

**CLIMATE COMMUNICATION FOR ADAPTATION PLANNING IN THE
TOURISM SECTOR IN LIVINGSTONE, ZAMBIA.**

By

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**A dissertation submitted in partial fulfilment of the requirements for the Masters
of Science in Environmental and Natural Resource Management.**

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DECLARATION

I Tuliswayo Annabel Muteba, declare that this dissertation is a presentation of my original research work and has not been submitted for any degree or examination at any other university. This dissertation does not contain other person's data, pictures, graphs or other information unless specifically acknowledged as being sourced from other persons. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

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CERTIFICATE OF APPROVAL FORM

This Dissertation on climate communication for adaptation planning in the tourism sector of Livingstone has been approved as partial fulfilment for the award of Masters of Science in Environment and Natural Resource Management by The University of Zambia.

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ABSTRACT

Following the collapse of the mining industry in the late 1980s, tourism has been identified as one of the key economic sectors for Zambia. Its ability to generate foreign exchange, create employment and contribute to the country's Gross Domestic Product (GDP), makes the sector valuable to the national economy. Tourism being one of the most climate sensitive sectors faces the risk of derailment as a result of increased climate variability and change. The need for coping and adapting the sector to climate variability and change necessitates the need for access to accurate and reliable climate information communicated through reliable channels. Literature review conducted did not reveal any studies that had been conducted on the effectiveness of the different channels of climate communication utilized in Zambia's tourism sector. This study, therefore, sought to determine the effectiveness of climate communication in tourism in Livingstone, Zambia. Specifically, it sought to; 1) determine how tourism activities were affected by climate variability in Livingstone, 2) identify climate information that is of relevance to tourists and tourism operators in Livingstone, and 3) evaluate the effectiveness of the methods used to communicate climate information in Livingstone from the end users' point of view. The study adopted a mixed method approach and conducted a survey among six key informants, 17 tourism operators, 80 international tourists and 140 local tourists. Data collected through semi structured interviews was analysed using thematic analysis while quantitative data from structured interviews was analysed using ANOVA- Least Square Difference post hoc test. The findings of the study indicated droughts 53percent, heat waves 53 percent, flooding 12percent and change in rainfall patterns 76percent as the main climate variability impacts affecting tourism activities. Wildlife safaris 36 percent and Victoria Falls viewing 30percent were the most affected tourism activities by climate variability. It was also observed that tourists and tourism operators were more interested in climate information on rainfall and temperature because most tourism activities such as Victoria Falls and game viewing are affected by amount of rainfall and high temperatures. Most tourism operators 87.5percent perceived climate information to be very important as it was key to planning tourism activities. However, only 59 percent of tourism operators and 66 percent of tourists have access to climate information. Based on the five measures of effectiveness; accessibility, timely dissemination, ease of language, relevance and credibility, the least square difference post hoc test revealed the internet and television as the most effective methods of disseminating climate information in Livingstone's tourism sector. Both the internet and television indicated significant differences compared with other modes of communication with higher means. In conclusion the study indicated that climate communication for tourism in Livingstone was ineffective as most communication channels had low mean scores.

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Table of Contents

DECLARATION	ii
CERTIFICATE OF APPROVAL FORM.....	iii
ABSTRACT.....	iv
ACKNOWLEDGEMENTS	v
LIST OF FIGURES	x
LIST OF TABLES	xi
LIST OF ACRONYMS AND ABBREVIATIONS	xii
CHAPTER ONE: INTRODUCTION	1
1.0 Background of Study	1
1.1 Problem Statement	3
1.2 Aim	6
1.3 Objectives.....	6
1.4 Research Questions	6
1.5 Research Hypothesis.....	6
1.6 Rationale	7
1.7 Structure of Dissertation.....	7
CHAPTER TWO: LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Theoretical Framework: Information Deficit Model.....	9
2.3 Impacts of Climate Variability and Change on Tourism.....	10
2.3.1 Impacts of Climate Variability and Change on International Tourism	11
2.3.2 Impacts of Climate Variability and Change on African Tourism	12
2.3.3 Background of Tourism in Zambia	14
2.3.4 Impacts of Climate Variability and Change on Zambian tourism.....	15
2.4 Climate Information.....	16
2.5 Effectiveness of Climate Communication Channels	17
2.5.1 Effectiveness of Climate Communication Channels in International Tourism.....	17
2.5.2 Effectiveness of Climate Communication Channels in Africa	18
2.5.3 Climate communication in Zambia	19
2.6 Measures of effectiveness in climate communication	20
2.6.1 Accessibility.....	20
2.6.2 Relevance	20

2.6.3 Credibility	21
2.6.4 Ease of Language.....	21
CHAPTER THREE: DESCRIPTION OF STUDY AREA.....	22
3.1 Introduction	22
3.2 Overview	22
3.3 Location.....	22
3.4 Demographics	22
3.5 Climatic Characteristics.....	23
3.6 Hydrology	23
3.7 Vegetation.....	23
3.8 Socio-Economic Characteristics	24
3.9 Tourism in Livingstone	24
CHAPTER FOUR: METHODOLOGY	26
4.1 Introduction	26
4.2 Philosophical Orientation.....	26
4.3 Research Strategy	27
4.4 Research Design	28
4.5 Sampling Technique.....	29
4.6 Data Collection Methods	30
4.6.1 Primary Data Collection Methods.....	30
4.7 Data Analysis Techniques.....	31
4.8 Ethical Considerations.....	32
CHAPTER FIVE: PRESENTATION OF RESULTS	33
5.1 Introduction	33
5.2 Demographics of International Tourists	33
5.3 Impacts of climate variability on tourism in Livingstone	34
5.3.1 Perceptions of the impacts of climate variability in Livingstone	34
5.3.2 Observed Impacts of Climate Variability in Livingstone	34
5.3.3 Impacts of Climate Variability on Tourism Activities in Livingstone	35
5.3.4 Perceptions of the Magnitude of Climate Variability Impacts on tourism in Livingstone	38
5.4 Importance of Climate Information	38
5.4.1 Reasons for importance of Climate Information	39

5.5 Types of Climate Information disseminated	40
5.5.1 Access to Climate Information	40
5.5.2 Types of Climate Information Accessed.....	41
5.5.3 Relevant Climate Information	42
5.6 Effectiveness of Climate Communication Channels in Livingstone’s Tourism Sector	42
5.6.1 Accessibility	42
5.6.2 Timely Dissemination	43
5.6.3 Ease of Language.....	43
5.6.4 Relevancy	43
5.6.5 Credibility	44
5.7 Preference of Communication Channels	45
Source: Field data, 2019.....	46
5.8 Multiple Pairwise Comparisons of Commonly Utilised Climate Communication Channels in Livingstone	47
5.8.1 Accessibility	47
5.8.2 Timely dissemination	48
5.8.3 Ease of Language.....	49
5.8.4 Relevance	50
5.8.5 Credibility	51
CHAPTER SIX: DISCUSSION	52
6.1 Introduction	52
6.2 Impacts of Climate Change on Tourism Activities.....	52
6.3 Relevant Type of Climate Information	53
6.4 Effectiveness of Modes of Climate Communication	54
6.5 Towards a Framework for Effective Climate communications	57
6.5.1 Application of the framework	57
CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS	60
7.1 Conclusion.....	60
7.2 Recommendations	60
7.3 Recommendations for Future Research	61
REFERENCES	63
Appendix A:Pairwise comparisons of climate communication channels used in Livingstone based on Accessibility	74

Appendix B: Pairwise comparisons of climate communication channels in Livingstone based on
timely dissemination..... 76

Appendix D:Pairwise Comparisons of climate communication channels in Livingstone based on
relevance..... 80

Appendix E:Pairwise comparisons of climate communication channels in Livingstone based on
Credibility..... 82

Appendix G: Interview guide for Tourism operators 88

Appendix H: Interview guide for Key informants..... 93

LIST OF FIGURES

Figure 1.1: Barriers to effective climate communication in Zambia.....	5
Figure 3.1: Map of study area and sampled sites	25
Figure 5.1: Respondents perceptions of the impacts of climate variability on the tourism sector in Livingstone	34
Figure 5.2:Observed impacts of climate variability in Livingstone’s tourism sector.....	35
Figure 5.3:Low water levels at the Victoria Falls, April 2019.....	37
Figure 5.4: Impact of drought at the Mosi oa tunya National park.....	37
Figure 5.5:Perceptions of the magnitude of climate variability impacts on tourism in Livingstone	38
Figure 5.6:Importance of climate information by tourism stakeholders	39
Figure 5.7: Access to climate information.....	41
Figure 5.8:Types of preferred climate information by tourism stakeholders.....	42
Figure 5.9: Effectiveness of climate communication channels by international tourists	44
Figure 5.10: Effectiveness of climate communication channels by locals.....	45
Figure 6.1: Effective climate communication for coping and adaptation	58

LIST OF TABLES

Table 5.1: Demographics of international tourists	33
Table 5.2: Impacts of Climate Variability on tourism activities in Livingstone	36
Table 5.3: Reasons for importance of Climate Information	40
Table 5.4: Types of Climate Information Accessed in Livingstone	41
Table 5.5: Preferred climate communication channels by tourism stakeholders	46
Table 5.6: Relationship between level of income and mode of climate communication ..	46
Table 6.1: Dimensions of Effective climate communication	57

LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
CC	Climate Change
DEWS	Drought Early Warning Systems
ECZ	Environmental Council of Zambia
GRZ	Government Republic of Zambia
IDM	Information Deficit Model
LSD	Least Square Difference
LTA	Livingstone Tourism Association
MTENR Resources	Ministry of Tourism Environment and Natural
NAPA	National Adaptation Program of Action
NGO	Non-Governmental Organisations
UNDP	United Nations Development Program
ZMD	Zambia Meteorological Department
ZNTB	Zambia National Tourism Board

CHAPTER ONE: INTRODUCTION

1.0 Background of Study

Climate change is the most rapidly growing global concern with apparent and hidden but grave consequences for human livelihoods (Corner, 2011). Climate change is inevitably resulting in changes in climate variability and in the frequency, intensity, spatial extent, duration, and timing. (Intergovernmental Panel on Climate Change, 2012). Climate change is the change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer (Intergovernmental Panel on Climate Change (IPCC) (2018). While Climate variability refers to variations in the mean state and other statistics (such as standard deviations, statistics of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Climate variability already has substantial impacts on biological systems and on the smallholders, communities of extreme weather and climate events (Thornton, 2014).

As climate variability intensifies, global, regional and national efforts are being made to either mitigate the impacts or to help affected communities to cope and adapt. However, coping and adapting requires a clear understanding of climate variability, how it affects societies and how to deal with the impacts. This can only be achieved through effective dissemination of accurate and reliable climate information (National Research Council, 2011). Climate information is information relating to “past, present and future climate conditions from both local and scientific sources” (Care Climate Change, 2014:5). Care Climate Change (2014) further indicate past climate information as information of previous seasonal patterns, present information as data on weather elements of rainfall recorded in real time and future information as predictions of the possible future state of the weather and climate. Climate information is crucial for coping and adaptation to climate variability (National Research Council, 1999; Lumosi, 2011) aimed at reducing vulnerabilities of communities and ecosystem to the impacts of climate change”. If the right information gets to the right people at the right time, it facilitates accurate decision making and accurate interventions. Therefore, effective communication of climate information can help to bridge the theory-practice gap on climate change, allowing

individuals and communities to understand the problem, raise awareness, encourage dialogue and influence behavioural change (Moser and Dilling, 2012).

Nevertheless, in spite of effective and appropriate climate communication being increasingly stressed as a critical factor affecting coping and adaptation it still remains a challenge in Africa (Moser, 2014). The BBC World Service Trust (2009) indicated that African citizens are at the climate change frontline, yet they are also among the least informed about human-induced global climate change, its causes and its consequences. They concluded that “broader public understanding of a range of climate change issues is required if Africa is to respond and adapt to climate change” (Deane, 2009: 16).

In Zambia, climate variability impacts have been observed particularly in land-based activities. Droughts, seasonal/flush floods, and extreme temperatures have affected both humans and the ecosystems: causing damage to crops as well as energy infrastructure, and affected water and its quality (Makano, 2011). Livingstone, Zambia’s tourism capital has in recent years experienced impacts of climate variability and change through droughts and changes in rainfall patterns. These impacts have the potential to disrupt tourism activities such as bungee jumping, water rafting and boat cruises. They also have the potential to undermine tourism infrastructure, deteriorate biodiversity and reduce tourist comfort, which might result in short term and long-term cost implications for the tour operators (Dube and Nhamo, 2018). Thus, due to tourism dependence on climate, tourism operators and tourists require appropriate information for decision making in disaster management and holiday destinations even in the wake of climate change and climate variability (Gómez-Martínez *et al*, 2017). However, this information must be delivered to end users in a form that is relevant to them and easy to interpret (Scott *et al*, 2011).

Presently, climate information in Zambia is disseminated through both media and non-media channels. “Media communication channels are the various forms of devices and systems that make up mass communication as a whole” (Danesi, 2014: 192). These include; newspapers, magazines, radios, television channels and internet-based forms such as social media, websites and weather apps. On the other hand, non-media communication channels are communication channels not done through media, such as, conferences, round-table discussions, peer-to-peer chats, formal and informal education,

as well as workshops. However, these climate communication methods are ineffective due to the language used, limited accessibility, lack of accuracy and limited credibility (Ministry of Tourism Environment and Natural Resources (MTENR), 2011). Addressing climate variability and change can only succeed if information is effectively disseminated to the public to make them realise the climate risk and adopt effective action. Therefore, this study seeks to determine the effectiveness of the commonly utilised methods of communicating climate information in Livingstone for the tourism sector.

1.1 Problem Statement

One of the major challenges in disseminating climate information is accessibility. According to the (MTENR, 2011:15), most stakeholders lack access to relevant and accurate climate information to enable them to make appropriate adaptation decisions. For instance, the Disaster Management and Mitigation Unit often use text messaging to convey climate information particularly with expected impacts such as heat waves, droughts and floods. Nevertheless, text messaging has a challenge of reach for people in remote areas as a result of their phones being off because they do not have access to electricity for charging. According (Zambia Information and Communication Technology Authority (ZICTA), 2018), only six percent of households in rural areas have access to electricity supplied by power utility companies (ZICTA, 2018). At times people who receive the text may continue forwarding even after the adverse event has passed which could alarm recipients of the forwarded texts even long after the warning event has passed, upsetting their trust in the source. Print media such as newspapers, also cover climate change in their articles, however; the information is only accessible to those who can afford it and are able to read. Additionally, climate information is shared through internet forms such as social media and the website although it is only accessible to those with smart phones and have access to the internet.

Failure to understand climate information and language barrier also contribute to ineffectiveness of communication. The coverage of issues on climate change in the media such as television, radio, newspapers and magazines is quite low in Zambia and sometimes nothing is said with regards to climate change in the tourism sector. Blackdot Media (2016) attributed this reduced coverage to lack of understanding on the subject of “climate change” among the reporters as well as the use of excessive jargon by scientists. Even

though various radio stations communicate climate information in a local language of a province they operate in the majority of media still disseminate this information in English thus making it difficult for the illiterate and those not acquainted with English. At times, government institutions and NGOs use non-media communication strategies such as workshops and/or seminars to communicate climate information among journalists, government representatives, traditional leaders, students and communities. While it is assumed that the attendees at these workshops and conferences will disseminate the climate information in their localities, the disseminated information may lose accuracy the longer the dissemination chain gets.

Generally, the channels of communication currently in use lack effectiveness in conveying climate information. This lack of effectiveness has been attributed to limited access, accuracy, language barrier and misunderstanding of disseminated climate information (MTENR, 2011). For the tourism sector in Livingstone, ineffective communication means tourism operators not accessing relevant information to enable them to minimize the risks resulting from climate variability and change (Scott *et al.*, 2011). For tourists, not accessing relevant climate information may lead to unpreparedness of climate calamities, it may affect time of visit for preferred activities, safety and thus may lead to poor planning and decision making for tourism destination (Becken, 2010). This may have a vicious impact on the tourism sector and lead to losses for the tourism operators which may in turn affect employees and taxes. Figure 1.1 illustrates reasons for ineffectiveness of climate communication.

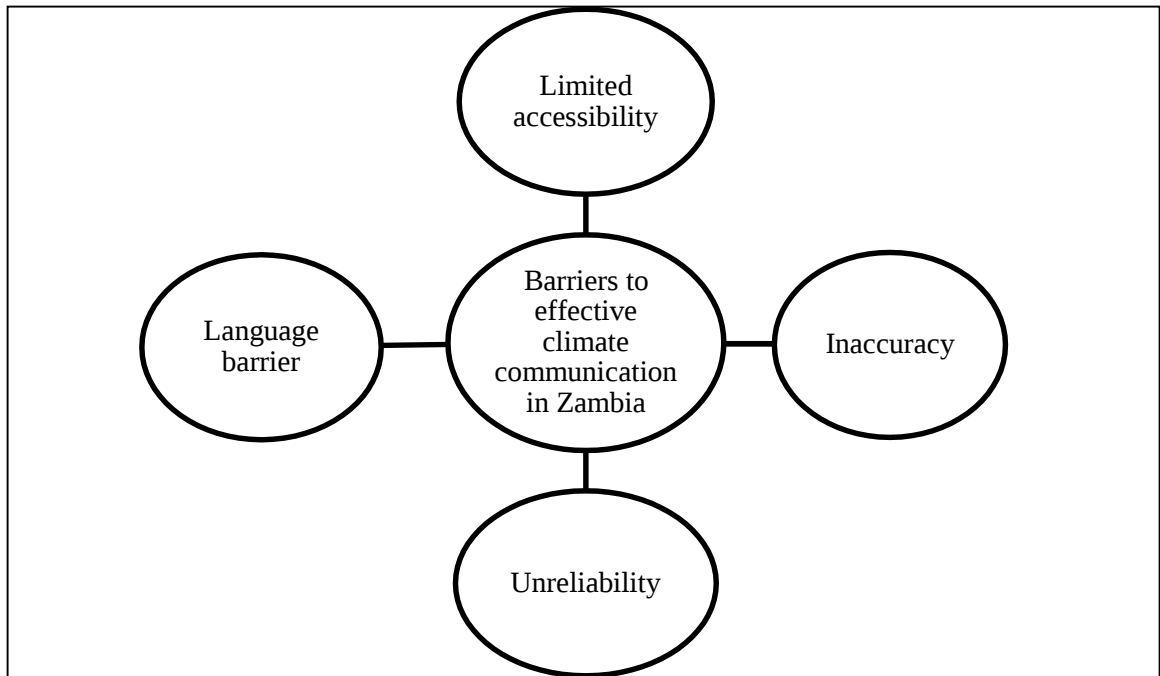


Figure 1.1: *Barriers to effective climate communication in Zambia*

Source: Author, 2019

1.2 Aim

To determine the effective channel/s of communicating climate information in the tourism sector in Livingstone, Zambia.

1.3 Objectives

- i. To determine how tourism activities are affected by climate variability in Livingstone, Zambia.
- ii. To identify climate information that is of relevance to tourists and tourism operators in Livingstone, Zambia.
- iii. To evaluate the effectiveness of channels used to communicate climate information in Livingstone, Zambia from the end users' point of view.

1.4 Research Questions

- i. What are the impacts of climate variability on tourism in Livingstone?
- ii. What type of climate information is communicated using the commonly utilised methods of climate communication in Livingstone?
- iii. What type of climate information is relevant to tourists and tourism operators of Livingstone?
- iv. What language is used to communicate climate information in Livingstone?
- v. How accurate is the climate information being communicated in Livingstone?

1.5 Research Hypothesis

In terms of the overall research hypothesis, the study hypothesises that the commonly utilized channels of communicating climate information among international tourists and locals in Livingstone are ineffective.

1.6 Rationale

Climate variability has been evident in Zambia over the past few decades, with changes in temperature and mean annual rainfall. Since the 1960s the country has seen an annual average increase in temperature of 1.3 degrees Celsius and a decrease in annual average rainfall of about 1.9mm (MTENR, 2007). These changes have adversely affected various sectors Zambia's economy including agriculture, energy, health and tourism. According to the United Nations Development Program (UNDP, 2010), extreme weather changes may lead to destruction of tourism's wildlife and flora and reduction in water levels at the Victoria Falls.

In recognizing the destructive impacts of climate variability, adaptation efforts are being made stipulating various measures in different economic sectors. However, a principal concern has been lack of adequate climate information and knowledge to policy makers, researchers, planners and the general public to assist in the mitigation and adaptation to climate variability and change (MTENR, 2011). Gómez Martínez *et al.*, (2017), notes that "providing information that meets the needs of tourists, tour operators, tourism planners, and hoteliers could be a key factor for adequate decision-making that guarantees the successful tourist destinations". Hence, in order to address adaptation challenges in Zambia, communication and data access have been outlined of key importance (Koeller, 2014).

