

CHAPTER ONE: INTRODUCTION

1.1 Background

Climate change currently poses the first universal crisis of our planet; an urgent crisis which demands immediate and concerted effort to abate its impact (Ford, 2009). It has been estimated that rising temperatures will lead to the loss of millions of plant and wildlife species around the world in the next 50 years. Zambia is one of many countries threatened by potential and actual effects of climate change. There had been a fear that the country might be plunged into the worst disaster it had ever seen since the AIDS pandemic (Kabange, 2007). Sichingabula (1998) also stated that Southern Zambia, including the Lusaka Province, would be prone to droughts due to climate change. In his four constructed scenarios of the implications of drought in Zambia under increased climate change-induced global warming, he asserts that there would be increased summer temperatures leading to the stretching of the dry seasons.

Sichingabula (1998) further pointed to a northward shift of the rain fed growing zone leading to reduced crop failures. However, no complimentary augmentation in food production will be available. Adverse impact on water resources leading to water rationing in towns and a decline in hydro-electric power generation as well as reduced foreign exchange earnings from water based recreation activities and tourism would be some of the negative effects suggested by Sichingabula (1998). Shitumbanuma (2008) confirmed some signals of climate change such as upward shifting of the agro-ecological region-I, increase in temperature among others, which Sichingabula (1998) foretold a decade earlier. Moreover, Kabange (2007) says that the three-year assessment study on climate change focused on its impact on the health of Zambians specifically the connection between temperature increases and spread of diseases. However, little has been documented on perceptions of climate change and appropriate types of education for climate change adaptation and mitigation. People such as those in the Lusaka Province have contributed the least to world Green-House Gases (GHGs) emissions and have had negligible ecological footprints on earth compared to developed countries like United States of America (USA). Nevertheless, they may suffer the worst impact of climate change because they have limited control over it when compared to developed countries (Smith, 1992). Lusaka residents' decades of knowledge and on-the-ground adaptation to worsening climatic conditions have much to teach on how to deal with the impacts of climate change (Morrison and Johnston, 2008).

Therefore, they must not be sidelined in the formulation of adaptation and mitigation strategies as well as climate change educational planning. The World Conservation Union-IUCN (2007) found that some communities in Zambia were aware of climatic changes but knowledge about why they occur is not widespread. Lack of awareness is more dangerous than the impact itself because it exposes people to high risks. Moreover, uncertainty in the perception of climate change may drag the future implementation of Climate Change Education into the curriculum because there would be no yardstick for the formulation of strategies.

Amedeo and Golledge (1975) in Bird (1977) argue that complication or solution to a problem lies in how people perceive it. In the quest to find sustainable mitigation and adaptation strategies in the face of climate change, it is important to assess peoples' knowledge otherwise we risk fighting a fruitless battle. Since the warning signs of climate change in Zambia and particularly Lusaka Province are subtle and only slightly perceptible, a deeper investigation into people's perceptions, along with the types of education they preferred, was imperative. By failing to take account of peoples' knowledge and to share it in a meaningful way, the findings of scientific research as well as current national and international policy making on climate change would not achieve useful results. Thus, studies to be included in the global assessment should preferably be carried out in accordance with people's worldviews in a way that can impact mainstream scientific views (Dounias, 2009). In this regard, this research investigated perceptions of climate change adaptation and types of education needed for adaptation learning among selected areas of Lusaka Province of Zambia.

1.2 Problem Statement

The main problem investigated by the researcher arose from the sense that perceptions of climate change and, more specifically, appropriate types of education for climate change adaptation and mitigation learning among selected areas of Lusaka Province of Zambia were not yet known. As already indicated, the IUCN (2007) found that some communities in Zambia were aware of climatic changes but knowledge about why they occurred was not widespread or almost non-existent. The Ministry of Tourism, Environment and Natural Resources-(MTENR) (2007) also acknowledged that there was no general public awareness on climate change and its potential impact on socio-economic aspects of ordinary people of Zambia. Just hearing of climate change occurrence was enough and therefore, the existing gap in people's perceptions of climate change

needed to be filled up first in order to devise sustainable adaptation and mitigation models for climate change, using appropriate education as a major driving force. Some coping strategies had failed because they were merely formulated by individuals, institutions and Governmental Organisations (NGOs) without regard for people's views and the role of education in the formulation of coping strategies. People at the grass root level, unlike top decision makers, were the worst hit by climate change (Banda et.al., 1997). Thus, their diverse perceptions of it could provide practical guidelines in the formulation of strategies to reduce the impacts of climate change. It was because of such gaps in terms of public views on climate change and appropriate types of education to be condensed within Climate Change Education (CCE) that this research was conducted. Having stated the problem, the general specific research questions are as shown below.

1.3 General research question

How did residents among selected areas of Lusaka Province of Zambia perceive climate change adaptation and what types of education did they need for climate change adaptation learning?

1.4 Specific research questions

The following were the specific research questions:

1. How did residents among selected areas of Lusaka Province perceive causes and effects of climate change?
2. How did residents among selected areas of Lusaka Province perceive climate change adaptation?
3. What types of education were needed for climate change adaptation learning among selected areas of Lusaka Province?

The research aim and specific objectives were as shown on the next page.

1.5 Aim

The aim of this research was to find out how residents of selected areas of Lusaka Province perceived climate change adaptation and types of education needed to address them.

1.5 Specific objectives

The following specific objectives were addressed:

1. To investigate perceived causes and effects of climate change among residents of selected areas of Lusaka Province in order to have preliminary guidelines in localised and national planning for climate change and education.
2. To seek Lusaka residents' views on how climate change could be adapted to, so as to secure some localised strategies for climate change adaptation and mitigation.
3. To find out the types of education needed for climate change adaptation learning among residents of selected areas in Lusaka Province, in order to have a starting point for further research and future designing of a sustainable model of Climate Change Education for adaptation and mitigation.

The next segment explains the significance of this research.

1.7 Significance of the study

The findings of this research may reinforce the implementation of objectives of the National Adaptation Programme on Action (NAPA), National Climate Change Response Strategy and the Disaster Management and Mitigation Unit's (DMMU). But above all, this research may stand out as one of the starting points in educational planning for climate change and further researches. There is also the prospect that the current study findings of public understanding of climate change may contribute to understanding of the challenge of and potential solutions to climate change among selected areas of Lusaka Province. The following section shows the operational definitions of terms:

1.8 Operational definitions of terms

The concepts given below were defined in the context of this particular research.

Adaptation Refers to the way people adjust to or cope with effects of climate change.

Education for climate change This is a complex, spatially contextual and temporally flexible process of learning to bring about behavioral change for adaptation purposes.

Mitigation It is a process of making climate change impact less harsh.

Perception It is a process of attaining awareness or understanding of something through sensory information or an attitude or understanding based on what is observed or thought.

Risk: It is the probability or chance of occurrence of danger, hazard or disaster (thus, climate change).

Ward Refers to residential areas from which specific villages and compounds were adopted

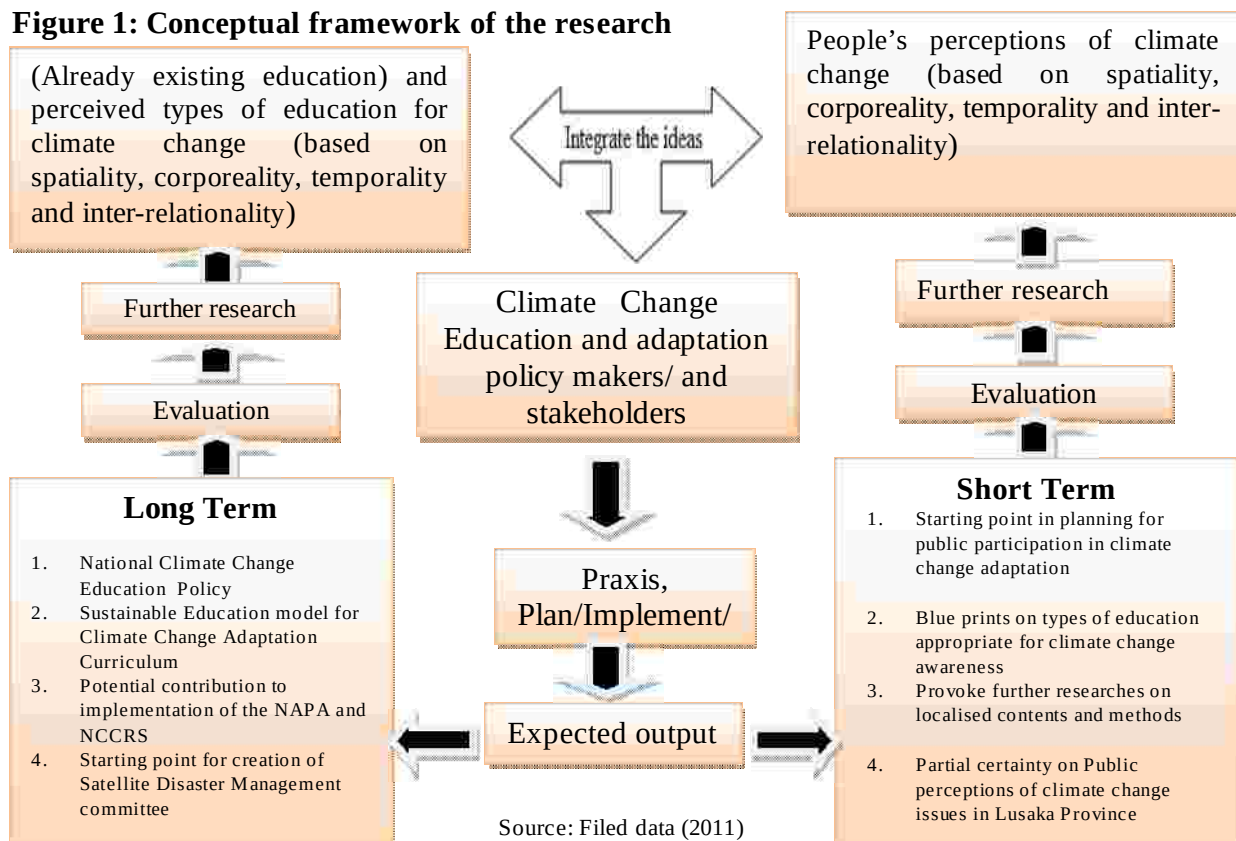
Having shown operational definitions of terms in the above segment, the subsequent section briefly shows conceptual framework of the research and how this dissertation was organized respectively.

1.9 Conceptual framework of the research

“Perception is one of our most important mental processes. If we could not perceive anything, then we would know nothing except the contents of our n minds” (Groenewald, 2004:3). Knowing only the content of our mind makes us apt for presumptuous decisions and would make us fail to make informed choices for daily emerging challenges such as those of climate change. This research applied two types of perceptions namely, proprioception (Internal perception that tells us what is going on in our bodies) and exteroception (external perception that tells us about

the world outside our bodies), because it is aimed at investigating how people make sense out of climate change under the influence of their socio-ecological and mental backgrounds (Ibid). Perception studies operate within four contexts namely, spatiality (lived space-environment), corporeality (lived body-purely mental), inter-relationality (people lived with) and temporality (lived time) (Op.cit). Thus, the area in which an individual lives, the people he or she has lived with, his or her personality and time of interaction with other factors tends to influence his or her perception of certain phenomena such as climate change. All such factors were fulfilled in this research because of inter and intra spatial variations and similarities which were observed premised on research findings in chapter five. Based on the general portrait of people's perspectives, the place of education would be identified in filling possible areas of weakness in their perceptions. Integrating educational values with people's perceptions of climate change could enhance the possibility of achieving the most desirable policy on climate change and education, curriculum and future attenuation of various national plans for climate change adaptation and mitigation. Figure one below summarises the conceptual framework within which this research was executed.

Figure 1: Conceptual framework of the research



Given the above conceptual frame of the research, the following section outlines the organization of contents of this dissertation.

1.10 Organization of the dissertation

This dissertation is composed of six chapters. Apart from the current subcomponent, Chapter one has already provided the background and problem statement. It also outlines the aim, objectives, research questions, rationale and significance of findings just before the operational definitions and theoretical conceptual framework of the research respectively. Chapter two reviews existing literature by first showing the significance of studying perceptions of environmental phenomenon and thereafter, a review of perceptions of climate change from global, African and Zambian contexts. Chapter three describes the study area (Lusaka Province) in terms of location of selected districts (with the aid of maps), general population density, ecological characteristics, socio-economic characteristics and lastly outlines why Lusaka Province was adopted as the study area.

Moreover, chapter four will show the methodology in terms of research design, population, sampling methods, primary and secondary data collection ds. It will also show methods of data analysis and limitations as well as delimitations of the study. Chapter five presents the research findings on perceptions of climate change mainly in terms of conceptual meanings, causes, effects, mitigation strategies and appropriate types of education for climate change adaptation and mitigation learning among selected areas of the four districts (Luangwa, Chongwe, Lusaka and Kafue) of Lusaka Province. In chapter six, all results presented in chapter five will be discussed then a summary, conclusions and recommendations will be presented. Just after the six chapter are the references and the appendix respectively. Introductory chapter (one) above showed the background, problem statement, aim, objectives, research questions, rationale, operational definitions, conceptual framework and organization of ideas. The following chapter (two) will show the review of literature from global, African and Zambian prior to the description of study area in the third chapter.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Having shown the introductory chapter in the preceding segment, this chapter presents literature reviews. It first shows the importance of studying people's perception of environmental phenomena and thereafter, the different perceptions of climate change from global, African and Zambian contexts respectively.

2.2 Importance of studying people's perception of environmental phenomena

According to Babitski (2010:1), "the role of the human perception is one of the most important questions. If we understood how a human - perceives information and operates it - we would more precisely make the future forecasts and increase efficiency". Studying the way people perceive various environmental phenomena is very critical in the formulation of decisions about environmental phenomena. Therefore, if we are to make viable policies on issues pertaining to climate change, people's views are imperative. Young (1997) argues that practical approaches in risk management such as climate change-induced ones should build on both the technical knowhow of professionally-trained people and the knowledge and perceptions of people at risk. By instituting risk management plans that ignore public knowledge, local policy structures and local priorities will not be effective. Neither will plans built largely on localised knowledge without external technical input where relevant, bring out meaningful results. Thus, there is need to strike a balance and this means formulating risk management plans into which the community has input and which local people help to implement together with the policy makers. Consultation, discussion and negotiation are vital aspects of such an approach (Ibid).

Perception is an important factor to be taken into account when communicating risks. When the views of the public about a particular issue are collected, more informed decisions and methods on how to conscientise people about the problem may be designed. Public opinion also matters in the case of climate change because success in addressing the challenge of climate change will require voluntary actions by individuals and organizations as well as wise national and international policies (Op.cit). Perceptions examine the opinions people express when they are asked, in various ways, to characterize and evaluate issues that may be of value towards problem

solving and save people from potential risk. In the words of Peter M. Sandman cited in Lorenzoni et. al., (2005:6), “the risks that kill you are not necessarily the risks that anger and frighten you.... But those that you might be less aware of because they accumulate over time and by the time they manifest, it might be too late.”

Murlis and Davies (2008) argue that since we now live in highly pluralistic societies, a single unique ‘public attitude’ or ‘opinion’ on any specific environmental issue is unlikely, although some societies display a more developed consensus than others. In general, the different constituencies of the public must be expected each to present a spectrum of opinion. Similarly, it can be expected that there will be considerable differences between the most commonly held views of the different publics. There is, therefore, an issue about the general relevance of work done on public perceptions, even where the results are taken from a sample chosen to represent a cross section of the wider public in a particular society. Public risk perceptions of climate change are critical components of the socio-political context within which policy makers operate. Public’s climate change risk perceptions can fundamentally compel or constrain socio-economic and political action to address particular risks. For public support or opposition to climate policies will be greatly influenced by public perceptions of the risks and dangers of global climate change (Leiserowitz, 2006). Given such a background, the following section reviews perceptions of climate change from a global perspective.

2.3 Perceptions of Climate Change: A Global Perspective

Bearing the earlier presented significance of studying perceptions of environmental phenomenon on mind, global review of literature will be presented in respective spatial order as United States of America (USA), United Kingdom (UK), Bangladesh and Arctic Region. Additionally, reviews from Turkey and Singapore, Nepal and Himalayas as well as Vietnam will be shown. Even if we are not strangers to climate change and global warming, various conceptions and misconceptions about this phenomenon are massive in both developed and developing nations (Intergovernmental Panel on Climate Change-IPCC, 2002). Premised on the above introductory remarks, the immediate subsequent section presents a review of perceptions of climate change in the context of USA.

2.3.1 Perceptions of Climate Change in the United States of America (USA)

A comparison of Gallup polls asking the American public how much they personally worried about global warming (or the greenhouse effect) found that between 1989 and 2003 twenty-four per cent to 40 per cent of the respondents worried ‘a great deal’ (Brehm, 2003:111). When these are added to the percentage that worry ‘a fair amount’, the Gallup polls indicate that between 50 per cent and 72 per cent of respondents have felt this way for a number of years. In another research, using case studies and the Dillman tailored design method, Leiserowitz (2006) contended that since the year 2000, numerous public opinion polls had demonstrated that large majorities (92 per cent) of Americans were aware of global warming. Moreover, 74 per cent of them argued that climate change was real and already underway. Meanwhile, 76 per cent of the total population already viewed climate change as a somewhat very serious problem. But at the same time, Americans continued to regard both the environment and climate change as relatively low national priorities even though they are the major (25 per cent) contributors to carbon emissions at global level. For instance, in a 2000 Gallup poll, climate change ranked 16th on America’s list of most important problems facing the country (PIPA, 2005). Namaste (2009) also highlights that even Barack Obama, the incumbent president of USA by the time this research was conducted, never considered climate change as a major pressing environmental issue compared to terrorism and others.

In their later research, Dunlap and Saad (2001) also affirmed that among most if not all Americans, global warming ranked 12th out of 13 environmental issues, just below urban sprawl. Unlike on themselves, a clear majority (68 per cent) of respondents in USA were most concerned about the impact of climate change on people around the world and non-human nature. Only 13 per cent were most concerned about the impact on themselves, their family or their local community (Ibid). This may help explain why global climate change remains a relatively low priority in issue ranking surveys in America. Higher-ranking socio-economic issues (such as the economy, education and health care) and environmental issues (clean air, clean water, and urban sprawl) are more easily understood as having direct local relevance. ‘Global’ climate change, is not yet perceived as a significant local concern among the Americans to the extent that, climate change is unlikely to become a high-priority national issue until Americans consider themselves personally at risk (Op.cit). Generally, the revealed perceptual studies on climate change in

America mainly focused on how worried people were about it, levels of awareness, how serious it has been and who could be most affected. This study adds more knowledge by focusing on how some residents from selected Zambia's Lusaka Province perceived the causal factors, effects, coping strategies and learning. In continuation, the next segment reviews some results from the United Kingdom (UK).

2.3.2 Perceptions of Climate Change in the United Kingdom (UK)

A 2004 survey in the UK also found that 62 per cent of respondents described climate change as a “fairly bad thing” or a “very bad thing” (verses 10 per cent who felt it was a “fairly good thing” or a “very good thing”). Two other UK surveys undertaken in the same year indicated that most people had heard of global warming, and rated it as the most important environmental issue for the world today. Nevertheless, they saw terrorism and domestic issues as having a higher priority just like in the earlier reviewed cases from USA (Norton and Leaman, 2004). In another research by Lorenzoni (2003), most interviewed people in UK believed that climate change was already happening and would continue in the future. In the survey by Globescan (2009), 64 per cent of people interviewed considered climate change and global warming as very serious problems and this showed an increase of up to 20 per cent from a 1998 poll. This issue was tabled at the Copenhagen Summit, yet the efforts to enhance a better perception were still marred by cyclopean futility especially following the failure of the Convention of Parties 15(COP15) (Globescan, 2009). Similar to the earlier mentioned cases from USA, the surveys in the UK also concentrated more on the perceptions of how serious was climate change and people's awareness without probing on educational aspects, which are addressed in this research. The next juncture shows some reviews from Bangladesh.

2.3.3 Perceptions of climate change in Bangladesh

In addition to the above reviewed case from UK, Bangladesh is forecast to be among the countries worst affected by climate change. The projected rises in sea-level combined with heavier rainstorms are predicted to lead to even more ing floods. However, Salequzzaman (2009) argued that majority of people in Bangladesh, which is one of the areas prone to climate change, did not view it from a broader perspective and some of them in certain

areas did not know what it was. Using reconnaissance survey, Salequzzaman (2009) discovered that 59 per cent in the southwest region of coastal Bangladesh did not know what climate change is. Using the focused group discussion he came to a conclusion that the people of Bangladesh juxtaposed climate change with heavy rainfall and floods only. Scarcely did they associate other aspects such as cyclones, irregular temperatures and others with climate change. It is for such instances that Groenewald (2004) argues that peoples' perceptions of climate change vary depending on different parts of the world and experiences. In my research I also discovered some variations in terms of perceptions of climate change. The subsequent part provides a review from the Arctic region.

2.3.4 Perceptions of climate change in parts of Arctic region

In connection to the review in Bangladesh shown above, Arctic Climate Impact Assessment (ACIA) (2008) argued that climate change is a topic about which common people had a great deal to share with the world based on their interaction with it. In the Arctic region, projects had amassed a large collection of knowledge and observations about climate and environmental changes, reflecting the depth of knowledge held by these people. An overview of humans in the Arctic is given in the (ACIA), Chapter one. This article attempts to show some of the observations of change that inhabitants of the Arctic considered to be related to climate change. In doing so, the comments and perspectives also showed what climate change meant to them and their communities within the context of the other forces affecting their lives and cultures. Although little material was available concerning lay people's perspectives on ultraviolet (UV) radiation and ozone depletion, this article includes a short summary of some related observations. Some communities, such as those in Greenland that survived on fishing, saw some benefits from climate change, which coincided with an increase in fish stocks, a perspective that may be missing from many case studies focusing more on the negative impacts of climate change (ACIA, 2008). This research also added more knowledge by discovering some positive aspects of climate change in Kafue District of Lusaka Province.

Further studies in the arctic region also showed that people had a strong tendency to use 'global warming' as a catch-all phrase, so that the problems of stratospheric ozone depletion and air pollution in general often become included within it. was also a tendency to confuse

climate for weather. Some investigators believe this to be driven, at least in part, by the media treatment of recent episodes of severe weather. It is widely recognised that there are cycles of media attention and that these have a powerful role in influencing the type and framing of issues within the public arena for debate on environmental issues, including global climate change (Murlis and Davies, 2008). The subsequent section shows review on perceptions of climate change in Turkey, Singapore and Nepal respectively.

2.3.5 Perceptions of climate change in Turkey and Singapore

Whilst the last section evinced a review from Arctic region, this subcomponent shows reviews from Turkey and Singapore. Turks are among the nationalities most convinced of the gravity of the climate change issue or more than four in five (81 per cent) view it as a “very serious” problem. Although emphasis was on simplistic theme such as how serious climate change was, the Turkish government had since embarked on the CCE programme in order to effectively disseminate learning values, skills, attitude, and knowledge about climate change (Dyakov and Studennikov, 2007) As opposed to Turkey, the impacts and implications of climate change in Singapore had been something still quite remote from the Singapore public. Many did not understand the full magnitude of how they would be affected by it. The country had been spared of natural disasters and environmental impacts such as the haze from Indonesia's forest fires and the recent more intense than usual rainfall which attracted people's attention but only for as transient as they lasted. However, the Singapore Ministry of Environment and Water Resources (SMEWR) recently initiated a programme to make people more aware of climate change. This was based on the realisation that climate change was something that would affect everyone and that everyone could play a part in reducing climate change drivers (Ibid). Whilst results from Singapore were based enhancing public awareness of climate change and participation, this research shows perceived adaptation and learning dimensions of climate change.

2.4.6 Perceptions of climate change in Nepal and Himalayas

Review from Himalayas revealed some information quite different from other areas. This was because natives mainly perceived climate change as a boon rather than a doom. Thus, its positive implications outweigh the negative ones. In this research, some few positive effects of climate change were also found, but only from Kafue District of Lusaka Province to be discussed later in

the sixth chapter. Dahal (2005) argued that many of the highland residents of Manang in the Annapurna Range of the Himalayas had observed heavy monsoon rains in recent years. According to the views of the residents, previously, monsoon rains used to be of lower intensities and amounts, and heavy monsoon rains only occurred at altitudes. Moreover, they opined that intense rainfall had affected traditionally-built flat-roofed houses made of mud and stone. Roof leakage and wall erosion problems were a major concern for low-income families who could not afford to regularly repair their houses.

Narendra Lama, a conservation officer in Manang, quoted by Dahal (2005:19-20) said that, “problems from the leakage of rainwater through the roof of traditional mud houses have increased in recent monsoons. The number of people seeking support from us to repair their houses has suddenly jumped.” In order to adapt to some extreme winter snow, the residents have traditionally redesigned the rooftops of their houses to accumulate winter snowfall for meeting domestic water needs. However, there was also a general view that decreased winter snowfall could eventually lead to a shortfall in village water supply. “Some farmers in Mustang, the neighbouring district to Manang, said that the changed climate had significantly impacted their lifestyles. They were confident that the climate had changed, not because they knew much about global warming or reports of rapidly receding Himalayan glaciers, but because of their long experience with the realities of the local environment.” This was actually the case among some residents in Lusaka Province. Dahal (2005:19-24) further noted that:

For most of the people in Himalayas the impact of climate change has been positive. Only a few pointed out the negativity. Farmers had been growing new vegetables such as cauliflower, cabbage, chili, tomato and cucumber, which used to need greenhouses to survive. Local fruits such as apples had better sizes and tastes. New plants that only used to grow at lower altitudes can now be found. Many noted the fact that their Himalayan district was greener than it was a few decades ago. Local residents say this was because of the changing climate rather than technological inputs or improved seed varieties.

From the above review, we can safely argue that climate change might not necessarily be detrimental to some communities. This was also noted in my research, which also added more knowledge on learning for adaptation and mitigation of potential and actual effects of climate change. Having shown the case review from Himalayas, the following section highlights some findings from Vietnam and Philippines, before venturing into African context.

2.3.7 Perceptions of climate change in Vietnam

While climate change was generally perceived as a blessing in parts of Himalayas showed above, it was not the same in the case of Vietnam. Oxfam (2008) surveyed two of Vietnamese provinces, Ben Tre and Quang Tri in May 2008 to take a snapshot of how poor families were experiencing climate change, and how they might deal with it in future. The perception of many villagers and local leaders in these provinces was that climate was already changing and in many cases they were ill-equipped to reduce, or adapt to the consequences. In many villages it was believed that women were hit the hardest by natural disasters as they often could not swim during severe flood waters, had fewer assets to turn to for alternative livelihoods when crops were destroyed and had fewer employment opportunities away from their homes. The other outcry was lack of proper source of climate change information among others (Ibid). However, if the educational implications of such perceived challenges faced by women due to climate change were investigated, a more complete spectrum would have been secured in planning for adaptation and mitigation learning. This research addressed this issue and also probed on perceived causes rather than attempting to find out its effects and whether climate change was happening or not. The next section shows some reviews from Africa.

2.4 Perceptions of Climate Change in Africa

Having shown reviews from different parts of the world in the preceding sections, this section will present some reviews from selected parts of Africa such as Nigeria, Sahel region, Ethiopia, South Africa, Mozambique, Darfur region, Kenya, among others.

Similar to other parts of the world earlier reviewed above, there are diverse and mixed views about the causes and indicators of climate change across and within communities in Africa, despite the evidence of a general awareness. A wide range of indicators for predicting wet and

drought seasons had already been identified in some areas. For example, people in some parts of Africa believed that cold winters were an indicator of drought, while hot summers signified good rains (Fumo et.al., 2008). Based on the general survey of Africa, Gordon (2008) was able to conclude that almost 70 per cent of the respondents had heard of global climate change but less than 25 per cent knew the causes. This view was similar to what IUCN (2007) observed in Zambia.

Madison (2007) surveyed ten countries in Africa and concluded that a significant number of people believed average temperatures had increased due to climate change. By contrast, almost none believed they had decreased or that the temperature range had altered due to climate change, apart from some in Ethiopia. The results for precipitation showed a similar uniformity of opinion across the ten countries. In six out of ten countries, majority of the people believed rainfall levels had decreased and a change in the timing of the rains. However, if not critically considered, such outcomes seem to suggest that Africans were brilliant at detecting climate change, which is a basic precondition for adaptation. It must be suspected that some individuals might have courteously suggested they had witnessed particular forms of climate change when in reality they had not. We should, therefore, attempt to validate these findings before ultimately arguing that Africans were as perceptive to changes in climate as they claimed (Ibid). This could be accomplished through multiple case studies to validate the findings.

In Niger, there appeared to be regions where neighbouring residents agree that precipitation had increased and others where they agree it had decreased due to climate change. There were also regions where clusters of neighbourhoods agreed that temperatures had remained constant. The results from Ghana were even more striking. Thus, there were regions where neighbouring residents agreed that temperatures had either increased or stayed the same, that precipitation had either increased or stayed the same, and even agreed that the timing of the rain had changed (Op.cit). This was perhaps the strongest evidence that could be agreed with given that some Africans were capable of perceiving changes in climate – the fact that neighboring residents told a consistent story. Further studies by Madison indicated that Burkina Faso, Cameroon, Egypt, Ethiopia, Ghana and Zambia had experienced significantly higher temperatures and that Burkina Faso, Ghana, Niger, Senegal and Zambia had experienced a significantly drier climate according

to the peoples' views. Large numbers of people in these countries were therefore, justifiable in stating that climate had become hotter and drier. According to evidence on page 42 of Madison's (2007) research paper, there was an over emphasis on physical aspects of climate change rather than socio-economic ones in Zambian context. This research added new ideas by adding social, economic and other dimensions of climate change. It also ventured into adaptation learning aspects of climate change in the context of Zambia's Lusaka Province. The following segment shows a review from Nigeria.

Having administered a questionnaire to 453 respondents of different social and demographic strata within the city of Ibadan, Gordon (2008) indicated that a significant proportion (92 per cent) of the public was aware of the dynamics of the local climate. Recent food crises in countries such as Nigeria were reminders of the continuing vulnerability of the region to the vicissitudes of climatic conditions. Apata , Samuel and Adeola (2009) analysed climate change perceptions and adaptation among arable food crop farmers in South Western Nigeria using logit regression analysis and concluded that residents perceived climate change as having a strong spiritual, emotional, and physical dimensions. The largest portion of the residents (95 per cent) was convinced that climate change was a sign of divine anger. Thus, in their opinion, climate change occurred due to many sinners in their midst and God had been trying to punish them by bringing floods with serious consequences (Op.cit). Although people's knowledge about climate change had some limitations in terms of causes, it revealed some reliable results with regard to the effects of climate change in south western Nigeria. Upon being asked on their interpretation of climate change, 89 per cent associated it to higher temperature, 72 per cent linked it to rapid water evaporation from the ground, 71 per cent to the spread of agricultural pests and weeds on crop land, 68 per cent to violent rain and hailstorms, 65 per cent to delayed rainfall and 65 per cent, linked it to less clearly defined seasons (Ibid). In continuation, the following segment reviews the results from the Sahel region.

Using focused group interviews and a household survey, Mertz et al. (2007) also analyzed the perceptions of climate change and the strategies for coping and adaptation by sedentary farmers in some parts of Sahel such as Senegal. They came up with a conclusion that households were aware of climate variability and identified wind and occasional excess rainfall as the most

destructive climate factors. Moreover, households attributed poor livestock health, reduced crop yields and a range of other problems to climate factors, especially wind. Generally, Mertz et.al. (2007) concluded that the communities studied had a high awareness of climate issues based on their ecological background. This research was almost the same context, but it added new ideas on learning for adaptation of the impact. Ouag (2010) also assessed farmers' perceptions of climate vulnerability and changes in the Sahel. He argued that climate-related changes in the physical and biological environments observed by the populations dated back to the major droughts of 1973-74 and 1983-84 which particularly marked and undermined the "Eco-socio system of the Sahel area". These changes occurred on the biophysical and agro-biological level on the one hand, and on the social level on the other hand. According to the respondents studied by Ouag (2010:32), changes brought by climate change in the Sahel were "manifested by severe thunderstorms, erratic rainfall, disturbance in the duration of the different seasons of the year, planting periods, disappearance of temporary water points, degradation of plant resources, gradual erosion of biodiversity, recurrent droughts, declining yields, change in the forage system, significant changes in the physiognomy of the landscape and loss of wildlife. The impacts felt at household level include poverty, erosion of solidarity and social fabric, loss of trust and mutual distrust between and within communities." The next segment reviews some findings from the Darfur region.

Similar to on-the-ground knowledge of climate change manifested by some respondents in Sahel region above, Baldauf (2007) also showed that people in Darfur have had on-the-ground perception of it. Some people in Darfur believed that climate change was aggravating the Darfur crisis on grounds that less rainfall especially in areas near the fringes of the Sahara Desert was putting more of a strain on resources than ever before. This had provoked people's tempers and civil conflicts escalations over water. For example, Baldauf narrated of some Darfur refugee women waiting up to two days for their chance to fill buckets at a communal water point. This situation triggered high psychological and physical frustrations such that it was only a matter of time before bickering over water turned into a full-fledged fight. Baldauf (2007:1-2) further narrated that:

In the 115°F (54.25°C) heat of the Touloum refugee camp, just across Sudan's border in eastern Chad, refugees received only 4.5 liters, on average, per family member – just enough for drinking

and cooking. A family that misses its day or gets shoved aside at the water pump may not survive. On this day, a younger woman has been caught cutting in line. She and an older woman wrestle each other to the ground. "I have been waiting here two days for my turn, and if the water finishes I will have to ask for water from other people," said Khadija Musa. "Sometimes I have to borrow water to cook. Our clothes are filthy, we cannot wash without water, the only thing left is to die," she sighed. Competition for water in refugee camps, between farmers and herders, and between countries has long sparked conflict in the arid region and forms one of the main causes of the war in Sudan's Darfur region. But the trouble was only beginning, as it became clear that dramatic climate change would have its sharpest effects in Africa, leading to rising hardship, massive population displacement, and, in some cases, all-out war. Yet a growing number of aid workers there said that the same issue (climate change-induced water crisis) that pits communities against each other could also bring them together—could be the first step towards reconciliation, and lasting peace. "In a way, water could be a divider or it could bring people together," said Caroline Saint-Mleux.

Many experts were of a view that the underlying tensions between mostly nomadic Arabs and sedentary black farmers both of whom were Muslim was their centuries-long competition for water and land, a competition that had been exacerbated by decades of droughts, which had worsened during the climate change era. In the face of climate change, Lake Chad, which forms part of the border between Chad, Nigeria, and Niger, had dropped to 10 per cent of its original size. Sudanese and Chadian officials estimated that rainfall had dropped nearly 40 per cent over the past 50 years. Less rain trickled into underground aquifers, and water tables had been dropping (Baldauf, 2007). From the above narratives cited by Baldauf, it was possible that climate change as perceived by some local people and experts in the area could be one of the indirect drivers to Darfur crisis because escalated water crisis in the region which might have undisputably contributed to further civil conflicts. Such instances would require education, but there were no considerations for it. However, this research added more knowledge by showing the relevance of learning to address various challenges posed by climate change. The following section reviews some perceptions from Samburu District of Kenya.

Just like in the case of people in Darfur Region shown above, selected local people of Samburu District had a localised way of interpreting climate change. According to Integrated Regional

Information Network (IRIN) (2010), the effects of climate change such as drought, livestock deaths and resource conflict – could be all too apparent for the pastoralists of Northern Kenya, but there could be too much to be done to explain the true causes. Most of the elderly people, however, related the advent of climate change impacts to degradation of spirituality and moral values in the present generation. For example, Lemeteki Lerinagato (70 years old) of Samburu District of Northern Kenya narrated the following to IRIN concerning the issue of climate change: “We were warned about the current situation (climate change) by our elders and spiritual leaders when I was very young. This was about 50 years ago when the *Ngishili* age groups were born,” He said the *Ngishili* began to be beset with bad luck when they started to marry, and that *somso* (floods) and *ngolin* (drought) would only end with their deaths.” Similar views were shared by other communities across the arid North of Kenya.

For example, Wario Ndenge, a Gabra elder from the upper eastern Marsabit region narrated the following to IRIN concerning climate change impact: "Our people are dying like wild animals due to hunger, thirst and poverty. It (climate change) is a curse... nothing else," "Frequent droughts and lack of food are clear signs of the curse. Concerning the mitigation of the impact of climate change, Wario Ndenge suggested that “Women must stop wearing trousers. They should respect their husbands. And the wealthy must help the poor.” Moreover, an imam in neighbouring Isiolo, Sheikh Yakir, said the following the spiritual interpretation of the causes and impact of climate change: "All humanity regardless of colour, tribe or religion has committed, and unfortunately continues to engage in sinful acts. The holy books, the Koran and the Bible, have the most accurate information about all these disasters; we are responsible for all of our problems." Sheikh Yakir lamented that rampant destruction of the environment, which is prohibited in Islam, was also to blame for water scarcity and conflict. In order to reduce the impact of climate change Sheikh Yakir suggested the following: "We must change, people are losing all their livestock yet they have a chance to prevent such losses. They must pay zakaat [alms], desist from mixing their herds with those that have been stolen... Our option now is to continue performing khunud [special prayers] and ‘fast’ three days every week."

