BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF NATURAL RESOURCES

CLIMATE CHANGE AWARENESS, ADAPTIVE AND MITIGATION MEASURES EMPLOYED BY RESIDENTS OF WARDS 13 AND 30 OF MUSANA COMMUNAL AREA, BINDURA DISTRICT

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DECLARATION

The undersigned certify that they have read this research project and have approved its submission for marking in relation to the department's guidelines and regulations.

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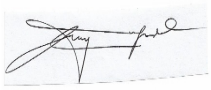
Signature…  **……Date……**

DEDICATIONS

This dissertation is dedicated to my family, whose unwavering support and encouragement have been my foundation throughout this journey.

Thank you for believing in me.

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ABSTRACT

This study sought to assess climate change awareness among the residents of Wards 13 and 30 Musana communal area in Bindura district. The study was designed to evaluate climate change awareness, to assess what the residents see as the causes and impacts of climate change, identify factors influencing communal people's climate change awareness. A questionnaire survey method was used in which some 200 randomly selected respondents were drawn from each ward using the convenient snowball sampling method. A structured questionnaire was administered to obtain information on communal peoples' knowledge about climate change causes, impacts, mitigation and perception on climate change. Variability in climate of the area was determined using meteorological data on temperature and precipitation from Zimbabwe's Meteorological Services Department. Data were qualitatively and quantitatively analysed and results displayed in tables, graphs and charts. Results revealed that Wards 13 and 30 of Musana, Bindura have experienced significant temperature and precipitation variability. Results also show that climate change awareness among residents of Wards 13 and 30 Musana is significantly low but their adaptation and mitigation measures are effective. Although some of the people registered some form of awareness of climate change, there are some gaps in their knowledge. Factors such as sex, education level attained and age emerged influential on communal people's awareness to climate change. Findings further exhibit that communal people view climate change as a threat of global concern. The residents are also adapting to and mitigating climate change using various strategies such as conservation agriculture and small livestock rearing. Key recommendations included: the Ministry of Environment and Climate Change to undertake climate change awareness campaigns and capacity building among these communities through organizing climate change seminars and training workshops for the communal inhabitants as well as distributing latest information materials on climate change.

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LIST OF ABBREVIATIONS

AGRITEX……Agricultural Technical and Extension Services

CC…… Climate Change

IPCC…….Intergovernmental Panel on Climate Change

GoZ……..Government of Zimbabwe

NGOs……Non-Governmental Organisations

NCCRS…….....National Climate Change Response Strategy

NCEP……...National Centre for Environmental Prediction of the United States

NOAA…….National Oceanic and Atmospheric Administration of the United States

UNCED……..United Nations Conference on Environment and Development

UNDP…….United Nations Development Program

UNEP…….United Nations Environmental Program

UNESCO……...United Nations Educational, Scientific and Cultural Organization

UNFCCC……...United Nations Framework Convention on Climate Change

UNICEF……United Nations International Children's Emergency Fund

SPSS……...Statistical Package for Social Sciences

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND TO THE STUDY

According to Government of Zimbabwe Report (2009), climate change is one of the biggest threats facing humanity today throughout the world. Science has clearly demonstrated that there is extreme urgency in taking real action to avoid irreversible damages to our planet. Reports of the Inter-governmental Panel on Climate Change state that, Africa will suffer the most from the impacts of climate change (IPCC, 2003). The serious under development of the continent signifies high vulnerability to climate change impacts. The global nature of climate change requires the widest cooperation and participation in an effective and appropriate international response comprising mitigation and adaptation measures based on the principles of the United Nations Framework Convention on Climate Change, (UNFCCC, 1992). Irrespective of a country's contributions to the problem we shall all be affected and must therefore act now to combat climate change.

Climate change is defined as a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer (Ogalleh *et al*., 2012). Climate change is a long term change in the statistics of weather expressed as a probable change in mean or extreme weather conditions (Codjoe and Owusu, 2011). According to Umar *et al*. (2008), climate change refers to change occurring in the climate during a period

Mitigation of climate change is defined as human intervention to reduce the sources or enhance the sinks of GHGs that's according to IPCC, 2007 and IPCC, 2012. Climate change adaptation was defined by IPCC (2007) as adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Taderra, (2010) further observed that although communal African people are aware of changing weather patterns, people in Africa, are poorly informed about global climate change. The low level of awareness on climate change across sub-Saharan African countries is attributed to limited education awareness campaigns on one hand and the fact that African countries have got too many problems ranging from poverty to political conflicts on the other hand hence climate change is never a priority issue (UNFCCC, 2007). In Zimbabwe, the majority of the population is unaware or partially aware of climate change, being experienced

in the country as noted by GoZ (2009). However, the government of Zimbabwe is aware of it and is concerned about climate change as a development issue.

According to IPCC (2007), negative impacts of climate change and variability include expansion of marginal lands, rising temperatures and increasing rainfall variability, droughts which is expected to exacerbate declining food outputs and further crippling economic growth and stability, (Muller *et. al*. 2011). Therefore, adaptation and awareness measures are very important to help these residents to be better prepared to face these extreme weather conditions and associated climatic hazards, (Adger *et al*., 2003). The economy and the livelihoods of the poor in Zimbabwe are highly vulnerable to climate change due to their heavy reliance on rain-fed agriculture. The Government of Zimbabwe (GOZ, 2010), stated that agriculture accounts for approximately 15-18 percent of the Gross Domestic Product and approximately 60 percent of the raw materials required by manufacturing industry and 40 percent of total export earnings in Zimbabwe. Substantial declines in agricultural productivity have been noted since 2000. Climate change and variability is already evident in Zimbabwe and as a result traditional agricultural systems are becoming increasingly unsustainable. In addition, Agro-ecological regions in Zimbabwe are reported to have shifted, resulting in drier climates (Brown *et al*., 2012). Climate Change awareness has the potential to significantly contribute to reductions in negative impacts from changes in climatic conditions.

Adaptation and mitigation to climate change did not receive much attention in the first years of the international climate change studies, (Kates ,2000, cited in Halsnaes et al, 2009) but adaptation and mitigation has recently been covered more extensively and has an important place (IPCC, 2007). There is an emerging process of seeing climate change as a main-streaming issue that implies that vulnerabilities and adaptation strategies are linked to the development of poverty reduction strategies (Halsnæs and Trærup, 2009).

Although resources are being put together to mitigate and adapt climate change, there is need to educate people on what climate change really is. Thus increasing people's awareness on climate change through education awareness campaigns is an important step to persuade people at all levels in the community to play an active role in mitigating and adapting to climate change. Consequently, Zimbabwe is considered a revision of its school curricula at all levels as demonstrated in the New Curriculum Review which came into effect 2017-2018. It is therefore imperative that the new curriculum includes climate change so that climate change is taught in school from primary to tertiary level. Although the government has tried

to find out climate change awareness among Zimbabweans in general, as gazetted in the Government of Zimbabwe Report of 2009, very little if any, has been done to investigate the level of climate change awareness among communal communities, (GoZ, 2009). This study was designed to fill this gap by assessing climate change awareness among communal communities in Wards 13 and 30 of Musana, Bindura since a positive mitigation strategy against climate change in communal communities is only possible if the people are aware of the climate change threat.

1.2 PROBLEM STATEMENT

The study focuses on assessing people's awareness, adaptations employed by people in Musana to achieve food security and poverty reduction at local level and the mitigation measures they are putting in wards 13 and 30 of Bindura district. There is no documented information about the level of awareness, adaptive and mitigation measures employed by residents of Musana. Most studies focused on the impacts of climate change and adaptations at global level and regional level and did not concentrate much on responses and adaptations these residents employed to adapt to climate vagaries at the local level especially in Musana, Bindura District.

1.3 JUSTIFICATION

The primary beneficiaries of the study's findings are the residents of ward 13 and 30 of Musana, Bindura. They will be informed on what climate change is and how it is contributing to household food security in the communal communities of Zimbabwe. This will help them to copy with the adverse effects of climate change through appropriate adaptation strategies. The study will also help to lay a platform where beneficial education awareness campaigns are done to make people aware of the impeding negative impacts that climate change can pose, thus increasing climate change impact resilience and preparedness. The study will also help to lay a platform where beneficial education awareness campaigns are done to make people aware of the impeding negative impacts that climate change can pose, thus increasing climate change impact resilience and preparedness. This study therefore will reduce the information gap that is there on climate change between communal communities and policy makers as a measure to mitigate climate change in Zimbabwe from the grassroots level through education awareness campaigns. The study will also add to existing board of knowledge. This is a benefit to the academics as they will inform their own studies based on

the study findings. The study will as well benefit the policy makers by providing the basis for policy formulation and planning intervention strategies for communal farmers in Zimbabwe.

1.4 AIM

To find out climate change awareness among the residents of Musana, evaluate climate change adaptive and mitigation measures employed by residents of wards 13 and 30 Musana, Bindura district, Zimbabwe.

1.5 OBJECTIVES

1.5.1 To identify if residents of wards 13 and 30 of Musana are aware of climate change; its causes and impacts.

1.5.2 To identify factors influencing climate change awareness in the study area.

1.5.3 To assess the mitigation and adaptive measures that residents are putting in response to climate change.

1.6 RESEARCH QUESTIONS

1.6.1 What is residents' understanding of Climate Change, causes and its impacts?

1.6.2 What factors influence residents' knowledge about climate change?

1.6.3 What are the adaptive and mitigation measures that residents are putting in response to climate change?

CHAPTER 2: LITERATURE REVIEW

2.1 A GLOBAL PERSPECTIVE ON CLIMATE CHANGE

According to the (UNCED, 1987), the 1970s saw some development in the concern about global warming. However, the public attention on climate change was only captured for the first time by the Brundtland Report, "Our Common Future", published in 1987, which highlighted a number of environmental problems including climate change affecting the world. The report stated that the world's climate is on a warming trend being driven by the unsustainable development practices of humankind (UNCED, 1987). However, Christianson (1999) noted on the contrary that, the global concern on the possibility of a changing climate was not triggered by the Brundtland Report, but rather by the unusual heat wave and drought of the summer 1988, (Ochieng, 2010).

Ochieng, (2010) further notes that, while the IPCC creates global awareness on climate change through its assessment reports, it leaves a gap in as far as information on public awareness and perception of climate change is concerned as it does not publish any research work on this area. IPCC published its first assessment report in 1990. The report of Working Group I confirmed that the world's climate is actually warming and action needs to be taken to curb further anthropogenic interferences of the climate system (IPCC, 1990).

However, Trainer (2008) notes that IPCC's work has come under sharp criticism with authors questioning the credibility of its reports. The fourth assessment report was particularly criticized for containing a lot of errors and exaggerated results, (Tol, 2007). Some scholars such as Sampei and Aoyagi-Usui (2009) criticized issues such as the disappearance of Himalayan glaciers by 2035, 50% reduction of crop yields in Africa by 2020, increased frequencies of extreme weather related events since 1990s and the loss of Amazon forest cited in IPCC's fourth assessment report were disputed by scientists as being too exaggerated and based on incredible sources

Worth noting here according to Eze (2011) is that, the implementation of the UNFCCC and its Kyoto Protocol has managed to not only spark global action on climate change, but also create awareness on the issue. The implementation of the UNFCCC and Kyoto Protocol required constant monitoring, something that has been achieved through the yearly Conference of Parties (also known as CoPs) (UNFCCC, 1992). While these meetings were meant to monitor progress and chart the way forward on a yearly basis, they have played a

significant role in creating awareness on climate change. This has been further buttressed by the wide media coverage of these conference proceedings which has made the public more aware of climate change now than it was when the Climate Change Convention was adopted in 1992, (Ochieng, 2010).

