Intergenerational adaptability to natural hazards: A case study of the Kasane community

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DECLARATION

I Madiphoko Sylveria Moholo, hereby declare that: "***Intergenerational Adaptability to Natural Hazards: A Case Study of the Kasane Community***" is my own work.

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I declare that this dissertation is my own work and is based on the work conducted by me and that it has not been submitted elsewhere for the purpose of obtaining a degree or diploma.

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ABSTRACT

Over the past decade, an increase in the frequent occurrence of natural hazards have had a negative impact to the human race. An increase in the incident and severity of natural hazards and disasters is due in part to the change in the climatic conditions experienced globally, with the results that both human and natural systems have been negatively affected. With the increase in the global climatic conditions, the adverse damaging impact of natural hazards has increased in severity, spatial coverage and in the frequency of the occurrence of these natural hazards. This is because climate change exacerbates some of the natural hazards, particularly those of hydro-meteorological origin. Multiple, frequent repeating and compound shocks that are experienced in Sub-Saharan Africa prevent the communities from fully recovering, and as each of these shocks is individually not of a scale that attracts global attention, responses are often under-resourced (Reliefweb, 2004).

To reduce the impact of natural hazards exacerbated by climate change measures need to be taken in the physical, economic and social environment of the areas at risk. In the field of Disaster Risk Management there are two generic measures that are often taken to lessen the adverse impact of natural hazards, namely adaptation and mitigation. Adaptation is continuous, and it encompasses a continuous stream of activities, actions, and attitudes that informs decisions about all aspects of life, and that reflects existing social norms and processes. Mitigation is the lessening or minimising of the adverse impact of a hazardous event.

The purpose of this study is to investigate the ways in which the community of Kasane, Botswana has through the years adapted to the adverse impacts of natural hazards that they are exposed to. Specifically, the study will focus on the adaptation of three different generations spanning the past 50 years. Thus, the main question in this study is “how have the different generations of Kasane community, Botswana dealt with the occurrences of the natural hazards that they have been exposed to in the past 50 years”?. To address this question and to achieve the objective of the study, the study applied both theoretical and empirical dimensions.

Firstly, a literature review of the conceptualization of natural hazards and the social learning theory, discussing how coping and adaptation strategies have been passed on from one generation to the next, is conducted. The study also undertook an empirical research by means of a qualitative research design in order to address the above stated objective in full.

Data in the empirical study was collected though semi-structured face-to-face interviews and focus group discussions. The collected data was then analysed by using a thematic analysis approach with verbatim quotes. A total of 107 participants participated in the study. The respondents were able to articulate how coping and adaptation strategies have been passed on from one generation to the next. These coping and adaptation strategies are, namely, educating local farmers about plantation; allocation of seasonal activities; sending children to school; planting trees in the yard; increase in retail prices during peak season; early warning messages; wearing wet clothes during summer; labour migration to towns; and provision of disaster relief programmes.

The respondents were also able to articulate the importance of indigenous knowledge within the community of Kasane and provided the different ways in which information is passed on from one generation to the next. The respondents mentioned ways such as the younger generation practising what they were taught e.g. planting and herding; the younger generation assisting the older generation with day-to-day activities; the Batswana culture forcing the younger generation to listen to the older generation; initiation schools; folk laws and tales; ceremonies; songs; village meetings; taboos; and arts and craft. Conclusions and recommendations pertaining to the empirical findings of this study were provided, highlighting an integrated approach towards the development and implementation of coping and adaptation strategies between the government of Botswana and the community of Kasane.

Keywords: Adaptation Strategies, Coping Strategies, Intergenerational Relations, Social Learning, Climate Change, Natural Hazards.

OPSOMMING

Oor die afgelope dekade het 'n toename in die gereelde voorkoms van natuurlike gevare 'n negatiewe impak gehad op die menslike ras. 'n Toename in die voorval en die erns van natuurlike gevare en rampe is te wyte aan die verandering in die klimaatsomstandighede wat wêreldwyd ervaar word, met die gevolge dat beide menslike en natuurlike sisteme negatief beïnvloed word. Met die toename in die globale klimaatstoestande het die nadelige skadelike impak van natuurlike gevare toegeneem in erns, ruimtelike dekking en in die frekwensie van die voorkoms van hierdie natuurlike gevare. Dit omdat klimaatsverandering sommige van die natuurlike gevare verhoog, veral dié van hidro-meteorologiese oorsprong. Verskeie, gereelde herhalende en saamgestelde skokke wat ondervind word in Afrika suid van die Sahara, verhoed dat die gemeenskappe heeltemal herstel. Aangesien elk van hierdie skokke individueel nie van 'n skaal is wat wêreldwye aandag trek nie, word reaksies dikwels onderbestand (Reliefweb, 2004).

Om die impak van natuurlike gevare wat vererger word deur klimaatsverandering te verminder, moet maatreëls in die fisiese, ekonomiese en sosiale omgewing van die bedreigde gebiede geneem word. Op die gebied van ramprisikobestuur is daar twee generiese maatreëls wat dikwels geneem word om die nadelige uitwerking van natuurlike gevare te verminder, naamlik; aanpassing en versagting. Aanpassing is deurlopend, en dit sluit 'n aaneenlopende stroom aktiwiteite, aksies, en houdings in wat besluite oor alle aspekte van die lewe gee, en dit weerspieël bestaande sosiale norme en prosesse. Versagting is die vermindering van die nadelige uitwerking van 'n gevaarlike gebeurtenis.

Die doel van hierdie studie is om die maniere te ondersoek waarop die gemeenskap van Kasane, Botswana oor die jare aangepas is vir die nadelige uitwerking van natuurlike gevare waaraan hulle blootgestel is. Spesifiek sal die studie fokus op die aanpassing van drie verskillende geslagte wat die afgelope 50 jaar strek. Die hoofvraag in hierdie studie is dus: "Hoe het die verskillende generasies Kasane-gemeenskap, Botswana, met die voorkoms van die natuurlike gevare waaraan hulle die afgelope 50 jaar blootgestel is?". Om hierdie vraag aan te spreek en die doel van die studie te bereik, het die studie beide teoretiese en empiriese dimensies toegepas.

Eerstens, 'n literatuuroorsig oor die konseptualisering van natuurlike gevare en die sosiale leerteorie, bespreek hoe hantering- en aanpassingstrategieë van een generasie na die volgende oorgedra word, uitgevoer. Die studie het ook empiriese navorsing onderneem met behulp van 'n kwalitatiewe navorsingsontwerp ten einde die bogenoemde doelwit ten volle te bereik.

Data in die empiriese studie is ingesamel alhoewel semi-gestruktureerde gesig-tot-aangesig-onderhoude en fokusgroepbesprekings. Die versamelde data is dan verkry deur 'n tematiese analise-benadering met woordelike aanhalings te gebruik. Altesame 107 deelnemers het aan die studie deelgeneem. Die respondente kon artikuleer hoe hanterings- en aanpassingstrategieë van een generasie na die volgende oorgedra is. Hierdie hanterings- en aanpassingstrategieë is naamlik die opvoeding van plaaslike boere oor plantasie; toekenning van seisoenale aktiwiteite; kinders na skool stuur; bome in die tuin plant; toename in kleinhandelpryse gedurende die hoogseisoen; vroeë waarskuwingboodskappe; nat klere dra gedurende die somer; arbeidsmigrasie na dorpe; en voorsiening van rampverligtingsprogramme.

Die respondente was ook in staat om die belangrikheid van inheemse kennis binne die gemeenskap van Kasane te verwoord en het die verskillende maniere waarop inligting van een generasie na die volgende oorgedra word, voorsien. Die respondente het maniere genoem, soos die jonger generasie wat hulle oefen, bv. aanplant en diere oppas; die jonger geslag wat die ouer generasie help met daaglikse aktiwiteite; die Batswana-kultuur dwing die jonger geslag om na die ouer geslag te luister; inisiëringskole; mense se wet en verhale; seremonies; liedjies; dorpsvergaderings; taboes; en kuns en kunsvlyt. Gevolgtrekkings en aanbevelings aangaande die empiriese bevindings van hierdie studie is voorsien, wat beklemtoon vir 'n geïntegreerde benadering tot die ontwikkeling en implementering van hanterings- en aanpassingsstrategieë tussen die regering van Botswana en die gemeenskap van Kasane.

Sleutelwoorde: Aanpassingsstrategieë, Coping Strategieë, Intergenerasieverhoudinge, Sosiale Leer, Klimaatsverandering, Natuurlike Gevare.

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CHAPTER 1: ORIENTATION AND PROBLEM STATEMENT

1.1 INTRODUCTION

Natural hazards pose a negative impact for humanity. From 2005-2014 annual averages of more than 173 million people were susceptible to the damaging effects of natural hazards worldwide (Guha-Sapir, 2016). Khan (2008:662) stressed that natural hazards do not only have a huge potential negative impact on economic losses but also contributes to social problems, such as migration, family breakdown and loss of livelihoods. Humanity is vulnerable to any form of natural hazard they are exposed to (Anderson, 1994:41; Dilley and Boudreau, 2001:234).

Vulnerability to natural hazards mostly reinforces aspects of susceptibility of a receiving environment to the impact of hazards (Blaikie *et al.* 1994:9, UNISDR 2004:46, Turner *et al.* 2003:8074, Wisner *et al.* 2004:97). Thus "vulnerability is the characteristics and circumstances that make a person susceptible to the adverse effects that a hazard poses" (Van Niekerk, 2011:11). According to Cardona *et al.* (2012:71) vulnerability describes a set of conditions of people that derive from the historical and prevailing cultural, social, environmental, political and economic contexts. Literature indicates that the four main types of vulnerabilities that make people susceptible to the adverse impacts of natural hazards are: physical, economic, social and environmental factors (Jansen van Vuuren, 2015:3). Figure 1.1 below shows the interacting factors that contribute to the vulnerability of humans to the adverse impacts of natural hazards.

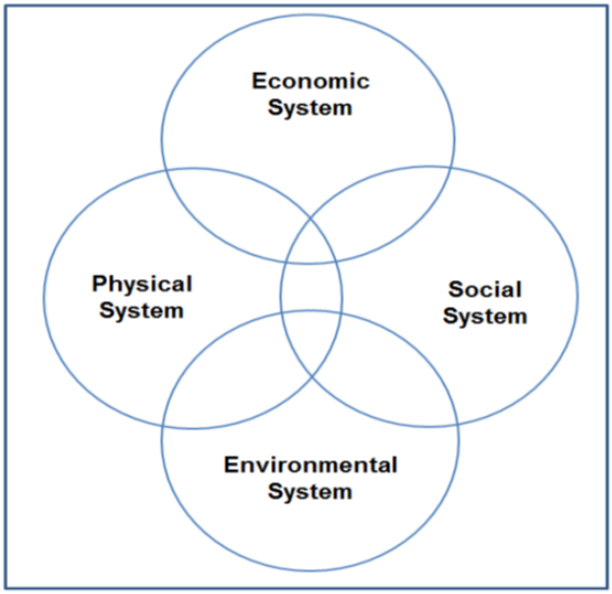

Figure 1.1: Interactions of vulnerability factors (Source: UNISDR, 2004)

Similarly, Hewitt (1997:153) posits that vulnerability is maintained by economic, social, physical and environmental conditions, and it is reproduced by the activities that sustain unsafe conditions for some people, or disempower them, and changes only if these conditions are transformed. Awal (2015:17) defined unsafe conditions as certain conditions in which a person's vulnerability is exposed in time and space in conjunction with a hazards and may normally occur through a process such as fragile local economic conditions, lack of disaster planning and preparedness, and a harmed environment. Therefore, in order for people to cope with the adverse effects of natural hazards they need to develop responses to decrease their vulnerability to the adverse effects that natural hazards pose to their lives (Maferetlhane, 2012:8)..

There are different manners in which people try to decrease their vulnerability towards the adverse impact of natural hazards, such as mitigation and adaptation strategies. Adger *et al.* (2004:78) emphasised that adaptation is continuous, and it encompasses a continuous stream of activities, actions, attitudes that informs decisions about all aspects of life, and that reflects existing social norms and processes. Abramovitz *et al.* (2002:19) indicate that one of the tools with which people can respond to the adverse impact of natural hazards is through adaptation. Abramovitz *et al.* (2002:10) defined the concept of adaptation as how both natural and human systems evolve over time when faced with changes in its environment.

Adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of change in conditions (Watson *et al.*, 1998:496). Mitigation is defined as measures that are taken to lessen or minimise the adverse impact of a hazardous event (UNISDR, 2009). These measures may include engineering techniques, hazardous-resistant construction, and improved environmental and social practices and public awareness. As with the rest of the world, the southern African region is vulnerable to the negative impacts of natural hazards. With the Southern African region highly susceptible to hydro-meteorological natural hazards (Botai *et al.*, 2015), the conceptualisation of this study focused on the hydro-meteorological natural hazards.

Figure 1.2. A map of Kasane, Botswana (Source: La Historia con Maps – 2015)

The study is about intergenerational adaptation to natural hazard, it focused on how the people in Kasane village have able to cope and adapt to the adverse impact of natural hazards over the past 50 years. Above is a location map of Kasane, Botswana. The study looked at three different generations spanning the past 50 years and sought to find out how coping and adaptation strategies have been passed on from one generation to the next. The study also sought to find out how these strategies have evolved over the years

as climate change has exacerbated the severity and frequency of the adverse impact on natural hazards. It is important to conduct such as study as a lot of literature has focused on natural hazard and their impact on humanity as well as intergenerational relationships. However there is not much literature focusing on the two concepts together and the significance of transferring information from one generation to the next.

This chapter is structured as follows: the first section introduced the study and provided the reader with an orientation and background of the study under investigation, followed by the problem statement for of the research topic. This was then followed by the research questions and objectives of the study, then the central theoretical statement, while a description of the research methodology outlined the empirical approach taken in this study. This was then followed by limitations and delimitations of the study, the significance of the study, ethical considerations to be considered by the interviewer and finally a preliminary chapter layout of the study to provide a briefing of the entire study. With the background on natural hazards and adaptation to impacts of natural hazards provided, the next section conceptualises the problem to be addressed in this study.

1.2 PROBLEM STATEMENT

Over the past decade, an increase in the frequent occurrence of natural hazards has had a negative impact to the human race. Climate change has resulted in an increase of frequency in the occurrences of some natural hazards and severity of the occurrence of natural hazards particularly those of hydro-meteorological and biological origin (Abramovitz *et al.,* 2002:16; Adger *et al.,* 2004:78; O'Brien *et al.*, 2006:64). Despite its tectonic stability, the African continent is particularly prone to natural hazards and risk posed by climate change (Bryant, 2005:6). The continent is exposed to floods, hurricanes, earthquakes, tsunamis, droughts, wildfires, pest plagues and air and water pollution causing extensive losses to livelihoods and property, as well as human lives (Mulugeta *et al.,* 2007:4).

Multiple, frequent repeating and compound shocks that are experienced in Sub-Saharan Africa prevent the communities from fully recovering, and as each of these shocks are individually not of a scale that attracts global attention, responses are often under-resourced (Reliefweb, 2004). Therefore, communities have not been able to adapt to the

frequent occurrences of natural hazards and the risk posed by climate change that they are exposed to. Despite the perception that Southern Africa has a homogeneous and low-risk profile, it is often the smaller scale emergencies that have the most impact on the vulnerability of the people (Holloway *et al.,* 2013:15).

This study focused particularly on Botswana as a country that falls within the southern African region and as a country that is prone to the occurrence of natural hazards. In Botswana communities are prone to natural hazards such as droughts, floods, windstorms, heavy rains and wildfires (Maripe, 2011:43). Kgwadu (2016) reported that the assistant Minister of Agriculture in Botswana announced that the country has been experiencing severe drought that has affected both arable and pastoral farming. Kgwadu (2016) further argued that natural hazards do not only have an impact on the economy of the country but also on infrastructure and the livelihoods of the people of Botswana.

Hydro-meteorological hazards that have been occurring in Botswana for the last decade and have had a negative impact on the food security of the country due to the damaging impact it had on the farming industry of the country (UNOCHA, 2015). The assistant Minister of Agriculture reported that in 2013/2014, stock feeds were reduced to 20% and further reduced to 50% in 2014/2015 (Kgwadu, 2016). Botswana experienced several natural hazards which impact on a wide range of sectors of development, especially economic, agricultural, water and health (Manthe-Tsuaneng: 2014:2).

Kasane is located in the north-most district of Botswana, the Chobe District, forming an international boundary with the Caprivi Strip of Namibia to the north & west, Zambia to the north and Zimbabwe to the east (Chobe District Council, 2003:1). Kasane is often referred to as the “four corners of Africa”. The coommunity is covered by dense forest inhabited by varied wild animal species, attracting tourists all over the world that has significant contribution to the country’s economic growth and development. According to Maripe & Tapologo (2017:2) Kasane is prone to natural hazards such as floods, drought, windstorms, veld fires and high temperatures, often resulting to loss of life, injuries, damage to roads and infrastructure, and loss of shelter.

According to the Department of Forestry of Range Resources (2016:12) one of the prominent hazard that Kasane is vulnerable to is wildfire outbreaks, with an average of 20 bush fires per year, of which 3 on average can be considered to be major fires. Maripe

& Tapologo (2017:2) argue that local communities such as Kasane have to prevailing low levels of disaster preparedness thus predisposing them to high level of stress and increased vulnerability to disasters. The reoccurrence of veld fires impacts tourism in Kasane negatively, which ultimately affects the community negatively due to the fact that the community highly relies on tourism as an economic contributor.

With the increase in the frequent occurrence of natural hazards, people adjust and align their behaviour and characteristics in order to enhance their ability to cope with adverse impacts of natural hazards. Over the years the ability of people to respond to or cope with the adverse impact of natural hazards has been passed on from one generation to another (Williams, 1996: 193; Adger, 2003a; Adger, 2003b:396). An increase in the occurrence of natural hazards has been accompanied by an evolution of strategies to cope with these hazards. Methods such as intergenerational adaptability to natural hazards, people have been able to deal with and enhance their ability to respond to the adverse impact of natural hazards (Maferetlhane, 2002:29).

The purpose of this study is to investigate if and how the community of Kasane, Botswana has through the years adapted to the adverse impacts of natural hazards that they are exposed to. Specifically, the study will focus on the adaptation of three different generations spanning the past 50 years. Thus the main question in this study was how the different generations of Kasane community have dealt with the occurrences of the natural hazards that they have been exposed to in the past 50 years? The study will also focus on how these strategies have been passed on from one generation to the other and if they have evolved over time. This problem under investigation will further be explored by addressing the research questions as outlined in the next section.

1.3 RESEARCH QUESTIONS

The following key questions will be answered by the study;

- What are the theoretical perspectives on adaptation to natural hazards?
- What are the theoretical perspectives on social learning (intergenerational information transfer)?

- What adaptation methods/strategies have been or are used by different generations in Kasane village to adapt to natural hazards?
- How have these methods/strategies changed over the years?
- What are the conclusions and recommendations on intergenerational adaptability to natural hazards?

1.4 RESEARCH OBJECTIVES

The following research aims to determine how have the people of Kasane, Botswana dealt with the occurrences of the natural hazards that they are exposed to.

- To provide a theoretical perspective on adaptation to natural hazards.
- To provide a theoretical perspective on social learning (intergenerational information transfer)
- To identify the different methods/strategies that have been used or are used by the different generations in Kasane village to adapt to natural hazards.
- To determine whether these strategies/methods have evolved over time.
- To provide conclusions and recommendations on the intergenerational adaptation to natural hazards.

1.5 CENTRAL THEORETICAL STATEMENT

This study will be grounded in the social learning theory, and specifically the intergenerational relations theory. Social learning theory posits that learning is a cognitive process that takes place in a social context and can occur purely through observation or direct instruction, even in the absence of motor reproduction or direct reinforcement (Bandura, 1969; Noone, 2008:26; Stith *et al.*, 2000:643). On the other hand, intergenerational relations is referred to as a wide range of interaction among individuals of different generations within a family/community (Kropf, 2013). Kropf (2013) further

argues that in most instances intangible factors such as beliefs, norms, values, attitudes, and behaviours specific to that family, or factors that reflect sociocultural, religious and ethically relevant practices and beliefs are factors that are transmitted from one generation to the next. This intergenerational information will be able to help the next generation to better cope and prepare for the adverse impact of natural hazards.

The following theoretical statements informed the study:

- An increase in the frequent occurrence of natural hazards has impacted the human race negatively (Rodriguez-Oreggia *et al.* 2008)
- The magnitude of natural hazards is intensified by climate and this is having a negative effect on human livelihoods, settlements and infrastructure thus enhancing the vulnerability social and natural systems (O'Brien *et al.*, 2006:68).
- Human societies have always used various ways to adapt to environmental changes and shocks (Miao, 2015)
- The ability of a community to adapt to the occurrence of natural hazards reduces the vulnerability of the community (Smit & Wandel, 2006:286).
- Learning is an act of acquiring new or modifying and reinforcing existing, knowledge, behaviours, skills or values, which may lead to a potential change in synthesising information, depth of the knowledge, attitude or behaviour relative to the type and range of experience (Gross: 2010).

1.6 RESEARCH METHODOLOGY

Research methodology is a scientific way of systematically solving a research problem (Kothari, 2004:8). Methodology is a description of how one is going to conduct their study. In this section of the study, an outline of the way in which research was undertaken, and among other things, an identification of the methods that were used will be provided. Moreover, a description of the specific methods or instruments used to collect data and the procedure for administering the instruments will be included (De Vos *et al.,* 2011:110). As such the discussion will focus on the literature review and the empirical study. Presentation of the empirical study will focus on the data to be consulted, research design, sampling, instrumentation, data collection, and data analysis.

1.6.1 Literature review

A literature review is a critical and in-depth evaluation of previous research (Shuttleworth, 2013). Boote and Beile (2005:3) define a literature review as a text of scholarly paper, which entails the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. In addition Boote & Beile (2005:3) and De Vos *et al.* (2011:135) emphasise that the purpose of a literature review is to convey to the reader what knowledge and ideas have been established on a topic, and what their strengths and weaknesses are. In this study, academic books, e-books, online accredited journals, government and international reports, and conference proceedings and research reports/documents were consulted. In this study the following are the databases that were consulted:

- EBSCO Academic Search Elite, Jstor, Google Scholar and a host of other academic database;
- Catalogue of books: Ferdinand Postma Library (North-West University);
- Science Direct/Elsevier; and
- Research Gate.

1.6.2 Empirical study

An empirical study is a way of gaining knowledge of a phenomenon through observation or experience. In this research the researcher used a descriptive research due to the fact that the researchers aimed to give specific details of the current situation in the community of Kasane. The researcher also focused on “how” the people adapt to the adverse effects of natural hazards and “how” effective has the manner been in which they cope with the adverse effects of natural hazards that they are exposed to.

1.6.2.1 Research design

According to Van Wyk (2009) a research design is defined as the overall plan for connecting research problems to the pertinent (and achievable) empirical research, it articulates what data is required, what methods are going to be used to collect and analyse this data, and how all of this is going to answer your research question. In this

study a qualitative research design is applied due to the type of study. A qualitative approach is one in which the enquirer often makes knowledge claims based-primarily on constructivist perspectives (i.e. the multiple meanings of individual experiences, meanings socially and historically constructed, with an intent of developing a theory or pattern) or advocacy/participatory perspectives (i.e. political, issue-oriented, collaborative, or change orientated) or both (Creswell, 2003:18) . Drawing from Crewsell's (2003:18) explanation, this study is a "people-focused" study as it focused on the behavioural patterns of the community of Kasane in relation to the types of hazards they are exposed to and how they have adapted to them, from one generation to the next.

De Vos *et al.* (2011: 325) state that when using the qualitative research approach the researcher collects open-ended, emerging data with the primary intent of developing themes from the data. Qualitative researchers often start with general research questions rather than specific hypothesis, they also collect an extensive amount of verbal data from a small number of participants, then organises those data in some form that gives them coherence and lastly uses verbal descriptions to portray the situation they have studied (Leedy & Ormrod, 2005:94-97).