One Kenyan official known as Lordman Lekalkalai (Isiolo Arid Lands Resource Management Project community officer) said that “most Samburu residents either disagreed with the scientific

explanation of climate change or were unaware of it. Thus, delivery of accurate information would help pastoralists, who have suffered the brunt of climate change, understand that the challenges are not a passing crisis, and change their current perception.” quoted by IRIN (2010), Lordman Lekalkalai’s assertions that delivery of accurate information would help pastoralists were demeaning to the cultural and spiritual integrity of local people in Samburu. This is because he was attempting to analyse the people’s views using pure scientific lenses the reality they have lived with. The local people of Northern Kenya were very right by having a spiritual interpretation of climate change. In fact, they were accurate such that they were even capable of relating the issues of climate change to their actual l settings and beliefs which may not be the case in some communities. Climate change has several interpretations when perceived through the ‘campus rose’ social, economic, natural and political aspects. I would therefore, suggest that people of Northern Kenya be given additional information to what they already knew about climate change and work hand in hand with them.

Due to such misinterpretation of people’s assertions by some scientist, educational dimension to climate change is much needed. In fact, one of the pastoralist experts in Kenya, Daud Tari, urged the integration of traditional knowledge in climate risk reduction. "It is misleading and unfair to suggest that nomadic pastoralists are ignorant [about climate change]", he added. Wa Maathai also recently noted that 15 of the 20 countries most vulnerable to climate change are in Africa. "We must find the right way to let our people why. Finding the most appropriate means to reach people and using their own language and culture is the key," (Ibid). From all the reviews presented in African context, emphasis was on of climate change without emphasis on types of education that may be appropriate to enhance people’s understanding of climate change issues and how to adapt and mitigate it , this research not only looked at the perceptions, but also the types of education that would be needed for climate change adaptation and mitigation learning. In continuation and conclusion of this chapter (two), the following section shows Zambian situation in terms of perceptions of climate change.

2.5 Perceptions of climate change in Zambia

Similar to some earlier highlighted pieces of evidence in parts of the World and Africa, in Zambia, any change in climate can spell disaster. As earlier stated, it had already been found that

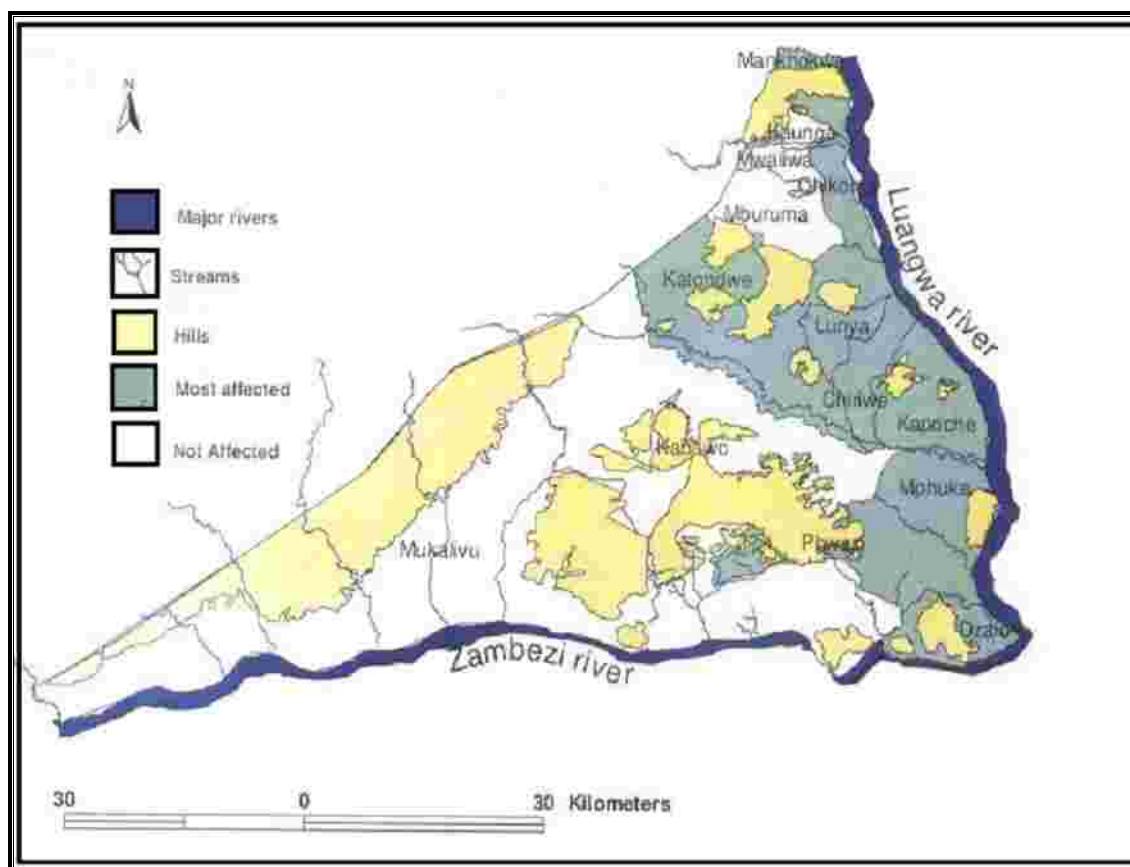
some communities in Zambia had been aware of climatic changes, but knowledge of why they occur had not been widespread (IUCN, 2007). Since most people are surviving on agriculture, their little knowledge about climate change may exacerbate poverty and food insecurity.

In Kalingalinga Compound of Lusaka District, some residents argued that before the advent of climate change, the first rains used to fall in October or the first week of November and was characterised by a light to a medium rainfall. Participants in Linda Compound-heavily dependent on rain-fed urban agriculture for their livelihood, pointed out that, in recent years, the rain season tended to start in the second (11th – 20th day) or third (21st – 31st day) parts of November. They also observed a trend towards early cessation of the rains, thus, by the end of March the rains had virtually stopped in most parts of Lusaka city. Some participants in both Kalingalinga and Linda Compounds thought that the recent shifts in the traditional patterns of the rainy season had wreaked havoc in their livelihoods due to more frequent water shortages resulting in sanitation problems and increased food prices (Simatele, 2010). “Life is very difficult for us. It is like we don’t have any weather to enjoy; everything is bad ... In October, it is very hot and there are many mosquitoes that make us get malaria. In June (winter) it is very, very cold and whatever we wear or cover with is not warm ... one wonders what is happening to the weather,” argued one of the respondents interviewed by Simatele (2010). Much as I appreciated Simatele’s research, its reliability in some parts, was somehow questionable due to lack of authenticity. For instances, some of the arguments which he claimed to have been his original findings from the respondents seem too similar to the results presented by IRIN on the website whose address is presented here: <http://www.alertnet.org/thenews/newsdesk/IRIN/33a98150e95ace0e50c1e3f1455073a7.htm>.

Such views seem to have already been expressed by some residents interviewed by IRIN in Samburu District of Kenya according to the website presented.

Banda (2005) also discovered from respondents that 33 per cent of the droughts in Lusaka Province were caused by climate change. However, he left out Luangwa District in his earlier study, yet Disaster Management and Mitigation Unit’s (DMMU) (2010) vulnerability assessment report indicated that Luangwa District was one of the most vulnerable to climate-related hazards, disasters and risks in Lusaka Province as shown in figures two and three on the next two pages.

Figure 3: Areas most affected by occasional climate change related-floods in Luangwa district.



Source: ZVAC (2007:65).

United Nations Development Programme-UNDP (2010) argued that extreme weather was affecting wildlife and flora alike in Luangwa District. Inadequate rain in Zambia's South Luangwa region, in the east of the country, meant that animals had to scavenge for roots and increased numbers of hippos, which depend on water had been dying. Vegetation has also been affected, with landscapes translating into scores of petrified trees in dried out areas. However, how selected people among selected wards of Luangwa District perceived climate change was initially not known by the time (2010) this research was proposed. It is for this reason that Luangwa was also included in the study in order to identify how selected residents perceived climate change and types of education for adaptation learning.

UNDP (2010) further argued that climate change was already affecting people's livelihood in Lusitu and Gwembe Valley of Southern Province. Some individuals within the area attributed climate change to drying up of rivers, low crop yields, and increased temperatures. During the

Climate Change Education Workshop held in Lusaka-Zambia, from 15th to 16th February, 2009, Masenke, a representative of an indigenous community in Gwembe Valley, gave a vivid account of the current state of small scale farming and the impact of climatic abnormalities on his community. Based on his observation and experience in Gwembe Valley, he narrated that climate change had contributed to deforestation, prolonged drought and changing patterns in farming practices (Masenke: pers.com 15th February, 2010). His narratives evocatively portrayed the situation in Gwembe Valley. They also lingered as an illustration of the inevitable connectedness of learning, knowledge and contextual approaches to climate change adaptation.

On 17th December, 2010 between 8:27 hours and 8: 42 hours in the morning, Zambia TeleVision2 (TV2) news crew non-randomly sampled public opinion polls in Lusaka City on what could be the major causes of climate change in Lusaka District. The causes of climate change were associated with accumulation of plastics, open burning of municipal wastes and throwing of wastes in the drainage system. The latter view was inherently flood-oriented. Other views blamed people and lack of public sensitisation for the changing climate. When further probed on what must be done to reduce the impact of climate change, they suggested revitalization of “Keep Zambia Clean Campaign” (KZCC), which was introduced under the Ministry of Housing and Local Government to maintain high standards of sanitation but proved futile under unknown circumstances. The other suggested strategy was change of people's mindset, throwing of litter in bins and abolition of use of plastic in preference for paper bags. Preparing before the rainy season was also suggested as one of the adaptation and mitigation strategies. Nevertheless, such views could not be entirely depended on because of lack of in-depth systematic and systemic methodologies and emphasis on crucial issues.

With marginal food security and low capacity to adapt farming practices, Zambia is highly vulnerable to climate change. Yet, the country is only responsible for a miniscule 0.006 per cent of global carbon dioxide emissions (IUCN, 2007). The 2007 report by the IUCN further says that climate change would hit Zambia particularly hard. The 2007 National Adaptation Programme on Action (NAPA) also reported that drought and floods had increased in frequency, intensity and magnitude over the last two decades and adversely on food and water insecurity due to climate change. Unfortunately this might not be well clearly known by the general public. With special reference to Zambia which was the general location of my study area (Lusaka

Province), Madison's (2007) results showed some perceived effects of climate change in Zambia although there was no specificity in terms of space where the research was conducted. As earlier noted, his focus was mainly on physical aspects without venturing into socio-economic, political and other parameters.

From the literature sifted out in Zambian context, there was little or nothing done in terms of perceptions of climate change in Zambian context and this was one of the major limitations of this research. Such a situation was among the reasons why a fairly wider area (four districts of Lusaka Province) was captured for data collection in order to set an expansive basis for further researches and significantly initiate the filling of gaps in the context of perceptions of climate change in Zambian and identification of appropriate types of education for climate change adaptation learning.

2.6 Summary of reviewed literature

Apart from chapter one which showed the general introduction, this chapter (two) has shown that there are spatial variations on how people would perceive climate change. Some findings from developed countries like USA showed simplistic dimensions of climate change such as 'how serious was the problem', 'levels of awareness', among others. Priority had been on several social issues unlike climate change on their list of urgencies. Learning aspects were not considered in most of reviewed researches on perception of climate change. However, in some nations such as Nepal and Turkey, educational oriented climate change researches had been implemented as a way of disseminating climate change information. African communities usually have had their own ways of perceiving it and they had been more concerned about it. This research was therefore designed to investigate perceptions of climate change adaptation and types of education needed for adaptation learning among residents of selected areas of Zambia's Lusaka Province. The geographical description of my study area is as shown in the third chapter.

CHAPTER THREE: DESCRIPTION OF THE STUDY AREA

3.1 Introduction

In addition to the introductory chapter one and chapter two which reviewed literature on perceptions of climate change, this chapter describes the study area (Lusaka Province) with the aid of maps. It also shows the socio-ecological and economic characteristics. Ecological features such as temperature and rainfall were described in order to understand grounds on which certain perceptions of climate change were premised. In the closing section, the chapter will show reasons for adopting the Lusaka Province as study area. The proceeding section describes socio-ecological characteristics of the study areas within Lusaka Province.

3.2 Socio-ecological backgrounds of the study areas

Lusaka Province is located in the southern half of Zambia. It is located within longitudes 27° 45' East to 30° 26' East and latitudinal range of 14° 40' South to 16° South. The approximate spatial extent of Lusaka Province is 21896 Km² with four districts, namely Luangwa, Kafue, Lusaka and Chongwe (CSO, 2003). Lusaka Province lies within the middle veld of Zambia whose altitude above sea level is between 900 metres and 1200 metres and is drained by four main rivers, the Kafue, Chongwe, Lunsemfwa and Luangwa. The total mean annual rainfall in Lusaka, Kafue and Chongwe Districts is between 800mm and 1000mm because they are in the agro-ecological region IIa as shown in figure four below. These three districts are on the plateau with moderately high rainfall whose mean annual value is 815.1mm (Banda, 2005).

Figure 4 : Location of the study areas (Lusaka, Chongwe, Kafue and Luangwa districts) within the agro-ecological region of Zambia

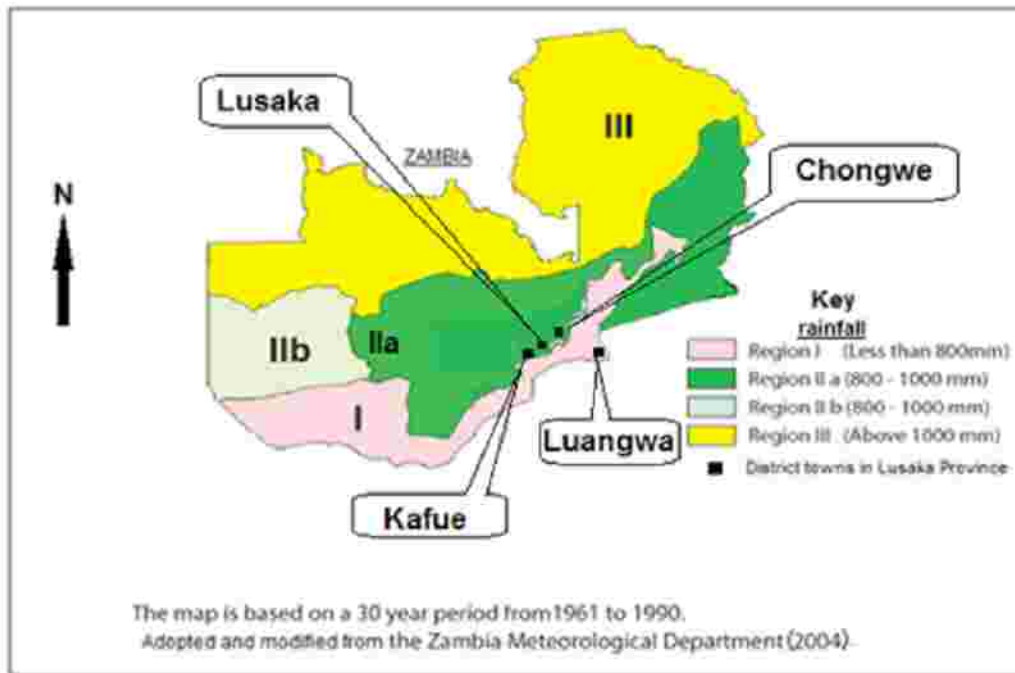
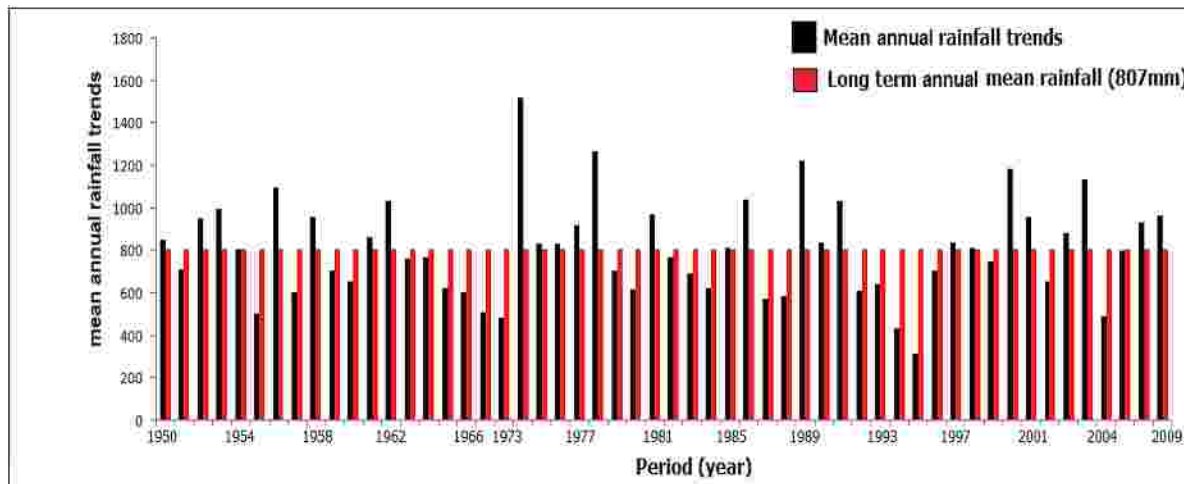


Figure five below show the mean annual rainfall trends in relation to long term mean rainfall values for Lusaka District. It shows that the district had experienced below average mean rainfall between 1989 and 1999, ut there was a drastic increase of rainfall in 2000.

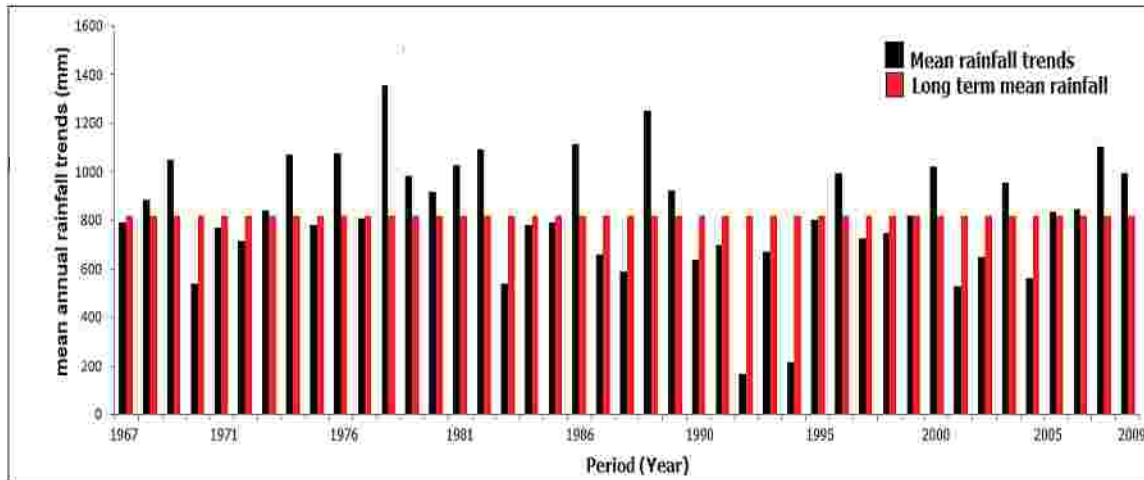
Figure 5: Mean annual rainfall trends in relation to the long term mean in Lusaka District of Zambia 1950-2009



(excluding the period from 1968 to 1972) Source: MDZ (2010).

Figure six below shows that Chongwe District had generally been experiencing less mean annual rainfall after 1990 than before.

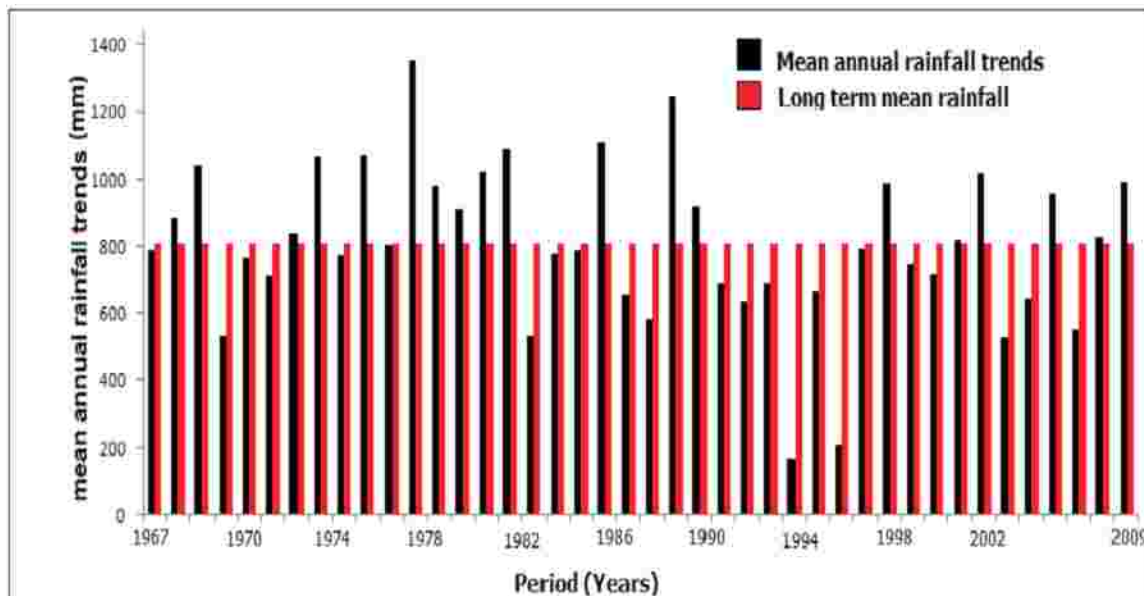
Figure 6: Mean annual rainfall trends in relation to the long term mean in Chongwe District of Zambia 1967-2009.



Source: MDZ (2010).

Figure seven below shows the mean annual rainfall trends in relation to the long term mean in Kafue District of Zambia 1967-2009. It shows that rainfall in Kafue District had reduced in the period between 1990 and 2009 than it used to be before 1990.

Figure 7: Mean annual rainfall trends in relation to the long term mean in Kafue District of Zambia 1967-2009



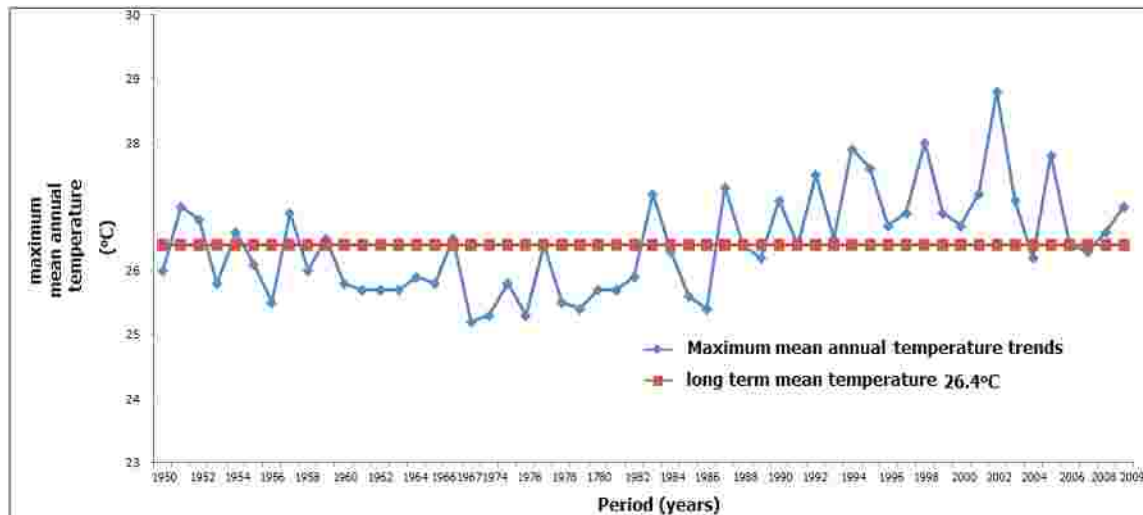
Source: MDZ (2010).

Lusaka, Chongwe and Kafue Districts have three main seasons namely, cool and dry from May to August, hot and dry from September to October and t l.

The average midday temperatures vary from a maximum of 31°C in October to a minimum of

10°C or slightly above 10°C in June (Meteorological Department of Zambia-MDZ., 2005). Figure eight below shows maximum mean annual temperature in relation to the maximum long term mean in Lusaka District. Between 1990 and 2009, Lusaka District experienced above average mean maximum annual temperatures.

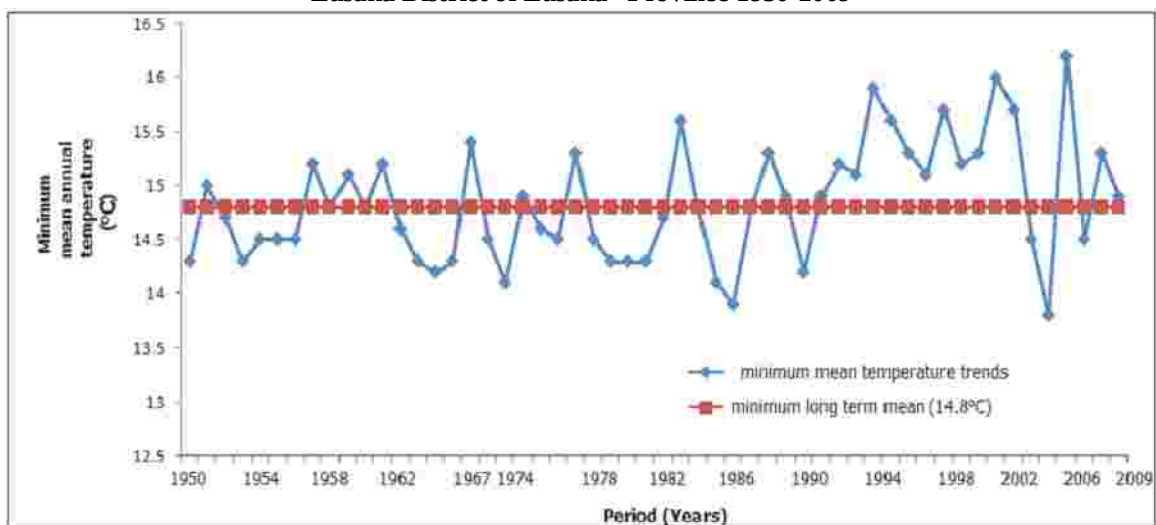
Figure 8: Maximum mean annual temperature in relation to the maximum long term mean in Lusaka District of Lusaka Province 1950-2009



Source: Field data (2010) (excluding the period between 1968 and 1973)

Figure nine below shows that Lusaka District had experienced increased mean minimum annual temperature trends between 1990 and 2009.

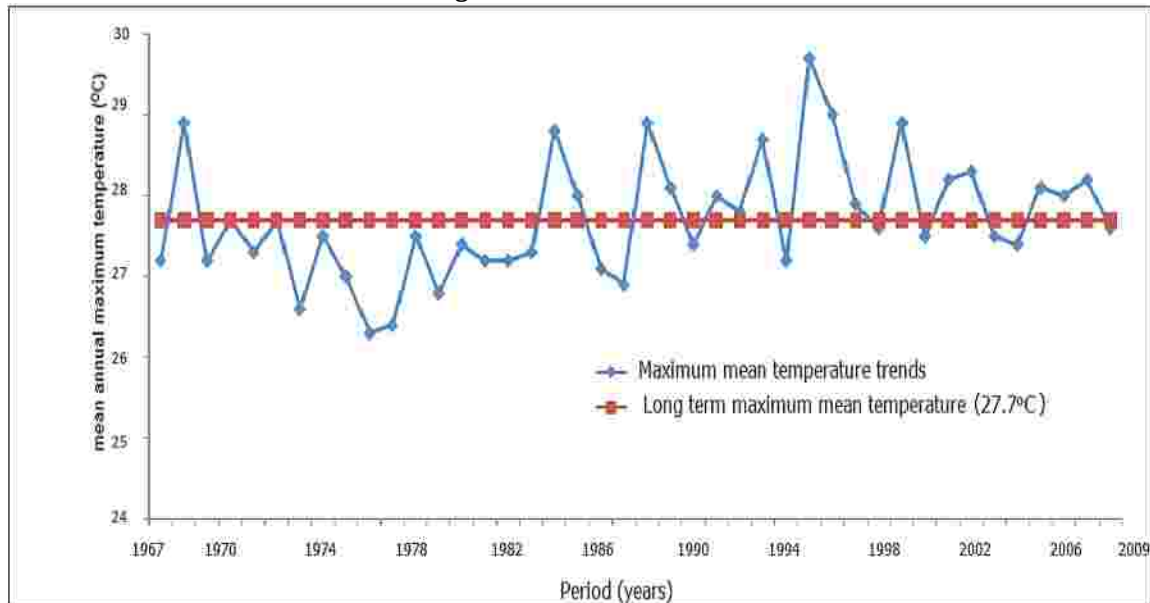
Figure 9: Minimum mean annual temperature trends in relation to the minimum long term mean in Lusaka District of Lusaka Province 1950-2009



Source: MDZ (2010) (excluding the period between 1968 and 1973)

Figure 10 below shows the maximum annual mean temperature trends in relation to the maximum long term means for Chongwe District between 1967 and 2009.

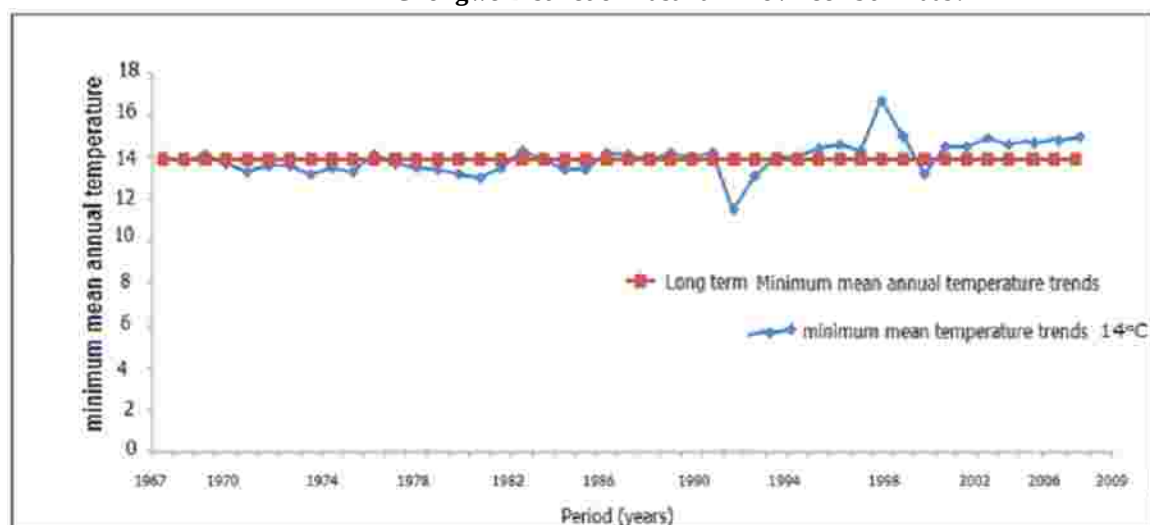
Figure 10: Maximum mean annual temperature trends in relation to the maximum long term mean in Chongwe District of Lusaka Province 1967-2009.



Source: MDZ (2010)

Moreover, figure 11 below shows minimum mean annual temperature trends in relation to the minimum long term mean in Chongwe District of Lusaka Province.

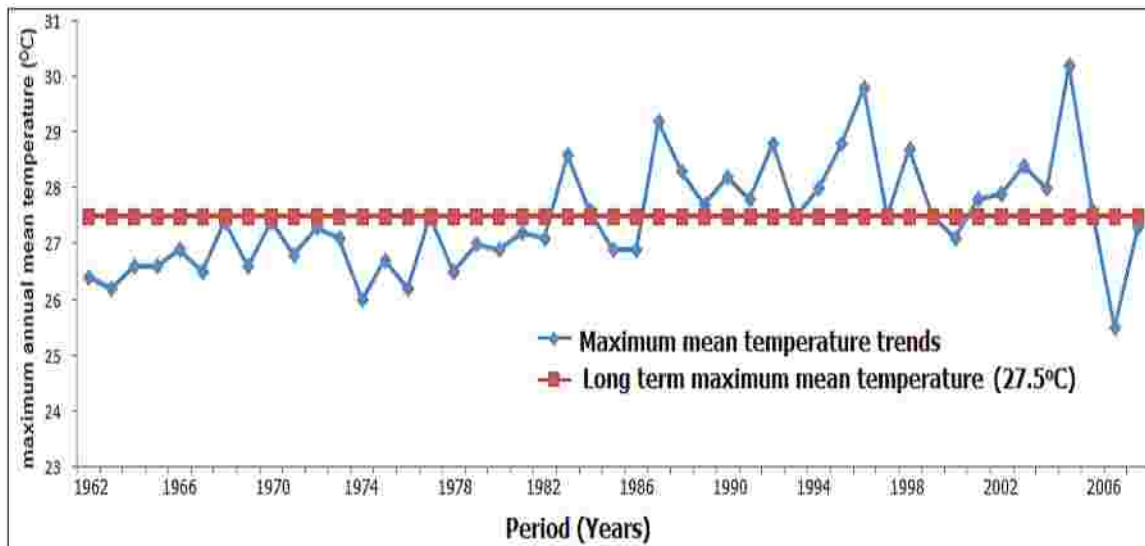
Figure 11: Minimum mean annual temperature trends in relation to the minimum long term mean in Chongwe District of Lusaka Province 1967-2009.



Source: MDZ (2010)

Figure 12 below shows the maximum mean annual temperature trends in relation to the long term mean in Kafue District of Lusaka Province. It shows that the mean maximum temperature trends were above average from 1986 to 2008 and vice versa during the period before 1986.

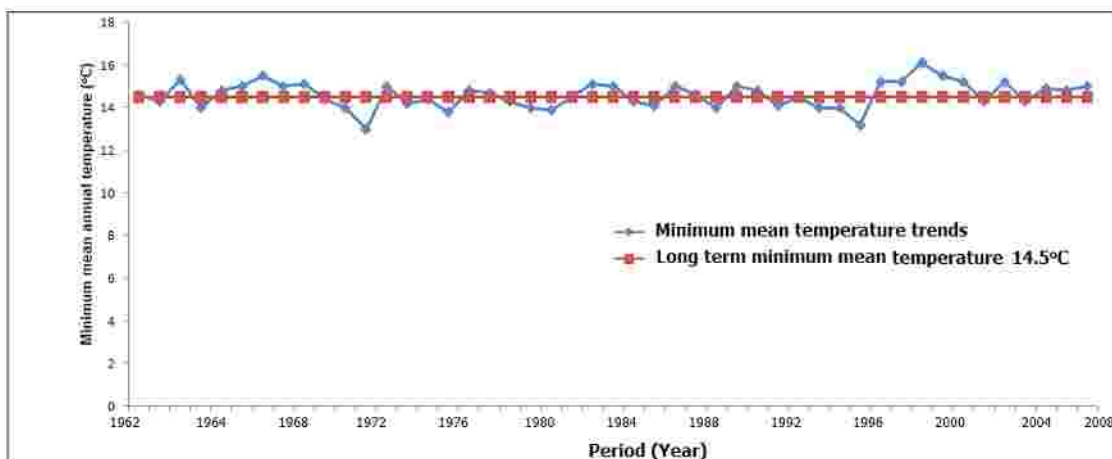
Figure 12: Maximum mean annual temperature trends in relation to the long term mean in Kafue District of Lusaka Province 1962-2008.



Source: MDZ (2010)

Figure 13 below shows minimum mean annual temperature trends in relation to the long term mean in Kafue District of Lusaka Province.

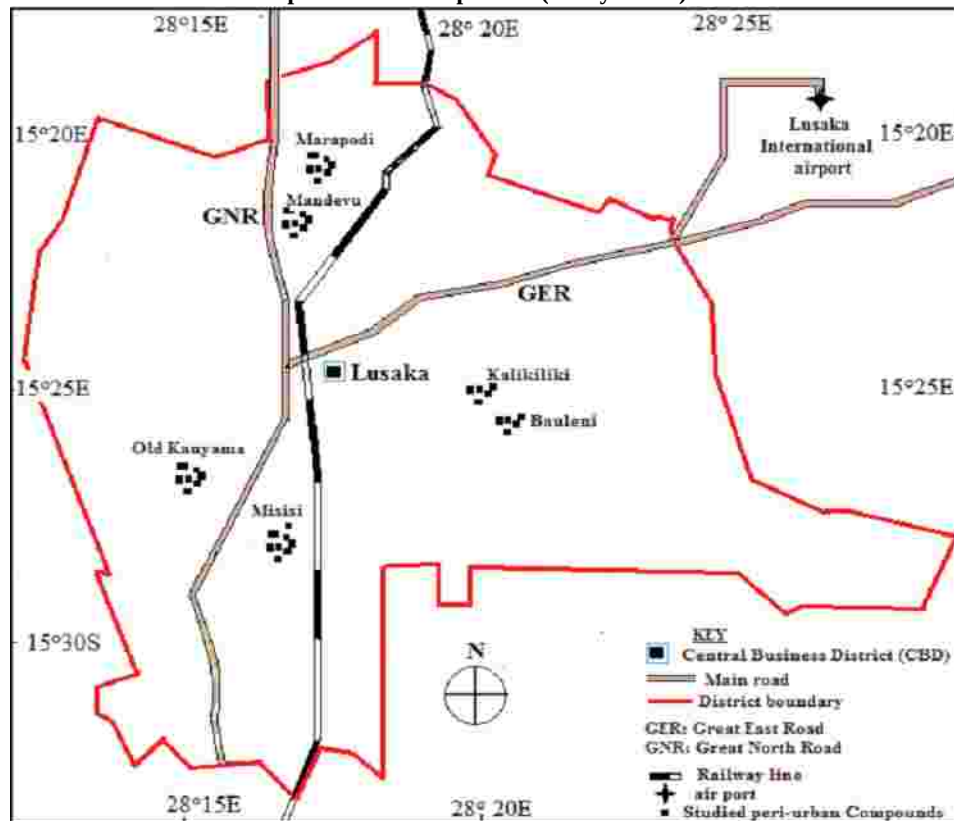
Figure 13: Minimum mean annual temperature trends in relation to the long term mean in Kafue District of Lusaka Province 1962-2009.