Despite some controversies that surround climate change and global warming, most governments across the world have adopted the view that climate change is happening and there is need for action against it, (UNDP, 2007). According to Sampei and Aoyagi-Usui (2009), climate change is like an untreated wound, it will gradually worsen as it is left unaided and neglected. These natural occurrences have already devastated many lives of Zimbabweans as what happened from previous years.

In spite of these developments, there is still a substantial majority of the population throughout the world in general and Zimbabwe in particular who are still unaware of climate change, (Pugliese and Ray, 2009). Most people only understand climate change to mean variations in weather patterns while the majority of people around the world are not able to differentiate between climate change and global warming hence the need to create awareness on climate change especially through education, cited in Ochieng, (2010).

2.2 THE CLIMATE CHANGE CONCEPT

According to Sexton *et al.*, (2001), climate change is most often equated to global warming yet climate change is more than just the warming of the earth. Many authors define climate change simply as the anthropogenic alteration of global climate system through combustion of fossil fuel, deforestation, and other related activities that contribute to increased concentration of greenhouse gases in the atmosphere (Curry, 2011).

According to IPCC, climate change is a change in the state of average weather patterns attributed to both natural and human induced factors and which in addition to variability persists over long periods, (IPCC, 2007 in Ochieng 2010). A comprehensive definition of climate change was again provided by John P. Holdren, a renowned scientist from Harvard University, in his 2006 public lecture titled Meeting the Climate-Change Challenge. In his lecture notes, Holdren (2006) defines climate change as alterations in earth's weather patterns in terms of the averages, the extremes, the timing, and the spatial distribution of weather events manifested in the form of hot or cold, wet or dry, snowpack or snowmelt, winds or storm tracks, and ocean currents or upwelling, which are in addition to rising global temperatures.

2.3 GLOBAL WARMING

According to IPCC (2007), global warming simply refers to a sustained increase in the average atmospheric temperature, which is capable of causing changes in the global climate system. Available scientific evidence shows that the earth experienced an average warming of approximately 0.6 °C during the 20th Century (IPCC, 2001) and is expected to warm by about 2- 3 °C by the end of the 21st century (IPCC, 2007). Holdren (2006) observed that the last 50 years of the 20th Century were the warmest in 600 years. In addition, the top ten world's warmest years with temperatures above the 20th Century average are all in the first decade of the 21th Century except for one, (NOAA, 2010) sufficing as evidence of a warming earth. This warming trend is blamed on anthropogenic activities such as combustion of fossil fuel, deforestation, and industrial air pollution, (Weart, 2010). All these activities have led to increased concentration of carbon dioxide in the atmosphere thereby enhancing greenhouse effect and hence the rising temperatures.

2.4 CLIMATE CHANGE IN ZIMBABWE

Zimbabwe lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations, (Unganai, 2009). According to Unganai (2009), rainfall in Zimbabwe exhibits considerable spatial and temporal variability characterised by shifts in the onset of rains, increases in the frequency and intensity of heavy rainfall events, increases in the proportion of low rainfall years, decreases in low intensity rainfall events, and increases in the frequency and intensity of mid-season dry-spells. Extreme weather events, namely tropical cyclones and drought have also increased in frequency and intensity (Mutasa, 2008). Moreover, according to the Zimbabwe Meteorological Service, daily minimum temperatures have risen by approximately 2.6°C over the last century while daily maximum temperatures have risen by 2°C during the same period.

Unganai (2009) further notes that changes in climate have resulted in more arid environments for agricultural production, which has shifted Zimbabwe's five main agro-ecological zones (or 'natural regions'). Rainfall patterns and crop production progressively deteriorate from Region I to V, (Brown *et al.*, 2012). For example, Chinhoyi and Chibero and their surroundings have shifted from natural region III to natural region IV. In addition, natural region I has reduced in size, natural region II has shifted further east and natural region III has shifted to the north.

Moreover, the climate in Zimbabwe is regionally differentiated, but is generally becoming warmer with more erratic rainfall patterns, (Brown *et al.*, 2012) Murwira *et al*., (unpublished) carried out two climate change studies at the Department of Geography and Environmental Science at the University of Zimbabwe and developed best and worst case regional climate change scenarios for the years 2020, 2050 and 2080 using CSIRO and HADLEY Global Climate Models for Zimbabwe. Their study demonstrates that the projected climate impacts are regionally differentiated and likely to adversely affect a variety of sectors. Overall, warming trends and water stress caused by rainfall variability are likely to generally increase the vulnerability of communal agricultural land, (Murwira *et al*., unpublished). 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, (Murwira *et al*., unpublished).

The expected climate change impacts presented in Murwira *et al*., (unpublished) report correspond well with the four main IPCC (2007) projections for Africa. Agricultural production and food security will be compromised (with very high confidence), water stress will be aggravated (very high confidence), ecosystems will change at a rate faster than expected (very high confidence); and human health, already compromised by a range of factors, will be further negatively impacted (e.g. malaria) (high confidence).

However, despite all these projected changes in climate, the GoZ Report (2009), stated that majority of Zimbabweans are not aware of this climate change and its related results. This means that most communal communities are just suffering in darkness without proper knowledge on how to respond to climate change due to lack of awareness.

2.5 GLOBAL PUBLIC CLIMATE CHANGE AWARENESS

According to Christianson, (1999), climate change only became a serious issue of global concern after 1988- the first hottest year recorded since mid-19th century. Awareness studies conducted since then, especially in the developed world revealed that climate change awareness level is high in developed countries and very low in developing countries like Zimbabwe, but still not a priority environmental issue in most of these countries, (Leiserowitz Kates and Parris, 2005; Leiserowitz, 2006; Pew Research Centre, 2013; Pew Research Centre, 2006; Pugliese and Ray, 2009).

Global public opinion on climate change has been extensively explored by research companies mainly Gallup and Pew Research Centre, (Pew Research Centre, 2013). Results from their studies shows that awareness of climate change is high in developed than in developing countries. According to Pew Research Centre Global Attitudes Project survey conducted in 2006, people from developed countries are increasingly aware of climate change compared to those in developing countries. Similar findings were revealed by Gallup's global opinion poll conducted between 2008 and 2009 in 128 countries around the word, which shows that people in Europe and America are more aware of climate change than those in Africa, Asia, and Middle East regions (Pugliese and Ray, 2009). While the Gallup and Pew Research Centre studies provide a global outlook, they are shallow studies based on opinion polls and hence reveal very little information on climate change awareness (Ochieng, 2010, unpublished).

A conclusion made based on such studies may be misleading hence the need to feel this gap with detailed empirical studies. However, the low level of awareness in developing countries calls for attention as it might have serious implications for climate change policy implementation in countries like Zimbabwe.

2.6 PUBLIC CLIMATE CHANGE AWARENESS IN AFRICA

According to a regional survey conducted by Africa Talks Climate in ten sub-Saharan countries including Zimbabwe in 2009, people in sub-Saharan Africa are poorly informed about climate change (Godfrey *et al*., 2009). Most people in Africa consider climate change to be an abstract, despite their understanding of changing weather patterns. Similar findings were revealed by a report on South African awareness of climate change, which stated that Africans have very limited understanding of global climate change, despite their awareness of changing weather patterns (Taderera, 2010). However, country specific studies reveal conflicting findings.

A descriptive survey conducted by Acquah (2011) using a random sample of 78 respondents to evaluate public awareness and quality of knowledge regarding climate change in Ghana revealed a higher level of awareness on climate change among inhabitants of central region of Ghana. Nonetheless, Acquah's study is limited in its sample size and may not be representative of the general population in central Ghana.

In a similar study Oruonye (2011) examined the level of awareness on the impacts of climate change effects among tertiary institution students in Jalingo Metropolis, Nigeria and found a

surprisingly low level of awareness. Of the 225 students Oruonye interviewed, 18.8% had never had of climate change before while 89% of those who claimed to be aware of climate change were unaware of its causes, effects, and possible adaptations or mitigations. According GoZ (2009), there has been no detailed study so far carried out in Zimbabwe to ascertain the level of climate change awareness among communal communities in particular. However, it is not surprising though that; a detailed country profile study will yield same results like the rest of sub Saharan Africa. This study therefore sought to fulfil this knowledge gap.

2.7 PUBLIC CLIMATE CHANGE AWARENESS IN ZIMBABWE

Literature on public awareness on climate change in Zimbabwe is relatively scarce. Most of the available literature is in the form of government reports. Nevertheless, the available literature reveals a low level of climate change awareness in Zimbabwe. According to a research conducted by Africa Talks Climate in 2009, most Zimbabweans are unfamiliar with the concepts of climate change and global warming, but are aware and concerned about frequent droughts and food scarcity in the country (Unganai, 2009). The author observed that there is eminent confusion among Zimbabweans on the true meaning of climate change even though they live with the impacts of climate change. Similar concerns are expressed in GoZ (2009) which state that the vast majority of Zimbabweans are unaware of climate change, despite their knowledge of changing weather patterns.

The authors also recognize the fact that data on climate change awareness is scanty in the country. The low level of climate change awareness among most Zimbabweans is confounded by the apparently lack of a uniform translation of climate change as a concept into the various vernacular languages in the country (GoZ, 2012). GoZ (2009), in particular, calls for in-depth studies to examine the level of climate change awareness, and how this perceived low level of awareness can be improved in all age groups across the country. The report also recommends education as a potential avenue for dissemination of climate change knowledge to various groups in Zimbabwe.

According to GoZ (2009) the government of Zimbabwe views global climate change as a serious threat to its people. This has seen Zimbabwe being one of the first countries to sign and ratify the United Nations Framework Convention on Climate Change at the United Nations Conference on Environment and Development, held in Rio de Janeiro in June 1992. Zimbabwe has accepted ratification of the Kyoto Protocol. The Challenge for the country is

how to develop adaptation strategies that can mitigate the diverse and complex impacts of climate change. The issues of climate change are included in the National Environmental Policy of Zimbabwe, (GoZ, 2009).

However, climate change has not attracted enough attention from a wide cross-section of our society, including political leaders. Public awareness for policy and decision-makers is therefore an important element for effective implementation of the Convention and its Kyoto Protocol. While climate change is global its adverse effects are local and most felt by poor people and poor countries because of their low adaptive capacity. This therefore makes climate change awareness and adaptation to adverse effects of climate change a priority, demanding policy direction at the highest level, (GoZ, 2009).

2.8 FACTORS INFLUENCING PUBLIC CLIMATE CHANGE AWARENESS

According to Pugliese and Ray, (2009) various studies have revealed that climate change awareness varies within and across regions. A review of related literature shows that people's level of awareness of climate change is influenced by factors which can be categorized into three, namely: access to information including media coverage of the issue and advocacy, personal experience including experience of extreme weather events; and demographic factors including age, gender, and level of education, (Pew Research Centre, 2006).

Firstly, Saroar and Routray (2010) notes that access to information is critical in shaping the public level of climate change awareness. Access to information determines individual's knowledge of climate change, which eventually influences behaviour. People who either read newspapers or other related prints, listen to radios, watch TVs, or have access to the internet are more likely to be familiar with climate change than those who do not have access to such media of information. According to a study on the influence of media coverage on Japanese public awareness of climate change issues conducted by Sampei and Aoyagi-Usui (2009), intense newspaper coverage of global warming issues is associated with an increase in public concern over global warming

Secondly, Saroar and Routray (2010), notes that demographic factors such as age is a critical predictor of individual's familiarity with climate change issues. According to a study conducted by them, there is a positive correlation between age and familiarity with climate change/extreme weather events. It is thus expected that older people should be more aware of climate change than younger people. Nevertheless, this is not obvious a rule of thumb. According to Patched, (2006), surveys conducted in Europe revealed that younger people are

more aware of environmental problems including climate change A study of junior high school students' awareness of climate change and sustainable development in Ghana by Owolabi, Gyimah and Amponsah (2012) also revealed that younger students (below 15 years) are more aware of climate change than older students but their results were not statistically significant. Older people are, however, more likely to be worried about climate change (Saroar and Routray, 2010). Hence, it is clear that age has an influence on the public's level of awareness of climate change but it is difficult to set with certainty whether the correlation is positive or negative.