This research will focus on how climate information is disseminated in Livingstone and determine its effectiveness. The study will contribute to effective planning in the tourism sector by identifying the most effective channel of disseminating accurate relevant climate information. The suggested channel/s of communication will also be used by the government and public media in formulating and disseminating climate change communication for behavioural change towards mitigation and adaptation. Non-governmental organisations may also use the proposed communication channels in raising awareness to enable communities to adapt to climate related shocks/events.

1.7 Structure of Dissertation

This dissertation is divided into seven chapters; introduction, literature review, description of the study area, methodology, presentation of results, discussion of results, and finally

the conclusion and recommendations. The introduction gives background information on climate variability and change and the need for climate information in decision making. The chapter further describes the research problem, aims, objectives, questions, hypothesis, and rationale of the study.

The literature review describes the theoretical framework i.e. the information deficit model that has been adopted for the study. Furthermore, it reviews the literature on the impacts of climate variability and change on the international, African and Zambian tourism sector. This chapter also describes climate information and the measures of effective climate communication channels.

The description of the study area describes the chosen study area including its location, climate, geography, and socio-economic characteristics followed by the explanation of the tourism sector within the site. This section is followed by the methodology which discusses the chosen philosophical orientation, research strategy, research design, sampling techniques, data collection methods, data analysis techniques, and ethical considerations.

The presentation of results presents the main findings of the research which has been done through structured and semi-structured interviews. This is followed by the discussion of results that details the findings of the research on the impacts of climate variability on tourism activities, the type of climate information required for the tourism sector, and the effectiveness of the climate communication channels utilised in Livingstone. Finally, the conclusions are drawn and suggested recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Literature review is a fundamental part of the entire research process (Kumar 2005:30). It is an important aspect of research as it helps identify what is known and unknown about a particular area or subject and also identifies areas of controversy or debate that need further investigation (Bolderston, 2008). Bruce (1994:218) states that “the purpose of literature review is to provide the background to and justification for the research to be undertaken”. Similarly, Creswell (2003:30), points out that reviewing literature helps one compare study’s findings with those of others, therefore assisting the researchers build knowledge in their field of study.

This chapter presents the literature reviewed for the study arranged by themes, these themes are categorised into five subsections reflecting on the objectives of the study. The first section 2.2 discusses the theory which underpins this study, section 2.3 discusses the impacts of climate variability and change on the tourism sector, section 2.4 elaborates on what climate information is, section 2.5 debates on the effectiveness of climate communication channels and finally the last section 2.6 defines the key terms in this study.

2.2 Theoretical Framework: Information Deficit Model

The theory underpinning this study is the information deficit model (IDM), also known as the deficit model, knowledge deficit model, and knowledge gap model (McDivitt, 2016). The information-deficit model holds that negative public attitudes or behaviours towards science and environmental problems are a result of a deficiency in knowledge (Gross, 1994). This theory was coined in the 1980s by social scientists studying public communication of science (Dickson, 2005). It holds two beliefs; firstly, that public uncertainty and scepticism towards modern science and environmental issues such as climate change is caused by lack of adequate knowledge about science and relevant subjects. Secondly, it posits that by providing adequate information to overcome this deficit, public opinions will change and decide that information provided on the environment and science is reliable and accurate (Dickson, 2005). “The ‘deficit model’ assumes that the public are ‘empty vessels’ waiting to be filled with useful information upon which they will then rationally act” (Nerlich *et al.*, 2010:100)”. As a remedy, the

deficit model is a one-way communication model where information flows from experts to publics in an effort to change individuals' attitudes, beliefs, or behaviour's (Suldoovsky, 2017).

According to the theory the more knowledge or scientific literacy one has, the more positive one's attitudes and behaviour towards science and scientific issues are (Gustafson and Rice, 2016). This theory is a popular approach to climate change communication and other science communication, the theory has been chosen because studies have shown positive relationship between science literacy and attitudes to science and environmental issues (Allum, 2008). However, wealth of literature shows that simply giving more information to people does not necessarily change their views partly because people make decisions based on a host of factors as well as the scientific 'facts'. These factors include ethical, political, and religious beliefs, in addition to culture, history and personal experience (Suldoovsky, 2017). Despite criticisms of the information deficit model in communicating climate change issues and the need for dialogue, providing reliable climate information in an accessible way through communication channels such as television, radio and websites is critical for planning and effective decision making. Hence, the deficit model is still present in current climate communication. Similarly, this study has adopted the theory based on the assumption that adaptation planning among tourists and tourism operators is promoted by accessible accurate and relevant climate information, thus a deficit in accurate and relevant climate information will limit adaptation actions.

2.3 Impacts of Climate Variability and Change on Tourism

Over the years' global temperatures have risen by over 0.5°C and are projected to rise during the course of the 21st century (IPCC, 2014). The increase in warmer temperatures could have major consequences for the tourism industry which is heavily dependent on climate, (Agnew and Viner, 2001). Scott *et al.*, (2012), assert that this could result in “environmental change that affects natural assets that define destination image and are critical attractions for tourists, environmental conditions that can deter tourists, operating costs and the capacity of tourism firms to do business sustainably.”

2.3.1 Impacts of Climate Variability and Change on International Tourism

Climate change is likely to affect three major markets; winter sports tourism, coastal tourism and nature-based tourism (Scott *et al.*, 2012). Winter sport tourism is highly dependent on temperature, snow cover, snowfall, length of snow season and the presence and absence of snow during winter holidays (Chin *et al.*, 2018) therefore, it is affected by climate variability and change. Climate change poses risks to the large international ski industry, particularly in the American and European tourism sectors which are vulnerable to loss of snow cover (Koenig and Abegg, 1997). It is anticipated that by the mid-century the ski tourism industry will be at risk of decreased reliability of natural snow cover, shortened and more variable ski seasons, and an eventual contraction in the number of ski areas (Scott *et al.*, 2012).

Damm *et al.*, (2017) conducted a study using time series regression models to ascertain the relationship between natural snow conditions and monthly overnight stays. Their study indicated that Austria and Italy are at high risk of losses in winter overnight stays due to snow scarcity. Similarly, studies conducted by Chin *et al.*, (2018) projected a decline in winter weather by 2080 in the Great Lakes of America affecting cold temperatures and snow cover. As a result, winter tourism will be affected due to a decline in downhill skiing and snowmobiling. Despite studies by Gilaberte-Búrdalo *et al.*, (2014) agreeing with other scholars on the impacts of climate change on ski tourism, they emphasise that there are differences on the impacts due to elevation of ski resort areas, for instance ski resort areas that on low mean altitude areas are more vulnerable as compared to those on high altitudes.

Coastal tourism is considered by many to be the largest segment of the global tourism industry (Hall, 2001), however it is another tourism market highly susceptible to climate change risks including sea level rise, inundation and extreme weather events, (Becken and Espiner, 2011). Changes in climatic conditions such as sea level rise, increased tropical cyclones and shoreline erosion affect tourism activities (Moreno and Becken, 2009). Studies by Mimura *et al.*, (2007) point out that due to low elevation the Maldives islands located in the Indian Ocean are at risk of sea level rise as a result of climate change. This will make the islands prone to coral bleaching causing damage to coral reefs which protect the islands, thus adversely affecting diving, the most common tourism activity of the Maldives islands (Agnew and Viner, 2001). These findings corroborate those of Cashman

et al., (2012) who observed that tourism in Barbados is vulnerable to sea level rise and increased sea water temperatures. They indicated that this can have negative impacts on natural coastal defences such as the coral reefs and mangroves thus affecting marine ecosystems and the beach environment which a major product of tourism.

Nature based tourism is a form of tourism which involves people travelling with the primary purpose of visiting natural destinations. It is a form of recreation that takes the individual away from the stress of modern life with the intent of getting in touch with the natural landscapes, flora and fauna (Nyaupane and Chhetri, 2009). Nature based tourism includes a range of activities such as trekking, bird watching, camping, hunting, fishing, rock climbing and white water rafting (Blamey, 2001). Climate and weather factors such as temperature, humidity, precipitation and wind can affect nature based tourism in various ways including the quality of tourism activities (Nyaupane and Chhetri, 2009). Thus nature based tourism is considered the most vulnerable type of tourism because it consists of outdoor activities which depend on good weather and climate conditions (Scott *et al.*, 2007).

Various tourism destinations offering nature based tourism are at risk of climate variability and change. Nepal is among the many tourist destinations at risk as its tourism is primarily nature based attracting tourists for its majestic mountains, glaciers, rivers, lakes, fauna and flora. In their study vulnerability to climate change of nature based tourism in the Nepalese Himalayas (Nyaupane and Chhetri, 2009), projected an increase in temperatures of Nepal 2030, 2050 and 2100. Their findings indicated that increased temperatures would have destructions on national parks such as the Chitwan National park and kill some endangered species. Additionally, the North-Eastern part of Nepal will experience more avalanches and glacier lake outburst floods which may destroy tourism infrastructure, roads and bridges. In the same way studies by Agnew and Viner (2001) indicate rising temperatures and decreasing rainfall caused by climate change have the potential to reduce the Amazon rainforest one of Brazil's tourism attractions.

2.3.2 Impacts of Climate Variability and Change on African Tourism

In Africa climate variability and change is projected to impact both low coastal lying areas and nature based tourism. Similar to Asia and America, Africa's coastal tourism is prone

to climate change. EL Raey *et al.*, (1999) conducted an elevation based Geographic Information Systems analysis to determine the potential impacts of climate change on Port Said in Egypt. The study found that beach areas are more likely to be affected by sea level rise as a result of climate change as compared to urban areas and that this threatens recreational activities on the coastal zone. Similarly, the findings of Snoussi *et al.*, (2008) indicate that the most vulnerable areas to inundation and erosion caused by sea level rise are urban areas and tourism recreational activities. Auwor *et al.*, (2008) specified that sea level rise has the potential to cause flooding in the coastal areas of Mombasa thus destroying sandy beaches, historical and cultural monuments as well as beach hotels. In South Africa, Fitchett, *et al.*, (2016) conducted a study to examine the impacts of climate change on tourism in the Eastern Cape Province of South Africa and their findings predicted that sea-level rise has the potential to encroach on the beach activities. McGuire, (2006), supported that South Africa is prone to sea level rise causing loss of coral reefs negatively impacting on dive – tourism. However, Steyn and Spencer (2012) pointed out that rising sea levels could also lead to coastal roads, yacht basins, sea side restaurants and hotels flooded and destroyed.

According to Hall and Highan (2005) nature tourism is considered to be an important contributor to Africa's future for durable, self-generating and ecologically tolerable wealth creation. In the case of southern Africa, nature-based tourism reportedly generates roughly the same revenue as farming, forestry, and fisheries combined (Balmford *et al.*, 2009). However, progressive changes in climate are occurring and have the potential to disturb nature based tourism.

Kupika *et al.*, (2018) conducted a study in Zimbabwe using a mixed method approach to obtain data on the effects of climate change on wildlife resources. The findings indicated that, Zimbabwe would experience a decrease in precipitation of up to 10 percent by 2050. This reduction could affect the availability of water and food on which wildlife depend on. The study also indicated that large herbivore such as elephants, buffalos and hippos with a low capacity to resist drought would either become extinct or migrate. Therefore, tourism activities such as game drives and wildlife safaris would adversely be affected. Similarly, Hambira *et al.*, (2013) indicated that precipitation and increasing temperatures

resulting from climate change have implications on the amount of inflow on the Okavango delta in Botswana which could result in drying of swamps and forests being replaced by grasslands. As a result, animal species would become extinct and migrate. These studies were confirmed by Kilungu *et al.*, (2017) who revealed that climate change and variability have resulted in high temperatures and decreased rainfall leading to drier conditions and aridity in the Serengeti national park of Tanzania. This has led to shortage of drinking water for wildlife and changes in land cover from heterogeneous to homogenous land cover thus threatening the tourism diversity on which tourism is famous for.

In Zimbabwe, climate change has been evidenced by delays in the onset of the rainfall season with a shift from October to November, thus, extreme hydrological variations are evident in the flow regime of the Victoria Falls (Dube and Nhamo, 2018). In his study *Tourism under Climate Change: perceptions and lessons from Victoria Falls Zimbabwe* Kaitano (2016) found that climate change would increase incidences of drought and heat waves. He pointed out that a drop in the water flow of the Zambezi River that feeds the Victoria Falls was the major concern of tourists and tourism operators. He also indicated that this would have a detrimental effect on the aesthetic value of the waterfall.

2.3.3 Background of Tourism in Zambia

Following the collapse of the mining industry in the late 1980s, tourism has been identified as one of the key economic sectors for Zambia. It contributes to economic growth, employment, foreign exchange, and social infrastructure. According to the World Tourism and Travel Council (WTTC) (2019), the sector contributed to US\$1,846.9MN (ZMK19.4 billion) and 318 thousand jobs to the Zambian economy in 2018 while posting a +6.3% Gross Domestic Product (GDP), making the sector valuable to the national economy.

Zambia's appeal to the European leisure visitor is based on its natural resources, including its unchanged and varied landscape (Acorn, 2018). "It stands out as one of the prime tourism destinations in Africa offering a wealth of natural tourism assets – waterfalls, lakes and rivers holding about 35percent of Southern Africa's total natural water resource, 'wildlife protected areas' occupying about 10percent of the country's total land area, and a tropical climate of sunshine experience almost throughout the year" (Zambia

Development Agency, 2013:2). These elements, combined with the country's interesting cultural traditions, make Zambia a strong adventure and safari destination (Acorn, 2018).

Zambia's tourism industry largely relies on two primary assets: The Livingstone (Mosi-oa-Tunya) area and the country's wildlife estate in 19 national parks, Game Management Areas (GMAs) and game ranches (Zambia Development Agency, 2013). The Livingstone (Mosi-oa-Tunya) site appeals to a large number of tourists more than the safari product visitors (Liu and Mwanza, 2014) due to its major tourist attraction, the Victoria Falls which is the largest waterfall in the world. Therefore, Zambia's major tourism supply side is clustered around national park locations with a strong bias to the Livingstone region that offers nearly 40percent of all nature tourism (Liu and Mwanza, 2014).

2.3.4 Impacts of Climate Variability and Change on Zambian tourism

Zambia has in recent years observed climate variability and change trends including changes in the start and end of the rainy seasons, increased or decreased average precipitation and increasing average and maximum temperatures and droughts (Ngoma 2010). These impacts have been observed particularly in land-based activities. Droughts, seasonal/flush floods, and extreme temperatures have affected both humans and the ecosystems: causing damage to crops as well as energy infrastructure, and affected water and its quality (Makano, 2011).

Climate change impacts will have negative impacts on different sectors and increase vulnerability of the categories of the population who are already vulnerable. Floods and droughts have increased in frequency over the past three decades, costing the nation an estimated 0.4% in annual economic growth. The negative impacts of droughts are felt most by those dependent on climate sensitive economic activities, such as rain-fed agriculture, for their sustenance (Irish Aid, 2017). "The start of the rainy season has changed generally tending towards late start and early ending resulting in shortened crop growing season" (Phiri *et al.*, 2013:10). Thus, threatening rural livelihoods through crop failures and degraded food and water security systems.

"Impacts of climate change are also affecting the health of vulnerable populations in Zambia. Health in general will also be affected by climate hazards in terms of heat stress caused by the rising temperatures, increase in water borne diseases and malnutrition due

to insufficient” (Irish Aid 2017:8). Further climate change will impact the natural resources such as water, vegetation and wildlife therefore impacting critical sectors i.e. the energy and tourism sectors.

In Zambia’s tourist capital Livingstone, a study was conducted to examine the potential impacts of climate variability and change on tourism. “The findings indicated that climate variability and change in Livingstone was evidenced by an increase in temperature, extreme rainfall patterns, decline in rainfall and a fluctuation in water flow levels at the Victoria Falls. The study found statistical evidence of climate change for temperature with annual temperatures increasing by 1°C from 30°C in 1976 to 31°C in 2016 (Dube and Nhamo, 2018). “These changes pose a potential threat to wildlife and the Victoria Falls resort and may undermine future tourism operations and activities,” (Dube and Nhamo, 2018:113). However, this study does not indicate how these tourism activities will be affected by climate variability and change.

The literature reviewed in these sections shows that a majority of research on the impacts of climate change on tourism is focused on the Mediterranean and Europe as compared to Africa. Therefore, there is more knowledge on impacts of climate change on coastal and winter tourism as compared to nature tourism on which most of Africa’s tourism is dependent. In the case of Zambia, there is almost no literature on the impacts of climate change on tourism and its activities.

2.4 Climate Information

“Climate information are seasonal climate forecasts knowledge and other kind of climate related information such as paleo climate reconstructions and climate change projections” (Lemos *et al.*, 2012:790). According to Wilkinson *et al.*, (2015) climate information can cover varying timescales, such as short range (hours up to a few weeks), medium range (from weeks to a month) and long range (greater than one month), including projections and scenarios (decadal and longer).

Soares (2018) highlights seasonal climate forecasts and climate change projections as the most common types of climate change information used in agriculture, energy, water and ‘other’ sectors of activity including the environment, industry and research sectors in Europe. However, for the tourism sector, short- to medium-range forecasts, warnings to

the public, aviation and marine transport and more recently climate change projections have been identified as the relevant climate information to facilitate successful adaptation (Scott and Lemieux, 2010). In Germany a number of tourists chose short to medium range climate information such as air temperature, number of rainy days, duration of sunshine and water temperature as the important types of climate information relevant to them. Temperature is the main variable in destination demand (Hamilton and Lau, 2004). On the contrary, climate information in Africa is related to agriculture thus it encompasses predetermined climate information such as probability of rainfall, warning on extreme events, future climate and risk measures related to the probabilistic forecast (Kgakatsi and Rautenbach, 2014).

2.5 Effectiveness of Climate Communication Channels

2.5.1 Effectiveness of Climate Communication Channels in International Tourism

Successful attempts have been made to provide understandable, familiar, and consistent international meteorological information that could be used by tourists and tourism operators such as the adoption of the World Health Organization Ultraviolet (UV) index and the international standard for UV measurement (Scott *et al.*, 2011). Scott *et al.*, (2011) also mentioned that how climate information is communicated to tourists and tourism sub sectors remains largely unexplored. With respect to information sources, this section highlights the variety of channels that are used to access climate information and their effectiveness from the user's point of view.

In their study “tourism and global environmental change”, Gossling and Hall (2006), assessed the various sources used to provide climate information ranging from temperature types to precipitation related information and humidity. The study revealed that friends and family as well as travel agents are the preferred sources of climate information while travel agents and tourist operators are the second most preferred source of climate information. On the contrary Tribbia and Moser (2008) found that newspapers were the primary source of climate information for coastal managers in California as there are easily accessible.

Studies conducted by (Nalau *et al.*, 2017) of weather and climate information-seeking behaviour by tourism stakeholders in Fiji, found the most popular medium for climate

information was the Internet, either through web-sites, e-mail alerts, or smartphone applications. These findings correlate with Rutty and Andrey (2014) who concluded that winter recreationists such as snow boarders and skiers rely primarily on internet and mobile communication as a source of weather and climate information. However, Gómez Martín *et al.*, (2017) argued that despite internet being an upcoming mode of disseminating climate information channel, it has its limitations. Their study indicated websites used for dissemination of climate information in Spain were not effective, this was attributed to the fact that information provided is too brief and general. Additionally, the websites did not display integrated climate information such as types of weather or information setting out the most times in terms of tourism activities. This review brings out various communication channels for delivery of climate information to tourist and the tourism sector although literature on communication channels, especially related to warnings of abrupt and dangerous weather events, are not widely documented within the tourism sector.

2.5.2 Effectiveness of Climate Communication Channels in Africa

Africa is among the poorest continents in the world affected by climate change with its poorest being the most vulnerable, hence climate communication is vital for the continent to adapt and respond to the impacts of climate change. Ouedraogo *et al.*, (2018) identified community radios, SMSs, emails, websites, call service and seminars as the major channels of diffusing climate information. Similarly, Mudombi and Nhamo (2014) highlighted radio extension, direct enquiry, TV, newspaper, mobile phone and magazines as possible channels of communicating climate information. Whereas, Mwalukasa (2013) recognized relatives, friends and neighbours, fellow farmers and agricultural extension officers as the major sources of climate information for climate change adaptation. However, perceived credibility of these information providers, including both the media and organizations, strengthen the facilitating effect of information on climate action.

Using accessibility, usability and relevance to assess the quality of drought early warning systems (DEWS) in Karamoja, Uganda, Akwango *et al.*, (2017) concluded that radio was the most preferred channel of communication in rural areas. However, the study also indicated that information was not received timely and that use of English was a barrier to effective communication. These findings replicated those of Mudombi and Nhambo

(2014), who assessed how communal farmers of Seke and Murewa in Zimbabwe accessed weather and forecasting information which identified the radio as the most important channel of accessing information. Nevertheless, there was a general lack of access to timely, reliable rainfall forecasts and early warning information on droughts and violent storms. Despite not underlining the criteria for effectiveness, Churi *et al.*, (2012), recognised radio as the most effective channel of disseminating climate information among villagers. Preference of the radio was attributed to its affordability and its potential for wide coverage. Similarly, Kirui *et al.*, (2014) revealed that women farmers in semi-arid areas of Marigat district of Kenya, preferred radio as the channel of communication. This was credited to use of vernacular language during broadcasting, so news about climate information was easily understood.

