Q40	2.687	-0.954	-2.122	-0.815	-0.815
LIV	=~	Q33	2.286	-0.527	-0.353	-0.135	-0.135
Q42	~~	Q43	2.193	0.672	0.672	0.201	0.201
RES	=~	Q33	2.178	-0.945	-1.987	-0.760	-0.760
Q33	~~	Q41	2.080	0.503	0.503	0.164	0.164
LIV	=~	Q42	2.046	-0.708	-0.474	-0.145	-0.145
GOV	=~	Q26	1.611	0.026	0.058	0.080	0.080
LIV	=~	Q34	1.519	-0.613	-0.411	-0.105	-0.105
Q26	~~	Q42	1.504	-0.089	-0.089	-0.169	-0.169
RES	=~	Q26	1.501	0.029	0.062	0.085	0.085
Q26	~~	Q40	1.378	0.067	0.067	0.153	0.153
Q29	~~	Q41	1.336	0.188	0.188	0.124	0.124
Q35	~~	Q41	1.301	-0.600	-0.600	-0.120	-0.120
Q26	~~	Q33	1.284	0.061	0.061	0.155	0.155
Q27	~~	Q33	1.044	-0.100	-0.100	-0.211	-0.211
Q29	~~	Q43	0.998	-0.146	-0.146	-0.119	-0.119
Q26	~~	Q38	0.945	0.065	0.065	0.129	0.129
Q27	~~	Q34	0.896	0.152	0.152	0.162	0.162
Q29	~~	Q35	0.829	-0.175	-0.175	-0.114	-0.114
Q34	~~	Q35	0.814	-0.599	-0.599	-0.098	-0.098
Q40	~~	Q41	0.810	-0.326	-0.326	-0.095	-0.095
Q34	~~	Q43	0.792	0.613	0.613	0.125	0.125
Q38	~~	Q42	0.757	-0.407	-0.407	-0.124	-0.124
Q27	~~	Q29	0.698	0.132	0.132	0.558	0.558
Q35	~~	Q43	0.695	-0.409	-0.409	-0.101	-0.101
Q29	~~	Q38	0.691	0.127	0.127	0.105	0.105
GOV	=~	Q29	0.644	-0.037	-0.082	-0.059	-0.059
Q38	~~	Q41	0.639	0.468	0.468	0.119	0.119
Q33	~~	Q38	0.636	-0.318	-0.318	-0.130	-0.130
GOV	=~	Q41	0.635	0.507	1.126	0.337	0.337
Q34	~~	Q42	0.632	0.457	0.457	0.091	0.091
RES	=~	Q29	0.587	-0.041	-0.086	-0.062	-0.062
GOV	=~	Q42	0.581	0.543	1.206	0.369	0.369

Table 5.24: Modification indices

			mi	epc	sepc (lv)	sepc (all)	sepc (nox)
Q29	~~	Q33	0.554	-0.091	-0.091	-0.097	-0.097
Q40	~~	Q43	0.512	-0.244	-0.244	-0.088	-0.088
Q27	~~	Q41	0.476	-0.089	-0.089	-0.116	-0.116
Q33	~~	Q42	0.464	-0.273	-0.273	-0.107	-0.107
Q29	~~	Q42	0.403	0.105	0.105	0.083	0.083
Q27	~~	Q35	0.356	0.092	0.092	0.117	0.117
RES	=~	Q34	0.354	-0.505	-1.062	-0.273	-0.273
Q27	~~	Q43	0.295	0.064	0.064	0.102	0.102
GOV	=~	Q27	0.292	-0.021	-0.047	-0.032	-0.032
RES	=~	Q27	0.279	-0.024	-0.051	-0.034	-0.034
Q33	~~	Q34	0.254	-0.229	-0.229	-0.061	-0.061
Q40	~~	Q42	0.250	0.203	0.203	0.071	0.071
Q26	~~	Q27	0.238	-0.052	-0.052	-0.522	-0.522
RES	=~	Q35	0.227	-0.395	-0.832	-0.255	-0.255
Q27	~~	Q38	0.213	-0.056	-0.056	-0.092	-0.092
Q33	~~	Q43	0.206	-0.152	-0.152	-0.061	-0.061
Q35	~~	Q38	0.169	0.218	0.218	0.055	0.055
Q41	~~	Q42	0.152	-0.185	-0.185	-0.045	-0.045
Q26	~~	Q29	0.148	-0.025	-0.025	-0.127	-0.127
Q29	~~	Q40	0.142	-0.049	-0.049	-0.047	-0.047
LIV	=~	Q41	0.116	-0.152	-0.102	-0.030	-0.030
Q34	~~	Q40	0.111	0.148	0.148	0.036	0.036
Q26	~~	Q35	0.105	0.027	0.027	0.043	0.043
Q29	~~	Q34	0.077	-0.056	-0.056	-0.030	-0.030
LIV	=~	Q43	0.057	-0.098	-0.066	-0.020	-0.020
LIV	=~	Q35	0.035	0.091	0.061	0.019	0.019
Q27	~~	Q40	0.020	0.015	0.015	0.028	0.028
Q26	~~	Q41	0.018	-0.010	-0.010	-0.015	-0.015
Q38	~~	Q40	0.013	-0.042	-0.042	-0.016	-0.016
Q27	~~	Q42	0.005	-0.009	-0.009	-0.014	-0.014
Q35	~~	Q40	0.003	0.023	0.023	0.007	0.007
Q26	~~	Q43	0.001	-0.002	-0.002	-0.004	-0.004
GOV	=~	Q43	0.000	-0.012	-0.026	-0.008	-0.008

Source (Survey, 2019)