Source: MDZ (2010)

Figure 14 below shows the general geographical setup of Lusaka District and specific study sites.

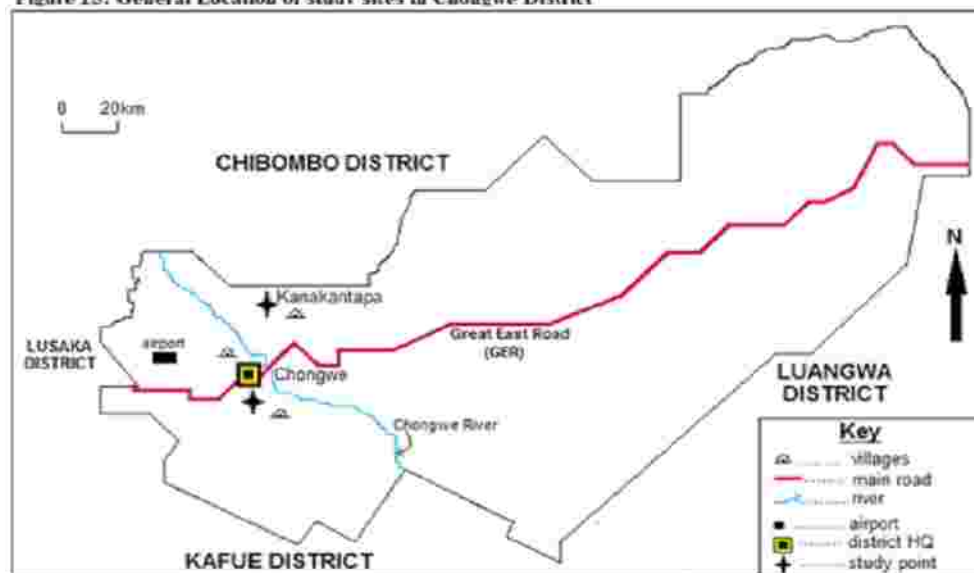
Figure 14: General location of selected peri-urban compounds (Study areas) in Lusaka District of Lusaka Province.



By M. Muchanga (2011)

Figure 15 below provides the general location of study sites within Chongwe District of Lusaka.

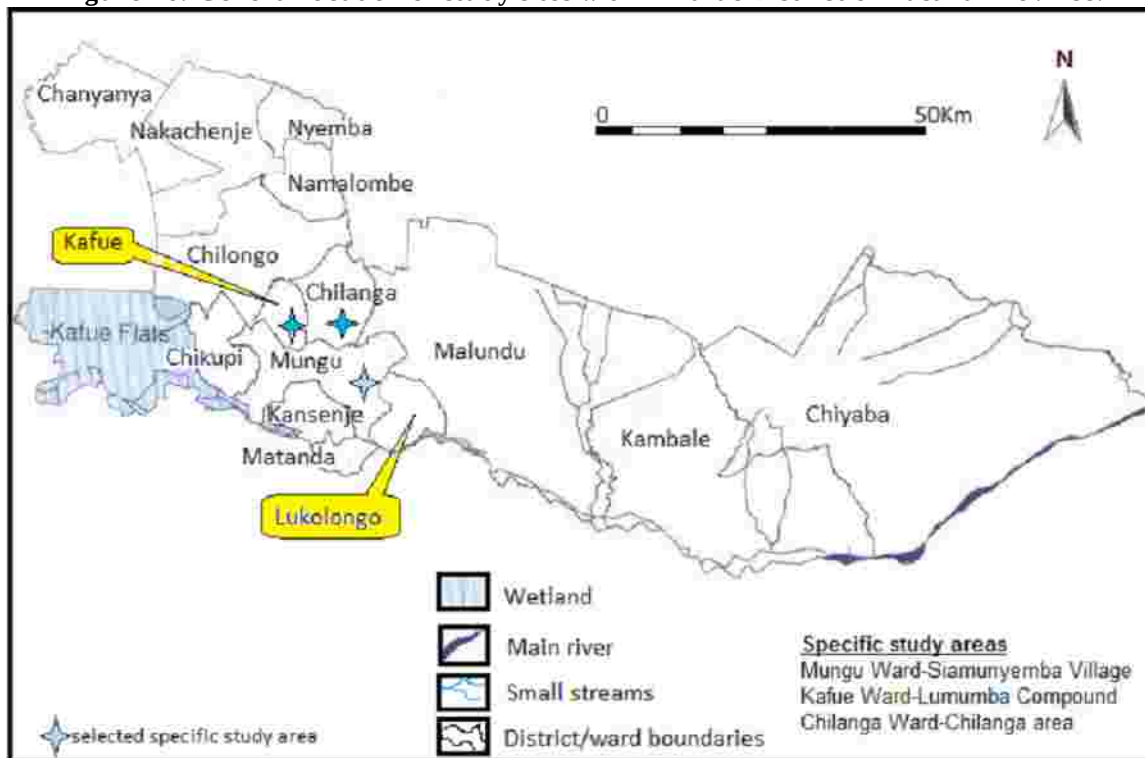
Figure 15: General Location of study sites in Chongwe District



By M. Muchanga (2010)

Figure 16 below shows the general location of study sites within Kafue District of Lusaka Province.

Figure 16: General location of study sites within Kafue District of Lusaka Province.

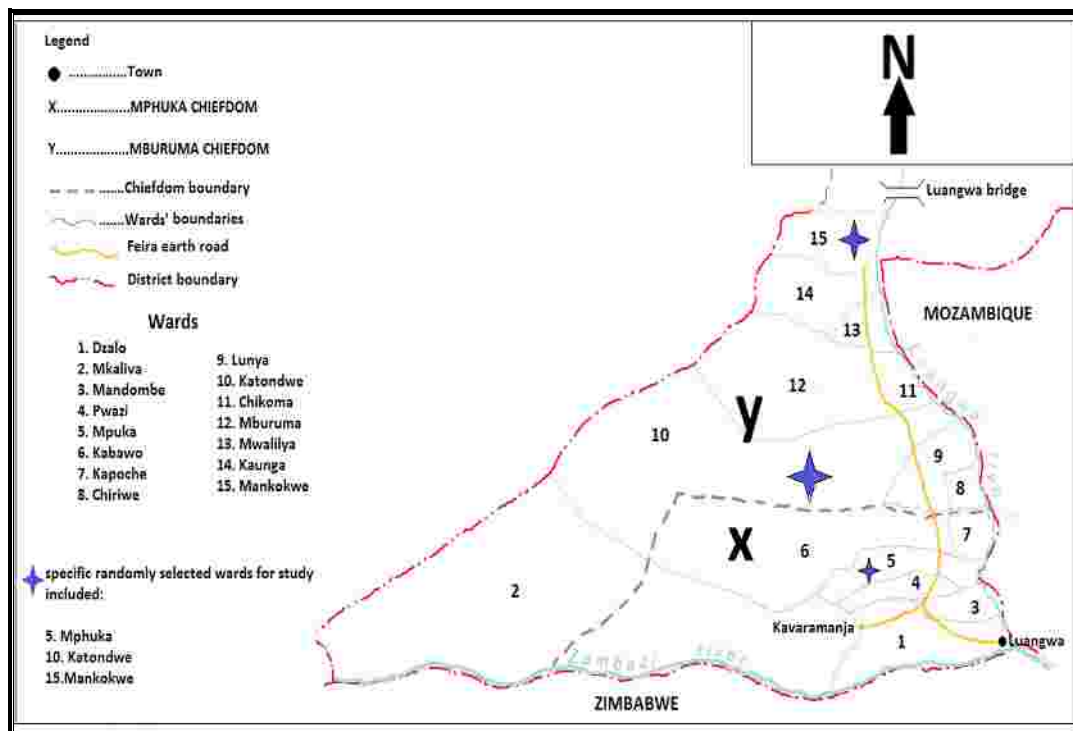


Adapted and modified from ZVAC (2007:65).

Peri-urban areas of Lusaka District are mainly inhabited by people whose socio-economic statuses are low. Major economic activities are quarrying, road side business, beer brewing among others Lusaka City Council (LCC) and Environmental Council of Zambia (ECZ) (2003). Most of them are very densely populated with poor housing facilities and are prone to annual floods and their related effects. Kafue District is one of the rural districts in Zambia where most people are engaged in small scale businesses such as fishing. Others are peasant farmers engaged in small scale shifting cultivation. In Chongwe District, charcoal burning is one of the major sources of income apart from small scale agriculture and stone quarrying. Only few people are employed in the formal sectors (Ibid). Luangwa District, located 320 kilometres east of Lusaka City, has different characteristics from the other three districts especially from ecological perspective. However, the southernmost fringes of Kafue District have some features similar to those of Luangwa district. It is located within latitudes 15° to 15°45' south and longitudes 29° 15' to 30° 31' east. It is mainly a valley area composed of Zambezi and Luangwa Valleys whose

altitude ranges between 300 and 400 metres above sea level. Thus, it is generally in the low veld zone (Luangwa District Planning Unit-LDPU, 2005). It is located in the agro-ecological region-I as earlier shown in figure four (Banda, 2005). Because of its valley and mountainous location, the area experiences very high temperatures almost throughout the year ranging between 25°C and 45°C with humidity levels of 60 per cent to 70 per cent (Lungu, 2006). It is a drought prone area whose annual rainfall ranges between 600 and 800 mm or below (Ibid). As earlier mentioned DMMU emphasized that, this district is among those which are very vulnerable to climatic risks, hazards and disasters. It has some drought resistant plants such as baobab trees, thorny (Munga) species and date palm. Others include grass, shrubs and masau bushes. The people in Luangwa District barely practice arable farm because of arid conditions. However, most of them engage in fishing and domestication of so animals such as goats (Op.cit). Figure 17 below shows the general geographical orientation of Luangwa District.

Figure 17: Specific study sites within Luangwa district of Lusaka Province.



Source: LDPU (2005)

Having described the study areas within Lusaka Province with the aid of maps, the following section shows reasons for adopting Lusaka Province as study area.

3.3 Reasons for choosing study areas within Lusaka Province

As earlier mentioned in chapter one by Sichingabula (1998), the southern half of Zambia, in which Lusaka Province is found, might be the worst hit by climate change because it would generally be prone to rainfall variability. Banda (2005) also confirmed that Lusaka Province experiences frequent rainfall variability. The study area was more accessible because it was the researcher's place of residence and this was more convenient from temporal and economic perspectives. Having described the study area in this the next chapter four shows the methodology used to collect data from the field prior to chapter five which will present collected data.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

The preceding chapter three described the study area from which the data presented in chapter five were collected. This chapter explains the research methodology used to collect the data. It will start by first explaining the main research design used in this study and reasons for adopting it. Thereafter, particular emphasis will be placed on population, sample and sampling method. It will also show the processes of primary and secondary data collection used just before the subsection that will show the method of data analysis as well as some limitations and delimitations of the study. Accordingly, the next section explains the research design and approaches used.

4.2 Research design

This research employed hermeneutic survey research approach. Hermeneutic survey approach was used in order to facilitate succinct interpretations of on-the-ground responses from various respondents premised on their different socio-ecological backgrounds. According to Sidhu (2009:109) “survey may be qualitative or quantitative” depending on the nature of data to be collected and how they are intended to be collected. This research combined both aspects. The quantitative approaches were employed mainly during the sampling processes, analysing and processing of data. The qualitative aspects were employed during face to face interviews and interpretation because the data were highly qualitative in nature although they were quantified as themes. Through the use of survey research, the researcher came into direct contact with selected people of Lusaka Province from whom new data on perceptions of climate change, adaptation, mitigation and learning were obtained. A survey was more appropriate given the expansive nature (178081) of the target population (households). It enabled capturing just a representative fraction of a whole, much as a camera takes a single photograph to represent larger landscapes. A survey approach also facilitated the use of both qualitative and quantitative techniques simultaneously. The next section shows the targeted population.

4.3 Population

While the preceding section explained the research design used, this section shows the target population which composed of ordinary residents in 178081 households (excluding low and medium density areas of Lusaka district) of the four districts of Lusaka Province (Central Statistical Office-CSO, 2003). The low and medium density areas of Lusaka District were streamlined because they might not have been the worst hit by climate change when compared to high density peri-urban areas. Thus, peri-urban areas provided more representative data. The following were the methods used to obtain the manageable sample from the target population.

4.4 Sampling design

This research used a combination of non-probability and probability sampling design which included cluster and simple random sampling techniques. The reasons for using cluster and simple random sampling approaches were as follows:

- Simple random sampling allowed a situation whereby every member of the generated clusters and households per selected subcomponent of a cluster (ward) within a district had equal chance of being selected.
- The target population of households in Lusaka Province was too expansive (178081), so it was not feasible to make up a list of every household in Lusaka Province, and from the list select a sample for study through normal randomisation process. Therefore, cluster sampling was most appropriate and cheaper method in order to arrive at manageable sample size of households.

4.4.1 Sample size and sampling processes

The sample size was made up of 165 residents from 165 households were selected from the total target population. From each selected household, a respondent was chosen. As earlier mentioned it was not feasible to make a list of every household in the area and from the list select a sample for study through a single randomization procedure. Therefore, in place of that, the researcher obtained provincial districts and subdivided them (using cluster sampling) into smaller clusters (wards or residential areas) containing households from which respondents were

fetches. As for Lusaka District, the researcher streamlined the high and medium density areas and only concentrated on the peri-urban areas (high density areas) because they were and still more vulnerable to climate change implications. They were also most likely to give the most representative perceptions of climate change as compared to those in and medium density areas. However, sampling techniques and process remained the same as those of other three districts. Table two below shows the total population households in Luangwa District from which the samples were obtained.

Each identified cluster (ward or residential area) in each district was assigned with a number and thereafter, simple random sampling was conducted to select some clusters from which desired samples of households were obtained. In instances where selected clusters were still too populated (the case of Lusaka district), each randomly selected cluster (ward) was further divided into sub-clusters. Simple random sampling was applied to select required subcluster(s) from which household samples were selected using simple random sampling. Table one below provides a summary of households obtained from each district.

Table 1: Summary population of households by district and the sample sizes in Lusaka Province

Universe	Districts	Total number of households	Size of the sample per district
Lusaka Province	Lusaka District (Peri-urban areas only)	145089	69
	Luangwa District	3,681	32
	Kafue District	29,311	40
	Chongwe District	23,786	24
Lusaka Province		178081	165

Source: Central Statistical Office-CSO (2000: 38-39)

The following sections show the processes and tools of primary and secondary data collection, ethical considerations, data analysis and processing as well as some limitations of the study.

4.5 Tools and process of primary data collection

To achieve the aim and objectives of this study the researcher mainly used semi-structured interview schedule shown in appendix two to investigate the perceptions of climate change and appropriate types of education for climate change adaptation and mitigation among selected areas of Lusaka Province. Semi-structured interviews explored participants' experiences of climate change in the context of conceptual meanings, effects, adaptation-mitigation measures and the most appropriate type of education for climate change. During this process, the respondents were allowed to express themselves as widely as possible on one theme of research before proceeding to the other. As the respondents expressed their views, the researcher was alert to capture subtle, meaningful cues and phrases in respondents' expressions and articulations of issues of climate change. As respondents did a lot of talking, the researcher did a lot of listening, note taking, simple unstructured observations, photographing and some follow-up questions where necessary.

My views about climate change did not feature in any way during interviews. Thus, I took note of important words and phrases of the respondents as uttered without any personal twisting. Suspension of researcher's academic notion of climate change enabled gaining of understanding of the typical experiences and perceptions of climate change that the respondents have had. Each respondent was interviewed for about 40 to 60 minutes.

The use of semi-structured interview facilitated follow-up questions to obtain deeper insight on certain issues that were raised by the respondents during the direct interviews. Moreover, semi-structured rather than fully structured interview schedule offered sufficient flexibility to approach different respondents differently while still covering the same areas of data collection. The researcher also used simple observations of respondents' non verbal cues during interviews and surroundings so as to confirm whether some of the issues they claimed to have been happening were existent or not. Being a face to face interview, discussion was also automatically incorporated and note taking was used to record respondents' words and phrases related to research.

4.5.1 Ethical considerations during primary data collection

The following were the ethical considerations during primary data collection on the perceptions of climate change:

- In rural settings of Luangwa, Kafue and Chongwe, the researcher was getting permission from relevant authorities of each visited area (for example, Village Heads or Representative Elders) before conducting interviews.
- Researcher's letter of introduction together with consent letter (shown in appendix one) for the research participants were revealed for approval and signing by each participant prior to being interviewed. The respondents were not allowed to disclose their names except their signature to show consent for interviews and none of them were photographed without their consent. The researcher politely requested the respondents to speak in the language they were more comfortable with prior to the interviews. The next section explains how primary data were processed and analysed.

4.6 Analysis and processing of collected primary data

Constant comparative method was used to analyse primary data. This involved classification of words and phrases that related to the same content into major themes. The idea was to allow the actual prevailing pattern, themes and phrases of the research findings to emerge from the data rather than be controlled by factors predetermined prior to their collection and analysis. After the summary of the findings from the interview questions, main emerging themes and ideas were manually coded, synthesized and quantified into percentages and presented in form of tables of frequencies and percentages as shown in chapter five. After obtaining the final overall portraits of the crude data from different areas, the data were qualitatively interpreted and discussed in chapter six. Thereafter, conclusions were drawn. The next segment explains the process of secondary data collection.

4.7 Process of secondary data collection

In this research, some secondary data were obtained from documentary sources, reports, print and electronic media and some dissertations, books, among others from the University of Zambia

library and other sources. The process involved reading, reviewing, critiquing necessary and comparing of different findings already done by different scholars in the context of perceptions of climate change. The limitations and delimitations of the study were as follows:

4.8 Limitations of the study

- A large scale survey would have been better, but due to limited financial resources and time, the researcher undertook a small scale survey of only households out of the total 178081 in Lusaka Province (excluding those of low and medium nsity areas of Lusaka district). However, substantial information was still gathered because respondents provided a lot of answers for each of the main questions. The researcher could not access the latest population of residential areas and households in Lusaka Province. Therefore, only the 2000 census statistics of households (10 years old) were adopted and used to determine the sample size when in the actual sense, some more households and residential areas could have developed within a period of 10 years. This might have brought in some biases which were beyond the researcher's control.
- During the review of literature in Zambian context, it was noted that there was generally little or no literature on perceptions of climate change. This limited comprehensiveness of reviews in Zambian context. This was actually one of the reasons why the research captured a lot of respondents' views. Having shown the research methodology employed, the following were the research findings.

CHAPTER FIVE: RESEARCH FINDINGS

5.1 Introduction

Premised on methods shown in the preceding fourth chapter and research objectives and questions, this chapter comparatively presents results on perceptions of climate change in terms of causes and effects. It also shows residents' views on how the impact of climate change could be adapted to and mitigated and thereafter, types of education needed for adaptation and mitigation learning. In the context of objectives the results are comparatively presented in the following order as Luangwa District (Nyangu, Robert, Katondwe, Chilukusha-A, Chilukusha-B and Mphuka Villages), Chongwe District (Lubuko, Lusoke and Kampekete Villages, and Chongwe Compound), Lusaka District (Misisi, Mandevu, Bauleni, Kalikili i, Old Kanyama and Marapodi Compounds) and Kafue District (Lumumba Compound, Siamun ba Village and Chilanga). The target sample population was composed of residents among 165 households. In the context of the first objective, the following were section findings.

5.2 Perceptions of climate change: causes and effects

In the context of objective number one, this section comparatively shows perceived causes and effects of climate change among residents of studied areas within Lusaka Province.

5.2.1 Perceived causes of climate change

Table two below shows perceived causes of climate change among residents of selected villages of Luangwa District.

Table 2: Perceived causes of climate change among residents of selected Villages in Luangwa District.

Perceived causes of climate change	Frequencies (F) and percentages (%)											
	Nyangu		Robert		Katondwe		Chilukusha-A		Chilukusha-B		Mphuka	
	F	%	F	%	F	%	F	%	F	%	F	%
Wind from Mozambique	1	7	-	-	-	-	1	6.25	-	-	-	-
Valleys	3	21	1	6.6	1	10	-	-	-	-	1	8.3
Mountains	2	14	3	20	1	10	1	6.25	1	10	3	25
Sun	2	14	3	20	-	-	-	-	1	10	1	8.3
God	1	7	1	6.6	1	10	2	12.5	1	10	2	16.6
Baboons and elephants	2	14	-	-	-	-	-	-	-	-	-	-
Women wearing trousers	1	7	-	-	-	-	-	-	-	-	-	-

Poor sanitation	1	7	-	-	-	-	-	-	-	-	-	-
I do not know	1	7	1	6.6	-	-	-	-	1	10	-	-
Location of the area	-	-	1	6.6	-	-	-	-	1	10	-	-
Aridity	-	-	1	6.6	-	-	-	-	-	-	-	-
Fire wood collection	-	-	2	13.3	-	-	-	-	-	-	-	-
Bush burning	-	-	2	13.3	-	-	1	6.25	-	-	-	-
Leap years	-	-	-	-	1	10	-	-	-	-	-	-
Increased rainfall	-	-	-	-	1	10	-	-	-	-	-	-
Rise in temperature	-	-	-	-	1	10	-	-	1	10	1	8.3
Decreased temperature	-	-	-	-	1	10	-	-	-	-	-	-
Nature	-	-	-	-	1	10	-	-	-	-	-	-
Clouds	-	-	-	-	1	10	-	-	1	10	-	-
Air pollution	-	-	-	-	-	-	1	6.25	1	10	-	-
Ozone layer	-	-	-	-	-	-	1	6.25	1	10	-	-
Motor vehicles	-	-	-	-	-	-	1	6.25	-	-	-	-
Deforestation	-	-	-	-	-	-	2	12.5	-	-	2	16.6
Porous soils	-	-	-	-	-	-	1	6.25	-	-	-	-
Deciduous trees	-	-	-	-	-	-	1	6.25	-	-	-	-
Luangwa River	-	-	-	-	-	-	1	6.25	-	-	-	-
Charcoal burning	-	-	-	-	-	-	1	6.25	-	-	-	-
Soil erosion	-	-	-	-	-	-	1	6.25	-	-	-	-
Cutting reeds along Luangwa River	-	-	-	-	-	-	1	6.25	-	-	-	-
Change of seasons	-	-	-	-	-	-	-	-	-	-	1	8.3
Global warming	-	-	-	-	-	-	-	-	-	-	1	8.3
Total	14	100	15	100	10	100	16	100	10	100	12	100

Source: field data (2010) continuation of table 2

From table two above, some similarities in terms of causes of climate change among residents in selected areas of Luangwa District were evident. Some of these similarly perceived causal factors included mountains and God. With exception of Chilukusha A and B Villages, valleys as causal factors of climate change were perceived among Nyangu, Robert, Katondwe and Mphuka Villages. From the same table above, some variations are also obvious. For instance global warming as a cause of climate change (8.3 per cent) was only noticed in Mphuka Village. Other causal factors such as charcoal burning (6.25 per cent), soil erosion (6.25 per cent), among others were only noticed in Chilukusha-B Village. Apart from table two above, table three below shows perceived causes of climate change among residents in selected areas of Chongwe District. Deforestation was the most similarly perceived cause of climate change among residents in all studied areas namely Lubuko, Lusoke, Kampekete and Kanakantapa Villages as well as Chongwe Compound. Whilst 8.3 per cent of responses in Kanakantapa Village isolated

witchcraft as one of the causes of climate change, none of the other studied areas within the district indicated so.

Table 3: Perceived causes of climate change among residents of selected areas in Chongwe District

Perceived causes of climate change	Frequencies (F) and percentages (%)									
	Lubuko		Lusoke		Chongwe		Kampekete		Kanakantapa	
	F	%	F	%	F	%	F	%	F	%
Deforestation	2	20	5	25	2	13.3	3	30	4	33.3
Charcoal burning	2	20	-	-	3	20	3	30	-	-
Carbon dioxide	1	10	-	-	-	-	-	-	-	-
Green House Gases	1	10	-	-	-	-	-	-	-	-
Population increase	1	10	-	-	-	-	-	-	-	-
Absence of clouds	1	10	-	-	-	-	-	-	-	-
I do not know	2	20	3	15	-	-	-	-	-	-
Municipal waste	-	-	-	-	1	6.7	-	-	-	-
God	-	-	1	5	-	-	-	-	-	-
Increased rainfall	-	-	1	5	-	-	-	-	-	-
Nature	-	-	2	10	-	-	-	-	-	-
Increase in sin	-	-	2	10	-	-	-	-	-	-
Bush burning	-	-	-	-	2	13.3	-	-	3	25
Air pollution	-	-	2	10	1	6.7	-	-	-	-
Industries	-	-	1	5	-	-	-	-	-	-
Motor vehicles	-	-	2	10	1	6.7	-	-	-	-
Ozone layer	-	-	1	5	-	-	-	-	-	-
Astronauts	-	-	-	-	1	6.7	-	-	-	-
Shifting cultivation	-	-	-	-	3	20	-	-	3	25
Destruction of catchment areas	-	-	-	-	1	6.7	-	-	-	-
Sun	-	-	-	-	-	-	2	20	-	-
Change of seasons	-	-	-	-	-	-	2	20	-	-
Witch craft	-	-	-	-	-	-	-	-	1	8.3
Traditional healers	-	-	-	-	-	-	-	-	1	8.3
Total	10	100	20	100	15	100	10	100	12	100

Source: field data (2010)

Table four below shows perceived causes of climate change among residents in selected per-urban compounds of Lusaka District. There were a lot of variations in terms of distribution of each perceived causal factor of climate change. Increased annual flooding was, however, among widely distributed among residents in Misisi (30 per cent), Kalikiliki (50%) and Old Kanyama (five per cent) Compounds. The view that climate change was caused by God was also common among residents in Bauleni (9.1 per cent), Old Kanyama (30 per cent) and Marapodi (20%) compounds.

Table 4: Perceived causes of climate change among residents of selected peri-urban compounds in Lusaka District

Perceived causes of climate change	Frequencies (F) and percentages (%)											
	Misisi		Mandevu		Bauleni		Kalikiliki		Old Kanyama		Marapodi	
	F	%	F	%	F	%	F	%	F	%	F	%
Open burning	5	25	-	-	-	-	-	-	-	-	1	10
Ozone layer	2	10	-	-	-	-	-	-	-	-	-	-
Air pollution	3	15	1	8.3	-	-	-	-	-	-	-	-
Factories	2	10	-	-	-	-	-	-	-	-	-	-
Increased floods	6	30	-	-	-	-	8	50	1	5	-	-
Carbon dioxide	2	10	-	-	-	-	-	-	-	-	-	-
Deforestation	-	-	1	8.3	-	-	-	-	-	-	-	-
Conurbation	-	-	1	8.3	-	-	-	-	-	-	-	-
Change of seasons	-	-	2	16.6	-	-	-	-	-	-	-	-
Motor vehicles	-	-	3	24.9	-	-	-	-	-	-	-	-
War	-	-	1	8.3	-	-	-	-	-	-	-	-
Industries	-	-	1	8.3	-	-	-	-	-	-	-	-
Fulfillment of bible Prophecy	-	-	1	8.3	-	-	-	-	-	-	-	-
Signs of Christ's second coming	-	-	1	8.3	-	-	-	-	-	-	-	-
God	-	-	-	-	1	9.1	-	-	6	30	2	20
Astronauts	-	-	-	-	1	9.1	-	-	-	-	-	-
Nature	-	-	-	-	2	18.2	-	-	-	-	-	-
Indeni oil refinery	-	-	-	-	1	9.1	-	-	-	-	-	-
Breweries	-	-	-	-	1	9.1	-	-	-	-	-	-
Government	-	-	-	-	4	36.4	2	12.5	4	20	-	-
I do not know	-	-	-	-	1	9.1	-	-	2	10	-	-
Urinating in public	-	-	-	-	-	-	2	12.5	-	-	-	-
Women from Monze	-	-	-	-	-	-	2	12.5	-	-	-	-
Explosion of the sun	-	-	-	-	-	-	2	12.5	-	-	-	-
Soil	-	-	-	-	-	-	-	-	3	15	-	-
Unknown beings	-	-	-	-	-	-	-	-	1	5	-	-
Sun	-	-	-	-	-	-	-	-	3	15	-	-
Poor drainage	-	-	-	-	-	-	-	-	-	-	4	40
Trees blowing cold air	-	-	-	-	-	-	-	-	-	-	1	10
Municipal waste	-	-	-	-	-	-	-	-	-	-	2	20
Total	20	100	12	100	11	100	12	100	20	100	10	100

Source: field data (2010).

Table five below also shows perceived causes of climate change among residents in Kafue District. Among the most commonly distributed perceived causes of climate change in Siamunyemba Village were charcoal burning, deforestation and municipal wastes. Poor government policy (two per cent) as a causal factor of climate change was only perceived in Chilanga areas. Open burning as a causal factor (16 per cent) only emerged from Lumumba area.

Table 5: Perceived causes of climate change among residents of selected area in Kafue District

Perceived causes of climate change	Frequencies (F) and percentages (%)					
	Lumumba		Siamunyemba		Chilanga	
	F	%	F	%	F	%
Open burning	5	16	-	-	-	-
Increased rainfall	-	-	2	4	-	-
Charcoal burning	-	-	7	14	6	12
Oceans	-	-	1	2	-	-
Beer drinking	-	-	2	4	-	-
Firewood collection	-	-	4	8	-	-
Deforestation	-	-	7	14	4	8
Sun	1	4	3	6	-	-
Change of seasons	3	12	-	-	-	-
Strong winds	1	4	-	-	-	-
Republican president	1	4	-	-	-	-
Frustration of ancestral spirits	1	4	-	-	-	-
Municipal waste	4	16	3	6	-	-
Adultery	-	-	1	2	-	-
God	5	20	4	8	-	-
Dumping of foetus	-	-	1	2	-	-
Nature	1	4	-	-	-	-
Eating expired foods	-	-	1	2	-	-
Bush burning	-	-	10	32	5	10
Increase in sin	-	-	4	8	-	-
I do not know	3	12	-	-	-	-
Cargo trucks	-	-	-	-	3	6
Roads	-	-	-	-	1	2
Lack of environmental knowledge	-	-	-	-	2	4
Increased dust	-	-	-	-	9	18
Air pollution	-	-	-	-	11	22
Lafarge cement company	-	-	-	-	8	16
Poor government policy	-	-	-	-	1	2
Total	25	100	50	100	10	100

Source: field data (2010)

Having presented results on perceived causes of climate change, the following section presents results on perceived effects of climate change in order to make the first objective of this research complete.

5.2.2 Perceived effects of climate change

According to table six below, increased temperature (4 per cent to 12 per cent) and increased droughts (three per cent to 8.1 per cent) were the most similarly perceived effects of climate change among residents in selected areas of Luangwa. They emerged among all studied areas.

The view that climate change was forcing residents to spend nights outside their houses was only registered in Nyangu and Robert Villages (6.6 per cent to eight per cent).

Table 6: Perceived effects of climate change among residents of selected Villages in Luangwa District

Perceived effects of climate change	Frequencies (F) and percentages (%)											
	Nyangu		Robert		Chilukusha-A		Chilukusha-B		Katondwe		Mphuka	
	F	%	F	%	F	%	F	%	F	%	F	%
Increased temperature	4	9	1	4	4	10.8	4	12.1	1	7.1	3	6
Washing away of earth roads	1	2.2	-	-	-	-	2	6.1	-	-	-	-
Shortened rainy season (2 months)	2	4.4	1	4	3	8.1	1	3	-	-	1	2
Little or no farming	1	2.2	3	12	3	8.1	3	9.1	-	-	1	2
Wild animals destroy crops	1	2.2	3	12	4	10.8	-	-	-	-	-	-
Lions kill livestock	1	2.2	-	-	-	-	-	-	1	7.1	1	2
Crop growth failure	2	4.4	2	8	2	5.4	4	12.1	-	-	7	14
Drying up of crops	2	4.4	-	-	3	8.1	3	9.1	-	-	2	4
Decreased fishing activity	3	6.6	-	-	-	-	1	3	-	-	1	2
Increased drought	2	4.4	2	8	3	8.1	1	3	1	7.1	2	4
Spending nights outside our houses	3	6.6	2	8	-	-	-	-	-	-	-	-
No source of monetary income	2.2	2.2	1	4	2	5.4	-	-	-	-	-	-
Food shortage	2	4.4	-	-	-	-	-	-	-	-	3	6
Increased poverty	1	2.2	-	-	1	2.7	1	3	-	-	3	6
Increased hunger	4	9	2	8	2	5.4	4	12.1	3	21.3	4	8
Our bodies easily get tired	1	2.2	-	-	-	-	2	6.1	-	-	3	6
Water scarcity	4	9	2	8	1	2.7	1	3	-	-	1	2
Skin & eye diseases	1	2.2	-	-	-	-	3	9.1	-	-	3	6
Increased loss of soil fertility	2	4.4	1	4	2	5.4	-	-	-	-	2	4
Increased Malaria incidences	3	6.6	1	4	4	10.8	-	-	2	14.2	2	4
Increased Diarrhoea	3	6.6	-	-	-	-	1	3	4	28.6	5	10
I do not know	1	2.2	1	4	-	-	-	-	-	-	1	2
Increased rainfall	-	-	1	4	-	-	-	-	-	-	1	2
Lack of HEP	-	-	1	4	-	-	-	-	-	-	1	2
Aridity	-	-	1	4	2	5.4	2	6.1	1	7.1	3	6
Increased HIV/AIDS	-	-	-	-	1	2.7	-	-	1	7.1	-	-
Total	45	100	25	100	37	100	33	100	14	100	50	100

Table seven below shows perceived effects of climate change among residents in selected areas of Chongwe District. Evidence in the table below shows that climate change-induced decrease in rainfall was common in Lubuko (17 per cent), Lusoke (f per cent) and Kampekete (8.3 per cent) Villages. Change in vegetation type as one of the effects of climate change was only confined to Kanakantapa Village (12.6 per cent).

Table 7: Perceived effects of climate change among residents of selected areas in Chongwe District

Perceived effects of climate change	Frequencies (F) and percentages (%)									
	Lubuko		Lusoke		Chongwe		Kampekete		Kanakantapa	
	F	%	F	%	F	%	F	%	F	%
Decreased rainfall	2	17	1	5	-	-	1	8.3	-	-
Change of seasons	1	8	-	-	-	-	-	-	-	-
Late onset of rainy season	2	17	-	-	-	-	-	-	3	12.6
Little or no farming	2	17	3	15	-	-	-	-	-	-
Fear of uncertainties	1	8	-	-	-	-	-	-	-	-
Lack of monetary income	1	8	-	-	-	-	-	-	-	-
Increased Eye diseases	1	8	-	-	-	-	-	-	-	-
I do not know	2	17	2	10	-	-	1	8.3	-	-
Increased floods	-	-	4	20	-	-	-	-	1	4.2
Increased hunger	-	-	1	15	-	-	3	25	-	-
Increased malaria	-	-	2	10	1	6.7	1	8.3	-	-
Increased temperature	-	-	2	10	-	-	1	8.3	1	4.2
Increased deforestation	-	-	2	10	-	-	-	-	-	-
Loss of soil fertility	-	-	3	15	2	13.3	-	-	-	-
increased flues & cough	-	-	-	-	3	20	-	-	-	-
Drying up rivers	-	-	-	-	2	13.3	-	-	-	-
Inconsistent rainfall	-	-	-	-	3	20	-	-	-	-
Decreased crop yields	-	-	-	-	1	6.7	-	-	4	16.8
Increased poverty	-	-	-	-	2	13.3	2	16.7	-	-
Change of weather patterns	-	-	-	-	1	6.7	-	-	-	-
Increased rainfall	-	-	-	-	-	-	2	16.7	-	-
Increased strong winds	-	-	-	-	-	-	1	8.3	2	8.4
Increased droughts	-	-	-	-	-	-	-	-	2	8.4
Increased malnutrition	-	-	-	-	-	-	-	-	2	8.4
Deaths of livestock	-	-	-	-	-	-	-	-	3	12.6
Decreased temperature	-	-	-	-	-	-	-	-	1	4.2
Increased water scarcity	-	-	-	-	-	-	-	-	2	8.4
Change of vegetation	-	-	-	-	-	-	-	-	3	12.6
Total	12	100	20	100	15	100	12	100	24	100

Source: field data (2010).

Table eight below shows perceived effects of climate change among residents in selected peri-urban compounds of Lusaka District.