On the contrary, Rasmussen *et al.*, (2015) identified phones as the most effective channel of communication based on salience (relevance), credibility (reliability) and legitimacy (trustworthy) in both rural and urban areas. However, studies conducted by Oluwadara (2017) in Nwoya district of Uganda revealed that most people do not have access to mobile phones especially female farmers. Thus, mobile phones and internet showed low percentages in accessing climate information due to lack of access to the media.

2.5.3 Climate communication in Zambia

Moser (2014) emphasizes that communicating adaptation is a unique challenge. She concluded that climate change communication for adaptation should use the language that taps into values that are resonant with the audience. According to Swanepoel (2018), climate change is a complex issue and thus it needs to use clear and accessible language. Swanepoel (2018) also recommends using trusted intermediaries to encourage adoption of adaptation behaviour. Similarly, a study conducted in Zambia on climate change knowledge, attitude and behavioural practice indicated ineffectiveness of climate change communications in Zambia's agro ecological regions due to the language used majority of the population was not well informed (Blackdot Media, 2016). Blackdot Media (2016) also revealed low levels of adaptation as most communities showed less diversification in crop production. Another study conducted by Nanja (2010), indicated that various communication channels such as radio, print media and meetings were utilized in communicating climate information to farmers in Mujika area of Monze district, Zambia.

The results of the study showed that the channels were useful in disseminating climate information, however lack of credibility of ZMD in disseminating climate information had a negative influence on use of climate information.

Despite the growing body of knowledge on climate communications in Africa, very few studies have focused on the effectiveness of the communication methods. However, for those that have done so their focus has been on communication in the agricultural sector. As a result, other important sectors of economy, tourism inclusive, have been left out. In Zambia, few studies have been conducted on climate communications, however, no studies were identified in this review focusing on the effectiveness of communication particularly for the tourism sector.

2.6 Measures of effectiveness in climate communication

This section provides the definitions of key concepts used in this study. It therefore describes the measures of effectiveness which are accessibility, relevancy, ease of language and credibility.

2.6.1 Accessibility

Tourists and tourism operators access climate information through various sources, which include: radio, mobile phones, television, travel agents, travel magazines, family and friends and the weather app. According to Tall *et al.*, (2013), effective communication should be able to provide timely access to information in several communities including those in rural areas with marginal infrastructures. Access therefore, refers to the opportunity to obtain the needed climate information by various groups in society. In this particular study, accessibility is defined as the ability of tourists and tourism operators to receive climate information from various sources.

2.6.2 Relevance

Cash *et.al.*, (2002) argue that information is only usable if is perceived by users as relevant, credible and legitimate. They further explain that users are only likely to deploy information products that they perceive to be accurate, credible and relevant. Climate change impacts affect people globally. However, since the impacts affect people differently, information should be communicated in a tone and format relevant for the target groups it aims to reach (Tall *et al.*, 2013). Relevant climate information is referred

to information relating to Livingstone's spatial boundaries and its tourism sector that is necessary for decision making for tourist operators and tourists.

2.6.3 Credibility

Cash *et al.*, (2002) relate credible information to that which is accurate and of good quality. It is associated to believability of the information provider (Pornpitakpan, 2004). A high level of trust in the climate information by tourism operators and tourists is associated with a high level of accuracy, which implies that the information is reliable or credible. In this study, credibility will refer to factual information that is considered accurate and reliable.

2.6.4 Ease of Language

Effective communication of climate information requires that information disseminated is understood. Taylor *et.al.*, (2015) indicate that information that is presented in a complex format may be disregarded and misinterpreted by users and decision makers if it is misunderstood. They also point out that people are less often motivated to engage with difficult information compelling them to focus on signals that may be easier to understand and yet maybe irrelevant. In this study, the measure of understanding will focus on climate information that is communicated in a language/languages and formats that are easily understood by the recipients' and decision makers in the tourism sector.

CHAPTER THREE: DESCRIPTION OF STUDY AREA

3.1 Introduction

This chapter of the research focuses attention on describing the study area (Livingstone). It gives an overview of the study area, describes in details its location, demographics, climatic characteristics such as temperature and rainfall and hydrology. It also describes the socio- economic activities undertaken in the study area and finally it includes a map of the study area indicating the main features and areas sampled.

3.2 Overview

This study was conducted in Livingstone City which is considered the tourist capital of Zambia due to its eminence in Zambia's tourism industry (Zambia Development Agency (2013). The town is home to one of the seven wonders of world, the Victoria Falls which receives an estimated 600,000 tourists per annum (Dube and Nhamo, 2018). Livingstone has been chosen for this study because of its significance in the tourism sector to Zambia. The city has the potential to become the number one tourist destination in Africa (Tipple *et al.*, 2012). However, Livingstone's tourism activities are likely to be affected by climate change and variability and thus may have adverse impacts on the city's economy owing to the fact that it is credited with getting at least 57% of the population economically active (Mubanga and Umar, 2016).

3.3 Location

Livingstone is located in Southern Province of Zambia and is approximately 500km south of Lusaka, the capital city of Zambia. It lies between coordinates -17.842 degrees' latitude and 25.854 degrees' longitude at 3,038 feet elevation (Livingstone City Council, 2008). It is the smallest district in southern province with a total land area of 695 square kilometres. The city lies 10km to the north of the Zambezi River with the Victoria Falls as its most important landmark located on the border between Zambia and Zimbabwe. Livingstone is the main entry point into the country by road from southern African countries such as Namibia, Botswana, Zimbabwe and South Africa (Tipple *et al.*, 2012).

3.4 Demographics

Livingstone district covers an area of 736 km² with a projected population of 185,003 persons in 2019 growing at an average annual rate of 3.09percent with a total female of

93,302 persons and 91, 701 males growing at an annual average rate of 3.12percent. (Majority of the population in Livingstone is between the age group of 15-64 years. The Central Statistics Office (2013) also indicates that most of the people in the city are settled in urban settlements (96.3%) and in the rural only 3.7%. The main traditional village in Livingstone is the Mukuni village located south east of Livingstone which is home of the Toka leya people with a population of 6000. The city consists of people from various tribes, however, the majority are the Lozi and Tonga speaking people.

3.5 Climatic Characteristics

Livingstone being in the Zambezi valley experiences a hot, semi-arid steppe climate with hot temperatures and less rainfall (Baumle *et al.*, 2007). Temperatures in Livingstone vary from 0.0 degrees Celsius in the cool season to 40 degrees Celsius in the hot season and average annual temperature of 22.6 degrees Celsius (Livingstone City Council, 2017). It has little rainfall averages of 689 mm per year thus it is considered a drought prone area. Most area rainfall in Livingstone is in January and December and has dry periods in April, May, June, July, August, September and October. On average the city's warmest month is October and the coolest is July.

3.6 Hydrology

The main water body in Livingstone is the Zambezi River which flows from the Kaleni hills in the North- Western province of Zambia to the Indian Ocean. The Zambezi River has two main tributaries in Livingstone, namely; the Maramba and Nansanzu rivers, (Livingstone City Council, 2017). Other water bodies include the Dambwa stream which runs at the foot of airport hill. The main types of wetlands are dambos which are the main sources of rivers.

3.7 Vegetation

Livingstone has a variety of vegetation of about 4590 plants (Liu and Mwanza, 2014). The area has a total of about 1000 species including herbs, grasses, sedges and ferns and woody flora of 500+ species (Fanshawe, 2010). A scrub woodland dominated by *Kirkia* and mopane is present in the Mosi oa tunya game park while the steep gorge sides carry an open deciduous woodland characterised by paper bark trees (ibid).

3.8 Socio-Economic Characteristics

Livingstone no longer has manufacturing base thus the tourism and hospitality industry are the major driving force of Livingstone's economy (Livingstone City Council, 2017). It has some of the country's finest tourist attraction centres which include; The Victoria Falls one of the Seven Wonders of the World, Musi-oa-Tunya National Park, Batoka Gorges, Livingstone Museum, Maramba Cultural Museum, the Railway Museum and Curio Markets with fine artistic crafts. The city also shows a number of breath taking adventures such as bungee jumping, elephant rides, lion walks, helicopter flights and white water rafting.

Following the collapse of the industrial sector, through liquidation and privatization in the Third Republic, Livingstone followed a decline in formal employment, this resulted in a growth in trading activities especially cross border trading (Livingstone City Council, 2017). Hence, majority of the city's population got into the informal sector operating small scale businesses selling groceries, alcohol, blankets and clothing items. Other traders are involved in making and selling curios targeted at international tourists, while some in the informal sector are involved in provision of transport. The people in the rural parts of Livingstone district are engaged in subsistence farming. Figure 3.1 shows the map of Livingstone indicating the sampled sites.

3.9 Tourism in Livingstone

Livingstone is marked by the Zambia National Tourism board as the adventure capital to Africa and gateway to the Victoria Falls (Zambia National Tourism Board, 2001). On average, almost half of the total tourists to Zambia visit Livingstone (Ngwira, 2018). "The growth of tourism in Livingstone has stirred up the development of a diversity of associated infrastructure and facilities, such as hotels, lodges, safari camps and guest houses, the only airport in Livingstone has been upgraded and the runway extended to be able land bigger aircrafts" (Ngwira, 2018:38). The city's prominence in tourism is owing to its proximity to the Victoria Falls and the Zambezi River, besides the many other tourist activities housed in the city such as world-class white water rafting, bungee jumping of the Victoria Falls bridge that links Zimbabwe and Zambia, river boarding, abseiling, canoeing, micro lighting, kayaking, Abseiling, gorge swinging and elephant Back safaris (Rogerson,2004). In addition, other tourist attractions include the Livingstone museum

which is the oldest museum in Livingstone showing the history of the city and pre-history and cultural development and the famous crafts market known as the Mukuni park curio market (Chimenge, 2017).

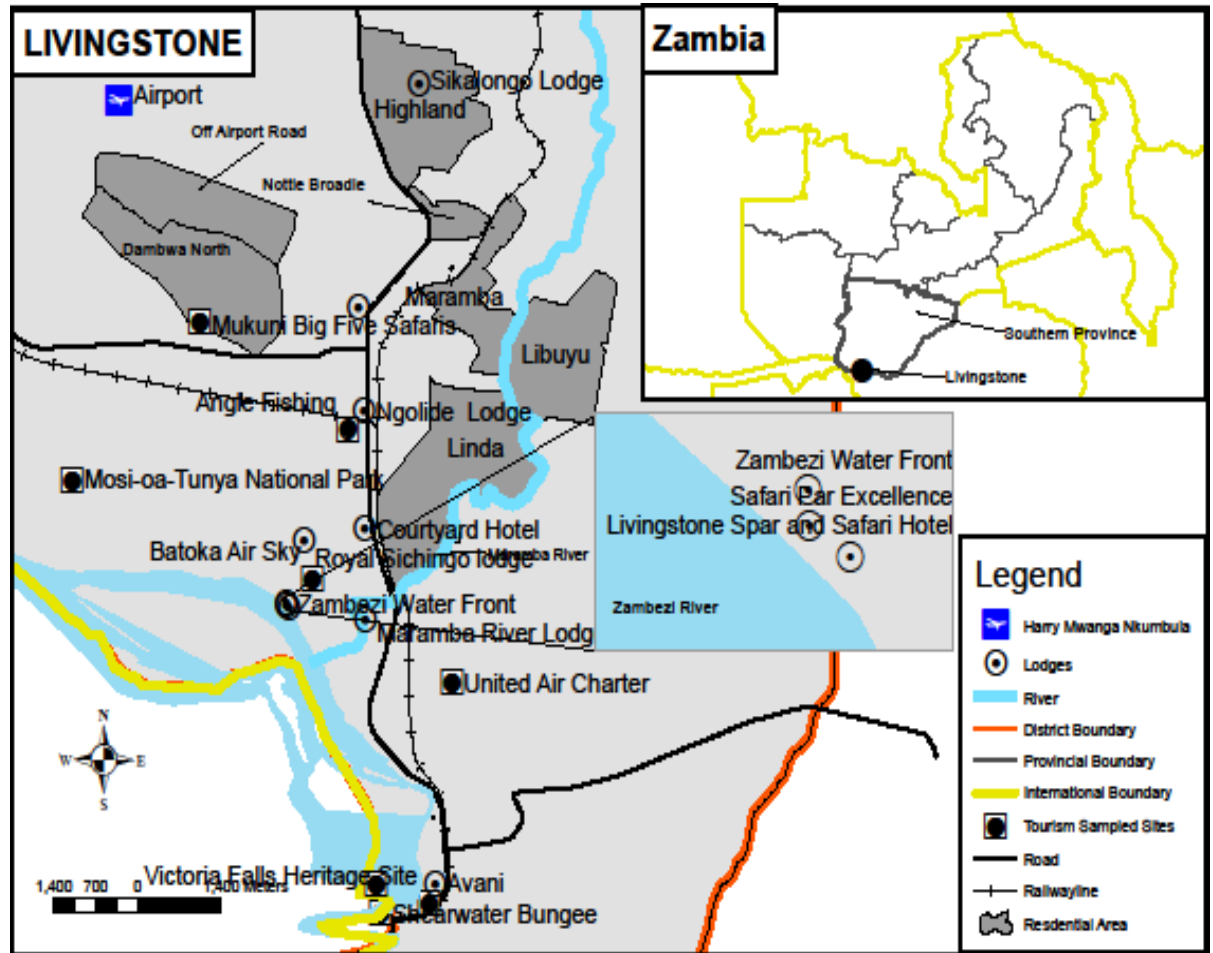


Figure 3.1: Map of study area and sampled sites

Source: Author, 2019

CHAPTER FOUR: METHODOLOGY

4.1 Introduction

Methodology is the “general approach a researcher takes in conducting a research project (Leedy and Ormrod, 2001: 14). It is that procedural framework within which the research is conducted (Remenyi *et al.*, 1998), involving data collection and the analysis of the assumptions in a particular study. This chapter describes the methodology for the study. Following this introduction are six key subsections which include; the Philosophical orientation, research strategy, research design, sample design, data collection and analysis. Further, ethical considerations are also included in this section.

4.2 Philosophical Orientation

There are a number of philosophical paradigms used in social sciences and educational research among them positivism, interpretivism, post positivism and pragmatism. These philosophical paradigms are assumptions, beliefs, values, ontology and epistemology that are crucial to methodology, (Kincheloe and Berry 2004:6). Therefore, they underpin the methodological choice, research strategy, data collection techniques as well as analytical procedures (Saunders, 2009). Jackson (2013) asserts that ‘without the formulation of the philosophical background, researchers may remain innocently unaware of the deeper meaning and commitments of how they conduct their research. These philosophical paradigms are mainly focused around ontological and epistemological assumptions.

Ontology simply refers to the assumptions of the nature of reality. Ontology is the interpretation of what one constitutes as reality, thus it shapes the way in which the researcher studies and perceives their research objects (Saunders, 2009). The researcher’s ontological perspective is therefore ‘closely related to issues of how one decides to collect research data because its linked to the basis upon which someone knows something to be true’ (Oliver, 2010:34). On the other hand, epistemology concerns assumptions about knowledge, what constitutes acceptable, valid and legitimate knowledge and how the knowledge can be communicated to others (Burrell and Morgan, 1979). Simply defined it is about information that counts as acceptable knowledge and how it should be acquired and interpreted. Therefore, once a researcher accepts a particular epistemology, he /she adopt methods that are characteristic of that position.

This research applied the pragmatism paradigm to determine the effectiveness of the commonly utilized methods of communicating climate information in Livingstone's tourism sector. Pragmatism is a philosophical paradigm that claims to bridge the gap between scientific method and structuralist orientation of older approaches (Creswell, 2014). As a research paradigm pragmatism is based on the proposition that researchers should use methodological approaches that work best for the research problem being investigated (Tashakkori and Teddlie, 1998). Therefore, it emphasises a proper understanding of the directions and perspectives of any research from multi-dimensions and multi-methods perspective (Fischer, 1998). Pragmatists recognise that no single point of view can give the entire picture and that there are multiple realities out there (Saunders, 2015). They believe that no two people have exactly identical experiences hence, they view of the world cannot be identical (Kaushik and Walsh, 2019). Based on this ontological position, the study did not base its research on a single reality that is tangible for example through experimentation, but rather the existence of climate change and effectiveness of climate communication was determined based multiple realities founded on individual's experiences and contextual influences. The epistemological assumptions hold that true meaning of theories and knowledge is that which leads to successful action, (Saunders, 2015). Pragmatism also holds that understanding some part of reality and creating knowledge is based on inquiry. Therefore, the purpose of inquiry is to create knowledge in the interest of change and improvement (Goldkuhl, 2012). With the objective of enhancing climate communication to enable adaptation planning, this study adopted this epistemological assumption by inquiry through both structured and semi-structured interviews.

4.3 Research Strategy

A research strategy is simply a general direction to the conduct of social research (Bryman, 2012). This study adopted a mixed method strategy. A mixed method strategy is an approach in which the researcher collects, analyses and integrates both qualitative and quantitative data into a single study (Creswell, 2003). It takes the advantages of both the qualitative and quantitative approaches. Hence, the mixed method strategy provides the researcher with the ability to conduct a single study that answers questions about both the

complex nature of phenomena from a participant point of view and the relationship between measurable variables (Williams, 2007).

Enhancing climate communication will require determining its effectiveness and understanding the reasons to its effectiveness or ineffectiveness. In this case the quantitative approach will be used to test the hypothesis that climate communication is ineffective while the qualitative approach will be used to get a detailed understanding for effectiveness or ineffectiveness from the respondents' experiences. Additionally, a mixed method strategy offsets the weaknesses of each strategy and draws on the strength of both (Bryman, 2012). While the quantitative approaches are unable to collect data such as how climate variability has affected the tourism sector and what type of climate information will be necessary for adaptation planning, qualitative methods will be able to, offsetting the weakness of the quantitative and taking advantage of the qualitative approach.

4.4 Research Design

A research design is the structure that guides the implementation of a research method and the analysis of successive data (Bryman, 2004). It is a master plan which specifies the methods and procedures for collecting and analysing data (Zikmund, 1988). A research design is simply an action plan that guides research from the questions to the conclusions and includes steps for collecting, analysing, and interpreting evidence according to pre-established propositions and application of set criteria for interpreting the findings (Yin, 2003). Thus it is important as it facilitates the smooth sailing of the various research operations, thereby making research as well-organized as possible in achieving its aims. This study employed a cross sectional survey research design. Cross-sectional research designs "involve the collection of data at a single point in time from a sample drawn from a specified population," (Krosich *et al.*, 2013). The key feature of this research design is that it takes a representative sample from the population to generalise the findings for the study population (Omair, 2015). Cross-sectional studies can be used in both descriptive and analytical studies. Thus, it will be used for this study as it involves both the descriptive aspects from the qualitative data and the analytical from the quantitative data. Additionally, the cross-sectional study will allow comparisons to be made on the effectiveness of climate communications from respondents' (international tourists', local tourists and tourism operators) perceptions

4.5 Sampling Technique

Sampling is a process of selecting a group of subjects in such a way that individuals represent a larger group from which they were selected (Ary *et al.*, 2009). Sampling makes it possible to study a population of a larger geographical area by examining an area in greater depth using a smaller sample hence saving on cost and time. The study sampled 80 international tourists, 140 residents, 17 tourism operators, and six key informants. Due to the difficulty in identifying and locating international tourists, a time venue sampling method was utilised. Venue based is a probabilistic method used to recruit members of a target population at specific times in set venues (Semaan, 2010). The sampling technique involved identifying days and times when tourists visited tourism sites. A sampling frame of tourism sites was created and later randomly sampled. Among the randomly sampled sites were the Victoria Falls, Mukuni cultural park, Shearwater bungee, and Jolly boys' backpackers. These places were visited on days and times when they were at a peak, for instance, the Victoria Falls is mostly visited from Mondays to Thursdays during its peak hours 06:00 A.M to 10:00 A.M and thus data was collected from random tourists on these days during those hours.

The local residents of Livingstone were sampled using stratified sampling. Stratified sampling is a technique which involves a classification of population into mutually exclusive groups, called strata, and choosing a simple random sample from each stratum (Kim *et al.*, 2013). This sampling technique was selected to ensure that the population was adequately represented. Hence, the locals were sampled at household level, stratified into low income, medium income and high-income households. Low income stratum consisted of households in Libuyu, Linda and Maramba, while middle income stratum consisted of households from Nottie broad and Dambwa North and high-income stratum consisted of households from off Airport and Highlands. Samples of 40 locals were sampled from each stratum using systematic random sampling.