5.12 STRUCTURAL MODEL FOR RESILIENCE FOR WOMEN IN FARMING

The main objective of the study is to develop a resilience framework for resettled women against climate change induced drought risk. To accomplish the main objective of the study, a structural model for resilience building was developed. Figure 5.9 below shows the newly developed structural resilience model for resettled women against climate change induced drought disasters.
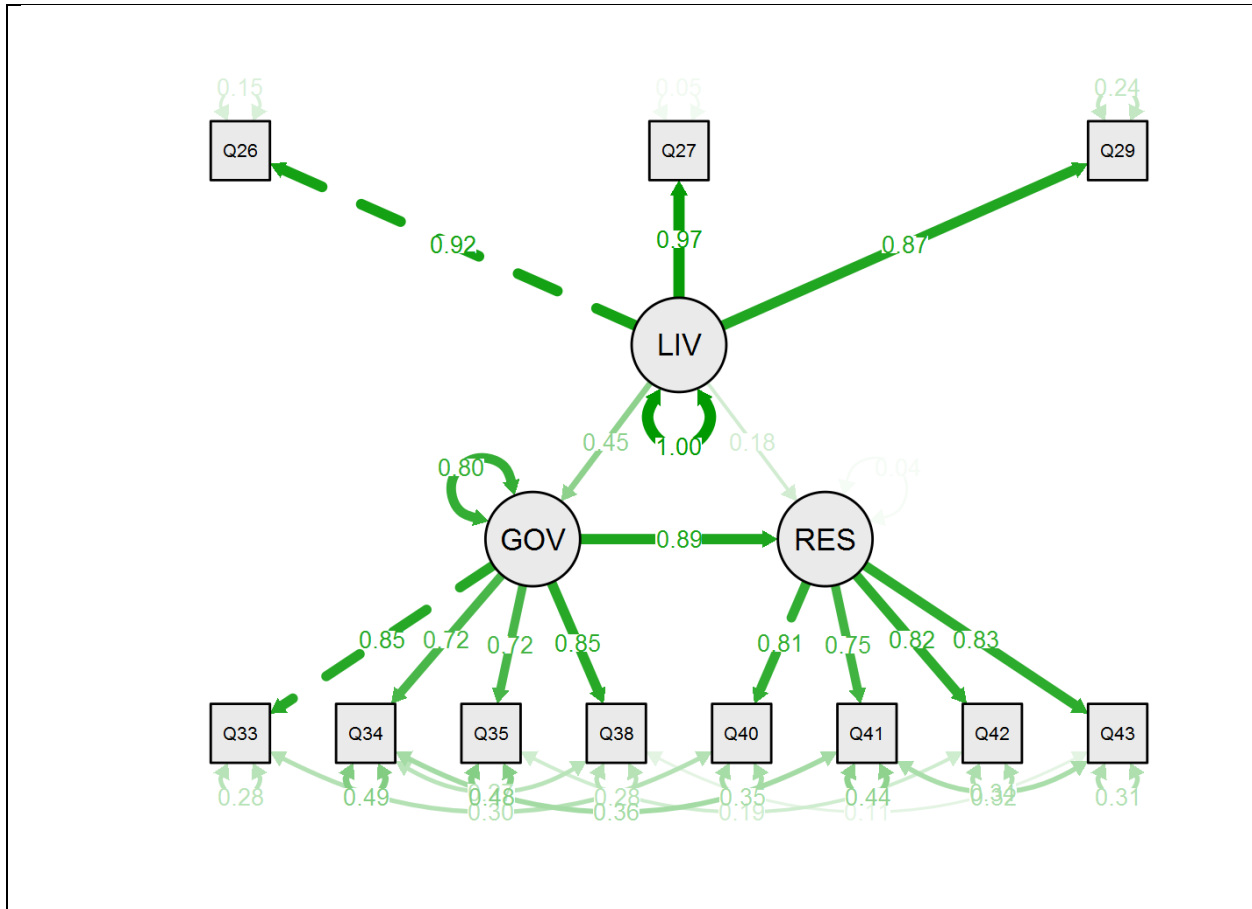
Figure 5.9: (Path Diagram: Structural model for drought resilience building)
Source (Survey results, 2019)

In Figure 5.9, the livelihood latent variable has three variables because the fourth variable was eliminated when the confirmatory factor analysis was conducted. The remaining variables for livelihood are Question 26 (Access to good markets), Question 27 (Other sources of employment in the community) and Question 29 (Programmes that advocates for women empowerment). For the governance latent variable there are four variables which are Question 33 (Organisations and

institutions that assist women in farming), Question 34 (Government engaging the community in planning), Question 35 (Government involvement in implementing disaster risk reduction activities) and Question 38 (Legislations, institutions and policies on climate change/drought).

The livelihood and governance variables contribute towards resilience. From the resilience model above, the lines are green, this is an indication that the variables have loaded very well (high correlations). Resilience was the dependent latent variable under consideration and livelihood and governance were independent variables. The manifest variable Question 27 (Other sources of employment in the community) in the livelihood variable had the highest loading of 0.97. The other two latent variables Question 26 (Access to good markets) and Question 29 (Programmes that advocates for women empowerment) had also high loadings which means all the three latent variables fit well in the livelihood variable. For the Governance variable Question 33 (Organisations and institutions that assist women in farming) and Question 38 (Legislations, institutions and policies on climate change/drought) had the highest loadings.

From Figure 5.9 above, the correlation coefficient of governance towards resilience is 0.89 which is 89 percent and the influence of livelihood towards resilience is 0.18 or 18 percent. This means the influence of governance towards resilience is higher than the influence of livelihood towards resilience. Therefore, if governance is increased, resilience will be affected positively. A shift in governance will also result in a shift in resilience hence there will be an achievement in strengthening the resilience of women in farming. From the results in Figure 5.9, much attention should be given to governance especially Question 33 (Organisations and institutions that assist women in farming) and Question 38 (Legislations, institutions and policies on climate change/drought), these latent variables contribute much towards resilience building of resettled women farmers. However, there is need to look at livelihoods and address the issue to improve the resilience.

The reason for correlating governance and resilience or livelihood and resilience using the structural equation is because all the variables must interact sufficiently to bring about the desired outcome. The structural equations model ensures that all the variables under consideration must interact, it allows the interaction of manifest variables and the latent variables to bring about the

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optimal solution of the optimal model that has been used. The researcher was also interested in the interactions of the independent variables (governance and livelihood), with the dependent variable resilience.

5.13 SUMMARY

This chapter focused on the presentation of data obtained from the study and the analysis of the results. Qualitative data was merged with quantitative data and was presented as specified by the convergent parallel research design. The major themes in qualitative data were presented in a cohesive style, this is by presenting the findings in discussions or text form and figure. The quantitative data was presented in the form of cross tabulation, tables, graphs and figures. The first section of the chapter dealt with the demographics of the resettled women farmers who participated in the study. The next section focused on the presentation and analysis of the hazards and stress that affected the women farmers, the future uncertainties, the livelihood of these women, the role of governance and the resilience of these women. In this section descriptive statistics per each section was outlined. A reliability test was conducted using the Cronbach's Alpha, the results of the test proved that the data was reliable. Confirmatory factor analysis was carried out, some of the questions that did not load very well were identified.

