

# MIDLANDS STATE UNIVERSITY



## FACULTY OF ARTS

### DEPARTMENT OF DEVELOPMENT STUDIES

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**EFFECTS OF CLIMATE CHANGE ON FOOD SECURITY IN MUTASA DISTRICT**

## **Dedication**

I dedicate this research to my parents Mr and Mrs Sauriri.

## **Acknowledgements**

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## **Abstract**

This research seeks to highlight the Impacts of climate change on food security in Mutasa District in Manicaland Province in partial fulfilment of Bachelor of Arts Honours Degree in Development Studies at Midlands State University. The research presents the background of the study which is the impacts of climate change on food security. Research objectives and questions, limitations encountered and delimitations to the study are as well presented in this research. This study reviewed the prevailing conditions in Mutasa District resulting from climate change. It also poses an assessment of the capacity of the community's mechanisms and other institutions in responding to the effect of climate change. The study objectives was to identify current prevailing effects of climate change in Mutasa District, to assess the impact of these effects on different age groups as well as gender based, to identify what the government and other players are doing in helping the community resilience capacity on climate change and give possible solutions in form of recommendations that can be useful in adapting to this problem or reduce the impact in form of mitigation recommendations. Interviews, questionnaires and observations were used to collect data in Mutasa for the fulfilment of the objectives and answer the research questions. The study showed that the community is suffering much from climate change and their coping muscle is tender to curb the devastating effects of climate change since the majority s poor and depend on agricultural activities. the however developed some mitigation strategies to cope with food shortages, thus the tendency to reduce the number of meal per day, reduce meal portions, sell of labour, lending and savings groups and cross border trading. The stud also proves that other players including the third sector are involved in supporting the community in coping up with climate change. Challenges in coping to climate have shown that financial constrain is the major challenge and insufficient extension personnel which is a national crisis. The research then ends with recommendations that can be adopted as solutions.

## **TABLE OF CONTENTS**

Approval form.....	
Dedication.....	I
Acknowledgements.....	II
Abstract.....	III
Table of contents.....	IV
List of tables.....	IX
List of figures.....	IX
List of appendices.....	IX
List of acronyms.....	X

### **CHAPTER 1**

1.0 Introduction.....	1
1.1 Background.....	1
1.2 Problem Statement.....	4
1.3 Aims and objectives.....	4
1.4 Research questions.....	5
1.5 Assumptions.....	5
1.6 Limitations of the study.....	5
1.7 Delimitations.....	6
1.8 Significance of the study.....	6
1.9 Theoretical framework.....	7
1.10 Chapter breakdown.....	10

1.11 Summary.....	11
-------------------	----

**CHAPTER 2**

2.0 Introduction.....	12
2.1 Causes of climate change.....	12
2.1.1 Industrialisation.....	13
2.1.2 Greenhouses gasses (GHGs).....	13
2.1.3 Deforestation.....	14
2.1.4 Desertification.....	15
2.1.5 Ocean currency.....	15
2.1.6 Destruction of wetlands.....	15
2.1.7 Dust and gasses.....	16

**2.2 EFFECTS OF CLIMATE CHANGE**

2.2.1 Changes in household food situations.....	16
2.2.2 Immoral behaviour.....	17
2.2.3 Migration.....	17
2.2.4 Drying up of wetlands.....	18
2.2.5 Warming.....	18
2.2.6 Water Quantity.....	18
2.2.7 Asset disposal.....	18
2.2.8 Alternating floods and droughts.....	20

**2.3 EVIDENCE OF CLIMATE CHANGE**

2.3.1 Frequent and recurring droughts.....	21
2.3.2 Frequent and recurring floods and cyclones.....	22
2.3.3 Increase in annual mean temperature.....	22
2.3.4 Rainfall data showing no constant trends.....	22
2.3.5 Changes in crop type.....	22

**2.4 ADAPTATION AND MITIGATION MECHANISMS**

2.4.1 Community Based Adaptation (CBA).....	23
2.4.2 Production diversity.....	24
2.4.3 Stock movement .....	25
2.4.4 Building stocks.....	26
2.5 Response Strategy.....	26
2.6 Development Plan.....	26

2.7 Summary.....	27
------------------	----

### **CHAPTER 3**

3.0 Introduction.....	28
3.1 Research design.....	28
3.2 Sampling procedure.....	28
3.3 Research instruments.....	29
3.3.1 Interviews.....	29
3.3.2 Questionnaires.....	29
3.3.3 Observations.....	30
3.4 Ethical Considerations.....	30
3.4.1 Seeking permission.....	30
3.4.2 Voluntariness.....	30
3.4.3 Consent.....	31
3.4.4 Privacy and confidentiality.....	31
3.4.5 Data presentation and analysis procedures .....	31
3.5 Summary.....	31

### **CHAPTER 4**

4.0 Introduction.....	32
4.1 Response rate to questionnaires.....	32
4.2 Response rate to interviews.....	33
<b>4.3 CURRENT EFFECTS OF CLIMATE CHANGE IN MUTASA DISTRICT</b>	
4.3.1 Pest and diseases.....	34
4.3.2 Unpredictable rainfall patterns and duration.....	36
4.3.3 Prolonged mid-summer dry spells.....	38
4.3.4 Too much rainfall concentration in a short space of time.....	39
4.3.5 Poor heat unit on crops.....	40
4.3.6 Extreme low temperatures.....	40

4.3.7 Infield soil erosion.....	41
4.3.8 Crop distraction.....	41
4.3.9 Decaying of crops in fields.....	42
4.3.10 High demand of maize.....	43
4.3.11 Diminishing intake by GMB.....	43
4.3.12 Poor and shortage of graze lands.....	44
4.3.13 Animal diseases.....	44
4.3.14 Scale down and drop in other project.....	45
4.3.15 Increased food shortages.....	45
 <b>4.4 EFFECTS ON DIFFERENT AGE AND SEX</b>	
4.4.1 Migration.....	46
4.4.2 Increase in theft cases.....	46
 <b>4.5 CHALLENGES TO ADAPTATION MECHANISMS</b>	
4.5.1 Poor support and financial shortages.....	47
4.5.2 Shortage of technical experts.....	48
4.5.3 Lack of participation.....	48
4.5.4 Climate variability.....	49
4.5.5 Lack of political will.....	50
4.5.6 Sabotage.....	51



4.5.6 Role played by the government of Zimbabwe and other organisations.....52

4.7 General assessment of existing mechanisms.....53

4.8 Summary.....53

**CHAPTER 5**

5.0 Introduction.....54

5.1 Summary.....54

5.2 Conclusion.....55

5.3 Recommendations.....56

Reference list.....58

## **LIST OF TABLES**

Table 4.1: Response Rate to Questionnaires.....	32
Table 4.2: Response Rate to Interviews.....	33
Table 4.3: GMB Intake Trends of Crops in Mutasa District.....	43
Table 4.4: Rainfall Distribution of Mutasa.....	49

## **LIST OF FIGURES**

Figure 1.1: Map Showing Mutasa District.....	1
Figure 1.2 Sustainable Livelihood Diagram.....	9
Figure 1.3 Components of Household Livelihood Security.....	9
Fig 4.1 Effects of Army Worm on Maize.....	35
Fig 4.2 Effects of Termites on Immature Maize.....	35
Fig 4.3: An Orange Tree Affected by Yellow Leaf and Fungi.....	36
Fig 4.4: A dead Potato Field Due to Insufficient Rainfall.....	37
Fig 4.5 massive salinization and abnormal weeds.....	39
Fig 4.6: Harvested Decayed Maize and the Little Gained From the Same Field.....	42
Fig 4.7: Quarantined Infected Road Runners.....	45

## **APPENDIX**

Appendix A: Questionnaire.....	60
Appendix B: Interview Guide.....	62

## **LIST OF ACRONYMS**

AESs Agricultural Extension Supervisors

AEWs Agricultural Extension Workers

DAEO District Agricultural Extension Officer

CBA Community Based Adaptation

GIZ Germany Intergovernmental Zimbabwe

GTZ German Transforming Zimbabwe

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## TABLE OF CONTENTS

Approval form.....	
Dedication.....	I
Acknowledgements.....	II
Abstract.....	III
Table of contents.....	IV
List of tables.....	IX
List of figures.....	IX
List of appendices.....	IX
List of acronyms.....	X

## CHAPTER 1

2.0 Introduction.....	1
1.1 Background.....	1
1.2 Problem Statement.....	4
1.3 Aims and objectives.....	4
1.4 Research questions.....	5
1.5 Assumptions.....	5
1.6 Limitations of the study.....	5
1.7 Delimitations.....	6
1.8 Significance of the study.....	6
1.9 Theoretical framework.....	7
1.10 Chapter breakdown.....	10

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-------------------	----

**CHAPTER 2**

2.0 Introduction.....	12
2.1 Causes of climate change.....	12
2.1.1 Industrialisation.....	13
2.1.2 Greenhouses gasses (GHGs).....	13
2.1.3 Deforestation.....	14
2.1.4 Desertification.....	15
2.1.5 Ocean currency.....	15
2.1.6 Destruction of wetlands.....	15
2.1.7 Dust and gasses.....	16

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2.2.1 Changes in household food situations.....	16
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2.4.2 Production diversity.....	24
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2.4.4 Building stocks.....	26
2.5 Response Strategy.....	26
2.6 Development Plan.....	26



2.7 Summary.....	27
------------------	----

**CHAPTER 3**

3.0 Introduction.....	28
3.1 Research design.....	28
3.2 Sampling procedure.....	28
3.3 Research instruments.....	29
3.3.1 Interviews.....	29
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4.0 Introduction.....	32
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4.7 General assessment of existing mechanisms.....	53
4.8 Summary.....	53

**CHAPTER 5**

5.0 Introduction.....	54
5.1 Summary.....	54
5.2 Conclusion.....	55
5.3 Recommendations.....	56
Reference list.....	58

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Table 4.1: Response Rate to Questionnaires.....	32
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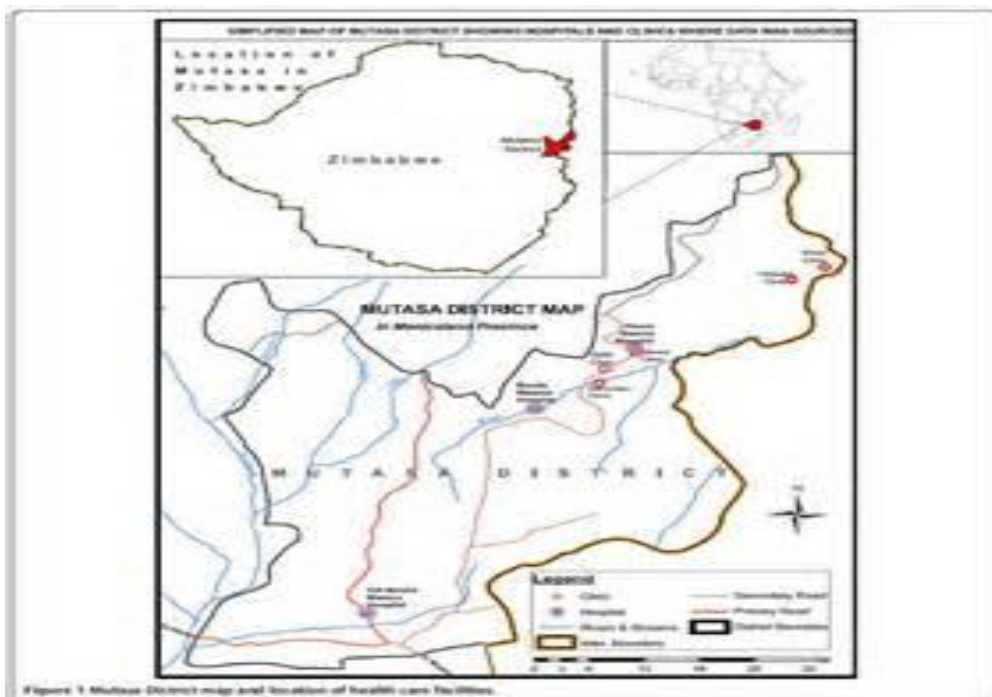
## Chapter 1-Problem and Its Setting

### 1.0 Introduction

This chapter gives the background of the area of study that is Mutasa District, the problem statement, objectives, research questions, assumptions, limitations to the study, delimitation, the significance of the study, theoretical framework that was used during the study and ends with the chapter summary a brief of the chapter content.