Quota sampling was used to recruit tourism operators. Quota sampling is a technique that ensures that a certain characteristic of a population sample is represented to the exact extent that the investigator desires (Archarya *et al.*, 2014). Tourism operators were quoted into hoteliers, lodges, backpackers and activity operators (tourism operators offering activities such as Bungee jumping, helicopter flights, game viewing and Boat cruises).

These quotas were then conveniently sampled to determine the sample of tourism operators that participated in the study.

Paharoo (1997:232) describes purposive sampling as “a method of sampling where the researcher deliberately chooses who to include in the study based on their ability to provide necessary data.” For the purpose of this study, purposive was used to sample institutions involved in disseminating climate information. Purposive sampling was used to sample the media; ZANIS, ZNBC Mosi oa tunya radio station, Zambezi FM radio, the Zambia Meteorological Department in Livingstone and Zambia National Tourism Board.

4.6 Data Collection Methods

Data collection is a method of gathering information following an established systematic procedure in order to address critical research questions (Mubanga, 2018). It is key for any research project as it establishes a basis for decision making. There are basically two main sources of data; however, this study used primary data. Primary data collection is first hand collection of data from subjects a researcher is interested in studying. It was used because it yields original and unbiased information from the population and it is the most reliable form of data (Krueger and Casey, 2000). Data was collected from tourism operators, local residents and international tourists from April to May, 2019 through semi-structured interviews and structured interviews. International tourists consisted of tourist from Britain, Czech, France, Portugal, Germany, South Africa, Belgium, Russia, Demark, Netherlands, Norway, China and Ireland.

4.6.1 Primary Data Collection Methods

4.6.1.1 Semi-structured Interviews

Semi-structured interviews (Appendix B) are a verbal exchange of information where the interviewer attempts to elicit information from another person by asking questions (Clifford *et al.*, 2010). Semi -structured interviews are used so that the researcher can keep more of an open mind of what he or she knows about and also to allow new concepts to emerge out of the data (Bryman, 2012). Semi-structured interviews were used on key informants such as the media houses, Livingstone tourism board, governmental and non-governmental organisations. Thus interview guides were utilized to elicit information from tourism operators to identify how climate change affects them in their operations

and to also determine how they perceived the climate information disseminated for adaptation.

4.6.1.2 Structured Interviews

Structured interviews (Appendix B) are a method of data collection which involve asking each informant the same question (Bernard, 2006). It entails administering an interview schedule to the participants by an interviewer. Structured interviews are usually very specific and offer an interviewee a fixed range of answers, (Bryman, 2012). The study used structured interviews to assess the effectiveness of climate communications from the tourists' perspective. Data was collected using interview schedules with questions set on a 5-pointer Likert scale (Appendix A) focusing on key aspects of effectiveness; timely dissemination, relevance, accessibility, credibility and language used based on their experiences. Each of the dimensions were rated using a 5-pointer Likert scale with the lowest indicated by 1 and highest by 5. For instance, if a respondent rated accessibility of television with 1, it simply means accessibility of climate information using television is very low, while a rating of 5 indicates high accessibility.

4.7 Data Analysis Techniques

Data analysis can be defined as the process of organising and examining the information gathered from the field in order to interpret or explain what it means and make sense out of it (Spicer, 2004). It is basically concerned with reducing the large quantity of information that the researcher has gathered to make judgment of it (Bryman, 2012). Data collected from the field is raw and has no meaning on its own. Therefore, the essence of data analysis is to help the researcher interpret the gathered information and decide whether or not the objectives have been met. For this study, field data was analysed using both qualitative and quantitative techniques. Qualitative information obtained from semi-structured interviews was analysed using thematic analysis. Thematic analysis involves converting textual material from interview transcripts into categories like themes (Bryman, 2012). It involved checking for patterns in the data collected and putting it into themes and presented in graphs.

The quantitative data on effectiveness of climate communication modes from structured interviews was analysed using ANOVA. The ANOVA was used to determine if there were

any differences in the effectiveness of modes used to communicate climate information. After determining that they were differences in these modes of communication, an ANOVA post hoc test (LSD) was conducted to determine which modes of communication were statistically different from each other and which ones were most effective for the tourism sector. Data collected using a Likert scale was ordinal. However, parametric instead of nonparametric tests were applied for the analysis. This is based on the assumption of the central limit theorem which states that when the sample size is large, the distribution mean is approximately normal regardless of the shape of population distribution. Therefore, normal distribution is adequate when the sample size is greater than 30 (Johnson and Bhattacharya, 2001). Additionally, Norman (2010) indicates that parametric tests are more robust than non-parametric tests and tend to be reliable even when statistical assumptions such as normality are violated.

4.8 Ethical Considerations

In both academic and professional research, ethics play an important role in guiding researchers on how to conduct it professionally. Ethics is a dimension of every human experience; it entails methods, procedure, or perspective for deciding how to act in a research and in analysing complex problems and issues (Vandyke and Christine, 1998). During data collection the researcher adhered to most of the ethical principles of research so as to uphold the dignity and privacy of all respondents. The researcher exercised fairness in the selection of participants, and before an individual became a subject of the research, he or she was notified through a consent letter in order to know the terms and conditions of the research. The respondent had the freedom to either take part or not. Therefore, no compulsion or inducement of any kind was applied to encourage an individual to become a subject of the research. Secondly, individuals were treated as autonomous agents and their views were not disrespected. Furthermore, the data collected had been treated with the highest degree of confidentiality. Therefore, confidentiality, anonymity and privacy were upheld during and after conducting the research and hence no names were written down.

CHAPTER FIVE: PRESENTATION OF RESULTS

5.1 Introduction

This study sought to determine the effectiveness of climate communication for adaptation in the tourism sector in Livingstone. The study particularly investigated the channels used to disseminate climate information in Livingstone's tourism sector to improve communication for adaptation. Therefore, it focused on three main objectives, namely, i) To determine how tourism activities are affected by climate variability in Livingstone, Zambia, ii) To identify climate information that is of relevance to tourists and tourism operators in Livingstone, Zambia and, iii) To evaluate the effectiveness of the methods used to communicate climate information in Livingstone, Zambia from the end users' point of view.

This chapter presents results of the research study and is organised into four sections using themes related to research objectives. The sections include demographics of tourists sampled, climate variability impacts on tourism, climate information for tourism and effectiveness of climate communication.

5.2 Demographics of International Tourists

The findings show that majority of international tourists, who visited Livingstone in April (2019), were Europeans 58 percent with the majority being males shown (Table 5.1). Europeans consisted of tourists from Germany, Netherlands, Norway, Belgium, Czech Republic, France, Russia, Britain and Ireland, America consisted of tourists from Canada, Mexico and Brazil, Asia from Israel, China and Japan, Australia from Australia and Africa from South Africa.

Table 5.1: Demographics of international tourists

Continent of origin of international tourists	Gender of respondents			
	F		M	
	Frequency	Percentage (%)	Frequency	Percentage (%)
American	12	24	5	17
Asian	1	2	6	20
African	4	8	4	15
European	32	64	14	46
Australian	1	2	1	2
Total	50	100	30	100

Source: Field data, 2019

5.3 Impacts of climate variability on tourism in Livingstone

5.3.1 Perceptions of the impacts of climate variability in Livingstone

Respondents were asked if they thought the tourism sector in Livingstone is affected by climate variability. Most of the tourism stakeholders' international tourists 80 percent, local tourists 79 percent and tourism operators 88 percent (Figure 5.1), perceived climate variability had an impact on tourism in Livingstone. Correspondingly, all key informants indicated without a doubt that climate variability was affecting the tourism sector in Livingstone. As such, the study dealt with majority of respondents who were already convinced of the occurrence of climate variability in Livingstone and perceived its effects on the tourism sector.

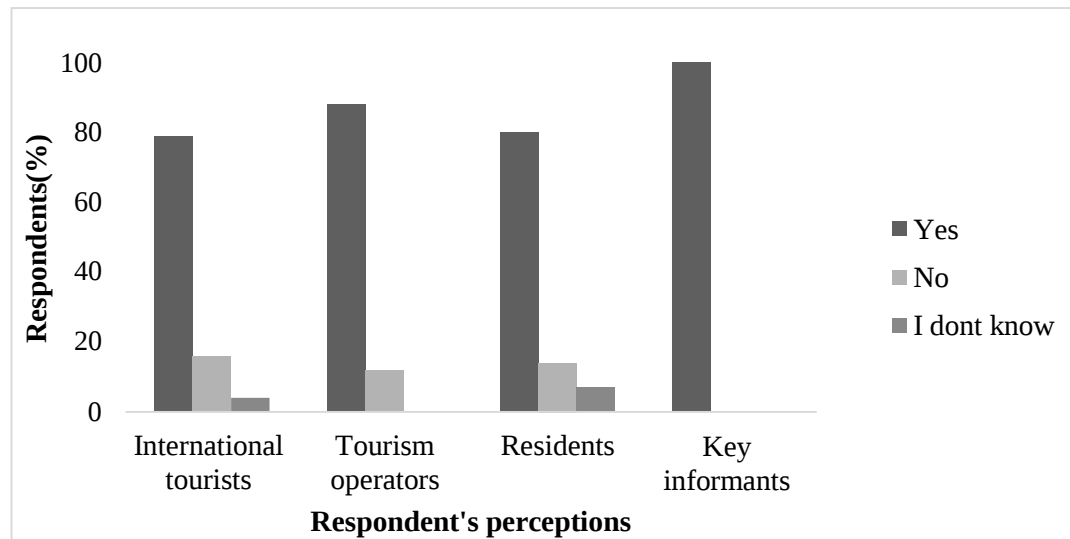


Figure 5.1: *Respondents perceptions of the impacts of climate variability on the tourism sector in Livingstone*

Source: Field data, 2019

5.3.2 Observed Impacts of Climate Variability in Livingstone

Respondents were asked the nature of climate variability impacts they observed in Livingstone. Figure 5.2 highlighted the commonly observed impacts; droughts, heat waves, floods and change in rainfall patterns. Change in rainfall patterns was the most frequently highlighted impact, while floods 12 percent were the least. Respondents indicated that generally Livingstone is a hot city with average temperatures of about 34 degrees Celsius in the hot months, however over the years increase in temperatures of above 37 degrees Celsius have been observed. According to a key informant “the highest

temperature Livingstone recorded so far is 41 degrees Celsius”, thus hitting the threshold for a heatwave.

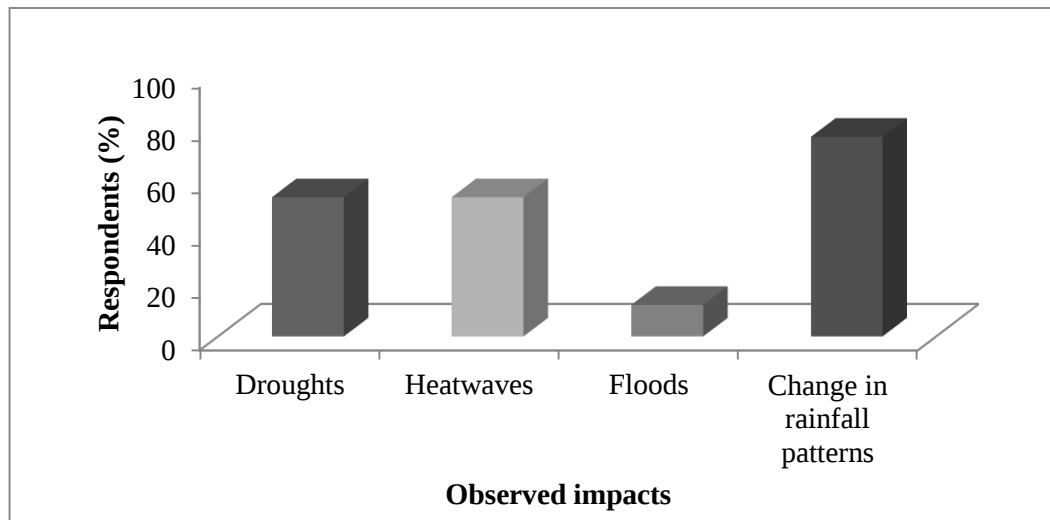


Figure 5.2: *Observed impacts of climate variability in Livingstone’s tourism sector*
Source: Field data, 2019

5.3.3 Impacts of Climate Variability on Tourism Activities in Livingstone

Findings from the interviews identified four major categories of tourism activities in Livingstone: river-based activities, wildlife activities, adventure activities and Victoria Falls viewing. The river-based activities take place on the Zambezi River and they include boat cruises, canoeing, kayaking, white water rafting and sport fishing. Wildlife activities comprise of game viewing, lion/cheetah walks, elephant rides and bird watching, adventure activities include helicopter and micro light flights, bungee jumping, gorge swing, bridge swing, bridge slides, and lastly the Victoria Falls viewing.

This study sought to find out the impacts of climate variability on tourism activities. The findings identified six activities affected by the impacts of climate variability Table 5.2. Wildlife safaris 36 percent as indicated as the most affected since climate variability impacts such as high temperatures restricted movements of wild animals in the park and thus tourists did not see most of the animals during game drives. Drought was also another factor as some tourism operators pointed out that it affected forage and water supply on which wild animals depend. One of the tourism operators stated that the natural dams in the Northern part of the park were drying up due to droughts and thus, they had to pump water from the Zambezi using solar powered pumps. However, 12 percent of the

respondents also indicated that tourism activities were not affected as they were seasonal activities. Figure 5.3 illustrates the impact of climate variability on the Victoria Falls scenery.

Table 5.2: Impacts of Climate Variability on tourism activities in Livingstone

Name of Tourism activity	Percentage affected by climate variability	How its affected by climate variability
Wildlife safaris	36	High temperatures restrict movements of animals in the national park, this forces tourism operator to adjust game drives to very early hours when the temperatures are cool. Drought also impact flora and fauna on which animals depend.
Victoria falls viewing	30	Drought affects water levels at the Victoria Falls. This affects the aesthetics of the falls.
Canoeing	6	Floods and heavy rainfall prevent canoeing activities from taking place.
Water rafting	7	Floods affect water rafting. The activity is closed when there is too much rainfall because the rapids are too high.
Fishing	3	Droughts or low rainfall affect fishing. Due to low water levels, fish stays below the water, hence no fish is caught.
Bungee Jumping	6	Floods limit bungee jumping activity due to limited movements of tourists.
Not affected	12	Believe tourism in Livingstone is seasonal, hence not affected by climate variability.

Source: Field data, 2019



Figure 5.3: *Low water levels at the Victoria Falls, April 2019*
Source: Field data, 2019



Figure 5.4: *Impact of drought at the Mosi oa tunya National park*
Source: Field data, 2019

5.3.4 Perceptions of the Magnitude of Climate Variability Impacts on tourism in Livingstone

Tourism operators were asked the magnitude of climate variability impacts on the tourism activities they offer. Majority of tourism operators (Figure 5.5) were of the view that climate variability impacts were moderate. The results indicate a difference in perceptions on the magnitude of climate variability impacts on tourism. This could be attributed to the fact that some tourism operators offer climate sensitive activities as compared to others. Majority of those who claimed the magnitude of impacts was moderate offered few or no river-based activities such as bungee jumping. On the hand, those who claimed the magnitude was very high offer river-based activities such as water rafting and Victoria Falls viewing.

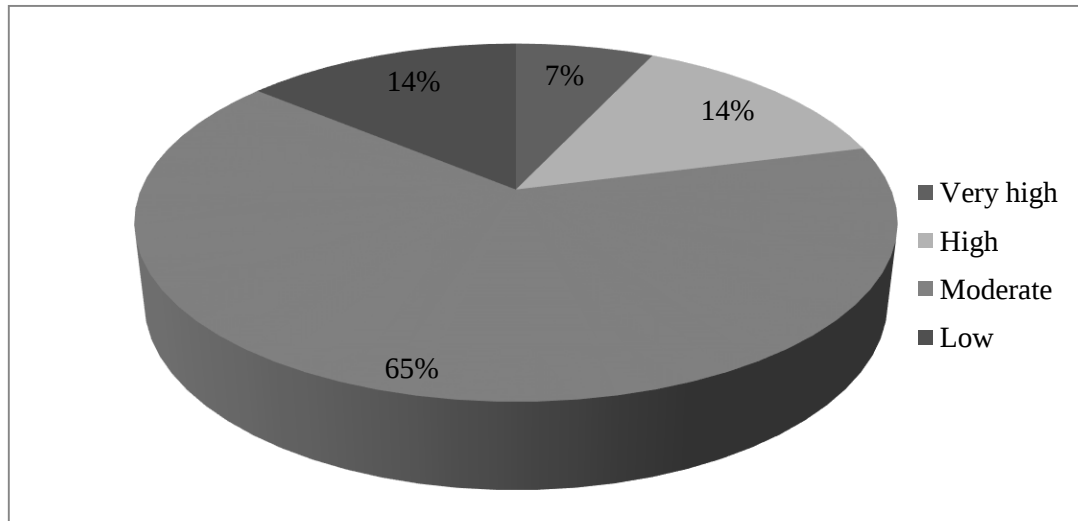


Figure 5.5: *Perceptions of the magnitude of climate variability impacts on tourism in Livingstone*

Source: Field data, 2019

5.4 Importance of Climate Information

Figure 5.6 displays respondents' perceptions on the importance of climate information. The findings show all tourism stakeholders perceived climate information as very important for the tourism sector. However, tourism operators perceived climate information to be important as compared to international tourists. This is since climate information is used for planning of activities they offer that are at risk of getting affected

due to change of weather and climate. Additionally, majority of key informants indicated that climate is very important to tourists and tourism operators because it enables them to prepare for safety in cases of a changing climate.

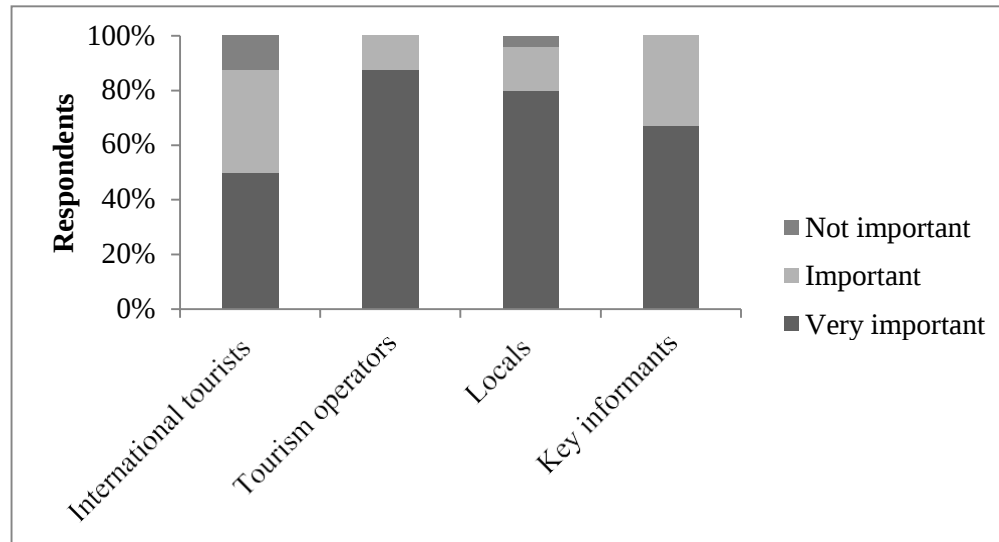


Figure 5.6: *Importance of climate information by tourism stakeholders*
Source: Field data, 2019

5.4.1 Reasons for importance of Climate Information

Table 5.3 indicates respondent's reasons for perceiving climate information as very important for tourism in Livingstone. Most of the respondents; 70 percent of international tourists, 79 percent of the locals, 71 percent of the tourism operators and 83 percent of the key informants pointed to planning of activities as the main reason for importance of climate information. One tourism operator stated, *"if we can get notifications about heavy rainfall or flooding then we know that we need to change our events and activities"*. Some tourism operators, 29 percent also indicated that climate information was important to promote (market) activities to their clients (tourists). Key informants acknowledged that climate information was very important for the tourism sector as it assists tourists to plan and decide plan on which activities to undertake and what to pack for the trip. They also indicated that climate information was important for tourism operators as it enabled them to plan for activities and tourists' safety in the case of changing weather and climate.

Table 5.3: Reasons for importance of Climate Information

<i>Reasons</i>	International tourists (%)	Tourism operators (%)	Locals (%)	Key informants (%)
<i>Time of visit</i>	70		52	-
<i>Plan for activities</i>	71	79	79	83
<i>Length of stay</i>	24		20	
<i>What to pack for trip</i>	66		56	50
<i>Marketing</i>	-	21	-	-
<i>Plan for safety of tourists</i>	-	-	-	17

Source: Field data, 2019

5.5 Types of Climate Information disseminated

Key informants indicated that they disseminated climate information using various channels including television, radio, newspapers emails, workshops, internet that is websites and Facebook and collaborations with governmental organisations such as the Ministry of Agriculture and the department of Disaster Management and Mitigation Unit (DMMU). Types of climate information disseminated comprise of seasonal weather forecast, daily and weekly weather forecast, daily temperature and decadal climate bulletin.