This was followed by a vulnerability analysis of hazard and stress and future uncertainty; it was proved that the resettled women were more vulnerable to the hazards and stresses. The chapter also focused on the model building for resilience using the structural equation. The Chi Square test was used to determine the fitness and the results proved that the Chi Square was insignificant because the test was influenced by the sample size. Therefore, other statistical indices were considered. The next step was to determine the parameter estimates for livelihood, governance and resilience. The variables correlated very well with their latent variables. Additional model fit indices for the model of resilience were used to judge the fitness of the model. The indices that fit the model of resilience were NNFI, TLI, RMSEA and GFI index. The modifications for the indices that were done were shown and the results were presented in a table form. The last part of the chapter focused on the building of the resilience model for women in farming. The model was built, and it was noted that governance played an important part in resilience building of women

farmers towards drought. The next chapter will focus on the conclusion remarks and the recommendations.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

It is essential for a farmer to have a piece of land that they call their own, but there are some challenges that are brought by weather related hazards such as drought. These challenges have affected the livelihood of farmers. This situation is similar to the lives of the resettled women farmers in Mashonaland Central, these women are affected by drought and their resilience needs to be strengthened. Resilience in the field of disaster management was defined by the UNISDR, as: *"The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions"* (UNISDR, 2009, p. 24).

Resilience building for farmers who are affected by drought is a major priority of the study. Women in farming experience difficult situations because they are not able to bear the impacts that are posed by drought. Mashonaland Central province has experienced a series of dry conditions, and this has been attributed to climate change and climate variability. Women farmers who obtained land under the FLRP are subjected to drought, they shared their different experiences as a way of highlighting their vulnerabilities and impact of drought. The experience of resettled women farmers in Mashonaland Central assisted the researcher to identify some ways to build women farmers' resilience towards drought.

The main object of the study was to develop a resilience framework for resettled women against climate change induced drought. The research problem focused on the evidence that women in Zimbabwe who benefited from the FLRP are facing a series of drought. The impacts of drought affected the women farmers' livelihood. To deal with the problem, the research came up with ways to increase resettled women resilience. By increasing resilience of resettled women against climate

change induced drought events, the country's food production will improve together with the economic and social status of these women.

6.2 THEORETICAL AND CONCEPTUAL FRAMEWORK

Frameworks that are linked to resilience, drought and climate change were used in this study. These frameworks include the PEOPLES framework, DRAMP Framework, the IPCC framework, the DFID resilience framework. All the other frameworks were useful in identifying some aspects that are important in the development of a drought resilient framework for women, however the V2R framework was adopted in the study. The V2R framework highlighted how farmers can move from vulnerability and initiate measures that can strengthen their resilience. The hazard and stress components helped in identifying the nature of the hazards and their effect on the lives of the resettled women farmers. It was established in the study that hazard prevention, and protection may be achieved by enhancing the management of the resources. The future uncertainty component of the V2R framework assisted in identifying that climate change is the current trend that is affecting the resettled women, this brought a negative effect to the farmers. The livelihood components assisted in identifying the skills that the resettled women possess, the technologies that they use, their social networks and some of the activities that they are involved to make a living. The vulnerability of resettled women is further worsened by their poor livelihoods. The governance component in the V2R framework assisted in identifying the private and public, formal and the informal organisations, the processes and the policies that are functional in the local districts and in the province of Mashonaland Central as a whole. It also assisted in identifying how the women farmers are getting resources they use in farming, the technologies that they use, and the skills needed for them to protect themselves from drought.

6.3 SUMMARY OF THE FINDINGS

The resettled women who participated in the study were from Mashonaland Central province, these women managed to fill in questionnaires, some of the people who took part in the study were extension officers, local leaders and agriculture experts.

6.3.1 The demographics and vulnerability of the resettled women

The demographics of the women farmers were an influential factor in assessing the resilience of women to climate change drought induced disasters. Women of different age groups and different marital status respond differently in face of a disastrous situation. The results indicate that most of women in A1 and A2 farms in Mashonaland Central are between the ages of 30 to 59, this age range is made up of middle aged women who have families to feed and agriculture is also their source of income. The 18 to 29 age group has the least number of respondents probably because most young women prefer to be employed in the cities and most of the young women did not manage to get land. The total number of women who are married was 170 and the combined number of women who were single, widowed, separated and divorced is 97. This is an indication that most of the respondents are farming together with their husbands and 36.3 percent of the respondents are independent women farmers. The resilience of married women between the ages of 30 to 59 is more likely to be greater than female headed household. Female-headed families are more likely to be vulnerable than married women in male headed households to climate-related disasters, this is because women tend to be more vulnerable than men (Fullera and Lainb, 2017). In most cases, before the hazard occurs, women normally have less risk management strategies as compared to their male counterparts. There is evidence in the literature that shows that men have favourable opportunities to diversify their livelihoods as compared to women (Lanjouw, Quizon and Sparrow, 2001; Musinguzi, Natugonza, Efitre and Ogutu-Ohwayo, 2017). Married women are likely to depend on their husband when it comes to ideas and other farming inputs.

Almost 42.7 percent of the total respondents have a household size of 5 to 9, this shows that most of the families have a bigger household size. None of the respondents who are divorced have a household size of 9 to 12 and more than 12 and only married people have the highest number of household size of 9 to 12 and more than 12. This is common in people who practice farming especially small-scale farmers. It is emphasised in the literature that most small-scale farmers prefer to have large families and one of the reasons is for labour purposes (FAO and UNICEF. 2019). Having a bigger household can affect the level of vulnerability of the family. Smaller households are likely to be affected less by the impacts of drought than larger household who are supposed to share even more from the little that they have. Research conducted by Orbeta, (2005) shows that all the indicators have proved that it does not matter which poverty measure person

make use of, it is clear that the level of poverty becomes worse as we move from smaller to a much bigger family size household.

The number of women farmers who are sole breadwinners and own a farm is greater than those breadwinners who do not own a farm. Although the number of respondents who own a farm (76) is not much, it is however an indication that the government is changing some past beliefs that a woman cannot own land. Results from literature shows that 18 percent of female headed peasant farmer households and 12 percent of female headed commercial farmer households benefited from A1 and A2 land allocations in terms of total household beneficiaries (ZWRCN, 2007). Female-headed households can take care of their families just like their male counterparts. Most of the respondents (156) indicated that there are wives are also owners of land. This shows that there are married women who are practicing farming together with their husbands and those women have an equal share of the land as the husbands.

There were 107 out of 267 of women with 'O' level, these women managed to obtain land from the government. Women with 'O' level have basic education which is necessary for them to understand basic farming requirements. There are 96 respondents with no schooling and primary school level, who have obtained land from the government. It is an advantage for these women to obtain land from the government because there are not qualified for any other formal employment. However, the level of vulnerability for these women is very high especially when there is a drought as they rely on farming as their only source of livelihood.