### Mutasa District Map

Fig 1.1



### 1.1 Background

Climate change has become common phenomena in history of development affecting mostly third world countries which heavily depends on the natural condition or state of climate which is greatly changing due to human and natural attributes. Though climate change can not completely be called a new phenomenon the new millennium stand showing clear and more evidence on changing climate. Climate has changed considering that rainfall was reliable characterised with limited natural disasters and good vegetation cover. Residents of Mutasa District have evidenced the existence of this phenomenon though it is difficult to understand. Evidence include changes and unpredictable rainfall patterns, long dry spell periods during summer season, too much rainfall towards and during the harvesting season of maize, beans and other related crops, extreme cold temperatures to banana farmers, drying up

of wetlands which are sources of water for their irrigation just to mention a few. Ministry of Environment and Tourism (2008), says that, during the twentieth century there has been an overall decline of nearly 5% in rainfall across Zimbabwe. This research is based on effects of climate change on food security in Mutasa District which have negatively impacted the District. Harvests have diminished compared to other previous years within this District resulting in insufficient households' food and income to those who survive on Agriculture both small scale and commercial resulting in poverty and starvation.

Residents, the government itself and other organisations third sector have tried some coping mechanisms in responding to this detrimental phenomenon. Some have worked but some proved to be of no use exposing the majority at risk considering that majority falls under unemployed population. However, the research also suggested some coping and mitigating and other measures that can be put forward in responding to climate change that can help the Mutasa District. Measures which includes borehole drilling for irrigation, changing in crop types, use of record books, new irrigation methods and tactics, crop diversity, mixed farming and others discussed in the research.

Climate change and its impact in different communities has become the cancer towards development especially on food security. This has become questionable in many African countries, the globe as a whole and risen attention internationally. Reports have been published through radios, newspapers, televisions and on internet of droughts, water shortages, cyclones, floods, temperature increase (Global Warming) characterized with vast diseases and food shortages in different societies. This has impacted greatly in rural settlements threatening peace and security of rural dwellers. Rural settlements rely much on subsistence production for their survival. According to an evaluation conducted by Chaipa, et al (2012) of World Vision Zimbabwe, in Zimbabwe the situation has been worsened by the failing or diminishing economy to cope up with these changes in climate. A case of Mutasa District is referred to.

Mutasa District is found in Manicaland province of Zimbabwe, according to Manenji (2004) located 30km from Mutare. The district borders with Nyanga district in the North, Mozambique in the East, Mutare district in the South and Makoni district in the West. The District has good fertile black and red soils which to Galang (2002) belong to the Dolomite and Umkondo rocks with high productivity and demand good conservation. Some parts of the district are however composed of sandy soils which are generally unproductive and demand a

lot of feeding to gunner better harvest. According to Nyamaphane (1999) these soils belong to Orthoferralic group. The climate of Mutasa district in the Honde Valley falls within the Savannah sub-Tropics with an average altitude of 900m. From the late of October to around the end of April the weather is wet and humid. Temperatures may rise up to 28 degrees Celsius and this is the period where most of the rainfall is received. From May to the beginning of July, the temperatures are very low and may hover around minimum of 2 degrees Celsius while August is very windy. From September to October it is very hot and minimum temperature may average 30 degrees Celsius. Zimbabwe is divided into five (5) natural Agro regions in which the dominant factor conditioning agriculture production is climate mainly rainfall and based on soil types too. Mutasa District falls under natural region one (1) and located in the Eastern Highlands of Zimbabwe. Most of the rainfall experienced is Convectonal rainfall. Martin and Johnson (1981) hold that, at times orographic rainfalls at various times of the year, in addition to the normal Convectonal rainfall are also received. Mutasa is amongst areas that receive highest rainfalls in the country though distribution differs and with gravity fed irrigation within most parts of the district.

Rainfall distribution pattern of different areas of the district are; Chavhanga, Sagambe EHPL to Muparutsa, Gwiriri, and District Central known as DC, Watsomba, Penhalonga and Imbeza receive the same amount of about 1200mm per year and all are in region 1A. Hauna to Dumba, Jombe and Mandeya 2 receives 1100mm per year and they fall under region 1B. Sherukuru, Premier and Nyamhanza receive 900mm per year and they are in region 2. Average rainfall for the whole district per annum is about 1150 millimetres.

This District is one of the tea and coffee producing districts in Zimbabwe, though Coffee has since yet been dropped by companies within the district resulting from Climate change only small holder farmers are still producing under Non-Governmental Organisations (NGOs) like World Vision (WVZ) supporting programmes. Farmers in Mutasa District have been making significant losses on perennial crops in recent years, which have led to the neglecting of tea and coffee fields and some even to an extend of destroying the fields converting them to other activities like Macadamia farming which demands little rainfall and drought resistant. This even happened in big Tea and Coffee producing companies in the District like the Katiyo Tea Estate which even faced closure and Eastern Highlands Plantations Limited (EHPL) which converted all Coffee fields and grow Macadamia (Hard nuts) and some Tea fields abandoned into bushes due to insufficient rainfall and equipment for irrigation both in rain season and



post rain season. According to WVZ report, In 1992 Smallholder farmers produced about 700MT of coffee but this has declined to only 2,5MT by 2009.

Key livelihood activities and sources of income for Mutasa households are engaged crop production like maize, ground nuts, livestock production, petty trading and provision of skilled and unskilled labour services especially in plantations, estates and mines and small gold claims. There is also banana, avocado, sugarcane and Tabashco chilli production in Mutasa North, pitch, fruits like pitches oranges and apples and potato production in Mutasa Central thus plantations for fruit trees in the fields and East with some vegetables, small grain production in Mutasa west thus the economy is agro-based.

This phenomenon of climate change has impacted greatly in Mutasa district for majority in the District heavily depends on subsistence agriculture using gravity irrigation water taken from up streams and wet lands and few in commercial agriculture for sustenance. Rain fed agriculture is the back bone of the district as well as for household level as it is the major source of income. The District is now characterised by increased food insecurity, at house hold level, increase in school going age drop outs, child labour, child sexual abuse, increase in theft cases, and drug abuse by children.

## **1.2 Problem Statement**

After realising the effects of climate change which has become a global concern and its effects has been also seen detrimental in Mutasa district of Zimbabwe through food insecurity and poverty. There is need to take effective mitigation measures that is improving institutional regulations, stiff policy frame works towards perpetrators and invest more in natural resources enhancing the capacity of the poor to respond and adapt to these climatic changes through local authorities. In Mutasa District climate change has left adaptation as a necessity not an option because of its effects on food security, women and children due to their limited adaptation capacity and the ability to mitigate the effects on the poor masses of the global south in general. However, this research is aimed at exploring ground effects of climate change and come up with actual controlee solutions for Mutasa District.

## **1.3 Objectives**

1. To document current effects of climate change in Mutasa district.
2. To show how climate change has impacted differently amongst men, women and children in Mutasa District.

3. To examine the challenges faced by residents of Mutasa in adapting to the effects of climate variability.
4. To establish possible solutions to the effects of climate change in Mutasa district.

#### **1.4 Research Questions**

1. What are the effects of climate change on food security in Mutasa district?
2. How effective are the adaptation mechanisms used by dwellers or farmers in the district to adapt to the effects of climate change?
3. What are the challenges faced by dwellers of Mutasa district in trying to adapt to the vagaries of climate change?
4. What is being by other organisations and the government to help the district in adapting to climate change?

#### **1.5 Assumptions**

The major assumptions to the research study are:-

- 1) The respondents shall provide all the relevant information to the study.
- 2) The respondents will have an understanding on effects of climate change.
- 3) The respondents might need clarity on some questions within questionnaires.
- 4) Respondents to be interviewed shall give recommendations that will reduce effects climate change and enhance food security in their own capacity.

#### **1.6 Limitations of the Study**

Some areas were inaccessibility during rainy season because they were slippery and no transport was going to those areas. However the researcher visited the areas during the mid-summer dry spell time when these areas were dry. Areas were now accessible as transport to those areas was plenty.

The time frame was limited for the researcher to carry out the research thoroughly. The researcher however used meetings and gatherings that were hosted and addressed by Agricultural Extension Officers to his advantage to administer his questionnaires and

conducted some of his interviews. This helped him to catch up with his time frame for he met farmers and other officers from different parts of the district thereby reducing the time that was going to be spent travelling to those areas .

Some sources of information were not totally cooperative and were reluctant to give all the required information. The researcher therefore used his own observations and accessed some information that was compiled earlier on about those areas.

### **1.7 Delimitation of the Study**

The research navigates in the wide range of Mutasa District though some parts were left out the reason being that they share the same climate conditions with their neighbourhood and for time management purposes. This study area was chosen because it is close proximity with the researcher and the researcher is well known within the area hence found to be ideal.

### **1.8 Significance of the Study**

This research was done in partial fulfilment of the requirements for the Bachelor of Arts Honours Degree in Development Studies. This also boosted and furthers the researcher's research skills for future use and personal knowledge.

The information gathered by the researcher help to improve the community's adapting mechanisms and allowing increased harvests hence food secured community. This will also be an advantage to the Grain Marketing Board (GMB) for their granaries will increase in their stocks and reserves.

The study also highlight most affected or vulnerable wards of the district which requires first attention in terms of aid might be food hand outs or inputs by different stakeholders working in the district. This will remove a general anticipation by different stakeholders that the District is exposed equally to different effects of climate change.

Also helped those who were consulted by the researcher to understand climate change. This increased stewardship and integration of all people in natural resources conservation granting harmony to the environment because those consulted are now clearly aware of this phenomenon. Genuine effects of climate change affecting the district and their recommendations were identified for the benefit of the community.

The research again helped in shifting much focus of organisations, the government and other stakeholders from only agricultural practises as the only ways that affects food security but also raising fair attention to climate change which will help to curb its impacts to food security through raised awareness.

Makes those who seek assistance for the district easier for there will be well researched and organised data. There is no much need for another data collection but just using the existing data and present to the relevant offices.

The study also gave ready information on the distribution of vulnerability in the District since the effects impact differently on different groups, hence easy to know where to begin. Since the District's parts are differently exposed to the effects of climate change it also means their food insecurity differs too, therefore organisations will be able to know which areas to start and end during their distributions.

## **1.9 Theoretical Framework**

A theoretical framework is a set of principles in form of theory(s) theories that inform a study particularly in attempting to answer the research questions as well as the objectives. In this regard Sustainable Livelihood Approach (SLA) was used. This approach was first introduced by Brundtland Commission on Environment and Development and later expanded by the 1992 United Nations Conference on Environment and Development. Chambers and Conway 1992 defined Sustainable Rural Livelihood as, "A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term". Thus, the current world should recover and cope up with climate variability towards food security sustainably.

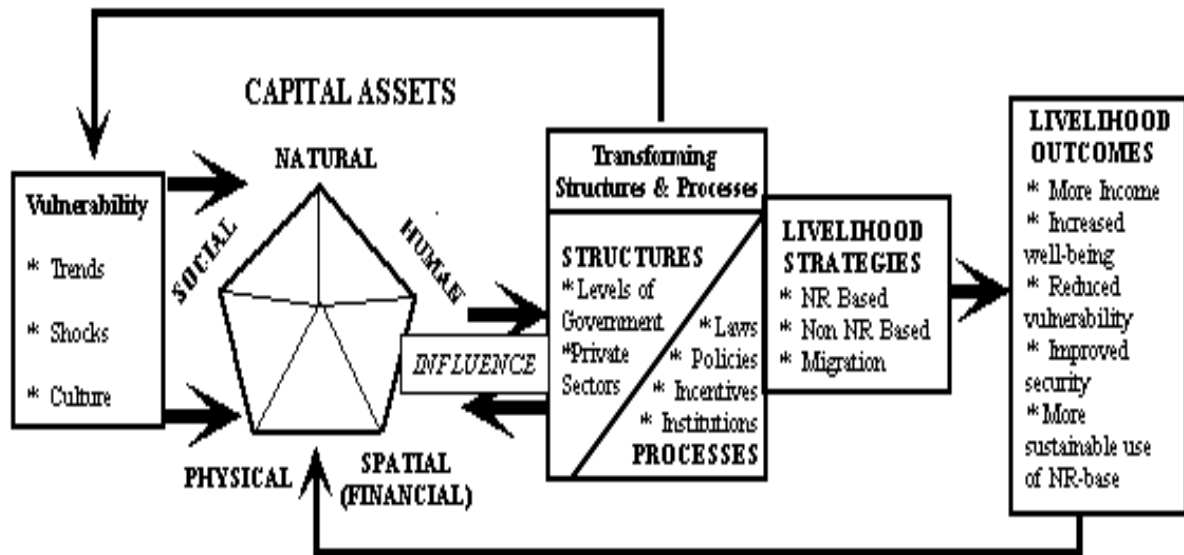
The SLA was preferred to be used because it gives emphasis to introduction of improved technologies as well as social and economic investments. Policy and governance issues as they impinge on people's livelihoods are addressed. Focus and support activities like demonstration fields as specific sustainable livelihood programme can be used, usually implemented at a district level according to UNDP.