McRoy (1995:2009-2015) explained that qualitative research is more concerned with describing and understanding rather than explaining and predicting human behaviour. The researcher is trying to understand rather than explain the research therefore a qualitative research approach was more appropriate for this study. Hence the researcher tried to understand the relationship between intergenerational relations and the adaptation of the community of Kasane to the occurrence of natural hazards.

1.6.2.2 Population and sample

A sample design is a technical plan for obtaining a sample form a given population (Kothari, 2004:56). In addition, Latham (2007) argues that sampling refers to the statistical process of selecting and studying the characteristics of a relatively small number of items from a relatively large population of such items, to draw statistically valid references about the characteristics about the entire population. In this study the purposive sampling and snowball sampling, which fall under the non-probability sampling techniques, was adopted. Patton (2000) defines purposive sampling as a technique widely used in qualitative research for the identification and selection of information-rich cases for the

most effective use of limited resource. The reason for selecting this type of sampling is because the identified and selected specific respondents that have the most characteristics or typical attributes of the population that serves the purpose of the study.

Snowball sampling is a technique that helps the researcher find the research subjects, this sampling occurs when one subject refers the researcher to another subject (Vogt, 1999). This method of sample was applied, as the targeted subjects referred the researcher to individuals who had more insightful information as well as technocrats that worked hands on with the community of Kasane. Frank and Snijders (1994) emphasise that this method of sampling may be advantageous when rare properties are of interest. This form of sampling method was beneficial in collecting rich and insightful information from the participants.

The participants in the study were selected based on their shared geographical setting and were further categorised into focus groups based on their age and gender. A hundred and five (105) respondents within six different focus groups (five females between the ages of 18-30, five females between 31-45, five females 46+, five males between the ages of 18-30, 5 males between the ages of 31-45 and 5 males 46+) that are directly exposed to natural hazards in the community of Kasane. Face to face interviews with the government officials from the national and local office who work hands-on with the community of Kasane were also held.

1.6.3 Data collection

“Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes” (Baker, 2003:345). Face to face interviews and focus group discussions were applied as the study aimed to understand how the community of Kasane has been able to adapt to the adverse damaging effects of natural hazards from one generation to the next (see Annexure C). Semi-structured interviews were conducted to allow for further probing (see Annexure D).

1.6.3.1 Instruments

In this study, semi-structured face-to-face interviews and focus group discussions were conducted in order to gather all the necessary and relevant primary data needed for the study. DiCicco-Bloom and Crabtree (2006: 316) define face to face interview as a data collection tool where direct communication between the interviewer and the respondent occurs in accordance to the prepared questions. Opendakker (2006) further argues that this data collection enables the researcher to acquire factual information, consumer evaluations, attitudes, preferences and other information during the interview with the respondent.

This method of data collection was utilised to collect insightful information from the government officials from the national and local offices. This method of data collection was appropriate as the officials who were interviewed worked closely with the community of Kasane and could also provide technical information and their perceptions regarding natural hazards in Kasane and the adaptation strategies that are implemented to deal with those natural hazards.

“Focus group discussions are designed to elicit perceptions, information, attitudes and ideas from a group in which each participant possesses experience with the phenomenon under study” (Stage & Manning, 2003:50). Focus group discussions permit researchers to access information from participants that might have been missed during one on one interviews particularly in-depth research questions (Campbell, 1988). Focus group discussions were conducted in the study in order to collectively gather the views and perceptions of the community of Kasane pertaining intergenerational adaptation towards natural hazards in Kasane. Six focus groups consisting of a hundred and five (105) participants collectively were conducted as mentioned in section 1.6.2.2. This allowed the study to gather insightful information and perceptions ranging from the different age groups.

According to Mathers *et al.* (1998:2) semi-structured interviews involve a series of open-ended questions based on the topic areas that the researcher wants to cover. Mathers *et al.* (1998:3) further state that the benefits of using semi-structured interviews are that they allow the researcher to prepare questions ahead of time and that in return allow the researcher to be prepared and appear competent during the interview.

In addition, using semi-structured interviews allows informants the freedom to express their views in their own terms. This thus will allow the identification of “blind spots” that the researcher will not be aware of in the beginning, in terms of the topic area. Moreover Kothari (2004:55) states that it is to ensure that the tools they use for data collection are valid and reliable because the validity and reliability of the research project is dependent on the correctness of the tools or instruments that have been used. Berg (2004) argues that in most cases it is essential for researchers to record and take notes during interviews and focus group discussions. This makes the analysis process of research much easier as the researcher will be able to recall all the important information during this process. Permission was granted by the participants to record and take down notes during the face to face interviews and focus group discussions.

1.6.3.2 Reliability, validity and triangulation

Reliability is defined as the ability for a measure to produce the same results when an experiment is repeated over and over again (Shuttleworth, 2008). Reliability is the degree to which a research instrument produces consistent results. This study undertook a test and retest reliability tool. The same set of questions were asked to the different focus groups, this enabled the reliability of the data collection method to be tested during the analysis process of the study. The technocrats from both the Disaster Risk Management Office of the State President Ministry of Botswana and the Department of Forestry and Range Resources based in Kasane were also asked the same set of questions and this enabled the researcher to assess the reliability of the interview questions during the data analysis process.

Validity is the extent to which the research truthfully measures what it is intended to measure and whether the results meet all the requirements. In addition, Brink (1993:35) emphasises this definition by stating that “a valid study demonstrates what actually exists and a valid instrument should actually measure what it is supposed to measure”. In simpler terms validity is how accurate an instrument is at measuring what it is trying to measure. During the analysis process, the validity of the questions that were asked during the focus group discussions and the face to face interviews were measured. The questions were able to provide the answers to the research questions thus proving the validity of the measuring tool.

“Triangulation is the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of a phenomenon” (Carter *et al.*, 2014: 545). According to Patton (1999) triangulation is a qualitative research strategy that tests the validity through the convergence of informat0ion from different sources. Therefore triangulation is a method of capturing different dimensions of the same phenomenon in order to assure the validity of the research and this is done by using a variety of methods to collect data on the same topic. In this study the use of literature, data from the findings, and the interpretations drawn from the findings were utilised to implement the triangulation of the study.

1.6.4 Data analysis

This study utilised the thematic method of analysis to analyse the data that was gathered during the data collection process. According to Babbie (2007:399) data analysis in qualitative studies is defined as the non-numerical examination and interpretation of observations, for the purpose of discovering underlying meanings and patterns of relationships. Wong (2008) states that in a qualitative research study the data analysis involves coding or categorising the data. Babbie (2007:378) highlights that in qualitative research the collected data has to be re-examined and the observations have to be interpreted with the aim of uncovering and understanding the fundamental related meanings and patterns. In this process this study followed the guidelines provided by de Vos *et al.* (2011:404-419) which are as follows:

- Preparation for, and organization of data:

An audio recorder and a video recorder were used to record the interviews and the focus group discussion with the consent of the participants. In order to prevent the malfunctioning of the two tools, they were tested and used before conducting the interviews and the focus groups. The two tools were ensured to be fully charged before the interviews and focus group discussion, there was also portable charger that was fully charged in case the tools go flat during the interviews and focus group discussions. After the collection of the data was completed, the data was arranged in accordance to the similarity of the questions under investigation. The information was handled carefully, and also backed up into multiple backup systems (laptop, memory stick and a hard drive).

- Reducing the data:

Schurink (2011:410) states that “this process demands a heightened awareness of the data, focused attention, openness to the subtle, tacit undercurrents of social life”. In this process the data that was collected was thoroughly analysed therefore bringing about the emergence of thematic groups. In this process, the collected data was organised and arranged in accordance to the thematic groups. This process provided an understanding of the phenomenon under investigation by analysing the data collected and matching the collected data with the research questions.

- Presentation of the data:

In this process the collected data was interpreted and presented in a form of a report. This step allowed the study to link the findings with the literature that was gathered in order to understand the problem under investigation.

1.6.5 Limitations and delimitations

Limitations are matters and incidences that arise in a study which are out of the researchers’ control (Simon & Goes, 2013). While delimitations are characteristics that arise from limitations in the scope of the study and by the conscious exclusionary and inclusionary decisions made during the development of the study plan (Simon & Goes, 2013). The following are the limitations and delimitations that were identified during the data collection process of the study.

The data collection process had to be extended due to the availability of the participants of the focus group discussion. The allocated time frame that was initially drafted to complete the data collection process was not enough to collect the required data, hence the extension of the allocated time frame.

During the data collection process, it was identified that among the older generation focus groups (46+ years) some of them did not fully comprehend Setswana as they came from a different ethnic group. The assistance of a local member was a limitation to the study as he could in broad details explain the questions and provide feedback in English. The majority of the middle aged generation focus groups (31-45 years) and the younger

generation focus groups (18-30 years) understood English and responded in English. This served as an advantage during the data analysis process.

The community of Botswana as well as the government officials were more than delighted to help, which made it easier for the researcher to move around the community of Kasane and be able to gather the focus group participants. The officials from the national offices in Botswana recommended the officials from the local offices in Kasane be interviewed as well. This assisted in gaining insightful information pertaining the occurrence and patterns of natural hazards in the community of Kasane, and how the adaptation strategies work that are implemented towards ameliorating the prevalent natural hazards.

1.7 ETHICAL CONSIDERATIONS

“Research should be based on mutual trust, acceptance, cooperation, promises and well-accepted conventions and expectations between all parties involved in research project” (De Vos *et al.*, 2011:113). According to Resnik (2015) ethical consideration may be defined as an accumulation of values and principles that address questions of what is good or bad in human affairs. Strydom (2005b:56) further outlines that a set of moral principles recommended by individuals constitutes ethics which are accepted accordingly and represent the regulations and behavioural expectations regarding conduct towards the participants (see Annexure A & B). The following ethical considerations were considered to ensure that the study was credible, reliable and valid.

1.7.1 Informed consent

“Informed consent is an ethical and legal requirement for research involving human participants” (Nijhawan *et al.*, 2013:134). According to Richards and Schwartz (2002) all research involving identifiable subjects, except in cases where an ethics committee judges that the consent is not possible and where it is felt that the benefits of the research outweigh the potential harm, informed consent is a prerequisite. The purpose of the scope of the study, the types of questions which were likely to be asked, the use which the results were going to be put to, the method of anonymization and the extent to which participants’ utterances were to be used in the study were communicated with the participants before conducting the focus group discussions and face to face interviews.

1.7.2 Privacy and confidentiality

In qualitative research, a large amount of personal information is collected therefore heightening the need for privacy and confidentiality of the participants (Richards & Schwartz, 2002). Some participants wish to remain anonymous, therefore it is important for the researcher to ensure the privacy and confidentiality of the participants. The study informed the participants that their names and identity would remain anonymous and the information provided by the participants during the face to face interviews and the focus group discussions.

1.7.3 No harm to participants

It is a fundamental ethical consideration that the participants are not exposed to any form of harm, not only physical or emotional harm in the course of the research, but also there must be no adverse consequences to the participants as a result of their participation in the study (Vanclay *et al.*, 2013). The study ensured that the participants were not exposed to any factors that could inflict physical, emotional and psychological distress. This was done by conducting the focus group discussions and face to face interviews in a safe environment and the methods of enquiry that were used to obtain information from the participants were not used with the aim to deceive the participants.

1.7.4 Permission required for audio- or video recording

Most countries have privacy legislations and a researcher would require legal approval in advance to conduct research and to audio and video record any participants (Vanclay *et al.,* 2013). Botswana has strict rules and regulations pertaining conducting research in the country due to over-exploitation that had been done in certain areas of the country. Therefore before conducting the data collection process, an application to conduct the study in Kasane was sent and also permission to audio, video record and take photographs of the participants and the surrounding environment was granted legally by the State President Ministry's Office of Botswana.

1.7.5 Voluntary participation

Voluntary participation in research as an ethical consideration issue is universally accepted as a precondition (Marshall *et al.*, 2006). “Participation must be voluntary and not subject to any coercion or threat of harm for non-participation” (Vanclay *et al.*, 2013: 247). The participants who were involved in the focus group discussions and the face to face interview were informed prior to the commencement of the study that they were free to participate in the study and it was out of their free will to do so. The participants were also informed prior to the commencement of the study that if they felt uncomfortable with the questions asked, they were more than welcome to withdraw from the research project.

1.7.6 Presentation of data

According to Bryman (2012:144) presentation of data as an ethical issue in research considers that the information presented is with honesty. Vanclay *et al.* (2013:247) further note that “research methods and analytical procedures must be fully disclosed to: enable replication of the research by another researcher; enable peer review of the adequacy and ethicality of the methodology; and to encourage critical self-reflection on the limitations of the methodology and any implications for the results and conclusions”. This study was bound by ethics concerning the presentation of data, therefore the study was reviewed by supervisors and all the literature that was consulted and used in the research was acknowledged.

1.8 SIGNIFICANCE OF THE STUDY

The aim of the study was to investigate how adaptation strategies towards natural hazards have been passed on from one generation to the next. Numerous research projects pertaining the occurrence of natural hazards as well as intergenerational relationships have been investigated. However, there is not a lot of research compiled in relation to adaptation strategies that have been passed on from one generation to the next (50 years). Scholarly research by the likes of Wisner, 2004; Adger 2003; Birkmann, 2011; Klein, 2003; etc. are examples of research conducted on adaptation towards natural hazards.

The significance of this study is that it provided information that is hardly ever focused on and it investigated how the community of Kasane has been able to adapt to the adverse damaging effects of natural hazards from one generation to the next. This study aspires to add value to the field of disaster risk reduction by providing information as to how different generations adapted to the occurrence in order to reduce the adverse impacts of natural hazards and also provide disaster risk reduction organisations with more strategies as to how to deal with the adverse effects of natural hazards.

1.9 PRELIMINARY CHAPTER LAYOUT

Chapter 1: Orientation and problem statement. In this chapter the Introduction, Problem statement, Research questions and Objectives as well as Research methodology were briefly discussed.

Chapter 2: Theoretical perspectives on adaptation to natural hazards. This chapter conceptualises natural hazards, discussing the different types of natural hazards that are experienced worldwide and their impacts on humanity. This chapter also discusses the impact of climate change on the frequent occurrence and severity of natural hazards.

Chapter 3: Social learning theory: the basis for intergenerational information transfer. This chapter presents the social learning theory which is important for intergenerational information transfer and coping and adaptation strategies are passed on from one generation to the next in order to reduce the adverse impact of natural hazards.

Chapter 4: Empirical findings and analysis. This chapter provides the presentation of the empirical data collected from the interviews.

Chapter 5: Conclusions and Recommendations. The researcher concludes the study and provides recommendations for the future if anyone plans on conducting a similar research study.

CHAPTER 2: THEORETICAL ANALYSIS OF NATURAL HAZARDS

2.1 INTRODUCTION

Chapter one introduced the study and briefly presented the problem under investigation. Chapter one also pointed to an increase in the occurrence of natural hazards and the way these natural hazards have negatively impacted on humanity physically, economically, socially as well the surrounding environment or infrastructure. The preceding chapter also highlighted the need for adaptation to the rapid and frequent occurrence of natural hazards. Chapter two will provide the theoretical framework on natural hazards by providing some analysis of the past and the current trends of the occurrence of natural hazards, types of hazards in general, hazards prevalent in the sub-Saharan African region and the Southern African region. Finally the argument will be presented for the need to adapt to the hazards. All of these themes will be reviewed in this chapter in order to address the first research objective of the study as presented in chapter one, namely; to provide a theoretical perspective on adaptation to natural hazards.

2.2 DEFINING NATURAL HAZARDS

Many of the early dominant views in the disaster risk management field identified natural hazards as hazards emanating from geophysical processes (Gowan, 2011). Ismail-Zadeh and Takeuchi (2007) emphasise that in the early days of research in the field of disaster risk management, geophysical events were viewed as the main trigger of loss of life and damage to property leading to economic losses. Shrubsole (1999) states that with the increase in literature focusing on disaster risk management, the term natural hazards has become more broadly defined over the past decade. The focus of literature on disaster risk management has resulted in the term natural hazards being viewed differently by different disciplines and each discipline provides a definition that suits their purpose. Some of the most common definitions of the term natural hazards are presented below.

Burton and Kates (1964:413) define natural hazards as “those elements in the physical environment that are harmful to man and caused by forces extraneous to him”. This definition denotes that natural hazards are external forces coming from the environment that the human interacts with that bring harm unto humans. Gowan (2011:40) citing the American Geological Institute (1984) defines a natural hazard as a “naturally occurring or man-made geological condition or phenomenon that presents a risk or is potential danger to life or property”. However, White (1945:51) defines a natural hazard as the result of interacting natural and social forces.

The most widely accepted definition for the term natural hazard is the one provided by the United Nations International Strategy for Disaster Reduction (UNISDR, 2007) which defines the term natural hazard as a “natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage”. As more research in the field of disaster risk management came about, the perception of natural hazards shifted from that of geophysical origin to an interaction between the physical and social components.

The term natural hazard is used to describe a threatening event that poses a negative impact and has the capability to entice a disaster. According to the UNISDR (2007) natural events can be characterised by their magnitude or intensity, speed of onset, duration and area of extent. Nelson (2013) further argues that it is important to note that natural hazards cease to exist where no human lives or property are affected, as these are only natural events. An example of this argument is when there is an earthquake in the middle of an African forest where no people reside this phenomenon is considered as a natural event, as compared to when a volcanic eruption occurs in the Democratic Republic of Congo in a densely populated area and the event will greatly affect people, then this phenomenon is considered as a natural hazard. With the concept of natural hazard defined and put into perspective, the following section will describe in detail the different types of natural hazards that occur worldwide and the potential impact that each natural hazard has on humanity.

2.3 TYPES OF NATURAL HAZARDS

There are different types of natural hazards that are experienced worldwide and they are classified into three major categories (Peduzzi *et al.,* 2009:1150). These three major categories are: biological hazards, hydro-meteorological hazards and geological hazards. Table 2.1 below presents a summary of the three major categories of natural hazards together with the main events that arise from these hazards. This is followed by a brief discussion of each of the three major categories of natural hazards together with the main events

Table 2.1: Categories of natural hazards (Source: New Delhi NDMP, 2016)

Category	Main events
Biological	• Epidemics • Insect infestation
Geophysical	• Earthquake • Volcano • Tsunami
Hydro-meteorological	• Flood • Extreme temperatures (heat waves and cold spells) • Drought • Wildfires/ Veldt fires • Tropical cyclones • Landslide

2.3.1 Biological hazards

Biological hazards are defined by the United States Centre for Disease Control and Prevention (CDC, 2009:3) as infectious agents or products of such agents that have a negative impact on human health, animal health and vegetation production. According to the Safety Institution of Australia (SIA, 2012:11) many biohazards are capable of coming from, or affecting, the community due to the fact that most of them are infectious disease

factors that can be transmitted from one individual to the other. Biological hazards are not only transmitted from one human to the other, they may also be transmitted from an animal/plant to either the next animal/plant/human. However this study will focus on the biological hazards that have an impact on human lives. Although some biological hazards may be transmitted in a variety of ways, other biological hazards can be transmitted directly or indirectly.

2.3.1.1 Epidemics

An epidemic is a sudden increase in the number of cases of an infectious disease, which already exists or suddenly appears in a specific region or population (Boivin *et al.*, 2000:1166). Unlike most of the natural hazards, epidemics are natural hazards that originate biologically and have a negative impact on humans, animals and vegetation.

2.3.1.2 Insect infestation

Animal and insect infestations are defined by the World Health Organisation (WHO, 2008) as the troublesome spreading of various kinds of insects in an area affecting communities, agriculture, cattle or stored perishable goods. According to Oliveira *et al.* (2014) insect and animal infestations have a direct and indirect negative impact on humanity, especially with regards to agricultural activities. Oliveira *et al.* (2014) further state that crop damage and reduction in crop production are the direct impact that insect and animal infestations have on humanity, while economic loss and loss of food security are the indirect impacts.

2.3.2 Geophysical hazards

Geophysical hazards are “geological processes or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage” (UNISDR, 2007). Geological hazards are natural events or a phenomena that pose a negative impact to the physical environment, the economy and human lives. Furthermore the UNISDR (2009:16) states that geophysical hazards include internal earth processes, such as earthquakes, volcanic activity and emissions, and related geophysical processes such as mass movements, landslides, rockslides, surface collapses, and debris or mud flows. The following are the different types of geophysical hazards

2.3.2.1 Earthquake

D'Orazio *et al.* (2011) define an earthquake as a naturally occurring shock wave generated by the movement of the earth's crust or volcanic action, particularly near boundaries and tectonic plates, resulting in the shaking of the earth's surface. According to Doocy *et al.* (2013) earthquakes have a destructive impact on humanity as they are associated with fatality, injury and displacement. The occurrence of earthquakes often results in a lot of infrastructural damage, not only leaving most people homeless but also resulting in most people getting injured or possibly losing their life.

2.3.2.2 Volcano

A volcano is a "geological environment that, at any scale, is characterised by three elements: magma, eruption and edifice" (Borgia *et al.*, 2010:115). A volcano is the threatening process of lava and gas being discharged from a volcanic vent. Volcanic eruptions subject the affected population to relocate to safer areas that have better shelter, water, food and health supplies (Tobin & Whiteford, 2002). Not only do volcanic eruptions bring about mass destruction to people's houses and other buildings, but they are also associated with human fatalities and destruction of livelihoods (Kirianov, 2000). The loss of livelihoods and infrastructural buildings also results in a negative impact on the economic status of the areas affected.

2.3.2.3 Tsunami

Tsunami is a Japanese word meaning "harbour wave" which is used to describe a series of large waves of extremely long wavelength and period (Jain *et al.,* 2005). Tsunamis are usually generated by a violent, impulsive disturbance or activity near to the coast or in the ocean (Bondevik *et al.,* 2003). These disturbances can be earthquakes or volcanic eruptions which are nearby the coastal region or within the ocean. Tsunamis have the potential to cause considerable loss of life and injury to humanity (Doocy *et al.,* 2013). Kathiresan and Rajendran (2005) state that tsunamis also have a negative impact on coastal vegetation which ultimately has a negative impact on the socio-economic status the people living within the coastal regions.

2.3.3 Hydro-meteorological hazards

A hydro-meteorological hazard is “a process or phenomenon of atmospheric, hydrological or oceanic nature that may cause loss of life, injury or health impacts, property damage, loss of livelihood and services, social and economic disruption, or environmental damage” (UNISDR, 2009:18). These phenomena include tropical cyclones, thunderstorms, hailstorms, tornados, blizzards, heavy snowfall, avalanches, coastal storm surges, floods including flash floods, drought, heatwaves and cold spells. According to Zanuttigh (2014) hydro-meteorological hazards are amongst the most common sources of natural disasters worldwide. Below are the different types of hydro-meteorological hazards.

2.3.3.1 Extreme temperatures

There are two different types of extreme temperatures that can be experienced, namely, heat wave and cold spells. Stefanon *et al.* (2012) define a heat wave as a prolonged period of abnormally and uncomfortably hot temperatures, and are usually associated with humid weather. Heat waves usually occur during the summer season and are caused by very hot, stagnant air masses. According to Anderson and Bell (2011) the increase in the global climatic temperatures has led to an increase in the occurrence of heat waves and this poses a threat to human health.

Tomassini *et al.* (2012) describes cold spells as a rapid fall of temperatures at or below freezing point. Cold spells are usually experienced during the winter season. Revich and Shaposhnikov (2008) state that illnesses such as influenza/acute respiratory infections and cardiovascular diseases are associated with cold spells.

2.3.3.2 Drought

Wilhite and Glantz (1985:114) define drought as a deficiency in precipitation over an extended period, usually a season or more, which results in a water shortage that causes adverse impacts on vegetation, animals, and/or humans. West (2016) further defines drought as a state in which human demand for water exceeds the availability of water which is caused by too little precipitation over an extended period of time. Therefore drought is a prolonged period of abnormally low/lack of rainfall which results in a shortage of water supply that may affect the surrounding environment, the economy and the livelihood of humans in a negative manner. Vogel *et al.* (2010:11) state that droughts are

frequent natural hazards that occur mostly in semi-arid areas all around the world. Drought is classified as a slow onset hazard, giving individuals who are susceptible to the occurrence of drought the ability to prepare and adapt to the adverse impact of drought (Sena, 2006).