Only two respondents who obtained land from the government indicated that they have a degree and 10 respondents who obtained land from the government have a diploma. This is an indication that very few women with higher education obtained land from the government. Evidence from the literature suggests that education plays an important role when it comes to managing a disaster Frankenberg, Sikoki, Sumantri, Suriastini, Thomas (2013). The literature revealed that education also influences individuals to control their resources, one can purchase a costly disaster insurance and highly educated people are likely to implement disaster preparedness measures (Muttarak and Lutz, 2014). The more educated a farmer is the less vulnerable the farmer is, this is because educated farmers have alternative sources of income, so they are likely to face less impacts during

a period. This is a different case in this study, most of the resettled women are not highly educated. The resettled women are vulnerable to drought because the level of education for most women is very low.

6.3.2 Hazards and stress experienced by women farmers

Most of the respondents do not have knowledge of climate change and drought impacts. Some of the respondents did not attend school and some went as far as primary school. It makes it difficult for them to understand the impacts of climate change. Lack of knowledge of climate change and drought poses a serious threat to women farmers because you need to understand the problem for you to deal with the problem. Lack of knowledge of the impacts of drought and climate change makes these resettled women vulnerable to the hazard. There were some few women farmers who have the knowledge of the impacts of climate change. These women had acquired basic education, and some of them indicated they received information after they attended some workshops on climate change. Some of the women farmers have been farming for many years, so through experience they got to know the impacts of drought. Those respondents who indicated that they knew the impacts seemed to be informed of the dangers of climate change and drought impacts.

Most of the women farmers practised arable farming, there were few farmers who were practising pastoral farming and mixed farming. Therefore, the results of farmers who lost their livestock due to drought were affected. From the observations conducted during the study, most of the resettled women who keep livestock prefer to keep cattle, goats and indigenous chickens. Some of the women farmers who keep livestock indicated that they lost their livestock. The reason behind the loss was some of the livestock died and some farmers sold their livestock. Literature suggests that selling livestock during drought is a common practise, some farmers sell their livestock to buy food Tau (2015) this supports the results of this study.

From the observations conducted, most farmers in the province were ploughing maize, tobacco, soya beans and some were involved in market gardening. Drought affected the resettled women, most of the respondents said they had lost their crops due to drought. These farmers were greatly impacted by drought because they survive on agriculture, loss of crops means they had to struggle

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to feed their families and they will not get income since most of the farmers sell their crops. Literature shows that the East African region also experienced a drought in 2009, which resulted in the dying up of rivers and scorching of crops, this gave rise to starvation of millions of people in Kenya (Howden, 2009). Loss of crops has a serious impact on the province and the country as well. There is also evidence that in Zimbabwe more than two million people encountered starvation, this is after a severe drought that affected food harvests (Chingono and Adebayo, 2019). It was reported that about 5.5 million people in the rural areas of Zimbabwe were affected by drought during the peak of the hunger season and almost 2.6 million children needed humanitarian assistance (UNICEF, 2019). The literature shows that resettled women experienced the same impacts of drought that other regions have experienced. Loss of crops has a negative impact on the food security of the country and the economy since Zimbabwe is an agriculture-based economy.

The lack or reduction of rain in an area has a great impact on the water sources. Water bodies in different areas react differently in the event of drought. In Mashonaland Central drought has affected the level of water in the boreholes. Since borehole water is considered safe for drinking in rural areas where water purification is hardly practised, it is very risky for people's health if borehole water is not available. People are likely to resort to unsafe water sources thus the risk of experiencing waterborne diseases such as diarrhoea, typhoid and cholera is very high. The persistence of drought in the area has a negative impact on wells as well. Observations in the areas of Muzarabani district, Bindura district, Shamva district shows that the water levels in the wells were very low and some of the wells were dry. Drought has also affected the water levels in rivers and ponds in the province. Although most of the respondents believed that rivers were not affected by drought, the observations conducted shows that the level of water in the rivers was very low.

Women farmers are affected directly and indirectly by drought. The resettled women farmers have recorded financial loss because of drought. The financial losses that these women farmers have recorded ranges from crop failure, loss of animals, lack of crop insurance and lack of labour. The majority (30 percent) of the women farmers said that they encountered some financial losses when their crops died or wilted because of drought. Twenty-three (23) percent of the women farmers

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indicated that they experienced some financial losses because they lost their animals. Some of the animals were sold for a small amount and some of the livestock died. Farmers across the world are experiencing financial loss because of drought. FAO (2018) reported that there were losses recorded in the developing world agriculture during 2005 and 2015, the losses countered for $29 billion. Nineteen (19) percent of the respondents indicated that they experienced some financial losses because they did not have insurance for their crops, livestock and property. Twenty (20) percent of the respondents encountered financial losses due to inadequate relief funds. These women emphasised that they made financial losses because they did not receive enough seeds and fertilizers from the government and other organisations that provide relief. Very few women farmers connected their financial losses to labour because most the farmers especially the A1 farmers do not need extra labour. They can plant and harvest their crops as a family and in few cases, they would need to hire few people to assist them.

There are mechanisms that should be put in place, so the impacts of hazards and stress are diminished. One other way is through preparing for the hazard, this is also an effective way of increasing resilience. Most of the women farmers were not aware of the drought preparedness strategies. Not knowing drought preparedness strategies means these women do not have mechanisms or activities to implement in the event of a drought. A drought management plan is used to inform farmers on the measures that can be taken to minimise the risk associated with drought impacts. Most of the respondents do not have a personal drought management plan. These were women farmers who had little knowledge on how to plan for a drought event. Nevertheless, a few women farmers indicated that they have a drought management plan. A drought management plan must have all the components of disaster management. Most of the women who indicated that they have a drought management plan stated that their plans are informal, the plans are not written. The women indicated that they stocked yields from previous season, and they plant short seasoned crops. The personal drought management plans drawn by the women farmers were not linked to many components of the disaster management cycle. Therefore, the plans were not effective even if they used them.