This approach also places people in both identification and implementation or addressing of activities where appropriate. It aims also to improve the sustainability of livelihoods among poor and vulnerable by strengthening the resilience of their coping and adaptive strategies. Here it suits much for much of the impoverished stay in rural areas and the study has been carried out in a Rural District.

Food insecurity leads to extreme poverty; therefore SLA recognises participation of communities in mitigating climate change that is Participatory Development. Thus being involved in the designing of policies and project intended to better their lot and ensure sustenance. A partnership with the public and the private sector including Civil Societies and NGOs is also given room. Their support should therefore recognise the dynamic nature of livelihood strategies, responding flexibility to changes in people's situations and develop long term commitments support to cope with repeated stress and shocks from climate change.

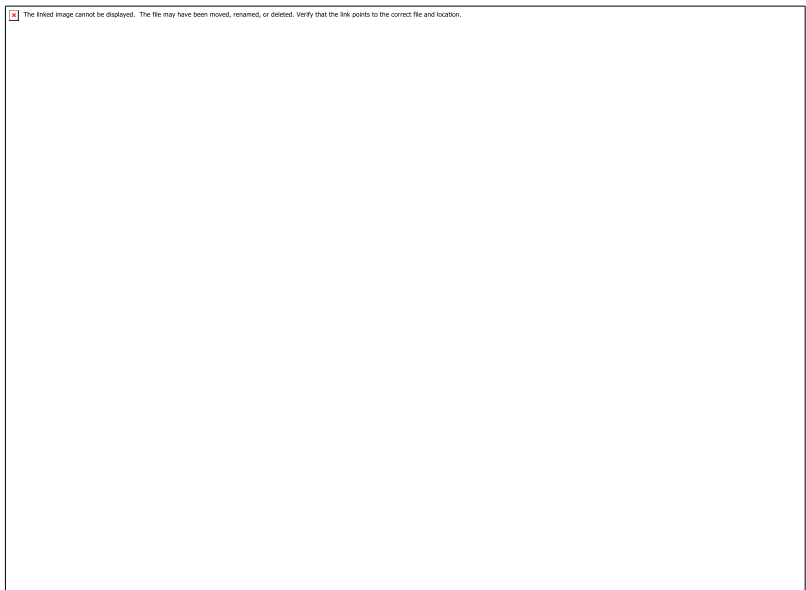
Sustainable Livelihood Approach is therefore ideal for this research because of its provision of a favourable framework towards intended goals and objectives of the research. This approach was used to explain and explore the effects of climate change on food security and sustainable mitigation and adaptation strategies that are technologies, stocks, skills, knowledge, labour, health and capital base and others with the inclusion of the affected members in proposed solutions since it allows participatory development. It also increase the community's stewardship on issues that facilitate climate thus the community will have the responsibility to control one another in bad practises that cause climate change for instance starting of wild fires burning of field residues and other related practises.

**Fig1.2: Sustainable Livelihood Diagram**



**Fig 1.3**

**Components of household livelihood security**



Source T.R. Frankenberger and M.K. McCaston: The household livelihood security concept

## **1.10 CHATER BREAKDOWN**

### **Chapter one**

Chapter one contains the problem and its setting followed by research objectives, research questions, assumptions, limitations and delimitations to the study as well as the theoretical framework.

### **Chapter two**

Chapter two reviews earlier writings related to the research area that is causes, effects, evidence, adaptation mechanisms of climate change. The chapter also included the existing development plan of climate change and the chapter ends a summary.

### **Chapter three**

This chapter present a full detailed discussion on the methodology the study adopted and contains a discussion on how the research was done fostering data collection, recording, analysing and presentation. Sampling procedure and the research instruments used that include interviews, questionnaires and observations and ends with a summary.

### **Chapter four**

Chapter 4 comprises of data presentation and discussion that was collected guided by research objectives and questions. This chapter also looked at what is done by the government and other players in helping the community to do away with the effects of climate change.

## **Chapter five**

Chapter five present recommendations gathered by the study for the community and other players involved consideration in their resilience processes.

### **1.11Summary**

In conclusion the research addressed the objectives of the study, changed the focus of the government and other stakeholders in the field of food security not only to focus much on farming methods but also to give fair concentration to addressing climate change, suggest possible solutions to the effects of climate change as well as suggesting adapting and mitigation mechanisms for the benefit of Mutasa Rural District for majority survive through rain fed agriculture as a source of food as well as a source of income.



## **CHAPTER 2- RELATED LITERATURE REVIEW**

### **2.0 Introduction**

Much work has been researched and done about climate change and this chapter reviews some earlier writings by other people and scholars on the effects or impacts, causes of climate change, possible solutions and effectiveness of the implemented solutions of climate change on food security in Mutasa District and other related areas including policy frameworks.

According to Boko et al (2007), Climate exerts a significant control in the day to day economic development of Africa particularly in the agricultural and water resources sectors at regional, local and household level. The researcher however went on to address some areas which he felt were left out or treated with little justice towards this phenomenon. According to the IPCC Report (2007), climate change refers to a change in the state of the Climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. According to Khemmarath (2002), food security is to assure enough food and food stuffs for every person at any time, both in a material and economic aspect, with increasing demand on nutritional quality, hygiene and balance so as to improve health and enable development and efficiency. According to Food and Agricultural Organisation (FAO, 2008) food security is when all people at all times have both physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

### **2.1 CAUSES OF CLIMATE CHANGE**

Human interference has played a greater role in climate change through different activities that they carry out day in day out to cater for their survival. Activities like industrialisation, deforestation, burning of fossil fuels, starting veld fires just mention a few. However on the other hand natural factors have also played a role in climate variations, factors like decomposition of organic matter, volcanicity, other gases and dusts and others but these natural factors some of them do not exist in the district.

#### **2.1.1 Industrialisation:**

Due to heavy or mass processing done in industries there is much smoke and are released in the atmosphere for example from Driers in Timber and Tea factories. This discharge increases the concentration of Carbon Dioxide (CO<sub>2</sub>) gases in the atmosphere forming greenhouse

gasses which results in Ozone Layer depletion hence an increase in atmospheric temperature due to direct sun raises heating the earth's surfaces. Ozone Layer is a layer that reduces or prevents the sun raises to directly heat the ground or reduces the sun's impact to the earth therefore these greenhouses gasses in the atmosphere results in the development of wholes within this layer resulting in the penetration of sun raises and heat the ground directly. Therefore an abnormal increase in temperature will be recorded which will be detrimental to crops for they suffer to much stress reducing their capability to produce.

In addition the emission of these gasses results in formation of Acidic rain fall. Acidic rainfall contents some nitric acid in it which causes white leaf in plants and skin diseases in animals therefore disturbs soil fertility hence crop and animal production is affected. These industrial processes are taking place within Mutasa District by Nyanga Pine Timbers, Eastern Highlands Tea Estates, Redwin Mine with small gold claims and other bush saw mills processing their produces resulting in these climatic variations.

### **2.1.2 Green House Gasses (GHGs)**

Human activities result in emissions of GHGs chief of which is CO<sub>2</sub>, Methane (CH<sub>4</sub>), Nitrous Oxide (NO<sub>2</sub>) and halocarbons (a group of gasses containing fluorine, chlorine or bromine. Heat trapping in the atmosphere is the same as the way that a glass in a greenhouse traps and holds heat; therefore the phenomenon is known as greenhouse effect.

IPCC (2007) in Zimbabwe Environment Outlook postulates that, changes in atmospheric concentration of GHGs and aerosols, land cover and solar radiation alter the energy balance of the climate systems and are drivers of climate change. They affect the absorption, scattering and emission of radiation within the atmosphere and the earth's surface. These changes are projected to lead to the changes in climate mainly temperature and rainfall. In the Initial International Communication Zimbabwe last reported on its GHGs emissions in 1998 to the UNFCCC and the assessment was based on the 1994 base year. Southern Centre (1996), propounded that at that time Zimbabwe was a net sink for CO<sub>2</sub> meaning that it was absorbing more CO<sub>2</sub> than it was emitting. The CO<sub>2</sub> were 17,088.48 Gg and emanated from fuel combustion and industrial process. Land-use change and forestry absorbed -62,269 Gg making a net CO<sub>2</sub> absorbed by Zimbabwe 45,18.52 Gg. Emissions from Zimbabwe were projected to increase three-fold over the next fifty years.

IPCC, (2001,2007,2012) conclude that not only GHGs emissions are already to change the global climate, but also that Africa will experience increased water stress, decreased yields from rain fed agriculture, increased food insecurity and malnutrition, sea level rise and increase in arid and semi-arid land resulting from these processes. Following this, we can see that these effects are being experienced already as evidenced by several organisations with humanitarian aid are operating within our country as well as in Mutasa Districts with food hand-outs.

### **2.1.3 Deforestation:**

Human in trying to fence their fields and yards they have indulged in harvesting trees which are vital Carbone sinks as fencing poles, road construction or structures like buildings, attempts by the government to meet the energy demand in terms of electricity construction and during agricultural field preparation. Majority of the district cut down some small trees and grasses in their fields, heap them and burn as a land clearing measure in preparation for the farming season. All these activities disturbs the natural or purification of the environment, trees play a vital role through Evapotranspiration a process which trees release water vapour into the atmosphere which will then be precipitation in due time. By so doing water cycle is disturbed resulting in poor rainfall patterns and insufficient rainfall for the District even at national level. People no longer value enough the role played by vegetation cover. In an interview Headman Newengo said, “In the past people valued indigenous plants and fruit trees and they were not allowed to cut them by traditional laws unless they have dried up by now they are now greedy and value money most than the aftermath, they harvest them to market firewood by the road sides and even load trucks to town due to their ignorance and disrespectful” He went on to say that they always here of EMA but they are not seeing its existence because of the prevailing damage to the environment which is resulting in their starvation as after effects. In this respect the researcher found it necessary for the Responsible Authorities and other Agencies to do what are they expected to do in conjunction with Traditional Leadership.

### **2.1.4 Desertification**

Extension of desert like areas within the District has also reduced the amount of intended water vapour that is supposed to be in the atmosphere (Evapotranspiration). The need for fuel by dwellers in form of firewood for cooking and other related activities has increased the cutting down of trees hence in extension of the desert like areas from the Manica-bridge

towards Watsomba. The residue will then rot and when wood rots in moist areas or swamps methane can be produced. Living trees remove carbon dioxide from the atmosphere

### **2.1.5 Ocean Currents**

According to EduGreen (2007), Ocean currents are known to change direction or slow down. Much of the heat that escapes from oceans is in the form of water vapour, which is the most abundant greenhouse gas on earth. This water vapour contributes to the formation of the clouds which shade the surface and have a net cooling surface. These have an impact on the climate as believed to have happened at the end of the last ice age about 14 000 years ago (

### **2.1.6 Destruction of Wetlands**

Human activities have been found playing a very big role in drying up of wetlands which supplies continuous water throughout the year for irrigation purposes or downstream farming activities. In the Honde Valley people grow yams in these wetlands (Dambo or Doro) and August maize (dry season agriculture) following its rich soils and endless moisture. Clearing of vegetation for these farming activities expose the original water source to direct sun heat and this further result in lowering of water table which is an underground water source which feeds the surface through different processes. Wetlands greatly want dense forests around them to keep shade, clearing of these forests exposes hence damaging its operations. Mutasa District used to have a number of these water sources but now they have dried up. Most of them used to supply water for Plan International village garden projects for example the Domborutinhira wetland which supplies water for both irrigation purposes and for home domestic uses within the community. Destruction of this surrounding vegetation has been seen also playing a vital role in increasing the local temperature, this is because wetlands normally have cold temperatures which will then neutralise with the outside temperatures and normal temperatures are experienced. Therefore increase in temperature results in over extraction of antecedent moisture by crops in trying to cop up with temperatures and scotching sun heat resulting in wilting of the crops due to delayed rainfall.