2.3.3.3 Wildfires/Veldt fires

Wildfires are uncontrollable fire burning that is usually experienced in wild lands or open fields and has the potential to cause damage to forestry, agriculture, infrastructure and buildings (Eriksen & Prior, 2013:88). Wildfires are large destructive fires that spread quickly over wild land and have a negative impact on the surrounding environment, infrastructure, human lives and the economy of a country. According to Prior and Eriksen (2013:1578) wildfires are usually caused by drought and dry conditions throughout various times of the year. Wildfires usually occur during the dry seasons. Wildfires have a devastating impact on humanity, property and the environment (Deorr & Santin, 2016).

2.3.3.4 Floods

Floods occur when water inundates land that is normally dry. Shepherd *et al.* (2011) indicates those factors such as volume, spatial distribution and duration of rainfall over a catchment; the capacity of the watercourse or stream network to convey runoff; catchment and weather conditions prior to rainfall event; ground cover; topography; and tidal influences constitute to the occurrence of floods. Shepherd *et al.* (2011) further indicate that the one major factor that contributes to the occurrence of floods is heavy rainfall. Floods are a temporary natural phenomena covering of water on land that is not usually covered by water and has a negative impact on human lives, the environment as well as the economy of the affected countries. (Ni *et al.,* 2010: 1932) stress that “floods are classified according to cause (high rainfall, tidal extremes, structural failure) and nature (e.g. regularity, speed of onset, velocity and depth of water, spatial and temporal scale”. Floods are common natural hazards that usually have a devastating impact on humanity (Ahem, 2005). Ni *et al.* (2010) emphasise that the economic, social and environmental equilibrium of a region can be deeply affected by the impact of floods.

2.3.3.5 Tropical cyclones

Tropical cyclones are low pressure systems that are associated with strong winds and thunderstorms that bring about heavy rainfall (Reason & Keibel, 2004). The associated weather patterns of a tropical cyclone contribute to the initial formation of a tropical cyclone and the increase in global temperatures exacerbates the frequent and intense occurrence of tropical cyclones (Yoshida & Ishikawa, 2013). Tropical cyclones originate over the oceanic region when temperatures are 27 degrees Celsius or above and in the southern hemisphere they usually rotate in a clockwise rotation and towards the inland (Lang & Ryder, 2016:3). Out of all the natural hazards tropical cyclones account for nine of the ten most costly and damaging natural hazards due to the associated weather conditions (Knutson *et al.* 2010).

2.3.3.6 Landslides

According to Cruden and Varnes (1996) landslides are defined in accordance to their basic movement mechanism, being, falls, topples, slides, spreads and flows. “Landslides occur when forces acting downslope exceed the strength of the earth materials that compose the slope and they are often triggered by rainfall, snowmelt, change in water level, stream erosion, changes in groundwater, earthquakes, volcanic activity, disturbance by human activity, or any combination of these factors” (Lakakis, 2009:2”. Landslides are the movement of a mass of rock, debris, or earth down a slope due to gravity. Landslides have a significant negative impact on human health, livelihoods and often result in economic vulnerability and environmental degradation (Geertsema & Highland, 2017).

“Preparing for a disaster can substantially minimise loss and damages from natural hazards” (Hoffmann & Muttarak, 2017: 32). However, one cannot just prepare for a natural hazard without fully comprehending all the details of the certain natural hazard that one is vulnerable to. Prevention is usually better than cure therefore the importance of providing the details of the different hazards in this study is to emphasise the impact of the different hazards that are experienced and establish the need for adaptation as a method to reduce the adverse impact of natural hazards. Now that the different types of natural hazards have been established, the following section will provide the natural

hazard's profile of the sub-Saharan African region, mainly focusing on the southern African region.

2.4 NATURAL HAZARDS RISK PROFILE OF THE SUB-SAHARAN AFRICAN REGION

The sub-Saharan African (SSA) region, along with the rest of the African continent, is prone to a wide variety of natural hazards (Van Niekerk & Nemakonde, 2017). Out of the 100 hazard reports worldwide, about 20 of these hazards occur widely in Africa (Loretti & Tegegn, 1996:180). The occurrence of natural hazards has a negative impact all around the world and African countries are amongst the countries that suffer the most due to the socio-economic status of the continent (Holloway *et al.,* 2013).

Therefore, the current socio-economic circumstances that African countries are faced with allow for the occurrence of natural hazards to escalate and magnify its impact to the continent thus, resulting in the continent being vulnerable to the adverse impact of natural hazards. Furthermore, Goering (2016) states that African countries are the most vulnerable countries to the occurrence of natural hazards because of other factors like political instability, corruption, poverty and inequality. Africa is prone and vulnerable to biological, geophysical and hydro-meteorological hazards (Lorreti & Tegen, 1996:182; Mulugeta, *et al.,* 2007:4). The vulnerability of the African continent to these natural hazards causes extensive losses to livelihoods, property and lives of many in Africa.

Figure 2.1: Map of sub-Saharan Africa (Source: ESRI - 2016).

A report compiled by a couple of regional and international organizations (Commission of the African Union, UNISDR and The World Bank in 2008), indicates that the sub-Saharan Africa region (figure 2.1 above) is not the most natural hazard prone region in Africa, but it is the most vulnerable region in Africa due to the physical, social, economic and environmental factors that negatively affect the capacity of people to secure and protect their livelihoods (Shiferaw *et al.,* 2014:68). Most of the countries that are situated in the sub-Saharan African region are vulnerable to more than one natural hazard. According to a concept note that was compiled by the Islamic Development Bank Group (IDB) during their 40th annual meeting that was held in June 2015, in Maputo, Mozambique, the sub-Saharan Africa's disaster profile is closely connected with the vulnerability of its population and economies, and exacerbated by minimal coping capacities.

Thus, it is very difficult for most counties in the sub-Saharan African region to cope with the adverse impact of natural hazards because of the minimal resources available for these countries. According to the World Economic and Financial Surveys (2016:61) the impact of natural hazards in the sub-Saharan African region is exacerbated by the structural factors that limit the regions' capacity to respond adequately and develop resilience over time. The concept note compiled by IDB emphasises the fact that the challenge faced by the sub-Sharan African region to respond effectively to the negative impact of natural hazards is due to the level of underdevelopment within the countries situated in sub-Saharan Africa (IDB, 2015).

Therefore, with the increase in the occurrence of natural hazards in the countries that lie within the sub-Saharan region, it becomes even more difficult for these countries to mitigate or even respond effectively to the adverse impact of the occurrence of the natural hazards that they are susceptible to. This is due to high level of natural hazards risk profile which is catalysed by multiple factors such as underdevelopment, political instability, corruption, poverty and inequality that exists within these countries. According to Silbert (2011) and Fletcher *et al.* (2013) the lack of adequate resources, economic instability and underdevelopment decrease the coping capacity of the people who are susceptible to the adverse impact of natural hazards. All these factors contribute to a slow recovery time for the people who have been affected by the adverse impact of natural hazards. The following section will in detail provide the impact of climate change to the occurrence of natural hazards and how these hazards affect humanity.

2.5 NATURAL HAZARDS IN SOUTHERN AFRICA AND A CHANGING CLIMATE

The southern African region falls within the sub-Saharan African region and is the southernmost region of the African continent (see figure 2.2. below). The countries that constitute the Southern African Development Community region as shown in figure 2.2. below include; Angola, Botswana, Comoros, Democratic Republic of Congo, eSwatini (formerly Swaziland), Lesotho Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zimbabwe, Zambia. Botswana being the case study of this study. The risk profile of the southern African region is characterised by natural hazards such as hydrometeorological and biological hazards (Lukamba, 2010:483).

Figure 2.2: Map of Southern African Region (Source: ESRI – 2016)

The southern African region is mostly affected by drought, floods, wildfires, tropical cyclones, and epidemics (Lukamba, 2010). Hoyois (2007:23) emphasises that the global climate change exacerbates the occurrence and magnitude of natural hazards and this will continue to increase the adverse impact of natural hazards to the socio-economic status of the countries affected thus the need for adaptation towards these natural hazards.

2.5.1 The impact of climate change on natural hazards

Over the past 40 years it has been recognised that the world's climatic conditions are changing and the temperatures are rising, thus having an impact on the earth's natural processes (Tadross & Jonston, 2012). The change in the global climatic conditions has been attributed to climate change. According to the Intergovernmental Panel on Climate Change (IPCC, 2007:6) climate change is "a 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. Climate change may be due to natural internal processes or external forces, or due to persistent anthropogenic changes in the composition of the atmosphere or in land use. The United Nations Framework Convention on Climate Change (UNFCCC, 2011:2) defines climate change as "Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".

Over the years there has been an increase in literature concerning climate change and thus has led to various definitions of the term "climate change". Therefore one may refer to climate change as a long-term change in the statistical distribution of weather patterns resulting in an increase in the average atmospheric temperature, which also includes major changes in precipitation and wind patterns. The discussion in this section focuses on the impact of climate change on the occurrence of natural hazards. The following discussion will specifically focus on drought, floods, wildfires and tropical cyclone as they are the most prevalent hazards in the Southern African region.

The IPCC Working Group II Third Assessment Report (WGIITAR) found evidence that represents the impact that the changing climatic conditions, particularly the increase in temperatures, have affected many physical and biological systems, and also primarily evident effects on in the human systems (Rosenzweig *et al.*, 2007:82). The changes in the global climatic conditions, particularly the temperature conditions of the world have impacted the global systematic processes one way or another especially that of the natural geological, climatological and hydrological processes (natural hazard occurrences).

According to Rosenzweig *et al.* (2007:90) the rapid changes in the climatic conditions of the world have influenced the occurrence of natural hazards in a positive manner as it has increased the frequency and the intensity of natural hazards. The increase in the global temperature is not evenly distributed across the African continent, however some regions like the Southern African region have been greatly affected (Tadross & Johnston, 2010:3).

The Intergovernmental Panel on climate Change published a special report on extreme events and disasters in 2012, which assessed the impact and the consequences of climate change on extreme events and disasters. The IPCC's (2012:9) compiled report concludes that climate extremes are a natural part of the climatic system; however, the changes in the global climatic conditions lead to changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather and climate events, and can result in unprecedented extreme weather and climate events. Therefore climate change acts as a catalyst towards weather and climate related hazards, thus having a detrimental impact on the countries that are posed or prone to the occurrence of weather- related and climatic natural hazards.

Extreme weather and climate events often have severe socio-economic impacts, such as loss of lives and livelihoods, food, water and energy scarcity, and adverse impacts on human health and the environment (USAID, 2009). The impact of climate change on weather and climate-related natural hazards poses a negative impact to the world and with the rise in the change of climatic conditions is only going to make matters worse. Below is a discussion of the impact that climate change has on the prevalent hazards in the southern African region.

2.5.1.1 Drought

The change in the climatic temperatures is likely to rapidly increase the frequency and severity of drought events (Trenberth *et al.,* 2003; Carnicer *et al.,* 2011). Briffa *et al.* (2009) state that scientific models such as the Palmer Drought Severity Index (PDSI) is used to measure the drought levels all around the world, by measuring the regional moisture availability (which is calculated by readily available temperature and precipitation data to estimate the relative dryness). Briffa *et al.* (2009) further indicate that soil moistures are likely to go down as the evaporative demand increases and higher temperatures

overweighing a possible increasing precipitation. In accordance to the predictions of the model the increase in the global climatic temperatures results in an increase in the frequent occurrence of drought as well as an increase in the severity of drought occurrence.

The combination of dry soil and high levels of potential evapotranspiration are likely to result in increases in the severity and frequency of droughts worldwide. Sheffield and Wood (2012) points out that according to the calculations of the PSDI since the 1970s there has been a decrease in moisture globally with a commensurate increase in the area on drought that is attributed, in part, to global warming. Models such as the PSDI point out that there exists a directly proportionate relationship between climate change and drought, therefore indicating that the more the climatic temperatures increase the more the frequency of drought occurrence as well the intensity of drought will occur. The observed change in the climatic conditions point that the frequency and intensity of drought is bound to increase as the climatic temperatures increase.

2.5.1.2 Epidemics

According to Wu *et al.* (2016) the increase in the global climatic condition has a directly proportional impact on the survival, reproduction, or distribution of disease pathogens and hosts, as well as the availability and means of their transmission environment. Watts *et al.* (2015) argue that natural hazards such as drought, floods, heat waves, cold spells and tropical cyclones have an impact in disease outbreaks, particularly those that are infectious in nature. In some cases disease outbreaks are secondary hazards, as they are a result of the occurrence of primary natural hazards such as floods, drought, heat waves, cold spells and tropical cyclones. Kovadio *et al.* (2014) state that infectious diseases such as diarrheal diseases, acute respiratory infections, malaria, leptospirosis, measles, dengue fever, viral hepatitis, typhoid fever, meningitis, as well as tetanus and cutaneous muco-mycosis are a result of floods, drought, heat waves, cold spells and tropical cyclones.

Furthermore, Liang and Gong (2017) state that the increase in the global climatic temperatures result in the increase in the survival rates of pathogens. The more the temperatures increase the more the longevity of pathogens within hosts. Therefore climate change increases the occurrence of epidemics.

2.5.1.3 Floods

Gaume *et al.* (2009) pointed out that global warming impacts the occurrence of rain in a significant manner as it increases the frequency and intensity of heavy rainfall events globally. According to Bates *et al.* (2008:15) the hydrological system is associated with climate change as it has greatly affected the hydrological cycle by changing the precipitation patterns and the intensity of the precipitation patterns. Bates *et al.,* (2008) further indicate that other components of the hydrological cycle that have been affected by the change in the climatic conditions are widespread melting of snow and ice, increasing atmospheric water vapour, increasing evaporation and changes in soil moisture and runoff.

Warmer climatic temperatures stimulate the evaporation of water from land and seas and allow the atmosphere to hold more moisture, thus resulting in an increase in extreme precipitation. According to Booij (2005:177) the global change in the climatic conditions has resulted in an increase in the global temperatures, change in precipitation patterns and a rise in the frequency of extreme natural events. Kundzewics *et al.* (2008:5) emphasise that climate change has resulted in a shift in the hydrological system as well as the precipitation patterns, resulting in a shift in rainfall patterns. The increase in the global temperatures has not only affected the increase in the intensity and frequency of rainfall (resulting to flooding), but also the melting of snow, inadequate drainage or failure of levees and dams have contributed to the increase in the occurrence of flooding worldwide.

Gaume *et al.* (2009) state that scientists predict that the frequency and intensity of floods are going to increase even further in the future as the global temperatures increase. Therefore the frequent occurrence and intensity of floods are dependent upon the increase in climatic temperatures, which show a directly proportionate relationship that exists between the two variables.

2.5.1.4 Tropical cyclones

Walsh *et al.,* (2016) point out that climate change imposes a positive influence on the severity and frequent occurrence of natural hazards due to the climatic conditions that tropical cyclones are dependent upon in order to formulate and sustain them. The minimum temperature required to formulate a tropical cyclone is 27 Degrees Celsius and

in this regard the increase in the global temperatures results in an increase in the frequent occurrence of tropical cyclones. Tropical cyclones draw energy from the surface waters of the ocean and as more energy (in the form of heat) is stored in the upper waters, the more intense and severe the tropical cyclone will become (Emmanuel, 2000; Wing *et al.,* 2007).

Theory and high resolution dynamic models indicate that due to climate change, the global average intensity of tropical cyclones will increase by 2-11% by 2100 (Knutson *et al.,* 2010:159). Connor (2012) further states that scientists have found support for the controversial idea that climate change is the primary cause of the more frequent and destructive occurrence of tropical cyclones. The more the climatic temperatures increase the more likely it is for the severity and frequency of tropical cyclones to occur. This emphasises that climate change acts as a catalyst to the rapid and destructive occurrence of tropical cyclones as natural hazards and this will continue to increase as the global climatic temperatures increase.

2.5.1.5 Wildfires/ Veldt fires

Wildfires are natural hazards that are primarily driven by climate/weather (De Groot *et al.,* 2009:367). Wildfires feed off dry weather conditions and the warmer the climatic conditions become the higher the intensity and frequency of wildfires. Schlossberg (2016) states that scientific models, such as the general circulation model (GCM) have shown evidence that climate change has contributed to the frequency and intensity of wildfires, the longer fire seasons and the increasing area of land that gets burned. The GCMs are tools that represent the physical processes in the atmosphere, ocean, cryosphere and land surface and is currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations (IPCC, 2013). This model is normally used for weather forecasting, understanding the climate and forecasting climate change.

Research points out that the changes in climatic temperatures constitute the early snowmelt due to warming in the spring and summer, leading to hot dry conditions thus resulting in an increase in wildfire activities (Fried, 2004). Fried (2004) further indicates that a factor such as increase in temperature and decrease in soil moisture has resulted in an increase in the frequent occurrence of wildfires. Climate change leads to drier

conditions and higher temperature increases thus resulting not only in the likelihood of wildfire occurrences but also a longer duration and severity of the wildfires.

The above discussion pointed out the influence of climate change on the occurrence of natural hazards. It highlighted that climate change acts as a catalyst towards the occurrence of natural hazards thus leading to more frequent and severe occurrence of natural hazards prevalent in the southern African region. According to Loftis (2015) research agencies and institutions in more than 20 countries have found that climate change has played a large role or set up in the increase in the severity, frequency, intensity, spatial extent, duration and timing of natural hazards. The more the temperatures increase the likely the occurrence of natural hazards to increase, with an increase in the severity and frequency of these natural hazards. Therefore, this points out that climate change acts as a catalyst to the frequent occurrence of natural hazards globally.

2.5.2 The impact of natural hazards in the Southern African Region

“A natural disaster is an act of nature of such magnitude as to create a catastrophic situation in which the day-to-day patterns of life are suddenly disrupted and people plunged into helplessness and suffering, and as a result, need food, shelter, medical and nursing care and other necessities of life, and protection against unfavourable environmental factors and conditions” (Asser, 1971:14). The escalation of natural hazards has had a devastating impact on developing countries and Africa in particular (Edoun *et al.*, 2015). The southern African region’s risk profile is diverse as factors such as the political instability and low socio-economic development result in the region being more vulnerable to natural hazards (Pourazer, 2017). The United Nations International Strategy for Disaster Reduction (UNISDR, 2008) further emphasises that the southern African region is vulnerable to the effects of natural hazards because of multiple stresses and the region’s low adaptive capacity arising from widespread poverty. There are many contributing factors that result in the southern African region being vulnerable to natural hazards, the following are the impacts of the prevalent natural hazards in the southern African region.

2.5.2.1 Drought

Much of the countries that lie within the Southern African region experience a recurring problem of drought, which has a negative impact on these countries. In the Southern African region drought occurs primarily in the semi-arid regions of Mozambique, Malawi, South Africa, Namibia and Botswana. Bhavnani *et al.* (2008:4) highlight that drought has a negative impact in the Southern African region because it aggravates environmental degradation through ecosystem and climatic effects. Drought further has a negative impact on the social environment and the economy of the countries within the Southern African region due to the fact that it results in deforestation, livestock overgrazing, soil erosion, wild land fires, biodiversity loss and water pollution.

Drought also intensifies the shortage of water supply in countries in parts of the Southern African region resulting in a negative health and sanitation problem, especially for vulnerable groups. According Jaka (2009:10) droughts in the Southern African region have the most pronounced impact on food security, affecting millions of vulnerable people negatively every year within this region. Impact on most of the people in the Southern African region is more severe due to the fact that most people are reliant on agricultural activities for basic food provision as well as a source of income for livelihood sustainment (van Dijk *et al.*, 2013).

The impact that drought has on agricultural activities in the Southern African region results in an increase in famine and food insecurity within the region. According to Analy (2016:62) the Southern African region experienced the worst El Nino-induced drought during October 2015 to March 2016. This drought was recorded as the worst experienced El Nino-induced drought with the worst impact in the Southern African region within the last 35 years.

According to the response plan drafted by the Regional Inter-Agency Standing Committee (RIASCO, 2016:12), over half a million children suffered from acute malnutrition in the seven priority countries (Angola, Lesotho, Madagascar, Malawi, Mozambique, eSwatini and Zimbabwe) in the Southern African region, while 3.2 million children have reduced access to safe drinking water as a direct result of the El Nino-induced drought. RIASCO (2016:12) further indicates that not only did this severe drought bring about health problems but it also brought about food insecurity within the seven priority countries in

the Southern African region as well as economic instability, and risk of civil unrest and conflict. Another main problem that exists within Southern African countries is the reactive response to drought (Wilhite *et al.*, 2014). It often takes a long time for Southern African countries to address and resolve the impacts of drought, thus taking years for a country to recover or even just function normally again after the drought has long passed.

2.5.2.2 Floods

Floods are amongst the most devastating natural hazards in the Southern African region that cause loss of life, damage to property and promote the wide spread of diseases such as malaria, dengue fever, cholera and chikanguya (Mulugeta *et al.*, 2006:5). Floods are hydrological hazards that create an opportunity for biological hazards to develop. Severe flooding are usually brought about by tropical cyclones and severe storms and pose a negative impact on the livelihoods of those affected in the Southern African region. An example is the recent occurrence of Tropical Cyclone Dineo which struck Southern Africa early February 2017. According to Lindeque (2016), more than 13 000 people had been displaced and 20 000 houses, including clinics and schools were destroyed during the occurrence of Tropical Cyclone Dineo. Lindeque (2016) further states that Tropical Cyclone Dineo resulted in 250 confirmed cases of cholera and at least seven people died from this epidemic.

Seventeen of the 52 largest trans-boundary river systems in the world are located in Africa, and three of these river systems are situated in the Southern African region, namely, the Zambezi, Limpopo and Orange River (GFDRR & WBG, 2016:5). These three rivers are the rivers that experience most floods in the Southern African region. Bickton (2016:70) highlights that the floods that occurred in December 2014 caused major damage in the region affecting Malawi, Mozambique, Madagascar and Zimbabwe negatively. For example, in 2014 alone Malawi received 400% higher rainfall than usual, causing the Shire River to reach its highest level in 30 years. As a result, flooding was experienced in 15 of the 28 districts in Malawi, affecting an estimated 638 000 people and resulting in an outbreak of cholera with about 693 reports and 11 deaths reported. Similarly, in Mozambique, heavy rains caused severe flooding across the central and northern Mozambique.

The national Institute of Disaster Management (INGC) reported that 373 026 people were affected in Zambezia, Nampula, Niassa, Cabo Delgado and Monica provinces, with 14 361 houses being partially damaged and 21 780 houses completely destroyed. The International Federation of Red Cross and Red Crescent (IFRC, 2015) also reported a cholera outbreak resulting in 8 835 people infected with the disease and 65 deaths were recorded. From the above examples it is evident that not only do floods have a negative impact on the lives of the people residing in the Southern African region but also on their livelihoods, the physical environment (infrastructure) and the economy of the countries affected.

2.5.2.3 Epidemics

Communicable diseases remain a major public health challenge in the African region, causing a significant burden of illness, disability and mortality (Kabede *et al.*, 2010:20). Disease outbreaks within the Southern African region such as, cholera, dysentery, meningococcal meningitis, malaria, measles, haemorrhagic fevers, yellow fever, ebola, marburg viral haemorrhagic fever, rift valley haemorrhagic fever, lassa fever, plague, TB, crimean-Congo haemorrhagic fever, HIV/AIDS, cancer, typhoid fever, are all a constant threat (Kabede *et al.*, 2010:21).

According to Mulugeta *et al*. (2006:15) the Southern African region suffers the most from the impact of epidemics among the countries in Africa. One of the major reasons that make this natural hazard even more destructive within the Southern African region is the weak public health systems that are characteristic within the countries of the region (Gray & Vawada, 2016). Mulugeta *et al.* (2006:15) state that amongst all the epidemics, HIV/AIDS is the leading cause of death in the Southern African region. The HIV/AIDS pandemic has claimed more than 15 million lives in the region since it started to spread. According to theUNICEF (2017) the Southern African region has been declared the region in the world with most HIV infected people.