5.5.1 Access to Climate Information

Respondents in the tourism sector were queried as to whether they had access to climate information. The results in Figure 5.7 show that majority of tourism operators 59 percent, international tourists 64 percent and local tourists 66 percent had access to climate information. However, tourism operators did indicate that they did not receive information from print media or WhatsApp messages instead they received via texts (phone messages), emails and internet sources such as weather apps.

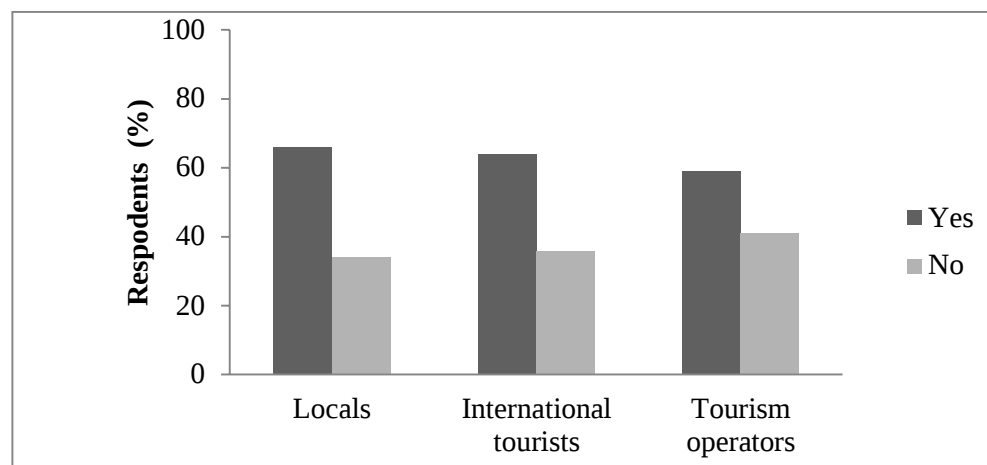


Figure 5.7: *Access to climate information*

Source: Field data, 2019

5.5.2 Types of Climate Information Accessed

Table 5.4 indicates the types of climate information accessed by international tourists, local tourists, and tourism operators. Forecast on daily temperature was the most accessed climate information by international tourists 38 percent, while for locals the highest received climate information was daily and weekly weather forecast of rainfall, temperature, sunshine, and humidity at 62 percent. Real time weather information was the most accessed by tourism operators 53 percent. The least received climate information for all tourism stakeholders is climate change projections 6percent for both international tourists and tourism operators and local tourists 9 percent.

Table 5.4: Types of Climate Information Accessed in Livingstone

Types of Climate Communication	International tourists(%)	Locals	Tourism Operators
Seasonal weather forecasts	43	51	30
Forecast on daily temperature	38	38	47
Monthly updates on climate	9	15	24
Daily and weekly weather forecasts	36	62	47
Real time weather information (temperature, rainfall etc.)	34	42	53
Climate change projections	6	9	6

Field data, 2019

5.5.3 Relevant Climate Information

When tourism stakeholders were asked about the most relevant climate information for them, majority indicated rainfall and temperature information respectively, (Figure 5.8). The results show that the users of climate information in Livingstone's tourism sector prefer short term weather and seasonal information as compared to long term climate change projections.

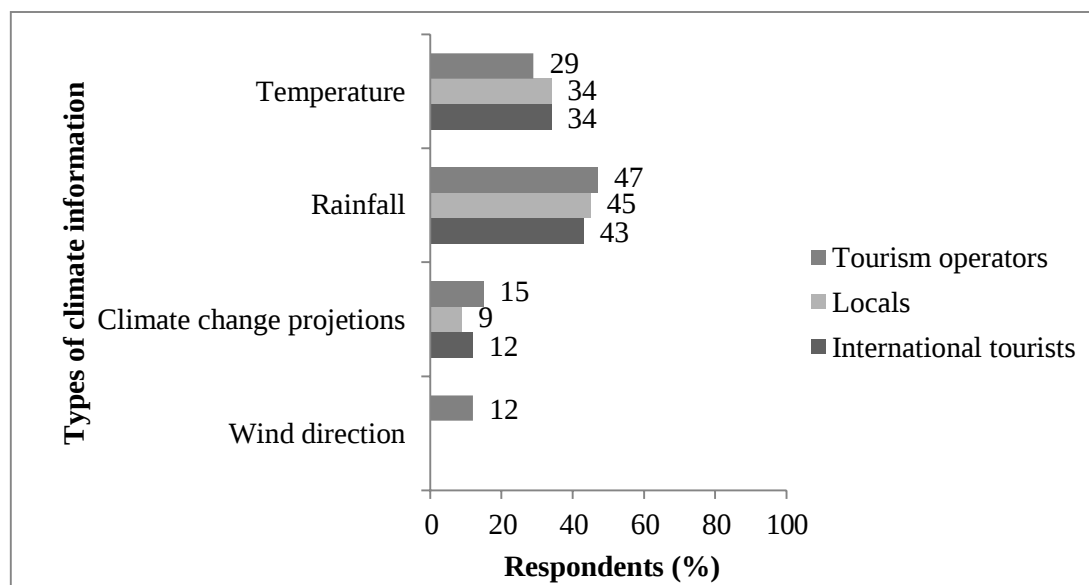


Figure 5.8: *Types of preferred climate information by tourism stakeholders*

Source: Field data, 2019

5.6 Effectiveness of Climate Communication Channels in Livingstone's Tourism Sector

In order to measure the effectiveness of the channels of climate communication used in Livingstone, five measures of effectiveness were used: accessibility, timely dissemination, ease of language, relevance and credibility. These measures were used in the assessment of the effectiveness of nine commonly utilised modes of climate communication, namely; Television, Radio, Travel Magazines, Newspapers, Phone texts, internet, Travel agents, Family and friends, and Government Institutions. This subsection presents the results of the effectiveness of channels of climate communication.

5.6.1 Accessibility

Participants were asked to rate how they perceived accessibility of climate information sourced from the commonly utilised channels in Livingstone. The results indicated that

majority of the international tourists 82 percent rated the internet as the most accessible channel of receiving climate information, followed by television (Figure 5.9). On the other hand, majority of the locals (79 percent) pointed out television as the most accessible, followed by radio, phone texts and the internet (Figure 5.10). For locals' climate information was easily accessible on television because most of them own one and climate information was disseminated every news hour on radio and during the main news on the national television. Thus, the results show that the most highly accessible channel of communication is the internet and television for international and local tourists, respectively.

5.6.2 Timely Dissemination

Based on timely dissemination of climate information most international tourists 75percent indicated the internet as the fastest channel of receiving climate information, seconded by family and friends and the least rated was the newspaper (Figure 5.9). Similarly, majority of the locals 59 percent rated the internet as the fastest channel of receiving climate information, followed by phone texts, radio and television (Figure 5.10). Therefore, both local and international tourists perceived the internet as the fastest channel of receiving climate information.

5.6.3 Ease of Language

The channels of communication were highly rated in terms of ease of language with most of them scoring above average. Most international tourists 82percent rated family and friends as the easiest channel of receiving climate information in an understandable language, seconded by the internet. The radio was the least rated by international tourists (Figure 5.9). On the contrary, majority i.e. 75 percent of the local perceived radio as language friendly seconded by family and friends (Figure 5.10). The high ratings of the radio with regards to ease of language can be attributed to the usage of various local languages in disseminating climate information.

5.6.4 Relevancy

Respondents were also asked to rate which channel communicated the most relevant climate information for the tourism sector. Most international tourists that is 65percent rated the internet highly in disseminating relevant information, followed by family and

friends while the least rated was the newspaper (Figure 5.9). Conversely, most locals rated the radio highly in disseminating relevant climate information, followed by television (Figure 5.10).

5.6.5 Credibility

Participants were asked the most credible channel in disseminating climate information, most of the international tourists 75 percent selected the internet as the most credible channel of communication. (Figure 5.9). Similarly, majority of the locals 60 percent rated the internet as highly credible followed by the television (Figure 5.10). However, family and friends were rated the least credible. The low ratings for family and friends can be attributed to the fact that climate information is usually shared later than it is received and therefore accuracy is compromised. The results of the survey suggest that despite variances in the channels of communication, the internet was the most effective channel of communication for international tourists' and television for locals with high scores in almost all measures of effectiveness.

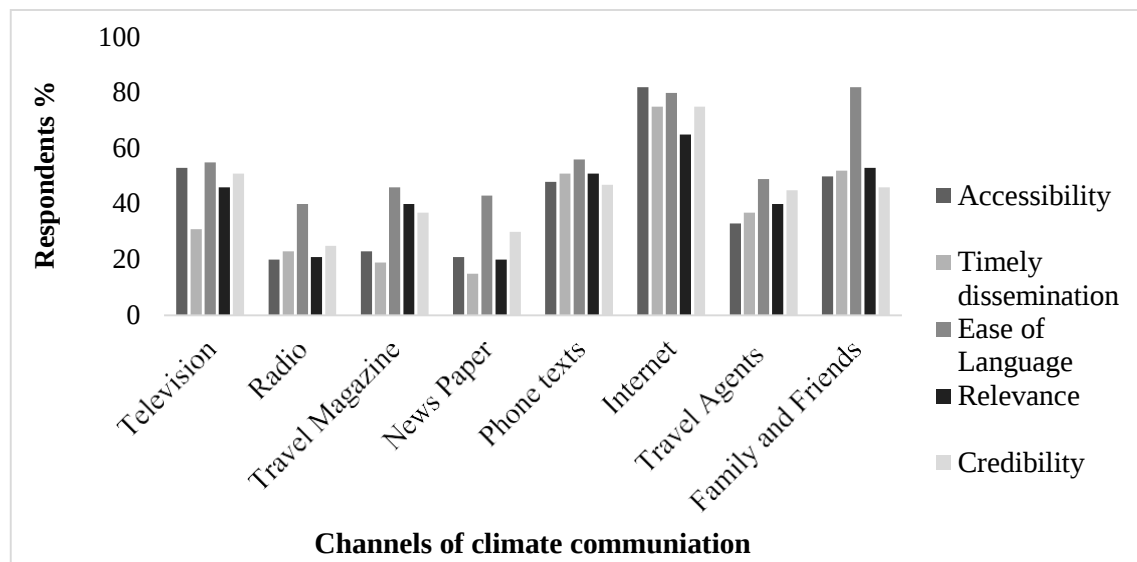


Figure 5.9: *Effectiveness of climate communication channels by international tourists*
Source: Field data, 2019

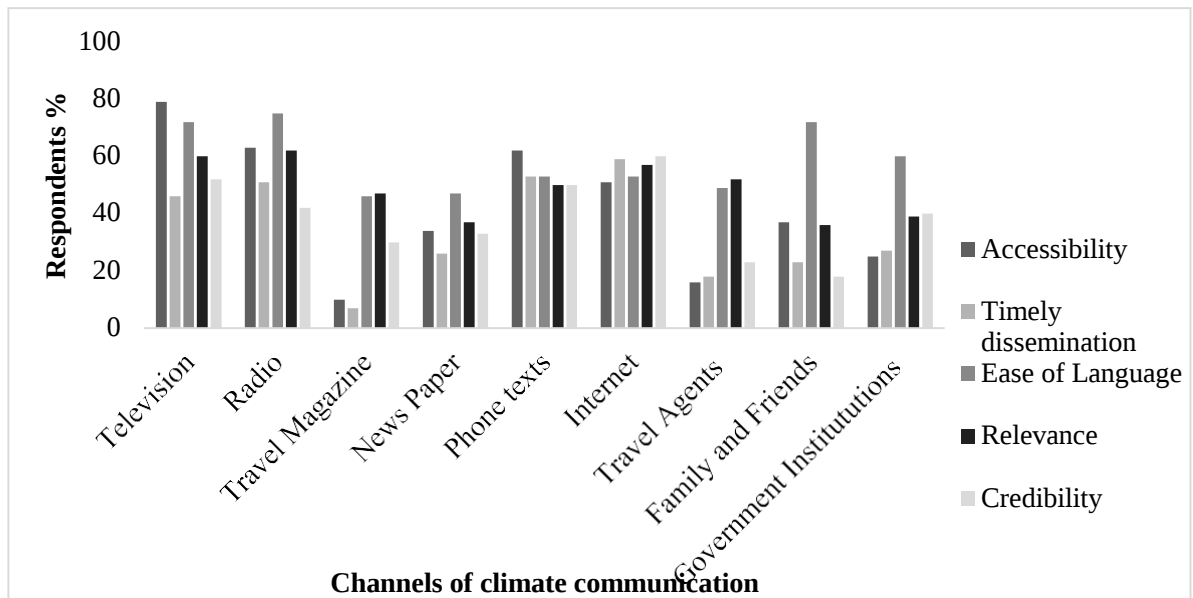


Figure 5.10: *Effectiveness of climate communication channels by locals*
Source: Field data, 2019

5.7 Preference of Communication Channels

Table 5.5 shows tourism stakeholders preferred channels of receiving climate information. Most international tourists that is 60 percent indicated the internet as the most preferred channel of receiving climate information asserting that the internet was easily accessible and disseminates accurate climate information. Family and friends and the television were the second most preferred channels. On the other hand, the television was the most preferred channel for the locals, 42 percent who claimed it provides reliable and accurate information, easily accessible and has visuals compared to radio. The television was seconded by the phone texts which the respondents' indicated were easily accessible. However, for tourism operators, 43.8 percent indicated they prefer email as a channel of communication because it is accessible. These results further indicate that accessibility and accuracy are the most important indicators of effectiveness for tourism stakeholders as they were the basis for selection of the most preferred channels.

Table 5.5: Preferred climate communication channels by tourism stakeholders

Channels	Reason	International Tourists (%)	Locals (%)	Tourism operators (%)
Television	Reliable and accurate Visual and audio Accessible	13	22 6 14	
Phone texts	Easy accessibility	10	23	12.5
Internet	Accurate and timely Accessible	21 39	19 10	37.5
Travel magazine	Relevant information			6.2
Family and friends	Reliable	13		
Travel agents	Relevant information	4		
Radio	Affordable		6	
Email	Accessible			43.8

Source: Field data, 2019

A spearman's correlation was run to determine the relationship between level of income and mode of climate communication utilised. The results showed that there was no correlation between level of income and mode of climate communication utilised ($R_s=0.151$, $n=140$, $P>0.005$).

Table 5.6: Relationship between level of income and mode of climate communication

Correlations

		level of income	mode of communication
Spearman's rho	Correlation Coefficient	1.000	.151
	level of income Sig. (2-tailed)	.	.074
	N	140	140
	Correlation Coefficient	.151	1.000
	mode of communication Sig. (2-tailed)	.074	.
	N	140	140

** . Correlation is significant at the 0.05 level (2-tailed).

5.8 Multiple Pairwise Comparisons of Commonly Utilised Climate Communication Channels in Livingstone

This study tested the hypothesis that there statistically significant differences in the commonly utilised channels of communicating climate information in Livingstone. Results support the hypothesis that there were statistically significant differences in the channels used to communicate climate information in Livingstone.

5.8.1 Accessibility

Results of Fisher LSD post-hoc tests revealed that there were statistically significant differences between channels of climate communication as determined by one-way ANOVA ($F = 10.9$, $P = 0.01$) for the accessibility of climate communication among international tourists of Livingstone (Table 5.6). There were statistically significant differences between internet and television ($P = 0.023$), internet and phone texts ($P = 0.005$), internet and family and friends ($P = 0.004$), internet and travel magazine, travel agents, radio. They were no statistically significant differences between Television and Phone texts ($P = 0.594$), Television and Family and friends ($P = 0.542$), Radio and Travel magazine ($P = 0.879$), Radio and Newspaper ($P = 0.647$), Radio and Travel Agents ($P = 0.493$), Phone texts and Television ($P = 0.594$), Phone texts and Family and friends ($P = 0.939$). These results show that among international tourists the internet was the most effective channel of accessing climate information with a mean score of 3.7 above average of 2.6.

There was a statistically significant difference between channels of climate communication as determined by one-way ANOVA ($F = 29.9$, $P = 0.01$) for the accessibility of climate communication among local tourists of Livingstone Zambia. Results of Fisher LSD post-hoc tests indicated statistically significant differences between Television and Radio ($P = 0.034$), Television and Phone texts ($P = 0.004$), Television and Travel Magazine, Newspaper, Travel agents, Family and friends, Internet, Government institutions ($P = 0.001$). There were no statistically significant differences between Radio and Phone texts ($P = 0.445$), Travel Magazine and Travel Agents ($P = 0.577$), Newspaper and Government institutions ($P = 0.655$), Newspaper and Family and Friends ($P = 0.503$), Phone texts and Internet ($P = 0.58$) and Internet and Family and Friends ($P = 0.163$) (Table 5.6). Television was the most effective channel of accessing climate information for locals with a mean score of 4.1 above average of 2.7 for locals

5.8.2 Timely dissemination

There was a statically significant difference between channels of climate communication as determined by one-way ANOVA ($F=13.6$, $P=0.01$) for the international tourists of Livingstone. Similarly, there was a statistically significant difference between groups as determined by one-way ANOVA ($F =23.9$, $P=0.01$) for the timely dissemination of climate communication among locals of Livingstone.

Fishers LSD results indicate that there were significant differences between the internet and other channels of climate communication for international tourists. There were statistically significant differences between the Internet and Family and friends ($P=0.021$), Internet and; Television, Radio, Newspaper, Travel magazine. There were no statistically significant differences between Television and Radio ($P=0.298$), Television and Travel agents (0.766), Radio and Travel magazine ($P=0.372$), Radio and Newspaper ($P=0.234$), Radio and Travel agents ($P=0.181$), Phone Texts and Family and friends ($P=0.298$), (Table 5.7). The internet was the most effective channel of disseminating information timely with a mean score of 4.1 above an average of 2.83.

The Fishers LSD results also indicated significant differences of channels of climate communication utilised by locals. There were statistically significant differences between the Internet and; Travel magazine, Newspaper, Travel agents, Family and friends, Government institutions ($P=0.001$). There were no statistically significant differences between the Internet and Television ($P= 0.63$), Internet and Radio ($P= 0.44$), Internet and Phone texts ($P=0.248$), Television and Radio ($P=0.8$), Television and Phone Texts ($P=0.525$), Radio and Phone Texts ($P=0.744$), Travel Magazine and Travel agents ($P=0.525$), Newspaper and Government Institutions ($P=0.298$) (Table 5.7). The internet was the most effective channel of disseminating climate information timely among the locals of Livingstone with a mean score of 3.47 above an average of 2.83.

5.8.3 Ease of Language

The results of this study also indicated significant differences between channels of climate communication utilised in Livingstone based on the delivery of climate information in a language that is easily understood. There was a statistically significant difference between channels of climate communication utilized by international tourists as determined by one-way ANOVA ($F = 8.52$, $P = 0.01$). Similarly, there was a statistically significant difference between channels of climate communication utilized by locals as determined by one-way ANOVA ($F = 6.38$, $P = 0.01$) for locals.

The results indicated statistically significant differences between Family and friends and; Television, Radio, Travel magazine, Newspaper, Phone texts and Travel agents ($P = 0.01$). There were no statistically differences between Internet and family and friends ($P = 0.83$), Television and Travel magazine ($P = 0.53$), Television and Newspaper ($P = 0.296$), Television and Phone texts ($P = 0.944$), Television and Travel agents ($P = 0.83$), Radio and Newspaper ($P = 0.164$), Radio and Travel magazine ($P = 0.07$) (Table 5.8). The showed Family and friends was statistically significantly higher in effectiveness based on ease of language compared to other channels of climate communication utilized by international tourists at mean score of 4.3 above average of 3.3.

Results of Fisher LSD post-hoc tests revealed that the radio was statistically significantly higher in effectiveness based on ease of language compared to various channels of climate communication at mean score of 4.02 above average of 3.4. The results indicated statistically significant differences between Radio and government institutions ($P = 0.007$), Radio and Travel magazine, Newspaper, Phone texts, Weather app, Travel agents ($P = 0.001$). There were no statistically significant differences between the Radio and Television ($P = 0.315$), Radio and Family and friends ($P = 0.291$), Television and Family and friends ($P = 0.955$), Television and Government institutions ($P = 0.09$), Travel magazine and Newspaper ($P = 0.916$), Travel magazine and Travel agents ($P = 0.222$) (Table 5.8).

5.8.4 Relevance

This study found significant differences in disseminating of relevant information by different climate communication channels utilised in Livingstone. The results indicate a statistically significant difference between channels of climate communication used by international tourists as determined by ANOVA ($F = 7.50$, $P=0.01$). Fishers LSD indicated statistically significant differences between the Internet and; Television, Radio, Travel magazine, Newspaper, Phone texts, Travel agents, and Family and friends ($P=0.033$). There were no statistically significant differences between the Television and Travel Magazine ($P=0.508$), Television and Phone texts ($P=0.825$), Television and Family and Friends ($P=0.123$), Television and Travel agents ($P=0.556$), Radio and Travel Magazine ($P=0.078$), Radio and Newspaper ($P= 0.768$), Travel magazine and Travel agents ($P=0.941$), Travel Magazine and Phone texts ($P=0.377$), Phone Texts and Travel agents ($P=0.418$), Phone texts and Family and Friends ($P=0.186$). The test indicated the internet as statistically significantly higher in disseminating relevant climate information with a mean value of 4.07 above average 3.06 ($P= 0.01$) (Table 5.9).