Most of the respondents said that they were not aware of any drought early warning system. The findings of the study differ with literature. Jordaan (2012) indicated that drought is normally a slow-onset phenomenon and therefore it is possible to make some predictions or early warnings. In this study, most of the participants failed to predict the early warning signs of drought. However, few respondents had knowledge of drought early warning system. These respondents pointed out they made use of indigenous knowledge. A few of the respondents said they received information regarding early warnings of drought through the weather forecast. They can tune in to the radios and television and they are able to find out about an approaching drought. Experts stated that there were no early warning systems in place in most areas. The province relies on the metrological department and weather information sent from the nearest stations. When launching drought early warning and drought monitoring systems, there are some challenges that are likely to be faced especially in developing countries. The World Metrological Organisation (2006) highlighted that some of the challenges include insufficient coverage and data quality, the cost of data and decision makers failing to understand the technical language used in early warning bulletins. Zimbabwe is facing an economic crisis; therefore, it is difficult for the country to be well advanced in early warning technologies that give accurate weather information.

It is essential to conduct some awareness campaigns so that the community is informed of the challenges that they are likely to face, and how they can overcome those challenges. Most of the resettled women indicated that there are no awareness campaigns in their area. The UN emphasised the need for public awareness of the impacts of drought and drought risk by improving and executing training and advocacy programmes (UN, 2014). The resettled women are at great risk from drought because they do not receive enough awareness. Most of the resettled women are not involved in drought risk reduction activities. The response by most of the respondents shows that the women are at great risk of drought because they do not take the responsibility of mitigating and preparing for drought. The response shows that women farmers do not take responsibility for minimising the impacts of drought, they rely more on the government and other organisations to assist them.

6.3.3 Future uncertainties

Future uncertainties are posed by climate change, and to address those uncertainties there must be some form of adaptive measures that are put in place. The number of women farmers who use diversity of crops as adaptive strategies are 36 percent. Women farmers in Mashonaland Central to deal with future uncertainties used crop diversity. Crop diversity gives these women farmers a variety of choices, they can increase production since the focus is on various crops. The observations conducted shows that the women farmers were having different crops such as maize, soya beans, vegetables and sorghum on a single farm. Another adaptive method applied by the resettled women was crop rotation, most of the respondents (56 percent) indicated that they applied crop rotation methods. Only 2 percent of the women farmers indicated they used irrigation as an adaptive strategy. The A2 farmers used this method and none of the A1 farmers indicated that they used this method. Of the participants (6 percent) indicated that they have insurance. Most of the participants that had insurance were A2 farmers. Having insurance in farming is such an advantage because when weather related events such as drought strike, the farmer can claim from the insurance. The resettled women farmers agreed that applying strategies such as diversifying crops, crop rotation, using improved irrigation systems and having insurance strengthened their resilience to drought.

6.3.4 Livelihood

The resettled women farmers applied various ways to improve their livelihood, these include access to markets, having other sources of income, having programmes that advocate for women empowerment and having other organisations that assist women in farming. Most of the resettled women farmers had access to good markets. Most of the women farmers sold their produces in their local markets, to the government and some of the farmers supplied farm produce to supermarkets. The resettled women can improve their lives and the lives of the community through selling farm produce.

Most of the resettled women indicated that the community does not have other sources of employment. The results are in line with literature, the UNDP stated that having a rural household that depends on agriculture, as the only source of food will affect the livelihood of the people (UNDP, 2005). A local leader pointed out that the reasons for not having alternative employment

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is most of the industries are in large cities and bigger towns. There are few shops available in rural areas therefore, only a few employment opportunities exist for community members. Even though most of the resettled women farmers indicated that there are no other sources of employment, few individuals indicated that there are other sources of employment. These respondents were asked to state the other sources of employment, the sources included employment as brick moulders, gold panning, fishing, trading, sewing and working as a shop assistant. Most of the employment mentioned is informal employment since there is a high unemployment rate in Zimbabwe.

Some cultural practises and values will have either a positive or negative effect people's way of life. Most of the respondents indicated that no cultural practises and values discriminates women from farming. The rights of women are being observed, and the resettled women farmers felt that they gained some respect from the society. Women farmers were not allowed to own any piece of land, according to cultural practises. During the Fast Track Land Redistribution Programme, women were allocated their piece of land, therefore some of the cultural practises and values were dealt with. Most of the respondents did not know of the programmes that advocates for women empowerment. However, some respondents indicated that there are programmes that advocate for women empowerment. The resettled women farmers mentioned the following programmes: bread-making project, detergent-making project, sewing and knitting cooperatives.

Resettled women farmers in Mashonaland Central province made use of various social networks, these social networks promote drought risk reduction. Network and networking of the resettled women assisted them in adapting to the drought events. Literature suggested that, social networks are utilised by people to accomplish their goals and interest (Coleman, 1998). It is in the interest of the resettled women to minimise the risk of drought; therefore, they are part of social networks. The resettled women farmers indicated that they make use of the following social networks: farmers' organisations, church members, *mikando*, family networks, political connections and friends. The farmers indicated that they find emotional support from these networks and sometimes they can get financial support. The farmers' organisation safeguards the interest of the farmers and offer support and assistance to the farmers. They assisted the farmers with information on how to reduce risk of events such as drought.

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Resettled farmers had different views about the ability to get a loan or any financial assistance from the bank. Most of the resettled women believed that it is possible for a woman to get a loan from the bank. These women mentioned that banks do not discriminate based on gender, but the bank only wanted collateral security. From the observations conducted during the study, most of the A2 farmers agreed and strongly agreed that they can get loan. This is probably because they have valuable assets that can be used as collateral, so it is not difficult for them to get loans. This is a different case for most of the A1 farmers who are small-scale farmers and most of them lack some resources. Some of the A1 farmers indicated that their loan applications were rejected by the banks because they did not have collateral. A government usually offers financial assistance to farmers during critical times such as a drought event that affects a whole country or some sections of the country. Most of the respondents (75) do not believe that they are able to get financial assistance from the government of Zimbabwe. A few numbers of respondents strongly agreed that the government financially assists women farmers. The researcher further questioned these respondents and they indicated that they receive financial assistance from the government in the form of subsidies. The government does not provide loans directly to the farmers, but it will arrange for guarantees for the loans presented to farmers of oil seeds and grains.

6.3.5 Governance

Most of the respondents revealed that there are not getting support from organisations or institutions that are supposed to assist women in farming. These women revealed that there a few organisations are helping women farmers. Most of the women farmers did not get support from these organisations because the numbers of women who required assistance is very high, therefore, the organisations are not able to assist all the women farmers. The experts revealed that the situation is even worse when there is a drought event in the area, the organisation and institutions do not have the capacity to accommodate most of the women farmers. Some of the resettled women pointed out that in some situations the women farmers will fail to get the relief from the organisation because of some corrupt leaders who will steal from the people. There were some respondents who pointed out that they were getting assistance from NGOs such as the Development Aid from People to People (DAPP), United Nations Development Programme

(UNDP) and United Nations World Food Programme (WFP). These organisations work with farmers who need assistance. Women farmers receive food aid especially when there is a drought. From the observations, some organisations were assisting women farmers in Mashonaland Central, but the number of women farmers outweighs the organisations so most of the resettled women do not get that assistance.