2.5.2.4 Wildfires/ Veldt fires

Southern Africa is prone to the occurrence of wildfires, mainly due to the semi-arid climatic conditions. Svoboda *et al.* (2002:1182) argues that wildfires are and will always be part of the Southern African region landscape and they occur as a natural phenomenon on grasslands, woodlands and fynbos and sometimes in indigenous forests. According to

the Food and Agriculture Organisation of the United Nations (FAO, 2001) Africa is often referred to as the “fire continent” due to the fact that Africa has the most extensive area of tropical savannah in the world, characterised by a grassy understorey (layer of dry vegetation that accumulate under the main layer of vegetation) that becomes extremely flammable during the dry season.

In the Southern African region wildfires are mostly prone in Angola, Southern Congo, Zambia, Northern Mozambique and Southern United Republic of Tanzania. Mulugeta *et al.,* (2006:7) states that in the Southern African region, wildfires may be ignited naturally by lightening or by spontaneous combustion of coal like in Zimbabwe and peat like in the Okavango Delta and the Lesotho highlands. Mulugeta *et al.* (2006:7) further argue that the negative impacts that wildfires have on the Southern African region lead to a destruction of biodiversity and reduction of the regeneration capacity for vegetation. Therefore wildfires do not only have a negative impact on the physical environment of the Southern African region, they also affect the livelihood of those dependent on agricultural activities as a source of income or as a source of food provision (livelihood).

2.5.2.5 Tropical Cyclones

Tropical cyclones as a natural hazard brings about destruction to the physical environment, the infrastructure and loss of livelihoods of many within the Southern African region. According to Reason and Keibel (2004:789) in February 2000 tropical cyclone Eline struck the Southern African region and brought about devastating floods in Mozambique, Zimbabwe and South Africa. Reason and Keibel (2004:789) further state that tropical cyclone Eline was recorded as the longest-lived tropical cyclone observed in the southwest Indian Ocean to date and had an unusual zonal track, penetrating exceptionally far inland over the interior plateau of Southern Africa. In normal instances, tropical cyclones lose intensity when they move inland due to the friction brought about by the land escarpment as well as the infrastructure within the inland, but tropical cyclone Eline brought about a different anomaly due to the fact that it was sustained for so long within the inland and had a severe negative impact to the countries within the Southern African region.

According to Machipisa (2000), Reason and Keibel (2004:789), and McGreal (2000) tropical cyclone Eline affected Mozambique, South Africa, Swaziland, Botswana, Madagascar, Zimbabwe and Namibia. For example, in Mozambique the tropical cyclone brought about destruction of households and infrastructure, more than 100 people died in the floods and there was an increase in the incidence of malaria. The Mozambique government declared that more than 500 000 people had been affected by the floods and the damage caused by these floods amounted to millions of pounds.

In South Africa tropical cyclone Eline brought about floods in the Limpopo River Basin causing the river basin to reach its highest level in 156 years. The flood also resulted in infrastructural destruction and 26 people were declared dead, with an estimation of 80 000 people left homeless. The damage to the Limpopo province alone was estimated to be $300 million (USD).

The impact of tropical cyclones on the Southern African region is that of a negative nature because it brings about loss of lives, livelihoods, infrastructure and homes as well as economical and agricultural loss. For a region relying so heavily on agriculture activities as an income and for basic food provision once the agricultural activities of the countries in the Southern African region are destroyed, many people lose their source of food provision as well as their source of income. Floods that are brought about by a tropical cyclone within the Southern African region bring about immense structural destruction and loss of crops as well as disease outbreaks. And the heavy winds also destroy a lot of homes and other structural material thus resulting in a lot of people losing their shelter and are left homeless.

The discussed natural hazards within the Southern African region all pose a negative impact within the region and affects all aspects of live in the region.

2.6 ADAPTATION TOWARDS NATURAL HAZARDS

The preceding section discussed the impact of climate change on the natural hazards, providing literature that supports that climate change and natural hazards have a directly proportionate relationship as climate change increases the rapid and intense occurrence of natural hazards. The section also discussed the impact that natural hazards have on the southern African region, pointing out the need to develop strategies to reduce the

adverse impact of natural hazards within the region. To reduce the impact of natural hazards exacerbated by climate change measures needs to be taken in the physical, economic and social environment of the areas at risk. In the field of Disaster Risk Management there are two generic measures that are often taken to lessen the adverse impact of natural hazards, i.e. adaptation and mitigation (Nyong *et al.,* 2007). This study focuses on adaptation as a measure to lessen the adverse impact of natural hazards.

There are various connotations for the term adaptation, depending on the focus of the disciplines. The UNISDR (2009:4) defines adaptation as “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities”. “Adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change” (UNFCCC, 2007:6).

Adaptation is the ability for a system (human and natural) to align its physical or behavioural characteristics to the changing environment in order to enhance the system’s survival (Wong, 2015:666). According to Adger *et al.* (2005) adaptation involves actions that are made up by individuals, groups and government throughout the society and can be driven by factors such as protecting the economic well-being of a country as well as improving the safety of individuals and their livelihoods within the country. Specifically, for natural hazards, adaptation has been developed as a method of effectively dealing with the impact of natural hazards to the society, the environment as well as the economic status of countries at risk.

This section considers both the definitions of the UNISDR (2009:4) and the UNFCCC (2007:6) due to the fact that (as mentioned in section 2.6.) climate change plays a significant role in the increase in the frequency and intensity of occurrence of natural hazards. Apuuli *et al.* (2000) argue that it is important to explicitly consider risks that are associated with climate change when developing adaptation strategies towards natural hazards.

The world is constantly changing thus there exists a need to develop strategies/methods to adapt and cope with the changing environment (Miao, 2015). The ability for people to align their behaviour to the constantly changing environment and the hazards that they are exposed to allows them to better cope with the negative impact of the natural hazards they are exposed to. However there are underlying factors that come into play when developing adaptation strategies. One of these is risk perception. Van Niekerk (2011:15) argues that due to complexities of human nature, underlying factors such as culture, beliefs, political orientation, link to nature and the environment, economic well-being, and social networks have a profound impact on how people perceive risk. These underlying factors ultimately impact the way in which people develop adaptation strategies. Adger *et al.* (2009) further stress that endogenous factors such as ethics, knowledge, attitudes to risk and culture within societies are non-structural factors which contribute towards development of adaptation strategies.

Efforts that are taken to respond to the occurrence of natural hazards reduce vulnerability and enhance adaptive capacity (Nelson *et al.,* 2007:396). There are various ways in which societies have been coping and adapting with the adverse impact of natural hazards (Miao, 2015). These various ways are both structural and non-structural. However in this section we will be focusing on the non-structural adaptation strategies that are employed by rural communities. According to Opiyo *et al.* (2015) there are short-term adaptation strategies towards natural hazards that are implemented by communities. Migosi *et al.* (2012) translate that the short-term strategies are often referred to as coping strategies as they involve temporary adjustments towards natural hazards.

2.6.1 Types of adaptation strategies towards natural hazards

The terms adaptation and coping are often used interchangeably. However, there is a difference between the two terms (Smit *et al.,* 2000). This section will distinguish the difference between adaption and coping, followed by the discussion of the types if adaptation strategies that are implemented in rural communities towards natural hazards. According to Opiyo (2015) adaptation strategies are long-term strategies that assist communities to lessen the adverse impacts of natural hazards in a continuous manner that involves practice and sustainable results. Adger *et al.* (2007) further argue that adaptation involves adjustments in reducing vulnerability of households to climate related

natural hazards. The following are some of the adaptation strategies that are implemented by rural communities in order to lessen the adverse impacts of natural hazards.

2.6.1.1 Livelihood diversification

Livelihood diversification is the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and improve their standard of living (Ellis, 1995). This strategy is implemented by communities or households in order to find new ways to raise income and reduce the vulnerability of households towards the risk of natural hazards that they are exposed to. This adaptation strategy has gained attention from academics and policymakers in the past decades, because not only does it provide opportunities to reduce risk and increase income but it also helps households to cope with the adverse impact of natural hazards (Takane & Gono, 2017). According to Helgeson *et al.* (2013) livelihood diversification is prominent as an adaptation strategy towards drought. However, drought is not the only natural hazard that drives livelihood diversification. Makate *et al.* (2016) highlight that heat waves, floods, strong winds and tropical cyclones are hazards that also drive livelihood diversification as an adaptation strategy.

Israr *et al.,* (2014) grouped livelihood diversification into two major categories, which are on-farm and off-farm diversification. Bartolini *et al.* (2014) define on-farm diversification as a diverse spread of crop and livestock production activities that interlock with each other in various ways. An example of this is maintaining a diverse range of crops on the same piece of land in order to take advantage of complementarities of the use of soil nutrients, sunlight and other resources of the different types of crops. Off-farm activities are activities that are indirectly involved with farming such as processing and trading of agricultural produce such as livestock and crops, depending on the agricultural activities that are undertaken by the specific household (Ellis, 2000). Activities such as service provision, trade and business, and manufacturing are other off-farm activities that are implemented in order to reduce natural hazard risk and increase household income within households.

There are two types of major patterns of livelihood diversification that have been identified, namely, survival-led diversification and opportunity-led diversification (Barrett *et al.*, 2001; Haggblade *et al.*, 2010; Loison, 2015). Takane and Gono (2017) describe

survival diversification as a strategy that is implemented for survival purposes. This strategy is the diversification of economic activity needed for survival and is often found in low-productivity and risk agriculture, seasonality of economic activities, prevalence of poverty and the occurrence of natural hazards. Opportunity-led diversification is described as an adaptation strategy that is implemented where a dynamic economic environment incentivises households to engage in high return economic activities (Takane & Gono, 2017). This diversification occurs when opportunities to increase the income of the household presents itself to an individual such as a more stable income job.

2.6.1.2 Mobility

Mobility is an adaptation strategy that involves moving livestock from one area to another in order to reduce hazard risk (Kreutzmann, 2012). This strategy enables opportunistic use of resources and helps minimise the effects of hazard risk that the rural communities are exposed to. Rota (2009) states that this adaptation strategy is seasonal as it is primarily implemented for livelihood purposes, which ensures that households that participate in such activities maintain the productivity of their herds and security of families. This adaptation strategy helps households adapt to the adverse impact of natural hazards. The movement of livestock from one area to another is efficient as it reduces exposure to the risk of natural hazards such as floods, drought, tropical cyclones and disease outbreaks.

2.6.1.3 Shifting planting dates

The shifting of planting dates as an adaptation strategy towards natural hazards is usually used by smallholding farmers where they choose to plant in a different season or on a different date as compared to that of the usual (Howden *et al.,* 2007). Households opt to conduct their planting activities during the pre-planting season or post-planting season in order to lessen the adverse impact of natural hazards. According to Below *et al.* (2012) most farmers in developing countries prefer to practise this adaptation strategy as it is relatively inexpensive to adopt. Belay *et al.* (2017) points out that individuals in developing countries opt to practise this adaptation strategy in order to enhance their resilience towards climate change related natural hazards such as drought and floods. Therefore due to the recognition of the change in the global climatic conditions, the practice of

shifting plantation dates as an adaptation strategy is beneficial to most small hold farmers who are reliant on agriculture as a source of food security and household income.

2.6.1.4 Training in livestock health

The world's largest land use sector is livestock farming, which utilizes about 60% of the global biomass harvest (Weindl *et al.,* 2015). The United Nations Food and Agriculture Organisation (FAO, 2011) points out that livestock production is the fundamental provision of not only food but also economic, social and cultural role in rural communities. Livestock farmers in the rural areas rely on livestock as a source of income and food security. Amenu *et al.* (2017:2) argue that "diseases result in poor livestock health, low productivity, mortality, reduced livestock products and increased risk of disease transmission to humans". It is therefore important that the local livestock farmers are aware of the types of diseases that their livestock is prone to and how to prevent their livestock from getting infected.

Livestock farming and production are at risk to natural hazards that are climate related due to the global increase of climatic conditions (Rojas-Downing *et al.,* 2017). Therefore the process of training community-based animal health workers can be used as a strategy to reduce the adverse impact that climate-related natural hazards pose. According to Resegrant *et al.* (2009) livestock products are an important agricultural commodity not only for global food security but also for the employment opportunity it creates for the poorest population in the world. Jenjezwa and Seethal (2014) state that training in livestock health involves "medical care, information and training on livestock management, laboratory testing of medicines and samples for diagnosis of diseases, monitoring and controlling disease risks and outbreaks, and promoting hygiene in abattoirs". These services can be rendered by either the government or NGOs.

2.6.1.5 Sending children to school

Sending children to school in order to acquire education is partly seen as an important adaptation strategy as it facilitates income diversification for rural households and is often viewed as a long-term strategy (Opiyo *et al.,* 2015). As the saying goes, "education is the key to success", when parents send their children to school, it enhances the household's ability to increase a household's income in order for them to lessen the adverse impact on their livelihood. This is due to the fact that children are able to acquire skilled jobs that

have a stable and consistent income, thus helping their families financially. Most importantly, the education that the children acquire can also benefit the household as children can bring new strategies to adaptation towards the occurrence of natural hazards, due to the fact that they are being taught about such anomalies and how to adapt towards such. Opiyo *et al.* (2015) argue that in some cases, adults send their children to school in order for them to get food through school nutritional programmes.

2.6.1.6 Soil and water conservation

Soil and water conservation are those activities at the local level which maintain or enhance the productive capacity of the land including soil, water and vegetation in areas prone to degradation through prevention or reduction of soil, compaction, salinity, conservation of drainage of water, and maintenance or improvement of soil fertility (Schwilch *et al.,* 2007:1). This adaptation strategy is used to preserve and protect soil and water and aims for sustainable development and poverty-oriented natural resource management. According to Lutz (2014) with climate change being a threat to agricultural production and food security in developing countries soil and water conservation is an effective adaptation strategy towards natural hazards, especially for smallholder farmers. Soil and water conservation as an adaptation strategy can help households to improve their food production therefore contributing to poverty alleviation in especially developing countries that rely heavily on agricultural activities as a source of income or food security.

2.6.1.7 Livestock off-take

Livestock off-take is the number of livestock sold as proportion of the total livestock given period of time, and in African rural communities it is often done through auctions, sales between community members and lobola payments (Nyariki *et al.*, 2005). This type of adaptation strategy is the process of increasing the off-take as an obligation to meet the household's demand for food when affected by natural hazards such as drought, floods, tropical cyclone or veld fires (Musemwa, 2010). This adaptation strategy is normally taken when a disaster has struck within a community, thus resulting in households selling their livestock or livestock products when prices have increased or buying livestock or livestock products when prices are low. However, Schilling *et al.* (2012) argue that most households in the rural areas do not opt to sell their livestock especially cows as they rely on the cows for the provision of milk and calf production, rather they opt to sell goats.

2.6.2 Types of coping strategies towards natural hazards

Coping strategies are short-term mechanisms that are put in place in a given context to achieve various ends through the use of available resources and ranges of expectations (Blaikie *et al.,* 1994). This type of strategy involves temporary adjustments in response to change or mitigate shocks and stresses on livelihoods (Migosis *et al.,* 2012). This strategy is therefore a reactive strategy that is often short-lived and used once off as a way to lessen the adverse impact of natural hazards. The following are some of the coping strategies that are implemented by rural communities in order to lessen the adverse impact of natural hazards.

2.6.2.1 Labour migration to towns

Labour migration is a movement from one place to another for the purpose of seeking employment in order to lessen the adverse impact of natural hazards unto a household (Raleigh *et al.,* 2008). According to Barnett and Webber (2010) this form of coping strategy is often taken by selecting an individual within a household to move and seek work in order to reduce the number of people that a household must support. Stark (1991) emphasises that this coping strategy assists households by creating an alternative income and results in increasing the resilience of the household towards the adverse impact of natural hazards. According to Black *et al.* (2013) there are pull and push factors that drive people to migrate to other towns, such as lack of access to resources (push factors) and availability of employment and demand for workers (pull factors). In most instances this type of coping strategy is a rural-urban type of migration, where the selected individual seeks a job in the urban areas in order to provide income for the household and lessen the damaging impact of natural hazards.

2.6.2.2 Increased wild food consumption

The occurrence of natural hazards results in an increase in the level of vulnerability of those households and can affect the households' food security including access to food, availability and stability of supplies and nutrition across the world (Habiba *et al.,* 2016). Broegaard *et al.* (2017) emphasise that one of the most common coping strategies employed by households to lessen the adverse impact of natural hazards is the increase in wild food consumption. This type of coping strategy is often employed when a natural hazard affects the level of food security of a community negatively, thus leaving the

community members with no option but to look for alternative food intake. An example of this coping strategy is when a tropical cyclone strikes a community that is dependent on crop farming as a source of income and for food security, the tropical cyclone ends up destroying the crop farms, leaving the community with no other option but to look for alternative food consumption such as wild spinach.

2.6.2.3 Seeking relief assistance

The world's poor people are disproportionately vulnerable to loss of livelihood and assets, dislocation, hunger and famine in the face of climate variability and change (Norton & Mearns 2009:48). Norton and Mearns (2009) further argue that poor people live with multiple risks and overlapping natural, social, political and economic hazards and this results in a decrease in their coping capacity. Poor communities are more vulnerable to the adverse impact of natural hazards thus leaving them more dependent on relief assistance from government relief programs, and NGOs. Seeking relief assistance as a coping strategy is driven by the fact that poor communities have a lack of access to resources, even the most basic resources that are readily available to the more financially stable communities (Birkmann *et al.*, 2010).

2.7 CONCLUSION

The aim of this chapter was to provide a theoretical analysis of natural hazards. In so doing this chapter conceptualised the term natural hazards by defining the term and highlighting that over the years as more literature started focusing on disaster risk management the term evolved and became transdisciplinary. The discussion highlighted that due to the introduction of the International Decade of Disaster Risk Reduction, more literature started to develop in the field of disaster risk management, thus leading to a more improved definition of natural hazards.

The Southern African region, as with the rest of the African continent, is prone to a wide variety of natural hazards. An understanding of these hazards and how communities effectively cope and adapt to the impacts of these hazards, is important in light of the changing climate. This chapter provided a theoretical framework on natural hazards, focusing on the analysis of the past and the current trends of the occurrence of natural hazards, types of hazards in general, hazards prevalent in the sub-Saharan region and the southern African region. The chapter further conceptualises adaptation to the hazards

as a way of coping with the hazards. In doing so, the chapter addressed the first research objective of the study presented in Chapter 1, namely; to provide a theoretical perspective on adaptation to natural hazards.

CHAPTER 3: SOCIAL LEARNING THEORY: THE BASIS FOR INTERGENERATIONAL INFORMATION TRANSFER

3.1 INTRODUCTION

Chapter 2 of this study discussed the concept of natural hazards in detail, conceptualising the term and providing a much broader understanding of natural hazards and their impacts. Section 2.5 presented and discussed the influence that climate change has on the occurrence and severity of natural hazards thus leading to a recognition of the need for strategies to lessen the adverse impact of natural hazards. In conceptualising the problem under investigation in Chapter 1, it has been argued that an increase in the occurrence of natural hazards has been accompanied by an evolution of strategies to cope with such hazards. According to Miao (2015) human societies have always used various ways to adapt to environmental changes and shocks, one of which is through social learning. Adaptation as a method of lessening the adverse impact of natural hazards can be learned, from one person to the other.

This chapter considers the social learning theory, significance of information transfer from one generation to the other as a form of learning how to adapt to the increase in frequency and severity of natural hazards. In so doing this chapter addresses the second research objective of the study as outlined in Chapter 1, which is to provide a theoretical perspective on social learning and providing an understanding of intergenerational information transfer. This chapter is structured as follows: firstly, this chapter unpacks the social learning theory by providing an understanding of intergenerational information transfer and acquiring new behavioural skills through observational learning. Secondly, the role of indigenous knowledge in the field of disaster risk management is discussed. Thirdly, this chapter highlights ways in which adaptation strategies that have been developed in indigenous communities, how they are taught from one generation to the next and the benefits of incorporating indigenous knowledge into adaptation strategies and disaster risk strategies.

3.2 SOCIAL LEARNING THEORY

Since the inception of psychology as an independent science in the late 1880s the process of learning has been a central topic in psychological research (Houwer, 2013). Many theorists in the discipline of psychology have tried to find an explanation as to why humans behave the way they do and how humans acquire behavioural skills in a social setting. From the early 1960s, a number of theories were developed in order to explain the concept of social learning, which were criticised on the basis of both conceptual and empirical grounds (Bandura, 1971). In the early 1970s Albert Bandura with the help of his colleagues, Albert Ross and Sheila Ross, developed the most influential theory of learning and development known as the social learning theory. The theory provides a basis on how knowledge and behavioural skills are acquired in a social setting.

Learning is an act of acquiring new or modifying and reinforcing existing, knowledge, behaviours, skills or values, which may lead to a potential change in synthesising information, depth of the knowledge, attitude or behaviour relative to the type and range of experience (Gross: 2010). According to Lachman (1997:447) “learning is the process by which a relatively stable modification in stimulus to response relations is developed as a consequence of functional environmental interaction via the senses”. Learning is a process whereby an individual can acquire new knowledge through observation, practice or by being taught and can possibly affect an individual's behaviour, attitude and perception towards related issues (Schunk, 1989). According to Pashler *et al.* (2009) there are different types of learning methods through which individuals can acquire knowledge from, for example learning can be acquired through visuals, aural, verbal, physical, logical, social and solitary. Therefore learning is an act of acquiring knowledge or skills by either studying, through experience or by being taught and has the ability to influence how one behaves within a certain social setting.

Ison and Watson (2007) define social learning as the process of achieving concerted actions in complex and uncertain situations. Social learning is learning that occurs within a social context, where one person can acquire new knowledge and skills through interactions with others within societies or by observing social behaviours and patterns. Cobb (2011) suggests that social learning facilitates change in the individuals involved. Most human behaviour is learned observationally through modelling and therefore, by observing others a person form an idea of how new behaviours are

performed, and on occasions this coded information serves as a guide for action (Bandura, 1977:69). Social learning theory is “the process of learning behavioural characteristics by observing and modelling others within the surrounding environment” (Bandura, 1977:69). The social learning theory argues that people modify their behavioural characteristics by observing, imitating and modelling other people within a social setting. The theory also outlines that through observational learning the younger generation is able to acquire behavioural skills from the older generation by imitating them.

3.2.1 Social Learning Theory’s observational learning and modelling

Observational learning according to the social learning theory explains the nature of children learning the behaviour of the people around them by observing them and ultimately imitating them (McLeod, 2016). According to the social learning theory observational learning is a “monkey see, monkey do” analogy, whereby children observe the behaviour of an adult and later on imitate the observed behaviour. The theory suggests that children observe the behaviours of adults around them and ultimately imitate their behaviours.

In 1961 and 1963 Albert Bandura together with his colleagues conducted a bobo doll experiment to investigate whether social behaviours can be acquired by observation and imitation. According to Hart and Kritsonis (2006) there were seventy two (72) participants that consisted of thirty six (36) boys and thirty six(36) girls from the Stanford University nursery school, all ranging from the age of three years to five years. Drewes (2008) further explains that the children were divided into four groups of which twenty-four (24) children were exposed to an aggressive model, twenty-four (24) children were exposed to a non-aggressive model and the remaining twenty-four (24) were part of a control group. The groups were then divided in accordance to their sex, which ensured that half of the children were exposed to models of their own sex and the other half were exposed to models of the opposite sex. Figure 3.1 below represents the children’s group division during the series of experiments.