Table 8: Perceived effects of climate change among residents of selected peri-urban compounds in Lusaka District

Perceived effects of climate change	Frequencies (F) and percentages (%)											
	Misisi		Mandevu		Bauleni		Kalikiliki		Old Kanyama		Marapodi	
	F	%	F	%	F	%	F	%	F	%	F	%
Increased floods	12	40	4	22	7	35	3	15	7	14	4	23.6
Increased temperature	3	10	2	11	2	10	2	10	4	8	-	-
Delay people's movements	1	3	-	-	-	-	-	-	2	4	-	-
Drowning of livestock	2	7	-	-	-	-	2	10	-	-	-	-
Loss of property	3	10	-	-	-	-	-	-	5	10	-	-
Loss of lives	2	7	-	-	-	-	-	-	-	-	-	-
Increased poverty	2	7	-	-	-	-	-	-	-	-	-	-
Increased cholera cases	3	10	2	11	-	-	2	10	5	10	-	-
Displacement of people	1	3	-	-	-	-	-	-	-	-	-	-
Toilets are flooded	1	3	-	-	-	-	-	-	-	-	-	-
Increased droughts	-	-	1	5.5	-	-	-	-	-	-	-	-
Closure of schools	-	-	1	5.5	-	-	-	-	-	-	-	-
Increased rainfall	-	-	4	22	-	-	2	10	-	-	4	23.6
Pupils could not attend school lessons	-	-	2	11	-	-	-	-	-	-	-	-
Seasonal overlaps	-	-	2	11	3	15	-	-	-	-	-	-
Increase in flues	-	-	-	-	4	20	1	5	8	16	-	-
Increased malaria	-	-	-	-	4	20	3	15	1	2	4	23.6
Increased beer drinking	-	-	-	-	-	-	2	10	-	-	-	-
Tsunamis	-	-	-	-	-	-	1	5	-	-	-	-
Increased diarrhea	-	-	-	-	-	-	2	10	-	-	1	5.8
Increased prostitution	-	-	-	-	-	-	-	-	1	2	-	-
Increased theft	-	-	-	-	-	-	-	-	1	2	-	-
Psychological disturbances	-	-	-	-	-	-	-	-	1	2	-	-
Fear of uncertainty	-	-	-	-	-	-	-	-	3	6	-	-
Increase in mud	-	-	-	-	-	-	-	-	3	6	-	-
Shortage of clean water	-	-	-	-	-	-	-	-	-	-	4	23.6
Total	20	100	12	100	11	100	12	100	20	100	10	100

Source: field data (2010)

From table eight above, residents among all studied areas of Lusaka District perceived climate change-induced increase in annual floods (14 per cent to 40 per cent). With exception of Marapodi compound, increased temperature also emerged one of the effects of climate change

among studied areas. Among the most area-specific perceived effects of climate change were fear of uncertainty (six per cent) in old Kanyama compound and increased droughts (5.5 per cent) in Mandevu compound. Meanwhile, table nine below shows results among residents in selected areas of Kafue District.

Table 9: Perceived effect of climate change among residents of selected areas of Kafue District

Perceived effects of climate change	Frequencies (F) and percentages (%)					
	Lumumba		Siamunyemba		Chilanga	
	F	%	F	%	F	%
Increased temperature	12	10	4	5	10	25
Decreased temperature	6	5.1	-	-	-	-
Increased coughing	5	4.2	-	-	3	7.5
Increased flu cases	5	4.2	-	-	5	12.5
Increased malaria cases	6	5	2	2.6	-	-
Increased cholera cases	3	2.5	-	-	-	-
Seasonal overlaps	6	4.7	3	3.8	-	-
Increased rainfall	1	0.8	3	3.8	6	15
I do not know	1	0.8	-	-	-	-
Abrupt weather changes	4	3.5	-	-	-	-
Loss of soil fertility	-	-	-	-	9	22.5
Increased strong winds	2	2.8	-	-	-	-
Crops growth failure	5	4.2	-	-	-	-
Decreased maize yields	5	4.2	3	3.8	5	12.5
Increased water scarcity	10	8.4	10	12.5	-	-
Increased deaths of livestock	5	4.2	4	5	-	-
Increased droughts	6	5	7	8.5	-	-
We easily get tired	1	0.8	-	-	-	-
Drying up of some trees	-	-	-	-	2	5
Increased HIV/AIDS infections	1	0.8	-	-	-	-
Decreased pasture	6	5	4	5	-	-
Increased mosquito breeding	4	3.4	-	-	-	-
Late onset of rainy season	5	4.2	-	-	-	-
Increased hunger	5	4.2	4	5	-	-
Inconsistencies in rainfall	3	2.5	-	-	-	-
Early departure of rain season	9	7.6	9	11.3	-	-
Able to cultivate new crops	2	1.7	-	-	-	-
Boosts soil moisture	-	-	1	1.3	-	-
Recharging of aquifers	-	-	1	1.3	-	-
Promoted organic gardening	-	-	1	1.3	-	-
Increased animal diseases	-	-	5	6.3	-	-
Increased poverty	-	-	3	3.8	-	-
Shortage of food	-	-	4	5	-	-
Surviving on roots	-	-	1	1.3	-	-
Increased abortion	-	-	1	1.3	-	-
Increase in pests (i.e. Ntata)	-	-	4	5	-	-
Increased beer drinking	-	-	2	2.5	-	-
Aridity	-	-	4	5	-	-
Total	118	100	80	100	40	100

From table nine above, similarities were evident. Responses showed that climate change had contributed to decrease in maize yields in Lumumba (4.5 per cent), Siamunyemba (3.8 per cent) and Chilanga (12.5 per cent). Whilst five per cent of responses in Chilanga area only isolated drying up of trees, 1.7 per cent of responses fetched in Lumumba area only showed that climate change had led to growing of new crops. The last eight tables presented results on how residents of selected areas of Lusaka Province perceived climate change in terms of causes and effects. The proceeding tables will show results on the second objective of this research. Thus, residents' views on climate change adaptation and mitigation.

5.3 Views on climate change adaptation

Table 10 below shows that provision of maize food aid was the most similarly perceived (4.2 per cent to 30 per cent) means of mitigating climate change among residents in Nyangu, Robert, Chilukusha A and B, Katondwe and Mphuka Villages. Praying hard was the second most similarly perceived (seven per cent to 12.5 per cent) adaptation strategy. Early harvesting of crops (12.5 per cent) as a means of adaptation was only suggested in Nyangu Village.

Table 10: Views on adaptation to the impacts of climate change among residents of selected areas in Luangwa District

Adaptation and mitigation strategies	Frequencies (F) and percentages (%)											
	Nyangu		Robert		Chilukusha-A		Chilukusha-B		Katondwe		Mphuka	
	F	%	F	%	F	%	F	%	F	%	F	%
Praying hard	2	8.3	2	7	2	11.8	-	-	1	12.5	2	7.4
Maize food aid	1	4.2	4	14.2	1	5.9	6	30	2	25	1	3.7
Women must stop wearing trousers	2	8.3	-	-	-	-	-	-	-	-	-	-
Aged people's aid	1	4.2	-	-	-	-	-	-	-	-	-	-
Cross-border trade	-	-	-	-	-	-	1	5	-	-	-	-
Business loans	1	4.2	2	7	-	-	3	15	-	-	-	-
Change the attire	2	8.3	-	-	-	-	-	-	-	-	-	-
Drought-resistant livestock	-	-	-	-	-	-	-	-	-	-	3	11.1
Build houses away from rivers	1	4.2	-	-	-	-	-	-	-	-	-	-
Build houses on hills	2	8.3	-	-	-	-	-	-	-	-	-	-
Climate change clubs	-	-	-	-	-	-	2	10	-	-	1	3.7
Adopt early maturing seeds	1	4.2	-	-	1	5.9	1	5	-	-	1	3.7
Migrate from the area	1	4.2	-	-	-	-	-	-	-	-	-	-
Early harvesting of crops	3	12.5	-	-	-	-	-	-	-	-	-	-

Cultivate crops on the uplands	1	4.2	-	-	-	-	-	-	-	-	-	-
Install water tanks	4	16.6	3	10.5	-	-	-	-	-	-	1	3.7
Fish farming	-	-	-	-	-	-	1	5	-	-	-	-
Game cropping	1	4.2	-	-	-	-	-	-	-	-	-	-
Drought-resistant seed					2	11.8	2	10	1	12.5	3	11.1
I do not know	1	4.2	1	3.5	-	-	-	-	-	-	-	-
Entrepreneurship	-	-	2	7	-	-	-	-	-	-	2	7.4
Climate change on TV	-	-	-	-	1	5.9	-	-	-	-	-	-
Install hammer mills	-	-	1	3.5	-	-	-	-	-	-	-	-
Set up orphanages	-	-	2	7	1	5.9	1	5	-	-	-	-
Improved housing	-	-	-	-	-	-	-	-	1	12.5	-	-
Tar Feira road	-	-	2	7	2	11.8	-	-	-	-	-	-
Rural industries	-	-	-	-	-	-	-	-	1	5	-	-
Sensitisation	-	-	1	3.5	3	17.7	1	5	-	-	2	7.4
Live in mud and thatched houses	-	-	4	14.3	-	-	-	-	-	-	4	14.8
Build health centres	-	-	2	7	-	-	-	-	1	12.5	-	-
medical personnel	-	-	2	7	-	-	-	-	1	12.5	-	-
Reforestation	-	-	-	-	1	5.9	-	-	-	-	1	3.7
Change farming type	-	-	-	-	-	-	-	-	-	-	2	7.4
Scientists to work with local residents	-	-	-	-	1	5.9	-	-	-	-	-	-
Irrigation schemes	-	-	-	-	1	5.9	-	-	-	-	1	3.7
Organic gardening	-	-	-	-	1	5.9	2	10	-	-	1	3.7
Honey production	-	-	-	-	-	-	-	-	-	-	1	3.7
We need to be strong	-	-	-	-	-	-	-	-	-	-	1	3.7
Total	24	100	28	100	17	100	20	100	8	100	27	100

Source: field data (2010). *Continuation of table 10.*

Table 11 below shows suggested means of adaptation and mitigation of climate change among residents of selected areas in Chongwe District. With an exception of Kanakantapa Village, residents from Lubuko, Lusoke and Kampekete Village as well as Chongwe Compound suggested reduction of deforestation as means of adaptation and mitigation. Introduction of solar energy was only suggested in Lubuko Village as shown in table 11 below.

Table 11: Views on adaptation to impacts of climate change among residents of selected areas in Chongwe District

Adaptation and mitigation strategies	Frequencies (F) and percentages (%)									
	Lubuko		Lusoke		Chongwe		Kampekete		Kanakantapa	
	F	%	F	%	F	%	F	%	F	%
Introduce use of solar energy	1	12.5	-	-	1	5	-	-	-	-
Jail illegal charcoal burners	2	25	-	-	-	-	-	-	-	-
Reduce deforestation	2	25	3	18.8	4	20	2	25	-	-

Rural empowerment funds	1	12.5	-	-	-	-	-	-	-	-
I do not know	2	25	2	12.5	-	-	-	-	-	-
Learning about climate change	-	-	1	6.3	-	-	-	-	-	-
Praying hard	-	-	2	12.5	-	-	-	-	-	-
Climate change workshops	-	-	-	-	2	10	-	-	-	-
We must work with scientists	-	-	1	6.3	-	-	-	-	-	-
Maize food aid	-	-	1	6.3	-	-	-	-	-	-
Repent of our sins	-	-	2	12.5	-	-	-	-	-	-
Climate change in local language	-	-	2	12.5	-	-	-	-	-	-
Reduce on use of private cars	-	-	1	6.3	-	-	-	-	-	-
Jail residents who litter around	-	-	1	6.3	-	-	-	-	-	-
Reforestation	-	-	-	-	4	20	1	12.5	4	40
Forestry sensitisation	-	-	-	-	3	15	-	-	4	40
Alternative source of livelihood	-	-	-	-	3	15	-	-	-	-
Learning about healthful living	-	-	-	-	3	15	-	-	-	-
Change behaviour	-	-	-	-	-	-	1	12.5	-	-
Reduce charcoal burning	-	-	-	-	-	-	4	50	-	-
Increase carbon tax	-	-	-	-	-	-	-	-	1	10
Practice sustainable farming	-	-	-	-	-	-	-	-	1	10
Total	8	100	16	100	20	100	8	100	10	100

Source: field data (2010).

Continuation of table 11

Table 12 below shows means of adaptation and mitigation suggested by residents of selected peri-urban areas of Lusaka District.

Table 12: Views on adaptation to impacts of climate change among residents of selected peri-urban compounds in Lusaka District

Adaptation and mitigation strategies	Frequencies (F) and percentages (%)											
	Misisi		Mandevu		Bauleni		Kalikiliki		Old Kanyama		Marapodi	
	F	%	F	%	F	%	F	%	F	%	F	%
Build toilets with raised foundation	5	23	-	-	-	-	-	-	-	-	-	-
Stop all smoking vehicles	1	4.5	-	-	-	-	-	-	-	-	-	-
Plant a tree on each house	3	13.5	-	-	-	-	-	-	-	-	-	-
Build good water drainage	5	23	5	25	-	-	3	24.9	5	15.6	4	40
Share ideas about the problem	3	13.5	-	-	-	-	-	-	-	-	-	-
Control litter burning	1	4.5	-	-	-	-	-	-	-	-	-	-
I do not know	1	4.5	-	-	-	-	-	-	-	-	-	-
Cut off some trees	-	-	-	-	-	-	-	-	-	-	1	10
Build houses with raised foundation	3	13.5	-	-	-	-	-	-	4	12.4	-	-

Involve local residents in planning	-	-	5	25	-	-	-	-	-	-	-	-
Avoid building in low laying areas	-	-	3	15	-	-	-	-	-	-	-	-
Relocation	-	-	-	-	-	-	-	-	-	-	3	30
Learn about climate change in local language	-	-	3	15	4	33.2	3	24.9	-	-	-	-
Prepare before rainy season	-	-	1	5	-	-	-	-	-	-	-	-
Charcoal burners to have identity cards	-	-	1	5	-	-	-	-	-	-	-	-
Praying hard	-	-	2	10	1	8.3	2	16.3	8	25	2	20
Stop corruption	-	-	-	-	1	8.3	-	-	-	-	-	-
Change government	-	-	-	-	2	16.6	1	8.3	3	9.3	-	-
Educate us about the environment	-	-	-	-	3	24.9	-	-	-	-	-	-
Teach us on waste management	-	-	-	-	1	8.3	-	-	3	9.3	-	-
Stop public urination	-	-	-	-	-	-	1	8.3	-	-	-	-
Depot Monze women	-	-	-	-	-	-	2	16.3	-	-	-	-
Climate change clubs	-	-	-	-	-	-	-	-	1	3.1	-	-
Learn about healthful living	-	-	-	-	-	-	-	-	3	9.3	-	-
Water-borne toilets	-	-	-	-	-	-	-	-	4	12.5	-	-
Build good schools	-	-	-	-	-	-	-	-	1	3.1	-	-
Total	22	100	20	100	12	100	12	100	32	100	10	100

Source: field data (2010). Continuation of table 12

From table 12 above, residents of selected compounds of Lusaka District similarly suggested building of water drainages (15.6 per cent to 40 per cent) as a means reducing climate change-induced floods. The only exception was Bauleni compound. Excluding residents of Misisi Compound, residents from other compounds suggested praying hard (8.3 per cent to 25 per cent) as a way of reducing climate change impact. Table 13 on the next page presents the final results from Kafue district in the context of the second objective, thus, to capture residents' views on means of adaptation and mitigation.

Table 13: Views on adaptation to impacts of climate change among residents of selected areas in Kafue District

Adaptation and mitigation strategies	Frequencies (F) and percentages (%)					
	Lumumba		Siamunyemba		Chilanga	
	F	%	F	%	F	%
Praying hard	5	16.6	4	8	-	-
Provide agriculture loans	-	-	5	10	-	-
Climate change sensitization	-	-	-	-	3	15
Reduce charcoal burning	-	-	6	12	-	-
Reforestation	-	-	6	12	4	20
Stop air pollution	-	-	-	-	8	40
alternative source of energy	-	-	3	6	-	-
Adopt climate change resistant seeds and crops	-	-	5	10	-	-
Introduce environmental law	-	-	-	-	1	5
Adopt drought resistant animals	5	16.6	5	10	-	-
Increase carbon tax	-	-	-	-	4	20
Open up a lot of churches	-	-	4	8	-	-
Practice organic gardening	-	-	6	12	-	-
Sink more boreholes	6	20	5	10	-	-
Involve traditional leader	-	-	1	2	-	-
Distribute mosquito nets	3	9.9	-	-	-	-
Climate change clubs	3	9.9	-	-	-	-
Learn about climate change	4	13.2	-	-	-	-
Improve child care	2	6.6	-	-	-	-
Change government	2	6.6	-	-	-	-
Total	30	100	50	100	20	100

Source: field data (2010)

From table 13 above it can be seen that no single strategy was common throughout all studied areas of Kafue District. For instance, praying hard as means of reducing the impact of climate change was only suggested in Lumumba and Siamunyemba areas. Moreover, reforestation was preferred in Chilanga and Siamunyemba areas. Changing government (6.6 per cent) was only suggested in Lumumba area.

Having shown results on objective number two of this research in the context of adaptation and mitigation of climate change, the following section shows results on objective number three which aimed to find out types of education that would be needed for adaptation learning.

5.4 Types of education needed for adaptation learning

According to table 14 below, agricultural education scored the highest frequency (25 per cent to 50 per cent) among residents of selected areas of Luangwa District. Business education (10 per cent to 30 per cent) was also suggested among some residents, but with an exception of those based in Robert and Katondwe Villages. Environmental education was only preferred in Chilukusha-B Village (10 per cent).

Table 14: Types of education needed for adaptation learning among residents in selected Villages of Luangwa District.

Types of education needed	Frequencies (F) and percentages (%)											
	Nyangw		Robert		Chilukusha-A		Chilukusha-B		Katondwe		Mphuka	
	F	%	F	%	F	%	F	%	F	%	F	%
Agricultural Education	5	25	4	40	3	30	5	50	2	40	4	40
Irrigation Education	3	15	-	-	-	-	-	-	-	-	-	-
Fishing Education	3	15	-	-	-	-	-	-	-	-	2	20
Business Education	3	15	-	-	3	30	1	10	-	-	1	10
Moral Education	1	5	-	-	-	-	-	-	1	20	-	-
Life skills Education	2	10	-	-	-	-	1	10	-	-	-	-
Gardening Education	2	10	-	-	-	-	-	-	-	-	-	-
I do not know	1	5	2	20	-	-	-	-	-	-	-	-
Climate change education	-	-	2	20	1	10	-	-	-	-	-	-
Children's climate change education	-	-	2	20	1	10	-	-	-	-	-	-
Pests control education	-	-	-	-	1	10	1	10	-	-	-	-
Health education	-	-	-	-	1	10	-	-	2	40	-	-
Crafts education	-	-	-	-	-	-	1	10	-	-	-	-
Environmental education	-	-	-	-	-	-	1	10	-	-	-	-
Literacy education	-	-	-	-	-	-	-	-	-	-	2	20
Education for Sustainable Development (ESD)	-	-	-	-	-	-	-	-	-	-	1	10
Total	20	100	10	100	10	100	10	100	5	100	10	100

Source: field data (2010)

With an exception of Lubuko Village, table 15 on the next page shows that forestry education was the most similarly needed (30 per cent to 40 per cent) type of education for adaptation and mitigation learning among residents of selected areas Chongwe District. Agricultural education was also preferred (20 per cent to 30 per cent) among all areas except in Chongwe Compound.

Table 15: Types of education needed for adaptation learning among residents of selected areas in Chongwe District.

Types of education needed	Frequencies (F) and percentages (%)									
	Lubuko		Lusoke		Chongwe		Kampekete		Kanakantapa	
	F	%	F	%	F	%	F	%	F	%
Agricultural Education	2	25	2	20	-	-	2	20	3	30
Climate Change Education	2	37.5	-	-	2	20	-	-	-	-
Environmental Education	1	12.5	-	-	-	-	2	20	-	-
Geography Education	2	25	-	-	-	-	-	-	-	-
Adaptation education	-	-	2	20	-	-	-	-	-	-
Adult education	-	-	1	10	1	10	-	-	-	-
Flood education	-	-	1	10	-	-	-	-	-	-
Moral education	-	-	1	10	-	-	-	-	-	-
Forestry education	-	-	3	30	4	40	4	40	4	40
Literacy education	-	-	-	-	2	20	-	-	-	-
Crafts education	-	-	-	-	1	10	-	-	-	-
Chemical education	-	-	-	-	-	-	1	10	-	-
Civic education	-	-	-	-	-	-	1	10	-	-
Anthropological education	-	-	-	-	-	-	-	-	1	10
Fire education	-	-	-	-	-	-	-	-	2	20
Total	8	100	10	100	10	100	10	100	10	100

Source: field data (2010)

Table 16 below shows types of education needed among residents of Lusaka District.

Table 16: Types of education needed for adaptation learning among residents of selected peri-urban areas in Lusaka District.

Perceived causes of climate change	Frequencies (F) and percentages (%)											
	Misisi		Mandevu		Bauleni		Kalikiliki		Old Kanyama		.Marapodi	
	F	%	F	%	F	%	F	%	F	%	F	%
Environmental Education	3	15	-	-	-	-	-	-	-	-	-	-
Health Education	4	20	-	-	2	18.2	-	-	5	25	2	16.6
Flood Education	7	35	3	37.5	3	27.3	12	60	13	65	4	33.3
Adaptation Education	6	30	-	-	-	-	-	-	-	-	-	-
Climate change education	-	-	2	25	5	45.4	-	-	-	-	4	33.2
Moral education	-	-	1	10	1	9.1	-	-	-	-	-	-
Sanitation education	-	-	1	12.5	-	-	-	-	-	-	-	-
Literacy education	-	-	-	-	-	-	4	20	-	-	-	-
Baby care education	-	-	-	-	-	-	2	10	-	-	-	-
Beer education	-	-	-	-	-	-	2	10	-	-	-	-
Waste management education	-	-	-	-	-	-	-	-	2	10	2	16.6
Total	20	100	8	100	11	100	20	100	20	100	12	100

From table 16 above, we could see that flood education was the most commonly needed (27.3 per cent to 65 per cent) among residents of all studied peri-urban compounds of Lusaka District. However, variations were noticed for other types of education. For instance, literacy education was only suggested in Kalikiliki Compound (20 per cent), whereas sanitation education was only preferred in Mandevu Compound (12.5 per cent) unlike other compounds.

Lastly, table 17 below shows the types of education needed for adaptation learning among residents of selected areas in Kafue District.

Table17: Types of education needed for adaptation learning among residents of selected areas in Kafue District.

Types of education needed	Frequencies (F) and percentages (%)					
	Lumumba		Siamunyemba		Chilanga	
	F	%	F	%	F	%
Agricultural Education	9	36	7	35	-	-
Health Education	11	44	-	-	-	-
Water Education	5	20	-	-	-	-
Forestry education	-	-	5	25	-	-
Traditional education	-	-	2	10	-	-
Fire education	-	-	6	30	-	-
Chemical education	-	-	-	-	8	40
Environmental education	-	-	-	-	4	20
Climate change education	-	-	-	-	8	40
Total	25	100	20	100	20	100

Source: field data (2010)

Table 17 above shows that health education was mostly needed (36 per cent) in Lumumba Compound, residents of Siamunyemba Village mostly needed (35 per cent) agricultural education. Chemical education and climate change education were the most needed (80 per cent) in Chilanga area. Traditional education scored the lowest frequency (10 per cent) among all suggested types of education in Siamunyemba Village. This chapter (five) has presented results in the context of perceived causes and effects of climate change, means adaptation and types of education needed for adaptation learning. The proceeding sixth chapter comparatively discusses them in the context of the objectives.

CHAPTER SIX: DISCUSSION OF RESEARCH FINDINGS

6.1 Introduction

This chapter provides an interpretive and comparative discussion of the research findings presented in the previous chapter (five) in the context of research objectives. Perceived causes and effects of climate change will be discussed first, followed by discussion of suggested climate change adaptation and mitigation strategies. Thereafter, the types of education needed for adaptation and mitigation learning will be discussed just prior to the reflection on the extent to which the objectives were met.

6.2 Perceptions of climate change: causes and effects

This section discusses results that were obtained in the context of how residents of selected areas of Lusaka Province perceived the causes of climate change. It is divided into two components. The first one will discuss perceived causes and the second section will discuss perceived effects of climate change.

6.2.1 Perceived causes of climate change

With reference to tables two, three, four and five which showed perceived causes of climate change in the previous chapter (five), it was evident that residents of selected areas in Lusaka Province associated the causes of climate change with various factors. Whilst some factors were similar, others were distinct premised on space and residents' experience with climate change. Deforestation was one of the perceived causes of climate change among residents. In Chilukusha-A Village, 12.5 per cent of responses by residents isolated it as one of causal factors of climate change. Residents of Mphuka Village also thought (16.6 per cent) in the same way. Deforestation was found to be the most commonly perceived (13.3 per cent to 33.3 per cent) cause of climate change among residents of all studied areas in Chongwe District. According to evidence in table three above, 20 per cent of responses by residents of Lubuko Village isolated it as one of the causes of climate change. A similar view (25 per cent) emerged among residents of Lusoke Village. In Chongwe Compound, deforestation was cited in 13.3 per cent of responses as one of causes of climate change. Whilst accounting for 30 per cent of views from Kampekete Village, it also claimed 33.3 per cent of perceived causal factors in Kanakantapa Village of

Chongwe District. Fourteen per cent of residents' views in Siamunyemba Village of Kafue District also upheld deforestation as a causal factor of climate change and so were eight per cent of responses obtained among residents of Chilanga area in the same District. Although deforestation was the most common causal factor of climate change in Chongwe District and partly in Luangwa and Kafue Districts, it was not popular in Lusaka District. Premised on evidence from table four in chapter five, deforestation was only perceived as a causal factor of climate change among residents in Mandevu Compound and it scored 8.3 per cent of all perceived causes in that area.

Deforestation as a causal factor of climate change is associated with several human activities such as charcoal burning, firewood collection and bush burning. Indeed, 6.25 per cent of responses among residents of Mphuka Village in Luangwa District cited charcoal burning as one of the causes of climate change. A similar view emerged from Chongwe District as highlighted in 20 per cent of responses from Lubuko Village, 30 per cent of views from Village and 20 per cent of perceptions among residents of Chongwe Compound. Fourteen per cent of views among residents of Siamunyemba Village in Kafue ict also attributed the occurrence of climate change to charcoal burning and so did 12 per cent of responses by residents of Chilanga area, in the same district, show. Charcoal burning and bush burning are inextricably linked to uncontrolled deforestation. Evidence from Robert Village of Luangwa District showed that 13.3 per cent of causes of climate change hinged on bush burning. This could have contributed to aridity as one of the indirect drivers climate change in the area. Moreover, 6.25 per cent of views among residents of Chilukusha-A Village also blamed bush burning for occurrence of climate change. A similar view also emerged in 13.3 per cent of responses among residents of Chongwe Compound and 25 per cent of responses among residents of Kanakantapa Village. In Siamunyemba Village, 32 per cent of reasons for occurrence of climate change were also attributed to bush burning. A similar view (10 per cent) was also upheld among residents of Chilanga area. Eight per cent of views by residents of Siamunyemba Village also evinced firewood collection as one of the causes of climate change in their locality. A related view (13.3 per cent) also emerged among residents of Robert Village. On the contrary, residents of selected peri-urban compounds of Lusaka District neither perceived charcoal burning nor bush burning as well as firewood collection as causes of climate change. This could be attributed urbanization

factors. However, 25 per cent of responses by residents of Misisi Compound and 10 per cent of views among Marapodi residents instead blamed open burning (public burning of municipal wastes) as one of the causes of climate change. Some residents of Lumumba Compound in Kafue District, whose characteristics follow after the similitude of peri-urban compounds of Lusaka District, also blamed open burning (16 per cent) as one of the causes of climate change.

According to Karpagam (2004), deforestation, which refers to uncontrolled removal of vegetation without replacement, leads to the accumulation of carbon (that emanates from charcoal, bush and open burnings) into the local atmosphere causing climate change. According to the MTENRs (2007), Zambia generally loses 250000 to 300000 trees annually due to the fact that about 80 per cent of citizens especially those in rural areas such as Luangwa, Chongwe and Kafue, depend on wood fuel. According to Otter, Olego and Niang (2007), vegetation helps in bio-sequestration (arresting of carbon through vegetation), which according to Otter, Olego and Niang (2007) is the most feasible means of reducing climate change in Africa and particularly, among studied areas of Lusaka Province. Environmental Council of Zambia (ECZ) (2010) adds that open burning could be a major contributor to climate change especially in peri-urban areas of Lusaka District. Therefore, there is need to teach residents on the importance of conserving trees and sustainable use of fire in the face of climate change.

According to table three on page 45, residents of Chongwe Compound cited shifting cultivation (20 per cent) as one of the causes of climate change in their area. A similar perception (25 per cent) also emerged from among residents of Kanakantapa Village. According to Lusaka City Council (LCC) and ECZ (2003), shifting cultivation had been one of the means of livelihood among Chongwe District residents. Simply described, shifting cultivation involves clearing of small plots to plant seed or crops for food. Sometimes practitioners clear the land by burning the forest in the process called slash-and-burn agriculture, this method makes the clearing process easier and releases nutrients into the soil quickly (Karpagam, 2004). However, this practice often leads to deforestation and subsequent emission and accumulation of carbon which increases the risk of climate change at local level as was the case in Chongwe Compound and Kanakantapa Village. Sustainable agricultural education could help in reducing such practices for the sake of the changing climate. Moreover, 6.7 per cent of responses by residents of Chongwe Compound

showed that destruction of catchment area by human activities such as shifting cultivation was one of the causes of climate change. This view also emerged from 6.25 per cent of responses on causal factors of climate change in Chilukusha-A Village of Luangwa District. “Over cutting of reeds along the Luangwa River is contributing to climate change in our area”, emphasised one of the residents. Catchment areas usually produce a variety of plants because of their proximity to rivers. They usually have variety of plants that act as carbon sinks, so if they were cleared in excess, most of the carbon accumulates into the atmosphere with possibility of causing climate change.

Blame was also projected on deciduous trees (6.25 per cent) for observed change in climate of Chilukusha- A Village. According to Mills et al. (2010), most trees mainly sequester carbon through their live attached leaves, unlike those which have already dropped off. So if most tree leaves were shed due to aridity as could have been the case in Chilukusha-A Village, bio-sequestration would not be as effective as it would be before complete shedding of leaves. As such, most of carbon would accumulate in local atmosphere with a possibility of causing climate change. Nevertheless, some tree species have leaves which can substantially bio-sequester carbon even after being shed off. For example, Mills et al. (2010:6) cited spekboom-rich thicket (), which is mainly confined to the southwestern part of t Eastern Cape Town, that the shed off leaves of this tree species could hold about 130 tonnes of carbon per hectare. “This is equivalent to stores in many forest types and 10 to 50 times more than in other semi-arid ecosystems.” So if such tree species could easily adapt to climatic conditions in Chilukusha-A Village, it would be prudent to have them planted there in order to help in arresting locally produced carbon. Another perceived causal factor of climate change which was only unique to Chilukusha-A Village soil erosion and it accounted for 6.25 per cent of all perceived causes. Soil erosion reduces soil fertility and microbial activities that make soil suitable for plant growth. Therefore, in a situation where soil erosion became persistent, plant growth would reduce as perceived in Chilukusha-A Village and carbon would eventually accumulate in the local atmosphere with potential to contribute to climate change.

Moreover, seven per cent of responses among residents of Nyangu Village showed that climate change had been caused by poor sanitation. According to Kapoor (2001), sanitation

etymologically comes from a French word *sanitas*, which means health. It is undisputable that climate change had been partly caused by poor health of the atmospheric elements and other biophysical parts of the environment. This view was only confined to Nyangu Village. However, it was linked to 6.7 per cent of views that emanated from Chongwe Compound that climate change was caused by accumulation of municipal wastes. Twenty per cent of responses by residents of Marapodi Compound also pointed out municipal waste as one of the causes of climate change. This was also found in 16 per cent of views among residents of Lumumba Compound and six per cent of responses that were obtained among residents of Siamunyemba Village. Kapoor (2001) argued that municipal wastes contribute to poor sanitation and produce methane (one of the Green House Gases (GHGs)) when they decompose and ferment. Methane also emanates from public urination, which was cited in 12.5 per cent of views among residents of Kalikiliki Compound as one of the causes of climate change in the area. In order to reduce emission of methane through public urination and upholding good sanitation, there is need to put legal frameworks to discipline those involved in this practice.

Motor vehicles were also deemed one of the causes of climate change according to 6.25 per cent of responses by residents of Chilukusha-A Village. A similar view (10 per cent) also emerged from Lubuko Village, and among residents of Chongwe Compound (6.7 per cent) and Mandevu Compound (24.9 per cent). This precisely coincided with eight per cent of views from Chilanga area that showed that climate change was caused by cargo truck roads (especially Kafue Road). Asthana and Asthana (2001) argued that automobile had been one of the major causes of climate change because of emission of sulphur oxide pollutants and other gases such as carbon dioxide, which cause air pollution and inextricably linked to climate change. Air pollution was actually cited in 6.25 per cent of views from Chilukusha-A Village and 10 per cent of responses from Chilukusha-B Village as one of the causes of climate change. In Lusoke Village and Chongwe Compound, it accounted for 10 per cent and 6.7 per cent of perceived causes of climate change. It was similarly cited (15 per cent) by Misisi Compound residents and also in Mandevu compound where it accounted for 8.3 per cent of perceived causal factors. In Chilanga area of Kafue District, air pollution scored the highest frequency (22 per cent) among all cited causes of climate change. This factor could not be separated from automobile as one of the causes of climate change. Similarly, 16 per cent of responses by residents in Chilanga blamed Lafarge

Cement Company for the occurrence of climate change, thus, justifying the view that air pollution was one of the causes of climate change in the area. This company vividly radiates a lot of dust (perceived to have contributed to climate change by 18 per cent) and gases which could be threats to the local atmosphere and possible changes in local climate. In some areas such as Misisi Compound (10 per cent) and Mandevu Compound (8.3 per cent) of Lusaka District as well as Lusoke Village (five per cent) of Chongwe District, residents generalised that climate change was partly being caused by factories which emitted carbon dioxide and other GHGs causing air pollution. It is now well known that industrialization has been one of the major causes of climate change through air pollution as also confirmed by Karpagam (2004).

Furthermore, 18.2 per cent of responses among residents of Bauleni Compound blamed Indeni Oil Refinery and Breweries for the occurrence of climate change. Much as we appreciate the connectivity of these two factors to air pollution and climate change, they were not localised. Indeni Oil Refinery Company is found in Ndola town on the Copperbelt Province of Zambia, not in Bauleni Compound of Lusaka District. Additionally, there were no breweries in the area. The media could have probably influenced such unlocalised, yet correct views. In similar circumstances, conurbation was highlighted in 8.3 per cent of responses by residents of Mandevu Compound as one of the causes of climate change the area. Conurbation refers to creation of a large urban area when neighbouring towns spread into and merge with each other (Lee, 2001). Conurbation implies high industrial development, increased human consumption and other activities which have potential to cause climate change especially through air pollution. Therefore, the response was correct except it did not pply to the local area. In a deeper sense, it probably implied urban sprawl which had been rampant in Lusaka District and could have led to large scale clearing of vegetation leading to carbon accumulation in the local atmosphere and possible alteration of local climate.

A view that climate change was partly caused by astronauts emerged from both Bauleni Compound (9.1 per cent) and Chongwe Compound (6.7 per cent). Indeed, the space shuttles used by astronauts to go to space do contribute to climate change through air pollution. Nevertheless, this neither applied to Bauleni Compound nor Chongwe Compound because there had never been astronauts or space shuttles in this compound, not even at national level. This unlocalised

causal factor including those already discussed could have been influenced by the media. Environment-oriented education would therefore be necessary in order to educate residents on how to distinguish local, national and international causes of climate change.

Although ozone (O_3) as a causal factor of climate change was not widely suggested, it emerged from Lusoke Village where it accounted for five per cent of causal factors. It also surfaced in Misisi Compound where it accounted for 10 per cent of all perceived causes of climate change. In Chilukusha-A Village of Luangwa District, it accounted for 6.25 per cent of all perceived causal factors. Correct though this view could have been, it did not directly apply to areas where it was suggested. Ozone is both a natural and human-made greenhouse gas. Ozone in the upper atmosphere is known as the ozone layer and shields life on Earth from the Sun's harmful ultraviolet radiation. Depletion of the ozone layer actually causes a slight cooling, offsetting a small part of the warming from greenhouse gases. However, ozone in the lower atmosphere is a component of smog, a severe type of air pollution. It is also a greenhouse gas that contributes about a fourth as much as carbon dioxide to global warming. Unlike the greenhouse gases such as carbon dioxide, methane and others, which are well-mixed throughout the atmosphere, ozone in the lower atmosphere tends to be limited to industrialized regions and often contributes to climate change in such areas (Encarta, 2009). None of the areas where it (O_3) was suggested is industrialized. However, in a deeper sense, it probably implied already discussed air pollution. Global warming was also perceived (8.3 per cent) to be one of the causes of climate change in Mphuka Village. Simply defined, global warming refers specifically to any change in the global average surface temperature leading to some areas being warmer and others being cooler (Climate Change News-CCN., 2010). Therefore, the view was precise, but it was not localised and this shows the need for relevant education in order to instruct residents on how to contrast local aspects of climate change from international ones.