Distraction of wetlands as water sources also increases the community susceptibility to floods apart from the above mentioned effects. During periods of continuous rainfall and cyclones, wet lands trap and suck water reducing surface runoff and accumulation of excess water on land through its dense forest surrounding them. The root systems of plants and foliage increase infiltration and further water percolation of water to reach underground water

sources. By so doing surface accumulation is reduced hence decreasing the flooding effect to communities on land farm production. Therefore the higher the distraction of wetlands the higher the exposure to flooding and the more they are conserved the lower the risk of flooding.

### **2.1.7 Dust and gasses**

Nitrous oxide and methane are other gasses emitted by strong blowing winds and human activities besides carbon dioxide (CO<sub>2</sub>) that when combined causes even half of warming. Dust produced from human activities like mining heavy tillage raise into the atmosphere and can reflect sunlight (like a window shade) and cool the earth. Sun's heat is very crucial for plant growth and helps in the processes Evaporation and Evapotranspiration also in the adiabatic cooling of rising air that forms rainfall pregnant clouds. Therefore through these gasses and dusts all these processes are hindered hence climate change.

## **2.2 EFFECTS OF CLIMATE CHANGE**

### **2.2.1 Changes in Household Food Situations**

According to Dube (2008), the amount of harvest greatly relate to house hold food situation and rationing. World Food Programme (WFP)-Plan (2008), "To those with poor harvest or serious food deficit end up coping by reducing the number of meals per day or overall reduction of meal sizes". Dube also noted that food supply and access to food situations were worse off in 2002 compared to 1992. In that nature, 2002 was characterised by low capacity of the country for importing maize and very little donor interest. Therefore reduction in number of meals per day or meal size may mean poor health with the community due to failure to meet expected calories per day. ZimVac (2013) in its annual vulnerability assessment indicated Rural Food Insecurity Trends statistics since the year 2009 to 2014 with year 2009 -20010 was 18%, 2010-2011 decreased to 15%, 211-2012 a decrease again to 12%, 2012-2013 a rise to 19%, and 2013-2014 a sharp rise to 25%. Considering the distribution of rainfall and other expected summer conditions for a good harvest, the harvest will be very poor not only in Mutasa District but throughout the nation. On this effect, the trends however the researcher feels that did not highlight how much role was played by climate change.

According to a study carried out by ZimVAC in 2010 revealed that for the year 2008/9 and 2009/10, own cereal production has not been adequate for family consumption. As such these households in Zimbabwe have been employing a number of coping strategies for

consumption such as: casual labour, market gardening, sale of non- food crops like tobacco and cotton, livestock sales and bartering, gold panning, remittances; most pronounced in districts closer to the borders with South Africa and Botswana, fishing near lakes, rivers and dams, petty trading, fruit sales; most pronounced in Mutasa and Chimanimani districts and non-agricultural employment.

### **2.2.2 Immoral Behaviour**

Natrass, 2002 concludes that, coping strategies may take forms, some of which may even be prescribed and discouraged by members of a social group or gender. Following destruction of livelihoods assets and means, women and children are at danger of using sex as a survival strategy. It has been observed elsewhere that food insecurity and economic factors reinforce unsafe practices especially where sex is a currency by which African women and girls are frequently expected to pay for life's opportunities, as permission for crossing borders, passing a grade at school to a trading license (UNAIDS, 1999). Food insecurity exacerbates the situation by encouraging women to engage in commercial sex as a survival strategy to get food for survival.

### **2.2.3 Migration**

Agricultural Technical & Extension, (2008) postulate that the continuous rural - urban migration and border jumping to neighbouring countries such as Mozambique and South Africa in search of opportunities among the productive age group poses a challenge to food production. Most of the migrants produce unskilled labour and the migration is due to a failure in agricultural production which according to District Agricultural Extension Officer (DAEO) has reduced from 4t/ha on a good year with normal rainfall distribution to 0,5t to 1t/ha resulting from the poor dynamics of climate change.

### **2.2.4 Drying up of Wetlands**

Zimbabwe Environment Outlook (ZEO), Wetlands are principal habitats for fish species, providing cover as well as suitable breeding and feeding grounds. Thus they support subsistence, artisanal and commercial fisheries. Also through evergreen jungles surrounding them they are habitat for different flora and fauna and by so doing they again support safari hunting and tourism. It goes on to say wetlands can buffer the effects of poverty to rural communities living close to them by providing natural resources like reeds thatch-grass timber fish crabs and edible plants. These activities increase the buying power of communities

through the mentioned commercial mentioned activities and even boost the food security of the local communities and health through some form of a balanced diet. Therefore a decrease and insufficient supply of input that is through constant rainfall supply in the correct season means they dry up and reach extinction.

### **2.2.5 Warming**

Hulme et al 2001; IPCC (2007), also projected that in future Zimbabwe will warm more rapidly than the global average because of its continental interior location. By the 2080s annual warming will reach about 0,15- 0,55 degrees Celsius per decade.

### **2.2.6 Water Quantity**

According to Hirji et al (2002) Zimbabwe is expected to experience water stress by the year 2025 that is having water consumption exceeding 10% of supply or 1,000 to 1,700 cubic metres per year of water. Southern African Development Community (2008) eluded that climate change and variability, increasing water demand amongst sectors are the major drivers and pressure causing the deficit in water resources. According to Mutasa (2008), extreme weather conditions that is tropical cyclones and droughts have risen with about 2,6 Degrees Celsius.

### **2.2.7 Asset Disposal**

Ndlovu (2010) in his studies of Bulilima and Mangwe districts of Zimbabwe observed that asset disposal has increased over the years with the selling of cattle and small livestock such as goats and chickens being the most popular coping strategy in the two districts. As well as providing income during a period of drought, selling cattle does have the benefit of reducing the herd size so that not all livestock die due to a shortage of feed. Some cattle may be sold even in form of butter trade to buy supplementary feed to save other cattle as well as human during drought years. Although the selling and consumption of small livestock, especially chicken and goats, was common to most of the households who had them, this coping mechanism did not significantly reduce vulnerability because of the little money they fetched on the market due to monopoly, those with products on demand took advantage of that during trade. Asset disposal, if relied upon too much, can increase drought risk by reducing their coping capacity in the long run, as communities will not have enough capacity and productive assets to prepare for future stresses and shocks.

(Ndlovu 2011) in his fulfilment of masters studies quoted Davies (1996) indicating that buying and selling cattle is generally recognized as a common strategy to cope with income fluctuations due to drought in many rural areas. However, a relatively large proportion of households often do not own any. Dercon (2002) finds that only half the households in a sample in Western Tanzania own cattle, even though cattle are important in the farming system and in their culture. It is not that other households simply choose to enter into other activities; rather, investing into livestock requires a sizeable surplus: livestock are expensive. A cow, for example, costs about a fifth of an average crop income. Cattle ownership is generally determined by endowments in male labour and land, suggesting that those with a poorer endowment cannot generate sufficient means to enter into cattle rearing, leaving them relatively more exposed to income risk (Dercon, 2002). More generally, the failure to cope with drought effects is not only reflected in household consumption. Effects on nutrition, health and education are also observed, as are intra household consequences. Children are often taken out of school in response to adverse income shocks; the result is lower accumulation of human capital (Dercon, 2002).

Matiza and Crafter (1994) holds that the current decrease in rainfall has impacted greatly in Mutasa District through the depletion and drying up of wetlands. Under the Ramsar Convention (1971), wetlands are defined as “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporally, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth at which at low tide does not exceed six meters” Breen et al (1997) from United States Fish and World life Service in Zimbabwe Environment Outlook considers wetlands as Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow waters. In this regards they ignored the issue of how wetlands are related and their relevance to human livelihoods. Wet lands are found of being of paramount importance as Zimbabwe has been seen being a signatory of Ramsar conversion. Some wetlands have dried up due to decreased rainfall hence insufficient supply, reduced continuous infiltration and percolation which feed underground sources of water. Wet lands are often called kidneys due to their operations; they continuously suck and store water in times of heavy rain falls, periods of prolonged rainfalls like floods and slowly release the water during dry seasons to maintain the base flows of rivers and streams which in turn supply rural market gardening and other agricultural activities. This stands as an effect of a decrease in rainfall supply Mutasa rural food security has greatly depleted through the drying



up of wetlands because majority of the rural population depends on wetland irrigated farming as water source if it is rainfall off season.

### **2.2.8 Alternating floods and droughts**

Climate change has also resulted in alternating floods and droughts within same season. There is a notable change in the way rainfall is distributed during the summer season which is changing to abnormal. A lot of rainfall which is maybe supposed to be distributed for more than a month due to current climate variations whereby it falls continuously for a week ending up flooding in fields sinking and washing away little inputs that has been applied by farmers in their fields. After experiencing this short period of heavy rainfall comes up a prolonged period of mid-summer dry spell periods (very hot summers) which stress farm production resulting in crop failure especially those which are drought intolerant like maize and garden plants.

Several scholars discussed the issue of climate change in Mutasa District including Moyo S et al (1981) who discussed on the effects of climate change of the district without showing how differently climate change has impacted in different areas of the district. They only revealed the impacts and suggested some of the mitigation measures which are being tried by the community to adapt to the effects of climate change in which there is great need to further go on how the effects impacted on different groups of the district.

Two studies by the Department of Geography and Environmental Science at the University of Zimbabwe (Murwira, unpublished; Murwira et al., unpublished) developed best and worst case regional climate change scenarios for the years 2020, 2050 and 2080 using CSIRO and Hadley Global Climate Models. Overall, warming trends and water stress caused by rainfall variability are likely to generally increase the vulnerability of communal agricultural land. However, while land suitable for maize production is expected to decrease overall, land suitable for other crops (i.e. sorghum and cotton) is expected to increase in some areas, but decrease in others. Water stress is also likely to adversely impact public health, water availability, forestry and biodiversity, rangelands, human settlements and tourism.

Zindore (2006) discussed also how climate change has affected the district's food security. Issues focus was much given on how rainfall generally impacted the agricultural sector of the district. His studies however ignored the issue of general household meals and their diets per day or weekly thus considering the effects of climate change on the nutritional side.

Some scholars also focused on climate change and natural capital that is flora and fauna. They did not put into consideration the social, human, economic and also physical capital as also being affected by the changes in climatic conditions. When studying rural livelihoods, the researcher must also focus not only on agriculture but other means of living that are being affected by climate change such as human capital (for example good health) which results in good food security through provision of healthy labour both in subsistence and commercial agricultural practises.

The Researcher however factored in his studies issues that he discovered like missing in previous made studies. Issues like, how climate change has differently impacted on different parts of the district since it is characterised with about 3 natural agricultural regions in it, climate change and gender as well as its impacts on kids as a depend sector since they depend on their parents on everything and also the impacts of climate change on wetlands and their relationship to the community especially those who rely on market gardening and river fishing during rainfall off season to boost their poor harvest.

## **2.3 EVIDENCE OF CLIMATE CHANGE**

### **2.3.1 Frequent and Recurring Droughts**

Droughts have become more prevalent, the 1982, 1992, 2002, 2008 and considering this 2014-2015 season seems to be of a bad harvest again due to prolonged mid-season dry spells. According to Meteorological Office rainfall has decreased with about 5% mid-season dry spells have increased extreme events becoming more intense and of longer duration compelled with periodic shifts in onset of rainfall

### **2.3.2 Frequent and Recurring Floods Cyclones**

Floods have also become very common and periods of prolonged rainfalls washing away field crops for instance. A good example is the cyclone Benita of 1996, cyclone Eline of 2000 and Cyclone Japhet of 2003 as well as the Tokwe Mukosi incident of Masvingo which damaged a water source which was able to be used for future irrigation purposes.

### **2.3.3 Increase Annual Mean Temperatures**

Temperatures are believed to be increasing following climate change. This has greatly impacted on food security for plants are suffering short of moisture due to prolonged mid-summer dry spells resulting in no or inadequate antecedent moisture for plants' sustenance.

### **2.3.4 Rainfall Data Showing No Constant Trend**

Rainfall pattern has become unreliable and not constant resulting in failure of meaningful harvest by farmers who rely on rain-fed agriculture as only their water source. Seasons are shifting time and again such that farmers are failing to predict the onset of first rains hence poor timing of planting period as well as of what amount rainfall is going to be.