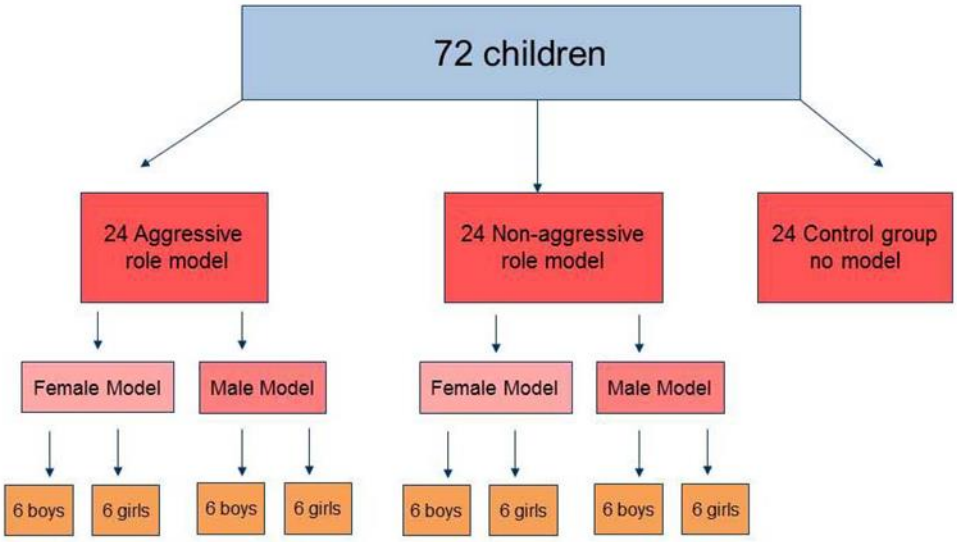

Figure 3.1: Albert Bandura's Bobo doll experiment (Source: McLeod - 2016)

All the children including the control group were subjected to 'mild aggression arousal with each child separately taken to a room with relatively attractive toys (McLeod, 2016). Twenty four (24) children, twelve (12) boys and twelve (12) girls watched a male or female model behaving aggressively towards a toy called a 'Bobo doll'. McLeod (2016) further explains that the adults attacked the Bobo doll in a distinctive manner - they used a hammer in some cases, and in others threw the doll in the air and shouted "Pow, Boom." The other twenty (24) children, twelve (12) boys and twelve (12) girls were exposed to a non-aggressive model who played in a quiet and subdued manner for ten minutes playing with a tinker toy set and ignoring the bobo-doll. The final twenty-four (24) children, twelve (12) boys and twelve (12) girls were used as a control group and not exposed to any model at all.

According to Hammond (2011) from the bobo doll experiment, a conclusion was reached that children learn and imitate the behaviours that they have observed from a modelled adult that they closely identify themselves with by simply observing and imitating the model afterwards. The theory demonstrates that the aggression the children showed towards the bobo doll was due to the aggression that they had observed from the modelled adult. The modelling process therefore outlined that the more closely related the children identified themselves with the model the more likely it is for the child to imitate the behavioural characteristics of the model. According to the social learning theory and analyses of behaviour as a function of social-structure, children copy the behaviour of their parents, siblings and family members and later on of their peers and television models (Bandura, 1969). However, like any other theory, there are some critics of Albert

Bandura's social learning theory particularly the findings of their experiment, while some tried to develop the theory further.

3.2.2 Critiques of the Social Learning Theory

Whereas social learning theory has developed and become a fundamental basis of explaining how people acquire new knowledge, it did not go unchallenged, particularly the Bobo doll experiment. Kasai (2012:53) states that "critics of the Social learning theory point out the distinction between the Bobo doll and other children". Some critics argue that the Bobo doll experiment does not accurately represent the imitation of aggression within human nature. Furthermore Kasai (2012) argues that the children showed aggressive behaviour simply because it was a doll and the outcome might have been different had the subject been another child. This therefore argues that in as much as the experiment stimulated an aggressive behaviour within the children when they came across the Bobo doll, that does not entirely mean that's how the children would have reacted had it been another child.

The children who were familiar with the doll were less likely to imitate the same aggressive behaviour as those who were not familiar with the doll (Cumberbatch, 1990). Most psychologists/behaviourists argue that the theory posits that aggression is learnt through observation and modelling, and chooses to ignore the cognitive process behind an individual's response towards given circumstances. While behaviourists state that the social learning theory chooses to ignore the biological states that not all behaviour is learnt through experience and observation, some are partly inherent (Kolb & Kolb, 2012). Some critics suggest that the children were playing rather than being aggressive with the Bobo doll (Perryman, 2011). This experiment does not take into consideration different types of cultural groups and ethnic groups of which there are possibilities that the outcomes would have proven Bandura's hypothesis to be incorrect. Durkin (1995) questions whether an adult can demonstrate how to attack something and allow a child to imitate the same aggressive behaviour.

According to Giraldeu (2003) copying comes with pitfalls, the acquired information might be outdated, misleading or inappropriate. The social learning theory does not necessarily take into consideration the need for evolution, the need to come up with new means and way to survive. It is an undeniable fact that humanity live in a changing and forever

evolving world hence the ability to adapt and the need to modify and improve methods and strategies of survival and not just copy behaviours and reciprocate new information without actually analysing the surrounding environment.

An individual does not just imitate the observed behaviours of a model, other factors such as an individual's cognition and environmental factors all influence how humans behave within a social setting (Bin *et al.,* 2010). This argument brought forth further development of the social learning theory, which states that humans do not simply imitate the modelled behaviour, but rather humans apply their cognisance before reciprocating the learnt behaviour.

3.3 THE CORE CONCEPTS OF THE SOCIAL LEARNING THEORY

Cherry (2017) states that there are three core concepts at the heart of the social learning theory that Albert Bandura had outlined. The three core concepts are learning through observation; importance of mental states to learning; and that learning does not necessarily lead to change in behaviour. These concepts are briefly discussed below.

3.3.1 Learning through observation

The findings in the Bobo doll experiment argue that behaviours can be learned by simply observing another individual. However, Edinyang (2016:40) argues that the social learning theory "refers to the reciprocal relationship between social characteristics of the environment, how they are perceived by individuals and how motivated and able a person is to reproduce behaviours happening around them". Cherry (2017) highlights that learning does not necessarily require watching another person behaving in a certain manner, but the ability of an individual to hear instructions can also lead to one learning new behaviour. The main argument here is that an individual can learn new behaviour in various ways such as reading, hearing or watching the behaviours of their models.

Social learning is one of the foundations of culture and factors such as observation or interaction with other individuals stimulate or influence learning (Heyes, 1994). Humans are cultural species, which are heavily reliant on a rich repertoire of ideas, beliefs, values, and practices acquired from other members of their social groups (Muthikrishna *et al.,* 2016). Thus the process of social learning can be practically viewed within strong cultural

groups whereby the older generation (parents, grandparents) teach the younger generation (children) cultural practices and believes.

The intergenerational relationship between the adult and the child highly determines the behavioural outcomes of the child. Jones (2012) states that in the field of aggression psychology, usually the children display aggressive behaviour toward their peers which are most of the time intergenerationally learnt behaviour and occurs mostly in abusive and violent households. However, the ability for a child to learn new behaviour through modelling is not entirely a negative aspect. A child can grow up in an abusive household, whereby he or she sees her mother being beaten up by his or her father and decide to be a better spouse to their partner. Alho (2015) states that this is the ability for one to use their cognisance and decide that they will take a negative experience and turn it into something positive.

3.3.2 Mental states are important to learning

The social learning theory takes into account both “behaviourist theories, which suggest that all behaviours are learned through conditioning, and cognitive theories, which take into account psychological influences such as attention and memory” (Hill, 2001:248). The state of mind is crucial in the social learning theory due to the fact that just observing an individual’s behaviour is not enough to result in one imitating that observed behaviour.

In this elementary concept Bandura (1977) argues that learning is not only affected by external reinforcement but by intrinsic reinforcement as well, which is driven by internal reward or feeling better once a person reciprocates the observed behaviour. Examples of these intrinsic reinforcements are pride, satisfaction, and a sense of accomplishment. The process of an individual to use their cognitive ability before imitating modelled behaviour is thus important. This therefore leads to the last element of the social learning theory, which emphasises that despite an individual having observed certain behaviours, it does not entirely mean the individual will imitate the observed behaviours.

3.3.3 Learning does not necessarily lead to a change in behaviour

In some instances the observed behaviour is not always imitated (Barr & Hayne, 2003). Just because a child has seen an adult behave in a certain way, does not necessarily mean the child will later on imitate the observed behaviour. This may sometimes be the result of the learning processes not being executed properly or due to the behaviour being punished thus leading to the child avoiding displaying such behaviour. Modelling is a behaviourally-based procedure that involves the use of live or symbolic models to demonstrate a particular behaviour, thought or attitude that a child may want to acquire or change (Nabavi, 2009). Children observe the behaviour of their models and depending on the consequences of that behaviour they either imitate them (this occurs when the behaviour is positive and rewarded) or they avoid certain behaviour (this occurs when the behaviour is negative and punished).

The following are the four prerequisite modelling steps that Bandura (1977) highlights in the social learning theory that enable observational learning to be successful. These steps play a vital role in determining whether the observed behaviour is being reciprocated effectively. The first step Bandura (1977) refers to is ***attention.*** Attention is the extent in which we are exposed/notice the behaviour. In order for one to be able to learn, one needs to pray attention to the model. Anything that distracts your attention is going to have a negative impact on your observational learning process. If the model is interesting or there is an innovative aspect to the situation, you are far more likely to dedicate your full attention to the model and thus result in a more effective observational learning process. Thus attention is important in whether behaviour has an influence in those that are imitating the certain behaviour of the model.

The second step that determines whether the behaviour is reciprocated effectively is ***retention***. This step emphasises that even though one might have observed the behaviour, one does not always recall the behaviour and thus prevents the learning process of the behaviour, leading to the behaviour not being imitated. The observed behaviour will not have much influence if one does not remember. This step includes the symbolic coding, mental images, cognitive organisation, symbolic rehearsal and motor rehearsal. It is therefore necessary to remember what one has paid attention in order for observed behaviour to be imitated.

The third step refers to ***reproduction*** where the behaviour is being performed. It comes forth once one has successfully paid attention and retained the relevant information and results in one demonstrating the learned behaviour. The repetition of the observed behaviour in this step is important as it enhances the ability for one to successfully perform the observed behaviour. For example if a child watches a soccer match and sees his favourite soccer player score a goal, in order for the child to be as good as his favourite soccer player (model) he will have to practise over and over again until he can score such goals.

Lastly, in order for the observational learning to be successful, the fourth step, ***motivation,*** is required. One has to be motivated to imitate the behaviour that has been modelled. The ability for one to feel motivated to repeat the observed behaviour is crucial in order for one to keep on performing the learned behaviour. Reinforcement and punishment play an important role in motivation as it determines whether one will perform the observed behaviour (if rewarded) or avoid the observed behaviour (if punished). The following section will discuss the social learning strategies that are implemented by individuals in order for them to acquire new information or imitate the behavioural patterns.

3.4 SOCIAL LEARNING STRATEGIES

There are different ways of acquiring behavioural patterns or new information through social learning. Rendell *et al.* (2011) identify four different strategies in which one can acquire information through social learning, namely unbiased or random copying strategies, context dependent strategies, content dependent strategies, and guided variation strategies. The following is a brief discussion of the four different strategies of social learning according to Rendell *et al.* (2011).

3.4.1 Unbiased or random copying social learning strategy

Unbiased social learning strategies occur when an individual randomly selects a model within a community and copies their behavioural patterns through observation or interacting with the specific model (Mesoudi *et al.,* 2013). These individuals may be referred to as “asocial learners” and are alluded to as information producers (Laland, 2004). This type of social learning strategy also assists in bringing in new and innovative

ways for a society to adapt or cope with a changing environment. An example may be that an asocial individual within a society may bring in different and innovate ways in order for the communities to cope with an increase in the severity and frequency of floods. An individual may have noticed that the main reason why the community is so susceptible and vulnerable to severity and frequency of floods is due to the settlement being established on a flood plain. Resulting in the individual suggesting that the community moves to higher grounds instead of just placing sandbags alongside the river banks.

According to Aoki and Feldman (2014) this social learning strategy is mainly focused on the cognition of an individual rather than just copying a model's behaviour or reciprocating in imparting the new information provided to the individual. Laland (2004:4) shares similar views and states that this type of social learners do not only observe behaviour within a social context but they are also innovative when it comes to adapting or coping with given circumstances of their environmental surroundings. These types of social learners are needed within societies due to the fact that humanity lives in a changing world which requires new means and ways for survival. Therefore these social learners bring forth an evolution of the types of strategies implemented towards natural hazards.

3.4.2 Guided variation social learning strategy

Guided variation social learning is a social learning strategy that entails the transmission of information from a modelled individual to a recipient, who then later on experiments with the information in search of a better or optimal character state (Eerkens *et al.,* 2017). A character state is the presence or absence of a heritable trait possessed by an individual (Freudenstein, 2005: 966). This type of social learning strategy can be viewed as a trial-and-error social learning strategy that is combined with unbiased transmission. This is due to the fact that the individual does not only copy the new behaviour or reciprocate the new information provided, but the individual tries to find the best suitable method to apply the new information provided.

Similarly to the unbiased or random copying social learning strategy, the guided variation social learning strategy is mainly focused on the cognition of an individual either than just copying a model's behaviour or reciprocating the new information provided to the individual (Aoki & Feldman, 2014).

3.4.3 Context Dependent Social Learning Strategy

Context dependent social learning strategy is reliant on the context in which stimuli occur and thus is reliant on when and who to copy within the social environment (Gustafsson, 2013). This type of social learning strategy is a frequency dependent strategy where the individual will copy the behaviours of a modelled individual due to the potential success of the copied behaviour (Rendell *et al.,* 2011).

Rendell *et al.* (2011) outline that this social learning strategy is a model-based strategy. Therefore this strategy may be viewed as a conforming strategy that is used by individuals to align their behaviours with the most frequent traits within a social setting in order to enhance their adaptive capacity. Gustafsson (2013) emphasises that these social learning strategies strongly depend on the age, sex, social rank, personality traits and previous experiences of an individual. This thus brings forth the modelling process mentioned in section 3.2.1 whereby individuals are more likely to copy the behaviours of models that they most likely identify themselves with. Therefore one could argue that in most instances girls will model the behaviour of their mothers in order to increase their adaptive capacity.

3.4.4 Content Dependent Social Learning Strategy

This social learning strategy is the process of humans absorbing social information that they are more likely to be attracted to, or find emotionally arousing (McElreath *et al.* 2008). This social learning strategy is also a biased social learning strategy as humans being selective copy the behaviours of a modelled individual due to the responses that the behaviours are bound to receive. An example of such a social learning strategy is if a little girl would aspire to become Miss World all due to the fact that the modelled individual, the current Miss World is beautiful. Gustafsson (2013) states that, similarly to the context dependent social learning strategy, this strategy also strongly depends on the age, sex, social rank, personality traits and previous experiences of individuals. Therefore, individuals are more likely to copy the behaviours of the models that they highly identify themselves with.

Rendell *et al.* (2011) outline that this social learning strategy is a model-based strategy. Therefore, this strategy may be viewed as a conforming strategy that is used by individuals to align their behaviours with the most frequent traits within a social setting in order to enhance their adaptive capacity. Similar to the context dependent strategy this strategy is a biased strategy as it is used based on the known outcome. All these strategies are learnt through observation. The unbiased or random copying social learning strategies reflect the thought process that an individual applies before implementing the observed behaviour, resulting in the individual either improving the coping or adaptation strategy or inventing an entirely new coping and adaptation strategy.

The context dependent social learning strategy and the content dependent social learning strategy on the other hand is the direct implementation of the social learning theory. Whereby the individual observes the behaviours of a modelled adult and later on reciprocates the observed behaviour. An example is if a wildfire breaks out and a child sees his or her neighbours carrying buckets of water in order to extinguish the fire, he or she will go fetch a bucket and do exactly what his or her neighbour is doing. Therefore these social learning strategies show that the younger generation acquires knowledge and behavioural patterns from the older generation, be it the reciprocated actions are exactly the same, enhanced or not applied at all.

All four of these social learners are needed within a community in order to enhance the adaptive capacity of the community within the given environment (Laland, 2004). In every society, asocial and social learners are needed. Asocial learners are those that bring about new and innovative ways to cope and adapt with the adverse impact of natural hazards, while social learners regulate the coping and adaptation strategies that are brought about by asocial learners. According to Vale *et al.* (2017) social learners are more likely to survive as they copy the successful characteristics. However, because we live in a world that is changing, asocial learners are also needed in order to enhance the chances of survival. With the social learning strategies identified the next section discusses the transfer of information from one generation to the next within a social context. The section highlights how intergenerational information transmission is reflective of the social learning theory.

3.5 INTERGENERATIONAL INFORMATION TRANSFER AS A FORM OF SOCIAL LEARNING

The above discussion presented the social learning theory and highlighted that children learn from modelled adults and imitate their behaviour. Most importantly the theory suggests that younger generation learns from the older generation through observational learning and resulting in an imitation of the observed generation's behaviour. The transmission of behaviours from adults to children may be referred to as 'intergenerational behaviour transmission'. Galef (1988) describes intergenerational behaviour transmission as social transmission of behaviour. This behaviour is transmitted by children learning behaviour through social interactions with adults and endure beyond the period of interacting between the transmitter and the recipient.

According to Kropf (2013) intergenerational relations are referred to as a wide range of interaction among individuals of different generations within a family/community. Kropf (2013) further argues that in most instances intangible factors such as beliefs, norms, values, attitudes, and behaviours specific to that family, or factors that reflect sociocultural, religious and ethically relevant practices and beliefs are factors that are transmitted from one generation to the next. Intergenerational transfer of information is a reflection of observational learning as per the social learning theory as they both highlight the transmission of information and behaviour from an adult (model) to a child.

There are various ways in which a child can acquire new behaviour or knowledge (Sheridan, 2017). Looking at the three models of observational learning, which are live models, verbal communication models and symbolic models, intergenerational information can be transferred the same way. Tinsley (2003) highlights that given the primacy of parents' influence on children's ability to develop competency, parents are likely to have a strong influential role in how children learn to adapt to the adverse impact of natural hazards. Miller *et al.* (2010) further stress that coping strategies may be acquired by children directly, such as when parents encourage children to adopt certain strategies. Coping strategies can also be acquired indirectly by children observing their parents' emotional, cognitive and behavioural patterns within given stressful situations (Miller *et al.,* 2010).

Humanity's capacity to learn by observation enables him or her to acquire large, integrated units of behaviour by example without having to build up the patterns gradually by tedious trial and error (Boyd & Richerson, 1985). The transmission of information and behavioural skills from one generation to the next is beneficial as the next generation does not have to physically experience certain events directly in order to determine what the consequences are of such behaviour. Brubaker and Brubaker (1999) emphasise that this enhances resilience within the next generation as families/societies develop strategies to deal with certain situations.

Learning how to act when a natural hazard occurs through intergenerational information transfer will assist the next generation in survival and ability to adapt to the adverse impact of natural hazards that they are exposed to. The next section will briefly discuss indigenous knowledge and the role of indigenous knowledge in intergenerational information transfer. This section will also highlight the importance of indigenous knowledge in disaster risk management and how it can be used to lessen the adverse impact of natural hazards.

3.6 INDIGENOUS KNOWLEDGE AND INTERGENERATIONAL INFORMATION TRASNFER

Indigenous knowledge is defined as "the local or traditional knowledge involving social, economic and environmental variables, unique to a particular culture or society which exists within and developed around specific conditions of women and men, indigenous to a particular geographic area" (Warren, 1991:46). Indigenous knowledge is knowledge that is gained over time through experiences by people who are native to the specific community or society and is often unique to the culture of the specific community. The importance of culture is that cultural processes facilitate the spread of adaptive knowledge, accumulated over generations, allowing individuals to acquire vital life skills (Rendell *et al.,* 2011).

According to Semali and Kincheloe (2011) indigenous knowledge reflects the dynamic way in which local people of a specific community have come to understand themselves and established relationships with their natural environment and how to protect and take care of their fauna and flora, cultural beliefs and history in order to enhance their lives. Local people of specific community or society are often seen as wise individuals due to

the broad knowledge they have on how to live and have lived sustainably. Indigenous knowledge is a holistic perspective of the world for the local individuals of the specific communities, this is perpetuated by the vast dependence upon their immediate environment in order to meet most of their basic needs (Berkes *et al.,* 2000). This results in the indigenous communities' possessing a deeper appreciation of the environment and its underlying processes as it is their main source of survival.

Mafaretlhane (2012) emphasises that the ability for indigenous communities to deeply appreciate the environment is due to the fact that it is the foundation for decision-making in most day-to-day activities. Indigenous knowledge is an evolving process, as the communities are able to align their behaviour with and adapt to the changing climatic conditions, which enhances their vulnerability to natural hazards. However the downfalls of such communities are that at times they are unable to recognise when they are vulnerable to the adverse impact of natural hazards, as they might identify it as part of the ever so evolving and changing environment that they live in. On the other hand communities such as these are extremely resilient and can adapt easily.

Indigenous knowledge has been passed on from one generation to the next through various methods such as traditional education, with adults teaching practical knowledge of culture, the environment and survival through demonstrations and through a wide range of ceremonies, stories, songs, village meetings and taboos (Rao & Ramana, 2007). Indigenous knowledge plays an important role in communities as it help empower local community members (Mwaura, 2008). Other societies use crafts as a form of information transfer. This transfer of information is an ongoing process within societies, where by the culture, norms, adaptive strategies, behavioural skills and believes are being passed on from one generation to the next repetitively.

King *et al.* (2007) argue the necessity of preserving indigenous knowledge and state that there are a lot of benefits that can be obtained from acquiring such knowledge. Indigenous knowledge helps the survival of the following generation to be easier and allow them to live longer (Ikola, 2016). Another vital role that has been recognised is that indigenous knowledge plays an influential role in reducing the adverse impact of hazards.

Specifically for disaster risk management, indigenous knowledge is very important as it facilitates the development of communities to establish natural hazard adaptation strategies that have been passed on from one generation to the next (Nyong e*t al.,* 2007; Mutasa, 2015). Due to the fact that indigenous knowledge contains real local experience passed on from one generation to the next, it plays a vital role in the field of disaster risk management. Nyong *et al.* (2007) state that local communities in Africa use indigenous knowledge to tackle the adverse impact of the various natural hazards that they are exposed to and vulnerable to. The passing on of indigenous knowledge from one generation to the other is valuable as the younger generation knows how to adapt to the various natural hazards they are vulnerable to without having to experience the adverse impact of those natural hazards.

Iloka (2016) states that another vital role that indigenous knowledge plays in the field of disaster risk management is the ability it has to empower local community members. An example is the ability of the community to farm mixed crops in order to yield various foodstuffs. Mwaura (2008) argues that in case a natural hazard occurs and as a result crop failure, alternative crops will be available for consumption for the local community members. Empowering the local community members and allowing them to implement native adaptation strategies, increasing the ability for the community to cope and adapt to the adverse impact of natural hazards.

Indigenous knowledge also enhances the conservation of natural resources as the local community members have over the years learnt how to live harmoniously with the environment (Iloka, 2016). This point is emphasised by Eyong *et al. (*2004) who state that forests that are known as sacred to African communities are often home to indigenous plants and species, used for medicinal purposes in African cultures. This allows for the indigenous species and plants to be given an opportunity to reproduce and not be exploited.

The importance of indigenous knowledge in disaster risk management is also acknowledged in international frameworks. The Hyogo Framework for Action 2005-2015 (HFA, 2005:10) stresses that the integration of indigenous knowledge in the field of disaster risk management is important as it plays a vital role in reducing the vulnerability of local communities towards the natural hazards that they are exposed to. Similarly, the Sendai Framework for Disaster Risk Reduction (UNISDR, 2015:15) states that in order

for disaster risk to be effectively reduced, it is important to make sure that disaster risk is understood at the local and national level by “ensuring the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment and development of policies, strategies, plans and programmes of specific sectors, with cross-sectoral approach, which should be tailored to localities to the context”. Indigenous knowledge evolves together with the change in the surrounding environmental conditions of the local community, and therefore this allows the indigenous communities to adapt to the natural hazards that they are vulnerable towards. Furthermore, Gaillard and Mercer (2012) and Rist and Dahdouh-Guebas (2006) highlight the fact that indigenous knowledge holds the potential of unlocking policies and frameworks that could help reduce the adverse impact of natural hazards.