Another important predictor of the public level of awareness and perception of climate change is the level of education. Studies have proved that individuals with high levels of education are more likely to be aware of climate change (Acquah, 2011; Adebayo *et al*., 2013). However, people with less years of education are likely to perceive climate change as a threat since they are likely to have less income and remain highly vulnerable to the impacts of climate change (Brulle, Carmichael and Jenkins, 2011).

In line with the above, gender is another predictor of climate change awareness. According to Patchen, 2006 studies have revealed that men are more aware of climate change than women. This is mainly due to the fact that men have a relatively high access to information through print and electronic media (Ekpoh and Ekpoh, 2011). However, women are more likely to perceive climate change as a serious threat. This was confirmed by a study of public perception of climate change done by Semenza *et al*., (2008), which found out that women in both Portland and Houston were significantly more concerned about climate change. This perception pattern reflects the fact that women are more vulnerable to climate change given their home makers role in the society, which forces them to directly interact with the environment.

Thirdly, personal experience of the impacts of climate change also plays a key role in shaping people's familiarity with climate change. People who live in disaster prone areas are likely to be more familiar and concerned about climate change. According to a longitudinal survey on Americans conducted between the years 2008 and 2011 by Myers *et al*., (2013), experience of the impacts of climate change provides the opportunity for experiential learning especially among people who are less engaged in climate change issues.

2.9 IMPACTS OF CLIMATE CHANGE IN ZIMBABWE

The Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report indicates that increases in warming and drying in Africa can impact agriculture by reducing crop yields by almost half by 2020 (IPCC 2007). This will have profound adverse impacts on the already vulnerable and poor communities that rely on climate-sensitive livelihood sources like agriculture and natural systems, (Nhemachena, *et al*., 2014).

Climate change models for southern Africa indicate that the region will face increased challenges due to projected changes in climate (Hulme *et al*., 2005). Further evidence (e.g. IPCC 2007; Tadross, Hewiston and Usman 2005; Tadross *et al.,* 2009) predict rainfall reductions and increased rainfall variability for most parts of southern Africa. In addition, southern Africa has recently been experiencing recurrent droughts (including mid-season droughts) (Moyo *et al*., 2012), and these experiences together with other extreme climatic events are expected to continue (Twomlow, Steyn and Du Preez 2006). The region is generally projected to face further warming, drying and extreme climatic conditions, although these will vary spatially across the region.

Brown *et al*., (2012) argue that evidence from climate change projections in southern Africa (such as increased intensity and frequency of extreme events) is supported by recent trends in climate in the region. Farmers in Zimbabwe are mostly reliant on rain-fed agriculture, and natural systems which are sensitive to climate change are vulnerable to current and expected changes in climate (Chagutah 2010). Failure to address climate change threatens to reverse developmental gains across various sectors and worsen the vulnerability of local systems and the national economy. Therefore climate change adaptation is of critical importance for the Zimbabwean economy, (Nhemachena, *et al*., 2014).

A study done to see how agricultural production would respond to climate change in Zimbabwe indicates that a 2.5 ˚C increase in temperature would decrease net farm revenues by USD 0.4 billion (Mubaya, 2010 cited in Muzari *et al*., 2015). A 5 ˚C rise in temperature would decrease net farm revenues across all farms, dryland farms and farms with irrigation by USD 0.4 billion, USD 0.5 billion and USD 0.003 billion respectively (Mano and Nhemachena, 2006, cited in Muzari *et al*., 2015). Moreover, a 7% decrease in precipitation would result in a decrease in net farm revenue by USD 0.3 billion for all farms (Mubaya, 2010, cited in Muzari *et al*., 2015).

Greater frequency of cyclones is also another impact of climate change. If there are more cyclones, coastal populations could suffer more damage to buildings, more frequent loss of power and water supplies, and contamination of water through flooded septic tanks and sewage systems. The solution is to construct stronger, specially-designed buildings, but many village people may not have access to the necessary finance.

2.10 **CLIMATE CHANGE ADAPTATION MEASURES**

Human beings or even animals by nature have the inherent capacity to adapt to a changing climate. It is more of a natural instinct that humankind adapts to a changing situation. Hence (Karin, 2013) asserts that throughout history, natural and human systems have always developed strategies to cope with and make best use of their surrounding climatic conditions, with more or less success. Therefore adaptation is the best way to deal with the impacts of climate change across the world, thus Bizikova et al (2009) say that adaptation to climate change needs to not only respond to these impacts, but also needs to be integrated into sustainable development strategies and their implementation. Bizikova et al (2009) further note that societies have a long record of adapting to the impacts of weather and climate, but climate change poses novel risks, often outside the range of experience, such as impacts related to drought, heatwaves and floods.

On another note Nourteva (2009) state that the developed countries are more capable of coping with the impacts of climate change than the less developed ones due to their wealth and level of development. This is very true looking at the issue of the Zimbabwean context which is a developing country struggling with its economy. Local communities have, for example, used traditional technologies to cope with regular flooding by building houses on stilts, as noted by (Stalker, 2006). Stalker, (2006) further emphasises that unlike mitigation, which is a relatively new task, adaptation is generally the continuation of an ongoing process for which many of the technologies are already being applied even in some of the least developed countries. This means that adaptation to climate change is not restricted to one aspect of the economy but everything that affects humanity. Thus Stalker, (2006) elaborates that adaptation, rather than being concentrated in one sector, such as energy, will essentially be ubiquitous, dispersed across all socio-economic sectors – including water, health, agriculture and infrastructure – each of which presents its own challenges.

2.11 CLIMATE CHANGE ADAPTATION STRATEGIES IN DEVELOPING

COUNTRIES

The following are examples of adaptation practices as stated by Schneider *et al*. (2007) and

World Bank (2009):

In Egypt ,Sea-level rise Adoption of National Climate Change Action Plan integrating climate change concerns into national policies; adoption of Law 4/94 requiring Environmental Impact Assessment (EIA) for project approval and regulating setback distances for coastal infrastructure; installation of hard structures in areas vulnerable to coastal erosion.

In Sudan, drought expanded use of traditional rainwater harvesting and water conserving techniques; building of shelter-belts and wind-breaks to improve resilience of rangelands; monitoring of the number of grazing animals and cut trees; set-up of revolving credit funds.

In Bangladesh, sea-level rise; salt water intrusion, consideration of climate change in the National Water Management Plan; building of flow regulators in coastal embankments; use of alternative crops and low-technology water filters.

In Philippines, sea-level rise; storm surges capacity building for shoreline defence system design; introduction of participatory risk assessment; provision of grants to strengthen coastal resilience and rehabilitation of infrastructures; construction of cyclone-resistant housing units; retrofit of buildings to improved hazard standards; review of building codes; reforestation of mangroves.

CHAPTER 3: METHODOLOGY

3.1 DESCRIPTION OF THE STUDY AREA

The study was carried out in communal areas of Wards 13 and 30 (Fig 3.1) of Musana communal area, Bindura district in Mashonaland Central Province of Zimbabwe. The area has an altitude of 1200 metres. Zimbabwe is a landlocked country located in Southern Africa. It has a subtropical climate. The country lies in a region with limited and unreliable rainfall patterns and has national mean rainfall of 655 mm with low lying parts of the country receiving less than 300mm and highlands areas receiving over 1 000 mm. The rainy season extends from November to March with a peak in January. Ward 13 is 30 degrees 56minutes and 30 seconds east and ward 30 is 16 degrees, 39 minutes and 33 seconds south. The area is accumulated with gneiss rocks.

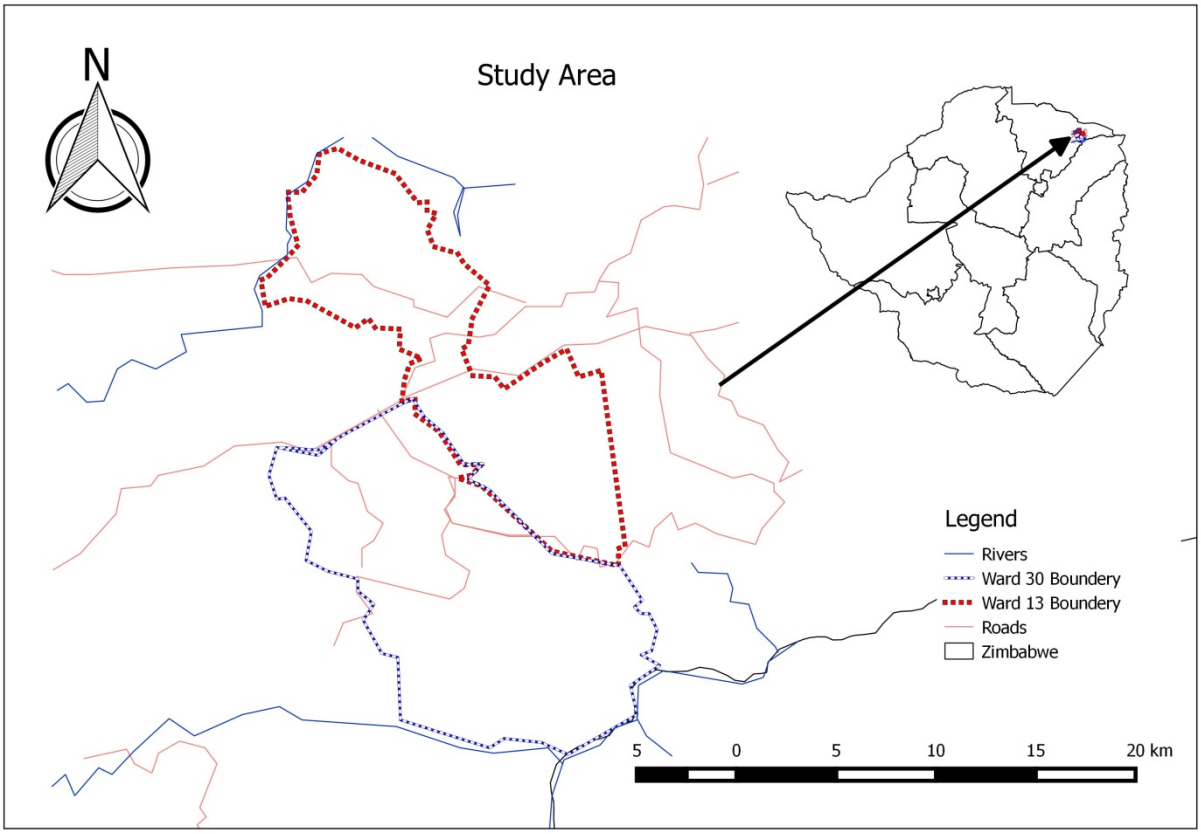

Figure 3. 1: Map of ward 13 and 30, Musana (Bindura District).

3.2 RESEARCH DESIGN

This involved a critical review of literature as well as field collection of primary data to provide the variety of information needed to assess residents' awareness of climate change. Primary data was collected from residents of wards 13 and 30 Musana. Secondary data was obtained from Meteorological Department and AGRITEX Extension Offices as well as through a review of scholarly journal articles, books, and reports (Mugenda and Mugenda, 2003). This descriptive design is based on the case study method where Wards 13 and 30 were taken as the case studies. The descriptive design was chosen because first-hand information was gathered from residents of wards 13 and 30 Musana, Bindura District. The design consisted of surveys and observations in which self-administered questionnaires were used to obtain information and it acts as a blueprint for a study as it guides data collection and analysis.