On a striking note, 8.3 per cent of views obtained from Mandevu Compound linked the occurrence of climate change to war. Bomb blasts and other war weapons irrefutably contribute to climate change by polluting the atmosphere. However, war as a causal factor of climate change was not applicable to this area because it had never experienced war incidences. Not even at national level had war been experienced. This view might have been influenced by the media images. Under such circumstances environment-oriented education would be very imperative in

order to instruct people on what may or what may not directly affect local climate in the area. Two per cent of responses from Siamunyemba Village revealed that eating of expired foods was one of the causes of climate change in the area. Given a deeper thought, such a view probably implied that climate change was contributing to stomach complication whenever somebody ate expired foods. But instead of being too speculative, strategically planned education could help clarify such puzzling perceptions of climate change. Moreover, 14 per cent of the responses captured from Nyangu Village showed that baboons and elephants were contributing to climate change in the village. Luangwa District, where Nyangu Village is situated, is a national park area. Due to its drought conditions and high temperature mentioned in chapter three under description of study area, wild animals migrate in search of water. As they roamed human settlements, they caused havoc to residents and destroyed their crops. Thus, they were indirect contributors to the impact of climate change in the area.

On another very unique and area-specific note, 12.5 per cent of responses by residents of Kalikiliki Compound showed that climate change in the und was happening because of women from Monze District of Southern Province of Zambia. According to respondents, climate change had been transferred from Monze District to Kalikiliki Compound by some suspected women who visited the compound. In my view, these residents probably thought that climate change could be transmitted like HIV and AIDS. However, it is not the case for climate change. Monze District shares the same boundary with Gwembe Valley on the south-east and Namwala on the north-west (as earlier shown in figure two on page 24) both of which are among climate change-vulnerable areas in Zambia (Disaster Management and Mitigation Unit-DMMU, 2007). This was probably an influencing factor, but instead of speculating, such cases would require environment-oriented education to instruct residents on how climate change could happen and spread from one area to the other.

Moreover, 10 per cent of responses obtained from Lubuko Village blamed human population for occurrence of climate change in the area. This was a crucial view because where population has increased, there is often a high demand for energy, food consumption and others. In an attempt to meet all demands for the growing population in Lubuko lage, certain environmental objects such as wood would be affected thereby, leading to afore mentioned deforestation and subsequent hibernation in local carbon sequestration, leading to climate change. Poor drainage

system was blamed to be a major cause (40 per cent) of climate change in Marapodi Compound. This was inherently influenced by increase in climate change-induced floods which could have disturbed residents in the area. As such, they hurled event on poor drainage system. Inherently, this factor could also be blamed on people and the LCC for their failure to maintain good drainage in such an area, so prone to floods.

Whilst most of the already discussed causal factors leaned heavily socio-economic aspects of climate change, others were analysed from a moral dimension. For instance, seven per cent of responses among residents of Nyangu Village showed that climate change was happening because women were wearing trousers. Indeed, from a typical African rural set up such as Nyangu Village, it is considered immoral for a woman to wear male outfit and vice versa. According to scholars such as Snelson (1990) and Njobe (1990), any form of immorality in typical African setup such as Nyangu Village would be associated with a punishment or curse. Therefore, those women who wore trousers were regarded to have brought a curse which had been manifested through climate change in the area. In a similar context, 10 per cent of causes of climate change among residents in Lusoke Village of Chongwe District were attributed to increase in sin, with eight per cent of responses from Siamunyemba Village showing the same. Unlike residents of Nyangu Village, some residents in Siamunyemba Village emphasised that there was an increase in adultery (sexual relationships outside marriages), which accounted for two per cent of perceived causal factors. Two per cent of responses from Siamunyemba Village also showed that some residents in the village were engaged in damping fetuses. Immorality or sin, especially in Christianity realm is associated with a punishment from God (Supreme Being in Christianity) unless repented. Therefore, respondents might have perceived climate change as a punishment to humanity because of increase in sin against God. This was not only unique to these areas, but also appeared in literature review where some residents in Nigeria and Kenya perceived climate change to have been happening due to increase in sin. Moreover, two per cent of views from Siamunyemba Village showed that climate change was happening because of careless beer drinking among some residents. According to Namafe (2006), beer is part of African traditional life and while it might be a positive act in certain instances, it is most often regarded by some people as a public nuisance, immoral and source of vices in some areas such as Siamunyemba Village. Intrinsically, this view could have implied that beer was

wrong and was bringing a curse (climate change) in the area. However, as environmental educationists, we need to take robust measures to research and find out how beer could be a *friend* and an *enemy* especially in the face of climate change, rather than looking at it from a linear perspective.

Association of climate change to issues of morality as discussed above, was linked to spiritual perspectives on climate change in one way or the other. Seven per cent of views obtained from Nyangu Village showed that climate change was caused by God. A similar view emerged among residents of Robert Village (6.6 per cent), Katondwe Village (10 per cent), Chilukusha-A Village (12.5 per cent), Chilukusha Village-B (10 per cent) and in Mphuka Village where the view claimed 16.6 per cent of all perceived causal factors. In Lusoke Village, five per cent of views also showed that climate change in the area was caused by God. A similar view claimed 9.1 per cent of perceived causes in Bauleni Compound, 30 per cent in Old Kanyama Compound and 20 per cent from Marapodi Compound of Lusaka District. A similar perspective also surfaced in Lumumba Compound and Siamunyemba Village where it accounted for 20 per cent and eight per cent of all perceived causes respectively. Linking the occurrence of climate change to God also inherently implied that climate change was happening as an ‘Act of God’. Even Americans who initially could not accept that God could be the origin of some calamities such as climate change, earthquakes and others recently accepted it. According to Reuter’s article entitled “*Americans see disaster as sign of end times*”, cited in The Monday Post News Paper dated 28th March 2011, on page twenty-nine, 56 per cent of Americans agreed that disasters such as climate change and recent Fukushima Daiichi earthquake in Japan could be attributed to divine power of God. Similar to above discussed aspect of sin as a causal factor of climate change, 29 per cent of Americans also thought that “God sometimes punishes an entire nation for the sins of a few individuals.” Therefore, residents of selected areas of Lusaka Province were precise to associate the occurrence of climate change to God and rampant wide spread of sin. In a similar context, 16.6 per cent of responses from Mandevu Compound associated climate change to fulfillment of the Bible (holy book in Christianity) prophecy and as one of the signs of the second coming of Jesus Christ (Supreme Being next to Jehovah God in Christianity or son of God). These views were justified by one of the residents using biblical scriptures (King James Version) from the Book of Mathew chapter 24 reading from verses three to eight as follows:

And as He (Jesus Christ) sat upon the Mount of Olives, the disciples came unto him privately, saying, “Tell us ... what [shall be] the sign of thy coming, and of the end of the world?” And Jesus answered and said unto them “... ye shall hear of wars and rumours of wars: see that ye be not troubled: for all [these things] must come to pass ... there shall be famines, and pestilences, and earthquakes, in diverse places. All these [are] the beginning of sorrows.”

Premised on the above scriptural passage, such responses had a concrete basis which must never be underestimated. Referring back to Reuter’s article earlier mentioned above, “forty-four per cent of Americans said that recent ... disasters such as earthquakes [and climate change] could be a sign of the Biblical end times, with 67 per cent white evangelicals holding that view.” Such views connived well with some of the views of the local people in Samburu District of Kenya earlier discussed in the second chapter (review literature) of this dissertation. From what has been discussed so far we can say that the cause of climate change could not be narrowed down to a single factor, but to several points of view.

As a continuation, the occurrence of climate change was also perceived from cultural dimension in some residential areas. For example, in Kanakantapa Village of Chongwe District, 16.6 per cent of perceived causes of climate change were attributed to witchcraft (alleged magical power to make something happen) and traditional healers. Witchcraft and its practitioners are part of African culture and almost every misfortune including ... emanating from climate change could not happen without being associated with them (Mbiti, 1990). The logic behind condemnation of traditional healers for the occurrence of climate change was that they were partly contributing to deforestation (as they fetched various herbs) which indirectly contributes to climate change as earlier discussed. Further in-depth research on this theme could help find more knowledge and this could be done by the Department of Forests. In Lumumba Compound, four per cent of perceived causes of climate change were attributed to frustration of ancestral spirits. In almost the same context, five per cent of views by ... idents of Old Kanyama Compound showed that climate change was caused by unknown beings. Ancestral spirits are spirits of powerful people, like great chiefs, who died before any people now living were born. According to Mbiti (1990), they are more powerful and are responsible for the well being of communities such as those mentioned above. Respect for them has always been part of African culture in

general and some people in African Traditional Religion (ATR) believe that a curse (climate change in this case) often proceeds any form of disrespect or frustration of such ancestral spirits (Njobe, 1990; Mbiti, 1990). So it was logical that some views from Lumumba Compound associate climate change to frustration of ancestral spirits. Although the response that climate change was caused by unknown being was not explained, it could have implied that climate change was happening because of some supernatural or magical forces.

Some residents among selected areas of Kafue and Lusaka Districts also perceived climate change from a political perspective. This was specifically manifested in Bauleni Compound where 36.4 per cent of the reasons for the occurrence of climate change were blamed on the government. The same view emerged from Kalikiliki Compound (12.5 per cent) and from Old Kanyama Compound where it scored 20 per cent of all perceived causal factors. In Lumumba Compound of Kafue District, four per cent of views directly blamed climate change on the incumbent Republican President of Zambia by the time (2010) this research was done. Two per cent of views from Chilanga area blamed poor government policy for the occurrence of climate change in the area. How political environment affects climate change cannot be over emphasised. Lack of political will to address climate change is one of the indirect drivers of climate change in all parts of the world and particularly in studied areas. In fact, it is no mere exaggeration that the environmental challenges which humanity faces now are partly to be blamed on political decisions that have been, and yet to be made. Therefore, there is need for the government to invest more in climate change research in order to have a broader spectrum for decision making. Lessons and strategies could be learnt from Norway and Sweden where the government has heavily invested in environmental researches in order to annihilate some impacts and mitigate them. Blaming climate change on the government system did not necessarily translate into residents' hatred for the government. It was just a strong message for it to prioritise climate change on national agenda before its impact worsens. Some statistics by Lidunda (2011) showed that Zambia in general is likely to lose between six and eight billion United States Dollars in the next 10 years if sustainable interventions are not made in addressing the impact of climate change. This may hard-hit areas such as Bauleni, Kalikiliki and Old Kanyama Compound residents who already living with various socio-economic squalors. As such, political will and commitment are needed in the fight against the impact of climate change.

Amedeo and Golledge (1975) in Bird (1977) argued that environmental response is a function of environmental behaviour. Two per cent of responses by residents of Chilanga area showed that lack of environmental knowledge could have caused climate change. This was another crucial and indisputable view. In more strict sense, climate change must have happened not just in Chilanga but also globally because of lack of an ecological and sustainable mind for the environment. An environmentally educated mind would always put nature first and if such was abode by, humanity would have been restrained from emitting gases which have caused climate change internationally and particularly, in Chilanga area. It is for such reasons that education for climate change would be needed in order to transform people's behaviour to act for the environment.

Nature also emerged as a causal factor of climate change among selected areas of Lusaka Province. It accounted for 10 per cent of all perceived causes of climate change in Katondwe Village of Luangwa District. Ten per cent of responses from Lusoke Village of Chongwe District showed a similar causal factor. Some residents in Bauleni Compound also cited (18.2 per cent) nature as one of the causes of climate change in the area. Moreover, four per cent of responses from Lumumba Compound of Kafue District also evinced a similar causal factor. Intrinsically, all such responses meant that climate change was occurring naturally without any form of anthropogenic factors, or as an "Act of God". However, the extent to which nature influences climatic change had been low since 1750, which marked expansive industrial development. But prior to 1750, natural factors some of which are yet to be discussed below were major causes of climate change. It is for such reasons that some scholars such as Otter, Olago and Niang (2007:35) argued that "climate change is as old as time" because it has always been there except for the trends in terms of causal factors from heavily natural before 1750 to anthropogenic after 1750 onwards.

Among the ecological factors cited to have caused climate change was the sun. Fifteen per cent of views by residents of Old Kanyama Compound showed that climate change was caused by it. Some residents of Kampekete Village shared the same view (20 per cent). In Nyangu Village, 14 per cent of responses showed that the sun was one of the causes of climate change, with 20 per cent of responses from Robert Village showing the same. Moreover, 10 per cent and eight per cent of responses from Chilukusha-B Village and Mphuka Village respectively showed the same

causal factor. It also featured in four per cent and six per cent of all causal factors given by residents of Lumumba Compound and Siamunyemba Village respectively. Such a view was connected to general loss of vegetation through various human activities leading to direct sun insolation on to the local earth's surface and subsequent unprecedented rise in temperature, which was also one of the perceived causal factors of climate change. However, increase in temperature as a causal factor of climate change only emerged from three studied areas of Luangwa District namely, Katondwe (10 per cent), Chilukusha-B (10 per cent) and Mphuka (8.3 per cent) Villages. Residents' views must have been subliminally influenced by arid conditions which have marred Luangwa District in general as earlier shown in chapter three under description of study area. On the contrary, 10 per cent of views obtained from Katondwe Village of the same district showed that climate change was caused by decreased temperature, a view which could have been influenced by perceived decrease in temperature. Simply put, some perceived effects of climate change influenced the causal factors associated with climate change.

Moreover, 12.5 per cent of responses from Kalikiliki Compound showed that the sun had exploded and that was why climate change was happening. "*Sitiziba vamene vinachitika, kapena zuba inapoleka ndiyechamene chilengesa ati kunkale kuchinja kwa nyengo*", (we do not know what had happened, may be the sun has exploded and that is why climate has changed), said one of the respondents. In my view, television graphical series could have had some influence in such a perception or alternatively, it inherently implies increase in temperature. Under such circumstances, climate change or environmental literacy-oriented education would elaborate more to some people of Kalikiliki Compound on what may or what may not cause climate change.

Moreover, 10 per cent of views from Katondwe Village blamed absence of clouds as one of the causes of climate change in the area. Another 10 per cent of responses captured from Chilukusha-B Village showed a similar causal factor. A similar view (10 per cent) also surfaced from Lubuko Village of Chongwe District. This factor was partly related to deforestation because clouds formation is a function of input from evaporation and transpiration from trees. In a situation where most trees were cut down as earlier in Lubuko Village, there would be little or no cloud. Absence of clouds also increases the rate of incoming radiation cascades from the sun which most often increases temperature. According to Henderson-Seller and

Robinson (1986), absence of clouds leads to direct solar insolation reaching the earth's surface leading to drastic increase in temperature especially during the day and vice versa at night. Therefore, residents were justifiable by citing absence of clouds as one of the causes of climate change in the area and it was probably one of the reasons why the sun was also blamed for the occurrence of climate change. Furthermore, 8.3 per cent of responses from Mphuka Village showed that climate change was caused by change of seasons, a view which was also upheld among some residents of Kampekete Village (20 per cent). Moreover, some residents from Mandevu Compound also cited (16.6 per cent) the same causal factor and so did 12 per cent of views by residents of Lumumba Compound show. Climate change is often associated with drastic seasonal change. It is one of the long term natural causes of climate change in all parts of the world and particularly, in above mentioned areas (Hander-seller and Robinson, 1986). According to Meteorological Department of Zambia (MDZ) (2010), the four districts of Lusaka Province had generally been experiencing unprecedented seasonal variations in terms of average annual temperature and rainfall in the last 20 years as also indicated in figures five to 13 in chapter three. Such climatic conditions as increased mean annual maximum and minimum temperature and others might have influenced such a perceived causal factor. But it was unfortunate that Luangwa did not have such climatic data due to lack of a meteorological station in the area. The government must, therefore, put up measures to establish a meteorological station in Luangwa District.

Increased rainfall was also deemed one of the causes of climate change premised on five per cent of responses by residents of Lusoke Village and this could have been inspired by the recently experienced heavy rainfall in 2008 and 2009 (MTENRs, 2010). In Katondwe Village, 10 per cent of responses also showed that climate change in the area was caused by increased rainfall and this was a similar case in Siamunyemba Village where it accounted for four per cent of perceived causes. Climate change in Misisi Compound was associated with increased flood (30 per cent), which also accounted for 50 per cent of all perceived causes of climate change in Kalikiliki Compound. Moreover, five per cent of responses from Old Kanyama Compound also showed that climate change was happening due to increased floods. Increased rainfall and increased floods meant almost the same thing. Peri-urban areas such as Misisi Compound have always been experiencing annual flooding which must have gotten worse with the advent of

climate change and hence, influencing residents' views. In fact, Groenewald (2004) argued that time of interaction with a particular phenomenon tends to influence people's perceptions as was the case in Bangladesh earlier shown in literature review. The other two per cent of views obtained from Siamunyemba Village blamed oceans for the occurrence of climate change in the area. Although this view was scientifically logical, it did not apply to the local area because there were and are no oceans in the Village or Zambia in general. Oceans could only cause climatic alteration at global level and in coastal regions which are in proximity with them (Henderson-seller and Robinson, 1986). In such instances, the solution lies in educating people on local, national and international factors around climate change by ECZ, MoE and MTENRs.

Moreover, seven per cent of responses from Nyangu Village showed that climate change was caused by wind from Mozambique, 6.25 per cent of responses from Chilukusha-A Village pointed to a similar causal factor. According to MDZ (2010), the Mozambique warm air current, which sometimes blows in most eastern parts of Zambia including Luangwa District, often punctuates drier climatic conditions that could have catalysed climatic change in the area. This could have influenced the perception of residents based on their on-the-ground knowledge and experience of stay in the area. Moreover, four per cent of responses from Lumumba Compound also showed that climate change in the area was happening due to strong winds. According to Henderson-seller and Robinson (1986), winds could either be dry-warm or wet-cold. So depending on the frequency of type of wind which was blowing in the area, drier or wetter local climatic conditions might have been created leading to perceived climatic alteration. While Mill et al. (2010), Asthana and Asthana (2001), Karpagam (2004) and other scholars argue that climate change could be reduced by presence of trees, 6.25 per cent of responses from Marapodi Compound blamed trees for the occurrence of climate change in the area. This was based on ordinary reasoning that trees in the area were blowing cold air which eventually led to unprecedented decrease in temperature. Such is a fertile ground for implementation of environment-oriented education to teach people on potential and actual causes of climate change. Furthermore, 6.25 per cent of responses from Chilukusha-A Village showed that climate change was caused by porous soil. An anonymous respondent said that "the dry soils swallow every drop of rain that falls". According to Gupta and Kapoor (1999), dry soils such as those of Chilukusha-A Village tend to have very high fluid infiltration capacity such that if it had not been raining for

some time, the first time it rains especially in lesser quantity, almost all rain water would just be infiltrated or sucked into the soil whilst the top surface remains almost entirely dry. This might have influenced the view that emerged from this area. In Old Kanyama Compound, 15 per cent of responses showed that climate change was caused by soils. Old Kanyama Compound has always been underlined by limestone which has poor drainage system leading to accumulation of rain water on the surface and subsequent floods, which were also cited as one of the causes of climate change in the area. In Robert Village of Luangwa District, 6.6 per cent of responses showed that the physical location of the area was one of the cause of climate change in the area. This was precise with reference to the fact that, the village was and is still located in the agro-ecological region-I, prone to harsh climatic conditions as earlier highlighted in chapter three which gave a general description of the study area.

Otter, Olago and Niang (2007) also argued that the physiology of most parts of Southern Africa and particularly, Robert Village of Luangwa District is one of the causal factors of climate change. In connection to the preceding argument, 14 per cent of responses from Nyangu Village showed that climate change was caused by mountains. Some residents of Robert Village upheld (20 per cent) the same view. A similar view also emerged from Katondwe Village (10 per cent), Chilukusha-A Village (6.25 per cent), Chilukusha-B Village (10 per cent) and from Mphuka Village where it accounted for 25 per cent of all perceived causal factors. Since mountains are always associated with valleys, 21 per cent of responses by residents of Nyangu Village blamed them for the occurrence of climate change, a view which was also upheld among residents of Robert Village (20 per cent) and Katondwe Village (10 per cent). Additionally, 8.3 per cent of responses from Mphuka Village also cited Valleys to be among the causes of climate change. Mountainous and valley areas are naturally hot because they easily absorb heat without easily losing it. This could have been contributing to intense heat among studied villages which influenced the perceptions. On a unique note, some few responses (10 per cent) captured from Katondwe Village indicated that leap year could be the reason why climate change was happening in the area. Gupta and Kapoor (1999) argues that leap year is a year with an additional day February 29 added to make up the difference between 365 day calendar and the actual duration of the earth's orbit of the sun. Zambia last experienced leap year (year with 366 days unlike 365 days) in 2008, which coincided with the period during which national wide heavy

rainfall and floods were experienced (MTENRs, 2010). Such events probably influenced the view. However, education for climate change would help in clarifying such seemingly difficult to explain perceived causes of climate change. Moreover, Luangwa River (6.25 per cent) was also cited as one of the causes of climate change in Chilukusha-A Village. There could be two possible rationales behind such a perception. Firstly, Luangwa River usually gets dried up and drastically reduces in size especially during the dry (August to mid November). Such a scenario might have contributed to perceived climate change and its impacts in the area. On the other hand, Luangwa River sometimes gets flooded with water overtopping the banks and affecting most areas situated near it as earlier shown in figure three (DMMU, 2007). This might have influenced some respondents to blame the river as one of the causes of climate change in the area.

Premised on above discussion, residents of selected areas of Lusaka Province generally manifested an overwhelming ability to relate causes of climate change based on their a-posteriori. Only seven percent of responses from Nyangu Village, 6.6 per cent from Robert Village and 10 per cent from Chilukusha-B Village could not associate the causes of climate change to anything. In Bauleni and Old Kanyama Compounds, only 9.1 per cent and 10 per cent of responses could not show the causes of climate change respectively. Inability to relate the causes of climate change was also manifested in 20 per cent of responses from Lubuko Village and 15 per cent of responses from Lusoke Village. As for Kafue District, it was only in Lumumba Compound where 12 per cent of responses could not reveal the causes of climate change. With such findings at hand, I disagree with IUCN's (2007) assertions that most Zambians had heard of climate change but knowledge of its causes is not common. This was over stated and over generalised because residents of areas of Lusaka Province provided overwhelming responses on causes of climate change irrespective of some few unlocalised views and some misconceptions. It has so far been shown that causes of climate change among residents of selected areas of Lusaka Province were resistant to a linear perspective. In a nutshell, causal factors of climate change were perceived from socio-economic, political, moral, spiritual, cultural, behavioural and ecological contexts. Intra and inter spatial variations and similarities in terms of perceived causes of climate change were also on. In order to fully address the

first objective of this research, the proceeding section (6.2.2) discusses perceived effects of climate change.

6.2.2 Perceived effects of climate change

Just like in the case of causal factors earlier discussed, residents of selected areas of Lusaka Province perceived effects of climate change from diverse points of view. Twelve per cent of responses obtained from Robert Village of Luangwa District showed that climate change had contributed to little or no farming in the area, with .2 per cent of responses from Nyangu Village showing the same. Moreover, some residents of Chilukusha-A Village upheld (8.1 per cent) a similar view and so did 9.1 per cent of responses from Chilukusha-A Village show. With exception of Katondwe Village, two per cent of responses from Mphuka Village also showed that climate change had contributed to little or no farming in the area. As for Chongwe District, 17 per cent of responses obtained from Lubuko Village showed that climate change had contributed to little or no farming in the area. A similar view (15 per cent) also emerged from among residents of Lusoke Village. MTENRs (2007) argued that most people in Zambia especially those in rural areas such as those mentioned above mainly survive on small scale farming. It is also irrefutable that farming largely depend on prevailing climatic conditions, if they change, then we can be too sure that farming system would either be altered or halted. It was therefore, logical that some residents among Villages of Luangwa District raised that concern so that sustainable intervention measures could be put in place to mitigate the challenges as will be discussed later under section 6.3.

In connection to disruption of farming system discussed above, some residents of Nyangu Village registered climate change had increased the rate at which wild animals such as monkeys, baboons, hippos and elephants destroyed crops (2.2 per cent) as they roamed around the settlement in search of water. A similar complaint was also found among residents of Robert Village (12 per cent) and Chilukusha-A Village (10.8 per cent) within Luangwa District. According to some residents, when wild animals such as those mentioned above get thirsty, they roam around human settlement on their way to Luangwa River for water. In so doing, they often destroy crops, a situation which could have indirectly contributed to the impact of climate

change. It was for this reason that some residents within the areas thought that climate change was partly being caused by some wild animals such as baboons and elephants.

Little or no farming was also closely linked to climate change-induced crop failure as showed in responses from Nyangu Village (4.4 per cent), Robert Village (eight per cent), Chilukusha-A Village (5.4 per cent), Chilukusha-B Village (12.1 per cent) and Mphuka Village (14 per cent). Some residents of Lumumba Compound perceived a similar effect (4.2 per cent), whilst emphasizing that climate change had contributed to a decrease in maize yields, which also scored 4.2 per cent of perceived effects. Residents of Siamunyemba Village had also noticed a climate change-induced decrease in maize crop (3.8 per cent), with 12.5 per cent of responses from Chilanga showing similar effect. Moreover, 6.7 per cent of responses from Chongwe Compound also showed that climate change had triggered a decrease in maize yields with 16.8 per cent of response among residents of Kanakantapa Village showing the same effect. Maize is actually a staple food among most, if not all, Zambians. Therefore, a decrease in its yields would spell food shortages and hunger among residents especially children. It is probably why UNDP (2010) earlier argued that any slight change in climate change in Zambia would spell doom because most Zambians and particularly those of selected areas of Luangwa, Chongwe and Kafue Districts depend on agricultural products.

Food shortage and hunger were among perceived effects of climate change among residents of some selected areas of Lusaka Province. For instance, 4.4 per cent of responses from Nyangu Village showed that climate change had contributed to food shortages because of above mentioned decrease in crop failures and yields. This was also recorded (five per cent) in Siamunyemba Village where 1.3 per cent of responses showed that some residents were surviving on unknown wild roots. Whilst not all wild roots could be dangerous for human consumption, some among those of Siamunyemba Village could be hazardous to human health and could lead to death. Such instances could not be separated from climate change-induced hunger as showed in five per cent of responses captured within the same area. Moreover, 4.2 per cent of responses among residents of Lumumba Compound showed that hunger was on the increase due to climate change. A similar complaint was launched among residents of Lusoke Village (25 per cent) and it also reflected in 25 per cent of responses given by residents of

Kampekete Village of Chongwe District. Increased hunger was common among all studied villages of Luangwa District. In Nyangu Village, it accounted for nine per cent of perceived effects whereas in Robert Village it claimed eight per cent of all perceived effects. Among residents of Chilukusha-A, Chilukusha-B Village, Katondwe and Mphuka Village, increased hunger respectively accounted for 5.4 per cent, 12.1 per cent, 21.3 per cent and eight per cent of all perceived effects of climate change. With above registered crop failure, reduction in crop yields and increased hunger were inevitable especially in the face of climate change.

Despite the agricultural negation perceived to have been espoused by climate change among residents of selected areas of Lusaka Province, some v from Siamunyemba Village and Lumumba Compound of Kafue District revealed that climate change was a source of positive agricultural transformation. In Lumumba Compound, 1.7 per cent of responses showed hat climate change had enhanced the growth of crops which used to grow well before its occurrence. Among the crops cited by an anonymous 72 year old male respondent were sorghum, millet and cassava. “In the past sorghum, mil and cassava used to get rotten before reaching maturity due to heavy rainfall, but they are ow growing well because rainfall has drastically reduced”, emphasised the respondent. Indeed, such types of crops require moderate amount of water to grow thus, a drastic reduction in rainfall (especially after 1990) as showed in figure seven on page 30 of this dissertation could have had a bearing on growth of such crops as millet and sorghum. This also coincided with earlier reviewed results from Himalayas where climate change was perceived to have improved the growth and taste of apples. Moreover, 1.3 per cent of responses from Siamunyemba Village showed that climate change-induced increase in rainfall had helped in recharging of aquifers (water-bearing underground rocks) leading to abundance of water. A 52 year old female respondent expressed happiness for occurrence of climate change because it easily enabled her sink a water-well (shown in figure 18 below) for irrigation of vegetables in her organic garden especia ly during dry seasons.

Figure 18: Female respondent (left) explaining to the researcher how she had easily sunken the water well (for organic garden irrigation) due to perceived climate change –induced recharging of aquifers.



(Photographed by respondent's daughter, 2010).

In her view which accounted for 2.6 per cent of all perceived effects, climate change-induced recharging of aquifers had tremendously improved her organic gardening and boosted soils' moisture for growth of different types of vegetables and crops such as *chibwabwa* (pumpkin leaves), Chinese cabbage, *Kalembula* (sweet potato leaves), onions, maize among others, which she was able to sale in Kafue main town to earn an additional source of income. Therefore, climate change in Siamunyemba Village was not purely perceived to be an enemy, but also a garment as it was the case in Lumumba Compound.

With such pieces of evidence shown above, I do not entirely agree with UNDP's (2010) assertions that any slight change in climate would spell doom among Zambians. It was rather too over generalised because climate change in such areas those shown above did not entirely prove to be a doom but also a boon. I therefore, recommend that further researches be conducted by UNDP on caring epistemologies of climate change rather than over emphasis on the risk epistemologies, this would provide a broader spectrum for decision making.

On the contrary, 12.5 per cent of responses by some residents within Siamunyemba Village showed that climate change had contributed to an increase in water scarcity. A similar view was also upheld (8.4 per cent) among some residents of Lumumba Compound. Water scarcity as one

of the effects of climate change in Chongwe District only emerged among residents of Kanakantapa Village where it accounted for 8.4 per cent of all perceived effects. However, it was one of the commonly perceived effects of climate change in Nyangu Village (nine per cent), Robert Village (eight per cent), Chilukusha-A Village (2.7 per cent), Chilukusha-B Village (three per cent) and Mphuka Village where it scored two per cent of all perceived effects. According to the Devolution Trust Fund (DTF) (2009) annual report, over three million people in Zambia still do not have access to safe drinking water supply. This has seen a number of people resorting to unsafe sources of water and poor sanitation. Culturally, water is perceived as a social good especially in rural areas such as those of Luangwa, Chongwe and Kafue Districts. Therefore, its scarcity especially in the face of climate change signified a gap in terms of their cultural system. National Water Supply and Sanitation Council (NWASCO) (2010) further added that due to climate change patterns, the country and particularly studied areas experienced a lot of droughts and floods impacting on water service delivery. In that context, some residents of Marapodi Compound also pointed out shortage of clean water as one of the most perceived (23.6 per cent) effects of climate change in the compound due to climate change-induced increase in floods. Flood waters in Marapodi Compound could have led to mixing of turbid-dirt-ridden surface runoff with water-wells in the neighbourhoods thereby, depriving people of clean water.

Increase in droughts was among commonly spread (appeared in all districts) effects of climate change among residents of selected areas in Lusaka Province. For instance, 4.4 per cent of responses by residents of Nyangu Village isolated it as one of the effects of climate change. It also emerged in Robert Village (eight per cent), Chilukusha-A Village (8.1 per cent), Chilukusha-B Village (three per cent), Katondwe Village (7.1 per cent) and Mphuka Village where it scored two per cent of all perceived effects. Luangwa District where such areas are found is generally vulnerable to climatic hazards because of its location in the agro-ecological region-I as earlier shown in figure four (MTENRs, 2007). Despite some occasional floods, the area is generally prone to droughts and aridity, which must have gotten worse with the advent of climate change as also confirmed by DMMU (2010) and UNDP (2010). Moreover, 8.4 per cent of responses from Kanakantapa Village of Chongwe District also showed that climate change-induced increase in droughts was prevalent. A similar view (5.5 per cent) also emerged in Mandevu Compound of Lusaka Province, with five per cent and 8.5 per cent of responses

captured from Lumumba Compound and Siamunyemba Village showing the same effect respectively. This partly explains why some residents raised concerns on increased water scarcity, crop failure and decreased crops yields as earlier discussed. At the same time, some residents complained of increase in floods, which were the most perceived (14 per cent to 40 per cent) especially among residents of peri-urban compounds of Lusaka District.

Evidence from table eight showed that increased flood was the most perceived (40 per cent) effect of climate change in Misisi Compound. Twenty-two per cent of responses from Mandevu Compound also showed a similar effect, with 35 per cent of responses from Bauleni Compound showing the same. A similar view also surfaced among residents of Kaliki iki Compound (15 per cent), Old Kanyama Compound (14 per cent) and Marapodi compound (23.6 per cent). It must be emphasized that residents of above mentioned peri-urban compounds have had a long interaction with annual flooding, which might have just gotten worse especially during climate change era. Ecologically, these compounds had been underlined by limestone whose drainage system is very poor leading to quick accumulation of rain water on the surface and subsequent flooding of the area, a phenomenon which had triggered subsequent socio-economic challenges in the last 10 years before 2011. Such subsequent effects will soon be discussed as opined by respondents. Some residents of Lusoke and Kanakantapa Villages also complained of climate change-induced increase in floods as highlighted in 20 per cent and 4.2 per cent of their responses respectively. Both Lusaka and Chongwe District are geographically in the plateau area (ecological region-IIa) which receives fairly high amounts of rainfall as earlier indicated under description of study area in chapter three. Hence, increased in floods especially in the face of climate change could not be escaped.

Premised on the above discussion, I partly disagree with Madison's (2007) over generalisation shown in literature review that Zambia had experienced a significantly drier climate according to the peoples' views. This is because climate change could make some area drier and others wetter as evidenced in above discussion. As such, there should be spatial contextualisation of researches on climate change because it may not necessarily affect different areas in the same way. This also shows the urgent need for contextual adaptation planning if we are to curb the impact of climate change in Zambia and particularly among studied areas.

Climate change is most often associated with various diseases, which are escalated by such events as floods and droughts as also noticed in this research. Four per cent of responses by residents of Mphuka Village showed that climate change had contributed to increase in malaria cases. This complaint was also captured from Katondwe Village (14.2 per cent), Chilukusha-A Village (10.8 per cent), Robert Village (four per cent) and Nyangu Village (6.6 per cent). Moreover, climate change-induced increase in malaria cases was also recorded (10 per cent) among some residents of Lusoke Village with 6.7 per cent of responses from Chongwe Compound showing a similar view. In Kampekete Village, increase in malaria as one of the effects of climate change accounted for 8.3 per cent of all those which were perceived. In Lusaka District, climate change-induced increase in malaria cases emerged from Bauleni Compound (20 per cent), Kalikiliki Compound (15 per cent), Old Kanyama Compound (two per cent) and Marapodi Compound where it accounted for 23.6 per cent of all perceived effects. In Kafue District and particularly in Lumumba Compound, it accounted for five per cent of all perceived effects with 2.6 per cent of responses from Siamunyemba Village showing the same. According to Kapoor (2001), events such as floods especially less mobile such as those in Misisi Compound, among others activate over breeding of malaria-carrying mosquitoes, which could have led to such malaria cases as noticed above. Some residents of Lumumba Compound thought that climate change had increased mosquito breeding as showed in 3.4 per cent of their responses. In fact, the National Adaptation Programme on Action (NAPA) by MTENRs (2007) earlier showed that Malaria would be on the increase, such results as those obtained among residents of selected area in Lusaka Province could just be a fulfillment.

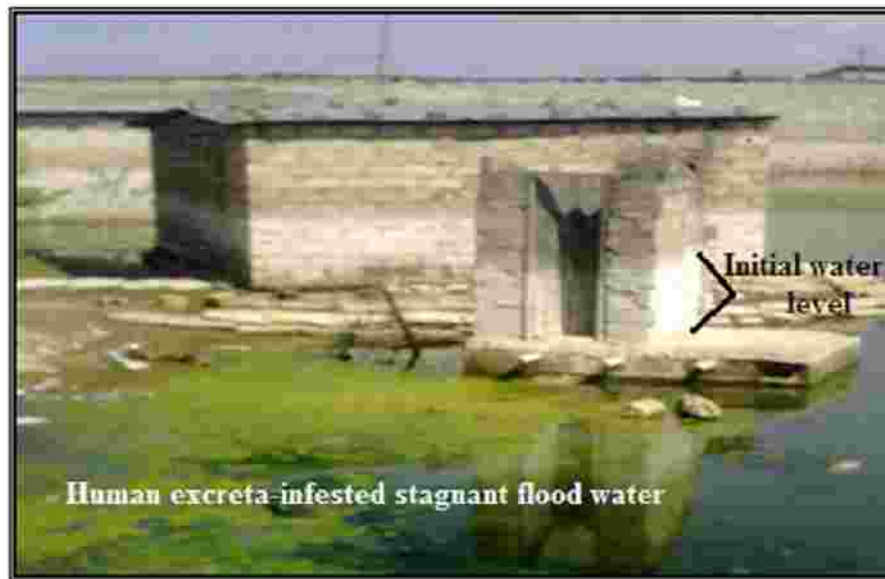
Human Immune Virus and Acquired Immune Deficiency Syndrome (HIV-AIDS) was also another disease sighted to have escalated with the advent of climate change. In Lumumba Compound, it only accounted for 0.8 per cent of all perceived effects of climate change. It also accounted for 7.1 per cent of all perceived effects of climate change in Katondwe Village and 2.7 per cent among residents of Chilukusha-A Village. In Lusaka District and particularly in Old Kanyama Compound, two per cent of perceived effects of climate change pointed out an increase in prostitution which was heavily linked to HIV-AIDS. Climate change-related increase in HIV/AIDS could be justified premised on perceived increase in hunger and poor agricultural activities as already discussed. It might have forced some people especially women into

prostitution (to earn a living), leading to increased risks of STIs such as HIV-AIDS. Further researches on this theme would be significant and could be done by organizations such as National AIDS Council and others. Closely connected to issues of HIV-AIDS and increased prostitution was a perception that climate change had led to increased abortion, as highlighted in 1.3 per cent of responses from Siamunyemba Village of Kafue District. Perceived increase in hunger and shortage of food could have also catalysed such perceived abortion cases given that some expecting mothers might have been skeptical of what they would give the babies once they were born. It also justifies earlier discussed view that climate change in the area was happening due to dumping of foetus. So intrinsically, this response could have implied that climate change was happening as a curse firstly to those involved in dumping of foetus and secondly to the village at large.