3.7 CONCLUSION

This chapter addressed the second research objective, which aimed to provide a theoretical perspective on social learning and an understanding of intergenerational information transfer. The social learning theory was presented in this chapter as a theory that explains the process of acquiring new knowledge and behavioural skills. The social learning theory outlined that an individual can acquire new knowledge through observation, practice or by being taught with the possibility of affecting an individual's behaviour, attitude and perception towards related issues. However, this chapter pointed out critics of this theory, thereby emphasising that learning cannot be done through observation alone. This concept argues that there are other factors that need to be considered when coming to learning new information such as the cognisance of an individual. Highlighting that the cognition of an individual plays a vital role in how an individual chooses to act in certain situations.

This chapter explored intergenerational information transfer. This discussion focused on how information is transferred from one generation to the next especially in strong cultural groups such as African communities. This chapter described how coping and adaptation strategies are passed on from one generation to the other in order to enhance the survival of the future generation, furthermore highlighting how valuable indigenous knowledge is especially due to the fact that indigenous communities are able to adjust and adapt to the constantly changing environment and the global climatic conditions. What comes out

clearly in this chapter is that adaptation and coping strategies are methods that are passed on from one generation to the next. This therefore enables the following generations to better adapt and cope to the changing environment and climatic conditions. The next chapter will present the findings of the research done and interpret these findings in comparison to the theoretical chapters provided.

CHAPTER 4: EMPERICAL FINDINGS AND ANALYSIS

4.1 INTRODUCTION

Chapter two of this study provided a theoretical framework of natural hazards and outlined the impact that they have on the Southern African region. From a theoretical point of view, Chapter two identified the adaptation and coping strategies to address the impacts of natural hazards. Chapter three of the study presented the social learning theory/social cognitive theory which entails learning through observation or interaction with other individuals (Rendell *et al.*, 2010). In the process, different ways in which information is transferred in the learning process were identified and highlighted. Both Chapters two and three provided a theoretical basis for the study. The purpose of Chapter three was to present the empirical findings of the study. This chapter will thus address the third and fourth research objectives, namely; “to identify the different methods or strategies that have been used or are used by the different generations in Kasane village to adapt to natural hazards” and “to determine if these strategies or methods evolved over time”.

This chapter opens by briefly outlining the methodology used to collect data and data analysis (see section 1.6 for a detailed research methodology). This is followed by an analysis and presentation of the findings of the study. The findings in this chapter are presented thematically. The following themes emerged from the study: prevalent hazards in Kasane; the role of climate change in exacerbating hazards; the impacts of natural hazards on the lives and the livelihoods of Kasane community; availability of policies and frameworks; coping and adapting to prevalent hazards in Kasane;, the role of indigenous knowledge in coping with and adapting to hazards; and information and knowledge transfer from one generation to the next. The chapter closes by summarising the findings and the discussions.

4.2 RESEARCH METHODOLOGY

To establish a more insightful understanding of the transfer of adaptation and coping strategies from one generation to the next a cross-generational approach was used to gather information from the selected target groups in Kasane. Key informants from the national, local government and the community in Kasane took part in the data collection phase. In order to address the objectives of this study in full, it was important to conduct

an empirical study in order to gather the practical information regarding intergenerational adaptability towards natural hazards. Data was gathered from both the community of Kasane as well as the relevant government officials at the national and local levels.

The study applied a qualitative research design due to the nature of the question being investigated. The study focused on behavioural patterns of the community of Kasane in relation to the types of hazards that they experience and the ability of the community to cope and adapt to the hazards, which is passed on from one generation to the next. McRoy (1995:2009) explains that qualitative research is more concerned with describing and understanding rather than explaining and predicting human behaviour. Denzin and Lincoln (2005:7) further emphasise that "qualitative investigators apply a naturalistic and an interpretive paradigm to make sense of human experience. This study aims to understand the relationship between intergenerational relations and the ability of the community of Kasane to cope and adapt to the natural hazards that they are susceptible to. It was therefore advantageous for this study to apply a qualitative research approach as it is more concerned with describing and explaining the behavioural pattern of the community of Kasane.

The study initially used a purposive sampling method as a data collecting tool. Initially, the study targeted specific individuals within the community of Kasane on the basis of their relevance to the question under investigation. Maree (2007: 101) states that "a purposive, or judgmental, sample is one that is selected based on the knowledge of a population and the purpose of the study. It is used so that individuals are selected because of some defining characteristic that makes them the holders of specific data needed for the study".

After identifying the individuals by using the purposive sampling method a snowball sampling method was used to identify more suitable individuals through the initial group. Therefore, the targeted individuals suggested other individuals who were more informed about the subject matter under investigation. According to Biernacki and Waldorf (1981) snowball sampling is a sampling technique that is utilized when participants identify and provide the researcher with informants who possess a great deal of information about a phenomenon, and it if often referred to as chain referral sampling. Tansey (2007) highlights that snowball sampling is a non-probability sampling technique in which a study initially begins with a small population of identified individuals and expands.

4.3 RESEARCH PARTICIPANTS

During the data collection process for this study, respondents from the national and local offices in Botswana and the community members of Kasane were consulted. Firstly, face-to-face, semi-structured interviews were conducted with the government officials from the national and local office. These respondents were best suited to answer questions based on their engagement with the community and the knowledge of natural hazards within the community of Kasane.

Secondly, respondents from the Kasane community were purposefully recruited for the focus group discussion using a snowball sampling method. A total of six focus groups discussions were conducted in the study. The focus groups consisted of members that fall within different age groups due to the nature of the study, which was to look at three different generations. This was one of the criteria that the study looked into in order to ensure the respondents spoke to the aim of the study.

As a result, a total of 107 members participated in the study. The questions asked focused on their individual and shared perceived knowledge as well as their understanding of natural hazards and how they have coped with and adapted towards these hazards over the years. The questions also focused on the methods used to transfer the coping and adaptation strategies from one generation to the next and whether or not these strategies have evolved as the nature of natural hazard has evolved due to climate change. Table 4.1 below provides a demographic presentation of the respondent profile for the focus group discussions.

Table 4.1: Respondent Profile of Focus Group Discussion

RESPONDENT PROFILE		
Respondents' Gender	**Age Group**	**Number of Participants**
Females	18-30	20
Females	31-45	15
Females	46+	15
Males	18-30	30
Males	31-45	10
Males	46+	15

The focus group discussions were also semi-structured. Jamshed (2014) states that semi-structured interviews are in-depth interviews whereby the respondent has to answer open-ended questions. Semi-structured interviews were more suitable for the study as they allowed the researcher to identify blind spots that were not initially visible from the initial stage of the study. Semi-structured interviews also provide informants with the opportunity to express their views in their own terms, thus being beneficial to the study as the study aimed to understand the perception of the community of Kasane. According to Corbin and Strauss (2008) semi-structured interviews can be conducted with an individual or sometimes with a group of people. Therefore the use of semi-structured interviews was more suitable in this study as the study targeted focus groups as well. The collected data is organized and presented thematically.

4.4 PRESENTATION OF THE RESEARCH FINDINGS

This section presents the findings from the data collected through semi-structured face-to-face interviews with the government officials from the national and local offices, as well as the focus group discussions conducted with the community of Kasane. All interview responses were transcribed verbatim and initially checked and categorised manually to identify core presenting themes and patterns. Themes that emerged from the data were

pieced together to provide a comprehensive picture of the views and experienced of the respondents. Table 4.2.below is a presentation of the findings in accordance with the themes identified.

Table 4.2: Themes from the data collection

	SUB-THEME	THEME NAME
4.4.1.Thematic Area 1		Respondents' perspective on the prevalent hazards in Kasane
4.4.2. Thematic Area 2		The role of climate change in exacerbating hazards
4.4.3. Thematic Area 3		The impacts of natural hazards on the lives and livelihoods of Kasane community
4.4.4. Thematic Area 4		Availability of climate change adaptation and disaster risk reduction policies and framework to the community of Kasane
4.4.5. Thematic Area 5		Coping and adapting to prevalent hazards in Kasane
	4.4.5.1.	*Adaptation strategies towards prevalent hazards*
	4.4.5.2.	*Coping strategies towards prevalent hazards*
4.4.6. Thematic Area 6		The role of indigenous knowledge in coping and adapting to prevalent hazards
4.4.7. Thematic Area 7		Information and knowledge transfer from one generation to the next

As already indicated in the preceding section, the collected data is organized and presented thematically. Braun and Clarke (2006:79) define thematic analysis as a method of identifying, analysing and reporting data within a thematic manner. Braun and Clarke (2006) further explains that thematic analysis also provides flexible and useful tools to provide rich and detailed, yet complex account of data. Vaismoradi *et al.* (2013) emphasise that studies that wish to employ a relatively low level of interpretation are best suited to utilize the thematic data analysis method. In this study views and opinions were captured in relation to the different experiences and knowledge that the participants of different age groups had.

4.4.1 Thematic Area 1: Respondents' perspectives on the prevalent hazards in Kasane

The emergence of this theme was based on the respondents' knowledge of the prevalent hazards in Kasane. Questions in this theme were used as an "ice breaker" and an introduction to the discussions to get the respondents' perspectives on the prevalent hazards in the study area.

The respondents from both the national and local government offices were able to highlight the types of natural hazards prevalent in Kasane. These respondents mentioned that Kasane is prone to natural hazards such as drought, wildfires, floods, heatwaves, wild animal invasion and epidemics such as malaria, and foot and mouth disease. Respondents from both these institutions were in agreement that frequent outbreaks of wildfires which are caused by both natural processes (lightning) and human-induced processes (humans sparking up the fire by throwing cigarettes in the field) are a serious problem in the area.

These respondents emphasised that not all hazards that are experienced in Kasane are natural hazards, as some are human-induced hazards and unfortunately, they bring along severe damage to the affected areas. An example that was made by a respondent from the local government office is that poachers who come into the nature reserve sometimes light up their cigarettes and throw them on the ground thus resulting to fire outbreaks. The officials also mentioned that they were observing an increase in the frequency of these hazards with wildfire outbreaks being the most frequently experienced hazard in the community of Kasane. The respondents highlighted that the community of Kasane is

vulnerable to the occurrence of natural hazards as they affect the community's socio-economic status negatively.

Similarly, the majority of the respondents from the focus group discussions agreed that they understood the term hazard and they knew the types of natural hazards prevalent in Kasane. The respondents from all the different focused groups mentioned hazards such as wild fire outbreaks, floods, drought, heatwaves and epidemics such as foot and mouth and malaria as the most prevalent in the area. As with the government officials' views, respondents from the focus groups pointed out that not all the hazards that they experienced were natural hazards like some such as wild fires being human-induced hazards.

An important finding regarding the natural hazards in Kasane is the argument made by the majority of respondents representing the community that the nature of these hazards has changed over the years. For instance, most respondents indicated that some hazards such as wildfire outbreaks and heatwaves occur more frequently, on an annual basis and with greater intensity. Respondents also noted that other hazards such as floods occur after a long while but when they eventually occur the damage that they cause is far worse than in the past. However, not all of the respondents, especially respondents from the focus groups of the age 46+, understood what causes the changes in the nature of these hazards. The respondents from this age group often referred back to the Bible and argued that these made up the end of time as referred to in the Bible. The quote below captures some of the views of the respondents.

"*The book of Daniel in the Bible talks about the four different types of animals. The last animal is a beast that came from the sea, it is not human, nor is it just strong winds. It brings about destruction and that is Tropical Cyclone Dineo"* (Respondent from focus group – male 46+ years).

Other respondents, particularly those from the younger age groups, based their arguments of what causes the changes to these hazards on more scientific reasoning. A female respondent from the focus group of 18-30 years mentioned that due to climate change, Kasane experiences heavier rainfall than usual, which results in the village experiencing severe floods. These two different types of responses show the difference in the scientific knowledge that the younger generation has as compared to the older

generation. These responses also show the different types of perspectives that different generations have about the cause of natural hazards.

Therefore, the younger generations' respondents had a perspective that is similar to that of the government respondents as compared to the older generations' focus groups, their perspective of the prevalent hazards was different and their arguments about the cause of these hazards were different. The older generation based their beliefs as being more important than scientific facts, they relied on the Bible and the communication that they received from nature itself, whereas, the younger generation based their arguments on more scientific facts that they have either been taught or read about.

Chapter 2 of this study dealt intensively with the different types of natural hazards that are prevalent in the southern African region and the impact that they have on those that are susceptible to their occurrence. The responses provided in this theme are in line with the literature consulted as reflected in Chapter 2 of the study. With the observation that the nature of the natural hazards in Kasane was changing, the next theme focuses on the role of climate change, as a natural hazard modifier.

4.4.2 Thematic Area 2: The role of climate change in exacerbating hazards

Numerous scholarly publications argue that most natural hazards especially those of hydro-meteorological origin are exacerbated by climate change (Djalante *et al.,* 2013), thus, resulting in an increase in the frequency, magnitude and intensity of these natural hazards. Section 2.5 of this study outlined the impact of climate change towards natural hazards. This section pointed out that climate change exacerbates the frequency and severity of natural hazards that are experienced worldwide.

Dinar *et al.* (2012) further elaborate that the changing climatic conditions have led to an atmosphere that collects, retains and drops more water, changing weather patterns in such a way that wet areas become wetter and dry areas become drier. In view of this, it was important to test the respondents' understanding of the role that climate change plays in changing the nature of the hazards. The development of this thematic area derives from section 2.5 of this study as it seeks to find out whether the respondents could make a link between climate change and the impact that it has on the prevalent hazards that are experienced in Kasane.

The respondents were asked questions on whether they think climate change has an impact on the hazards that the community of Kasane is vulnerable to, and the ways in which these affect households and the community at large. Firstly, all the respondents from all the age groups were familiar with the term climate change. They were able to explain what it is and how it has affected them, some respondents especially from the focus groups of 46+ years, both male and female explained it based on experience. These respondents explained that in the past they would receive rain every rainfall season, and their plantations would grow extensively.

However, recently there has hardly been any rainfall during the rainfall season and when it eventually rains it usually results in floods. This therefore results in the community members being unable to plant and grow healthy, rich crops. They stated that Kasane is no longer as green and beautiful as it used to be, as the drought has resulted in dry conditions with an increase in poverty and hunger in the village. This pointed out that the older generation (focus groups 46+ years) were able to make a link between climate change and the impact it has on the prevalent hazards experienced in Kasane.

Respondents from the focus groups of 18-30 years, 31-45 years, and respondents from both the national and local government offices explained it from a scholarly perspective together with experience. Here the respondents agreed that climate change has an influence on the occurrence of prevalent hazards in Kasane. They stated that some hazards such as droughts had not always been as frequent as they currently are. In the past Kasane would experience drought roughly after a period of five to ten years. At present Kasane has been experiencing less rainfall on a yearly basis, which has resulted in an increase in the frequency and severity of droughts experienced.

On the other hand, hazards such as floods were not experienced as much as they are currently in the present times. This is due to the fact that currently Kasane receives intensive rainfall over a duration of minutes to hours, resulting in localised flooding, whereas in the past Kasane would receive adequate rainfall for a week or so. The respondents from both offices emphasise that all this has a negative impact on the economic activities of the community of Kasane.

The focus group respondents of the age of 46+ years both male and female, provided a different perspective. These respondents based their explanation on a more religious perspective as compared to the other respondents. These respondents again referred back to the Bible, and stated that what is happening in the world today was written a long time ago in the Bible. The respondents mentioned that this is God's doing and there is nothing we can do about it but pray for forgiveness unto God. The statement below is one of the statements that was mentioned to explain climate change and the role it plays in exacerbating prevalent hazards in Kasane.

"*All of this has been written in the book of Revelations, we are living in the end of times. Us as the people of Botswana, we used to pray for rain but now we pray in fear because the rain that we are given is associated with mass destructions. This is a form of punishment from God, for all the sins that we have committed over the years*" (Respondent from focus group – male 45+).

The statement above indicates the type of perspective that the older generation has in terms of the increase in the global climatic conditions. This perspective relates back to the issue of "Acts of God" in the field of disaster risk management. According to Reale (2010) most people, particularly those in the non-Western world, are religious and their perceptions and believes are shaped by their religions. Sherry and Curtis (2017:314) state that "despite the secular orientation of contemporary disaster research, religious beliefs still govern people's interpretations of natural events across many continents and cultures". In the field of disaster risk management the religious aspect is a complex issue that is still not understood till today.

Most scholarly publications assume that traditions and belief often leave most people vulnerable to the occurrence of hazards by producing helpless victims (Cali-Parisetti, 2011). This aspect is often overlooked and not given enough attention, despite it playing a major role in the lives of non-Western countries. The one thing that needs to be kept in mind is the fact that people base their decisions upon what is correct religiously so that they can avoid offending God(s) and getting punished. Therefore in order for disaster risk reduction to be successful in non-Western countries, it is important to take into account people's perspective of what is happening around them and the origins of such.

Section 3.5 outlined that tangible factors such as beliefs and religious practices are transmitted from one generation to the next. However, based on the perspectives of the older generation (focus groups 46+ years) and the younger generations (focus groups 18-30 years and focus groups 31-45 years) not all the information that is taught by the older generation to the younger generation is implemented. The younger generation does not entirely believe in the concept of “Acts of God”. They believe that there are ways and means to lessen the adverse impact of the prevalent hazards due to the scientific knowledge that they have been taught through educational programmes provided to them. The older generation on the other hand believe that the occurrence of such events is beyond their control and all they can do is pray for forgiveness.

The findings suggest that the government officials are unbiased or random coping social learners as they alluded as information producers. They provided the community of Kasane, particularly the younger generations, with new information about prevalent hazards through educational programmes. They taught the younger generations that there are other means and ways to cope and adapt to the prevalent hazard and lessen the adverse impact associated with these hazards. They taught the younger generations about climate change and the impact that it has on the prevalent hazard and that prayer is not the only answer towards this phenomenon.

This finding suggests that the younger generations used the guided variation social learning strategy (see section 3.3.2.), whereby they did not just respond to the information provided to them by the older generation, which is to pray and hope that the Lord forgives them for their sins. They used their cognition and became aware that this method of thinking towards prevalent hazards in Kasane is not the suitable way and it will not result in lessening the adverse impact of prevalent hazards that are exacerbated by climate change. They however inherited the information taught by the government officials through school and education programmes.

All the respondents agreed that climate change plays a role in exacerbating the occurrence of hazards in terms of their frequency and severity. However, the reasoning and explaining of this concept differed from that of the officials from the two offices, the focus group age 18-30 years and 31-45 years from that of the focus respondents of 46+ years. The respondents of the officials from the two offices, the focus group age 18-30 years and 31-45 years based their understanding on a more scientific and western

platform whereas the focus group respondents of 46+ years based their understanding on a more religious aspect.

The findings suggest that all the respondents are also aware of the fact that the current occurrence of natural hazards affects the community and households negatively. It further suggests that all the respondents are aware of the concept climate change and could link climate change to the impact that it has on the prevalent hazards that are experienced in Kasane. This was important as it brought forth the idea of the need to develop coping and adaptation strategies within the community of Kasane in order to lessen the adverse impact of prevalent hazards that are exacerbated by climate change.

Even though the linkage could be made by all the respondents, the older generation (focus groups 46+ years) had a different explanation as to how climate change impacts on the occurrence of prevalent hazards as compared to the younger generations (focus groups 18-30 years and 31-45 years) and the government officials. This shows that even though information is transferred from one generation to the other, due to the changing world that humanity lives in, the information is bound to be modified. The younger generation does believe in the “Acts of God” but not particularly believe that this is it and nothing can be done to change the situation at hand.

A respondent from the focus group 18-30 years mentioned that they still do pray for change, they pray for rain and for God to see them through this tough period, but not entirely rely on God to make a change. The scientific knowledge that they have acquired through school and educational programmes has allowed them to change their perception on prevalent hazards and climate change. This has thus resulted in the younger generation explaining the linkage in a more scientific manner and allowing them to establish that something can be done in order to lessen the adverse impact of prevalent hazards in Kasane, as compared to the older generation that believe that the only way to resolve this matter is through prayer. The following thematic area will discuss the impact of natural hazards on the lives and the livelihoods of the Kasane community.

4.4.3 Thematic Area 3: The impacts of natural hazards on the lives and livelihoods of Kasane community

Section 2.5 highlights that natural hazards have posed a negative impact on humanity thus leaving them helpless and suffering. Therefore, natural hazards pose a problem for those that are affected in more than just one way. This section briefly discussed the impacts that the different types of natural hazards have on countries in the Southern African region. The development of this thematic area was to establish how natural hazards impact on the lives and livelihoods of the people in the community of Kasane.

All the respondents agreed that natural hazards such as wildfires, drought, floods, extreme temperatures (particularly heat waves), and epidemics such as malaria and foot and mouth have a negative impact on the lives and livelihoods of the community of Kasane. They also mention that the invasion of wild animals within the community has had a negative impact and they classify this as a hazard.

One of the prominent issues that came out in the discussion with the focus groups and face-to-face interviews is the impacts of natural hazards on tourism. Respondents indicated that the transformation of natural hazard to disaster hinders the economic activities that are brought about through tourism in the community of Kasane. Kasane is considered as one of the tourism hubs of Botswana, and most economic activities in the area are related to tourism. Thus the community of Kasane is highly reliant on tourism as a source of income. Hazards such as wildfires affect the nature reserves in the area leading to fewer tourists visiting the area and ultimately having a negative impact on the economy of the community. In severe cases, people are retrenched from reserves and this has a negative impact on household income. The reduction of household income results in an increase in poverty levels of the community of Kasane

Not only tourism is affected negatively by natural hazards, but other sectors that contribute to the economy such as agriculture and fishing are also affected. According to the Southern African Development Community Fisheries Fact Sheet (SADC, 2016:7) Botswana has three main kinds of fishers, namely commercial, subsistence and recreational fishers. However, commercial fishing is the main source of income for local fishers, and subsistence fishery is the main source of food security in the community of Kasane (SADC, 2016:7). The occurrence of natural hazards such as flooding affects the

fishing activities negatively. For instance, if the Chobe River becomes flooded, the fishing community become negatively affected as they won't be able to engage in fishing activities, thus having a negative impact on food security and economic income of the community of Kasane.

With most farmers in Kasane area being subsistence farmers (Chevallier & Harvey 2016) they are frequently affected by natural hazards such as drought and heatwaves. This impacts negatively on food security as well as income for those who rely on agricultural production such as wheat, corn, sorghum and soybeans. These are a few examples mentioned by the respondents on how natural hazards prevalent in the area are affecting the lives and livelihoods in Kasane. The following statement captures some of the views of the respondents regarding natural hazards in Kasane.

"*The occurrence of Tropical Cyclone Dineo lead to a destruction of some households due to the strong winds that were associated with this tropical cyclone and some game reserves and boat cruise activities were shut down due to flooding. Fishermen were prohibited from fishing until such a time the Chobe River's water levels subsided again*." (Respondent from the National Disaster Risk Management Office)

"*This year alone (2017) we experienced a wildfire outbreak that burnt around 200 000 hectares of land which included a portion of the Chobe National Park. Factors such as the gusty winds that were experienced during the outbreak and Tropical Cyclone Dineo which was experienced earlier this year (which was responsible for the biomass) contributed to the intensity of the wildfire outbreak. Fortunately for us this time the National Park was not badly although some animals lost their habitats*". (Respondent from the local Department of Forestry and Range Resources in Kasane).

Respondents from the focus group 18-30 years (female) mentioned that there are other negative impacts that natural hazards have on the lives of the community of Kasane. The respondents mentioned that currently, due to the increase in the drought and wildfire breakouts, the wild animals are now moving more inland towards the residential areas of Kasane. The respondents mentioned that these animals attack humans thus leading to injuries to human lives and in the worst cases fatalities. They also mentioned that these animals feed on their crops and vegetable gardens within their yards and this reduces the amount of food provision within their households.

Other respondents mentioned that they are forced to cohabit with the wild animals such as wild pigs, elephants and baboons. The respondents also believe that this is just the beginning and some extreme cases are yet to arise. Respondents also highlighted that the prevalent hazards also bring about negative health implications into the lives of the community of Kasane. Disease outbreaks such as malaria, and foot and mouth have also contributed to the negative impacts of natural hazards.

The responses as reflected in the preceding discussions are in convergence with the literature. Jonkman and Kelman (2005) state that natural hazards have a direct and indirect impact on the lives and livelihoods of those affected by their occurrence. In relation to chapter 2 of this study, the direct impact of natural hazards may bring about fatalities, injuries to human lives and loss of homes to those that are affected. While the indirect impact of these natural hazards may result in loss of household income, loss of infrastructural buildings and roads, negative health implications and increase in the poverty levels of the areas affected.