3.3 DATA COLLECTION METHODS

Rapid Communal Appraisal (RRA) (transect walks, identification and inspection of communal communities) was used first to encourage the respondents to describe their

relationship with their natural resources and their awareness about the changing climate. This helped in identifying variables of importance to the communal dwellers and in the formulation of questions that was included in the more formal semi- structured interview schedule and questionnaires in locally meaningful terms.

3.4 SAMPLING AND JUSTIFICATION

3.4.1 THE SAMPLE

The researcher worked with a convenient sample of 200 respondents since it was difficult to cover the entire population in the two wards with a population of 2520, ward 13 with 312 households and ward 30 with 211 households according to Zim Stats (2012), (Five included one Community Leader, Local Councillor, Policy marker/parliamentarian, Agricultural Extension Workers representative and Climate Change Expert for qualitative interviews and 195 communal people, for questionnaire survey). The main reason for this is to achieve the best results within a short limited time, resources and scope of research in a manner that would accomplish the research objectives.

3.4.2 SAMPLING METHODS

Two sampling methods were relied on during the research in the field. The sampling methods depended on the research method that was applied at that particular time. Considering the prevailing economic situation in Zimbabwe, the two methods were the most appropriate to quickly gather data from the field. The methods that were used are convenience sampling and snowball sampling.

3.4.3 CONVENIENCE SAMPLING

Basing on field circumstances already explained above, time, transport and financial resources demanded that only those most accessible people be interviewed. Expedience, chance and opportunity rather than deliberate intent determined the sample of respondents. Accordingly, convenience sampling relies on what is available to the researcher. This sampling method was helpful in the questionnaire survey. According to Chiromo (2009), convenience sampling involves choosing the nearest individuals to serve as respondents for example interviewing the first individual one encounter or using volunteers. However, the main weakness of this sampling method is that it may not be representative of the population. To overcome this weakness, the researcher used observation to try to balance the composition of respondents' chosen for questionnaire survey.

3.4.4 SNOWBALL SAMPLING

The researcher relied on the local leaders for reference to those people who could give informative questionnaire interviews. Through this sampling method, a short list of interviewees was drawn. The population of the communal areas in Ward 13 and 30, Musana Bindura passes for what Deacon *et al*., (1999) refer to as very closed or informal social groupings, where the social knowledge and recommendations of the initial contacts are crucial for opening up and mapping tight social networks. It is in such settings where snowball sampling is mostly used.

3.5 RESEARCH INSTRUMENTS

3.5.1 QUESTIONNAIRE SURVEY

In this research both closed and open ended questionnaires were used. A total of 189 random conveniently sampled communal people were interviewed using a structured questionnaire. The sample size was large enough to increase the validity of the information obtained. The researcher administered the questionnaires personally by hand directly. The research questions and objectives of the study influenced the questions used in the study. Information collected was characterised in three categories in accordance to Chiromo (2009) that is, basic demographic characteristic of respondents; information on knowledge and perceptions (memories and experiences regarding climate changes) and information on problems being encountered as well as recommendations. The questionnaire was therefore divided into two sections that is, A and B. Section A was meant to obtain the residents' basic demographic data. It sought information on the demographic and other socio-economic characteristics that have implications on the farmers' awareness, attitudes and knowledge about climate change. These characteristics include gender, age, sources of income, annual incomes, education, farming experience in years, household farm size and period of stay in the area and livestock ownership. The questionnaire asked for information on whether there are any supporting organizations and the form of information they are given since these have an influence on their climate change awareness. Section B sought information on the residents' awareness on climate change causes and its impacts. Respondents were asked questions about sources of information that influence their decision making and perceptions. Questions that were asked included whether the farmers have observed any changes in climate, the period of observation and the observed changes on the climatic change. The section also sought information on the perceived causes of changes. The respondents were also asked if the changes were affecting them and also the effects if any.

3.5.2 KEY INFORMANT INTERVIEWS

Formal interview was conducted with AGRITEX officials in the two Wards on their awareness and perceptions about climate change and the implications on communal land. The AGRITEX officials were interviewed to corroborate the residents' claims because they work closely with the communal farmers. A list of predetermined questions, that is, interview guide was used. The interview guide was used to ensure that interviewees respond to a similar series of questions. The questions were open ended in order to give room for probing for information from the interviewee. The interview guide approach has the advantage that the researcher remains focused on aspects to be looked at in the research without diverting from the topic. Interviews with AGRITEX official members were targeted to take at least 30 minutes. AGRITEX officials were interviewed because they understand the climate change and variability issues better than the residents'.

3.5.3 OBSERVATION

Direct observation was used as a data gathering tool. Observation was used to improve upon other research methods applying what Chiromo (2009) say about observation as a method that deploys a number of methods including observation, talk and interviews, and scrutiny of documentary sources. Community participation and the hidden truths of power dynamics, control and agenda-setting processes involved in climate change was observed and recorded through this method.

3.6 DATA ANALYSIS

In order to give an accurate picture of the findings, the researcher analysed the data using Statistical Package for the Social Sciences (SPSS) version 24 and Microsoft excel. Unrecorded answers, inappropriate responses were addressed through data editing/cleaning which included duplication consistence, validity edits and statistical edits. Cross tabulations of the ages, sex of respondents, sex of household head and the education levels of household heads were done to determine if they are correlated.

CHAPTER 4: RESULTS

4.1 QUESTIONNAIRE RESPONSE RATE

The desired sample size for this study was 200 respondents. Since the researcher used convenient snowball sampling, twenty (20) people were initially randomly chosen to participate in the study.

These twenty were chosen so that they would refer the researcher to others in the community whom they thought to know more about climate change. However, out of these, approached, one declined to participate resulting in 19 responses. The 19 who responded further referred the researcher to other 77 respondents and a total of seventy seven referrals were approached. Out of the seventy seven, seven declined to participate for unknown reasons. The seventy who agreed to take party in the research further referred the researcher to other one hundred and fifteen (115) referrals for further questionnaire interviews to give a total of 212. However the researcher only approached 98 respondents since the total tally was now exceeding the desired sample size. Of the 98 approached, three again declined to participate for unknown reasons resulting in 95 responses. Five slots were reserved for key informant interviews. This gives a total of 189 responses out of 200 which represents a 94.5% acceptance rate. The decline by some respondents to participate in the study was attributed to suspicion among the communal people who perceived the researcher to be a government spy.

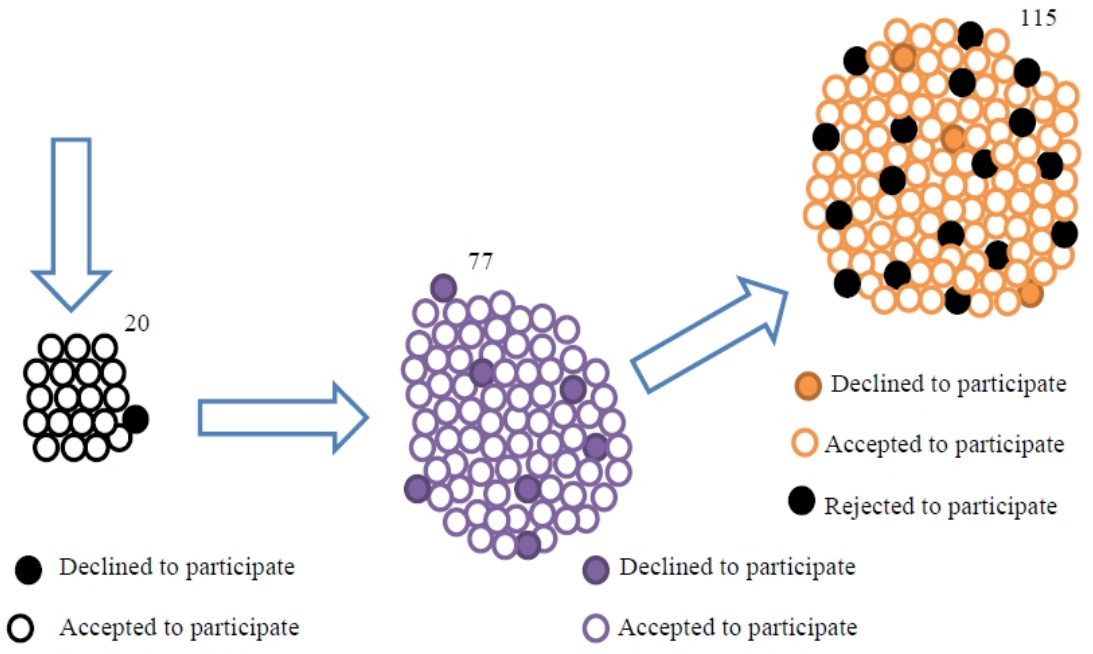

Figure 4. 1: Selection of respondents using convenient snowball sampling.

4.2 RESPONDENTS' GENDER CHARACTERISTICS

The distribution of respondents by gender was almost even. The total number respondents approached for the study were 189. Of the 189 respondents, 50.3% (n = 95) were females while 49.7% (n = 94) were males. This distribution was not systematically chosen but occurred randomly as respondents cumulatively referred others to be contacted for the study This distribution might however suggest that Wards 13 and 30 in Musana, Bindura has slightly more females than males. Figure 4.2 below shows distribution of respondents by gender.

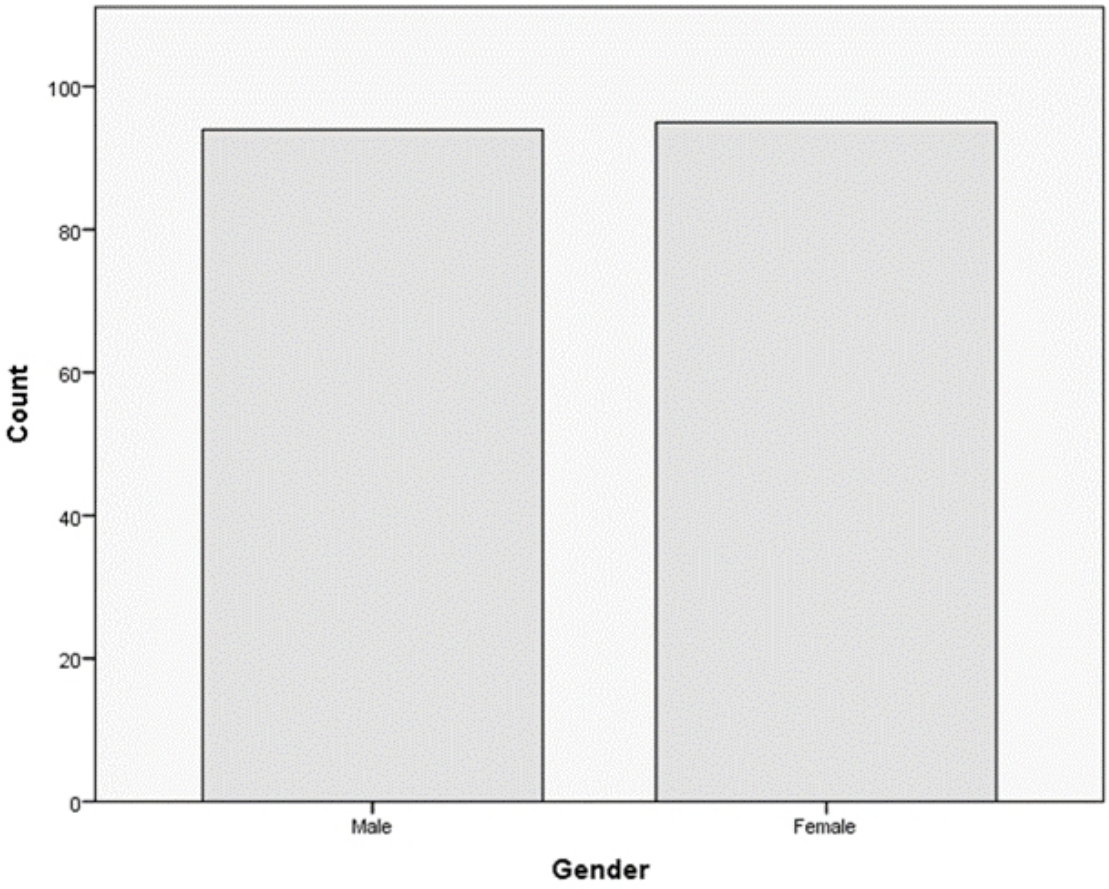

Figure 4. 2: Distribution of respondents by gender

Majority of respondents 54% (n = 102) were between 31-45years of age, while 26.5 (n = 50) were below 30 years of age. An additional 16.9% (n =32) were aged between 46-60years while the remaining 2.6 (n = 5) were 61 years and above. This shows that almost all the respondents used in this study were adults who had enough climate change experience in the area.