Apart from HIV-AIDS, some water borne diseases such as cholera and diarrhea were also cited among perceived effects of climate change. Such diseases often occur due to aridity or too much flood waters especially stagnant ones. For instance, in Luangwa District, 6.6 per cent of responses among residents of Nyangu Village showed that diarrhea cases were on the increase and so did three per cent of responses from Chilukusha-A Village show. A similar view (28.6 per cent) emerged from Katondwe Village and from Mphuka Village where it accounted for 10 per cent of all perceived effects. Luangwa District where these areas are found is generally a drought prone area and water scarcity as earlier discussed is inevitable. Some of the interviewed residents argued that they could not sink boreholes or water wells because the area is too arid and stony. As such, they entirely depended on water from Luangwa River for bathing and drinking without chlorination. It is no mere overstatement that water from Luangwa River is too turbid (has too many fine soil particles due to intense heat and rapid evaporation) to be fit for human consumption. Climate change-induced water scarcity could have also contributed to such cases. As for Lusaka District, 10 per cent of responses from Mchilili Compound also showed that diarrhea was on the increase due to climate change and a similar view (5.8 per cent) was upheld among some residents of Marapodi Compound. It was also recorded as one of the effects of climate change in Misisi Compound (10 per cent), Mandevu Compound (11 per cent), Kalikiliki Compound (10 per cent) and Old Kanyama (10 per cent). Such water-borne diseases among selected areas of Lusaka Province were closely connected to annual flooding which also

engulfed nearby pit latrines and water wells. Figure 19 shows a once flooded pit latrine (to almost roof level) as captured from Misisi Compound leading to resurfacing of human excreta. This could have led to infestation of sunken water wells with human waste materials posing high risks of cholera, diarrhea and eutrophication (over enrichment of water with nutrients leading to growth of green algae and other weeds)-leading to reduced supply of clean water.

Figure 19: Aftermath of climate change-related floods in Misisi Compound.



Photographed by M. Muchanga (2010)

Given such instances as observed from Misisi Compound and other areas, sustainable measure and education are needed in order to annihilate the recurrence of such diseases as cholera. The reasoning provided above could also explain perceived climate change-induced increase in cholera among residents of Lumumba Compound where it accounted for 2.5 per cent of all perceived effects. This is because the compound has socio-economic and ecological characteristics which follow after the similitude of studied peri-urban compounds of Lusaka District. Furthermore, 2.2 per cent of response by residents of Nyangu Village showed that climate change had contributed to skin and eye diseases and so did 9.1 per cent and six per cent of responses by residents of Chilukusha-B Village and Mphuka Village respectively show.

A similar view also emerged among residents of Nyangu Village and it accounted for eight per cent of all perceived effects. According to Asthana and Asthana (2001:218), there is a direct link

between eye diseases and direct ultra-violet radiation from the sun, which are common with occurrence of climate change. “Human skin and eye-lens contain chromatophore (pigment containing cell), which absorbs ultraviolet radiation and generate highly reactive oxygen, hydroxyl radicals (negative ion formed by the attachment of an oxygen atom and a hydrogen atom) and hydrogen peroxide (chemical compound of hydrogen and oxygen with formula, H_2O_2) that damage cell’s structural and functional components.” Thereafter, they lead to eye and skin diseases. In fact, if precautions are not put in place, eye cataracts and some skin diseases would ensue. Moreover, 20 per cent of responses by residents of Chomwe Compound showed that climate change had contributed to increased coughing and flu cases. This view was also captured from among residents of Bauleni Compound (20 per cent), Kalikiliki Compound (five per cent) and Old Kanyama Compound (16 per cent). In Kafue District, a similar view emerged among residents of Lumumba Compound (8.4 per cent) and in Chilanga area where it accounted for 20 per cent of all perceived effects. Such diseases were among those which the MTENRs (2007) in its NAPA document indicated that they would be on the increase in the face of climate change. In most cases, coughing and flu happen concurrently in dust ridden areas such as Chilanga area thus climate change might have simply escalated what could have always been happening. Moreover, some flu and coughs could be caused by flood water-induced decrease in temperature, so either extreme was capable of causing such illnesses.

Furthermore, 6.3 per cent of responses from Siamunyemba Village attributed perceived increase in deaths of livestock to climate change, with 4.2 per cent of responses from Lumumba Compound showing the same. The reasons behind this were premised on perceived climate change-induced decrease in pasture, which accounted for five per cent of perceived effects from Lumumba Compound. Five per cent of responses from Siamunyemba Village also showed climate change-related increase in death of livestock. Similarly, 6.3 per cent responses from the same area cited an increase in animal diseases (such as *Denkete*-corridor disease) as one of the effects of climate change, leading to sudden death of livestock especially cows. A similar view emerged from Kanakantapa Village and accounted for 12.6 per cent of all perceived effects. Poor pasture was cited to have drastically reduced the immune system of livestock in Kanakantapa Village, a situation which claimed animal lives. In Misisi Compound, seven per cent of views also indicated an increase in deaths of livestock such as pigs and chicken under the reasoning

that they were drowned by climate change-induced flood waters. Some few responses (10 per cent) from Kalikiliki Compound also revealed the same. Such instances could have contributed to loss of property such as collapsing of flooded houses, vegetable gardens and others as confirmed by 10 per cent of responses captured from among residents of Misisi Compound and Old Kanyama Compound (10 per cent).

Climate change was also perceived by residents of Misisi Compound to have contributed to loss of human lives (seven per cent) through drowning or electric shocks by collapsed electric poles. Displacement of people (three per cent) and interruption of their movements (three per cent) were also among perceived effects in Misisi Compound. Such views were among the least ranked by percentages, but in reality, they were related to most frequently perceived (40 per cent) effect (flood) of climate change in the area. According to the residents, climate change-induced floods blocked roads with water and mud which eventually slowed down people's movements. A similar situation was perceived to have prevented some pupils in Mandevu Compound from attending school lessons as highlighted by 11 per cent of all perceived effects. Furthermore, 5.5 per cent of some responses from Mandevu showed that flooding of roads and schools also contributed to closure of some schools thereby, disrupting pupils' motivation for school and their educational achievements in their final school examinations. This issue needs to be investigated further to find out how floods in peri-urban areas of Lusaka District affect pupils' performance in their final school examinations and it could be done by MoE. The issue of climate change-induced displacement of people from Misisi Compound was crucial and was not as lighter as showed by the percentage above. Red Cross (2010) showed that 177 families (985 people) were temporarily relocated from Misisi Compound to another area around the national independence stadium from 26th February to 30th June, 2010. Some of those were as shown in figure 20 on the next page.

Figure 20: Researcher in front of a photo discussing with one of the families displaced from Misisi Compound to Independence Stadium in the north-west of Lusaka Province due to climate change-related floods.



Source: Field data (2010)

With such climate change induced event as those shown figure 20 above, psychological disturbances would be inevitable. As such climate change would also require trained psychologists to help in counseling such victims of climate change-induced floods. Some few responses (two per cent) by residents of Old Kanyama Compound also showed that climate change had played a role in perceived increase in theft within the local This inherently implied that climate change had also led to a reduction in social security. Therefore, the safety of affected communities must be one of the issues that must be tabled on our national and particularly local plans for studied areas in order to combat climate change.

A small percentage of responses by (five per cent) residents of Siamunyemba Village connected an increase in pests (locally known as *Ntata*) to climate change. In his explanation, one of the male residents in his late 60s explained that *Ntata* was initially, only found in livestock such as dogs and chicken, but with the advent of climate change, they had massively bred and extended to people within the village, among whom they caused unknown skin diseases. Another view fetched from selected areas such as Nyangu Village (2. ent), Chilukusha-A Village (6.1 per cent) and Mphuka Village (six per cent) showed that climate change could easily make them tired because of the intense heat it had induced. According to Boswell (2008), increased temperature easily dehydrates the human body leading to feelings of weakness. This may sound a simple issue, but it is inherently complex because people in rural areas such as those mentioned

above depend on human energy to do most of their farm works and other economic activities to earn a living. Therefore, climate change-induced tiredness would not only affect their bodies but their economic activities-with high chances of hunger and malnutrition among especially children.

Increased temperature was one of perceived effects of climate change. With reference to table six, it was one of the commonly perceived (four per cent to 12.1 per cent) effects of climate change among studied areas of Luangwa District. It must be echoed that the temperature of Luangwa District has always been in the maximum quadrant, but the intensity has just gone up due a combination of other climate change-induced effects such as aridity, water scarcity and increased droughts earlier discussed. In fact, the MTENRs (2007), DMMU (2010) and UNDP (2010) also confirm that the area has one of the harshest temperatures in Zambia. In Lusoke Village, 10 per cent of responses also showed that temperature had increased and so did 8.3 per cent and 4.2 per cent of responses by residents of Kampekete and Kanakantapa Villages respectively show. This view could also be authenticated by referring back to figure 10 on page 32. It showed that maximum annual temperature was above the long term mean especially after 1990. Increased temperature was also registered as one of the effects of climate change in Misisi Compound (10 per cent), Mandevu Compound (11 per cent), Bauleni Compound (10 per cent), Kalikiliki Compound (10 per cent) and Old Kanyama Compound (eight per cent). Residents' view that temperature was increasing augured well with what was earlier shown in figure eight, thus, general rise in mean temperature trends since 1990. In Lumumba Compound, 10 per cent of responses were also premised on increase in temperature and so were five per cent of views captured from Siamunyemba Village and 25 per cent of those that emerged from Chilanga area. Indeed, figure 12 which was constructed based on climatic data from the MDZ (2010) also showed that mean annual temperature was on the increase especially after 1990. This justified residents' on-the-ground ability to observe change in some climatic variables. In fact, climate change-induced increase in temperature had been one of the major predictions by Sichingabula (1998), MTENRs (2007) and IPCC (2002).

Eight per cent of views captured from Robert Village further disclosed that climate change in the village had forced some residents to be spending nights outside their houses (especially iron-

roofed ones). This concern was also raised in Nyangu Village (6.6 per cent) probably due to close proximity of the two areas in terms of spatiality and residents' inter-relationality. One of the male residents in his mid 40s narrated that "it is better to sleep outside than inside houses because outside is cooler than inside of the houses". Nevertheless, he only lamented of subsequent risks of attacks by wild animals especially baboons that wandered around the villages at night. This vividly shows the need to put up strategic measures to build houses that would best suit the climatic conditions of the areas as will soon be discussed under section 6.3. On the other extreme, a few responses (5.1 per cent) by residents of Lumumba Compound showed that temperature was decreasing and so did 4.2 per cent of responses from Kanakantapa Village of Chongwe District show. Within Chongwe District and particularly in Kampekete Village, some residents thought (16.7 per cent) that rainfall had increased due to climate change. This view was also upheld by some residents of Mandevu Compound (22 per cent), Kalikiliki Compound (10 per cent) and Marapodi Compound (23.6 per cent). Although this did not reflect in other compounds such as Misisi, it was inherently vivid in already discussed view that climate change had induced some floods. Although Luangwa District is generally known to be a drought prone area, four per cent of responses by residents of Robert Village showed that rainfall was on the increase. In fact, Zambia Vulnerability Assessment Committee (ZVAC) (2007) argued that sometimes Luangwa area in general experiences some unprecedented floods citing those of 2007 as an example. Figure three on page 25 also confirms that irrespective of the aridity of the area, Luangwa District and particularly Robert Village could also experience heavy rainfall which sometimes led to overtopping of water over Luangwa River banks leading to flooding of nearby areas. In Lumumba Compound, only 0.8 per cent of views showed that rainfall was increasing with 3.8 per cent of responses from Siamunyemba Village showing the same. Moreover, 15 per cent of responses by residents of Chilanga area also indicated the same view. When we refer back to figure seven, we noted that Kafue District generally recorded above average mean annual rainfall during 2009/2010 season and this could have had an influence on residents of Chilanga area and others.

Whilst some pieces of evidence above show that rainfall was increasing due to climate change, 17 per cent of views from Lubuko Village showed that it was decreasing. A similar view was also upheld (five per cent) in Lusoke Village and Kampekete Village (8.3 per cent). Much of

what could be said about this view relates directly to earlier discussed increase in droughts. Such opposite extreme area is a clear indication of the non-deterministic nature of climate change, it could bring coldness when we anticipate hotness and vice versa.

Seventeen per cent of views from Lubuko Compound showed that in the of climate change, rain fall was coming later than it used to do before the change in climate. A similar view (12.6 per cent) was also upheld among residents of Kanakantapa Village. In Chongwe Compound, 20 per cent of responses by residents showed that even though rainfall was experienced, it was inconsistent or technically speaking highly subject to variability. Some residents of Lumumba Compound also shared a similar view (2.5 per cent). This partly explains why there was an outcry of little or no farming in the area as earlier discussed. Banda (2005) earlier found that Chongwe District in general was prone to droughts by 63.9 per cent during the period between 1972 and 2002, followed by Kafue with 56.5 per cent during the me period. Premised on some respondents views in this research, the trend had been the same.

In Nyangu Village, 4.4 per cent of responses showed that climate change had contributed to shortening of the rainy season from four months to two months thereby contributing to crop failure, food shortages, hunger and decreased yields as earlier discussed. This view also emerged among residents of Robert Village (four per cent), Chilukusha-A Village (8.1 per cent), Chilukusha-B Village (three per cent) and Mphuka Village (two per cent). In Kafue District, it emerged from Lumumba Compound and accounted for 4.2 per cent of perceived effects. Climate change-induced early departure of rainfall was also observed ong residents of Lumumba Compound (7.6 per cent) and those of Siamunyemba Village (11. 3 per cent). Hender-seller and Robinson (1986) argued that climate change is most often associated with early departure of rainfall leading to crop failure, drying, and reduced which all translate into hunger and malnourishment especially among children.

Moreover, climate change-induced increase in loss of soil fertility was registe in 4.4 per cent of responses among residents of Nyangu Village, four per cent from Robert Village, 5.4 per cent from Chilukusha-A Village and four percent from Mphuka Village. A similar view surfaced among residents of Lusoke Village (15 per cent) and Chongwe Compound (13.3 per cent). The

soil whose fertility has been lost lacks microbial activities and chemical elements that would make it suitable for plant growth. It would be irrefutable that plant growth is an assurance for carbon sequestration. Therefore, in a situation where soil erosion became persistent, plant growth would reduce as perceived in above mentioned areas and carbon eventually accumulates in local atmosphere with possibilities of causing climate change. Therefore, soil erosion could be an indirect driver of climate change. In Kanakantapa Village of Chongwe District, 12.6 per cent of views showed that climate change was contributing to change of natural vegetation. This could be linked to deforestation which was earlier discussed as one of the causes of climate change in the area although it also emerged as an effect among some residents of Lusoke Village (10 per cent). The recurrence of deforestation and pyric factors especially in this era of climate change would automatically prompt change of vegetation as perceived by residents of Kanakantapa Village. In Chilanga area, five per cent of responses also showed that trees were drying up due to climate change-induced soil infertility and deforestation. When vegetation changes or dries up, a lot of other objects that depend on natural vegetation such as, insect, catchment area and aquatic life, soils, water cycle, people and others would be affected thereby escalating the impact. Therefore, reforestation programmes through the UNREDD+ would be imperative.

Since destruction of catchment areas in Chongwe District was one of the perceived causes of climate change as earlier discussed above, climate change-induced drying up of rivers as perceived (13.3 per cent) by residents of Chongwe Compound was inevitable. When rivers start to dry up due to climate change, we could be sure of rampant water scarcity, poor farming system among others as earlier discussed. Therefore, protection of catchment areas in this area would be needed and this could be done by NWASCO and the Department of Forests. Lack of money income, was one of perceived effects of climate change in some parts of Lusaka Province. In Lubuko it accounted for eight per cent of all perceived effects. It also surfaced from Nyangu Village (2.2 per cent), Robert Village (four per cent) and Chilukusha-A Village (5.4 per cent). Poor agricultural system could have been one of the reasons for such an impact. Even pastoral farming which could have been an alternative to earn some money had been affected because 2.2 per cent of responses from Nyangu Village stated that some lions were killing livestock such as goats and some cattle as they roamed around the area in search of water. This complaint was also registered in Katondwe Village (7.1 per cent) and Mphuka Village (two per

cent). Even fishing which could have been a better replacement for some residents had undergone drastic declension due to climate change-induced drying up of parts of Luangwa River. This emerged from Nyangu Village (6.6 per cent), Chilukusha-A Village (three per cent) and Mphuka Village (two per cent). Aquatic organisms such as fish depend on enough fresh water to breed in abundance, so in a situation where most of water has been evaporated as observed on the Luangwa River, production reduces and subsequently, fishing activities reduce.

Due to either climate change induced-aridity or floods, 2.2 per cent of responses capture from Nyangu Village showed that earth roads including Feira main earth road were being washed away by agents of denudation (large scale wearing of earth surface) such as strong wind and occasional flood water. A similar concern was also raised among residents of Chilukusha-B Village (6.1 per cent). If proper medium of transportation was available in Luangwa District, it would have reduced the impact of climate change. Good transport network is deemed a source of social transformation because good tarred road would make it easier for people to move to and from the market and other centres where they could access goods and services which could not locally be available especially due to climate change, such as lack of money income. Public transport was not easy to access in these areas because of lack of good and variety of roads. By the time this research was conducted, only one poorly maintained and eroded Feira earth road connected the main town centre to the Great East Road. During a simple participant observation by the researcher, it was noted that there was only one frequent open van vehicle (canter) which was transporting people from the GER junction to Feira town and back to the junction per day at a fare charge of Zambian K15, 00 (US-\$3) per trip. So if one missed it, he or she could only travel the next day. This was said to be very inconveniencing and people could not easily make movements to find alternative solutions to various challenges including those triggered by climate change in the Villages. Public buses could not often be accessed due to eroded roads. The government must tar Feira road and this is going to be a source of solution to some of the challenges triggered by climate change.

Few responses (four per cent) from Robert Village showed that climate change had contributed to lack of Hydro- Electric Power (HEP). This somehow explains why some respondents cited firewood collection as one of the causes of climate change in the area because people could not

access cleaner and sustainable sources of energy such HEP. Sichingabula (1998) earlier predicted that reduced supply of HEP would be one of the implications of climate change in Southern half of Zambia where Robert Village is also situated. Therefore, this was simply a fulfillment of part of the predictions and there is need to establish rural electrification in order to help reduce deforestation and further change in climate.

Fifteen per cent and eleven per cent of responses from Mandevu and Bauleni Compounds respectively showed that climate change had contributed to seasonal overlaps. Climate change-induced seasonal overlaps were also registered in Lumumba (4.7 per cent) and Siamunyemba Village (3.8 per cent). Simply defined, a seasonal overlap refers to a situation where one climatic season partly intrudes into another one (Hender-seller and Robinson, 1986). As further argued by these two scholars, seasonal overlaps are inevitable in any area whose climate has undergone change. They also argued that climate change is most associated with abrupt weather and seasonal changes as also registered in Lumumba Compound (3.5 per cent), Chongwe Compound (6.7 per cent) and Lubuko Village (eight per cent). The implication of such instances would mainly affect farmers because once a dry-hot season extends into the rainy season, there would be a high probability of crop failure, food shortages and hunger.

In Siamunyemba Village, beer drinking (2.5 per cent) was perceived as one of the effects of climate change, with 10 per cent of responses from Kalikiliki Compound showing the same. Given perceived decrease in economic activities, people in Siamunyemba Village and Old Kanyama Compound probably got too dormant such that those who cherished beer drinking ended up over indulging it, leading to various social vices such as illegal sexual activities as earlier discussed. However, based on Namafe's (2006) philosophy of beer, beer drinking as one of perceived effects of climate change might not always be viewed from a negative side because it could probably have been a form of cheap adaptation to poverty and hunger-related mental stress provoked by climate change. A research on this theme by Zambia National Breweries could avail massive knowledge. Fear of uncertainty was one of perceived (eight per cent) effects of climate change among residents of Lubuko Village and it also emerged in Old Kanyama Compound (six per cent). Smith (1992) argued that a risk or hazard that strikes hard is that which humanity is less certain off because the impact cannot precisely be determined. The

fear of uncertainty of climate change could have posed a risk of psychological trauma among some people in the village because they would not know what might or might not happen, even though there could have been numerous projections and interpretations of climate change risks and vulnerabilities. Therefore, residents need to be educated on reflexive in order to cope with uncertainties of climate change.

On a very unique note, five per cent of responses by residents of Kalikiliki Compound isolated tsunamis to be among effects of climate change in the According to Mahapatra (1994), a tsunami is a gigantic and cataclysmic ocean wave caused by a marine earthquake (earth quakes that take place under the ocean bed or floor). Though tsunamis could be inevitable especially in the face of climate change, they are only confined to coastal and island areas such as Fukushima Daiichi in Japan and that is where climate change could have an influence on their (tsunamis) occurrence. According to Reuter, as published in 'The Monday Post' dated March 28th 2011, fifty-eight per cent of Americans attributed the recent tsunami and marine earthquake that happened in Fukushima Daiichi to global climate change. The response was therefore, correct, but was applicable neither to Kalikiliki Compound nor in Zambia being a landlocked country. Television or other media graphical images must have probably provoked such unlocalised perception. Such instances, indisputably call for environment- based education in order to enhance local people's capabilities to distinguish among local, national and international issues surrounding climate change.

Increased poverty as one of the effects of climate change among residents of selected areas in Lusaka Province could not be over-emphasised. If all of the above discussed effects were condensed together, they would add up to poverty. Seven per cent of responses from Misisi Compound showed that poverty was on the increase and so did 13.3 per cent and 16.7 per cent of responses from Chongwe Compound and Kampekete Village show. Increased poverty was also one of perceived effects of climate change in Siamunyemba Village of Kafue District. A similar view was also captured from Nyangu Village (2.2 per cent), Chilukusha-A Village (2.7 per cent), Chilukusha-B Village (three per cent) and Mphuka Village (six per cent). According to Petruskis et al. (2007), poverty is not simply household income deprivation, but also lack of social goods and services, environmental sanity as well as mental well being. Carefully relooking

on the above discussed effects of climate change we can precisely say that poverty and climate change are the two side of the coin especially in this era of climate change. In fact, NWASCO (2010) further argued that over 70 per cent of Zambia's population lives below poverty datum line. Thus, climate change would just escalate it to another level.

Residents manifested an overwhelming ability to relate effects of climate change despite some few unlocalised, yet correct views. Only 2.2 per cent of responses from Nyangu Village could not show effects of climate change. Robert Village only recorded four per cent responses which could not show the effects of climate change, with only 0.8 per cent of responses from Lumumba Compound not able to show its effects. From Lubuko Village, only 17 per cent of responses could not show the effects. Whilst Lusoke Compound recorded 10 per cent of inability to show the effects of climate change, Kampekete Village recorded 8.3 per cent.

Premised on the above discussed effects of climate change among residents of selected areas of Lusaka Province in Zambia, I wish to disagree with Americans casualisation of issues of climate change as highlighted in the literature reviews. For instance, Leiserowitz (2006) as reflected in the literature review showed that Americans regard the environment and climate change as relatively low national priorities. This was also highlighted by the Gallup poll (2000) as well as Dunlap and Sadel (2001). Moreover, Namafe (2009) as cited in the Environmental Southern African Journal of Environmental Education Vol.29, Pp. 38-48, also quoted Barack Obama saying that climate change is not a serious problem as compared to terrorism and social security. While this could have been logical given the economic strength of USA and its ability to cope, it does not apply to Zambia and particularly studied areas (with weak economic base) where wider spectrum of effects of climate change had been revealed.

This research also partly nullified the over generalised statement by UNDP (2010) that climate change would spell doom among Zambians. Some findings of this research showed that climate change could be both a challenge to majority of people, but at the same time a source of transformation for some residents. Sichingabula (1998) also stated that Southern Zambia, including the Lusaka Province, would be prone to droughts due to climate change. In his four constructed scenarios of the implications of drought in Zambia under increased climate change-

induced global warming, he asserted that there would be increased summer temperatures leading to the stretching of the dry seasons. Whilst the temperature and seasonal changes were fulfilled in this research as also earlier predicted by Sichingabula (1998), the generalisation that southern half of Zambia would be prone to drought did not entirely apply to all studied area. For instance, most of the responses (within the range of 14 per cent to 40 per cent) from studied peri-urban compound observed floods rather than droughts. Floods than droughts influenced their perceptions of other effects of climate change. Nevertheless, drought factor was perfectly fulfilled especially among selected areas of Luangwa District, which had also been mapped as one of districts most vulnerable to climatic hazards such as droughts. Madison's (2007) over generalisation that Zambia had experienced a significantly drier climate as earlier shown in literature review, was also partly nullified. This is because climate change could make some area drier and others wetter, as evidenced in this research, selected areas of Luangwa District were perceived to be drier whereas, peri-urban compounds of Lusaka District were wetter. Moreover, his research concentrated more on physical aspects such as temperature, precipitation and droughts however, this research added some social, economic, political and other aspects. Given such intra and inter spatial variations and similarities in terms of effects of climate change, all scholars aspiring to research on climate change topics must seriously take the *spatial context* into consideration before making general statements because climate change is highly stochastic and may not affect all areas in the same way. Generally, effects of climate change among residents of selected areas of Lusaka Province were perceived from social, economic, ecological, psychological and moral contexts. Combining the context in which causes and effects were perceived, the conclusion on the first objective of this research was as presented below.

In a nutshell and in the context of the first objective of this research, causes and effects of climate change were perceived from social, economic, political, moral, spiritual, cultural, behavioural, psychological and ecological contexts. Intra and inter spatial variations and similarities in terms of perceived causes and effects of climate change were also common. These dimensions provided the blue prints of the contexts which adaptation and mitigation plans and programmes could assume to address the challenges of climate change among selected areas of Lusaka Province. The next section discusses views on climate change adaptation.

6.3 Views on climate change adaptation

This section, discusses views expressed by residents of selected areas of Lusaka Province on how the effects of climate change as earlier discussed could be adapted to and mitigated. In Nyangu Village of Luangwa District, a few responses (4.2 per cent) by residents suggested introduction of aged residents' aid in order to reduce the impacts of climate change. This view intrinsically implied that climate change had been affecting aged members of Nyangu Village. It is logical that aged residents of Nyangu Village would be hard-hit by the impact of climate change such as hunger and diseases which are already discussed. Therefore, aid for the aged would be necessary. However, the feasibility of this strategy in Zambian context is quite bleak given its economic substructure. I am therefore suggesting that well wishers and NGOs with a passion for aged people be involved in this issue. Moreover, highly trained gerontologists (human resource specialized in the study of the different aging processes that occur among individuals and the factors that cause these changes) would also play a significant role in counselling aged residents on how to adapt to various challenges posed by climate change in the area.

Moreover, seven per cent of views from Robert Village expressed the need to set up orphanages as a way of mitigating climate change impacts such as death of fatherless and motherless children. This view was also registered in Chilukusha-A Village (5.9 per cent) and Chilukusha-B Village (five per cent). This proposition to establish orphanages was inherently sending a message that climate change was affecting orphans in such areas or could have contributed to deaths of some parents leading to an increase in number of orphans. With such already discussed effects as poverty, hunger and diseases, there was a probability that climate change impact would be more tilted towards children without parents. So in view of addressing some of their psychological and social challenges that might be catalysed by climate change, building orphanages would be one of the solutions. Some few responses (five per cent) from Chilukusha-B Village suggested introduction of small scale cross border trading between area residents and those of neighbouring Mozambique, as a way of coping with decimated agricultural system. This strategy could temporarily help local people raise an income, but it may also lead to other vices such as prostitution and sale of illegal substances such as drugs and

psychotropic substances. If this was to be implemented, stringent measures to avoid such vices must be put in place.

Since some residents among selected areas of Luangwa District complained of lack of income and poor farming system, they proposed introduction of business loans in order to enable them find alternative means of livelihood. This view surfaced among residents of Nyangu Village (10 per cent), Robert Village (seven per cent) and Chilukusha-B Village (15 per cent). Provision of business loans would improve residents' source of income and help them diversify the local economy from agriculture to some other means of livelihood that do not depend heavily on climate. A few responses (12.5 per cent) captured from Lubuko Village of Chongwe District suggested introduction of Rural Empowerment Funds (REF) as a measure to reduce local climate change impacts. This was a crucial strategy as it would reduce over-dependency on activities such as subsistence farming and charcoal burning which were perceived to have caused havoc to the local forest ecosystems and subsequent change in local climate. In order to ensure fruition of this strategy, cumbersome bureaucratic measures must be avoided in order to help residents access funds for alternative business activities, otherwise, it might prove futile as has been the case concerning the Youth Empowerment Funds.

Similarly, 10 per cent of views by residents of Siamunyemba Village suggested provision of agricultural loans in order to revamp their emaciating farming capital and improve the farming inputs such as fertilizer and seeds. This would also help in reducing climate change-induced shortage of food and hunger. Five per cent of views captured from Chilukusha-B Village showed that fish farming could help residents adapt to the changing climate because crop farming was no longer reliable, yet the potential for fish farming was still available. They pointed to the Luangwa River as a potential motivation for fish farming. This is a feasible suggestion and it would reduce over-reliance on crop farming which was deemed disappointing due to harsh climatic conditions. This strategy needs to be backed up with fish farming training for residents to practice it sustainably.

A moderate proportion of responses (seven per cent) by residents of Robert Village showed that promotion of entrepreneurship in sewing, metal work, basketry and others would help in

reducing over dependency on erratic agricultural system and diversification of local means of livelihood. In order to ensure fruition of this strategy, sustainable entrepreneurship skills must permeate residents' minds on how to decide on the product, acquire the facilities, and bring together the labor force, capital, and production materials. This would inherently require business education as a major driving force. Some few responses (five per cent) obtained from Katondwe Village showed the need for rural industrialization to cope with climate change impact. This would lead to a transition from over-dependence on agricultural activities to one based on village industrial skills. This would help residents of Katondwe Village where this view (five per cent) was proposed improve their per capita through increased productivity. Alternative source of livelihood as one of the suggested means of adaptation in Chongwe Compound (15 per cent) would help in adapting to and mitigating climate change in the area. Implemented, this would reduce over dependency on charcoal burning and shifting cultivation which were the most perceived (40 per cent) causes of change in the area and subsequent enhancing of environmental sustainability for mitigation of climate change. However, the fruition of this strategy would be dependent on above discussed training in industrial skills.

Tarring of Feira Road (main earth road that leads to Luangwa District's only town centre) was also suggested by a moderate percentage (seven per cent) in Robert Village, as one of the means of adapting to the impact of climate change in the area. A similar suggestion also emerged from Chilukusha-A Village (11.8 per cent). By the time this research was conducted, Feira earth road, which connects the main town centre to the Great East Road (GER), was in degraded state and most buses could not access areas along this road. If road was tarred, it would be a source of transformation for most residents of Luangwa area. They would be able to transport their goods to and from market for profit and thereby mitigating some impacts of climate change such as lack of monetary income, hunger and others. Moreover, good road network would enable local residents to have a timely access to basic goods and services from other areas such as Lusaka District due to easy transportation.

Due to harsh climatic conditions in Mphuka Village, 7. per cent of views by residents proposed the changing the type of agriculture. While this was a brilliant view, it would require a lot of concerted effort to achieve. One of them would be technology to invent new crops in the face of

climate change. Alternatively, residents could also adopt xerophytic crops such as sorghum and millet because these do not require too much water to grow by virtue of being drought resistant Nasitwitwi (1998) in Banda (2005). Introduction of irrigation was also suggested by residents of Mphuka Village (3.7 per cent) to facilitate irrigation farming. A few responses (5.9 per cent) from Chilukusha-A Village also showed the need for irrigation schemes. Due to the presence of Luangwa River, this could be one of the possible means of reducing climate change impacts especially agricultural related ones and enhance food security.

Similarly, 10 per cent of responses by residents of Chilukusha-B Village proposed adoption of organic gardening as a form of adaptation to some agricultural impact of climate change in the area. This view also emerged from Chilukusha-A Village (5.9 per cent) and Mphuka Village (3.7 per cent), Siamunyemba Village (12 per cent). Organic gardening relies on ecosystem management by using pesticides and fertilizer obtained from plants, animal dung and droppings and it could be an Ecosystem based Adaptation (EbA) strategy (Newcomb, 1986). Ecosystem based Adaptation to climate change is indeed a major thrust in the quest to combat the challenges of climate change. According to the United Nations Framework Convention on Climate Change (UNFCCC) (2009), Ecosystem-based Adaptation activities should be part of a broader portfolio of adaptation measures. Zambia's education policy document by Ministry of Education (MoE) also acknowledges the need to preserve biodiversity as a way of mitigating environmental challenges such as climate change. One way of achieving this is by involving people into sustainable practices such organic gardening. However, caution would be needed in order to prevent local methane emissions through organic manure.

Some few responses (3.7 per cent) by residents of Mphuka Village further suggested introduction of honey production because the place was regarded to be conducive for such an activity. It was also thought to be a means of reducing dependency on poor agricultural system in the area. Some residents had already started practicing this and all they needed was support from the government. In fact, honey is now earning value on the world market and it is one of the few Zambian products that have been shortlisted for export to the under the Africa Growth Opportunity Act (AGOA). So if such a suggestion was implemented, it would help residents earn an income and cope with some economic challenges triggered by climate change. Moreover,

some responses from Nyangu Village (8.3 per cent) showed that intense heat induced by climate change could be adapted to by changing the design of attire. Thus, wearing open sandals and sleeveless shirts (summer attire) in order to reduce over sweating and enhance comfortability of the body. As earlier discussed, over sweating reduces energy that would otherwise be used for farm labor. So if change of attire is what would reduce dehydration and body weaknesses, it is worth implementing. In almost similar context, majority of responses (14.8 per cent) from Mphuka Village proposed the adoption of wood-reed-mud-thatched houses in order to adapt to intense heat. This suggestion also emerged from Robert Village (14.3 per cent) and was based on the logic that grass, mud and tree branches are ecologically friendly and poor absorbers of heat. Actually, some people around Robert Village were already living in such houses. Whilst such houses as those shown in figure 21 below could help residents adapt to intense heat, it was also observed that they could not withstand unexpected floods, unless built in strategic places where flood water could not reach or by improving them using suggested materials.

Figure 21: Wood-Mud-Grass thatched huts in Robert Village (these were perceived to be a mean of adapting to intense heat perceived to be an effect of climate change)



Photographed by M. Muchanga Field data (2010).

Another area of concern was that some materials such as tree branches suggested for building houses might be contributing to deforestation, which was perceived as one of the causes of climate change. Therefore, caution must be put in place to avoid deforestation. This could be done by the Ministry of Local Government and Housing (MLGH) since the idea has already been suggested. Similarly, 12.6 per cent of views from Nyangu Village showed that building

houses on hills and away from Luangwa River banks would reduce flooding of houses and loss of property in case of unexpected floods. This view was mainly suggested by residents who were settled near the banks of Luangwa River. Moreover, some residents from Misisi Compound suggested (13.5 per cent) building houses with raised foundation with 12.4 per cent of views captured from Old Kanyama Compound showing the same. Building houses with raised foundation could help them adapt to climate change-related floods and lessen loss of property and collapsing of houses. Twenty-three per cent of responses captured from Misisi Compound also showed that building toilets with raised foundation would help reduce flooding of toilets and at most, resurfacing of human excreta which was perceived to have contaminated the top soils and water wells thereby, depriving people of clean and safer water. Furthermore, 15 per cent of responses from Mandevu Compound cautioned residents to avoid building houses in low lying areas where floods could easily occur. Such strategies would help reduce water-borne diseases such as cholera, as well as improve water and sanitation, among others.

Building good water drainages was one of commonly held views (15.6 per cent to 40 per cent) to reduce climate change-induced flooding of houses and property among studied peri-urban compound of Lusaka District. With exception of Bauleni Compound, this view emerged from Misisi Compound (23 per cent), Mandevu Compound (25 per cent), Kalikiliki Compound (24.9 per cent), Old Kanyama Compound (15.6 per cent) and Marapodi Compound where it scored 40 per cent of all suggested means of adaptation and mitigation. According to Kapoor (2001), good drainage systems drastically reduce unnecessary accumulation of water. Since all of these peri-urban areas are geologically underlined by limestone which leads to rapid accumulation and stagnation of flood waters, building good drainage would help in reducing flood-related diseases, reduce loss of property through flooding, among others. Moreover, 12.5 per cent of responses by residents of Old Kanyama Compound suggested water-borne toilets in order to reduce flood-related diseases such as cholera. This would also apply to Misisi Compound where toilets were flooded leading to resurfacing of human excreta with potential to cause cholera. Water borne toilets would indeed be safer than pit latrines in such areas. This is because they are underlined by limestone which according to Kapoor (2001) is not suitable for pit latrines due to its poor drainage or permeability.

Furthermore, 16.5 per cent of responses by residents of Lumumba Compound suggested improvement of child care and supply of mosquito nets in order to reduce risks of climate change-related illness among children. According to UNICEF (2007), children would be more affected by climate change-related diseases than adults. This assertion was true children have weak immune system to with stand such challenges of climate change as cholera, malaria, flues among others. Therefore, the suggestion for improved child care in places such as Lumumba was timely. Some few responses (8.3 per cent) from Nyangu Village showed that for climate change impact to reduce, women must stop wearing trousers so as to remove the curse of climate change. As earlier mentioned, in typical African traditional realms such as Nyangu Village, it is a taboo, immoral and unethical for a woman to wear a pair of trousers. So to remove a curse (climate change) associated with a perceived taboo (female wearing of trouser), a suggestion was made for those women to stop wearing trouser. This view also coincided with the one found by IRIN (2010) from Samburu District of Kenya as earlier shown in literature review.