An example of this is the wildfire outbreaks in Kasane which negatively affect the lives and livelihoods of the community. The direct impact is the increase in mortality and morbidity brought about by the wild animal invasions within the local residential areas. The indirect impact is the negative impact that these outbreaks have on the tourism industry which results in people losing their jobs and becoming unable to provide food and other basic needs for their households leading to an increase in the poverty levels of the community. Therefore, prevalent hazards impact the lives and livelihoods of the community of Kasane negatively as it brings about lack of income within households, food insecurity, lack of economic income within the community itself and an increase in mortality and morbidity rates.

The government officials' responses emphasised that there are other vulnerability issues that come into play. For instance, even though Kasane is the tourism hub of Botswana, it is situated in one of the poorest districts in Botswana, making the community very vulnerable to the prevalent hazards. Therefore the fact that Kasane is situated within the poorest district in Botswana also makes the community vulnerable to the adverse impact of natural hazards.

The respondents mentioned that they do not have money to sustain their households and the community itself and it is often difficult to get a job. The increase in the occurrence of natural hazards is not helping either as it exacerbates poverty in the community of Kasane. Such arguments are in line with the literature. Section 2.4 pointed out that poor communities often lack adequate resources to prepare for and respond to hazards given their social and economic composition which leaves these communities highly vulnerable to natural hazards.

The findings suggest that the prevalent hazards in Kasane have a negative impact on the lives and livelihoods of the community. This results in an increase in the level of poverty of the community by disrupting economic development and decreasing food security of Kasane. However, the geographic location of Kasane also contributes to the level of poverty of the village, therefore placing the village in a non-favourable position to develop the economy and to increase the food security of the community of Kasane.

4.4.4 Thematic Area 4: Availability of climate change adaptation and disaster risk reduction policies and framework to the community of Kasane

The Sendai Framework for Disaster Risk Reduction (SFDRR, 2015:17) states that “disaster risk governance at the national, regional and global levels is of great importance for an effective and efficient management of disaster risk. Clear visions, plans, competence, guidance and coordination within and across sectors, as well as participation of relevant stakeholders is needed”. In order for the effective and efficient reduction of the adverse impact of natural hazards, a set of policies and guidelines need to be available at the disposal of the community of Kasane. This is beneficial as the people will be able to align their behaviour with the set rules and guidelines that are provided to them.

This thematic area was developed to establish whether there are any plans of action, policies, frameworks or any sort of guidelines in Botswana that are used to help manage disaster risks. This is essentially important in order for the government to effectively and efficiently assist the community of Kasane to address the adverse impact of natural hazards.

The government official respondents indicated that there were policies, frameworks and guidelines in place. They also stated that there were some educational programmes that they have established to teach the community about hazards that they are exposed to such as wild fires. The respondents stated that in the past the development of policies, frameworks and guidelines adopted a top-down approach, whereby people's views were not being incorporated in the development and they were just forced to comply. However since the inception of the Hyogo Framework of Action, the government has employed a bottom-up approach towards the development of policies, frameworks and guidelines. Despite having changed the approach of the development of such, not everyone fully complies with what they are advised to in terms of adapting to and mitigating the hazards that they are susceptible to.

The majority of the focus groups were not aware of any policies, guidelines, frameworks, educational programmes or any sort of intervention measure that had been developed by the government in order to educate or inform the community about the hazards they are susceptible to. Some members from the focus groups of 18-30 years of age and focus groups 31-45 years of age mentioned a couple of intervention programmes that they were aware of from the government. Organisations such as the local Red Cross organisation and Somarelang Tokologo were mentioned to have taught the community about natural hazards and disasters. Other forms of interventions were early warnings such as SMSs, and news outbreaks on TV and radio that are provided prior to the occurrence of the oncoming hazard. However, the majority of the respondents of focus groups of the age 46+ all complained that they do not know of any form of intervention that is implemented by the government in order to inform the community of the natural hazards that they were exposed to.

"*Most of the interventions taken upon by the government are inefficient due to the methods in which they implement them. An example is the early warning SMSs that we receive where only a certain network provider sends out these SMSs, where else the rest don't. This defeats the purpose of informing the community about on coming hazards*". (Respondent from focus group – male 31-45 years).

The findings suggest that there seems to exist an ineffective communication bridge between the government and community in terms of provision of guidelines, policies, frameworks, workshops and any other form of intervention that is implemented by the

government. Respondents from the focus groups complained about how most of these interventions were redundant because they served no purpose in the community. Respondents from the focus groups of the age of 31-45 years of age mentioned that the government hosts workshops and awareness campaigns during the week when the majority are at work. The respondents stated that this means it is ineffective due to the lack of attendance of such and the inability for the message to be conveyed to the community at large. The respondents suggested that awareness campaigns and workshops should be done when more people are available for instance during weekends.

On the other hand focus group respondents of the age of 45+ years knew nothing about such interventions that were taken by the government to inform them about the types of hazards that they are susceptible and vulnerable to. The majority of them mentioned that they relied on nature itself to tell them what to expect the following season. Factors such as weather patterns, animals and trees often communicate with people in terms of what is to be expected. The respondents mentioned that nature often talks to us but the younger generation is too caught up in their own lives to even notice. The respondents mentioned that all these help them to prepare themselves for oncoming hazards just in case they occur.

"*The National Disaster Risk Management Policy of Botswana was developed in 1996 and has not been amended since, thus making this policy obsolete*". (Respondent from National Disaster Risk Management Office of the State President Ministry).

The statement above outlines another problem that is facing the government and the people of Botswana as a whole. The obsoleteness of the National Disaster Risk Management Policy of Botswana which was developed in 1996 results in the government not being able to provide relevant and effective policies to the community of Kasane. This results in a gap in educating and informing the community of Kasane of the types of hazards they are susceptible to and how they can lessen the adverse impact of these hazards or mitigating towards them. Most people complain that the government lacks implementing interventions successfully thus leaving the community even more vulnerable and uninformed. However, most respondents mentioned that they government does supply people who are affected by disasters with basic needs such as tents and

food parcels. The respondents also stated that even though there is such assistance from the government, the resources provided are not always enough to sustain the victims.

The findings suggest that there are policies and frameworks in place that act as guidelines in Botswana to help manage disaster risk. These policies and frameworks are provided to the community through awareness campaigns, workshops and educational programmes. However the obsoleteness of these policies and frameworks that are in place hinders the effectiveness of disaster risk management in Botswana. The method of communication as well is not effective as the majority of the community are not aware of or are unable to attend these workshops and campaigns, particularly the older generation (focus groups 31-45 years and 46+ years).

4.4.5 Thematic Area 5: Coping and adapting to natural hazards in Kasane

The development of this thematic area was necessary in order to find out what type of coping and adaptation strategies the community of Kasane employ towards the types of hazards they are susceptible and vulnerable to. According to Opare (2016) climate change has a significant influence on the frequency and severity of natural hazards. Kihila (2017) notes that the major impacts of climate change onto the livelihoods of rural communities bring about the need to utilize available knowledge and marshal efforts from diverse sources. The diverse efforts will enable the rural communities to adapt and cope with the challenges associated with climate change. Alemayehu and Bewket (2017) distinguish the difference between adaptation and coping strategies as short-term responses to shocks and long-term responses to stressors, respectively.

All the respondents agreed that there were coping and adaptation strategies that are available for the community of Kasane to implement and utilise in order to lessen the adverse impact of natural hazards. The respondents from both national and local levels stated that the available coping and adaptation strategies run from national level to district level to village level in order to address the problems effectively. The following adaptation strategies were mentioned by the respondents.

4.4.5.1 Adaptation strategies towards prevalent hazards

The government official respondents mentioned that adaptation strategies such as educating local farmers about plantation and allocation of seasonal activities such as fish farming season and hunting seasons. The focus group respondents mentioned adaptation strategies such as sending children to school, planting trees that grow tall in their yards as an adaptation strategy to protect their houses from strong winds and heavy rainfall and increase in retail prices during tourism peak season. These adaptation strategies are implemented by the government and community of Kasane in order to reduce the adverse impact of natural hazards that the community is susceptible and vulnerable to. Below is a brief discussion of the mentioned strategies.

- Educating local farmers about plantation

The government teaches the local farmers about the benefits of ploughing with hands as compared with machines. The respondents form the local and national offices mention that they teach the local farmers this strategy because it is beneficial in retaining soil moisture and in return is beneficial for crops and other plants. This adaptation strategy is similar to the adaptation strategies outlined in section 2.7.1 in this study, namely training in livestock health, and soil and water conservation. This strategy assists the community of Kasane in stabilising food security and also equipping local farmers with knowledge that will assist them in improving the farming activities in Kasane.

- Allocation of seasonal activities

The allocation of seasonal activities such as fish farming and hunting are provided to the community of Kasane by the government as an adaptation strategy towards the adverse impact of natural hazards that they are susceptible and vulnerable to. This adaptation strategy is similar to the adaptation strategy briefly discussed in section 2.7.1 namely, shifting of planting dates as it provides dates as to when hunting and fishing can be done in Kasane. This adaptation strategy is beneficial to the community of Kasane as it prohibits over-exploitation of resources that support economic activities in the community.

- Sending children to school

The focus group respondents mention that this adaptation strategy is implemented by the community of Kasane as an adaptation strategy in order to educate children and equip them with the necessary knowledge and skills that will put them at an advantage of acquiring good jobs. This adaptation strategy is the exact same strategy discussed in section 2.7.1 namely sending children to school. This strategy serves as a benefit for the community of Kasane as these children will then be able to enhance household income and lower the levels of poverty within the community of Kasane in the future.

Another adaptation strategy that is similar is the provision of a programme that is provided by a local NGO, namely, The Red Cross Youth Skills Development Programme. This programme educates the youth of Kasane about the tourism industry. The programme also provides the youth with skills such as catering, hosting, housekeeping, bookkeeping, communication skills, how to be a waiter, interpersonal skills, how to be a tour guide, and many more that are related to tourism in the community. The programme also has a signed contract with all the local lodges, guesthouses and restaurants to take in students for a period of six to 12 months, with a possibility of being hired permanently. This is beneficial for the community of Kasane as the youth is provided with skills, experience as well as job opportunities.

- Planting trees in the yard

The focus group respondents of the age of 46+ mentioned that they often plant trees that grow tall in their yards as an adaptation strategy to protect their houses from strong wind storms and rainfall. The respondents also mentioned that these trees are also used as refrigerators in order to retain cold water during the dry hot season.

- Increase in retail prices during peak season

The focus group respondents stated that local traders usually increase their product prices during peak tourism season as an adaptation strategy. This strategy is similar to the adaptation strategy briefly discussed in section 2.7.1 of this study, namely, livestock off-take. This adaptation strategy is used in order to increase the economy and reduce the poverty level of the community.

4.4.5.2 Coping strategies towards prevalent hazards

The respondents from government officials mentioned that early warning messages are provided to the community of Kasane as a coping strategy. The focus group respondents mentioned wearing wet clothes during summer, labour migration to towns and provision of disaster relief programmes as coping strategies towards the hazards that they are susceptible and vulnerable to. Below is a brief discussion of the mentioned coping strategies implemented by the community of Kasane and the government of Botswana towards the adverse impact of hazards that they are vulnerable to.

- Early warning messages

The respondents from government officials mentioned that early warning messages are provided to the community of Kasane as a coping strategy. Early warning messages are provided to the community through media (tv, radio and newspapers) as well as through social networks (network providers and community meetings). This coping strategy assist the community in preparing themselves against natural hazards that are going to occur and helps the community minimise the adverse impact of those natural hazards.

- Wearing wet clothes during summer

The focus group respondents of the age of 31 to 45 years of age and 46+ years mention that they often wear wet clothes or wrap themselves with wet towels as a coping strategy. This strategy is often utilised by local female traders at the markets where they sell cloths, souvenirs and other local products or by local females who go to the fields for subsistence farming. This strategy is beneficial as it helps cool down the body during hot seasons and also restores moisture in the body so the females do not get dehydrated while working.

- Labour migration to towns

All the respondents mentioned labour migration to towns as a coping strategy. Most of the times adults leave their children with the grandparents and relocate to other surrounding towns for better job opportunities. This coping strategy is similar to the coping strategy discussed in section 2.7.2. This coping strategy assists households by injecting economic advantage into the local households, the ability for local households to increase food security and decrease poverty levels of the community of Kasane.

- Provision of disaster relief programmes

All the respondents mentioned that the government of Botswana often provides disaster relief programmes in order to lessen the adverse impact of natural hazards on the community of Kasane. This strategy is similar to the coping strategy mentioned in section 2.7.2., namely, seeking relief assistance. These programmes include provision of food parcels and tents to those affected. The following are the coping strategies that are employed by the community of Kasane in order to decrease the adverse impact of natural hazards.

The findings suggest that the majority of the adaptation and coping strategies mentioned by the respondents are similar to the ones that have been briefly discussed in section 2.7 of this study. The focus group respondents of the age of 18 to 30 years and those of 31 to 45 years where they employed adaptation strategies and a coping strategy provided by the government. However, the focus group respondents of the age 45+ years had other adaptation and coping strategies that have been used by the previous generations. These focus group respondents used indigenous coping and adaptation strategies that they were taught by their parents, grandparents and local community members when they were younger. They mentioned that in as much as these new and improved strategies that are employed by the younger generations are beneficial they feel that their strategies were far better than those of the modern days. This thus brings forth the next thematic area that addresses the role of indigenous knowledge in coping with hazards.

4.4.6 Thematic Area 6: The role of indigenous knowledge in coping and adapting to prevalent hazards

The importance of indigenous knowledge in reducing the risk of disasters is acknowledged in the Sendai Framework for Disaster Risk Reduction. The Framework (UNISDR, 2015:15) states that in order for disaster risk to be effectively reduced, it is important to make sure that disaster risk is understood at the local and national level by "ensuring the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment and development of policies, strategies, plans and programmes of specific sectors, with cross-sectoral approach, which should be tailored to localities to the context". Section 3.4 of this study briefly discussed the concept of indigenous knowledge by defining what indigenous

knowledge is and the role that it plays in the disciplinary field of Disaster Risk Management.

The majority of respondents in this study agreed that indigenous knowledge is important and it plays a major role especially in rural communities such as Kasane. The respondents from government indicated that it is advisable to integrate indigenous knowledge in the field of disaster risk management especially for continents such as Africa where culture and traditional practices are prominent. The respondents acknowledge that it will take time for indigenous knowledge to be integrated into the field of disaster risk management as there are diverse groups on the continent.

These respondents emphasised that the development of policies and frameworks that provide for community adaptation and coping strategies towards natural hazards have to be on a local level. The government respondents mention that it will be highly advantageous for the adaptation and coping strategies that are developed by the government to incorporate indigenous knowledge. This would be helpful as people will be more willing to comply and align their behaviour with those strategies. The respondents emphasise that it will not be something that will happen overnight as indigenous knowledge is still overlooked.

The focus group respondents all agreed that indigenous knowledge plays a big role in their everyday lives and their ability to survive. Adaptation and coping strategies such as planting trees to protect houses from wind storms, women wearing wet towels when going to local markets or farming fields are some examples that were mentioned. Other coping and adaptation strategies that were mentioned are wrapping water bottles with wet cloths and hanging in trees to keep the water cool during dry and hot summers; cutting crops that were close to houses in order to prevent any houses burning down when wildfires break out; and praying for rain and practising rain rituals during the dry season, this assisted the community in calling upon the ancestors to bring rain.

One example is the Jau Flats flood predictions that were made in 2008/09 as mentioned by the government respondents. This settlement was located in Kasane. The local community members who lived around there were advised to relocate to higher grounds due to the heavy floods that were predicted. However, the local community members refused to relocate despite being offered to be assisted with developing a new settlement

on higher grounds. The Disaster Risk Management officials from the Office of State President Ministry and the minister and the District Commissioner consulted the Chief to intervene, yet the locals were still adamant about staying.

The time of the predicted floods came and went by without any rainfall experienced in the area. The officials were shocked and were told by the community members that they knew that they were not going to experience flooding that year because nature had communicated with them. The locals told the officials that they often look at where the birds build their nests, if the birds build their nests on higher branches of the trees in the valleys, then they know that they are going to experience heavy rainfall with a possibility of flooding. However, if the birds build their nests on the lower branches of trees then they are going to experience drought during that rainfall season.

Iloka (2015) states that indigenous knowledge has played a vital role in assisting local communities in Africa to adapt and cope with the adverse impact of natural hazards for generations. As outlined in section 3.4 the integration of indigenous knowledge in the disciplinary field of disaster risk management is important as it has the potential to help reduce the adverse impact of disasters risk to poor communities.

Shaw *et al.* (2008) emphasise that there are several important characteristics that indigenous knowledge contains which distinguish it from other types of knowledge. These several important characteristics originate within the community, maintaining a non-formal means of dissemination, collectively owned, developed over several generations and subject to adaptation, and imbedded in community's way of life as a means of survival (Rahman *et al.,* 2008).

The findings suggest that indigenous knowledge plays an important role, particularly in rural areas such as Kasane. Indigenous knowledge has allowed communities to gain knowledge about the environment that they live within and given communities the ability to cope with and adapt to natural hazards that they are exposed to. Therefore, the integration of indigenous knowledge would be beneficial towards effectively and efficiently managing disaster risk, especially in rural areas. Despite it being widely acknowledged, the integration of indigenous knowledge in disaster risk management is still a dream and will take some time before it can be integrated.

4.4.7 Thematic Area 7: Information and knowledge transfer from one generation to the next

Section 3.5 discusses intergenerational information transfer and outlines that culture plays an important role in information-sharing as cultured groups have close intergenerational relationships thus allowing information to be transferred from one generation to the next. This section also emphasises that the transfer of information and knowledge from one generation to the next is beneficial as the next generation does not necessarily have to physically experience certain events directly in order to determine the consequences of such behaviour. The development of this thematic area was necessary in order to explore how information and knowledge is transferred from one generation to the next.

The focus group respondents all mentioned that they have close relationships with their elders and this has resulted in them learning a lot. The majority of the respondents stated that they were raised by their grandparents as their parents had to migrate to nearby towns in search of employment. These respondents mentioned that they had learnt a lot of skills from the older generation that helps them with the day to day activities of their lives - skills such as taking care of their herds, how to farm, how to take care of a household, praying for rain and taking care of their surrounding environment. The respondents mentioned that the Batswana culture promotes the transfer of knowledge and information transfer as it emphasises that the younger generation must always listen to the wise and old.

"*The one thing that the Setswana culture has taught us is that two hands are better than one. The concept of communism has been deeply instilled in our culture and till today we still practice it. We work together as a community and assist each other. We help our neighbours with their cattle and even ploughing when we are in the fields."* (Respondent from focus group – female 46+ years).

Section 3.4 pointed out that African communities rely heavily on inheritable ideas, belief, values and practices that have been passed on from one generation to the next, thus playing a vital role in passing on indigenous information and knowledge from one generation to the next. The statement above reveals that the community of Kasane is a strong socio-cultural community that firmly believes in the teachings of their culture. This

plays a vital role as it promotes the transfer of information and knowledge from one generation to the next. This therefore points out that the younger generation acquire knowledge and information from the older generation.

The majority of the focus group respondents mentioned that they had acquired their knowledge about natural hazards and the ways of addressing them through the interaction with their grandparents and some mentioned with their parents. The respondents mentioned that they acquired such information through stories such as folk law and tales that they were told by their parents and grandparents. Others mentioned that they would hear these stories through other community members when visiting their friends. Some respondents mentioned that they learnt coping and adaptation strategies through initiation schools such as Bogwera, which is an initiation school for boys and Bojale, which is an initiation school for girls.

"*In the initiation school we would be taught how to be real men and take care of our families and community. We would be divided into different management groups (Mabuapeba and Mashwapeba) in according to our strengths and weaknesses. In the initiation school we were taught how to deal with certain disasters, such as wildfire outbreaks and we would often be called to assist once these disasters occur."* (Respondent from focus group – male 31-45 years).

The respondents mentioned methods such as ceremonies, stories, songs, village meetings, taboos, and arts and crafts that have been used as a form of transferring information and knowledge from one generation to the next. The majority of the respondents mentioned that they were taught coping and adaptation strategies towards prevalent hazards through practice. For example, the girls would go out to the fields with their grandmothers and get taught how and when to plough and harvest. Another example that one respondent from the focus group of male 18-30 years mentioned, was that he was taught to look at the moon and it would tell him if it was time for him to go fishing or not. The focus group respondents argued that they had been taught to communicate with nature and to look out for certain signs that nature communicates with them. This has helped them to cope and adapt with the adverse impact of prevalent hazards that they are vulnerable and susceptible to.

The findings above reveal that culture plays a vital role in the community of Kasane and it enables the transfer of information and knowledge from one generation to the next. The findings also point out that there are many ways in which information has been passed on from one generation to the next in the community of Kasane. Thus, this has enabled the community to develop coping and adaptation strategies towards the adverse impact of prevalent hazards that they are vulnerable and susceptible to.

4.5 CONCLUSION

The analysis above provides a clear point that the people in Kasane are aware of the hazards that they are exposed to and have set coping and adaptation strategies in place. However, it is also clear that there exists a gap between the professional disaster risk management team and the community that needs to be reached in order for disaster risk to be reduced effectively and efficiently. The above analysis clearly points out that indigenous knowledge is indeed reliable and can help the community of Kasane to lessen the adverse impact of hazards that the community of Kasane is vulnerable and susceptible to. Throughout the discussion, it is clear that both the community and the technical teams of the community of Kasane are more than willing to work together; however, there is a bit of a gap between the two. The analysis also provided information that showed that the impact of natural hazards on the community of Kasane can be lessened through intergenerational information transfer. The following chapter will discuss the conclusions and recommendations of the study.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

With the increase in the global climatic conditions, the frequency and severity of natural hazards have increased worldwide. This results in an increase in the negative impacts that natural hazards pose for humanity. Thus the implementation of coping and adaptation strategies towards these natural hazards is important as it helps humanity lessen the adverse impacts that these natural hazards are associated with. Rural communities experience the worst impact of the occurrence of natural hazards as they neither have the economic capability nor enough resources to help them bounce back once a natural hazards has struck. Intergenerational transfer of coping and adaptation strategies can yield various benefits for such communities. In this regard the purpose of this study was to investigate if and how the community of Kasane, Botswana has through the years adapted to the adverse impacts of natural hazards that they are exposed to. The focus of this study was to also investigate how these coping and adaptation strategies have been passed on from one generation to the next and if they have evolved over the years.

The preceding chapter, analysed and presented the empirical research results for the coping and adaptation strategies for addressing the impacts of natural hazards. In this chapter, the conclusions and the recommendations of the study are presented. This chapter will unfold in the following manner: the chapter opens with an overview of the chapters in which the study has been divided. This is followed by an assessment of the achievements of the study aims and objectives as set out in Chapter one. The recommendations of the study in line with the objectives are provided. After the presentation of the recommendations, the overall conclusions of the study are presented.

5.2 OVERVIEW OF THE CHAPTERS

The chapters of this study were outlined in a way to ensure that all the objectives of the study are fully addressed. Chapter one provides an overview of the study. The chapter further conceptualises the problem under investigation and presents the research questions and objectives to be addressed in the study. After the presentation of the study objective, the theory in which the study is grounded, the Social Learning Theory, is identified and briefly presented in the Central Theoretical Statement. A detailed methodology in the study is then presented, followed by the ethical considerations. The chapter closes by presenting the structure of the dissertation by presenting the chapter outline.

Chapter two presents an intensive literature review on the concept of natural hazards. The chapter opens with the conceptualisation of natural hazards wherein the definitions of the term natural hazards are outlined. The discussion moves on to identify the different types of natural hazards and their potential impact. The influence of climate change on the frequency, intensity and magnitude in the occurrence of natural hazards is also briefly highlighted in the chapter. A need for the adoption of coping and adaptation strategies to address the natural hazards cannot be over-emphasised and chapter two identifies and presents the different strategies as presented in the literature. The identification of these strategies in the literature is important because coping and adaptation forms the basis of the study, and these were tested empirically.