Most of the respondents indicated they strongly agreed that the government should engage the community when there are planning for drought risk measures in their area. They believe that if the government works hand in hand with the community, they will be able to minimise the risk imposed by drought. Most of the respondents do not think the government have effective strategies. The reason for not believing that the government is effective is probably because the women farmers have a bad experience in the past. The government of Zimbabwe is experiencing some economic challenges and the country lacks some of the resources that can be used to implement effective drought risk measures. Studies by Dube (2015) and Bongo, (2013), suggested that Zimbabwe put in place measures to reduce the impacts of disaster. These measures were influenced by the disaster management continuum and the government of Zimbabwe manages the national institutions and organisations to examine drought early warnings. The study provides different results, the resettled women pointed out some challenges they have with governance and how drought is being managed.

Most of the respondents did not agree that the current legislations, institutions and policies on climate change and drought in the country are affective. Even if the government has been formulating these laws and policies, the respondents do not see their effectiveness because they have not experienced many positive results. The policies that the respondents were familiar of include the land policy, the new grain policy, the national gender policy and food and nutrition security for Zimbabwe in the context of economic growth and development. Literature suggests that appropriate governance is crucial for maintaining and building essential provision to formulate drought policies and for incorporating drought risk matters into a sustainable development and processes of disaster risk reduction (UNSDR, 2017). Therefore, there is need for good governance in the country to reduce the risk posed by drought.

6.4 CONCLUSION

The research focused on women who acquired land through the FTLRP, the women farmers who were resettled under the A1 model and A2 model were the targeted group. The aim of the study was to develop a climate change induced- drought resilient framework for the resettled women. The study also focused on the vulnerability and impact of drought on the A1 and A2 women farmers. The first step of assessing the resilience of the resettled women farmers in Mashonaland Central province was to examine the vital demographic characteristics. The general findings of the study showed that it is important to focus on ways that promote resilience to strengthen the resilience of a community. The Iyengar-sudarshan method was used to calculate the level of vulnerability for the resettled women using the hazard and stress and future uncertainty variables per latent variable. The overall vulnerability of the resettled women showed that the women were vulnerable to drought. This is an indication that resettled women farmers were vulnerable to drought that was affecting the area. The vulnerability was high because the resettled women farmers survived on agriculture and drought had caused the farmers to lose their crops and livestock, therefore they struggled to feed their families. The women farmers also experienced some financial losses since they experienced crop failure, loss of animals, lack of crop insurance and lack of labour. Drought caused a severe impact on the water bodies in the province. The farmers were also vulnerable to drought because there were limited drought awareness campaigns.

There is lack of coordination between the government and the community members. The government is failed to assist the local government and the community to come up with some coping capacities. The government lacked on translating drought risk policies into local drought risk reduction practices. The resettled women felt the government had not yet developed effective preparedness and mitigation measures. Even though the resettled women encountered challenges, these women acquired some sort of resilience within them. The resettled women can apply some adaptive strategies such as crop rotation and crop diversity. These women farmers have access to good markets, they can sell their produce, and they also have social networks such as farmers' organisations, *mikando,* and church groups which could assist with financial and emotional support. The resettled women are independent farmers, they can make decisions that are

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agriculture related. In the event of drought, the farmers can benefit from drought relief, they are able to get support from the government and other local and international organisations.

The indices that were used to determine the fitness of the model of resilience were NNFI, TLI, RMSEA and GFI index. The resilience model was built using the structural equation modelling technique. The livelihood variable and governance variable contributed towards resilience in the structural model. The results of the structural model for resilience proved that the influence of governance towards resilience is higher than the influence of livelihood towards resilience. Therefore, if governance is increased, resilience will be impacted positively.

6.5 CONTRIBUTION OF THE STUDY

The primary aim of this study was to develop a unique framework for climate change induced drought resilience. The study is unique because none of the reviewed literature used the structural equation model to build resilience of women in farming to drought and the use of structural equation model is a new concept in disaster management. The resilience model that exists show the important variables to observe in measuring resilience. However, none of the models used the structural model, none of them showed how the variables interact to bring about the optimal structural model to be used in the development of resilience to drought. Various studies have been conducted on the resilience of women to disasters globally; however, there is a gap on the extensive study of strengthening resilience of resettled women. In this study, the researcher focused on the resilience of women to drought-adverse impacts. The framework was used as a tool that served, supported and analysed issues that are related to drought resilience of women in farming. The framework is two-fold in terms of its contribution to science through provision of useful knowledge on factors that might have impact and contribute to the successful adoption of drought risk reduction. This accounted for the theoretical contribution of the study and the practical contribution was intended to set an avenue for an understanding of local strategies and innovations employed by local people in coping with drought events adverse effects. Vulnerability and impact assessment for the study will assist the government with mobilisation of resources. The findings of the study will assist the disaster management systems in the country with the aim of strengthening disaster management interventions. The study, therefore, stands to provide

significant policy recommendations that will contribute to the attainment of resilience building against adverse effects of drought events.

6.6 RECOMMENDATIONS

Organisations and institutions that assist farmers should be encouraged to give more support to women farmers. The organisation should be able to identify vulnerable women farmers and assist them first. Organisations or institutions must be able to work directly with the farmers and manage the donations and relief packages that they give to farmers to avoid cases of local leaders who are corrupt and steal from the farmers.

The national drought policy should set up a clear regulated principle to administrate the management of drought and the associated impacts. The policy should put an emphasis on management of risk. The policy is supposed to aim toward reducing the risk through developing better awareness and knowledge of drought hazard as well as the primary causes of community vulnerability. The policy should also promote an understanding of how remaining proactive and implementing an extensive variety of preparedness measures will likely escalate community resilience. So many people, especially the resettled women, do not know the policies, laws and institutions on climate change and drought. The government should make the farmers aware of these initiatives so that the farmers abide by the rules of the country.

The government should work closely with the farmers and the local leaders to make sure that the community abide by the laws and policies of the country. The laws and policies should be effective. For the government of Zimbabwe to implement drought risk measures, there is need to for the government to have effective early warning system. Early warning systems decrease economic damages and mitigate the number of people affected by the disaster by presenting information that will allow farmers to safeguard their lives and their property. The presence of early warning information encourages the farmers to act prior to a drought event. The government should have improved and advanced metrological systems so that they will be accurate in weather forecasting. The presence of effective early warning systems will assist the farmers with information about forthcoming drought events leading to proper preparation.