The results indicate that there were statistically significant differences between channels of climate communication utilized by locals as determined by ANOVA ($F = 4.83$, $P=0.01$). There were statistically significant differences between Radio and Newspaper ($P = 0.001$), Radio and Phone texts ($P= 0.002$), Radio and Family and friends ($P= 0.001$), Radio and Travel agents, ($P=0.006$) and Radio and Government institutions ($P= 0.001$). There were no statistically differences between Radio and Television ($P=0.574$), Radio and Travel magazine ($P=0.160$), Radio and Internet ($P=0.118$), Television and Travel magazine ($P= 0.397$), Television and Internet ($P=0.314$), Travel magazine and Phone texts ($p=0.101$), Travel magazine and Internet ($P=0.874$), Phone texts and Newspaper ($P=0.290$), Phone texts and Government institutions ($P=0.832$), Phone texts and Family and friends ($P=0.153$), Phone texts and Travel agents ($P=0.791$) (Table 5.9). The Radio is statistically higher in disseminating relevant climate information among local with a mean value of 3.7 above average 3.1 ($P=0.01$). The radio updates relevant climate information every news hour of the day.

5.8.5 Credibility

Based on credibility, Fishers LSD results indicated statistically significant differences in the channels used to communicate climate information. The results showed that there were statistically significant differences in credibility between channels of climate communication utilized by international tourists as determined by ANOVA ($F = 5.47$, $P = 0.01$). The post hoc test indicated the internet as statistically higher in disseminating credible climate information for international tourists at a mean value of (3.8) above average (3.0), ($P = 0.01$). There were statistically significant differences in credibility between Internet and; Television, Radio, Travel Magazine, Newspaper and Travel agents ($P = 0.01$), Internet and Phone texts ($P = 0.00$), Internet and Family and friends ($P = 0.012$). There were no statistically significant differences between Television and Travel magazine ($P = 0.337$), Television and Newspaper ($P = 0.077$), Television and Phone texts ($P = 0.605$), Television and Travel agents ($P = 0.882$), Television and Family and friends ($P = 0.375$), Radio and Travel magazine ($P = 0.301$), Radio and Newspaper ($P = 0.825$), Phone texts and Family and friends ($P = 0.712$) and Phone texts and Travel agents ($P = 0.712$) (Table 5.10).

Similarly, results showed that there were statistically significant differences in credibility between channels of climate communication utilized by locals as determined by ANOVA ($F = 10.04$, $P = 0.01$). Fishers LSD revealed that the Internet is statistically higher in disseminating credible climate information for locals at a mean score of (3.5) above average of 3.0 ($P = 0.01$). There were statistically significant differences in credibility between Internet and Radio, ($P = 0.01$), Internet and Travel magazine ($P = 0.01$), Internet and Newspaper ($P = 0.01$), Internet and Travel agents ($P = 0.01$), Internet and Family and friends ($P = 0.01$) and Internet and Government institutions ($P = 0.01$). Nonetheless there were no statistically significant differences in credibility between the Internet and Television ($P = 0.363$) and Internet and Phone texts ($P = 0.14$), Phone texts and Television ($P = 0.57$), Phone texts and Radio ($P = 0.282$), Phone texts and Government institutions ($P = 0.173$), Travel agents and Travel Magazine ($P = 0.280$), Travel agents and Family and friends ($P = 0.495$) and Government Institutions and Radio ($P = 0.776$) (Table 5.10).

CHAPTER SIX: DISCUSSION

6.1 Introduction

This chapter provides the discussion. It discusses in detail the results presented in chapter five relating them to the research objectives and questions. It further discusses the implications of the findings for policy.

6.2 Impacts of Climate Change on Tourism Activities

Livingstone's tourism is predominantly nature based attracting tourists for its outstanding tourism attractions among them; the Victoria Falls, Zambezi River and the Mosi oa tunya national park. However, nature-based tourism is one of the most climate change sensitive and vulnerable type of tourism (Scott *et al.*, 2007). Being an integral part of nature-based tourism, climate can affect the choice of tourism recreation by tourists (Gomez, 2005). In this study, the consequences of climate variability on tourism have been explored. The findings indicated that the tourism sector in Livingstone is experiencing climate variability. Despite tourism being seasonal in Livingstone, with the period between January and April being months with the highest peak of tourism activities and number of tourist visits. Majority of respondents perceived climate variability to have an impact on the tourism sector in Livingstone, indicating that over the years they have seen an increase in droughts and changes in rainfall patterns affecting mostly the national park and beauty of the Victoria Falls.

According to Scott *et al.*, (2007), climate change affects nature-based tourism by affecting the natural resources on which tourism is dependent. Confirming claims by Scott *et al.*, (2007), the findings of the study showed wildlife safaris and the Victoria Falls as the most affected tourism activities by climate variability. Droughts have a negative impact on the Victoria falls as they affect the aesthetic of the Victoria Falls, additionally droughts have an impact the Mosi oa tunya game park causing the loss of flora and water on which wild animals are dependent. Heat waves also impact game viewing as most animals are in hiding when temperatures are very high, thus tourism operators have to adjust their game viewing times to as early as 05:00 hours. The results of this study confirm the studies of Kilungu *et al.*, (2017) who revealed decreased rainfall as one of the main climate change impacts affecting the Serengeti national park of Tanzania leading to shortage of drinking

water and food thus affecting wildlife. Similarly, Stuike *et al.*, (2018) predicted a decrease in precipitation by 10percent in Zimbabwe by 2050 which would affect availability of water and food on which wildlife depend on. While previous research by Dube and Nhamo (2018) focused on evidence of climate variability and change in Livingstone indicated by increase in temperatures and decline in rainfall. The results of this also demonstrate how these climate change impacts are affecting specific tourism activities such as wildlife safaris and the Victoria Falls scenery

6.3 Relevant Type of Climate Information

Tourism operators' and tourists perceived climate information to be very important. However, climate information was more cardinal to tourism operators. This is because tourism operators are the service providers who need climate information to assess the risks that a changing climate may have on their businesses and tourism activities which they offer. Thus it is vital to enable them to plan tourism activities that will keep their tourists happy. Tourism operators indicated that climate information enabled them to plan and adjust their outdoor activities and menus, stating that in the case of a change from sunny to rainy weather even their menus would be adjusted to include particular items such as soups. Additionally, a proportion of tourism operators also indicated that climate information was important to enable them to market to their clients (tourists). This supports Becken and Wilson (2011) who suggested the use of climatology information by tourism managers to promote a range of tourism activities. These results also agree with De Freitas (2003) who indicated that climate information is important for promoting attractive climate conditions to encourage business. However, only half of the interviewed tourists indicated that climate information was important, this was due to the fact that international tourists travel across the world mainly to see the Victoria Falls, regardless of the weather or climatic conditions. Nonetheless majority of tourists who viewed climate information as important indicated that climate information was vital for planning and decision making of activities to undertake as compared to the length of stay.

Another key focus of the study was the type of climate information relevant to tourists and tourism operators. Most tourism operator's and tourist have access to climate information, showing forecast on temperature as the most accessed climate information by international tourist, daily and weekly forecast of rainfall and temperature for locals

and real-time weather information for tourism operators. While climate change projections were the least type of climate information received. Both tourism operators and tourists were mainly interested in short term climate information such as forecasts on temperature and rainfall as compared to long term climate change projections. These results support the findings of (Hamilton and Lau, 2004), who identified short to medium term climate information such as air temperature, number of rainy days, duration of sunshine and water temperature as the important types of climate information relevant for the tourism sector. Their study further suggested that temperature was the major variable for destination demand. Similarly, Becken *et al.*, (2010) perceived temperature as the key variable in choice of tourism destination; particularly they supposed higher temperatures and ample hours of sunshine as positives and rainfall as negative.

On the contrary this study, found that rainfall was the most important variable to both tourists' and tourism operators. This is because European countries where the said studies were conducted have very cold weather and thus most tourists prefer to undertake outdoor activities in summer when temperatures are warmer. As opposed to this, Livingstone temperatures are warm. However, tourism activities such as game drives and Victoria Falls are mainly affected by temperature and water levels. Additionally, tourists fail to participate or enjoy activities during rainy season especially when there are heavy rains, hence they stay indoors. Thus these results support Becken *et al.*, (2010) who suggests that although rains do not often interrupt water based activities such as boat trips for sightseeing or fishing, they can affect customer experience and affect bookings for boat trips.

6.4 Effectiveness of Modes of Climate Communication

Climate information is fundamental to the understanding of climate risks and planning for adaptation in the tourism sector. Ayscue *et al.*, (2015) indicates that weather and climate information such as medium to long term forecasts can enable businesses to plan ahead and make decisions. However, the use of this climate information is dependent on whether its accessible, if it's credible and trustworthy and relevant to the decision maker (Lackstrom, 2014). Based on these measures of effectiveness; accessibility, timely dissemination, ease of language, relevance and credibility. The findings of this study indicated the internet as the most effective mode of disseminating climate information for

international tourists. It was also the highest rated channel of accessing timely relevant and credible information. The internet was seconded by family and friends who were rated highly in accessibility ease of language and relevancy of climate information. The least square difference pairwise comparisons further indicated the internet to be statistically significantly different in terms of accessibility, timely dissemination, relevancy and credibility with other channels of communication; television, radio, travel magazine, newspaper, phone texts, travel agents, and family and friends with its mean value being higher. The most plausible explanation for this is that internet is available in developing countries where most of the tourists reside, making real time climate information easily accessible and up-to-date. These findings confirm those of Rutty and Andrey (2014) who noted that most winter recreationists such as snow boarders and skiers rely primarily on internet particularly national websites and mobile communication as a source of weather and climate information indicating less use of traditional channels of communication. Similarly, Nalau *et al.*, (2017) found that the most popular medium for climate information among tourism stakeholders of Fiji was the Internet, either through web-sites, e-mail alerts, or smartphone applications.

This study revealed that tourism operators have limited access to climate information via traditional media such as television, newspapers and radio due to their busy schedule. Nonetheless, they also pointed to the internet as the most effective channel of climate communication indicating that emails were their most preferred channel of receiving climate information. This study is in direct contrast to available studies by Tribbia and Moser (2008) who found newspapers as the primary source of climate information for coastal managers in California as there are easily accessible. This could be partly related to timing of the study due to the fact that technology has advanced as compared to when the studies were conducted. This could also be due to the fact that newspapers are expensive in Livingstone, thus to avoid cost most tourism operators choose not to purchase them.

The results of the study also indicated differences in the effectiveness of channels of climate communication utilised in Livingstone. While international tourists indicated the internet as the most effective channel of communication, locals rated the television as the most effective channel of climate communication. The television was rated highly in

accessibility, ease of language, relevancy and credibility. It was followed by the radio which was rated highly in terms of accessibility, timely dissemination and ease of language. The results of the study also show the internet and phone texts as upcoming channels of climate communication among the locals. These findings are contrary to the findings of Churi *et al.*, (2012), who recognised radio as the most effective channel of disseminating climate information among locals of Tanzania. This is because these studies focus on climate communication in the rural agriculture sector as opposed to communication in the tourism sector. Additionally, there is a growing use of television as a source of receiving climate information as most individuals own a television in their homes and work places. Travel magazines are the least effective because very few locals purchase travel magazines and due to the fact that magazines have out-dated climate information as they are issued weekly. This study also builds on the existing evidence of Rasmussen *et al.*, (2015) whose findings show how mobile phones have the potential to effectively deliver climate information to pastoralists.

This study also revealed that government institutions were not effective in disseminating climate information particularly in the tourism sector. Despite governments playing an important role in the provision of climate information, majority of locals indicated limited accessibility to climate information from government institutions such as the Ministry of Tourism, Zambia National Tourism Board and the Zambia Meteorological department. Locals indicated that climate information from government institutions was not easily accessible and that in most cases it was inaccurate thus proving to be unreliable. Further, Tourism operators stated that they did not receive climate information from government institutions, instead those whose activities were heavily dependent on weather and climate such as boat cruises and helicopter flights voluntarily went to the meteorological department to retrieve climate information. Scott and Lemieux (2010) assert that national meteorological services are mainly concerned with production of climate information that benefits society at large to avoid damages and enhance human wellbeing. This is the case for Livingstone as most of climate information disseminated by government institutions is mainly concerned with early warning such as seasonal climate information particularly for the agricultural sector.

6.5 Towards a Framework for Effective Climate communications

Since anthropogenic climate change first emerged on the public agenda in the mid-to-late 1980s, public communication of climate change, and more recently the question of how to communicate it effectively has witnessed a steep rise (Moser, 2009). Therefore, ways of communicating climate change and climate information have been evolving ever since. The framework in Table 6.1 assists in determining the effectiveness of communication channels used in disseminating climate information. The proposed framework utilises five key dimensions to assess and measure effectiveness of Channels of climate communication, namely; accessibility, timely dissemination, ease of language, relevancy and credibility.

Table 6.1: Dimensions of Effective climate communication

Number	Dimension	Description
1	Accessibility	Accessibility of climate information disseminated using particular communication channels such as a television, phone, radio
2	Timely dissemination	Accessibility of climate information in time to make a decision
3	Ease of language	Language that is understood by the users and is communicated using very clear graphics which are simple to interpret.
4	Relevancy	Usefulness of climate information to the targeted audience
5	Credibility	Accuracy and reliability of disseminated climate information

Source: Author, 2019

6.5.1 Application of the framework

Generally, efforts have been made to ascertain effectiveness of climate communication; however, there has been no specific model for evaluating effectiveness. This framework

assesses whether a particular channel of communication disseminates timely accessible climate information that is easy to understand, relevant and credible. It takes into consideration key aspects that contribute to effective climate communication. Therefore, the model will be useful determining effectiveness of communication channels used to communicate climate information, risks as well as general climate change.

This framework builds on the information deficit model which holds that lack of understanding and negative public attitudes or behaviours towards science and environmental problems such as climate change are as a result of a deficiency in knowledge (Suldovsky, 2017). This theory focuses on one-way channel of disseminating climate information which is accessible. The proposed framework recommends that climate communication channels should be two way involving feedback between the sender and the recipient and should focus on multiple dimensions; timely, relevant, ease of language and credibility in addition to accessibility.

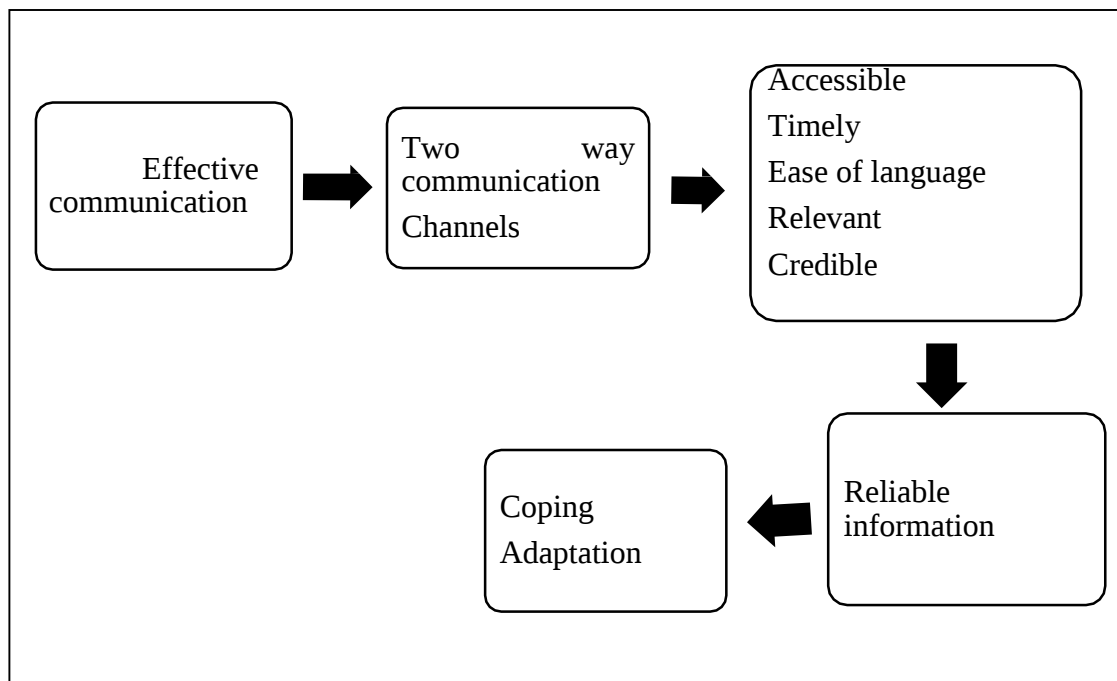


Figure 6.1: Effective climate communication for coping and adaptation

Source: Author, 2019

Enhancing climate communications requires timely accessibility to accurate climate information. The National Policy on Climate Change (2016) recognises awareness and

education through dissemination of climate change information as necessity for mitigation and adaptation. In Zambia, Climate change information is communicated through traditional communication channels such as television, radio, newsletters, brochures and newspapers as recommended in the national climate change communication strategy of 2011. Thus, despite these policies promoting climate change communication through traditional media, research shows an increase in use of advanced technologies and internet in accessing climate information. There is need for policy to emphasise the use of non-traditional communication media such as internet (weather apps, websites, emails and social media) as climate change is evolving so is communication.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

This study examined the effectiveness of climate communication channels utilized in the tourism sector of Livingstone. It investigated the impacts of climate variability on the tourism sector, the type of information required, how it is acquired and the effectiveness of the channels utilized to acquire this information. The study indicates that the tourism sector in Livingstone has been affected by climate variability with noticeable impacts being droughts, heat waves, floods and change in rainfall patterns. Droughts and changes in rainfall patterns lead to drying of flora and water on which wild animals depend, further heat waves restrict movements of wild animals in the national park forcing tourism operators and tourists to adjust game viewing times. This negatively impacts on the tourism sector as game viewing is one of the additional factors that pulls tourists to Livingstone (Dube and Nhamo, 2018). Droughts lead to water levels at the Victoria falls affecting the Victoria falls scenery. These impacts necessitate adaptation planning and thus climate information was identified as very vital for tourism in Livingstone, particularly by tourism operators. The study indicated that tourism stakeholders were more interested in short term climate information particularly temperature and rainfall as compared to long term climate information such as climate change projections. This is can be attributed the fact that most tourism activities are impacted by temperature and water levels.

The study concluded that majority of the tourism stakeholders in Livingstone have access to climate information. However, there are limitations in information dissemination as most utilised channels of communication are not effective due to limited accessibility, credibility and not timely. This study established the internet as the most effective channel of climate communication among international tourists and the television as most effective for locals.

7.2 Recommendations

The study identified various issues which affect effective climate communication in the tourism sector of Livingstone and may affect coping and adaptation planning. Therefore, the study makes recommendations as an approach to enhance climate communications to

enable sustainable operations of the tourism sector. The recommendations that follow address the problems that were identified.

- i. The study established that accessibility to climate information is vital for planning in Livingstone's tourism sector, however there is still a large proportion of tourism operators with limited accessibility. It is recommended that the Zambia Meteorological department and Ministry of Tourism disseminate climate information to tourism operators via email on a daily basis rather than on the assumed need-for-information-basis.
- ii. The study recognized the importance of the internet in the dissemination of climate information to tourists and tourism operators. It is recommended that ZMD develop a Zambian weather app with updated climate information inclusive of climate change projections be developed specifically for the tourism sector
- iii. In order to enhance effectiveness of climate communications in Livingstone's tourism, it is recommended that the Livingstone Tourism Board (LTB) disseminates up to date climate information through online platforms such as Facebook apps, twitter and online booking apps.
- iv. During the study participants indicated that climate information was communicated to them plainly without suggesting any coping options. It is recommended that the Ministry of Tourism and Zambia Meteorological Department communicate climate information inclusive of coping and adaptation options for the tourism sector to assist effective planning. This could entail inter-sectorial collaborations with departments that can apply the data generated by ZMD so that the disseminated information is inclusive of adaptation options.

7.3 Recommendations for Future Research

Effective communication of climate information is very vital in decision making and planning for expected climate impacts. This research provides an insight into the communication channels through which climate information is accessed in Livingstone's tourism sector. As such it provides knowledge on the effectiveness of these communication channels and determines the most effective channel to disseminate relevant and credible climate information to tourist and tourism operators to support adaptation. The research sufficiently the intended objectives, however, they would be a

great benefit from further research in climate change adaptation for the tourism sector.