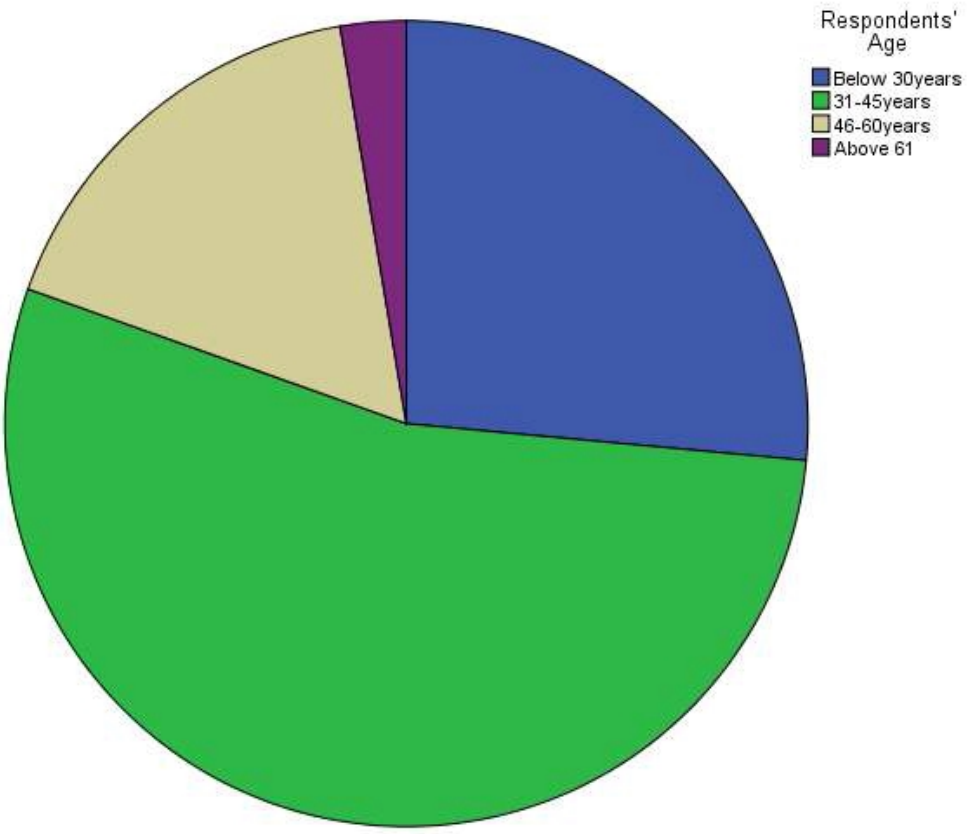

Figure 4. 3: **Distribution of respondents by age groups**

Almost half of the respondents, 49.7% (n = 94) said they have been staying in the area longer than thirty years or since birth. Their experiences in the environment exceed three decades and this means that they have enough knowledge on how the weather and climate have changed over three decades. The remaining 38.1% (n = 72) said they have stayed in the area for a period between 16-30 years while 12.2% (n = 23) said they had stayed in the area for less than 15years.

4.3 DISTRIBUTION BY RESPONDENTS' LEVEL OF EDUCATION

Most of the respondents attended school up to Secondary level that is 70.9% (n = 134), while 16.9% (n = 32) attended up to primary school, 10.1% (n = 19) had tertiary education and the remaining 2.1% (n = 4) had no education (not attended any formal school). The levels of literacy in the area are high as evidenced by higher percentage of people that had attended formal education with a cumulative percentage of 97.9% (n = 185).

4.4 DISTRIBUTION OF RESPONDENTS BY EMPLOYMENT STATUS

The results show that majority of respondents in the study area were not formally employed. This is evidenced by a higher percentage of respondents 52.9% (n=100) indicating that they were not employed. A higher percentage also revealed that they were self-employed, 36%, (n=68) while only 11% (n=21) recorded that they were employed. The table 4.1 shows a summary of the employment status of respondents

Table 4. 1: Employment status of respondents.

		Frequency	Valid Percent
Valid	Employed	21	11.1
	Not Employed	100	52.9
	Self Employed	68	36.0
	Total	189	100.0

Further probing of respondents in the field revealed that the main sources of income of respondents in the area of study were livestock sales, cash crop sales especially tobacco, pension, casual labour and business. Some of the respondents had multiple sources of income. Tobacco sales were identified as a source of income by a large percentage of the respondents. Some of the respondents said they get their income from livestock sales. Casual labour was also identified as a source of income by some of the respondents while others indicated that they get incomes from remittances. The sources of income of respondents were significant because they exhibit the degree of interaction and dependency of the population in the study area to their environment and climate. A higher level of interaction shows that respondents have in one way or the other been affected by climate change in their operations for survival. This helped the researcher to find out whether the respondents were aware of climate change that was in one way or the other affecting their day to day operations.

4.5 COMMUNAL PEOPLE'S AWARENESS OF CLIMATE CHANGE

Respondents were asked to state how much they know about climate change as a guiding question on communal people's perceived awareness. Responses to this question were intended to give a synopsis view on Wards 13 and 30 communal people's belief about their level of awareness on climate change and ranged from "I have never heard of it" to "I know more about it." The result of the analysis of this question is presented in Table 4.2

Table 4. 2: Respondents' knowledge about climate change

		Frequency	Valid Percent
Valid	I have never heard of it	17	9.0
	I know a little about it	155	82.0
	I know more about it	17	9.0
	Total	189	100.0

The results shown in Table 4.8 depict that the residents of wards 13 and 30 Musana, Bindura are not significantly aware of climate change. Only 9% (n = 17) of the respondents included in this research claimed to know more about climate change, while the majority 82% (n = 155) knew a little about climate change. On the other hand another 9% (n = 17) had never heard of climate change.

In line with the above, it was assumed that respondents who claimed to be aware of climate change should be able to understand what climate change is all about even in a lay-man's language. As such, respondents were asked to express the definition of climate change so as to probe their understanding of the phrase "climate change." The results from this question are shown in the table 4.3.

Table 4. 3 : Responses on the meaning of climate change

Climate change means	Frequency	Valid Percent
Rising global temperatures	111	58.7
Changes in the average weather conditions towards extremes recorded over long periods	26	13.8
Short term variations in weather patterns	33	17.5
Hole in the ozone layer	13	6.9
Other	6	3.2
Total	189	100.0

Findings revealed that an overwhelming majority, 86.3% (n = 163), of the 189 respondents who provided a response to this question was unable to give the correct definition of climate change and associated it with rising temperature (58.7%), short term changes in average

weather patterns (17.5%), hole in the ozone (6.9%) and other (3.2%). Surprisingly, only 13.8% (n = 26) of the respondents understood climate change as changes in the average weather conditions towards extremes recorded over long periods, which was the correct definition of climate change.

Besides understanding the right definition of climate change, knowledge of the causes of the current climate change was another good measure of awareness. It was therefore of necessity to analyse whether communal people's opinions on the causes of the current climate change conform to the widely accepted scientific consensus. Thus respondents were asked to state whether climate change is caused by human, natural or both factors first and the results are shown in fig 4.4.

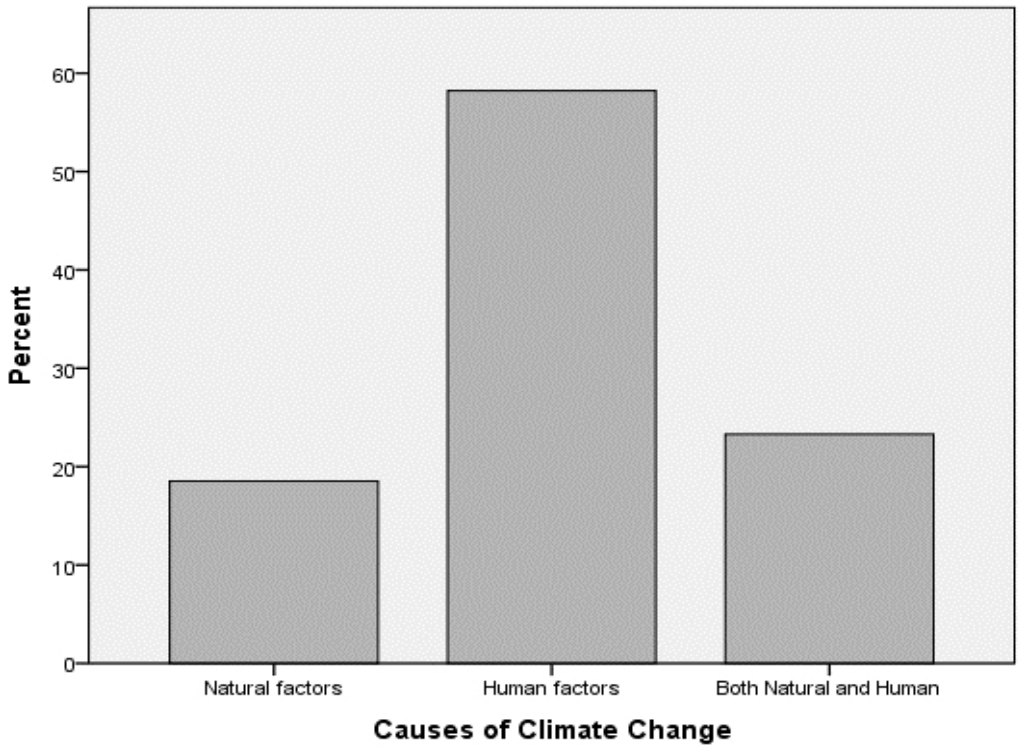

Figure 4. 4: Respondents' views on the causes of climate change

Results in the figure show that majority of respondents view climate change as human induced with 58.2% (n = 110) while only18.5% (n = 35) said that climate change in caused by natural factors. A further 23.3 % (n = 44) viewed climate change as caused by both natural and human factors.

Although the period of stay in the area of study varied markedly, an overwhelming majority 96.3% were positive that they have observed variations in the climate of the area under study while only 3.7% were negative.