The government should engage the community when they are planning for drought risk measure for that community. Different communities experience things differently, so the measures should be designed to fit the need of the community. The government should be engaged in the implementation of disaster risk reduction activities in the community. The government should assign relevant people who will work closely with the community so that there are effective preparedness and mitigation measures. The government should make sure that there are transition warnings as well as connected responses to address all the people, specifically the most vulnerable people in the community.

There must be collaborations amongst governmental departments, this will promote appropriate execution of a plan for drought risk reduction. The provincial civil protection department and the department of agriculture should plan together. The leaders should organise many awareness campaigns so that the community is informed of the challenges that they are likely to face, and how they can overcome those challenges. There should be a variety of methods used to raise awareness campaigns, such as announcements on radios, creating advertisements, road shows and distributing brochures.

Local leaders should make sure that the women farmers receive training and are educated on issues related to drought and climate change. Furthermore, increasing productivity enriching technologies, increasing the access to irrigation technologies will benefit farmers to deal with drought. The farmers should be encouraged to participate in other forms of livelihood activities that are not related to farming, the farmers will be able to diversify their income and will have a backup when there is a drought. The farmers should be introduced to new marketing trends like internet marketing, this will expose the farmers to international buyers and not limiting themselves to the local market. Civil protection unit and the extension service are required to work close together. There must be civil protection centres in every province and districts and must be efficiently managed and their roles and responsibilities must be clarified.

6.7 AREAS FOR FUTURE RESEARCH

Further research on the resilience of resettled women in other areas is needed to widen the scope of measures and strengthen the resilience of women farmers. The same study should be conducted with peri-urban and communal farmers who are considered as small-scale farmers who lack some many resources. Future research works should focus on the relationship between gender and the level of education of the owner of the farm and their contribution towards the resilience of the community. Another focus should be on the direct comparison of female-headed and male-headed households and their contribution towards disaster risk management in the communities.

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APPENDIX A: RESEARCH QUESTIONNAIRE

INTRODUCTION

I am a student at the University of the Free State, conducting research on "**A climate change – induced drought resilient framework developed for resettled women under Fast Track Land Resettlement Programme: A case of Zimbabwe**". The study is focusing on strategies that can be implemented to increase resilience of women in farming.

You are invited to participate in this research by providing your views and your contributions will be highly appreciated. The data gathered will be kept confidential and the results will be used for academic purposes and may be used by other relevant stakeholders that are within and outside the university for development intervention purposes. You are welcome to withdraw from the research at any stage if you do not feel comfortable. If they are not happy with any aspect of the way the research is conducted, you can contact DIMTEC offices at the University of the Free State. Please answer all questions in all possible honesty.

DEMOGRAPHICS

1. Indicate your age group in years: 18-29 [ ], 30-39 [ ], 40-49 [ ], 50-59 [ ], 60+ [ ]

2. Which one applies to your marital status? : Married [ ], Single [ ], Widowed [ ], Separated [ ]
Divorced [ ]

3. What is your household size? Less than 2 [ ], 2 to less than 5 [ ], 5 to less than 9 [ ], 9 to less than 12 [ ], More than 12 [ ].

4. What is your primary position in the household? Sole breadwinner [ ], wife [ ], grandmother [ ], relative [ ], other (specify)

5. What is your highest level of education? No schooling [ ], Primary school [ ], O level [ ], A level [ ], Diploma [ ], Degree [ ].

6. Do you own the land you are farming? Yes [ ], No [ ].

7. How did you obtain the land you are farming on? Land grabbing [ ], from government [ ], Purchased the land [ ], other, specify.

8. Which model of farming under land reform do you fall under? A1 [ ], A2 [ ].

9. Which type of farming are you practicing? Arable farming [ ], Pastoral farming [ ], Mixed farming [ ]

10. Did you receive any formal education that is agriculture related? Yes [ ], No [ ]

HAZARDS AND STRESSES

11. Do you have knowledge of climate change/drought impacts? Yes [ ], No [ ]

12. Have you lost any livestock due to drought? Yes [ ], No [ ] If yes how many did you lost through: Sold [ ], Dead [ ].

13. Have you lost crops due to drought? Yes [ ], No [ ]

14. Has drought affected any of the following surface water sources?

Type of water source	Yes	No
Boreholes		
Wells		
Rivers		
Ponds		

15. Have you recoded any financial losses due to drought? Yes [ ], No [ ], if yes what was the reason behind loss of revenue (tick the reasons behind)

Crop failure	
Loss of animals	
Lack of crop insurance	
Inadequate relief funds	
Lack of labour	
Other specify	

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16. Are you aware of any drought preparedness strategies? Yes [ ], No [ ].

17. Do you have a personal drought management plan, Yes [ ], No [ ] if yes briefly describe the plan? ───────────────────────────────────────

18. Are there drought early warning system that you are aware of? Yes [ ], No [ ]. If yes please state them ─────────────────────────────────────

19. Are you as a woman involved in processes of drought risk reduction? Yes [ ], No [ ]

FUTURE UNCERTANITY

20. What are the adaptive strategies do you apply in case of climate change induced drought? You can tick more than one answer

Strategy	Tick
Diversify crops	
Change crops	
Improve irrigation systems	
Buy insurance	
Other, specify	

21. Have the adaptation strategies that you applied lead to stronger resilience? Yes [ ], No [ ]

22. Will current strategies allow the community to cope with or respond to these trends and changes?   Yes [ ], No [ ]

23. Which sector experts can inform you on the latest adaptation options to support livelihoods assets in relation to drought? You can tick more than one answer

Research organisations	
Government inputs	
Water management experts	
Agriculture extension	
Private sector	
Other	

24. Are there climate change awareness campaigns in place? Yes [ ], No [ ].

25. Do you have access to relevant and timely information relating to climate change induced drought? Yes [ ], No [ ]

LIVELIHOOD

26. Does the community have good access to markets? Yes [ ], No [ ]

27. Does the community have other sources of employment? Yes [ ], No [ ]. If yes state the sources of employment

_____

28. Are there cultural practices and value that discriminates women from farming? Yes [ ], No [ ]

29. Are there programmes that advocate for women empowerment? Yes [ ], No [ ] if yes mention the programmes _____

30. Mention social networks that are involved in drought risk reduction _____

31. Indicate by marking an "X" on how you feel about the following statements:

Statement	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Because of my gender, I am able to make decisions that are agriculture related					
As a women I am able to get a loan or any assistance from the bank					
As a women farmer, I am able to get financial assistance from the government					

32. What other type of assistance should be given to women in farming?

_____

_____

GOVERNANCE

33. Are there organizations or institutions that are assisting women in farming? Yes [ ], No [ ] if yes mention them.

34. Indicate by marking an "X" on how you feel about the following statement:

Statement	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
The government should engage the community when there are planning for drought risk measures in the area.					