### **2.3.5 Changes in Crop Types**

Changes have been discovered in the type of crops being planted. Most farmers are now switching to more drought resistant crops like sorghum, rapoko and short seasoned seeds especially for maize those that can be harvested in three months.

## **2.4 ADAPTATION and MIGATION MECHANISMS**

The UNFCCC (2007) in Climate Change Impacts, Vulnerability and Adaptation in Zimbabwe defines adaptation as the process through which societies increase their ability to cope with an uncertain future, which involves taking appropriate action and making the adjustments and changes to reduce the negative impacts of climate change. The two main types of adaptation are autonomous (indigenous responses) and planned (conscious policy options or response strategies). According to Mutingwende (2014), whilst adaptation can focus on changes to infrastructure or behaviour, the majority of the case studies support behavioural changes related to agricultural livelihoods. According to the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) chief executive officer, Dr Lindiwe Majele Sibanda, there is need for knowledge and responsive action that allows stakeholders to create the appropriate policy frameworks for building and adapting agriculture in order to improve food security. "We need to develop networks and platforms where farmers, policymakers, researchers, the private sector, extension workers and civil society organisations are linked together in joint learning and knowledge exchange — catalysing and developing appropriate networks and true partnerships for action," Sibanda was speaking at a workshop in Harare convened to generate valuable and timely evidence on climate change and household vulnerabilities.

### **2.4.1 Community Based Adaptation (CBA)**

This is done with a purpose to develop community-based adaptation strategies aimed at enhancing adaptive capacity of that community that is the ability to anticipate, cope with, respond to, having information about and how to apply Indigenous Knowledge Systems (IKSs) and recover from climatic variability and extremes. These adaptation mechanisms according to Ayers et al (2009) in a journal *Climate Change*, adaptation should be done from a development perspective, addressing the underlying socio-economic risk factors that exacerbate vulnerability) and with geographic focus: Contextually grounded at the community level in low-and-middle income countries.

The adaptive process should be participatory processes in decision-making, planning and implementation with co-production between development/ climate change/ disaster risk reduction practitioners and communities.

According to Action Aid International, 2005; Ayers, 2011 CBA is based on the recognition that climate impacts will be experienced by vulnerable people least able to cope, which will require local adaptation planning and a greater focus on building adaptive capacity. Ayers, (2011); VanAalst et al., (2008). CBA is widely regarded as a significant improvement over top-down ‘impacts-based’ approaches to adaptation, which typically entailed the provision of infrastructure like sea walls to reduce exposure to climate impacts like sea-level rise.

Brown et al (2012) quoted Ayers and Forsyth, (2009). says Critics highlight a number of limitations of this approach, notably its failure to consider the underlying socio-economic factors that cause vulnerability In contrast, the case studies demonstrate how CBA has enabled poor people to assess their vulnerability, to identify the degree to which climatic change and variability affects their communities and livelihoods, and to identify locally-relevant adaptation strategies that build on indigenous knowledge and cultural practices (ibid).

However, Dodman and Mitlin (2011) urge practitioners to consider the limitations of CBA as a form of participatory development. In particular, Dodman and Mitlin argue that “CBA projects are located at a level at which they cannot contest significant and substantive issues including the role of the state in supporting community adaptation priorities, and the required distribution of resources”. Mohan, (2002), “Whilst CBA empowers local communities to

tackle adaptation themselves; it is not able to address the structural inequalities that perpetuate vulnerability and underdevelopment”.

In addition, according to Chagutah (2010), many of the adaptation activities undertaken by NGOs and international organisations tend to be uncoordinated, leading to potential challenges in targeting beneficiaries and duplication of roles. Thus, a key challenge for scaling-up is to move beyond individualised project-based approaches to adaptation towards multilevel policy-making and investment. Policy-making and investment at all levels must fundamentally support participatory and inclusive decision-making processes in order to ensure that adaptation strategies address the needs of poor women and men. As argued by Dodman and Mitlin (2011), “Strengthening the ability of local groups to negotiate to get more, rather than less, from local and national political processes requires making a more substantive institutional investment...” The case study on ‘Mainstreaming Climate Change Adaptation and Disaster Risk Reduction at the District, Provincial and National Levels provide a good example of how community-based approaches can empower local communities in decision-making processes at all levels. These cases should be considered by policymakers as Zimbabwe continues to develop its national climate change framework.

#### **2.4.2 Production Diversity**

Diversification of production is regarded as one most important risk-averse strategy with the farming people. Usually their production involves mixed cropping, intercropping, the cultivation on non-staple root crops and use of kitchen gardens. Wisner et al., (2004) concludes that this strategy provides a surplus in good years since it is normally planned on the basis of meeting subsistence needs in bad years. It should be noticed that diversifying production makes use of environmental variations and provides the best chance of an optimum yield under all variations of weather and plant pests.

Income diversification is very common among rural households these days. It becomes even more important following a drought that temporarily disrupts farm and livestock production. Black smiting, charcoal making, honey collection and crafts have increasingly become important since they do not suffer directly from the impact of drought or climate change. Wisner, et al. (2004) noted brewing beer as an important source of income, especially for women and drought reduction of beer ingredients can affect their income and nutrition. However, some coping strategies such as charcoal production can be effective in the short run

while they undermine the basis of livelihood in the long run in the form of de-vegetation, soil erosion and finally desertification.

### **2.4.3 Stock Movement**

A monitoring survey done by Plan before vulnerable group feeding of year 2009/10, revealed that all people interviewed had access to arable land in Mutasa district and 95% of these managed to cultivate their respective fields during the previous summer. Most of the households only had few cereals in stock though. However, movement of stock from farmer to farmer was taking place at a higher level but for grain. Community coping strategies were varied. A relatively high level of entrepreneurship in producing and/ or buying and selling vegetables was indicated. Despite the fact that other households had cash after selling vegetables; the challenge was that of access to cereals due to relatively low amounts stored by farmers.

However, Davies (1996) indicates that buying and selling of cattle and is generally recognized as a common strategy in trying to cope up with food shortages and income fluctuations due to drought in many rural areas. Unfortunately, a relatively large proportion of households often do not own any. He finds that only half the households in a sample in Western Tanzania own cattle, even though cattle are important in the farming system and in their culture. It is not that other households simply choose to enter into other activities; rather, investing into livestock requires a sizeable surplus: livestock are expensive. A cow, for example, costs about a fifth of an average crop income. Cattle ownership is generally determined by endowments in male labour and land, suggesting that those with a poorer endowment cannot generate sufficient means to enter into cattle rearing, leaving them relatively more exposed to income risk (ibid). More generally, the failure to cope with food insecurity effects is not only reflected in household consumption. Effects on nutrition, health and education are also observed, as are intra household consequences. Children are often taken out of school in response to adverse income shocks; the result is lower accumulation of human capital (ibid).

### **2.4.4 Building Stocks**

Building up of stocks of food and other saleable assets is cited as one important coping strategy of rural households (Dercon, 2002; Wisner, et al., 2004; Ndlovu, 2010). Rural people who have access to land often store grain and other staple food. This is an important buffer

against expected seasonal shortages, as well as prolonged periods of hardship because people will refer back to their granaries in periods of bad harvest. Livestock farmers may follow a strategy of increasing their herd size in years of good rains and grass availability in order to maintain the herd size in the inevitable bad years with high mortality.

## **2.5 Response Strategy**

Zimbabwe National Response Strategy (2013), Climate change is a global issue that should concern every individual, group, organization and nation. Mitigation measures and adaptation strategies are needed for people to accommodate the anticipated changes. The Intergovernmental Panel on Climate Change (IPCC) projects that under a business-as-usual scenario, current carbon dioxide (CO<sub>2</sub>) levels, around 380 ppm in 2007, will increase to 450 ppm. Stabilization at this level will cause an increase in temperature of 2°C and any increase in temperature beyond this point will not sustain life on this planet. Thus climate change presents the biggest threat facing mankind today. Major adverse impacts of climate change include declining water resources; reduced agricultural productivity; spread of vector-borne diseases to new areas; changes in populations and distribution of biodiversity; and turbulent weather and climatic disasters.

## **2.6 Development Plan**

According to Zimbabwe National Response Strategy (2013), there is no official development plan in Zimbabwe but a Medium Term Plan (MTP) that is covering from the year 2012 to 2015 promoting social and economic development. This plan acknowledges that the increasing frequency and intensity of extreme weather conditions like gradual temperature increase, recurring droughts and decreasing precipitation will negatively impact on key natural resource based climate sensitive sectors of the economy, agriculture, energy, forestry, water tourism in particular and these sectors significantly contribute to the country's Gross Domestic Product (GDP). This will ensure the sustainability of current strategies for social and economic development as well as their compatibility with international best practices on climate change adaptation and mitigation.

The MTP also highlights that the development choices the county makes particularly in the energy sector most likely contribute to increased GHGs emission facilitating climate change at large. MTP however advocate for climate-smart policies and places climate change concerns at the centre of development strategies, plans and programmes in all sectors of the economy (ibid).

These policy targets are being addressed through the Climate Change Office in the Ministry of Environment and National Resources Management that initiated a process aimed at formulating a comprehensive Climate Change Response Strategy. Zimbabwe National Response Strategy (2013) holds that, The Strategy will include a National Action Plan for adaptation and Mitigation as well as provide a framework for a comprehensive and strategic approach on aspects of adaptation, mitigation, technology, financing as well as public education and awareness. It will also help Government to determine whether there is need for a policy or another legal framework on climate change.

## **2.7 Summary**

The chapter highlighted the causes of climate, its effects to communities mainly Mutasa District, some frameworks that has been put forward as measures, its evidence within the District and outside the District and how the district is trying to adapt and mitigate the devastating situations caused by this phenomenon.



## **CHAPTER 3-RESEARCH METHODOLOGY**

### **3.0 Introduction**

This chapter discusses sampling methods techniques and data collection methods that were used for the study. The researcher used interviews, questionnaires, observations as well as sampling techniques as research tools, ethical considerations. This chapter focused on the research design applied in conducting the research.

### **3.1 Research Design**

Parahoo (1997) defined a research design as “A plan that describes how, when and where data are to be collected and analysed”. The research was carried out in Mutasa District a district with 31 wards, which variations by some of the wards in terms of rainfall distribution whilst others share similar distribution or climate. Qualitative research was adopted by the researcher to discover the trends in climate change and casual links between variables. This approach was used for both primary and secondary data collected on sample basis from observations made, interviews and distributed questionnaires.

### **3.2 Sampling Procedure**

Snowball sampling method was used. According to Cohen and Crabtree (2006), this involves the use of well-informed people to identify critical cases or informants who have a great deal of information about a certain phenomenon. Snowballing was first used by identifying individuals in subsistence farming who advised the researcher to visit the Agricultural Extension Officers’ office, DAEO’s office, GMB and Livestock department who was believed to have the actual trends and variability in climate and production. Thirty people were selected to participate in the research. A total of 48 people were selected and are presented in tables in the following chapter.

### **3.3 Research Instruments**

#### **3.3.1 Interviews**

Personal interviews were conducted by the researcher were the researcher started by introducing himself. According to Kuman and Aaker (1999) “Personal Interviews offers a direct conduct between the interviewer and the interviewee in a suitable environment”. Also they give room to ask some areas of interest when the interviewer find the need than

questionnaires. This method is also favourable for the illiterate participants. This tool was designed for key informants like DAEO, Agricultural Extension Workers, Councillors, Headman, and other office holders as well as the community at large. The researcher also jotted some short notes during interviewing the above mentioned group. A total of 35 people were interviewed, 1 District Agricultural Extension Officer (DAEO), 7 Agricultural Extension Supervisors (AESs), 7 Agricultural Extension Workers (AEWs) and 14 community members who represented the whole district as it is divided according to its agricultural setup, 2 livestock personnel, 2 from Irrigation Department and 2 from mechanisation.

### **3.3.2 Questionnaires**

Questionnaires to gather information on the impacts of climate change on food security were designed. These questionnaires were both open and closed ended and were self-administered for clarity to those who needed help. The researcher first introduced himself to the participants and tells them what he intend to do with them before handing them over the questionnaires which started by introducing the researcher too. Again questionnaires were employed during the course of research because they are a best method to use when gathering information from many people in a short period of time and it has minimum disruption to busy scheduled people because they can answer at their free time. A total of 26 people were served with questionnaires.