Below are recommendations for future research,

1. Research to carry out the willingness to pay for climate information among international tourists and tourism operators. It would be very interesting to know the value of climate information among tourism stakeholders.
2. An in-depth exploration of how climate variability is impacting the tourism sector and to what extent. The research could explore how the impact of climate variability on tourism is affecting Livingstone socially and economically.
3. A final but critical research question to address in future research would be what coping and adaptation mechanisms have been put in place to mitigate the risk of climate variability and change.

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Appendix A: Pairwise comparisons of climate communication channels used in Livingstone based on Accessibility

Locals					International tourists			
(I) Modes of communication	(J) Modes of communication	Mean Difference	Std. Error	Sig.	(J) Modes of communication	Mean Difference	Std. Error	Sig.
Television	Radio	.41591 [*]	.19530	.034	Radio	.94118 [*]	.25712	.000
	Travel magazine	2.25000 [*]	.19477	.000	Travel magazine	.98039 [*]	.25712	.000
	Newspaper	1.33696 [*]	.19477	.000	Newspaper	.82353 [*]	.25712	.001
	Phone texts	.56522 [*]	.19477	.004	Phone texts	.13725	.25712	.594
	Internet	.93478 [*]	.19477	.000	Internet	-.58824 [*]	.25712	.023
	Travel agents	2.14130 [*]	.19477	.000	Travel Agents	.76471 [*]	.25712	.003
	Family and friends	1.20652 [*]	.19477	.000	Family and friends	.15686	.25712	.542
	Government institutions	1.42391 [*]	.19477	.000				
Radio	Television	-.41591 [*]	.19530	.034	Television	-.94118 [*]	.25712	.000
	Travel magazine	1.83409 [*]	.19530	.000	Travel magazine	.03922	.25712	.879
	Newspaper	.92105 [*]	.19530	.000	Newspaper	-.11765	.25712	.647
	Phone texts	.14931	.19530	.445	Phone texts	-.80392 [*]	.25712	.002
	Internet	.51887 [*]	.19530	.008	Internet	-1.52941 [*]	.25712	.000
	Travel agents	1.72539 [*]	.19530	.000	Travel Agents	-.17647	.25712	.493
	Family and friends	.79061 [*]	.19530	.000	Family and friends	-.78431 [*]	.25712	.002
	Government institutions	1.00800 [*]	.19530	.000				
Travel magazine	Television	-2.25000 [*]	.19477	.000	Television	-.98039 [*]	.25712	.000
	Radio	-1.83409 [*]	.19530	.000	Radio	-.03922	.25712	.879
	Newspaper	-.91304 [*]	.19477	.000	Newspaper	-.15686	.25712	.542
	Phone texts	-1.68478 [*]	.19477	.000	Phone texts	-.84314 [*]	.25712	.001
	Internet	-1.31522 [*]	.19477	.000	Internet	-1.56863 [*]	.25712	.000
	Travel agents	-.10870	.19477	.577	Travel Agents	-.21569	.25712	.402
	Family and friends	-1.04348 [*]	.19477	.000	Family and friends	-.82353 [*]	.25712	.001
	Government institutions	-.82609 [*]	.19477	.000				
Newspaper	Television	-1.33696 [*]	.19477	.000	Television	-.82353 [*]	.25712	.001
	Radio	-.92105 [*]	.19530	.000	Radio	.11765	.25712	.647
	Travel magazine	.91304 [*]	.19477	.000	Travel magazine	.15686	.25712	.542
	Phone texts	-.77174 [*]	.19477	.000	Phone texts	-.68627 [*]	.25712	.008
	Internet	-.40217 [*]	.19477	.039	Internet	-1.41176 [*]	.25712	.000
	Travel agents	.80435 [*]	.19477	.000	Travel Agents	-.05882	.25712	.819
	Family and friends	-.13043	.19477	.503	Family and friends	-.66667 [*]	.25712	.010
	Government institutions	.08696	.19477	.655				
Phone texts	Television	-.56522 [*]	.19477	.004	Television	-.13725	.25712	.594

	Radio	-.14931	.19530	.445	Radio	.80392	.25712	.002
	Travel magazine	1.68478	.19477	.000	Travel magazine	.84314	.25712	.001
	Newspaper	.77174	.19477	.000	Newspaper	.68627	.25712	.008
	Internet	.36957	.19477	.058	Internet	-.72549	.25712	.005
	Travel agents	1.57609	.19477	.000	Travel Agents	.62745	.25712	.015
	Family and friends	.64130	.19477	.001	Family and friends	.01961	.25712	.939
	Government institutions	.85870	.19477	.000		*		
Internet	Television	-.93478	.19477	.000	Television	.58824	.25712	.023
	Radio	-.51887	.19530	.008	Radio	1.52941	.25712	.000
	Travel magazine	1.31522	.19477	.000	Travel magazine	1.56863	.25712	.000
	Newspaper	.40217	.19477	.039	Newspaper	1.41176	.25712	.000
	Phone texts	-.36957	.19477	.058	Phone texts	.72549	.25712	.005
	Travel agents	1.20652	.19477	.000	Travel Agents	1.35294	.25712	.000
	Family and friends	.27174	.19477	.163	Family and friends	.74510	.25712	.004
	Government institutions	.48913	.19477	.012				
Travel Agents	Television	-2.14130	.19477	.000	Television	-.76471	.25712	.003
	Radio	-1.72539	.19530	.000	Radio	.17647	.25712	.493
	Travel magazine	.10870	.19477	.577	Travel magazine	.21569	.25712	.402
	Newspaper	-.80435	.19477	.000	Newspaper	.05882	.25712	.819
	Phone texts	-1.57609	.19477	.000	Phone texts	-.62745	.25712	.015
	Internet	-1.20652	.19477	.000	Internet	-1.35294	.25712	.000
	Family and friends	-.93478	.19477	.000	Family and friends	-.60784	.25712	.019
	Government institutions	-.71739	.19477	.000				
Family and friends	Television	-1.20652	.19477	.000	Television	-.15686	.25712	.542
	Radio	-.79061	.19530	.000	Radio	.78431	.25712	.002
	Travel magazine	1.04348	.19477	.000	Travel magazine	.82353	.25712	.001
	Newspaper	.13043	.19477	.503	Newspaper	.66667	.25712	.010
	Phone texts	-.64130	.19477	.001	Phone texts	-.01961	.25712	.939
	Internet	-.27174	.19477	.163	Internet	-.74510	.25712	.004
	Travel agents	.93478	.19477	.000	Travel Agents	.60784	.25712	.019
	Government institutions	.21739	.19477	.265				
Government institutions	Television	-1.42391	.19477	.000				
	Radio	-1.00800	.19530	.000				
	Travel magazine	.82609	.19477	.000				
	Newspaper	-.08696	.19477	.655				
	Phone texts	-.85870	.19477	.000				
	Internet	-.48913	.19477	.012				
	Travel agents	.71739	.19477	.000				
	Family and friends	-.21739	.19477	.265				

Appendix B: Pairwise comparisons of climate communication channels in Livingstone based on timely dissemination

Locals					International tourists			
modes of communication	modes of communication	Mean Difference	Std. Error	Sig.	modes of communication	Mean Difference	Std. Error	Sig.
Television	Radio	-.04790	.18855	.800	Radio	.27451	.26334	.298
	Travel magazine	1.47826 [*]	.18803	.000	Travel magazine	.50980	.26334	.054
	Newspaper	.77174 [*]	.18803	.000	Newspaper	.58824 [*]	.26334	.026
	Phone texts	-.11957	.18803	.525	Phone texts	-.60784 [*]	.26334	.021
	Internet	.09783	.18803	.603	Internet	-1.49020 [*]	.26334	.000
	Travel agents	1.35870 [*]	.18803	.000	Travel agents	-.07843	.26334	.766
	Family and friends	.89130 [*]	.18803	.000	Family and friends	-.88235 [*]	.26334	.001
	Government institutions	.57609 [*]	.18803	.002				
Radio	Television	.04790	.18855	.800	Television	-.27451	.26334	.298
	Travel magazine	1.52616 [*]	.18855	.000	Travel magazine	.23529	.26334	.372
	Newspaper	.81964 [*]	.18855	.000	Newspaper	.31373	.26334	.234
	Phone texts	-.07167	.18855	.704	Phone texts	-.88235 [*]	.26334	.001
	Internet	.14572	.18855	.440	Internet	-1.76471 [*]	.26334	.000
	Travel agents	1.40659 [*]	.18855	.000	Travel agents	-.35294	.26334	.181
	Family and friends	.93920 [*]	.18855	.000	Family and friends	-1.15686 [*]	.26334	.000
	Government institutions	.62398 [*]	.18855	.001				
Travel magazine	Television	-1.47826 [*]	.18803	.000	Television	-.50980	.26334	.054
	Radio	-1.52616 [*]	.18855	.000	Radio	-.23529	.26334	.372
	Newspaper	-.70652 [*]	.18803	.000	Newspaper	.07843	.26334	.766
	Phone texts	-1.59783 [*]	.18803	.000	Phone texts	-1.11765 [*]	.26334	.000
	Internet	-1.38043 [*]	.18803	.000	Internet	-2.00000 [*]	.26334	.000
	Travel agents	-.11957	.18803	.525	Travel agents	-.58824 [*]	.26334	.026
	Family and friends	-.58696 [*]	.18803	.002	Family and friends	-1.39216 [*]	.26334	.000
	Government institutions	-.90217 [*]	.18803	.000				
Newspaper	Television	-.77174 [*]	.18803	.000	Television	-.58824 [*]	.26334	.026
	Radio	-.81964 [*]	.18855	.000	Radio	-.31373	.26334	.234
	Travel magazine	.70652 [*]	.18803	.000	Travel magazine	-.07843	.26334	.766
	Phone texts	-.89130 [*]	.18803	.000	Phone texts	-1.19608 [*]	.26334	.000
	Internet	-.67391 [*]	.18803	.000	Internet	-2.07843 [*]	.26334	.000
	Travel agents	.58696 [*]	.18803	.002	Travel agents	-.66667 [*]	.26334	.012
	Family and friends	.11957	.18803	.525	Family and friends	-1.47059 [*]	.26334	.000
	Government institutions	-.19565	.18803	.298				
Phone texts	Television	.11957	.18803	.525	Television	.60784 [*]	.26334	.021
	Radio	.07167	.18855	.704	Radio	.88235 [*]	.26334	.001
	Travel magazine	1.59783 [*]	.18803	.000	Travel magazine	1.11765 [*]	.26334	.000

	Newspaper	.89130 ⁺	.18803	.000	Newspaper	1.19608 ⁺	.26334	.000
	Internet	.21739	.18803	.248	Internet	-.88235 ⁺	.26334	.001
	Travel agents	1.47826 ⁺	.18803	.000	Travel agents	.52941 ⁺	.26334	.045
	Family and friends	1.01087 ⁺	.18803	.000	Family and friends	-.27451	.26334	.298
	Government institutions	.69565 ⁺	.18803	.000				
Internet	Television	-.09783	.18803	.603	Television	1.49020 ⁺	.26334	.000
	Radio	-.14572	.18855	.440	Radio	1.76471 ⁺	.26334	.000
	Travel magazine	1.38043 ⁺	.18803	.000	Travel magazine	2.00000 ⁺	.26334	.000
	Newspaper	.67391 ⁺	.18803	.000	Newspaper	2.07843 ⁺	.26334	.000
	Phone texts	-.21739	.18803	.248	Phone texts	.88235 ⁺	.26334	.001
	Travel agents	1.26087 ⁺	.18803	.000	Travel agents	1.41176 ⁺	.26334	.000
	Family and friends	.79348 ⁺	.18803	.000	Family and friends	.60784 ⁺	.26334	.021
	Government institutions	.47826 ⁺	.18803	.011		*		
Travel agents	Television	-1.35870 ⁺	.18803	.000	Television	.07843	.26334	.766
	Radio	-1.40659 ⁺	.18855	.000	Radio	.35294	.26334	.181
	Travel magazine	.11957	.18803	.525	Travel magazine	.58824 ⁺	.26334	.026
	Newspaper	-.58696 ⁺	.18803	.002	Newspaper	.66667 ⁺	.26334	.012
	Phone texts	-1.47826 ⁺	.18803	.000	Phone texts	-.52941 ⁺	.26334	.045
	Internet	-1.26087 ⁺	.18803	.000	Internet	-1.41176 ⁺	.26334	.000
	Family and friends	-.46739 ⁺	.18803	.013	Family and friends	-.80392 ⁺	.26334	.002
	Government institutions	-.78261 ⁺	.18803	.000				
Family and friends	Television	-.89130 ⁺	.18803	.000	Television	.88235 ⁺	.26334	.001
	Radio	-.93920 ⁺	.18855	.000	Radio	1.15686 ⁺	.26334	.000
	Travel magazine	.58696 ⁺	.18803	.002	Travel magazine	1.39216 ⁺	.26334	.000
	Newspaper	-.11957	.18803	.525	Newspaper	1.47059 ⁺	.26334	.000
	Phone texts	-1.01087 ⁺	.18803	.000	Phone texts	.27451	.26334	.298
	Internet	-.79348 ⁺	.18803	.000	Internet	-.60784 ⁺	.26334	.021
	Travel agents	.46739 ⁺	.18803	.013	Travel agents	.80392 ⁺	.26334	.002
	Government institutions	-.31522	.18803	.094				
Government institutions	Television	-.57609	.18803	.002				
	Radio	-.62398 ⁺	.18855	.001				
	Travel magazine	.90217 ⁺	.18803	.000				
	Newspaper	.19565	.18803	.298				
	Phone texts	-.69565 ⁺	.18803	.000				
	Internet	-.47826 ⁺	.18803	.011				
	Travel agents	.78261 ⁺	.18803	.000				
	Family and friends	.31522	.18803	.094				

Appendix C: Pairwise Comparisons of Climate Communication Channels in Livingstone based on Ease of Language

Locals					International tourists			
(I) modes of communication	(J) modes of communication	Mean Difference (I-J)	Std. Error	Sig.	modes of communication	Mean Difference	Std. Error	Sig.
Television	Radio	-.20676	.20576	.315	Radio	.68627 [*]	.28107	.015
	Travel magazine	.79348 [*]	.20520	.000	Travel magazine	.17647	.28107	.530
	Newspaper	.81522 [*]	.20520	.000	Newspaper	.29412	.28107	.296
	Phone texts	.60643 [*]	.20576	.003	Phone texts	-.01961	.28107	.944
	Internet	.50339 [*]	.20464	.014	Internet	-1.07843 [*]	.28107	.000
	Travel agents	.54348 [*]	.20520	.008	Travel agents	.05882	.28107	.834
	Family and friends	.01087	.20520	.958	Family and friends	-1.01961 [*]	.28107	.000
	Government institutions	.34783	.20520	.090				
Radio	Television	.20676	.20576	.315	Television	-.68627 [*]	.28107	.015
	Travel magazine	1.00024 [*]	.20576	.000	Travel magazine	-.50980	.28107	.070
	Newspaper	1.02198 [*]	.20576	.000	Newspaper	-.39216	.28107	.164
	Phone texts	.81319 [*]	.20632	.000	Phone texts	-.70588 [*]	.28107	.012
	Internet	.71015 [*]	.20521	.001	Internet	-1.76471 [*]	.28107	.000
	Travel agents	.75024 [*]	.20576	.000	Travel agents	-.62745 [*]	.28107	.026
	Family and friends	.21763	.20576	.291	Family and friends	-1.70588 [*]	.28107	.000
	Government institutions	.55459 [*]	.20576	.007				
Travel magazine	Television	-.79348 [*]	.20520	.000	Television	-.17647	.28107	.530
	Radio	-1.00024 [*]	.20576	.000	Radio	.50980	.28107	.070
	Newspaper	.02174	.20520	.916	Newspaper	.11765	.28107	.676
	Phone texts	-.18705	.20576	.364	Phone texts	-.19608	.28107	.486
	Internet	-.29009	.20464	.157	Internet	-1.25490 [*]	.28107	.000
	Travel agents	-.25000	.20520	.223	Travel agents	-.11765	.28107	.676
	Family and friends	-.78261 [*]	.20520	.000	Family and friends	-1.19608 [*]	.28107	.000
	Government institutions	-.44565 [*]	.20520	.030				
Newspaper	Television	-.81522 [*]	.20520	.000	Television	-.29412	.28107	.296
	Radio	-1.02198 [*]	.20576	.000	Radio	.39216	.28107	.164
	Travel magazine	-.02174	.20520	.916	Travel magazine	-.11765	.28107	.676
	Phone texts	-.20879	.20576	.311	Phone texts	-.31373	.28107	.265
	Internet	-.31183	.20464	.128	Internet	-1.37255 [*]	.28107	.000
	Travel agents	-.27174	.20520	.186	Travel agents	-.23529	.28107	.403
	Family and friends	-.80435 [*]	.20520	.000	Family and friends	-1.31373 [*]	.28107	.000
	Government institutions	-.46739 [*]	.20520	.023				
Phone texts	Television	-.60643 [*]	.20576	.003	Television	.01961	.28107	.944
	Radio	-.81319 [*]	.20632	.000	Radio	.70588 [*]	.28107	.012

	Travel magazine	.18705	.20576	.364	Travel magazine	.19608	.28107	.486
	Newspaper	.20879	.20576	.311	Newspaper	.31373	.28107	.265
	Internet	-.10304	.20521	.616	Internet	-1.05882*	.28107	.000
	Travel agents	-.06295	.20576	.760	Travel agents	.07843	.28107	.780
	Family and friends	-.59556*	.20576	.004	Family and friends	-1.00000*	.28107	.000
	Government institutions	-.25860	.20576	.209				
Internet	Television	-.50339*	.20464	.014	Television	1.07843*	.28107	.000
	Radio	-.71015*	.20521	.001	Radio	1.76471*	.28107	.000
	Travel magazine	.29009	.20464	.157	Travel magazine	1.25490*	.28107	.000
	Newspaper	.31183	.20464	.128	Newspaper	1.37255*	.28107	.000
	Phone texts	.10304	.20521	.616	Phone texts	1.05882*	.28107	.000
	Travel agents	.04009	.20464	.845	Travel agents	1.13725*	.28107	.000
	Family and friends	-.49252*	.20464	.016	Family and friends	.05882	.28107	.834
	Government institutions	-.15556	.20464	.447				
Travel agents	Television	-.54348*	.20520	.008	Television	-.05882	.28107	.834
	Radio	-.75024*	.20576	.000	Radio	.62745*	.28107	.026
	Travel magazine	.25000	.20520	.223	Travel magazine	.11765	.28107	.676
	Newspaper	.27174	.20520	.186	Newspaper	.23529	.28107	.403
	Phone texts	.06295	.20576	.760	Phone texts	-.07843	.28107	.780
	Internet	-.04009	.20464	.845	Internet	-1.13725*	.28107	.000
	Family and friends	-.53261*	.20520	.010	Family and friends	-1.07843*	.28107	.000
	Government institutions	-.19565	.20520	.341				
Family and friends	Television	-.01087	.20520	.958	Television	1.01961*	.28107	.000
	Radio	-.21763	.20576	.291	Radio	1.70588*	.28107	.000
	Travel magazine	.78261*	.20520	.000	Travel magazine	1.19608*	.28107	.000
	Newspaper	.80435*	.20520	.000	Newspaper	1.31373*	.28107	.000
	Phone texts	.59556*	.20576	.004	Phone texts	1.00000*	.28107	.000
	Internet	.49252*	.20464	.016	Internet	-.05882	.28107	.834
	Travel agents	.53261*	.20520	.010	Travel agents	1.07843*	.28107	.000
	Government institutions	.33696	.20520	.101				
Government institutions	Television	-.34783	.20520	.090				
	Radio	-.55459*	.20576	.007				
	Travel magazine	.44565*	.20520	.030				
	Newspaper	.46739*	.20520	.023				
	Phone texts	.25860	.20576	.209				
	Internet	.15556	.20464	.447				
	Travel agents	.19565	.20520	.341				
	Family and friends	-.33696	.20520	.101				

Appendix D: Pairwise Comparisons of climate communication channels in Livingstone based on relevance