35. Is the government engaged in implementing effective drought risk reduction activities/strategies?   Yes [ ], No [ ]

36. How can the government build comprehensive drought monitoring and early warning systems?

37. What policies exist which promote poverty reduction at national and local levels.

38. Are the current legislations, institutions and policies on climate change and drought effective? Yes [ ], No [ ]

39. How can the government of Zimbabwe improve on drought risk management?

RESILIENCE

40. Are you aware of the relief programmes in place? Yes [ ], No [ ] if yes mention the programmes

41. Do you get relief funds in the event of drought? Yes [ ], No [ ]

42. In what way do you get relief amount? Cash [   ], Cattle care [   ], Subsidies [   ], Food for work [ ], Employment generating schemes [ ], others [ ] specify

43. Indicate by marking an "X" on how you feel about the following statement

Statement	Very satisfied	Satisfied	Neutral	Not satisfied	Very unsatisfied
How satisfied are you with the relief that you are getting?					

APPENDIX B: INTERVIEW GUIDE

INTRODUCTION

I am a student at the University of the Free State, conducting research on "**A climate change – induced drought resilient framework developed for resettled women under Fast Track Land Resettlement Programme: A case of Zimbabwe**". The study is focusing on strategies that can be implemented to increase resilience of women in farming. This interview guide is directed to key informants: extension officers, experts and the local leaders.

You are invited to participate in this research by providing your views and your contributions will be highly appreciated. The data gathered will be kept confidential and the results will be used for academic purposes and may be used by other relevant stakeholders that are within and outside the University for development and intervention purposes. Please answer all questions in all possible honesty.

HAZARDS AND STRESSES

1. What are the challenges women farmers are facing due to drought?

2. Do you regard drought as a regular part of farming, and why do you say so?

3. How are farmers managing with the impacts of drought?

4. Are there early warning systems in place?

5. What can be done to improve monitoring and early warning systems of drought?

FUTURE UNCERTANITY

6. Do you have access to relevant and timely information relating to climate change induced drought? Yes [ ], No [ ]

7. Are there climate change awareness campaigns in place?

8. What are the adaptive strategies do you apply in case of climate change induced drought?

LIVELIHOOD

9. What are the local livelihood assets and resources used by women?

10. Which strategies is the community using to secure their livelihoods against the impacts of drought?

11. Are women farmers receiving adequate agricultural training/education?

12. What type of insurance is available for women farmers?

GOVERNANCE

13. What type of preparedness measures have been implemented by the government and other organisations?

14. What type of assistance are farmers receiving from government and other organisations?

15. Are there policies and legislations that are drought related? If yes mention them.

16. Is the government engaged in implementing disaster risk reduction activities/strategies?

17. How can the government of Zimbabwe improve on drought risk management?

RESILIENCE

18. Is the amount of assistance women farmers are receiving from sufficient?

19. What should be done to strengthen the resilience of women in farming?

20. Are there drought relief programmes in place?

APPENDIX C: ETHICAL CLEARANCE LETTER

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

UFS
UV

GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

28-Oct-2019

Dear Miss Nyahwo, Moddie MZ

Application Approved

Research Project Title:
A climate change – induced drought resilient framework developed for resettled women under Fast Track Land Resettlement Programme: A case of Zimbabwe

Ethical Clearance number:
UFS-HSD2019/1299

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Prof Derek Litthauer
Chairperson: General/Human Research Ethics Committee

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APPENDIX D: PERMISSION TO CONDUCT RESEARCH

OFFICE OF THE PRESIDENT AND CABINET
MASHONALAND CENTRAL PROVINCE

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All communications should be addressed to
the Minister of State for Provincial Affairs

ZIMBABWE

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P.O. BOX 300
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567 THURLOWS AVENUE
BINDURA

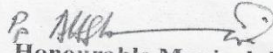06 December 2019

TO WHOM IT MAY CONCERN

AUTHORITY TO CONDUCT PHD RESEARCH: MODDIE NYAHWO, UNIVERSITY OF FREE STATE. DECEMBER 2019 –JUNE 2020

The Minister of State for Provincial Affairs and Devolution Mashonaland Central Province, is pleased to grant you authority to conduct your research study in the province as per your submitted application.

We take assurance that the study will conform to the requirements of the relevant statutory regulations of Zimbabwe and that findings shall be used for the stated purpose for which this authority is granted.

By way of this authority, relevant assistance shall be rendered as may be necessary.

Wish you all success in your academic pursuit

Office of the President & Cabinet
Min. of State for Provincial Affairs

0 4 DEC 2019

Mashonaland Central Province
Zimbabwe

Honourable Monicah Mavhunga (Sen)
Minister of State for Provincial Affairs and Devolution
Mashonaland Central Province
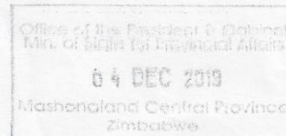
APPENDIX E: CONFIRMATION LETTER FROM THE EDITOR

D.K.M
LANGUAGE AND TECHNICAL EDITING ♦ PROOFREADING ♦ PLAGARISM CHECKING ♦ ACADEMIC RESEARCH
(HONS AND MASTERS) AND PROJECT SUPERVISION ♦ BUSINESS PROPOSAL

29 June 2020

LETTER OF CONFIRMATION

I hereby confirm that I have done the language editing for the following dissertation:

Author: Ms M Nyahwo

Title: Climate change – developing an induced drought resilient framework for resettled women under fast track resettlement programme: A case of Zimbabwe

Document: Doctor of Philosophy in Disaster Management

This letter serves to confirm that I have edited Ms M Nyahwo document and I have made appropriate changes and highlighted areas that the student needs to revisit. The document was edited using track changes and comments in Microsoft word.

I was only responsible for the language editing. The student took care of all the technical aspects of the document. I am not responsible for any additional information that is added to the document after I have edited it. The student is responsible for the final document submitted.

I trust you find the above in order.

Hazvinei Majonga
Registered Board: South African Translators Institute
Membership Number :10033691

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