### **3.3.3 Observation**

Peter 2011 defined observation as the use of eyes to observe people and their environment, situations, interactions or phenomena and record what is seen as dat. This method advantages the researcher with information that the respondents might not be aware of or are not willing to discuss. The researcher also used his own observations on areas and issues where he found them necessary for his researches, notable climate change and some related effects which can be observation for examples field crop observations. Observations were done while the researcher was moving around administering his instruments.

### **3.4 Ethical Considerations**

In conducting any research there are some ground rules or ethical considerations that should be followed by the researcher. Below are some of the ethical considerations that the researcher adhered to for the success of his research on the effects of climate change of food security in Mutasa District.

### **3.4.1 Seeking Permission**

Every society has got its own responsible authorities be it a work place, authorities may be Headman, managers, human resources officers to mention a few. In the case of Mutasa District the researcher managed to seek permission from those were responsible where there was need before talking to any member.

### **3.4.2 Voluntariness**

When carrying out the research, the researcher did not use force to the participants but respected their way of thinking and feelings in case they might have decided to refuse or withdraw from the session. Therefore the information gathered was out of the participants' willingness.

### **3.4.3 Consent**

The researcher openly told the participants that he was carrying out a research on their District. It was up to the participants to agree to take part in the research or not, therefore it is always important that there is an agreement between the researcher and the respondent before the interviews begin though they had no power vested in them to stop the research since the authorities had approved already.

### **3.4.4 Privacy and Confidentiality**

The researcher also ensured confidentiality and the participants' anonymity. Some participants did not want to be exposed and want their identity to be anonymous therefore it was the researchers' duty to protect the privacy of participants who agree to provide with the required information for the research.

### **3.4.5 Data Presentation and Analysis Procedures**

Data analysis and presentation is a practice where unorganised collected data through various methods is assessed, ordered and organized to highlight useful and then presented using tables and narrations. It also involves processing and working on data in order to understand what is present in the data. The data gathered through interviews, observation and questionnaires was presented in the form of tables and write-ups in text form.

### **3.5 Summary**

The chapter discussed research methodologies used by the researcher data presentation methods and highlights some of the advantages why they were used than other methods to reach his conclusion of the study. Methodologies include the research design, sampling procedure, research instruments (questionnaires, interviews) and research ethics and lastly data presentation and analysis.

## CHAPTER 4- DATA PRESENTATION AND DISCUSSION

### 4.0 Introduction

This chapter presents the current effects of climate change experienced in Mutasa District, how climate change has impacted differently amongst different age groups and in line with gender. Challenges being faced by the residents of the District in adapting to the effects of climate change and an assessment of existing adapting mechanisms in the District as well as works of Zimbabwean government and other players interested in climate change. The chapter then ends with a summary.

**Table 4.1 Response rate to Questionnaires**

<b>Respondents</b>	<b>Questionnaires Distributed</b>	<b>Questionnaires Received</b>	<b>Response Rate %age</b>
Livestock department	2	2	100
EMA	2	1	50
Mechanisation	1	1	100
Agriculture Extension Workers	5	3	60
GMB	2	1	50
Community	14	10	71.43
<b>Total</b>	<b>26</b>	<b>18</b>	<b>69.2</b>

26 Questionnaires were self-dispatched by the researcher and 18 were collected back 8 were not retrieved because those who were issued with the questionnaires had travelled with the questionnaires and some left them in locked doors and they were not able to be retrieved because the keys were not available. However key respondents responded very well to the dispatched questionnaires giving a response rate of 69.2% meaning that information gathered is useful and reliable for the study for it represents majority resoundingly.

### 4.2 Response Rate for Interviews

The researcher also scheduled interviews with Agricultural Extension Supervisors (AESs), Agricultural Extension Workers (AEWs), Livestock Department and the Community including Headmen. Interviews were aimed at exploring real effects of climate change affecting Mutasa Community, real causes of these effects, challenges that the community is

facing in dealing with these effects, assessing existing local measures that were put in place in responding to the impacts of climate change and lastly to come with possible solutions to these effects.

**Table 4.2: Interviews Response Rate**

<b>Respondents</b>	<b>Targeted Respondents</b>	<b>Responded</b>	<b>Response Rate %age</b>
DAEO	1	1	100
AWSs	7	5	71,4
AEWs	7	7	100
Community	14	14	100
Livestock	2	2	100
Irrigation & Mechanisation	2	2	100
<b>Total</b>	<b>33</b>	<b>31</b>	<b>93,9</b>

### **4.3 Current Effects of Climate Change in Mutasa District**

#### **4.3.1 Pests and Diseases**

Both instruments showed that pest and diseases are causing great impact on food security in Mutasa District. In an interview with the DAEO, he highlighted that long dry spells have greatly promoted pests and diseases like Beanstem maggot and have been found prevalent in the past 3 years. This is a cut worm that cut the bean stem just after it sprout out after germination when the stem is still tender. Black and yellow beetles and nematodes during flowering and fruit bearing period have been found prevalent to beans, potatoes and sweet potatoes. They feed on flowers of these crops thus reducing their tubing capacity and bean production since in beans the flowers are the fruit. Majority show that they survive on these crops as breakfast therefore existence of these pests in their crops reduces their crop output resulting in them using the little grain they have (maize) as breakfast through porridge or “mutakura”.

In Honde Valley and Manica-bridge ants have been found greatly affecting the production of legumes specifically. They suck water from the tender outer layers of them in some extend eat the fruit resulting in wilting of these crops threatening local food security. Termites are also active in the whole district affecting maize production at large which provides the staple food. Long mid-summer season dry spells give a conducive environment for termites. They eat up maize stems before they are due for harvest resulting in them falling down and they continue eating the cobs. Most farmers are greatly facing this challenge and they have no solution to this problem. This therefore gives rise to the District food insecurity.

Army worm outbreak in the 2013-2014 and 2014-2015 farming seasons have greatly impacted on farmers resulting from excessive concentration of rainfall over a long period of time with very short dry spells than normal. This type of worm is very destructive it feeds on every green plant leaves including grass. Thus it destroys field crops and pastures for animals. In a discussion with Agritex extension supervisors Mr Chanaka and Mr Muzawa eluded that in these two seasons it was a very tough match for them to fight against this problem. After sending out their fighting teams for spraying, just after they finished or a night after spraying a heavy down pour of rain follows washing away the spray. This even gets worse by creating resistance to the worms though they later managed to get rid of these worms but it seems like it is now a yearly routine. This greatly affected maize farmers and graze lands for pastures turned yellow and leafless living insufficient feed for animals. Therefore reduces the expected yield per hector threatening food security of the district and poor animal health which is the source of drought power due poor condition of pastures.



**Fig4.1**showing effects of army worm on maize**Fig4.2**showing effects of termites on immature maize

Diseases like leaf rust, purple or yellow leaf and fungi are in maize, potatoes, sweet potatoes, fruit trees and vegetables resulting from too much rainfall have been seen all over the district. These disturbances also reduce the production capacity of crops due to different impact degrees on different plants. In fruit trees they may try to produce but the fruit size and quality will be of poor grades especially citrus. In other plants causes stranded growth which even leads to failure to produce by those plants.

**Fig 4.3: Showing an orange tree affected by yellow leaf and fungi**





### **4.3.2 Unpredictable Rainfall Patterns (onsets) and Duration Every Year**

The District is experiencing complete changes or shifting of agricultural seasons particularly the onset and duration of rainfalls every year. Dates in which people used to receive their first rains and start farming activities are always moving ahead as years are moving too. In a questionnaire a farmer said, *“We used to start farming activities in mid-October but now we are starting either in late November to early December”* DAEO said in Honde Valley rains used to start in the 1<sup>st</sup> week to mid-October but shifted to November, Premier South and almost the whole of the resettlement and around that area used to start mid-December but now January due to unpredictable rainfall patterns. The community highlighted that some of them planted with first rains this 2014-2015 farming season thinking that things will be similar to the previous 2013-2014 season and their plants died due to shortage of rainfall because it went for three solid weeks of full scorching sun which resulted in wilting of those which had sprouted those which had not burst and decay underground. One of the villagers said that ‘not even dew could fall in the morning to sustain the plants over the day since during the night cool temperatures prevail’. They even ploughed down those which had survived start replanting again. In the previous season those who did dry planting and those who did their planting during the course of the first rains especially from the Chitova area and part of Mutasa East harvested better than those who did later in November. Therefore it has shown that this shifting of season and unpredictable onset and rainfall patterns has a great impact on farmers for it results in poor timing of planting season and causes much doubt on farmers of when to start their planting and poor selection of crop variety and in this case farming become a gamble. By so doing low household production with poor harvest is experienced increasing food insecurity per household as well as at District level because farmers believe in past trends yet changed.

In addition to that, most farmers had proved to suffer insufficient rainfall supply to their crops. Rainfall is early going whilst the community is still in great need of it, for instance beans and potatoes farmers of Chitombo and Domborutinhira areas and in some cases the whole District on maize and other related crops. This has resulted in harvesting of crops before their standard maturity levels which will be of poor quality therefore putting the District food security at high risk. Duration and intensity of rainfall has also affected them, rainfall has become of short duration and light intensity. Heavy textured soils require at least 25mm of rainfall while light textured soils require at least 20mm rainfall to support good germination. Due to climate change these requirements are hardly reached during the first

rains resulting in decaying of planted seeds due to lack of adequate and poor antecedent moisture increasing food insecurity.

**Fig 4.4: Showing a dead potato field due to insufficient rainfall**



#### **4.3.3 Prolonged Mid-summer Dry spells**

The District is also affected by mid-summer season dry spells hindering thriving and success of the farming production through increased crop shocks and stresses thereby increasing their food insecurity and is associated with a sharp increase in pricing of food until the following good harvest. It has been discovered that for the past 5 years those who do poor timing of the rainfall onset and grow high breed varieties in maize especially Chimanyika variety and 513 Seedco popularly known as Nzou has suffered severely from this problem except of the 2012-2013 season which it gave a bumper harvest to those who had grown it though majority had dropped it because of insufficient and erratic rainfalls. This variety needs a lot of water during its growth of normal and constant supply for it produce well and it is commended of good yielding in years of good rainfall. Plants have been drying up due to extension of dry spells during summer compared to previous decades. This has affected fertilisation too for people are poorly timing when to fertilise fearing to burn their crops which is exposing the District too high food insecurity due to crop failure.

#### 4.3.4 Too Much Rainfall Concentration in a Short Space of Time

Too much rainfall concentration in a short period of time has become a norm during the course of the summer season followed by dry spells. This has resulted in massive soil salinization as well as washing away of the little inputs like fertilizers and other chemicals that farmers do apply for the success of their crops. Soils quickly reach their field capacity hence could no longer allow anymore infiltration thereby promoting surface runoff which washes away the inputs and other nutrients. Flat fields suffer infield flooding and crops turn into yellowish showing lack of enough nutrients due to continued wet conditions. Abnormal weed growth is being experienced in the District this is due to short dry spell duration between rainfall intervals therefore the community has no enough time to weed their fields. To those who manage weeding in that short dry spell period, rainfalls before the weeds dry reviving them to life again. Headman Newengo in an interview highlighted that they are having a problem in weeding because weed's roots need three days to dry up but this is not happening because after weeding or during the night rainfalls. Since weeds are the pioneer plants they take much of the inputs more than intended plants resulting in poor yield, through these negative influence from climate change food security is hindered within the District.

**Fig 4.5: Showing maize and nut field affected by salinization and abnormal weeds.**



Continuation of wet conditions during the course of crop growing period resulted in water logging, excessive leaching, flooding and when these conditions prevailed in harvesting or post-harvesting period they result in serious crop damage and crops rot in fields or during the drying process in their drying shelves ( matara).

#### **4.3.5 Poor Heat Unit on Some Crops**

Late rainfall onset followed by alternating floods and dry spells with much wet conditions has a great impact on plants through reduced heat unit. Late rainfall onset means delayed planting by the community and may affect plant germination if the water comes of light intensity. During the course of the season continued wet conditions concentration of rainfall reduces the heat to plants affecting their growth and production. Crops like maize requires a specific heat unit to give a good yield therefore delayed rainfall onset and continued wet conditions resulted in maize producing shrivelled grains which are of poor quality and weigh less below standard. This even affect the GMB because they will have a stock of poor quality to the farmers their produce fetches little on market as it will be of poor quality and it also gives poor meals.