Table 4. 4:Period variations were observed

		Frequency	Valid Percent
Valid	Past 5years	28	14.8
	Past 10 years	38	20.1
	Past 15years	40	21.2
	Past 20years	31	16.4
	Past 25years	30	15.9
	Over 30years	22	11.6
	Total	189	100.0

The results show that variations have been observed over a period of five years. A large Percentage of respondents 21.2% (n = 40) showed that they have observed the variations over 15 years while only 11.6% (n = 22) showed that they had observed the variations for over 30years of staying in the area. As a follow up of the above, respondents were asked to indicate the ways they think the climate has changed within their area. The results are shown in table 4.5

Table 4. 5 shows how the climate has varied in the area

		Frequency	Valid Percent
Valid	Decreased precipitation	43	22.8
	Increased variability of precipitation	13	6.9
	Increased temperature	71	37.6
	Rainfall starts late and ends early	6	3.2
	Decreased temperature	6	3.2
	Increased incidences of droughts	35	18.5
	Increased risk of flooding	8	4.2
	Long dry spells during the rainy season	7	3.7
	Total	189	100.0

The results show that a large percentage of respondents 37.6% (n = 71) stated that they have observed the climate changing in form of increased temperatures, while another 22.8% (n = 43) stated that they have observed a decrease in precipitation. A further 18.5% (n = 35) stated that they have observed increased incidences of drought in the area while a small percentage 6.9% (n= 13) stated that they had observed increased variability of precipitation. A paltry 3.7% (n = 7) stated that they had observed long dry spells during the rainy season while a further 4.2% (n =8) stated that they had observed increased risk of flooding. In addition, 3.2% (n = 6) stated that the have observed that rainfall starts late and ends early while a surprising 3.2% (n = 6) stated that they have observed a decrease in average temperature.

Table 4. 6 : How Climate change has affected respondents' lives

		Frequency	Valid Percent
Valid	Reduced Yields	64	33.9
	Shortened growing season	22	11.6
	Increased incidences of pests and diseases	5	2.6
	Reduced pastures	16	8.5
	Reduced Livestock	31	16.4
	Food Insecurity	26	13.8
	Reduced Water for domestic use	19	10.1
	Reduced Incomes from Farming	6	3.2
	Total	189	100.0

The results show that a larger percentage 33.9% (n = 64) stated that climate change has affected them by reducing their agricultural yields while 16.4% (n = 31) stated that climate change has affected them by reducing their livestock. A further 13.8 (n = 26) stated that they have been affected by food insecurity whereas 11.6% (n = 22) responded that they have been affected by a shortened growing season. Also, 10.1% (n = 19) of respondents stated that they have been affected by reduced water for domestic use while a further 8.5% (n = 16) said they have been affected by reduced pastures. Only 3.2% (n = 6) and 2.6% (n = 5) stated that they have been affected by reduced incomes from farming and increased incidences of pests and diseases respectively.

Further alternating statements on climate change causes and impacts asking respondents to rate those expressing their level of agreement with each statement on the Likert scale were used during the survey and in data analysis. Respondents were asked to rate whether they; Strongly Disagree, Disagree, Don't know, Agree, Strongly Agree with statements on climate change causes, effects and mitigation. Results of the analysis of responses to these statements are presented in Table 4.7

TABLE 4.7 RESULTS FROM THE ANALYSIS OF RESPONSES TO CLIMATE CHANGE STATEMENTS

Table 4. 7: Climate change causes

Statements on causes, effects and mitigations of CC	SD	D	DK	A	SA	TOTAL
Climate Change is caused by Natural factors (Climate change is natural)	5.3%	15.%	36%	34.9%	8.5%	100%
Climate change is caused by human activities such as combustion of fossil fuels and air pollution from industries and poor agricultural practices	7.4%	14.3%	24.3 %	41.8%	12.2%	100%

Table 4. 8: Climate change effects

Climate change is associated with the increased frequencies of droughts and floods	2.1%	6.3%	3.7%	77.2%	10.6%	100%
Climate change leads to rise in sea Levels	1.1%	7.9%	81.0%	9.0%	1.1%	100%
Climate change leads to food Shortage	3.2%	2.6%	5.8%	69.8%	18.5%	100%
Climate change leads to shrinking of lakes and rivers	1.6%	4.8%	28.0%	58.2%	7.4%	100%
We should not be concerned about climate change	8.5%	55.0%	24.3%	8.5%	3.7%	100%
Temperatures have risen	1.1%	7.4%	9.5%	57.1%	24.9%	100%

over the years in wards 13 and 30 Chesa						

Key: SA = Strongly Agree, A = Agree, DK = Don't Know, D = Disagree, SD = Strongly Disagree

Respondents were also asked to state problems they think are associated with climate change awareness in their area. The results are shown in table 4.9

Table 4. 9: Problems associated with climate change awareness

		Frequency	Valid Percent
Valid	Lack of information from government	77	40.7
	Lack of support from government	29	15.3
	Lack of capital by government	30	15.9
	Lack of will by the government	32	16.9
	Unreliable information	21	11.1
	Total	189	100.0

4.6 SOURCES OF CLIMATE CHANGE AWARENESS AMONG COMMUNAL COMMUNITIES

Having established that some residents of wards 13 and 30 Musana, Bindura are aware of climate change, establishing the sources of awareness became equally important. Medium of information transfer, seminar attendance and availability of climate change materials were considered potential sources of information transfer. As such, respondents were asked to state the main source of their climate change knowledge so as to find out whether there were any sources of climate change information available to them. The results are as shown in Table 4.10.

Table 4. 10: Source of information on climate change

		Frequency	Valid Percent
Valid	Radio	102	54.0
	Newspapers	16	8.5
	Agricultural Extension Officers	23	12.2
	Friends	13	6.9
	Internet	8	4.2
	NGOs	16	8.5
	Indigenous Knowledge Systems	11	5.8
	Total	189	100.0

The results show that majority 54.0% of respondents' source of climate change information is the radio. This proves that radio as a medium of communication is widely used and is very effective as a source of climate change information in communal areas of Zimbabwe. Another main source of climate change information is AGRITEX officers with 12.2% of respondents stating that they get climate change information from them. The other sources of climate change information stated were Newspapers (8.5%), Friends (6.9), Internet (4.2%), NGOs (8.5%) and Indigenous Knowledge Systems 5.8%. The residents were further asked about the mitigation and adaptation strategies. The fig below shows the mitigation and adaption strategies

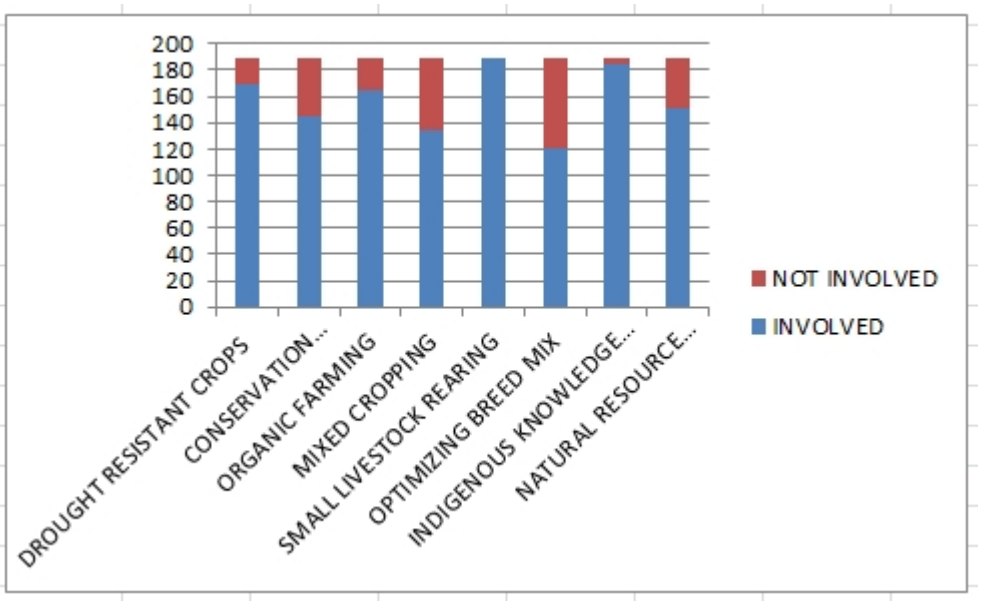

Figure 4. 5: Adaptation and mitigation strategies of Climate Change

The results above shows that most of the residents are involved in Climate change coping strategies. 170 of the residents were involve in the growing of drought resistant crops, 145 involved in conservation Agriculture and 44 were not, of the sample 165 used organic manure and 24 were not, mixed cropping was done by 134 residents of the sample.189 residents kept small livestock and 184 believed in Indigenous Knowledge System and 151 manage the Natural Resources .

CHAPTER 5: DISCUSSION

5.1 COMMUNAL PEOPLE'S AWARENESS OF CLIMATE CHANGE

Only 17 respondents ought to know more about climate change. These results may be taken to mean that communal people in Wards 13 and 30 Musana are not significantly aware of climate change, such a conclusion may well be misleading as knowing a little or a more about climate change at this level might mean just knowledge of the phrase "climate change" or even misinformed knowledge about climate change. These results concur with findings from a study carried out by Oruonye (2011) in Nigeria which revealed that 81.8% of students in tertiary institutions in Jalingo Metropolis, Nigeria were aware of climate change based on the question that asked them whether they had heard of climate change. When the same respondents were probed further, an overwhelming majority of students (89%) who fell in this category did not understand what climate change is all about. The author, therefore, concluded that students in tertiary institutions in Jalingo Metropolis, Nigeria have a low level of awareness on climate change, (Oruonye, 2011). It was thus necessary to further probe respondents who claimed to know a little or a great about climate change to detailed questions on the same topic and hence makes an informed conclusion as to whether or not residents in Wards 13 and 30 Musana, Bindura are aware of climate change.

Responses on the meaning of climate change proved beyond any reasonable doubt that majority of respondents who took part in the research don't know the correct definition of climate change. This might point to the conclusion that the residents of Wards 13 and 30 Musana, Bindura have very poor knowledge about climate change and only know it in passive. Those results are not new and confined to the two wards of Musana, Bindura, Zimbabwe (13 and 30), but concur with findings of researches from other parts of the world. For example in a similar results were presented by Adebayo et al. (2013) who also found out that 90% of the populace in Adamawa State, Nigeria claimed to be aware of climate change, but only 70% of those who claimed to be aware knew the causes of climate change.

Having established that residents of Wards 13 and 30 Musana, Bindura are partially aware of climate change, but with gaps in their knowledge, it was necessary to assess their level of awareness. This was achieved by using a composite awareness scale developed using summative method, which added respondent's score for the 12 Likert items on climate change awareness. Low level of awareness category, respondents in this category remained negative (i.e. either disagreed or strongly disagreed) to the positive statements and positive (i.e. either agreed or strongly agreed) to the negative statements. Respondents who fell in this category were considered unaware of climate change. Medium level of awareness category, respondents in this category had mixed responses in either direction of the statements. Respondents who fell in this category were considered aware of climate change, but with gaps in their knowledge. High level of awareness category, respondents remained positive (i.e. agreed or strongly agreed) to the positive statements and negative (i.e. disagree or strongly disagreed) to the negative statements. Respondents who fell in this category were considered highly aware of climate change.

The respondents recorded a low composite awareness mean which when interpreted denote a low level of climate change awareness. This shows that even though residents of Wards 13 and 30 Musana, Bindura is aware of some of the concepts of climate change, there exist gaps in their knowledge of the same. These results are consistent with the results found earlier in the previous section of this discussion, which also revealed that residents of Wards 13 and 30 Musana, Bindura are partially aware of climate change though with some noticeable gaps in their knowledge. By comparison, studies reporting the level of climate change awareness in Zimbabwe reveal a low level of climate change awareness among Zimbabweans (GoZ, 2010).