Some residents from Nyangu Village further thought (4.2 per cent) that migration from the area would lead to complete avoidance of the dry climatic conditions in the area. Some residents of Marapodi Compound also subscribed to a similar view (30 per cent). While this sounds interesting, the feasibility is somehow bleak because climate change has no boundaries. So where ever they would wish to migrate they would find places with different impacts, which they would probably fail to adapt to. Moreover, some houses such as those in Marapodi compound are occupied by tenants and not the landlords. Therefore, it would be difficult to assess who must vacate between the affected tenants or the land lord who would probably be settled somewhere. So what would be needed is education to train them how to live with climate change impacts in their vicinities.

Spiritual perception of climate change was one of the commonly spread both inter and intra-spatially. Therefore, it was logical that some residents suggested praying hard as one of the solutions to climate change. With the exception of Chilukusha-B Village, this view (seven per cent to 12.5 per cent) was common in Nyangu Village, Robert Village, Chilukusha-A Village, Katondwe Village and Mphuka Village. Some residents from Lusoke Village of Chongwe District also subscribed (12.5 per cent) to the idea of praying hard. In Lusaka District, residents

of Mandevu Compound upheld a similar view (10 per cent), with 8.3 per cent of responses from Bauleni Compound subscribing to the same. Praying hard as one of the means of adaptation and mitigation also emerged from Kalikiliki Compound (16.3 per cent), Old Kanyama Compound (25 per cent) and Marapodi Compound where it accounted for 20 per cent of views on adaptation and mitigation. The same suggestion also surfaced from Lumumba Compound (16.6 per cent) and Siamunyemba Village (eight per cent). Given such revelations, it is no mere exaggeration when scholars such as Mbiti (1990) argued that Africans are notoriously religious and spiritual. In spiritual realm, it is generally believed that a faithful prayer, unlike other measures, could be a solution to every problem. One of the female residents of Mandevu insisted that there could be no any other solution to climate change apart from praying hard for the Kingdom of God to come so that the challenges of climate change could end. She justified her view by quoting the Bible (King James Version) from the book of Daniel chapter two reading from verse 44 as follows:

And in the days of these kings shall the God of heaven set up a kingdom, which shall never be destroyed: and the kingdom shall not be left to other people, [but] it shall break in pieces and consume all these kingdoms, and it shall stand for ever.

According to Christianity belief, the new earth and heaven will be free from any form of suffering including environmental challenges such as those triggered by climate change. This is generally taught in all Christian churches and it served as a basis for the above discussed strategy. Similarly, some residents of Lusoke Village in Chongwe District also thought (12.5 per cent) that climate change impact could be mitigated by repentance of sins. As earlier stated, a sin in most, if not all, spiritual realms is associated with a punishment or curse (climate change effects) unless repented. Since some causal factors of climate change were associated with increase in sin, the solution was partly believed to be enshrined in faithful repentance. Some few responses (eight per cent) from Siamunyemba Village suggested opening up of churches as a solution to climate change impact. A church is a building for public worship, especially in the Christian religion (Encarta, 2009), so it was thought that if more of them were built, people would pray more and repent their sins in order to reduce the impact of climate change. Such views as discussed above augured well with some of the views expressed by residents of Samburu District of Kenya (earlier mentioned in literature review).

Maize food aid was also suggested as one of the means mitigating the impact of climate change among selected areas of Luangwa and Chongwe Districts (3.7 per cent to 30 per cent). In Luangwa District, it emerged from Nyangu Village (4.2 per cent), Robert Village (14.2 per cent), Chilukusha-A Village (5.9 per cent), Chilukusha-B where it scored the highest frequency (30 per cent). A similar view was also captured from Katondwe Village (25 per cent) and Mphuka Village (3.7 per cent) of Luangwa District as well as Lusoke Village (6.3 per cent) of Chongwe District. Such statistics intrinsically showed that hunger had affected residents in these areas and something more sustainable was needed to be done to avoid nutrition-related illnesses, especially among children. However, provision of maize food could only provide short term solutions to perceived hunger incidences and crop failure. In this case, it could only be used as a stepping stone towards the construction of sustainable measures such as agricultural education and others to reduce hunger and related consequences.

In order to reduce crop failure and boost the yields, a few responses (4.2 per cent) from Nyangu Village suggested adoption of early maturing seeds and crops, which was also suggested among residents of Chilukusha-A Village (5.9 per cent), Chilukusha-B (five per cent) and Mphuka Village (3.7 per cent). Indeed, if early maturing plants and seeds were provided, there would be an improvement in food security and subsequent reduction in hunger. Adoption of drought-resistant seed was additionally proposed in Chilukusha-A Village (11.8 per cent), Chilukusha-B Village (10 per cent), Katondwe Village (12.5 per cent) and Mp Village (11.1 per cent). This would also help in improving crop yields, reduce crop failure and consequently reduce on hunger and shortage of food which were among perceived effects of climate change. In a similar context, though unique, 10 per cent of responses from Siamunyemba Village proposed the invention of climate change-resistant seeds and crops in order to annihilate crop failure, improve crop yields and reduce hunger. In my own words, climate change-resistant seed or crop is that which can withstand any impact of climate change be it drought, flood or pests. This could really be a major achievement though it would require very specialized and shrewd technology. Ministry of Science and Technology (MST) must do some researches on this suggested strategy. Even though Luangwa River banks were deemed to be convenient for growing of some crops by residents of Nyangu Village, a few responses (4.2 per cent) captured from the same area suggested cultivation of crops on the upland. This was deemed a better way of reducing flooding

of crops in case of unexpected heavy floods. This would also reduce on destruction of crops by wild animals such as baboons and elephants that sometimes come to drink from the river. Moreover, 11.1 per cent of views from Mphuka Village showed that adopting drought-resistant livestock such as goats, sheep and indigenous chicken would help people adapt to and mitigate some challenges such as livestock diseases and deaths. A fairly high frequency of responses (10 per cent) from Siamunyemba Village showed a similar strategy, with 16.6 per cent of views from Lumumba Compound showing the same. The logic behind their view was that such animals as goats (shown in figure 22 below) would be capable of surviving on dry pasture and little amount of water thereby reducing unexpected deaths through malnourishment.

Figure 22: Goats feeding on dry pasture-a form of climate change adaptation



Photographed by M. Muchanga (2010).

Due to perceived increase in diseases as earlier discussed, 14 per cent of views by residents of Robert Village lobbied for installation of health centres and medical personnel in the area. Most responses (25 per cent) from Mphuka Village made the same suggestion. Provision of good health services would be crucial for the well being of residents in such Villages because climate change was perceived to have escalated the prevalence of diseases such as flu, coughs and diarrhea. Some female residents of Robert Compound interviewed on safety of water in the area argued that climate change had deprived them of safe water because they entirely depended on un-chlorinated water from Luangwa River which indisputably exposed them to high risks of water-borne diseases. So if medical personnel were provided, they would educate people on how

to prepare safer water for consumption and subsequently reduce water related diseases as indicated by some of the women (shown in figure 23 below) interviewed.

Figure 23: Women from Robert Village flocking to Luangwa River to fetch some water (water scarcity was one of the most worrying perceived effect of climate change in this area)



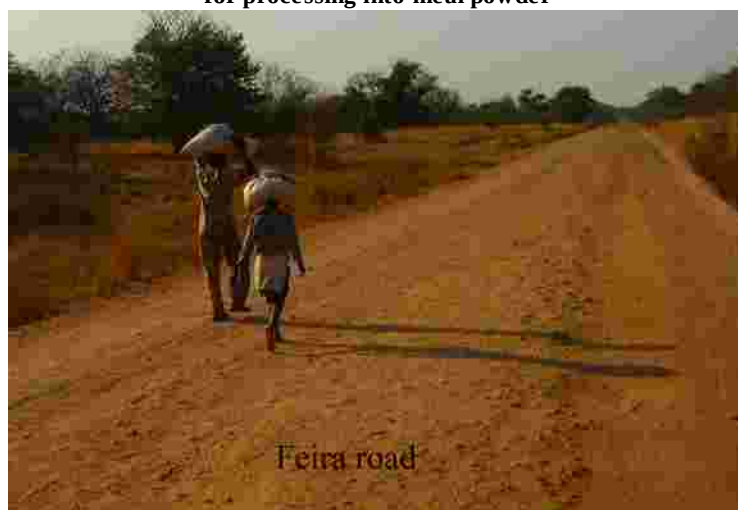
Photographed by M. Muchanga Filed data (2010)

Due to climate change induced water scarcity, some residents of Robert Village suggested installation of water tanks (10.5 per cent) and so did 16.6 per cent of responses by residents of Nyangu Village show. As earlier mentioned these areas are too stony and arid such that boreholes or water wells could not easily be sunk. Therefore, installation of water pumps and tanks could be the most feasible strategy. In fact, this would even ensure that people have access to chlorinated water in order to reduce water-borne diseases. Moreover, twenty per cent of views captured from Lumumba Compound and 10 per cent of those from Siamunyemba Village showed the need to sink boreholes in order to reduce water crises in both areas. They say “water is life” so its scarcity would affect various facets of life particularly among residents of these areas and women could be the most affected because they need water more than men. This is true because women are the ones who fetch water, cook with water and wash with water, among others, especially in African context. Flashing back on the Darfur region in the literature review,

women were the ones who wrestled for water and not men. Therefore, installation of water systems would be a source of transformation for them especially in the face of climate change.

Furthermore, 4.2 per cent of views by residents of Nyangu Village suggested game cropping of some wild animals such as elephants, lions, baboons, m and hippos as a way of reducing climate change. This was premised on the views that these wild animals were attacking livestock and destroying crops in the village thereby, worsening effects of climate change such as shortage of food. This matter must not be dramatized given some earlier agricultural challenges to which residents had been exposed. If game cropping not be achieved then to quarantine such wild animals would be inevitable by some relevant authorities such as Zambia Wildlife Authority (ZAWA). The UNDP (2010) earlier mentioned that wild animals in Luangwa District as a whole had jeopardized socio-economic wellbeing of residents. This must have gotten worse with the advent of climate change as such something needs to be done. Moreover, four per cent of views from Robert Village suggested setting up of hammer mills as a measure to reduce some hunger-related impacts of climate change. This inherently showed that some people could have had raw dry maize but due to lack of where to have it processed into meal powder, they ended up starving. Some respondents argued that their children (such as those in figure 24 below) often travelled longer distances to just have a handful of maize grains processed into meal powder for preparation of *Nshima* (Very thick maize meal porridge), which is a staple food for most Zambians.

Figure 24: Boys from Robert Village of Luangwa District taking dry maize to a hammer mill for processing into meal powder



Photographed by M. Muchanga

Field data (2010).

Moreover, 3.7 per cent of responses from Mphuka Village evinced that in order for people to adapt to climate change, they needed to be strong. Some effects of climate change such as droughts, unexpected floods and loss of property could be associated with psychological and physical disturbances. So in order for residents to meet or override such challenges, they would first need psychological and physical determination and strength. This could be the simplest and cheapest means of short term adaptation among residents of Mphuka Village whilst awaiting long term measures. In addition, 3.7 per cent of views from the same area suggested reforestation (replanting of trees on a piece of land whose initial ion has been cleared) in order to abate the impact of climate change. This was also suggested among residents of Chilukusha-A Village (5.9 per cent). Reforestation as also emerged from Chongwe Compound (20 per cent), Kampekete Village (12.5 per cent) and Kanakantapa Village (40 per cent). It also surfaced in Siamunyemba Village (12 per cent) and Chilanga area (20 per cent). In Misisi Compound of Lusaka District, 13.5 per cent of responses were based on planting of a tree on each household within the compound. Reforestation would help in the revitalization of bio-sequestration in order to reduce the accumulation of carbon (major cause of climate change) into the local atmosphere. This actually coincides with one of the aims of the United Nations-Reducing Emissions from Deforestation and Forest Degradation (UNREDD+) programme to reduce degradation of forest through reforestation and mitigate climate change (MTENRs, 2010). Replanting of more trees would help in restoration of catchment areas, recharging of ial systems, improve soil fertility and provide enough carbon sinks and help in offsetting possibilities of increase in local climate change.

Most of the responses (50 per cent) from Kampekete Village suggested a reduction in charcoal burning. Twelve per cent of responses from Siamunyemba Village also showed a similar strategy. Moreover, forestry sensitisation was also proposed in Chongwe Compound (15 per cent), Robert Village (3.5 per cent), Chilukusha-A Village (17.7 per cent), Chilukusha-B (five per cent) and Mphuka Village (7.4 per cent). Charcoal burning is known for contributing carbon through burning and clearance of vegetation, both of which lead to climate change. Once drastically reduced, it would help preserve trees carbon bio-sequestration and possible reduction in climate change. Moreover, sensitising residents on the significance of vegetation was also a welcome move. Residents such as those of Chongwe District have long lived with charcoal

burning and shifting cultivation which contribute to deforestation. So in order for them to realize the wrong in cutting trees and appreciate conservation, strategic sensitisation would be required to change their (conservative) minds. This would help them act and care for vegetation. In Lusaka District and particularly Mandevu Compound, there was a suggestion (five per cent) for all charcoal burners should have identity cards. This would help reduce illegal and uncontrolled charcoal burning which would contribute to environmental sustainability. Adopting alternative source of energy as suggested in six per cent of response from Siamunyemba Village, would also help serve trees and reduce carbon emissions. This could be achieved through the use of renewable and clean energy sources such as solar power as suggested in Lubuko Village (12.5 per cent) and Chongwe Compound (five per cent). However, these require larger sums of money and advanced technology.

A fairly high frequency of responses (25 per cent) from Lubuko Village suggested imprisonment of unauthorized charcoal burners. Such a strategy could have been premised on the most perceived causes of climate change in the village, thus, deforestation and charcoal burning (40 per cent), which were and are still a common phenomenon in Chongwe District as a whole. Such a strategy could help in restoration of lost forests, reboot carbon sequestration and possible mitigation of climate change intensity in the village. Harsh though the strategy of jailing illegal charcoal burners might seem, it was in tandem with the Zambian Law. The Criminal Procedure Code Act (CPCA) of chapter 88 of the Laws of Zambia indicates that damaging trees as in the case of Lubuko Village and other areas is contrary to section 335 of the Penal Code (PC). Section 335 (1) of the PC in Chapter 87 of the Laws of Zambia reads as shown in the direct quote below:

Any person who willfully and unlawfully destroys or damages any property (*trees*) is guilty of an offense, which, unless otherwise stated, is a misdemeanour and he is liable, if no other punishment is provided, to imprisonment for two years.

Premised on the above penal code, the suggestion by residents of Lubuko Village to jail those who would continue cutting trees was justifiable and could significantly contribute to

conservation of forests. Emphasis must not just be on human rights and other cases, but also on ecological rights and justice especially as we live in climate change era. However, measures must be put in place to introduce illegal charcoal burners to legal education in order for them to realize why they would be imprisoned should they act contrary to the law.

Whilst the recently discussed responses among selected areas advocated for replanting and protection of trees, 10 per cent of responses from Marapodi Compound suggested cutting down of some trees as a way of reducing climate change-related decrease in temperature. This was premised on ordinary person's logic that too many trees were blowing cold air which was opined to have contributed to decreased temperature. This may sound very comical but inherently shows the need for environment-based education in order to clarify the role of trees in climate change mitigation within the compound. Moreover, 10 per cent of views by residents of Kanakantapa Village showed that practicing sustainable farming would also be necessary in adapting to and mitigating climate change. According to Newcomb (1986), sustainable farming is a system of agriculture that excludes the use of synthetic pesticides, genetically modified seeds and animal breeds, antibiotics, among others. It reckons on ecosystem conservation that includes the use of pesticides and fertilizers derived from plants, animal wastes, and minerals thereby, increasing soil fertility, balance insect and pest populations, avert air, soil, and water pollution (Ibid). All such eco-friendly aspects would be of great significance in local residents' efforts to adapt to and mitigate the effects of climate change. It would also reduce on deforestation in the case of Kanakantapa Village and other areas.

Some few responses (4.3 per cent) from Misisi Compound suggested a control on litter burning in order to reduce on local air pollution through open fires. Some responses (6.3 per cent) from Chongwe Compound showed that, if it were possible, all those engaged in littering around be jailed in order to reduce on litter burning and subsequent air pollution which all contribute to air pollution. Zambia already has pollution control Acts on both small and large scales. What would be needed is implementation especially as we attempt to plan for climate change adaptation. Similarly, five per cent of responses from Chilanga suggested that environmental law be effectively implemented. This was a timely suggestion because Zambia generally lacks effective environmental legal system to prosecute those who carelessly degrade the local environments

such as those of Chilanga area. There had been an over reliance on environmental policies which could easily be manipulated to suit certain egoistic interests. A lesson could be derived from Japan which has such affirmative environmental laws in order to ensure environmental justice, respect, and integrity for climate change adaptation and mitigation (Pro. Hideki Yamamoto, pers.com-24th September, 2010). If this was to be robustly implemented in Chilanga area, perceived increase in air pollution as a major causal factor (22 per cent) in the area would drastically be reduced.

To further reduce air pollution which is a long term adversary of climate, 4.5 per cent of views from Misisi Compound further suggested disbanding all les that emit a lot of smoke. This inherently suggested the introduction of eco-friendly fuel and cars because emission of gases through automobiles cannot be stopped since people are always on the move. However, if strictly followed, it is a possible suggestion. For example, in Pretoria the capital city of South Africa, all over-used or second hand cars are by law, not allowed to be on the road because they tend to emit a lot of smoke, this has helped in reducing air pollution. Similarly, twenty per cent of responses from Chilanga area suggested an increase in tax as a way of reducing air pollution by automobiles. A similar view also emerged from Kanakantapa Village (10 per cent). In my view this is the most feasible in Zambian context unlike disbanding second hand cars from the road as it is the case in most parts of South Africa, which is by far, more economically stable than Zambia. The issue of carbon tax was implemented by the government in 2006 and was purportedly envisaged to be raising approximately K30.7 billion annually. Nevertheless, some motorists resented it both in the print and electronic media because the government did not clarify what the collected money would be used for (Zinyama, 2010). Indeed, collected funds needed to be accounted for, I am suggesting that all such funds be invested in environmental awareness campaigns, sustainability projects and sensitization of motorists on the importance of reducing carbon emission in the face of climate change. Otherwise, motorists shall always keep on resenting it unless educated about it and that all collected funds are accounted for.

In connection to the above arguments, 6.3 per cent of s by residents of Lusoke Village suggested a reduction in the use of privately owned cars and adopt public buses in order to reduce carbon emission and possible climate change. This was indeed a strategic form of

adaptation and it shows why some respondents thought automobiles were one of the causes of climate change in the village. In fact, this would be more applicable in Lusaka urban areas because that is where larger traffic volumes are prevalent as compared to Lusoke Village. In some other countries such as Norway and New Zealand, over dependence on few, yet accommodative public buses had already been marketed in order to reduce on the over use of privately owned cars. This was in view of plummeting carbon emissions and ensure environmental sustainability for the sake of climate change adaptation (Shamulenge: pers.com 20/02/10). Therefore, such a suggestion by respondents from Lusoke Village was not just a mere illusion, it could be a starting point towards adapting to climate change. This actually links with behavioural change which was suggested in Kampekete Vi lage (12.5 per cent) as one of the means of mitigating and adapting to climate change. This was indeed a very crucial suggestion, as Amedeo and Golledge (1975) in Bird (1977) put it, environmental response is currently more a function of environmental behaviour than other factors. Thus, the way the environment responds is dependent on the behaviour which people have towards it. So all such suggested strategies would be mere presumptions if people's behaviour especially towards the environment, consumption and transport was not changed.

In connection to behavioural change, learning about climate change in local language was also suggested in order for residents to understand what it is and help them make informed decisions to change behaviour and adapt to the impact. Learning climate change in local languages would really lead to public understanding of issues surrounding climate change. This view emerged among residents of Mandevu Compound (15 per cent), Bauleni Compound (33.2 per cent), Kalikiliki Compound (24.9 per cent), Lumumba Compound (18.8 per cent) and Lusoke Village (18.8 per cent). Moreover, some residents of Bauleni thought that if they were taught about the environment (24.9 per cent), they would easily adapt to climate change impact by changing their behaviour. Similarly, 8.3 per cent of responses from Bauleni Compound suggested learning about waste management with 9.3 per cent of views from Old Kanyama Compound showing the same. This was a timely suggestion because residents in such compounds and other peri-urban areas actually generate a lot of waste. So if they were taught on how to reduce, reuse and recycle waste, it would definitely help in reduction of local methane emission through decomposition and fermentation of uncollected municipal wastes and possible reduction in climatic changes.

Moreover, 15 per cent of views by residents of Chongwe Compound showed that if local people were taught about healthful living, they would easily to climate change. A similar idea was also highlighted (9.3 per cent) among residents of Old Kanyama Compound of Lusaka District. With such perceived effects of climate change as increased malaria, flu and coughing, healthful living (which indirectly suggested health education) would be beneficial among residents. In Kalikiliki Compound, 8.3 per cent of responses showed climate change could be reduced by stopping the habit of public urination within the compound. However, this is not just a common practice in Kalikiliki Compound, but also in other areas and males are the ones who often indulge in it. Implementing this strategy would help reduce local methane (one of the Green House Gases-GHGs) emission into the local atmosphere and promote e sanitation for climate change adaptation in Kalikiliki Compound and other areas. Generally, an environmentally educated mind would always put nature first and if this was abode by, humanity would have been restrained from emitting gases which have caused climate change internationally and particularly, among the studied areas.

In order to facilitate learning for behavioural change in the face of climate change, some residents of Lumumba Compound suggested (9.9 per cent) the formation of climate change clubs. This view was also suggested (3.1 per cent) in Kanyama Compound, Chilukusha-B Village (10 per cent) and Mphuka Village (3.7 per cent). In almost similar context, 10 per cent of responses from Chongwe Compound proposed frequent organization of workshops on climate change where local people would learn more about climate change and share ideas and different experiences. Indeed, such could be fora where local people and climate change scientists and educationists would blend both traditional adaptation scientific adaptation strategies (as suggested in Chilukusha-A Village (5.9 per cent) and Lusoke Village (6.3 per cent)) in order to ensure a more sustainable and balanced adaptation and mitigation plan. Most of the responses (25 per cent) from Mandevu Compound recommended involvement of local residents in planning for climate change adaptation and mitigation. As earlier argued by Banda et al. (1998), most adaptation strategies in Zambia have failed because they were merely created by technocrats without seeking on-the-ground people's views. On the 17th page of the National Adaptation Programme on Action (NAPA) by MTENRs (2007), lack of public participation is

one of the barriers to the implementation of the programme. Therefore, people's views as highlighted in this research must be incorporated in order to ensure a workable and intelligible climate change plan for residents of studied areas and Zambia at large. It is ordinary people who actually feel the gravest impact of climate change, as such, they are the ones who could tell us what to do to address their challenges. As earlier noted in literature review, Americans and some Europeans sparsely regard climate change as a serious problem because they have had a lot of means to cope and consequently not willing to change their lifestyle or take action for adaptation. However, this must not be subscribed to in Zambian context and particularly studied areas given the pieces of evidence that have been presented.

Although the strategy to engage traditional leaders in adaptation and mitigation planning only scored two per cent of adaptation measures in Siamunyemba Village, it was a very significant suggestion both in the context of Siamunyemba Village and at National Level. In fact, it had been one of the National Policy on Environment's (NPE's) goals to engage traditional leaders in local natural resources and environmental managements. Their traditional knowledge would be as significant as scientific knowledge in the fight against climate change. The role of traditional leaders' knowledge in enhancing climate change adaptation among communities create possibilities for the surfacing of new forms of agency capable of harnessing their culturally specific and historically contingent content for redressing the failure of the modern methods especially their scientific-technical aspects (Vedwan, 2006).

Majority of Africans and particularly those of Siamunyemba Village prefer looking up to their chiefs (heads of traditional ceremonies and reservoirs of traditional knowledge), who are their traditional leaders, for some initiatives on various problems including environmental issues such as climate change. So since chiefs and queen mothers are the custodians of the traditional ceremonies, knowledge, among other cultural facts, they can definitely lead the 'new war', thus; fighting against climate change, which is currently a challenge to humanity especially in traditional societies such as Siamunyemba Village in Kafue District. Empowerment of the traditional authorities for example, to mobilize the residents to plant trees in their localities to serve as carbon sink, collect garbage, give speeches about climate change or sustainability; would be a step in the right direction towards addressing climate change challenges and enhance

awareness. In Zambian context, politicians often make use of traditional leaders to win their political mileages so if we also made good use of them to communicate adaptation and mitigation messages, we would learn some new strategies for adaptation planning. Generally, how traditional leaders' knowledge could be used for climate change adaptation and mitigation planning had not been fully explored. I am therefore, proposing a research to myself and MTENRs in order to have clear understanding of climate change adaptation epistemologies enshrined in traditional leaders.

Moreover, 8.3 per cent of views by residents of Bauleni Compound suggested stopping of corruption within the political system as one of the means of enhancing climate change adaptation and mitigation in the area. Climate change is such a complex issue that demands a lot of funds in planning for adaptation, so in a situation where funds were misappropriated, the plans would prove futile. According to Transparency International Zambia (TIZ) (2010), approximately K348.244 billion worth of public money is misappropriated, stolen or grossly mismanaged annually since 1984. In recent years, Zambian media-radio, television and the news papers were marred by a plethora of news about some top government leaders and civil servants who were allegedly involved in misappropriation of public funds though their cases were acquitted in unclear circumstances. Really, if such misappropriated funds were to be invested in environmental projects and researches on climate change and invention of eco-technology, a lot would have been gained. This somehow justifies motorists' resentments against tax because they were perhaps aware of history of corruption in Zambia.

In addition, some few responses (6.6 per cent) by residents of Lumumba Compound showed the need for change of government (Movement for Multi-Party Democracy, by the time (2010) this research was conducted) in order to reduce the impact of climate change. This motion was also suggested among residents of Bauleni Compound (16.6 per cent), Kalikiliki Compound (8.3 per cent) and Old Kanyama Compound (9.3 per cent). This suggestion was not necessarily suggesting hatred for the government, but rather sent a strong message for political leaders to pragmatically prioritise climate change adaptation on their agenda. We cannot deny the fact that most environmental problems and particularly climate change are a function of unsustainable political decisions that have already been made and yet to be made. Therefore, such a view was welcome in order to wake political leaders from a slumber on several environmental issues.

Since women from Monze District of Southern Province were suspected of causing climate change in Kalikiliki Compound as earlier discussed, 16.3 per cent of responses by residents suggested chasing them back as one way of reducing climate change implications. Such a misconception simply implied the need for strategic education and learning for climate change in order to clarify how climate change could be mitigated in Kalikiliki Compound. Lastly, 5.9 per cent of responses from Chilukusha-A Village proposed introduction of educative climate change programmes on National Television (TV). Indeed, dissemination of climate change knowledge requires the use of different media. However, caution, with emphasis on education, must be taken. Moreover, considerations on who disseminates what information and how, through the media must carefully be tailored. Otherwise, the media such as television most often excites rather than educating people and this is partly due to the type of personalities they engage to communicate information. In this regard, I strongly repudiate the idea of assigning the so-called TV celebrities to be handling critical issues such as climate change as it is often done on other issues such as HIV-AIDS. They tend to concentrate on the surface rather than emphasise cross-cutting issues. Only specialized interviewers, interviewees and discussants must be featured in on TV climate change programmes in order to effectively help people such as those of Chilukusha-A Village learn more about climate change and pass informed decisions to change lifestyles for adaptation sake.

The above discussion on climate change adaptation among selected areas of Lusaka Province showed an overwhelming ability of residents to contribute to adaptation planning at national level and particularly, among studied areas. In Nyangu Village for example, only 4.2 of responses could not suggest any adaptation strategy. This was also the case in Robert Village (3.5 per cent), Lubuko Village (25 per cent), Lusoke Village (12.5 per cent) and Misisi Compound (4.5 per cent). Irrespective of some few misconceptions on adaptation strategies, the general impression was outstanding and it clearly showed how important ordinary people's views could be in planning for adaptation and mitigation of climate change both among studied areas and at national level. Inter and intra spatial variations which were evident in views on adaptation and mitigation of climate change also clearly showed the need for *contextual* adaptation planning in order to address the challenges based on how people have been affected. In summary, all views on climate change adaptation emerged from different dimensions whilst

having a homogenous focal point. They were suggested from socio-economic, ecological, technological, psychological, legal, spiritual, moral, political, educational and behavioural points of view. In connection to the above discussion on adaptation and mitigation of climate change, the following section discusses the types of education needed for adaptation learning.

6.4 Types of education needed for adaptation learning

According to Gangwar (2010), education is cardinal in building community resilience towards the implication of climate change. This section discusses 31 types of education which residents of selected areas of Lusaka Province needed for adaptation and mitigation learning.

Agricultural education was one of the types of education needed for adaptation learning among residents of selected areas of Lusaka Province. It was the most needed (25 per cent to 50 per cent) among studied areas of Luangwa District namely, Nyangu Village, Robert Village, Chilukusha-A Village, Katondwe Village and Mphuka Village. It was also fairly desirable (20 per cent to 30 per cent) among residents of Lubuko Village, Lusoke Village, Kampekete Village and Kanakantapa Village of Chongwe District. Some residents of Lumumba Compound also moderately needed (36 per cent) agricultural education in order to learn more on how to adapt to agricultural impact of climate change. While it was the most needed (35 per cent) in Siamunyemba Village, none of interviewed residents from peri-urban areas of Lusaka District suggested it probably due to peri-urbanised lifestyle or little or no engagement in agricultural activities.

Newcomb (1986) in Wikipedia online dictionary defines agricultural education as instruction about crop production, livestock management, soil and water conservation and various other aspects of agriculture. Agricultural education for climate change adaptation learning would not just instruct residents among selected areas of Lusaka Province in crop farming, but also help them solve such issues as water scarcity through water conservation learning. It would prepare the victims of climate change for effective learning and agricultural techniques for climate change adaptation. Agricultural education also involves food education therefore, it would enable residents such as those of Nyangu Village and Robert Village improve their quality of life and nutritional values of food. It would pave way for expansive learning of various arable

agricultural techniques practices and values to decrease local methane emission from animal manure storage, increasing livestock production efficiency by learning how to alleviate animal pests and diseases such as *Denkete* (corridor disease) and pests such as *Ntata* which were cited in Siamunyemba Village. Agricultural education would be relevant to residents especially in adoption of sustainable farming methods (unlike shifting cultivation), selection of types of crops and seeds that could adapt to impacts of climate change such as increased floods and droughts (Grubinger, 2004).

Irrigation education which accounted for 15 per cent of all suggested types of education in Nyangu Village of Luangwa District is a form of learning where learners are trained how to artificially water their land to sustain plant growth (2001). Rainfall in such areas as Nyangu Village was perceived (by respondents) to be unreliable because it only rained for about two months (December to January) annually and droughts were increasing. Therefore, introducing residents of Nyangu Village to irrigation would help them learn how to grow irrigated food crops irrespective of shortened rainy seasons and prolonged droughts. This would ensure food security in the face of climate change. Similarly, gardening education was also needed (10 per cent) for adaptation and mitigation learning in Nyangu Village. Gardening education for climate change adaptation would equip local residents of Nyangu Village with knowledge on how to select drought resistant seeds and seedlings. It would also help the learners understand the soils and where to cultivate which vegetable and the water rating for irrigation and pest control thereby maximizing crop yields and increase food security. This form of education could eventually help reduce perceived hunger incidences in the area.

Pest control education for climate change adaptation was also needed as suggested in few responses (10 per cent) by residents of Chilukusha-A Village and Chilukusha-B Village (10 per cent). Pest control education would offer to the peasant farmers of such villages, a wide range of environmental interventions and knowledge on how to reduce climate change induced-insect pests, plant pathogens, and weed populations to acceptable levels. It would also offer a guide on sustainable chemical and pesticide use for climate change adaptation and mitigation (Grubinger, 2004). Pest control education could be the medium through which residents would acquire more knowledge on how to reduce livestock diseases (trypanosomiasis) caused by pests such as tsetse

flies which are very common in Luangwa District as a whole and particularly in Chilukusha-A and Chilukusha-B Villages .

Moreover, 20 per cent of responses from Lumumba Compound of Kafue District suggested water education in order to learn how to adapt to water-related effects of climate change. According to Gadsen (2001), water education refers to on sustainable use, conservation and management of water. Therefore, it would play an important role in this area and others in management of water as a vital lubricant for life and sustain local people's unique and treasured environment. It would also contribute to their economic health and a range of social, recreational and cultural activities since water is part of a broader cultural system. Moreover, residents would learn sustained, cheaper and locally efficient methods of treating and preparing water before domestic consumption (Ibid). Even though water education for climate change adaptation was only suggested in Lumumba Compou residents of Nyangu and Robert Villages of Luangwa District learn how to prepare water because they only depended on untreated water from Luangwa River.

Fishing education was also deemed to be imperative for adaptation learning according to 15 per cent of responses from Nyangu Village and Mphuka Village (20 per cent). This would instruct local people on sustainable fishing methods to ensure that fishing on the Luangwa River becomes an alternative means of livelihood given the decimated agricultural activities in the area. It would expose residents to new techniques of fish aquaculture. Fishing education could help fish farmers within Nyangu Village, Mphuka Village and others to carefully manage their production units to ensure that water quality does not deteriorate and become stressful to the culture organisms such as fish (Grubinger, 2004). This would enhance sustainability of aquatic products as an alternative to adapt to agricultural impacts of climate change in affected areas. It is no mere exaggeration to argue that all of the above discussed types of education are in one way or the other a subcomponent or linked to agricultural education. Therefore, agricultural education would be very crucial to the wellbeing of residents of areas whose agricultural system has been hampered by climate change.

Business education was yet another type of education thought to be appropriate for adaptation learning. However, it only emerged among residents of Nyangu Village (15 per cent), Chilukusha-A Village (30 per cent), Chilukusha-B Village (10 per cent) and Mphuka Village (10 per cent) in Luangwa District. Due to unreliable agricultural activities in these areas, business education would help them with financial skills and discipline for building alternative means of livelihood rather just depending on almost impracticable agricultural system in the face of climate change. This would empower local people with eco-friendly business knowledge, values, ethics and entrepreneurship in confronting the challenge of climate change especially economic ones. It would also impart business creativity and financial literacy for climate change adaptation. Actually, financial and business discipline are a cheaper forms of adaptation to climate change (Fage, 1979), so if people especially those in Luangwa District were exposed to business education, they would learn more skill in order to adapt to the challenges of climate change and survive within their economic means. In addition to business education, life skills education was another type of education needed for adaptation learning in Nyangu Village (10 per cent) and Chilukusha-B Village (10 per cent). Based on some effects of climate change such as poor farming system and water scarcity that were noted in these Villages, life skills education would be inevitable for them. It would impart skills on how to adjust to the dynamic and uncertain effects of climate change. It is life skills education that could probably help residents with reflexive adaptation prowess thus, ability to adapt to unexpected effects of climate change. Smith (1992) argued that risk exposure increases with increase in uncertainty about the risk. So in order to reduce psychological panic that might arise from uncertainties and build reflexive inventiveness among the residents, life skills education would be needed for them to develop new sets of capabilities. Thus, reflexive ways of being and doing things that would possibly be different to the way in which they had done things before the advent of climate change (Lotz-Sisitka, 2010).

Moral education was also suggested for climate change adaptation learning among residents of Nyangu Village (five per cent), Katondwe Village (20 per cent), Lusoke Village (10 per cent), Mandevu Compound (10 per cent) and Bauleni Compound (9.1 per cent). According to Mwaipaya (1980), moral education aims at developing the moral obligation of learners and sharpens their inner potential to adequately prepare them for the demand of daily life. The fight

against climate change in above mentioned areas requires critical social moral obligation among the victims. This could only be achieved by incorporating moral education in the broader framework of climate change adaptation learning. Moral education sharpens a sense of social moral contract and also forces individuals to be committed to the preservation of environmental dignity and respect for nature, which are crucial in reducing the impact of climate change. Moral education would also help affected people easily change their behaviour (one of the suggested means of adaptation), be empathetic and actively care their local environments, participate in planning for climate change adaptation and fully realize their role in the implementation process (Mwaipaya, 1980). He further adds that moral underdevelopment is a major stumbling block to development. Therefore, the residents from selected area of Lusaka Province were justifiable to suggest such a form of education in order to develop their moral conscience for the local ecosystems and the fight against climate change. In fact, this type of education would be very crucial to those involved in adaptation policy making it would make them act rationally and objectively without any partiality or corrupt motives planning for adaptation learning at local, national and international levels. If those (such as MoE) who are involved in education planning for adaptation purposes ignore the study of moral norms of affected people, but instead embraces the study of scientific and technical aspects of climate change, they would at best be superficial, capable of producing only humanlike robots without a moral obligation towards various challenges that would be triggered by climate change among vulnerable areas.