#### **4.3.6 Extreme Low Temperatures**

Extreme low temperatures during winter have affected banana farmers of the District to extremes. Very low temperatures are being experienced in the District than before; this has impacted much on banana, tomato farmers and partially to those who grow things like covo, rape, tsunga and other related things. These crops in times of very low temperatures especially during the night there leaves and fruits are burnt and turn from green to brown colour. This affects the quality of the intended produce and some of them die or the fruits decay. These crops are planted as cash crops in the District as well as subsistence food. People earn cash to buy grain after their sales this means that this negative effects are affecting their buying power resulting in them being food insecure.

#### **4.3.7 Infield Soil Erosion**

Prevalence of cyclones and short duration heavy down pours in the District has resulted in field erosion. This has resulted in washing away of field plans as well as nutrient rich top soils especially to those with loam soils. Continuous rainfall result in soil saturation as well as heavy down pours of short duration closes soil pores than promoting infiltration. Therefore water quickly accumulates and flow as surface runoff. Most residents pointed out that 2012-2013 season damaged their drainage contours and destroy their fields washing away their crops especially those along the Mutare River as the river encroached their fields. Therefore reducing the intended harvest hence reducing food security for some of the crops have been washed away by water due to changing climate.

#### **4.3.8 Crop Destruction**

Existence of windy cyclones, hail storms have destructed much crops and buildings in Mutasa District. Hail storms affected crops with large surfaced area leafed plants by tearing apart their leaves thereby increasing their water loss rate through transpiration in sunny days, falling of flowers in other crops affecting their fruit production, winds fall crops that grow about a metre above the ground like soya beans, beans, maize and others. Stocks have been destroyed their roofs especially in the Toronto and Manica-bridge and part of Jombe-Gwiriri areas leaving much reserved food stuffs from the previous year exposed to rainfall in 2013, resulting in some of them decaying. In an interview Mr Chikumbu of Manica-bridge who do cattle fattening and piggery said that in December 2014 his storeroom roof was taken by windy and his stoke feed was affected by rainfall and more than half of it decayed which however was used to feed his pigs but it was a great loss to him. He went on to say some of his neighbours lost their maize which they were not able to dry using sun since it went for some days of overcast. This therefore affected their food security.

#### **4.3.9 Decaying of Crops in Fields**

In Mutasa Central crops are decaying in fields before harvest but when they are ripe especially beans and green maize due to excessive rainfall followed by a short period of a very hot sun. Heat will then accumulates in maize cobs and develop moulds decaying the cobs and beans. Due to continuous shifting of farming seasons some people practise early farming in fear of losing sufficient rainfall for their crops since it sometimes disappear early leaving some plants stranded, their crops ripe earlier and suffer from too much rainfall and start decaying and beans germinate in their shells before they are harvested. Most farmers have been complaining that they harvested more decayed maize and beans than good maize for consumption in the year 2011 and 2013 Below is a man showing his decayed harvest of 2013 with the little white he got which he was drying on the rock (Dwala). Wild fruits like guavas which used to act as supplement rot in trees worsening the situation.

**Fig4.6** Showing harvested decayed maize and the little gained from the field.



#### **4.3.10 High Demand of Maize**

In an interview with Grain Marketing Depot Manager and chief Nyamandwe alluded that, *'due to crop failure resulting from various negative effects climate change by almost the whole district has given rise to the demand of maize'*. They say people are in great need of maize to feed their families yet production is low in "Zunde raMambo" (Community grain reserve room), and the GMB itself has diminishing stocks which cannot supplement the whole District. Therefore these authorities have crippled capacity at both village and District level to insure food security.

#### **4.3.11 Diminishing Intake by GMB**

Annual grain intake by the Mutasa District GMB depot is not constant. The records have shown wide ranges from one year to another and the intake is diminishing each year which the manager said it is due to grain producing crop failure. She went on to say it might be even serious this 2014-2015 harvest which will be their 2015 intake, she said there is almost nothing in fields therefore those who have better harvest will never give them anything but keep them for sustenance through the course of the year and for labour during the farming season again. This dissenting trend means increasing food insecurity every within the District, information from the year 2011 backwards could not be found because the depot had no computers to capture their data and some records were lost.

**Table 4.3 Showing GMB intake trends crops grown in Mutasa District.**

<b>YEAR</b>	<b>WHITE MAIZE (tones)</b>	<b>YELLOW MAIZE (tones)</b>	<b>SUGAR BEANS (tones)</b>	<b>WHEAT (tones)</b>	<b>RED SORGHUM (tines)</b>
2010	—	—	—	—	—
2011	—	—	—	—	—
2012	261.915	4.746	4.630	38.050	0.505
2013	65.988	2.218	0.288	41.457	—
2014	196.313	1.394	0.140	> 20	—

#### **4.3.12 Poor and Shortage of Graze Lands**

Climate change as shown by changes in rainfall patterns especially drought also affects grazing animals and the District's non-ruminant's' feeds availability for both animal classes is compromised and hence productivity decreases. In situations where floods are experienced, cases of livestock drowning are also recorded in Mutasa District increasing livestock mortality apart from livestock mortality due to poor nutrition. This decrease in animal productivity has obvious implications on availability of animal products like meat and milk. Other indirect effect on food security is a reduction in availability of draught power which greatly impact on crop production resulting in poor balanced diet in the community.

#### **4.3.13 Animal Diseases**

In the essence of too much rainfall animals have been found susceptible to various kinds of diseases. Diseases like new castle and eye diseases in chicken, red water, black leg and tick borne diseases in cattle, too much worms in pig stays have been found prevalent in the district increasing demand of de-worming which is costly. This has increased animal mortality and big drop in other project reducing diversification amongst farmers of the district. A decrease in these projects impact negatively on food security due to decreased balanced diet and in terms of field crop failure the District has reduced adaptation capacity exposing them to increased food insecurity. During this 2014-2015 farming season a new disease is suspected to have arisen where chickens (road runners) are losing furthers from their heads, losing weight, coughing and die.

**Fig 4.7 Showing quarantined road runners infected by a new unknown disease by a community farmer.**



#### **4.3.14 Scale Down in Other Projects**

Crop failure has resulted in scale down or drop in venturing in other project like piggery, chicken farming, dairying and cattle fattening, goats and other project which needs feeding. These changes have resulted from the negative impacts of climate change on food security. Too much rainfall, drought, fluctuating temperatures have resulted in farmers of the District experience poor harvest which is even insufficient to feed their families which provide the subsistence labour. By so doing fodder production, graze lands become poor hence majority have dropped such projects meaning a decrease in farm diversification. Such projects play a vital role in fostering food security through provision of manure, draught power, income generation to buy inputs like fertilisers, pay labour as well as good health through provision of balanced diet for the community.

#### **4.3.15 Increased Food Shortages**

Food shortage is increasing at household levels. Majority of rural dwellers survive through agriculture which has greatly since been affected by climate year in year out. This has therefore crippled their eating routines especially a reduction in number of meals per day has been found common in Mutasa currently resulting in malnutrition. Majority revealed that they are having one or two meals at most per day while kids will only have white porridge when they are going out for school cooked maize after school and sadza at night or vies versa. Only those who live the house for manual labour in local industries and plantations will have solid food and lunch packed for them. Some have gone to extreme conditions of



cooking “majo” which grow along river banks and look like yams. They boil them twice or thrice and then eat them which might be dangerous to their health.

#### **4.4 EFFECTS ON DIFFERENT AGES AND SEX**

##### **4.4.1 Migration**

Male population have been found being very migrant to counter the effects of climate change. Failure in crop production have dispersed the male specie to towns and neighbouring countries especially Mozambique, South Africa and Botswana in search of greener pastures and other sources to feed their families as a survival strategy. They move out in search of employment mostly in form of both skilled and unskilled labour in construction companies, garden duties, carpentry and majority revealed that during the preparation of 2010 World Cup in South Africa majority flocked there as handy man and carpenters. A few females also migrate as shopkeepers, house maids and others as commercial sex workers and others for orders to sale in flea markets. This has resulted in unskilled labour and child headed families left behind which is unproductive worsening the situation.

##### **4.4.2 Increase in Theft Cases**

Theft cases are increasing within the District. It was noted that parts of the Districts which share boundaries with Mutare have increased stock theft cases especially cattle by youths, and green mealies mostly by school going age and those who do vending by the highway sides. School kids boil them and eat in forests and bushes while vendors cook or sale them, what they earn is then used to buy food for their family or maize for sadza so do those for cattle. Therefore draught power and intended harvest per field by those farmers is compromised increasing their food insecurity.

#### **4.5 CHALLENGES TO ADAPTATION MECHANISMS**

##### **4.5.1 Poor Support and Financial shortages**

Due to poorly or underperforming economy of Zimbabwe at all levels, the District is facing financial constrains to adapt and recover from detrimental effects of climate change. The government and other responsible authorities to finance the agricultural sector so that it can adapt to climate change. For example finance to buy equipment for gully reclamation to safeguard community farm lands, cloud seeding in water pregnant clouds in times of droughts, paste and herbicides for field crops, injections and other medications for animal

treatment to foster food security. In some parts of the Districts, due to gradient they need pump supported irrigations therefore people need financial support in form of loans from the government or banks. In 2014 Germany Transforming Zimbabwe (GTZ) and German Intergovernmental Zimbabwe (GIZ) carried a Training of Trainers Workshop at Forest Industries Commission (FITC), they highlighted that due to a decrease in rainfall so do surface and ground water. Therefore there is need for adopting a drip irrigation systems which is water conservative though sophisticated and trained AEWs how to join, use and maintain drip kits but because of the dead economy it is a great challenge for individuals to buy them or get assistance from different angles.

Also those down scaling and dropping other projects besides farming they also need cash to revitalise their and increase their projects' sizes. Capital is needed to buy stock feeds, medications constructions of their shelter feeding bowls erection of market places if their need. This promotes diversification of farm production but however poor performing economy has suppressed this to happen.

#### **4.5.2 Shortage of Technical Experts**

Distribution of technical expertise within the District proved to be minimal not sufficient for the District. The District has only 3 Livestock Extension Workers (LEWs) apart from District Specialist, only 1 EMA office with 2 workers for the whole district, 1 Natural Resources Officer and only 1 good functioning Meteorological Station in the District. Above all, these workers have no transport to move around the District carrying their supposed duties; distribute some equipment in favour of food security. Therefore it's a big challenge for the District to fight against the effects of climate change on food security.

#### **4.5.3 Lack of Participation**

Gender stereotype is prevalent within Mutasa resulting in poor cooperation and lack of participation amongst sexes. With such a situation there is need to grow short seasoned varieties in every crop type and this includes legumes at large, "nyemba, nyimo, nzungu" including beans, drought resistant crops like sorghum, rapoko, and other crops also a nitrogen fixer. This also promotes crop rotation. However traditionally growing of such crops was associated much with women and up to now majority have inherited that culture. Several men says these plants they need much concentration in terms of weeding hence they need women who are naturally patient which is reducing the community resilience capacity to the effects

of climate change. On the other hand woman lack self-confidence to venture into some technical agricultural activities yet they comprise about 70% of the rural set up and survive through agriculture. They have low esteem to venture in things like assembling of irrigation kits, management and there maintenance they believe that they are male chores. This increase their vulnerability as well as increasing the District food insecurity since they are the major producing sector for the District. Therefore AEWs are facing a big challenge in mobilising the community to have a mixed cropping including such crops at large.

#### **4.5.4 Climate Variability**

Climate variations have also become a big challenge when people of Mutasa try to do away with the effects of climate change. Most adaptive or mitigation strategies the community put forward responding to the effects of climate change, the climate behaves the other way that is the unprepared way. For instance the community in the year 2010 once adapted the system of planting short seasoned varieties that ripe in a period of 2 to 3 months on a large space than long seasoned varieties as a strategy to insufficient rainfall. In that year there was too much rainfall that the crops decayed in fields and the community harvested almost nothing. The harvest failed to sustain majority to the following harvesting season that people survived through buying and informally importing rice from Mozambique. Therefore no matter how the community is trying climate change is also never stopping to inconvenience them.

**Table 4.4: Showing Rainfall Distribution between since 2005 to 2014.**

YEAR	RAINFALL AMOUNT	NUMBER OF RAIN DAYS
2005	1833.4	95
2006	2021	112
2007	3520	101
2008	2278	83
2009	2632,5	124
2010	3629	125
2011	2781.5	101
2012	1448.1	78
2013	2254.5	106
2014	2655.7	122

The above rainfall trends show unstable rainfall distribution for the past 10 years. This has impacted on community activities in which the community is failing to predict resulting in them operating on guess work. The number of rainy days is also miscellaneous that in some years crops are left with insufficient supply of rainfall and in some crops are over fed with rainfall depending on which variety one has preferred to grow.