Locals					International tourists			
(I) Modes of communication	(J) Modes of communication	Mean Difference (I-J)	Std. Error	Sig.	(J) Modes of communication	Mean Difference (I-J)	Std. Error	Sig.
Television	Radio	-.11562	.20573	.574	Radio	.64706 [*]	.26622	.015
	Travel magazine	.17391	.20517	.397	Travel magazine	.17647	.26622	.508
	Newspaper	.72826 [*]	.20517	.000	Newspaper	.72549 [*]	.26622	.007
	Phone texts	.51087 [*]	.20517	.013	Phone texts	-.05882	.26622	.825
	Internet	.20652	.20517	.314	Internet	-.98039 [*]	.26622	.000
	Travel agents	.45652 [*]	.20517	.026	Travel agents	.15686	.26622	.556
	Family and friends	.80435 [*]	.20517	.000	Family and friends	-.41176	.26622	.123
	Government institutions	.55435 [*]	.20517	.007				
Radio	Television	.11562	.20573	.574	Television	-.64706 [*]	.26622	.015
	Travel magazine	.28954	.20573	.160	Travel magazine	-.47059	.26622	.078
	Newspaper	.84388 [*]	.20573	.000	Newspaper	.07843	.26622	.768
	Phone texts	.62649 [*]	.20573	.002	Phone texts	-.70588 [*]	.26622	.008
	Internet	.32215	.20573	.118	Internet	-1.62745 [*]	.26622	.000
	Travel agents	.57215 [*]	.20573	.006	Travel agents	-.49020	.26622	.066
	Family and friends	.91997 [*]	.20573	.000	Family and friends	-1.05882 [*]	.26622	.000
	Government institutions	.66997 [*]	.20573	.001				
Travel magazine	Television	-.17391	.20517	.397	Television	-.17647	.26622	.508
	Radio	-.28954	.20573	.160	Radio	.47059	.26622	.078
	Newspaper	.55435 [*]	.20517	.007	Newspaper	.54902 [*]	.26622	.040
	Phone texts	.33696	.20517	.101	Phone texts	-.23529	.26622	.377
	Internet	.03261	.20517	.874	Internet	-1.15686 [*]	.26622	.000
	Travel agents	.28261	.20517	.169	Travel agents	-.01961	.26622	.941
	Family and friends	.63043 [*]	.20517	.002	Family and friends	-.58824 [*]	.26622	.028
	Government institutions	.38043	.20517	.064				
Newspaper	Television	-.72826 [*]	.20517	.000	Television	-.72549 [*]	.26622	.007
	Radio	-.84388 [*]	.20573	.000	Radio	-.07843	.26622	.768
	Travel magazine	-.55435 [*]	.20517	.007	Travel magazine	-.54902 [*]	.26622	.040
	Phone texts	-.21739	.20517	.290	Phone texts	-.78431 [*]	.26622	.003
	Internet	-.52174 [*]	.20517	.011	Internet	-1.70588 [*]	.26622	.000
	Travel agents	-.27174	.20517	.186	Travel agents	-.56863 [*]	.26622	.033
	Family and friends	.07609	.20517	.711	Family and friends	-1.13725 [*]	.26622	.000
	Government institutions	-.17391	.20517	.397				
Phone texts	Television	-.51087 [*]	.20517	.013	Television	.05882	.26622	.825
	Radio	-.62649 [*]	.20573	.002	Radio	.70588 [*]	.26622	.008
	Travel magazine	-.33696	.20517	.101	Travel magazine	.23529	.26622	.377
	Newspaper	.21739	.20517	.290	Newspaper	.78431 [*]	.26622	.003

	Internet	-.30435	.20517	.138	Internet	-.92157 [†]	.26622	.001
	Travel agents	-.05435	.20517	.791	Travel agents	.21569	.26622	.418
	Family and friends	.29348	.20517	.153	Family and friends	-.35294	.26622	.186
	Government institutions	.04348	.20517	.832				
Internet	Television	-.20652	.20517	.314	Television	.98039 [†]	.26622	.000
	Radio	-.32215	.20573	.118	Radio	1.62745 [†]	.26622	.000
	Travel magazine	-.03261	.20517	.874	Travel magazine	1.15686 [†]	.26622	.000
	Newspaper	.52174 [†]	.20517	.011	Newspaper	1.70588 [†]	.26622	.000
	Phone texts	.30435	.20517	.138	Phone texts	.92157 [†]	.26622	.001
	Travel agents	.25000	.20517	.223	Travel agents	1.13725 [†]	.26622	.000
	Family and friends	.59783 [†]	.20517	.004	Family and friends	.56863 [†]	.26622	.033
	Government institutions	.34783	.20517	.090				
Travel agents	Television	-.45652 [†]	.20517	.026	Television	-.15686	.26622	.556
	Radio	-.57215 [†]	.20573	.006	Radio	.49020	.26622	.066
	Travel magazine	-.28261	.20517	.169	Travel magazine	.01961	.26622	.941
	Newspaper	.27174	.20517	.186	Newspaper	.56863 [†]	.26622	.033
	Phone texts	.05435	.20517	.791	Phone texts	-.21569	.26622	.418
	Internet	-.25000	.20517	.223	Internet	-1.13725 [†]	.26622	.000
	Family and friends	.34783	.20517	.090	Family and friends	-.56863 [†]	.26622	.033
	Government institutions	.09783	.20517	.634				
Family and friends	Television	-.80435 [†]	.20517	.000	Television	.41176	.26622	.123
	Radio	-.91997 [†]	.20573	.000	Radio	1.05882 [†]	.26622	.000
	Travel magazine	-.63043 [†]	.20517	.002	Travel magazine	.58824 [†]	.26622	.028
	Newspaper	-.07609	.20517	.711	Newspaper	1.13725 [†]	.26622	.000
	Phone texts	-.29348	.20517	.153	Phone texts	.35294	.26622	.186
	Internet	-.59783 [†]	.20517	.004	Internet	-.56863 [†]	.26622	.033
	Travel agents	-.34783	.20517	.090	Travel agents	.56863 [†]	.26622	.033
	Government institutions	-.25000	.20517	.223				
Government institutions	Television	-.55435 [†]	.20517	.007				
	Radio	-.66997 [†]	.20573	.001				
	Travel magazine	-.38043	.20517	.064				
	Newspaper	.17391	.20517	.397				
	Phone texts	-.04348	.20517	.832				
	Internet	-.34783	.20517	.090				
	Travel agents	-.09783	.20517	.634				
	Family and friends	.25000	.20517	.223				

Appendix E: Pairwise comparisons of climate communication channels in Livingstone based on Credibility

Locals					International tourists			
Modes of communication	Modes of communication	Mean Difference	Std. Error	Sig.	Modes of communication	Mean Difference	Std. Error	Sig.
Television	Radio	.31498	.19169	.101	Radio	.52941*	.26511	.046
	Travel magazine	.73913*	.19117	.000	Travel Magazine	.25490	.26511	.337
	Newspaper	.57609*	.19117	.003	Newspaper	.47059	.26511	.077
	Phone texts	.10870	.19117	.570	Phone texts	-.13725	.26511	.605
	Internet	-.17391	.19117	.363	Internet	-.90196*	.26511	.001
	Travel agents	.94565*	.19117	.000	Travel agents	-.03922	.26511	.882
	Family and Friends	1.07609*	.19117	.000	Family and friends	-.23529	.26511	.375
	Government institutions	.36957	.19117	.054				
Radio	Television	-.31498	.19169	.101	Television	-.52941*	.26511	.046
	Travel magazine	.42415*	.19169	.027	Travel Magazine	-.27451	.26511	.301
	Newspaper	.26111	.19169	.174	Newspaper	-.05882	.26511	.825
	Phone texts	-.20628	.19169	.282	Phone texts	-.66667*	.26511	.012
	Internet	-.48889*	.19169	.011	Internet	-1.43137*	.26511	.000
	Travel agents	.63067*	.19169	.001	Travel agents	-.56863*	.26511	.032
	Family and Friends	.76111*	.19169	.000	Family and friends	-.76471*	.26511	.004
	Government institutions	.05459	.19169	.776				
Travel Magazine	Television	-.73913*	.19117	.000	Television	-.25490	.26511	.337
	Radio	-.42415*	.19169	.027	Radio	.27451	.26511	.301
	Newspaper	-.16304	.19117	.394	Newspaper	.21569	.26511	.416
	Phone texts	-.63043*	.19117	.001	Phone texts	-.39216	.26511	.140
	Internet	-.91304*	.19117	.000	Internet	-1.15686*	.26511	.000
	Travel agents	.20652	.19117	.280	Travel agents	-.29412	.26511	.268
	Family and Friends	.33696	.19117	.078	Family and friends	-.49020	.26511	.065
	Government institutions	-.36957	.19117	.054				
Newspaper	Television	-.57609*	.19117	.003	Television	-.47059	.26511	.077
	Radio	-.26111	.19169	.174	Radio	.05882	.26511	.825
	Travel magazine	.16304	.19117	.394	Travel Magazine	-.21569	.26511	.416
	Phone texts	-.46739*	.19117	.015	Phone texts	-.60784*	.26511	.022
	Internet	-.75000*	.19117	.000	Internet	-1.37255*	.26511	.000
	Travel agents	.36957	.19117	.054	Travel agents	-.50980	.26511	.055
	Family and Friends	.50000*	.19117	.009	Family and friends	-.70588*	.26511	.008
	Government institutions	-.20652	.19117	.280				
Phone texts	Television	-.10870	.19117	.570	Television	.13725	.26511	.605
	Radio	.20628	.19169	.282	Radio	.66667*	.26511	.012

	Travel magazine	.63043*	.19117	.001	Travel Magazine	.39216	.26511	.140
	Newspaper	.46739*	.19117	.015	Newspaper	.60784*	.26511	.022
	Internet	-.28261	.19117	.140	Internet	-.76471*	.26511	.004
	Travel agents	.83696*	.19117	.000	Travel agents	.09804	.26511	.712
	Family and Friends	.96739*	.19117	.000	Family and friends	-.09804	.26511	.712
	Government institutions	.26087	.19117	.173				
Internet	Television	.17391	.19117	.363	Television	.90196*	.26511	.001
	Radio	.48889*	.19169	.011	Radio	1.43137*	.26511	.000
	Travel magazine	.91304*	.19117	.000	Travel Magazine	1.15686*	.26511	.000
	Newspaper	.75000*	.19117	.000	Newspaper	1.37255*	.26511	.000
	Phone texts	.28261	.19117	.140	Phone texts	.76471*	.26511	.004
	Travel agents	1.11957*	.19117	.000	Travel agents	.86275*	.26511	.001
	Family and Friends	1.25000*	.19117	.000	Family and friends	.66667*	.26511	.012
	Government institutions	.54348*	.19117	.005				
Travel agents	Television	-.94565*	.19117	.000	Television	.03922	.26511	.882
	Radio	-.63067*	.19169	.001	Radio	.56863*	.26511	.032
	Travel magazine	-.20652	.19117	.280	Travel Magazine	.29412	.26511	.268
	Newspaper	-.36957	.19117	.054	Newspaper	.50980	.26511	.055
	Phone texts	-.83696*	.19117	.000	Phone texts	-.09804	.26511	.712
	Internet	-1.11957*	.19117	.000	Internet	-.86275*	.26511	.001
	Family and Friends	.13043	.19117	.495	Family and friends	-.19608	.26511	.460
	Government institutions	-.57609*	.19117	.003				
Family and friends	Television	-1.07609*	.19117	.000	Television	.23529	.26511	.375
	Radio	-.76111*	.19169	.000	Radio	.76471*	.26511	.004
	Travel magazine	-.33696	.19117	.078	Travel Magazine	.49020	.26511	.065
	Newspaper	-.50000*	.19117	.009	Newspaper	.70588*	.26511	.008
	Phone texts	-.96739*	.19117	.000	Phone texts	.09804	.26511	.712
	Internet	-1.25000*	.19117	.000	Internet	-.66667*	.26511	.012
	Travel agents	-.13043	.19117	.495	Travel agents	.19608	.26511	.460
	Government institutions	-.70652*	.19117	.000				
Government institutions	Television	-.36957	.19117	.054				
	Radio	-.05459	.19169	.776				
	Travel magazine	.36957	.19117	.054				
	Newspaper	.20652	.19117	.280				
	Phone texts	-.26087	.19117	.173				
	Internet	-.54348*	.19117	.005				
	Travel agents	.57609*	.19117	.003				
	Family and Friends	.70652*	.19117	.000				

Appendix F: Structured interviews for Locals and International tourists

Introduction

Hi my name is

I am a student at the University of Zambia pursuing a Master's of Science in Environment and Natural Resource Management. I am conducting a study titled: **Climate Communication for Adaptation Planning in The Tourism Sector in Livingstone, Zambia**. The study is significant to the tourism sector as it contributes to enhancing communication for adaptation planning. You are invited to participate in the study. The information collected will be used for academic purpose only and the researcher will keep such information strictly confidential. Thank you for participating in this survey.

SECTION A: PERSONAL INFORMATION

Please tick where appropriate.

1. Gender

☐ Male ☐ Female

2. Age:

3. Nationality:

4. Home Address e.g. Dambwa.....

SECTION B: IMPACTS OF CLIMATE VARIABILITY /CHANGE ON TOURISM IN LIVINGSTONE

5. Do you think this tourism destination is affected by climate variability/ change?

☐ Yes ☐ No ☐ I don't know

6. If yes, how is it being affected by climate variability/change?

☐ Heat waves ☐ droughts ☐ flooding ☐ change in rainfall patterns

Any other ways
(specify).....

7. How would you rate the impacts of climate variability/change affecting tourism in this area?

	Very high	High	Moderate	low	Very low
Impact					
Heat waves	☐	☐	☐	☐	☐
Droughts	☐	☐	☐	☐	☐
Floods	☐	☐	☐	☐	☐
Changes in rainfall patterns	☐	☐	☐	☐	☐

8. How do you perceive the magnitude of climate variability/change on the following tourism activities?

Tourism activities	Very high	High	Moderate	Low	Verylow
Water rafting	☐	☐	☐	☐	☐
Wildlife safaris	☐	☐	☐	☐	☐
Boat cruises	☐	☐	☐	☐	☐
Victoria Falls	☐	☐	☐	☐	☐
Sceneries e.g parks, buildings	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
Sport fishing	☐	☐	☐	☐	☐

SECTION C: IMPORTANCE OF CLIMATE INFORMATION

Climate information describes data on temperature, rainfall, wind, humidity, sunshine hours etc. ranging from short term (days to weeks) to long term (months to years and decades).

9. How would you rate the importance of climate information to tourists?

[] Very important [] Important [] Moderately important [] Not important

10. Do you receive any climate information in relation to this tourism destination?

[] Yes [] No

11. If answer to question 10 is yes, what type of climate information do you receive?

- a) Seasonal weather forecasts []
- b) Forecast on daily temperature []
- c) Monthly updates on climate []
- d) Daily and weekly weather forecasts []
- e) Real time weather information (temperature, rainfall etc.) []
- f) Climate change projections []

12. If answer to question 10 is No, state the type of climate information you are interested in receiving?

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

13. How does climate information assist in decision making for a tourism destination?

[] Time of visit [] Activities to take part in [] Length of stay [] what to pack for trip

SECTION D: DELIVERY OF CLIMATE INFORMATION IN LIVINGSTONE.

14. What mode of communication do you use to access climate information about this tourist destination?

[] Television [] Radio [] Travel Magazine [] Newspaper [] Phone (sms) []
Internet

[] Travel agencies [] Family and friends [] Government institutions

15. In the table below rate each type of media in terms of **accessibility, ease of language, credibility, relevancy and timely dissemination** of climate information. Rate each media using the following scale, placing the rating number in the Blank boxes.

Very high [5] High [4] Medium [3] Low [2] Very low [1]

Media	Accessibility	Timely	Ease of Language	Relevancy	Credibility
Television					
Radio					
Travel Magazines					
Newspaper					
Phone (text messaging)					
Internet					
Travel agents					
Family and friends					
Government institutions					

16. Select your most preferred channel/channels of receiving climate information

- Television []
- Radio []
- Magazine []
- Newspaper []
- Phone (text messaging) []
- Internet []
- Family and friends []
- Government institutions []
- Non - governmental organisations []

17. reasons for your answer on question 16.....

Thank you for taking part in the Survey!

Appendix G: Interview guide for Tourism operators

Introduction

I am a student at the University of Zambia pursuing a Master's of Science in Environment and Natural Resource Management. I am conducting a study titled: **Climate Communication for Adaptation Planning in The Tourism Sector in Livingstone, Zambia**. The study is significant to the tourism sector as it will contribute to enhancing communication for adaptation planning. You are invited to participate in the study. The information collected will be used for academic purpose only and the researcher will keep such information strictly confidential. Thank you for participating in this survey.

SECTION A: PERSONAL INFORMATION

Name:

Age:

Gender:

Position:

Type of Tourism Company:

SECTION B: IMPACTS OF CLIMATE VARIABILITY/CHANGE ON TOURISM IN LIVINGSTONE

Please tick where appropriate

1. Do you think the tourism sector in Livingstone is affected by climate variability/change?
Yes ☐ No ☐ ☐ I don't know
2. If answer to question 1 is yes, what climate variability/change impacts have you observed?
Droughts ☐
Heat waves ☐
Floods ☐
Change in rainfall patterns ☐
Other, specify.....

3. What is the magnitude of these climate variability/change impacts on Livingstone's tourism?

Impacts	Very high	High	Moderate	Low	Very low
Droughts					
Heat waves					
Floods					
Change in rainfall patterns					

4. How are these impacts affecting the tourism sector?

5. What tourism activities do you offer?

6. How are these tourism activities being affected by climate variability/ change?

7. How do you perceive the magnitude of these impacts on the tourism activities you offer?

Very High [] High [] Moderate [] Low [] Very Low []

SECTION C: IMPORTANCE OF CLIMATE INFORMATION

Climate information is information on historical climate and real time weather conditions. It describes data on temperature, rainfall, wind, humidity, sunshine hours etc. ranging from short term (days to weeks) to long term (months to years and decades).

8. How important is climate information to tourism sector?

[] Very important [] moderately important [] Not important

9. Do you receive any climate information?

[] Yes [] No

10. If answer to question 9 is yes, what type of climate information do you receive?

- a) Seasonal weather forecasts []
- b) Forecast on daily temperature []
- c) Monthly updates on climate []
- d) Daily and weekly weather forecasts []
- e) Real time weather information (temperature, rainfall etc.) []
- f) Climate change projections []

11. If answer to question 9 is No, specify the type of climate information are you interested in receiving.

12. How does climate information assist you in planning for adaptation?

SECTION D: DELIVERY OF CLIMATE INFORMATION IN LIVINGSTONE.

13. What mode of communication do you use to receive climate information?

☐ Television ☐ Radio ☐ Magazine ☐ Newspaper ☐ Phone (text messaging) ☐

Internet ☐ Family and friends ☐ Government organisations ☐ Non-governmental organisations.

14. What language is used to communicate climate information? -----

15. In the table below rate each type of media in terms of **accessibility, ease of language, accuracy, relevancy, legitimacy and timely dissemination** of climate information. Rate each media using the following scale, placing the rating number in the Blank boxes.

Very high [5] High [4] Medium [3] Low [2] Very low [1]

Media	Accessibility	Timely	Ease of Language	Relevancy	Credibility
Television					
Radio					
Travel Magazines					
Newspaper					
Phone(text messaging)					
Emails					
Internet					
travel agents					
Family and friends					
Government institutions					
NGOs					

16. Select your most preferred channel/channels of receiving climate information

- | | |
|----------------------------------|--------------------------|
| Television | ☐ |
| Radio | ☐ |
| Magazine | ☐ |
| Newspaper | ☐ |
| Phone (text messaging) | ☐ |
| Internet | ☐ |
| Family and friends | ☐ |
| Government institutions | ☐ |
| Non - governmental organisations | ☐ |

17. reasons for your answer on question 16.....

Thank you for taking part in the survey!

Appendix H: Interview guide for Key informants

Introduction

Hi my name is -----

I am a student at the University of Zambia pursuing a Master's of Science in Environment and Natural Resource Management. I am conducting a study titled: **Climate Communication for Adaptation Planning in The Tourism Sector in Livingstone, Zambia**. The study is significant to the tourism sector as it will contribute to enhancing communication for adaptation planning. You are invited to participate in the study. The information collected will be used for academic purpose only and the researcher will keep such information strictly confidential. Thank you for participating in this survey.

SECTION A: ORGANISTIONAL INFORMATION

Name:

Age:

Gender:

Position:

Organization:

SECTION B: IMPACTS OF CLIMATE VARIABILITY/CHANGE IN LIVINGSTONE

1. Do you think Livingstone is experiencing climate variability/change?
Yes [] No [] [] I don't know
2. If the answer to question 1 is yes, what climate variability/change impacts are being experienced?

3. How are these climate variability/change impacts affecting tourism in Livingstone?

- -----

4. What tourism activities are affected by climate variability/change?

- -----

5. Which of these tourism activities are being affected the most?

SECTION C: DELIVERY OF CLIMATE INFORMATION

6. How important is climate information for tourism?

Very important [] Moderately Important [] Not Important []

7. How do you disseminate climate information to tourists and tourism operators?

- -----

8. What climate information do you disseminate to the tourists and tourism operators?

9. Is the mode of dissemination easily accessible to the users of climate information?
Yes [] No []

10. Give reasons for your answer to question 9

11. In what Language is climate information communicated?

12. Is the climate information disseminated easily understood?

Yes [] No []

13. Give reasons to answers in question 12

14. Is the communicated climate information accurate and reliable?

15. How relevant is the communicated information to tourists and tourism operator needs?

16. Does the communicated climate information encourage action towards adaptation planning to climate variability/change?

17. How can climate communication in the tourism sector be improved?

Thank you for your Participation