Environmental education was also deemed significant for adaptation learning among residents of selected areas of Lusaka Province. It was suggested among residents of Chilukusha-B Village (10 per cent), Lubuko Village (12.5) and Kampekete Vil ge where it moderately accounted for 20 per cent of all types of education recommended. It featured in Misisi Compound (15 per cent) and in Chilanga area (20 per cent). It was also one of the least suggested (10 per cent) in Chilukusha-B Village. Simply defined, environmental education is how to care for nature, other people, ourselves and the supernatural (Namafe, 2006). Given the systematic and systemic nature of environmental education in addressing socio-ecological and political-economic challenges of life, it was worth suggesting it for adaptation learning among the above mentioned localities. This form of education would mould residents on how to care for their local ecosystems and advocacy for mitigation of perceived and actual effects of climate change. As

earlier defined, environmental education would also equip climate change residents of Misisi Compound, Chilanga area, Lubuko Village and Nyangu Village with inter-personal skills and empathy to dialogue with and care for one another especially during the worst climatic events such as droughts and floods. Since some residents perceived climate change as having strong spiritual attachments, environmental education would be there to provide additional values and attitudes on how to interact with their supernatural for the sake of abating the impact of climate change (Muthoka, Rego and Rimbui, 1998).

Geography education was also moderately suggested (25 per cent) to be suitable for adaptation learning in Lubuko Village. This could have been based on respondents' observed hostile interaction between local people's activities and physical environmental objects, especially trees. In simpler terms geography is the study of humanity and its activities in the biophysical environment (Gupta and Kapoor, 1999). Therefore, learning about such in an organized and systematic way would definitely impart in local people's minds, how to live in harmony with the environment and consequently adapt to climate change. After all, the wellbeing of people such as those in Lubuko Village is dependent on the wellbeing of the environment especially in the face of climate change.

Adaptation education was one of the moderately suggested (20 per cent) for adaptation learning in Lusoke Village. It was also the second most needed (15 per cent) among residents of Misisi Compound. Adaptation education is the process of training people how to fit in a new environment or different conditions, particularly those triggered by climate change. Climate change is a stochastic environmental construct, thus, one cannot precisely determine what may or may not happen even though there could be numerous projections and interpretations of climate change risks and vulnerability mappings such as those done by the DMMU (2010) and MDZ. Given such a unique nature of climate change, organized and planned instructions on how people among studied areas could cope with the challenges thereof are very imperative and this could partly be fulfilled through adaptation education. Even if adaptation learning was not suggested among residents of selected areas of Luangwa District, it would be very important in building their reflexive adaptation capabilities to least envisaged impacts of climate change such as occasional severe floods.

Adult education was also regarded to be relevant for climate change adaptation learning in Lubuko Village (10 per cent) and Chongwe Compound (10 per cent). Indeed, teaching climate change adaptation especially to adult members of societies such as those in Lusoke Village, Chongwe and others would require application of adult education theories and principles. Otherwise, it would not be an easy task to change their conservative minds especially those who could have long-survived on charcoal burning and shifting cultivation. Climate change dialogue in Chongwe area would be marred with cyclopean futility if adult learning theories such as cognitivism and behaviourism were disregarded. Application of adult education praxis and techniques would secure the amenability of seemingly rigid people in Chongwe area in the fight against deforestation and uncontrolled charcoal burning to reduce climate change. Therefore, adult education is indisputably significant for adult behavioural change for the environment, which was one of the suggested means of adaptation.

Moreover, flood education was the most needed (27.3 per cent to 65 per cent) type of education for climate change adaptation learning in Misisi, Mandevu, Bauleni, Kalikiliki, Old Kanyama and Marapodi Compounds because these areas have always been flood-prone, but more especially during the climate change era. It was also desirable among residents of Lusoke Village (10 per cent) in Chongwe District. Flood education could be a source of sustainable, innovative and creative ways of learning for adaptation to climate change-induced floods in these areas. According to Namafe (2006), flood waters including climate change-induced ones could be a source of transformation if carefully and sustainably modified with the help of education. Residents would also learn new practices, in order to reduce the intensity of floods, build resilience to flood waters and their related impacts such as malaria, cholera, among others. Floods education would equip them with skills on how to design houses, behave, live and think to mitigate climate change-induced floods and their impacts.

Forestry education was the most needed (30 per cent to 40 per cent) for adaptation learning among all studied areas (Lusoke Village, Kampekete Village, Kanakantapa Village and Chongwe Compound) in Chongwe District, with an exception of Lubuko Village. Reference could be made to table two for area-specific statistics. A fairly high frequency (25 per cent) of responses from Siamunyemba Village also endorsed forestry education for adaptation learning.

According to Phipps (2010), forestry education involves learning on how to manage natural resources that are associated with forest environments. This can include water resources, timber, fish and wildlife, plants and soil. Forestry education also teaches about climate change and how it affects forests. Forest management education covers all aspects of environmental protection and restoration. It also includes health maintenance, research and product development, and fire hazard reduction. This was therefore, a very strategic suggestion given that deforestation was one of the major causal factors of climate change in such as Kampekete Village and Kanakantapa Village. Education related to forests and trees would be crucial to achieving sustainable management and villaged sustainable development, because it would orient local people to values and attitudes to sustainably think and live for the wellbeing of local vegetation and catchment areas. Forests-based education and trees would also be crucial in providing local people with shrewd instruction to discover the importance of local forests, appreciate forest management and understand how forests contribute to their quality of life. It would also make them learn sustainable ways of using, improving and protecting forest environments to enhance bio-sequestration and subsequent mitigation of climate change (Ibid).

Similarly, fire education was the second most needed (30 per cent) for adaptation learning among residents of Siamunyemba Village. Some residents of Kanakantapa Village also subscribed to the same type of education (20 per cent). According to Shumba (2010), fire is an integral part of people's lives in African setups such as those in Kanakantapa and Siamunyemba Villages. They cook, keep warm, and farm with fire (which leads to deforestation and local carbon accumulation). Therefore, fire education would enhance their understanding of both the sustainable and unsustainable uses of this form of energy for climate change adaptation learning. Educating and raising villagised awareness about sustainable and unsustainable use of fire in daily life of the local people especially those of studied areas in Kafue and Chongwe Districts would make a significant impact among them and would be a relevant aspect of climate change adaptation learning.

Twenty per cent of responses from Chongwe Compound showed that literacy education could also be relevant for climate change adaptation learning. This type of education was also suggested by residents of Kalikiliki Compound (20 per cent) and Mphuka Village (20 per cent).

Premised on some observed misconceptions (for example, climate change being caused by women from Monze town of Southern Province of Zambia and eating expired food) about climate change, this type of education would be imperative not only to residents of above mentioned areas but also other studied areas. It would make them aware of how, where and when could climate change affect their livelihoods. It would also make them realize the urgency to act and participate in mitigation and adaptation, through and localised praxis. Climate change literacy would prepare people on how to interact in multiple social, economic, political and ecological spheres in the face of climate change. This form of education must therefore, go beyond mere reading and writing, but must impart ecological, social, economic and political literacy for climate change adaptation among local people in the Villages thereby, ensuring their understanding of issues that may or may not be linked climate change both locally, nationally and internationally.

Crafts education was also preferable for adaptation learning in Chongwe Compound (10 per cent) of Chongwe District and Chilukusha-B Village (10 per cent) of Luangwa District. This type of education aims at equipping learners with alternative social dexterities such as weaving, sewing and basketry especially when they experience climate change-induced crop failure. It would also help residents reduce over-dependence on charcoal burning which was pointed out to be one of the causes of climate change in the compound. Some respondents confirmed that they were already doing crafts such as basketry and reed-mat weaving for survival. So once given additional knowledge through crafts learning for climate change adaptation, they would partly be apt to meet some challenges triggered by climate change (especially poor agricultural system).

According to 10 per cent of responses by residents of Village in Chongwe District, chemical education could also be crucial for adaptation learning. This type of education was also mostly needed (40 per cent) among residents of Chilanga area where air pollution was one of the perceived causes of climate change. This form of education focuses on teaching and learning of chemicals and their impact on the environment. It would make residents understand how various chemicals and gases especially those locally produced by pyric factors (such as carbon dioxide) could affect their local environments such as water, soils, atmosphere and overall, the local climate and how they could be managed and mitigated (Gilbert et al., 2003). If implemented, this

would really be very crucial in areas such as Chilanga where Lafarge Cement Company was perceived to have significantly contributed to local climate change through air pollution. When people are educated about the pros and cons of chemicals they would make more informed decisions to reduce or entirely abandon all activities that could chemically affect the local atmosphere and they would also have courage to confront those whom they suspect to be polluting their local environments. People's passiveness on pollution issue could partly be attributed to lack of knowledge on the impact of chemicals and particularly how they affect local climates. Therefore, chemical education must be part of the broader portfolio for climate change adaptation learning.

Health education was another type of education proposed for adaptation learning in Lumumba Compound where it scored the highest frequency (44 per cent) and Katondwe Village (40 per cent). This type of education was also needed in Misisi Compound, Bauleni Compound, Old Kanyama and Marapodi Compounds of Lusaka District, and the frequency was between 16.6 per cent and 25 per cent. Some few responses (10 per cent) from Chilukusha-A Village also showed the need for health education. According to the Joint Committee on Health Education and Promotion Terminology (JCHEPT) (2001:1) cited in Wikipedia (2010) health education is "any combination of planned learning experiences based on sound theories that provide individuals, groups, and communities the opportunity to acquire information and the skills needed to make quality health decisions." The World Health Organization (WHO) as also cited in Wikipedia (2010) defined health education as comprising of consciously constructed opportunities for learning, involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills which are conducive to individual and community health. Usually floods especially less mobile ones like those of Misisi Compound could be associated with water borne diseases such as cholera and dysentery as noted by respondents. Under such circumstances people need to be instructed on water and sanitation and how to take good care of themselves in order to stop any escalation in climate change-induced illness and possible loss of lives. This would also equip them with knowledge and skills on how to care for children during outbreaks of climate change-induced diseases such as (as malaria, diarrhea, coughing, flu and others). Moreover, Baby care education was also fairly deemed (10 per cent) to be relevant in Kalikiliki Compound in order to learn how to curb perceived climate

change-induced diseases such as malaria among babies and children. In the face of climate change, baby care education would be significant to protect babies from chronic diseases such as malaria that would be on the increase with the advent of climate change (MTENRs, 2007). It would equip residents (especially women) with creative and cheaper skills on how to care for their children whose immune system might be weak to withstand climate change-induced diseases.

In line with health education, 12.5 per cent of response from Mandevu Compound suggested sanitation education for climate change adaptation learning. Since perceived increase in annual flooding could be associated with a declension in good sanitation, this form of education was strategic and crucial. According to Kapoor (2001), good sanitation is key to sustainability and it is the way of life that must come from within the people such as those in Mandevu Compound and other areas especially in the face of climate change. Through sanitation education, residents would learn how to build and construct good water drainages (one of the suggested adaptation strategies), safer water wells, latrines and others that could withstand flood waters. Sanitation education would also equip people with skills on how to reduce waste and keep their local environments healthy for climate change adaptation.

Some few responses (10 per cent) from Old Kanyama Compound suggested waste management education for adaptation learning. A similar type of education also emerged from Marapodi Compound (16.6 per cent). This form of education would instruct residents on how to reduce local methane emission through fermentation and decomposition of locally generated wastes in the area (Kapoor, 2001). It would also equip them with sustainable means of recycling, reusing, and reducing domestic wastes for a sustainable local environment in the face of climate change. It would also impart skills on how to change life style for the sake of reducing waste accumulation for climate change adaptation and mitigation (Ibid). In my view, this type of education must be implemented in all studied peri-urban areas (if possible even those which were not studied) because that is where most of non-biodegradable waste is accumulated especially after the floods (Lusaka City Council (LCC), 2010).

Education for Sustainable Development (ESD) was also deemed relevant for adaptation and mitigation learning in Mphuka Village (10 per cent) of Lua District. ESD was first described by Chapter 36 of Agenda 21. It is a vision of education that seeks to empower people to assume responsibility for creating a sustainable future to cope with environmental challenges such as climate change. It is an education system that aims at 'educating of a new citizen' with a sustainable type of logic, expansive world outlook and deep moral ethical values. It is a system of education that envisages creation of behavior and life styles required for climate change adaptation among residents of Mphuka (Thomas, 2008). The recognition of the importance of ESD, the United Nations (UN) has declared 2005-2014 as the UN Decade of Education for Sustainable Development (DESD), which provides an opportunity for countries and particularly the residents who were studied to define for themselves the kind of path they wish to follow (McDonald, 2008). Carefully planned in the context of affected villages such as Mphuka and others, ESD would infuse in local people's minds skills, values, knowledge and attitudes to make them think and act *for* and *in* the environment.

A few responses (10 per cent) from Kampekete Village of Chongwe District further suggested civic education for climate change adaptation learning. According to Nisbet (2011:1), "climate change education needs to promote a range of outcomes and just technical understanding of climate science." Therefore, civic education is such a system of learning that would enable understanding of political dimension of climate change that are specific to Kampekete Village and other areas especially in adaptation and mitigation planning and processes. It may promote different forms of legal and political knowledge, efficacy and trust; and the skills that would help local people in Kampekete Village learn, connect, collaborate, participate, and plan for climate change adaptation and mitigation (Ibid). Since some political views on climate change emerged among various areas and specifically Kampekete Village, civic education for climate change adaptation and mitigation learning would be an eye opener in evaluating government's and individual's efficacy in addressing climate change issues in the area. Climate change is a civic issue and therefore, civic education should be part of the tight frontiers for adaptation planning and learning.

According to 10 per cent of response by residents of Kalikiliki Compound, beer education could also be necessary for climate change adaptation and mitigation learning. Although beer drinking is part of African people's culture in general, some people in Kalikiliki Compound perceived it to be a source of vice (worsening the impact of climate change). While that could be accurate from the surface, Namafe (2006) argued that environmental educators must not parochially adhere to one perspective of beer drinking because it has both destructive and constructive sides. Through Beer drinking education for climate change adaptation, people of Kalikiliki Compound could be instructed on how to sustainably make use of beer to adapt to psychological and socio-economic challenges and how they could avoid excessive use that might punctuate climate change impacts on them. It must therefore, be embrace a pertinent part of education for climate change adaptation learning.

Moreover, 10 per cent of views by residents of Kanakantapa Village and anthropological education for climate change adaptation learning. In simpler terms, anthropological education is the type of education that involves teaching and learning about humanity in its entirety, especially human culture or human development (Ki-Zerbo, 1990). Climate change affects all such aspects of humanity such as culture, religion, socio-economic and political-ecological aspects as also discovered among all studied areas. Therefore, anthropological epistemologies on learning for climate change adaptation must be versed in the frames of adaptive capacity and resilience among residents of Kanakantapa Village and possibly other areas. In fact, Crate and Nuttall (2009) further noted that anthropological education takes into equal account both practices and theoretical norms thereby, discarding all the prejudices that mar the scientific cinctures of climate change discourse. It is through this form of education that part of meaningful modes of adaptation and mitigation climate change learning in Kanakantapa Village and other areas would be found and learnt.

Moreover, African Traditional Education (ATE) was considered by residents of Siamunyemba Village (10 per cent) as having a bearing on climate change adaptation learning. According to Snelson (1990) and Njobe (1990), traditional education was mainly historically used, to instruct people especially youths on how to live in harmony with nature and how to empathetically care for it. Technically, it implied *education for the environment* (instructing people to behave, think

and act for nature) and *education in the environment* (learning on how to harmoniously co-exist with, and learn from the ecosystems). Given such unique form knowledge embedded in traditional education, it would be presumptuous to sidestep it in the fight against climate change and planning for adaptation learning. In my view, this type of education must be incorporated in the fight against climate change not just in Siamunyemba Village, but also in other rural areas. This is because, it would create a superior capacity of affected people's intellect and inventive initiatives to cherish their cultural environments for climate change adaptation and mitigations. Children's Climate Change Education (CCCE) was also opined to be appropriate for climate change adaptation and mitigation in Robert Village (20 per cent) and Chilukusha-A Village (10 per cent). Some global researches by the IPCC (2002) and United Nations International Children's Education Funds (UNICEF) (2007) indicated that the impacts of climate change on children might be huge in the future. Moreover, this research also showed that children could be among the worst affected by hunger, diseases and child labor due to climate change. As such, CCCE could be a type of education that would promote s actions so that children, who would be future citizens in such areas as Robert Villa grow, play, learn and develop in healthy, clean and safe environment. In other words, CCCE would be cardinal in moulding an ecological mental model among children and to ensure t they grow up with it for the sake of sustaining their village and urban ecosystems and adapt to the future challenges of climate change in their localities. Currently, all predictions are showing that climate change would be gravest in the future; areas such as Chilukusha-A Village could be among the worst hit. As such, CCCE was a timely suggestion and it is very desirable to prepare the ounder citizens to meet the future challenges of climate change.

Lastly, Climate Change Education (CCE) was deemed to be necessary for adaptation and mitigation learning in Robert Village of Luangwa (20 per cent). It was also deemed necessary among residents of Chilukusha-A Village (10 per cent), Lubuko Village (37.5 per cent) and Chongwe Compound (20 per cent). Climate Change Education was also the most needed (45.5 per cent and 33.2 per cent) among residents of Bauleni and Marapodi Compounds of Lusaka District respectively. It also emerged as the second most needed (25 per cent) type of education for adaptation learning in Mandevu Compound of Lusaka and Chilanga area of Kafue District, where it was also one of the most need (40 per cent) for ptation learning. Climate

Change Education is quite a complex form of education that would help residents of studied areas develop understanding of societal challenges, crucial aspects associated with climate change, sharpen their ability to analyse local issues and the local political will required in order to implement adaptation strategies they suggested. According to Mckeown and Hopkins (2010), climate change education would inculcate societal and personal decision making skills for climate change, social justice and behavioural change for adaptation purposes. Such competencies would be imperative to reduce some effects of climate change among studied areas. CCE would also be apt to evoke social learning processes that are critical, analytical and enhance socio-ecologically collaborative behaviour that would nurture sustainable practices for climate change among affected residents of studied areas of Zambia's Lusaka Province. The complex nature of climate change as highlighted in this research and other scholars would however, require people to develop new sets of capabilities which could best be offered through different types of education for adaptation learning. Having discussed the 31 types of education needed for climate change adaptation learning among selected areas of Zambia's Lusaka Province, the following were the matters arising concerning what the *education* to address climate change might be in the context of Lusaka Province.

What the 'education' to address climate change might be is one of the most asked question among climate change researchers and educationists. Based on my research findings on types of education needed for adaptation learning, I thought that 'Climate Change Education' as the general *name* of 'education' to address climate change impacts makes it seem limited in scope. As such, a proposition was made to change the name from CCE to Education for Climate Change (EfCC) in order to make it unlimited just by its *name*. Insignificant though this might seem to some scholars, it must be realized that a name is a construct by which a phenomenon is *known* and *distinguished* from others. It has a strong bearing on the reputation and the enthusiasm which the public may have towards it. This was not however, intended to change what the content and approaches might be. It is very desirable that the name for any type of education intended to bring about a particular behaviour be as self explanatory as possible. For example, education meant to achieve Sustainable Development is called Education for Sustainable Development, the name is self explanatory with regard to the purpose and allows it to interact with other existing types of education and those yet to be discovered as long as they

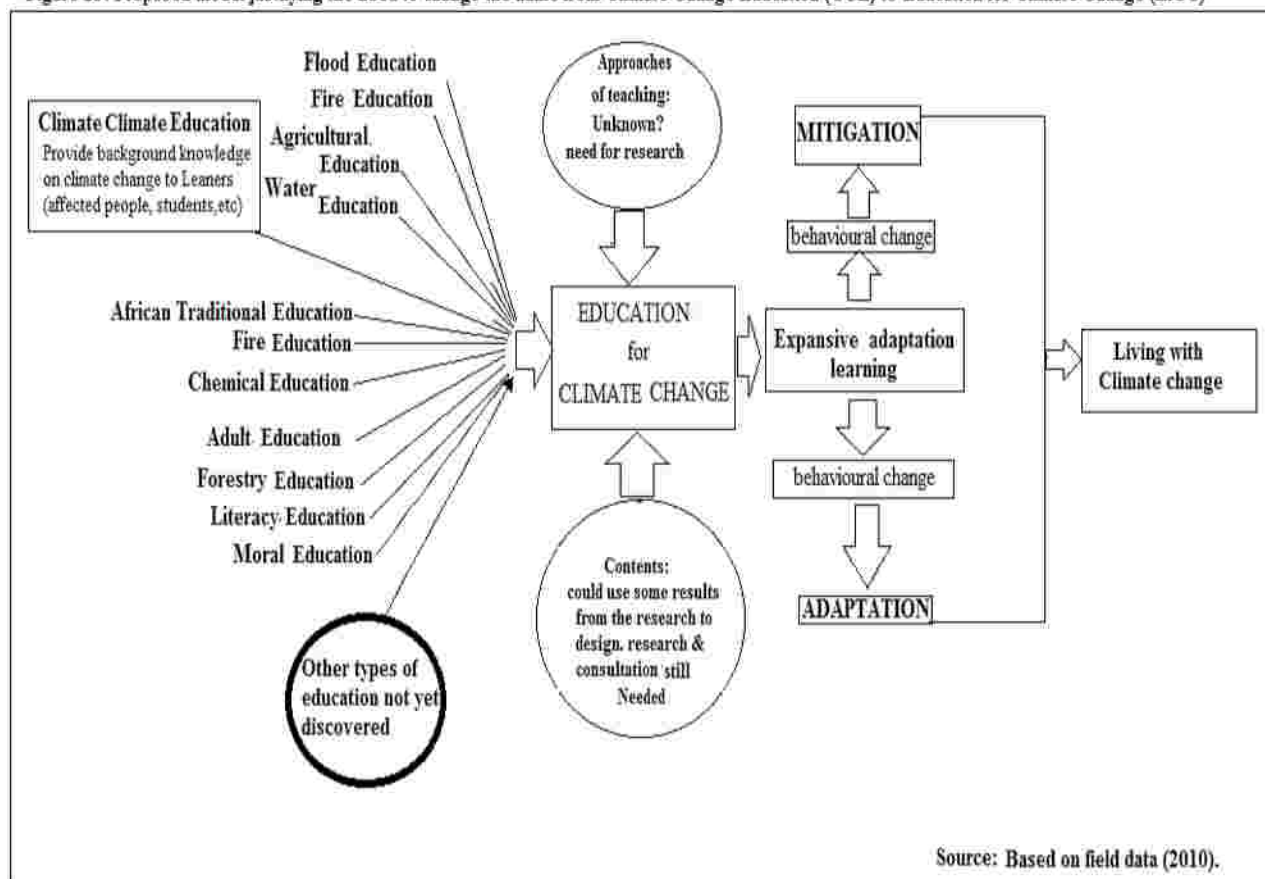
could help towards achieving Sustainable Development. If we want education to eradicate poverty obviously the name would be education for poverty eradication and so on. The *name* CCE as noticed in relation to other discovered types of education sounds so restricted to climate change science or simply general knowledge about it especially to ordinary citizens (those who are not specialized in the field). The purpose also seems hidden.

Whilst *education* to address climate change must freely interact with any other type of education to meet a common goal, CCE as a name sounds to be closed with little or no chance of having free interaction and common focal point with other types of education as those discussed above. The exact contrary of CCE in terms of its name is possibly the truth in the case of EfCC. I have a view that EfCC would be more self explanatory than CCE such that even a scholar alien to the field of study would precisely understand its purpose at glance. Moreover, EfCC as a *name* of education to address climate change impacts would also be more inclusive. Thus, could freely link to any other type of education including those yet to be discovered as long as they could contribute to behavioural change for climate change adaptation. In other words, EfCC as a name of education to address climate change would be open ended by name and thus, allowing interaction with other disciplines given the multi-faceted nature of climate change implications as also evidenced from this research. For example, in this research agricultural education was suggested to address agricultural impacts of climate change, forestry education and fire education to help in reducing deforestation, flood education to address climate change-related floods and so on. Premised on figure 25 on the next page and in my own words, EfCC could simply be defined as a complex, spatially contextual and temporally flexible process of learning to bring about behavioural change for climate change adaptation. It would be *complex* because it would be a combination of different types of education aimed at addressing various social, economic, ecological, political, cultural, moral, spiritual, psychological and other challenges triggered by climate change. It would also be able to integrate any other existing and yet to be discovered types of education, as long as they would help in shaping behaviour for climate change adaptation.

It would be *temporally flexible* because it would be capable of changing (in terms of contents and approaches of teaching) with time in order to suit impending climate change effects, because

climate change is unpredictable in terms of its effects over time. For example, if climate change brings floods today, flood education would be raked into EfCC to help address the challenge. If it brings droughts in the future, irrigation and drought education and others would easily be incorporated into EfCC to bring about behavioural change to suit droughty conditions. Referring to figure 25, I am proposing that CCE become a subcomponent of EfCC in order to provide background knowledge on climate change as a science to new learners (such as effected victims) in climate change adaptation. Moreover, EfCC would be more *spatially contextual* thus, able to meet diverse adaptation learning needs at the same time, but in different spaces. For instance, being a blend of different types of education, EfCC would help people of Luangwa District learn how to adapt to droughts whilst at the same time, but different places, helping residents of Misisi Compound of Lusaka District learn how to adapt to floods and so on.

Figure 25: Proposed model justifying the need to change the name from Climate Change Education (CCE) to Education for Climate Change (EfCC)

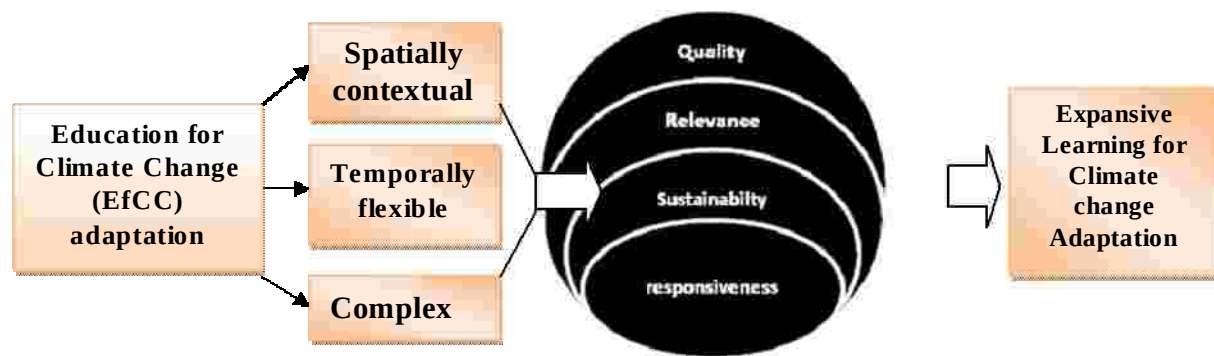


The proposition to change the name could actually be a research on its own. A question such as *what could be the most appropriate 'name' of 'education to address climate change, and why*

that name?-could be addressed. This therefore, leaves my proposition to change the name from CCE to EfCC contestable. Thus, other researchers are at liberty to express their investigative contestation.

Spatial contextualization, temporal flexibility and complexity of education to address climate change would append *relevance, quality, responsiveness* and *sustainability* to education for climate change adaptation learning among residents of 11 studied areas. Responsiveness is concerned with how characteristics of learners (residents of Zambia's Lusaka Province) such as learning abilities, learning styles and personal growth are acknowledged and taken into account by the education system. This is one of the reasons why temporal flexibility in terms of content and approaches were suggested to meet the changing learning needs of the residents in time and space and also based on their learning capabilities. Flexibility would also ensure sustainability of the education system. These are the issues which the government of Zambia, Ministry of Education and Ministry of Tourism, Environment and Natural Resources must consider in their policy planning for climate change adaptation and education. The objectives of the Zambia National Adaptation Programme on Action (NAPA) and Climate Change Response Strategy (CCRS) would not be successfully implemented without mainstreaming responsive, relevant, quality and sustainable education for adaptation learning (Ministry of Tourism, Environment and natural Resources (MTENRs, 2007)). Figure 26 below summarises the linkages between educational contextualization-complexity-flexibility and educational relevance, quality, responsiveness and sustainability and how they may lead to intelligible learning for climate change adaptation.

Figure 26: Conceptual Framework of Education for Climate Change Adaptation in Lusaka Province of Zambia



Source: Modification of field data (2010)

Having presented the proposition to change the name from CCE to EfCC, the previous section (6.4) discussed types of education needed for adaptation learning. In a nutshell, the research revealed that behavioural change for climate change adaptation is resistant to a single type of education. Therefore, different types of education to address different impacts of climate change would be required.

For instance residents of studied areas in Luangwa mainly wanted agricultural education (25 per cent to 50 per cent), those of Chongwe District mostly needed (forestry education), and those from selected peri-urban areas of Lusaka District mainly craved flood education (27.3 per cent to 65 per cent). In Kafue District, intra spatial variations were noticed, thus, residents of Lumumba Compound mainly needed (44 per cent) health education, whereas those of Siamunyemba Village deemed agricultural education to be the most needed (35 per cent). In Chilanga area, CCE and chemical education were the most needed (80 per cent). Whilst some similarities in terms of the types of education needed were evident, some variations were also common. However, they all had a common focal point or purpose. In Zambian context and particularly studied areas, it would be infeasible to design the content and methods for each type of education suggested in this research to address climate change. Instead, a blend of all of them would be more practicable and intelligible for contextual adaptation learning. Having discussed perceived causes of climate change, adaptation and mitigation as well as types of education needed for adaptation learning, the following section shows a brief reflection of the extent to which the objectives have been met.

Based on the above discussion, all research objectives were successfully attained. It had been established that climate change could not be understood from a linear context. In the context of this research, climate change issues were emerged as a constellation of political, economic, social, ecological, cultural, moral, spiritual, educational and technological aspects. Therefore, it would also require a holistic approach in order to find out the solution. Different types of education for adaptation would also be inevitable. Meanwhile, the following sections present the conclusion, summary and recommendations prior to references and appendix one.

6.5 Summary of dissertation main contents

Inclusive of this chapter, this dissertation had been made up of six chapters. Chapter six has discussed the results on perceptions of climate change among residents of selected areas of Lusaka Province. The emphasis of discussion was on perceived causes and effects of climate change, adaptation strategies as well as types of education needed for adaptation learning. Chapter five presented research findings which were discussed in chapter six. The methodology was shown in chapter four in terms of research design, target population, sampling methods, secondary and primary data collection methods as well as ethical considerations. It also showed analysis, limitations and delimitations of the study. Chapter three described the study area (Lusaka Province) in terms of location of study areas (with the aid of maps), population density, ecological characteristics, socio-economic characteristics and an outline of why Lusaka Province was adopted as the study area. Chapter two reviewed the literature from the global, African and Zambian contexts. Chapter one provided the background, problem statement, research questions, objectives and significance of research findings. It also outlined the operational definitions and conceptual framework of the research. The following were the conclusions derived.

6.6 Conclusions

This research aimed to investigate how selected people among selected areas of Lusaka Province perceived climate change adaptation and types of education they needed for adaptation learning. It specifically sought to investigate how residents of selected areas of Lusaka Province perceived causes and effects of climate change and views on adaptation strategies. It also aimed at finding out the types of education needed for adaptation learning. In the context of the first objective of this research, causes of climate change among residents of selected areas of Lusaka Province were resistant to a linear perspective. Thus, all causes and effects of climate change were perceived from social, economic, political, moral, spiritual, cultural, behavioural, psychological and ecological contexts. For instance some causal factors were blamed on the government, God, deforestation, immorality and witchcraft among others. Some effects included increased temperature, variations in rainfall, hunger and poverty, among others. Intra and inter spatial variations and similarities in terms of perceived causes and effects of climate change were also common. These dimensions provided the blue prints of the contexts which adaptation and

mitigation plans and programmes should take to address the challenges of climate change among selected areas of Lusaka Province.

The manifested inter and intra spatial variations and similarities in of views on climate change adaptation, showed the need for *contextual* adaptation planning in order to address the challenges based on how people had been affected in various areas. Diverse views on adaptation were expressed whilst having a homogenous focal point. They were generally suggested from socio-economic, cultural, ecological, technological, psychological, legal, spiritual, moral, political, educational and behavioural points of view. Among the suggested strategies for climate change adaptation were, change of agricultural practice involvement of traditional leaders, reforestation, adoption of drought-resistant seed and livestock, imprisonment of illegal burners, praying hard and stopping corruption, among others. The study also concluded that different types of education to address different impacts of climate change would be required. However, a combination of all of them would be the most desirable and this would in turn make the education for climate change adaptation learning complex because it would be a blend of different types of education, contextual in order to address different challenges at the same, yet in different places. This type of education would also be temporally flexible in order to allow change in content and approaches depending on the effects that would be triggered by climate change in time and space.

Premised on the overall impression of the study, a clear understanding of climate change issues and solutions among all studied areas could be found at the interface of environment-oriented types of education, social science and natural sciences. This is because residents in all studied areas of Lusaka Province understood climate change using mainly social knowledge, which required social science to be interpreted. Other ideas had a natural science touch, hence the need to use natural science approaches to explain them. Moreover, they also proposed different types of education in order to learn for climate change adaptation. The study also demonstrated that future educational plans, programmes and policies for climate change adaptation and mitigation in selected areas of Lusaka Province should be able to consider the *context* in which people had been affected by climate change. Despite some few misconceptions and unlocalised analyses of climate change in some selected areas, the study generally provided a firm basis for further

researches. It also showed that climate change could not be entirely a doom, but also a source of transformation because some residents of selected areas of Kafue District perceived it as a boon. Based on some research findings, the following are the recommendations:

6.7 Recommendations

1. Robust and immediate researches are required on what the contents and methods of all types of education for climate change adaptation learning might be. The major stakeholders must be the University of Zambia-School of Education Environmental Education Unit and MoE.
2. There is also need for a more vigorous implementation of Environmental Education (EE) policy. This is premised on the finding that EE was not popular among most studied areas (60-83.4 per cent). This must be done by MoE, University of Zambia and other stakeholders.
3. Religion-Environment-Climate Change interfaces researches are also being recommended to the School of Education-UNZA and the Jesuit Centre for Theological Reflection (JCTR). This is premised on the spiritual analysis of climate change by residents of most studied areas.
4. Using some beer drinking philosophical ideations by Namafe (20), further researches on how beer can be a friend and enemy in the face of climate change may contribute to the broader body of knowledge on climate change. This is because in Kalikiliki Compound climate change was associated with increased beer drinking. This could be done by Zambia National Breweries and University of Zambia, School of Education.
5. Based on some deforestation-related causes of climate change in selected areas of ngwe District such as Kanakantapa Village and Siamunyemba Village of Kafue District, UN-REDD+ pilot programmes are needed. This is a task for MTENRs and DoF.

6. Using a 'caring' epistemological framework, further researches are needed in Siamunyemba Village and Lumumba Compound of Kafue District where some effects of climate change were deemed to be positives. This can be done by Care-International Zambia and UNDP.
7. In Siamunyemba Village, two per cent of views on adaptation and mitigation strategies suggested involvement of traditional leaders. Therefore, further researchers the significance of traditional leaders' knowledge in adaptation planning and learning are needed. This must be done by myself, MoE, Ministry of Community Development and House of Chiefs.
8. Luangwa is one of the districts most vulnerable to climatic hazards, yet it did not have a meteorological station. There is urgent need for installation of a meteorological station in Luangwa District in order to have long term and informed climatic data for the sake of further researches. This must be done by the government and Meteorological Department of Zambia.
9. Psychological counselors must be involved in planning for adaptation. This is because climate change had triggered psychological fear of uncertainty among residents of Old Kanyama Compound (two per cent), Lubuko Village (eight per cent) and others.
10. There is need for a research on the influence of the media on people's perception and analyses of climate change. This is because some respondents showed in this research seemed to have been influenced by the media. For instance, tsunami as an effect of climate change was not applicable in Zambian context. This could be done by the media houses of Zambia, UNDP, MTENRs and others.
11. Further researches are needed on agricultural impacts of climate change in Luangwa District because most of the respondents complained of poor agricultural system. This must be done by the Ministry of Agriculture And Cooperatives.

12. Further in-depth researches on the impact climate change on water resources in Luangwa District are needed. Water scarcity was one of the most cited effects of climate change. This must be implemented by NWASCO, Water and Sewerage Company as well as the government
13. There is also need for legislation and legal framework for climate change adaptation and mitigation planning in order to prosecute those who clear out forests as was the case in Chongwe District. This must be done by the government.
14. Sustainable flood education is also urgently needed among residents of peri-urban areas of Lusaka District because annual flooding was found to be a major effect of climate change. This must be done by Ministry of Education, DMMU and Ministry of Local Government and Housing.

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APPENDIX ONE

1.1 letter of consent and the semi-structured interview schedule for the respondents

Dear Respondent,

I am (Manoah Muchanga- ID 529003598) a post graduate student of Environmental Education and a Staff Development Fellow (SDF) at the University of Zambia. This semi-structured interview schedule on climate change perceptions seeks to gather information, which could be used to find out the ways of enhancing awareness about climate change and adaptation measures. The findings will also help reduce the impact of climate change in our community, which may lead to improvement in the socio-economic livelihood. Apart from addressing some climate related problems in our communities, this research is also meant for my academic fulfillment. The information you are going to provide in this interview will be treated with a high degree of confidentiality thus; you are not supposed to indicate your name anywhere except your signature to show your consent. In this regard, you are kindly requested to answer the questions honestly.

Respondent's signature.....

1.2 Perceptions of climate change adaptation and learning among residents of selected areas of Zambia's Lusaka Province

A. Perceived causes and effects of climate change and adaptation

1. What in your view has caused climate change in your local area?.....
2. What effects of climate change have you perceived in your local area?.....
3. What must be done in order to adapt to the impact of climate change in your local area?.....

B. Types of education needed for climate change adaptation and mitigation learning

4. What types of education would be needed for adaptation learning in your local area?

Thank for your responses.