#### **4.5.5 Lack of Political Will**

The issue of climate change is now demanding cooperation from all angles that is social, economic, religious and political everyone should play a role as if influences these sectors seriously. Political activists like Councillors, Member of Parliaments and others have become reluctant and ignorant in Mutasa to address this phenomenon in their gatherings. They lack a consultative skill of what the community really need thus (needs assessment) and problems do they have to be good leaders. In some parts of the District majority highlighted that there is absolutely nothing they are getting from the political side people only campaign for the posts once they win they disappear while a few said they get a little support through their political representative in form of maize for consumption, good crop varieties and other things like projects. Therefore the District highly lacks the political muscle in fighting against climate change.

#### **4.5.6 Sabotage**

The traditional leadership which is responsible for some local laws enforcement is facing a great sabotage challenge from the community. Majority highlighted that the community is not respecting their traditional post as Headmen's hence they do not listen to any development ideas that they are putting forward towards climate change. If they call for a village meeting the attendance rate is very poor showing that people do not want which is sowering their relations with their community. They went on to say that, some are even politicising the issues just to create troubles for them hence and they don't attend sabotaging on political grounds. The issue of cultural erosion through modernisation is believed to be one of the major challenge and causes of climate change by the District Traditional Leadership.

*“ These days our young kids are no longer respecting traditional norms like observing the rain making ceremonies, not putting on red clothing during the summer season or rain times, observing ‘Dzimbahwe’ females even go to their with trousers and shorts which very disrespectful of the ancestors, and at one point my husband*

*was asked 'Why don't you do your rain making ceremonies in August to prove that they are useful' when he was conducting and facilitating a meeting of rainmaking contributions and also the issue of churches therefore denouncing traditional activities, 'vana vava kungoita zvisingataurike mumasango umu' the ancestors are throwing misfortunes on us as punishment due to our lack of respect." Said Mrs Newengo*

#### **4.6 Role Played by the Government of Zimbabwe and Other Organisation**

The government of Zimbabwe has done much in promoting Mutasa District's resilience to climate change. Through Forest Commission has given out gum tree seedlings which act as carbon sinks, stops erosion through surface runoff and can also be used for gully reclamation, wind breaks to crops. Provision of EMA and Agricultural extension works which teaches and supervises the district on smart farming which is environment friendly has been helpful from the government. Again through the livestock department, livestock have been saved greatly through construction of deep tanks, dissemination of knowledge through Master Farmer Trainings and other useful ideas on animal rearing in response to climate dynamics which is showing a remarkable decrease in animal mortality. The Ministry of Youth Indigenisation and Economic Empowerment has been issuing out loans to youths on which some of them were used in the subsistence agricultural sector to buy irrigation equipment like, construction of canals, purchasing pastes and insecticides, livestock treatment and start other Income Generating Projects IGPs besides farming which is promoting diversification amongst community members thus strengthening their resilience capacity to climate change.

The Government through GMB and Agritex department is giving out agricultural inputs on yearly basis which includes good crop varieties, fertilisers and other related inputs. This has helped those under privileged not to suffer much from the detrimental effects of climate change or show a widened gap through this phenomenon.

Other players are doing much in complimenting government works on improving community adaptation and mitigation works towards the effects of climate change within the Mutasa District. Organisations like FAVCO, Food Agriculture Organisation (FAO), Matanuska have introduced banana projects in some parts of the District where conditions are favourable as well as revitalisation of abandoned coffee and tea fields. NGOs like Plan International, World Vision Zimbabwe (WVZ) have rescued in the District through food relief programmes and other programmes that promotes food security within the District.

#### **4.7 General assessment of Existing Mechanisms**

Generally the mechanisms are flourishing and fruitful because in terms of conservation agriculture like the use of mulch and contour ridges, smart farming, natural resources conservation as shown by dense forest and general knowledge conceptualisation by community members through trainings received from extension workers are effective. Some implemented methods have increased the District's harvest. However a few mechanisms still need to be polished up especially on the side of law enforcement and penalisation of perpetrators. This side is still lagging behind, and the issue of poor financial muscle of the District has resulted in failure of so many mechanisms slowing the recovering process of the district against the impacts of climate change.

#### **4.8 Summary**

The chapter presented and discussed gathered data inform of current effects affecting the community of Mutasa District, the impact of climate change on different age groups and sex. Challenges being faced by the District in adapting to the effects of climate change to enjoy their food security at District as well as at household level followed by an assessment of existing mechanisms to fight against the impacts of climate change. Also the role played by the government of Zimbabwe and other interested stakeholders in increasing the community's resilience capacity to climate change is included in this chapter.

## **CHAPTER 5-CONCLUSION AND RECOMMENDATIONS**

### **5.0 Introduction**

This chapter stands as the last stance of the since then presented research project. It focuses on providing summary conclusions and recommendations to the problem under research as provided for in the last chapter.

### **5.1 Summary**

This research was focused on the Impacts of climate change on food security in Mutasa District. For the succession of this research objectives and research questions were drafted and placed in the first chapter of this project to guide the researcher. This was done to identify the major purposes of the study and objectives were:

- i) To document current effects of climate change in Mutasa District.
- ii) To show how climate change has impacted differently amongst man, women and children.
- iii) To examine challenges faced by the residents of Mutasa in adapting to the effects of climate variability.
- iv) To establish possible solutions to the effects of climate change Mutasa District.

Significance and relevance of the study as well as limitations and delimitations to the study were discussed in the first chapter of the project.

Earlier writings by other scholars inform of literature review found relevant to the problem under study was presented in chapter 2. This was done to accumulate knowledge and shade more light on the problem under study from what has been published by others. The review includes impacts, causes, solutions and mechanisms of other areas including the area under study through internet, books, journals and other relevant sources.

Chapter 3 focused on the methodology that was used to tackle and execute the research. This stands to present procedures and methods applied during data collection for the success of the research and they were analysed in line with their compatibility as well as their value to the research. Interviews, questionnaires were administered and observations carried out and sampling was done during data collection. A resounding response to these instruments was experienced during the research and observations done were very useful and relevant to the study.

Data presentation and discussion was done in chapter 4 of the research project. Much focus is given to data presentation and discussion of field results gathered thus giving order to the former disordered raw data researched to give sense and understanding. Tables, field visuals

and narrations were used during data presentation. In the findings, majority accepted that climate change is taking place within the District and highlighted some of the believed causes; prevailing effects and what they think should be done to curb this phenomenon.

The last final chapter 5 summarises the whole project, conclude and give recommendations to the problem which was under study.

## **5.2 Conclusion**

The study of Mutasa District from the previous chapters showed that climate change has greatly impacted and is highly manifesting itself in the whole of the District. Giving a close look to the findings, the poor will be highly affected if they have no any other source of food or income to boost their food security in times of crop failure or government and the third sector failed to give relief support. Climate change as shown by the study has risen, political and social instability through sower relations and limited association amongst members of the same community and threatens livestock production a source of draught power which highly contributes to food security. Climate change has shown not only impacting on domestic crops and animals only but also on wild fruits and animals which were used as food supplement to relief and support the District food security in times of crop failure. Depending on farming has proved to be a gamble activity for people are now operating under guess on which crop variety to plant for they cannot foretell what the season is going to bring in terms of rainfall and drought distribution it only goes by lucky. However climate change has proved posing an increasing impact and threat to food security of Mutasa Despite efforts being made in response to it crippling the District development strides.

## **5.3 Recommendations**

The research findings has shown that climate change has posed detrimental effects in Mutasa District therefore the researcher has put forward some recommendations which he believes can be useful to the District in achieving food security at household and at District level.

- Diversification of production: this is the practise of mixed cropping, intercropping, cultivation, cultivation of the non-staple root crops. It provides much surplus for storage in the event of good years. Diversification has have been found making use of environmental variations and provides the best chance of an optimum yield under all variations of weather and plant pests.
- The community should adopt staggering method; this is where they plant their seeds spaced giving an interval of at least 2 weeks so that when one field failed the other fields will yield better.



- Capacity building: this has been found of great importance for it raise awareness amongst communities about certain phenomenon and raise their resilience capacity. Capacity building also educates the community thus the element of ignorance is removed there installing the spirit of unit and stewardship amongst communities.
- Opening up and revitalisation of non-functional irrigation schemes which promotes ground water recharge during their operation. Adapting sophisticated irrigation methods like drip irrigation which is water conservative by reducing evaporation for it drips directly and adequately on the plant stem as well as other water harnessing methods.
- Growing of legumes: like beans and small grain towards the end of rain season when cereal fail due to excessive rainfall. This may allow a better yield and legumes provide better nutrients and fetches higher prices on the market compared to other crops for instance a bucket of maize is going for between US\$6-7 while beans is going for between US\$20-25.
- Practising other off farm activities like honey projects, these project do not normally fail no matter how the climate behaves their diversity should encroach to such activities.
- Formation of Area Management Committees which manage the day to day activities in favour of food security.
- Involvement of Higher and Tertiary Education Institutions in leading communities to grow grasses and trees like Katambura Rhodes in their graze lands to cater for their livestock from poor condition of pastures
- Introduction of District farm field schools and laboratories by the government. This will help in provision of skilled farmers and extension personnel.
- Erection and revitalisation of District Meteorological Department Services. This help in record keeping of past rainfall trends on the onset dates of rainfall, number rainfall dates, amount of rainfall per month and annually as when as when did rainfall normally disappear. It helps the community to draw better conclusion about when can they approximately start their planting, which variety to plant most and which methods to use.
- Third sector or Donor sector interference: third sector should come and rescue in seasons of great crop failure with food relief and hand outs. However this should be done wisely with much care of not giving birth of a donor syndrome community.

- The community should practise borehole drilling for irrigation with the help from third sector.
- Community should adopt the use of record books to try and understand the sequence seasons which is an advantage to their planning process.
- Water harnessing by the community especially gravity harnessing which is cheaper.
- Production diversity by the community.
- The Responsible Authority should put in place stiff measures to those found damaging the natural environment as a common good.
- In seasons of too much rainfall the community can grow rice taking advantage of the seasons.

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## Appendix A: Questionnaire

### Questionnaire

Greetings to you in the name of our Lord Christ, I am Solomon G.T Sauriri a student at Midlands State University studying Bachelor of Arts Honours Degree in Development Studies. In partial fulfilment of my studies, I am doing a research on *Effects of climate change on food security in Mutasa District.*

#### Part A

##### Socio-demographic Information

Tick in the appropriate box

1. Sex ..... Male  Female .....
2. Age ...10-18  19-50  0+
3. Marital status ..... Single  Married
4. Level of education  
Primary - ZJC  "O" Level  " A" Level  Tertiary   
Other specify .....
5. Employment status  
Employed  Not employed   
Farmer
6. For how long have you stayed in Mutasa District?  
1-5  6-10  11-15  16-20  21+

#### Part B

7. Do you understand anything about climate change Yes  NO

If yes list any causes of climate change.....  
.....

8. Is climate changing in your area Yes  No

If yes explain what are the signs that climate change is taking place in your area  
.....

.....  
.....  
.....

9. What are the effects of climate change on food security experienced in your area

.....  
.....  
.....

10. What do you think is the role of your community in mitigating and adapting to climate change .....

.....  
.....

11. What community measures have you put forward to reduce the effects of climate change .....

.....  
.....  
.....

Have they been successful? If no explain why .....

.....  
.....  
.....

12. Is the government, NGOs and other stakeholders playing any role in mitigating effects climate change in Mutasa District? If yes, what are they doing .....

.....  
.....  
.....

13. What other institutions and measures that you think should be involved in climate change mitigation process

.....  
.....  
.....  
.....

## **Appendix B: Interview Guide**

### **Interview Guide**

1. What educational level have you attained?
2. Are you employed or not or do you rely on agricultural produce?
3. How long have you stayed in Mutasa District?
4. Do you understand what climate change is?
5. What effects of climate change are you experiencing on your food security?
6. What measures have you put in place as a community with your Traditional Leadership in trying to mitigate climate change and ensure your food security?
7. What challenges are you facing in implementing the mentioned measures?
8. Do you have any environmental laws put in place by the Local Authority and EMA to mitigate climate change to ensure food security?
9. What is the government, NGOs and other stakeholders doing in helping the District mitigate climate change and foster food security?