As a matter of confirmation, respondents' level of awareness was cross tabulated against their awareness of UNFCCC, Kyoto Protocol and IPCC as well as their knowledge of climate change. Results show that respondents who fell in the low level of awareness category also indicated having not heard about the UNFCCC, Kyoto Protocol and IPCC. There is also a tendency of respondents who fell in the high level of awareness category to state being unaware about the existence of such important climate change instruments/institutions such as UNFCCC, Kyoto Protocol and IPCC. It was thus concluded that even the respondents who fell in the high level of awareness had gaps in their knowledge of climate change hence a medium level of awareness for the whole population was deemed appropriate.

5.2 RESPONDENTS' VIEWS ON THE CAUSES OF CLIMATE CHANGE

58.2% of the people included in this research stated that Climate change is caused by human factors these include deforestation, mining, urbanisation, industrialisation and nuclear power generation. 18.5% of respondents said that it is caused by natural factors these are: natural fires, droughts and volcanic eruptions. The remaining 23.3% said that it is caused by both natural and human factors. This distribution points to the idea that the residents of Wards 13 and 30 Musana, Bindura concur with globally acceptable views that the current climate change is anthropogenic driven. This is supported by various available literatures which also support widely accepted scientific consensus across the world that the current climate change is anthropogenic driven. This is further supported by an analysis done by Cook *et al.,* (2013) on 11, 944 peer-reviewed articles, only 0.7% of the abstracts rejected the view that climate change was a result of anthropogenic factors, Greenhill *et al*., (2013).

Findings from the results exhibit that communal people support the view that the current climate change is anthropogenic, (58.2% of the respondents agreed), but are not sure whether the effect of natural factors should be ruled out of the same (18.5% disagreed while 23.3% said both natural and human cause climate change). This was confirmed through a chi-square analysis, which also revealed an insignificant relationship between responses to these two statements. That is, it is not guaranteed that respondents who agree to the theory that the current climate change is anthropogenic will disagree to the theory that natural factors are to blame for the current climate change. These results point to the fact that residents of Wards 13 and 30 Musana, Bindura are not sure whether or not anthropogenic activities bear the greatest blame on climate change and thus do not conform to the scientific consensus. This also reflects the existence of some gap in communal people's knowledge of climate change.

5.3 RESPONSES TO IMPACTS OF CLIMATE CHANGE

The results point to the fact that communal people understand the impacts of climate change based on their day-to-day interaction with the environment. This explains why food shortages and increased frequency of floods and droughts were considered the most significant effects of climate change while sea level rise was least understood as an effect of climate change. These findings concur with studies done in Kenya where finding by Otieno, Pauker and Maina (2009), also revealed deforestation and pollution as the main causes of climate change mentioned by Kenyans while droughts and floods emerged top in the Kenyans list of climate change impacts. The authors concluded that Kenyans only understand climate change from their day-to-day interaction with the environment and therefore global aspects of climate change like combustion of fossil fuel and sea level rise remain abstract in their knowledge of climate change.

In line with the above, majority of respondents also agreed that Ward 13 and 30's average temperatures have been increasing over the year. Although there is no scientific evidence to substantiate their claim, 82% of responses were positive that the temperatures in their area have risen significantly over the years while only 18% were negative, with 9.5% expressing that they don't know. These findings are in tandem with globally accepted scientific consensus that world's average temperatures are on an upward trend. Available scientific evidence shows that the earth experienced an average warming of approximately 0.6 °C during the 20th Century (IPCC, 2001) and is expected to warm by about 2-3 °C by the end of the 21st century (IPCC, 2007). Holdren (2006) observed that the last 50 years of the 20th Century were the warmest in 600 years.

However, there is no evidence to prove that being impacted by climate change makes someone aware of it therefore the researcher is not banking on that the residents of wards 13 and 30 are aware of climate change because they have been largely negatively affected by it.

5.4 FACTORS INFLUENCING WARDS 13 AND 30 RESIDENTS' AWARENESS OF CLIMATE CHANGE

This study was not only designed to assess rural people of awareness on climate change, but also to explore some of the factors affecting their level of awareness. The results show a weak association between the respondents' level of climate change awareness and various demographic attributes including gender, age and highest level of education, all of which

yielded a correlation coefficient of at least 0.1. Only the former attributes (gender, age, and highest level of education) were explored further to determine their influence on the respondents' level of awareness on climate change.

5.4.1 GENDER

Findings show that gender is a key determinant of climate change awareness on climate change as has been revealed by most studies. Being male or female influences people's access to information and eventually influences their knowledge of climate change (Patchen, 2006). Most documented studies have revealed that men are generally more aware of climate change than women (Patchen, 2006). Based on the analyses presented in this section, it was concluded that gender may have some influence on teachers' level of awareness on climate change, but the influence remained statistically insignificant in this study. Similar results were revealed by Acquah (2011) who also found the possibility of gender influence on the respondents' level of awareness on climate change, but the results were not statistically significant. Studies by Olajide *et al.,* (2011) and Ekpoh and Ekpoh (2011) however found statistically significant gender influence on tertiary students and teachers level of climate change awareness respectively.

5.4.2AGE

Apart from gender, age is another key determinant of the level of awareness on climate change. This means that the level of climate change awareness increases with increase in age. A computation of awareness mean scores revealed that the scores increases with increase in age from younger to older age groups, but this was only true up to age 45 years above which increase in age did not produce any influence on respondents level of climate change awareness. Results show that respondents in the age category 31-45 recorded the highest awareness mean while those who fell in the age category of below 30 recorded the lowest. Those in the age group above 61 showed the highest knowledge of indigenous knowledge systems as noted by the researcher through further probing. However, the results contradict the findings of Owolabi, Gyimah and Amponsah (2012) who revealed that younger students Ghana's junior high school are more aware of climate change and sustainable development than older students even though their results were also statistically insignificant. Results revealed noticeable evidence of age influence on respondent's knowledge of climate change. All the respondents who reported having not heard about climate change fell in the age category of below 30 years. Just like in the case of gender, it was concluded that age may

have some influence on rural peoples' level of awareness of climate change, but the influence remained statistically insignificant in this study.

5.4.3 HIGHEST LEVEL OF EDUCATION

The results portray an increase in the level of awareness with increase in the level of education. Communal people with tertiary education appeared to be more conversant with climate change issues. This may be interpreted to mean that climate change knowledge is extremely lacking in those with low education levels. A look at the frequency counts of the distribution of respondents in revealed that respondents with up to tertiary education level are more aware of climate while those with low education levels are less aware of climate change.

5.5 ADAPTATION AND MITIGATION STRATEGIES IN WARDS 13 AND 30 MUSANA, BINDURA

The researcher noted that the adaptation and mitigation strategies being implemented in Wards 13 and 30 Musana, Bindura are mainly Community Based Adaptation (CBA) Strategies. The researcher observed that the dominant adaptation strategy in Wards 13 and 30 of Musana is Community Based Adaptation (CBA) which is enhancing sustainable livelihood options. The strategies that have been implemented in Wards 13 and 30 of Musana include improvements in water availability for agriculture through establishment of large scale irrigation schemes, rehabilitation of existing irrigation schemes, centralized community gardens, green houses, adoption of small seed grain and adoption of indigenous knowledge system just to mention but a few. The researcher, through observation and interviews carried out noted that though communities are adapting to the effects of climate change there seem to be lack of knowledge about the phenomenon of climate change.

5.5.1 DROUGHT RESISTANT CROPS

Drought resistant crops such as sorghum, yellow maize, rapoko and millet have been introduced in wards 13 and 30 Musana, Bindura. Cowpeas and sesame have also been introduced in the wards in order to curb the effects of climate change and adaptation. These type of crop varieties are resistant to dry climatic conditions and favourable for Musana, Bindura little rainfall capacity. Despite dwindling rainfall patterns of less than 250mm (Moyo 2012) experienced in the district over the years, communities have still managed to maintain bumper harvests of about 1000 to 1200 kilograms per hectare of cow peas and sesame as a result of the shift to growing drought tolerant crops. Research carried out by health experts

has found out that drought resistant crops have high nutritional value. One respondent highlighted the fact that cow peas and sesame have provided them with extra income for sustaining their livelihoods. One respondent highlighted the fact that cow peas and sesame have provided them with extra income for sustaining their livelihoods. In light of the above, a farmer in ward 13 also noted that over the past years, they have been facing challenges in harvesting maize as a result of the poor erratic and sporadic rainfall patterns witnessed over the years. The farmer highlighted the fact that on average, they used to harvest 200 to 300 kilograms of maize per hectare which amount to four (4) to six (6) bags respectively. According to the farmer, this could hardly sustain their food consumption levels at household level to the next season. He highlighted the fact that on average a family requires one and a half bags of maize per month for consumption which meant that with the 4 to 6 bags of maize harvested per hectare, this could only sustain them for about 4 to 2 months leaving them food insecure thereafter. In most cases, this often led to the communities over reliance on food supplements from the government and non-governmental organizations working in the district.

5.5.2 CONSERVATION AGRICULTURE

In Bindura District, the researcher observed and also noted through interviews that communities have resorted to conservation farming as a panacea to curbing the effects of climate change. Owing to the effects of climate change, communal farmers in the district were unable to harvest well; their crops were often affected by high temperatures. Through interviews, the researcher noted that the highest temperatures averaging 26*C, poor and sporadic rainfall of less than 250 mm per annum. With the coming in of conservation farming, farmers were able to practice minimum tillage, conservation of water through digging holes where water for the crop is planted and also saving inputs like fertilizer by placing the fertilizer directly on the crop. This has enabled farmers to engage in environmentally friendly farming practices but producing high yields at the same time.

In an interview carried out by the researcher with AGRITEX officers revealed that maize production had increased tremendously by 30% as compared to the previous years where in most cases householders were not food secure, they had limited access to food, though there have not been able to eliminate food insecurity totally, there is significant evidence that if communities are educated more on conservation farming, they can realize high yields as evidence shows that conservation agriculture is indeed working.

5.5.3 ORGANIC FARMING

Organic farming is also another strategy that has been implemented in wards 13 and 30 of Musana in order to deal with the effects of climate change. Organic farming is a type of farming that avoids the use of pesticides, fertilizers and genetically modified seeds (Hicknel 2013). Organic farming seeks to use natural methods like manure, compost just to mention but a few for agricultural purposes. It is a type of farming that is environmentally friendly and reduces harm to the environment. Through observation, the researcher noted that farmers in wards 13 and 30 of Musana have opted for organic farming as a means of increasing their maize productivity. Organic farming has enabled the farmers to maximize their yields and minimize costs at the same time. Through interviews with farmers in the district, the researcher noted that organic farming was more preferable as compared to conventional farming as it is cheap and maximizes profits. One farmer highlighted the fact that conventional farming practices require 300kgs of Ammonium Nitrate and 300kgs of Compound D fertilizer per hectare. The researcher also found out that a bag of Ammonium Nitrate and Compound D fertilizer costs $45 and $35, respectively. In light of this, for a farmer to plant their maize with fertilizer, whereas if they are to practice organic farming they incur no costs at all, as they use manure from cattle dung in the area and other organic material. Agricultural extension officers in the area, continued to reiterate that there has been a 20% increase in maize production as a result of farmers practicing organic farming. Thus organic farming has been an effective adaptation strategy as it has made sure that farmers do not incur costs of purchasing fertilizers but still maintain high yields.

5.5.4 MIXED CROPPING

Interviews conducted in the region revealed that mixed cropping is also an adaptation mechanism that has been implemented in wards 13 and 30 of Musana. The district has been relying on rain fed agriculture for the production of maize, groundnuts and roundnuts which are the traditional crops in the area. However the harvest per tonnes has dropped to less than 30% in the past twenty years (Grain Marketing Board (GMB) report of 2015). This has been caused by reduced, sporadic rainfall of less than 250 mm as argued by Moyo (2012) which have ultimately led to serious food insecurity in the district. As an adaptation strategy employed to enhance food security as indicated by food shortages, improvement in mixed farming is an adaptation strategy employed in wards 13 and 30 of Musana where different crops are grown in one field, for instance maize and nitrogen fixing groundnuts to increase maize production. This has enabled communities to enhance their climate change resilience. It was also noted through interviews that before farmers adopted this mechanism, they would produce an average of six bags of maize which is insignificant in terms of promoting food security, as their plants were more susceptible to climate change.

5.5.5 SMALL LIVESTOCK REARING

Livestock has also been affected as a result of climate change in wards 13 and 30 of Musana, Mt Darwin. An interview carried out with an AGRITEX Officer in the area revealed that more than 60% of the districts herd has been affected. Livestock provides draught power, meat and milk to supplement the diet of people in wards 13 and 30 of Musana, Bindura. The government through the ministry of agriculture and livestock production has embarked on improved livestock production. Cattle rearing in wards 13 and 30 of Musana has been the most dominant livestock activity but has also been on a decrease due to poor climatic conditions which have resulted in the recurrence of drought more particularly the 1992 and 2002 drought which killed notably more than 60% of the district herd cattle in the area as reported by the veterinary department. Veterinary report 2008 indicates that diseases like red water killed more than 60% of the cattle in the drought of 1992 and the district has not increased to reach its height since then. In response to the above, the district embarked on a small livestock production as climate change adaptation strategy in a bid to cope with the effects of climate change on the environment. Households in wards 13 and 30 of Musana, Bindura are now rearing goats and sheep in the area in response to the effects of climate

change. In an interview with an AGRITEX officer revealed that they had been encouraging farmers to shift to rearing small livestock as a coping strategy to climate change. The AGRITEX Officer also noted that the pastures that a single cow feeds on, 6 goats can feed on the same area. Henceforth, communities in wards 13 and 30 of Musana, Bindura have been encouraged to opt for small livestock, as they do not require as much grazing land as compared to cattle.

5.5.6 OPTIMIZING BREED MIX

Another strategy that has been implemented in wards 13 and 30 of Musana, Bindura is optimizing breed mix. This strategy is the process of cross breeding animals in order to have more resilient and more productive livestock varieties. Goat and sheep production have also been introduced in wards 13 and 30 of Musana, Bindura District to increase meat production. In communal areas people are more hesitant to kill or sell cattle as it symbolizes wealth and bear family respect as compared to goats where people can kill and improve their dietary needs henceforth improving their sustainable livelihoods options. Goat mixed breeds have been introduced for drought and disease resistance in wards 13 and 30 of Musana, Bindura area. In an interview with an AGRITEX officer in ward 13 revealed that a farmer in the ward on farm 502 cross breeding 1 Boer goat Ram with goats in the area. This in turn has improved the local breed of goats in the area. Goats are sold and money is used to supplement their diet and sending children to school. Thus optimizing breed mix has been an effective adaptation strategy in dealing with the effects of climate change in wards 13 and 30 of Musana, Bindura District**.**

5.5.7 INDIGENOUS KNOWLEDGE SYSTEMS

Owing to the districts over dependence on rain fed agriculture, indigenous knowledge systems have emerged as an adaptation mechanism for rainfall prediction (weather forecasting). The researcher, through interviews, noted that farmers in the wards continued to reiterate that indigenous knowledge systems provided a basis in predicting the coming season rainfall pattern. Mugabe et al (2010) defines Indigenous Knowledge Systems (IKS) as the traditional methods that have been developed by communities over years in dealing with the natural environment.

Residents of wards 13 and 30 of Musana have managed to increase their harvests by simply predicting rainfall patterns in the area. One farmer interviewed highlighted the fact that they use trees, bird movements, and animal species in the area to forecast how weather patterns will be for the coming season. The respondent in ward 30 went on to give an example of the "Mutsambatsi" tree where he said that if the trees flowers bloom and they do not fall off, it would mean that they would have a bumper harvest for the coming season and if they do not bloom at all this would mean that there would not be rains in the coming season.

Furthermore, residents of wards 13 and 30 have highlighted that Indigenous Knowledge system as a coping strategy has enabled them to make effective crop management decisions. Through interviews with farmers the researcher noted that farmers in the district are very much able to manage their crops effectively as through (IKS), they have been able to know when to plant their crops, the type of crops to use, and type of tillage this has resulted in high yields as the combination of Indigenous Knowledge Systems and rainfall predictions from the metrology department has enabled them to harvest and manage their crops. One farmer in ward 13 highlighted the fact that they are able to predict late rains with the help of IKS coupled with metrology department weather forecasts, and have in most cases opted to plant stagger their plants which resulted in a harvest of 12 tonnes of maize this last season.

5.5.8 NATURAL RESOURCES MANAGEMENT

Natural resource management is another adaptation strategy that is being carried out in wards 13 and 30 of Musana, Bindura. Through observation, the researcher noted that, the management of wetlands in the area has played a pivotal role in reducing climate vulnerability in wards 13 and 30 of Musana, Bindura. Protection of natural resources such as wetlands and mountain ecosystems has resulted in improvements in life styles for the people in wards 13 and 30 of Musana, Bindura. Ecosystems provide fresh water for domestic use and animals while mountains are good grazing lands and provide wood for energy. Thus the adaptation strategy has been effective in ensuring that the communities maintain their livelihoods though the researcher noted that the communities lack knowledge on the importance of wetlands and natural resources as there is over deforestation of trees in the area.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Climate change is a complex subject usually surrounded with a lot of scepticism hence the need for conclusive evidence to support climate change reality. Results of this study shows beyond reasonable doubt that Wards 13 and 30 Musana, Bindura are experiencing climate variability just like the rest of the country. The results of this study have revealed that residents of wards 13 and 30 Musana, Bindura are slightly aware of climate change though with gaps in their knowledge of the same. By implication, the relatively low level of awareness on climate change recorded by communal communities is a negative ingredient in the country's policy on climate change knowledge transfer, and the gaps existing in communal people's knowledge cannot be underestimated calling for capacity building to enhance their quality of knowledge on climate change. Factors such as gender, age, highest level of education, showed some level of influence on communal peoples' awareness of climate change though the influence remained statistically insignificant in this study.

Quite a number of mitigation and adaptation strategies were observed and are effective in preventing and reducing the impacts of climate change in wards 13 and 30 Musana, Bindura District.

6.2 RECOMMENDATIONS

6.2.1 The government should introduce climate change experts to work in communal communities in particular so that they carryout climate change awareness campaigns among the communal communities so as to increase climate change awareness among them. The Ministry of Environments and Climate Change should carry out a nationwide survey so as to find out factors that influence climate change awareness among communal communities so as to come up with a sound strategy to improve awareness. While this study gave a bird's eye view of the situation, the Ministry of Environment and Climate Change should carry out a countrywide survey on the level of climate change awareness among communal communities as part of a needs assessment for communal communities in Zimbabwe. The government also through the Ministry of Primary and Secondary Education should undertake to introduce climate change as a major examinable topic in the school curriculum starting at primary,

secondary up to tertiary level of education. This will help to make everyone in the community aware of climate change from an early stage.

6.4 RECOMMENDATIONS FOR FURTHER RESEARCH

6.4.1 Further research should be carried out to determine factors influencing communal peoples' level of awareness on climate change.

6.4.2 Researchers should also explore the link between level of awareness on climate change and behaviour change to inform any policy that seeks to make the public adopt positive environmental behaviour through awareness creation.

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APPENDICES

Appendix 1. 1: Questionnaire for communal people

Introduction

My name is Carole Tinotenda Tambara (B1337091) an undergraduate student studying for a BSc honours degree in Natural Resources Management at Bindura University of Science Education. Currently I am doing my research on Climate Change Awareness in Communal areas. I kindly ask you to fill the questionnaire as part of the research. The process may take 15-25 minutes. Your answers to the questions will be treated confidentially. The information will be used for academic purposes in this research only.

Please tick in the spaces provided (√)

Name of Interviewer	Carole Tinotenda Tambara
Date of Interview	
Ward	
Farm number	

SECTION A: DEMOGRAPHIC INFORMATION

May you provide information on the following, (Tick (√) where applicable

1. Sex of respondent: Female Male ☐

. 2. Age of Respondent: 30 and below ☐ 31-45 ☐ 46-60 ☐ above 61 ☐

3. Marital status: Married ☐ Single ☐ Widowed ☐

4. Highest level of education: Primary ☐ Secondary ☐ Tertiary ☐ No education ☐

5. How long have you been living the area? 1-15 years ☐ 16-30 years ☐ 31and above since birth ☐

SECTION B: CLIMATE CHANGE AWARENESS

The following are a number of questions on climate change. (Tick (√) the most appropriate answer)

7. How much do you know about climate change?

a) I have never heard of it ☐

b) I know a little about it ☐

c) I know more about it ☐

8. The following are important institutions and instruments concerning climate change. Tick (√) where appropriate to show whether you know about their existence or not.

Institution/ Instrument	I have never heard of it	I know something about it
United Nations Framework Convention on Climate Change (UNFCCC)		
Kyoto Protocol		
IPCC		

9. The phrase "climate change" means:

Rising global temperatures ☐

Changes in the average weather conditions towards extremes recorded over long periods ☐

Short term variations in weather patterns ☐

Hole in the ozone layer ☐

Other ☐

10. Where do you get information about climate change in your area? Tick where applicable.

Source of information	Tick (√)
1) Radio	
2) Newspaper	
3) Agricultural extension officer	
4) Friends	
5) Internet	
6) NGOs	

12. In which period have you observed changes? Tick where applicable.

Past 5 years		Past 20 years	
Past 10 years		Past 25 years	
Past 15 years		Over 30 years	

13. How has climate change affected you? Complete the table below, Tick (√) where applicable

Reduced yields		Reduced pastures	
Shortened growing season		Reduced livestock heads	
Lengthened growing season		Food insecurity	
Increased yields		Reduced water for domestic uses	
Increased incidences of pests and diseases		Reduced incomes from farming	

Questions No. 14 to 20 consist of statements on causes and effects. Rate them on a scale of 1-5 expressing how much you agree with each statement. Where SD = Strongly Disagree, D = Disagree, DK = Don't Know, A = Agree, SA= Strongly Agree. (Tick inside (√) the appropriate box)

Statement	SD	D	DK	A	SA
14. The current Climate change has been caused by Natural factors (veld fires, volcanic eruptions etc.)					
15. Climate change is caused by human activities such as combustion of fossil fuels and air pollution from industries and poor agricultural practices					
16. Ward 13's temperatures have risen over the years					
17. Climate change leads to rise in sea levels					
18. Climate change leads to food shortages					
19. Climate change increased frequencies of droughts and floods					

20. What problems do you think are associated with climate change awareness in your area? (Tick where appropriate)

Lack of information from government	
Lack of support from government	
Lack of capital by government	
Lack of will by the government	
Unreliable information	

END OF QUESTIONNAIRE

Appendix 1. 2: Interview Guide for key informants

KEY INFORMANT INTERVIEW GUIDE

• Have you noted any changes in weather and climate in Wards 13/30?

• What were the major changes that you noted in your area?

• What are the cause and impacts of these changes in climate to communal people's livelihoods and your life?

• What are you doing to make communal people aware of climate change?

• What measures have you put in place in helping communities adapt and mitigate to climate change?

• What are the mitigation measures being adopted by communal people in your community?

•What are the adaptive measures being adopted by communal people in your community?