This is followed by an intense discussion of the social learning theory in Chapter three. The Social Learning theory was identified in this study as the main theory in which this study is grounded. This chapter is important because it identifies and provides the ways in which information is passed between individuals and groups as outlined in the literature. This chapter also discussed the role of indigenous knowledge in the development of adaptation and coping strategies, particularly in rural areas such as Kasane.

Chapter four briefly outlines the research methodology of this study (see chapter 1 for a detailed methodology), briefly highlighting how data was collected through a qualitative research method, i.e. semi-structured interviews with government officials from the local and national offices. Focus group discussions with the local community members were

also used as a tool of data collection. Most importantly, this chapter analyses and presents the empirical findings of the study. The findings gave rise to seven major themes and two sub-themes, namely:

- Respondents' perspectives on the prevalent hazards in Kasane;
- The role of climate change in exacerbating hazards;
- The impacts of natural hazards on the lives and livelihoods of Kasane community;
- Availability of climate change adaptation and disaster risk reduction policies and frameworks to the community of Kasane;
- Coping and adapting to prevalent hazards in Kasane;
- Adaptation strategies towards natural hazards;
- Coping strategies towards natural hazards;
- The role of indigenous knowledge in coping and adapting to prevalent hazards; and
- Information and knowledge transfer from one generation to the next

The final chapter, Chapter five presents the conclusions and the recommendations of the study.

5.3 ACHIEVEMENTS OF RESEARCH OBJECTIVES

The focus of this study was to explore how the different generations of the Kasane community have dealt with the occurrence of natural hazards they have been exposed to in the past fifty (50) years. In so doing, the goal was to explore how these strategies have been passed on from one generation to the other and if they have evolved over time. The achievement of this goal was based on realizing the objectives as outlined in chapter one, i.e. to provide a theoretical perspective on adaptation to natural hazards; to provide a theoretical perspective on social learning (intergenerational information transfer); to identify the different methods/strategies that have been used or are used by the different generations in Kasane village to adapt to the natural hazards; to determine if these strategies/methods evolved over time; and to provide conclusions and recommendations on the intergenerational adaptation to natural hazards. Overall, the research objectives of the study were achieved through the literature review in chapters two and three; and empirical findings in chapter four. The section below outlines how each objective was addressed in order to satisfy the overall goal of the study.

5.3.1 Objective 1: To provide a theoretical perspective on adaptation to natural hazards

The first objective of the study was addressed in Chapter two of this study. As the focus of the study was on intergenerational adaptation to natural hazards, the conceptualisation of natural hazards was thus important. A proper conceptualisation of the term natural hazards was necessary as it gave an in depth knowledge of natural hazards. This was achieved through defining the term natural hazards as well as focusing on the types of natural hazards that are experienced worldwide and their potential impact on humanity. Chapter two of this study thus outlined the three categories of natural hazards and their impacts.

Section 2.4 discussed the natural hazards risk profile of the sub-Saharan African region and revealed that countries in this region are highly vulnerable and susceptible to the occurrence of natural hazards. This section pointed out that factors such as underdevelopment, political instability, corruption, poverty and inequality result in countries and communities that lie within this region to be more vulnerable to the occurrence of natural hazards. The discussion of the impacts of the different kinds of natural hazards and the discussion of the sub-Saharan African region underlined the need to identify adaptation and coping strategies presented in the literature. This was important to provide the basis for comparison with the strategies adopted by the community of Kasane to cope with and adapt to the natural hazards.

5.3.2 Objective 2: To provide a theoretical perspective on social learning (intergenerational information transfer)

Social learning theory focuses on information transfer between individuals and/or groups. Since this study focuses on intergenerational information transfer, the adoption and discussion of social learning theory was deemed important and necessary in order to identify the ways in which information is transferred. This objective was addressed in Chapter 3 of the study. This study specifically focused on Albert Bandura's Social Learning Theory, which argues that children learn new behaviours through observing and modelling adults in their close proximity. The theory also argues that culture plays an important role in information sharing as cultured social groups have close

intergenerational relationships thus allowing information to be transferred from one generation to the next.

5.3.3 Objective 3: To identify the different methods/strategies that have been used or are used by the different generations in Kasane village to adapt to natural hazards

This objective was addressed in chapter four of this study. The empirical findings in Chapter four identified the following adaptation strategies: sending children to school; training local farmers about planting; relief programmes; seasonal fishing and game farming; educational programmes for skills development; and market trading off-take. The following coping strategies were also identified in the empirical findings: labour migration to towns; early warming; and protective clothing and hydration. The coping and adaptation strategies that the community of Kasane utilised towards natural hazards are relatively similar to those identified in the literature as presented in chapter four.

5.3.4 Objective 4: To determine if these strategies/methods evolve over time

This objective was discussed in Chapter four of the study, where the empirical findings sought to find out if the strategies that were taught to the younger generations have evolved over time or whether they are still the same. The empirical findings point to the fact that the coping and adaptation strategies that have been taught from one generation to the next in the community of Kasane have evolved over the years. The change in the global climatic conditions has led to the community modifying the coping and adaptation strategies that they have been taught from one generation to the next. The modification was not only brought forth by the change in the global climatic conditions, however the majority of the community of Kasane mentioned that the world is moving towards a more technological era. Thus the community of Kasane itself is evolving and is moving towards a more technological community.

5.4 SIGNIFICANCE OF THE STUDY

Firstly, the aim of this study was to explore how the different generations of Kasane community have dealt with the occurrence of natural hazards they have been exposed to in the past fifty (50) years. In so doing, the goal was to explore how these strategies have been passed on from one generation to the other and if they have evolved over time. In

order to achieve this objective, an empirical exploration of how the community of Kasane copes and adapts towards prevalent hazards was done. The empirical enquiry further sought to establish how these coping and adaptation strategies have been passed on from one generation to the next.

Secondly, the research further explored the importance of indigenous knowledge in the field of disaster risk reduction, and looked at how the community of Kasane has implemented indigenous knowledge in developing coping and adaptation strategies. The importance of indigenous knowledge in reducing the risk of disasters is acknowledged in the Sendai Framework for Disaster Risk Reduction. The Framework (UNISDR, 2015:15) states that in order for disaster risk to be effectively reduced, it is important to make sure that disaster risk is understood at the local and national level by ensuring the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment and development of policies, strategies, plans and programmes of specific sectors, with cross-sectoral approach, which should be tailored to localities to the context.

This study aspires to add value to the field of disaster risk reduction by providing information as to how different generations adapted to the occurrence in order to reduce the adverse impacts of natural hazards and also provide disaster risk reduction organisations with more strategies as to how to deal with the adverse effects of natural hazards.

5.5 RECOMMENDATIONS

It has been argued throughout chapter one to four that there is an imperative need for humanity to develop coping and adaptation strategies towards natural hazards in order to lessen the adverse impact of these hazards. Chapter one identified the gap in literature in addressing adaptation towards natural hazards and intergenerational information transfer. Chapter two argued that natural hazards have a negative impact on humanity and that climate change exacerbates the negative impact on humanity, therefore identifying the need for humanity to cope and adapt to prevalent hazards that they are vulnerable and susceptible to. This argument was carried over to Chapter three, where it is argued that children learn new behaviours through observing and modelling adults in their close proximity. This argument gave off the basis of intergenerational information

transfer and how culture plays an important role in information sharing, as cultured social groups have close intergenerational relationships thus allowing information to be transferred from one generation to the next. The findings presented in Chapter four revealed that there are coping and adaptation strategies that have been developed in the community of Kasane with regard to the prevalent hazards that they are vulnerable and susceptible to. This chapter also revealed that there are communication barriers between the community of Kasane and the government as information about prevalent hazards does not reach the majority of the community. Based on the results of the empirical findings and the review of the literature, this section presents the proposed recommendations for the study as outlined below.

5.5.1 Recommendation 1: Sharing of intergenerational information transfer

The empirical findings revealed that there are a lot of traditional methods that the community of Kasane transfers information from one generation to the next. However this information does not necessarily reach all the younger generation's individuals, resulting in some individuals not knowing how to effectively cope and adapt to prevalent hazards.

This can be addressed in promoting engagement of the different generations, through methods such as allowing the younger generation to sit through village meetings. This can also be addressed through using modern technology such as radio and television to play stories that teach the younger generations how to effectively cope and adapt with prevalent hazards. Another method of addressing this issue can be done through actively organising an engagement session between the three different generations and promoting teachings on how to effectively cope and adapt with prevalent hazards in Kasane.

5.5.2 Recommendation 2: The use of traditional adaptation methods by the youth of Kasane (the importance of indigenous knowledge)

The empirical findings reveal that the youth of Kasane are more prone to implement scientific adaptation strategies that they have been taught by the government through education programmes and schools. This is driven by the fact that the world is becoming more modernised and more scientific information driven pertaining prevalent hazards has become available to the community of Kasane, particularly the youth of the village. However, there is a realisation that the modernisation has brought about certain negative

impacts to the community of Kasane, such as promotion of environmental pollutions and environmental degradation. This is brought forth by climate change.

This issue can be addressed by promoting the use of traditional methods by the youth of Kasane. The youth can integrate indigenous knowledge that they have been taught by the older generation into the coping and adaptation strategies. This can be done by being more mindful of the impact that the coping and adaptation strategies provided by the government has on the nature of their environment.

5.5.3 Recommendation 3: The teaching of adaptation strategies to the younger generation by the older generation

Through the data gathering process, it was revealed that the boys were more vocal than the girls in terms of the teachings of adaptation strategies. The girls were taught more domestic skills and knowledge as compared to the boys, who were taught more of how to cope and adapt to prevalent hazards. This was done through initiation schools, the community at large and households. This thus puts the girls in a more vulnerable position as compared to the boys.

This issue may be addressed by teaching the girls more coping and adaptation strategies. This will enhance the resilience of the girls, ultimately enhancing the coping capacity of the community of Kasane.

5.5.4 Recommendation 4: Creating effective awareness of prevalent hazards to the community of Kasane

There seems to be a gap that exists between the community of Kasane and the government of Botswana. Chapter four pointed out that the majority of the local community member respondents did not know of any awareness campaigns or workshops that were provided by the government to inform the community member about the types of natural hazards that they are exposed to and how to effectively reduce the adverse impacts of those natural hazards.

As such, it is recommended that these awareness campaigns and workshops be held during weekends, as the majority of the community will be available during that time. A majority of the respondents mentioned that workshops and awareness campaigns are conducted during the week and they are either at work or school and are unable to attend.

By conducting these awareness campaigns and workshops during the week, the majority of the community members will be able to attend, thus being able to communicate the messages more effectively.

5.5.5 Recommendation 5: Review of policy and legislative frameworks for DRR in light of climate change as a natural hazards risk enhancer

The SFDRR (2015:13) in section iii, sub-section (h) highlights the importance of developing, strengthening and implementation of relevant legislation, policies, plans, practices and mechanisms. The empirical findings revealed that the National Disaster Management Plan of Botswana has not been reviewed since 1996, making this plan irrelevant and ineffective towards the prevalent hazards in Botswana. In the light of the changing natural hazard profile, it is recommended in the study that government reviews and update their policies and legislation.

5.5.6 Recommendation 6: Community consultation and stakeholder involvement in DRR

The empirical findings revealed that an integrated approach towards the development of policies and frameworks in Botswana need to be set in place. The government officials usually employ a top-down approach in the development of policies and frameworks. This has led to the community of Kasane not complying with these policies and frameworks effectively.

It is therefore recommended in the study that the government of Botswana should implement a bottom-up approach in the development of these policies and frameworks. This will provide an opportunity for the government to discover what the community perceives as prevalent, therefore providing adequate coping and adaptation strategies. This will also provide the government officials an opportunity to educate the community and make them aware of the prevalent hazards that they are vulnerable to and enhancing the community's effective implementation of the provided coping and adaptation strategies.

5.5.7 Recommendation 7: Incorporation of indigenous knowledge in risk reduction measures

Literature consulted (see Chapter three) and subsequently the empirical findings in Chapter four, outlined the importance of indigenous knowledge and identified the different types of benefits that indigenous knowledge has in reducing disaster risk within Africa and local communities such as Kasane. The incorporation of indigenous knowledge can help communities such as Kasane to effectively reduce the adverse impact of natural hazards.

The study recommends that the government of Botswana should consider incorporating indigenous knowledge in the development of risk reduction measures.

5.5.8 Recommendation 8: Economic development as a form of reducing vulnerability in Kasane

Literature consulted (see Chapter two) outlined that the vulnerability of African communities is induced by factors such as economic instability. The empirical findings revealed that tourism is one of the biggest economic contributors in Kasane. This industry provides the community of Kasane with job opportunities and reduces the poverty levels.

The study therefore recommends that the government of Botswana should invest more in the tourism industry, especially in the community of Kasane as it is the tourism hub of Botswana. This will help the community unlock the potential of poverty alleviation and enhance their adaptive capacity.

5.6 LIMITATIONS TO THE STUDY

Due to the limited scope of the study, the study mainly focused on natural hazards. It would have been ideal if the study could focus on the prevalent hazards, therefore identifying other hazards that the community of Kasane perceives as harmful to the community. Furthermore, the research focused only on the Kasane village. It would have been ideal if the study had explored the whole Chobe district. This would have allowed the study to concentrate more on the different types of adaptation strategies that are employed in rural areas towards prevalent hazards. This would have also allowed the study to explore more on how these adaptation strategies have been passed on from one

generation to the other. To address some of these limitations, recommendations for future research are provided in the following section.

5.7 RECOMMENDATIONS FOR FUTURE RESEARCH

The recommendations for future research are as follows (doing more exploration of different areas):

- To explore indigenous knowledge within communities such as Kasane and how they play a role in the development of coping and adaptation strategies;
- To explore intergenerational relationships and the influence that the older generation has on the decision making of the younger generation;
- To test empirically and theoretically how economic development can help reduce the vulnerability of communities such as Kasane and improving their adaptive capacity;
- To look more at the effectiveness of the adaptation strategies that the community of Kasane implements towards prevalent hazards, particularly those that have been passed on from one generation to the next; and
- The willingness of community members, particularly of the older generation to change their perception of prevalent hazards and their causes, and to implement adaptation strategies provided by the government

5.8 CONCLUSION

This study has argued that as a result of an increase in frequency, intensity and magnitude of natural hazards and the ultimate impacts, the adoption of proper adaptation strategies is imperative. The study employed both the study of literature and empirical research. Through a review of literature and respondents' contributions, the study emphasised the importance of sharing adaptation information between different generations in order to address and reduce the impacts of natural hazards.

Both the literature and the empirical findings were able to provide the different adaptation strategies and different ways for information sharing between individuals and/or groups. The adaptation strategies identified empirically in this study are educating local farmers about plantation; allocation of seasonal activities; sending children to school; planting trees in the yard; increasing retail prices during peak season; early warning messages;

wearing wet clothes during summer; labour migration to towns; and provision of disaster relief programs. Similarly, the intergenerational information transfer strategies include: initiation schools' teachings; physical implementation and practice of strategies; ceremonies; songs; village meetings; taboos; arts and crafts; and folk stories.

The limitations discussed in the study identified the limited scope of the study and presented the prospects for the study to recommend additional areas for future research. Therefore instead of just focusing on Kasane village, it is recommended that future research should explore the Chobe District as a whole. In conclusion, indigenous knowledge plays a vital role in communities such as Kasane, therefore the incorporation of these strategies will help the government in effectively lessening the adverse impact of natural hazards.

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ANNEXURES

ANNEXURE A

Letter of Consent

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

ACDS
African Centre for Disaster Studies

AFRICAN CENTRE FOR DISASTER STUDIES

Unit for Environmental Science and Management
School for Geo- and Spatial Sciences
North-West University
Potchefstroom Campus
Faculty of Natural Sciences
Private Bag X6001
Potchefstroom
North West Province
2520
South Africa
18 July 2017

To whom it might concern:

Re: Confirmation of registration of Ms. Madiphoko Moholo as a Student at the North-West University.

Ms. Madiphoko Moholo (Student number 23491744) is enrolled for the qualification MSc. In Environmental Sciences With Disaster Risk Science. The main part of this qualification and the successful completion thereof relies on the student's successful completion of a year-long research project. Ms. Madiphoko Moholo has decided to focus her research on the intergenerational adaptability to natural hazards using Kasane, in Botswana as a case and aim to establish how different generation have adapted to the occurence of natural hazards. The Title of here dissertation is " INTERGENERATIONAL ADAPTABILITY TO NATURAL HAZARDS: A CASE STUDY OF THE KASANE COMMUNITY".

The purpose of this letter is to support Ms. Moholo in her application for a permit to conduct the study in Botswana during the course of this year (2017). In terms of funding for this research Ms. Moholo will rely on bursaries from the North-West University as well as funding from the EAGER Project due to her research being conducted in one of the countries involved in the EAGER Project.

With the African Centre for Disaster Studie's, NWU, involvement in a community based, capacity building project (EAGER Project) in Botswana and more specifically Kasane Ms. Moholo has become quite interested to focus her empirical component of his research in Kasane, Chobe District. It is therefore recommended that you allow Ms. Moholo to conduct here study in Kasane, Botswana and we would like to confirm that the findings of her study will be solely used for academic purposes and that they will not jeopardize any participant and the country.

We hope that you will find his application in order and invite you to make contact with either her supervisor or programme coordinator at any stage of the application process should you need further information.

Kind regards

Livhuwani Nemakonde (PhD)

Lecturer: African Centre for Disaster Studies

North West University
Potchefstroom Campus
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ANNEXURE B

Research Permit

TELEGRAMS: PULA
TELEPHONE: 3950800
TELEX: 2655 BD

REPUBLIC OF BOTSWANA

MINSTRY OF PRESIDENTIAL AFFAIRS,
GOVERNANCE AND PUBLIC
ADMINISTRATION
PRIVATE BAG 001
GABORONE

REF: OP 5/59/8 XII (2)

17th August, 2017

Ms Madiphoko S. Moholo
52 Riverside Drive, Glen Harmony
Virginia, Free State
South Africa 9430

Dear Sir/Madam

APPLICATION FOR RESEARCH PERMIT

Reference is made to above subject matter.

You are herewith granted permission for research permit to conduct a study titled: **"Intergenerational adaptability to natural hazards: A case study of Kasane community."** The permit is valid for 1 month, from 1st October 2017 to 30th October, 2017.

1. Copies of any report/papers written as a result of the study are directly deposited with the Office of the President.

2. The permit does not give authority to enter any premises, private establishment or protected area. Permission for such entry should be negotiated with those concerned.

3. You conduct the project according to the particulars furnished in the approved application taking into account the above conditions.

4. Failure to comply with any of the above stipulated conditions will result in the immediate cancellation of the permit.

Thank you.

Yours faithfully,

Dr. F. J. Ramsay
For/PERMANENT SECRETARY TO THE PRESIDENT

Copied to: Director, Botswana National Library Services
Director, National Archives and Records Services

ANNEXURE C

Focus Group Discussion Questions

Location: Kasane Township, Chobe District, Botswana	
Subject/Theme	**Discussion Questions**
1. Biological Information	• Gender • How are you? • How many years have you lived in Kasane?
2. Knowledge of prevalent hazards in Kasane	• What do you understand by the term “hazards”? • Which natural hazards have you experienced in Kasane? • After how long did you experience these hazards? • How have these hazards affected you and your family? • How have these hazards affected the community of Kasane? • Are you seeing any changes to the frequency of these hazards over the years? • What do you think is the cause of that? • Are there any community/educational activities that teach you about the hazards? • Do you know of any policies or bylaws for addressing the hazards? • Do you know the potential impact of these hazards?

3. Climate change impact on the occurrence of prevalent hazards	• According to your experience, do you think the climate conditions have changed over the years? • What do you understand by the term “climate change”? • Do you think the change in the climatic conditions play part in the occurrence of hazards? • What impact does the change in the climatic conditions have on the occurrence of prevalent hazards? • How has this affected you and your family? • How has this affected the community of Kasane?
4. The impact of prevalent hazards on the Kasane community	• Do you know the potential impact of the prevalent hazards? • What impact do you think these hazards have on you and your family? ➢ *How has this changed over the years?* ➢ *What impact do you think these hazards will have towards the future generations?* • What impact do you think these hazards have on the community of Kasane? ➢ *How has this changed over the years?*

	➢ *What impact do you think these prevalent hazards will have towards the future generations?*
5. Hazard coping and adaptation strategies	• Do you have any methods in place towards the prevalent hazards? (e.g. adaptation strategies or coping strategies) • What methods (coping or adaptation strategies) do you implement towards the hazards? • What do you understand by "adaptation strategies" and "coping strategies"? • Do you have adequate resources to cope with or adapt to the hazards? • How does the local government assist the community in adapting or coping with the hazards? • Are there any initiatives that are conducted by the local government to assist the community towards hazards? • Do you think the methods implemented by the local government are attainable and realistic? ➢ *If yes, please specify* ➢ *If no, please specify* • Do you think the local government is doing enough in assisting the community to adapt or cope with the hazards? ➢ *If yes, please specify*

	➢ *If no, please specify* • Are there any suggestions that you would provide to the local government in order to assist the community to adapt to or cope effectively and efficiently with the hazards?
6. Transfer of hazard knowledge, and coping and adaptation strategies from one generation to the next	• How did you learn the methods you used towards the prevalent hazards? • (If applicable) do you teach your children/grandchildren these methods? • Do you talk to your children/grandchildren about your experiences with the hazards that you have experienced over the years? • What type of relationship do you have with your child/grandchild (or parents/grandparents)? • Do they implement the methods you have taught them to use towards the prevalent hazards? ➢ *Do you think the type of relationship that you have has an impact on this?* ➢ *Have you noticed any changes in the way in which they implement these methods that you have taught them over the years?* *-If yes why do you think that is*

ADDITIONAL COMMENTS

ANNEXURE D

Face to Face Interview Questions

Location: Kasane Township, Chobe District, Botswana	
Subject/Theme	**Discussion Questions**
1. Biological Information	• Gender • How are you? • How many years have you lived in Kasane?
2. Knowledge of prevalent hazards in Kasane	• What do you understand by the term “hazards”? • Which natural hazards have you experienced in Kasane? • After how long do you experience these hazards? • How have these hazards affected you and your family? • How have these hazards affected the community of Kasane? • Are you seeing any changes to the frequency of these hazards over the years? • What do you think is the cause of that? • Are there any community/educational activities that teach you about the hazards? • Do you know of any policies or bylaws for addressing the hazards? • Do you know the potential impact of these hazards?

3. Climate change impact on the occurrence of prevalent hazards	• According to your experience, do you think the climate conditions have changed over the years? • What do you understand by the term "climate change"? • Do you think the change in the climatic conditions play part in the occurrence of hazards? ➢ *How has this affected you and your family?* ➢ *How has this affected the community of Kasane?*
4. The impact of prevalent hazard on Kasane community	• Do you know the potential impact of the prevalent hazards? • What impact do you think these hazards have on you and your family? ➢ *How has this changed over the years?* ➢ *What impact do you think these hazards will have towards the future generations?* • What impact do you think these hazards have on the community of Kasane? ➢ *How has this changed over the years?* ➢ *What impact do you think these prevalent hazards will have towards the future generations?*
5. Hazard coping and adaptation strategies	• Do you have any methods in place towards the prevalent hazards? (e.g.

	adaptation strategies or coping strategies) • What methods (coping or adaptation strategies) do you implement towards the hazards? • What do you understand by “adaptation strategies” and “coping strategies”? • Do you have adequate resources to cope or adapt towards the hazards? • How does the local government assist the community in adapting or coping with the hazards? • Are there any initiatives that are conducted by the local government to assist the community towards hazards? • Do you think the methods implemented by the local government are obtainable and realistic? ➢ *If yes, please specify* ➢ *If no, please specify* • Do you think the local government is doing enough in assisting the community to adapt or cope with the hazards? ➢ *If yes, please specify* ➢ *If no, please specify* • Are there any suggestions that you would provide to the local government in order to assist the community to adapt or cope effectively and efficiently towards the hazards?

6. Transfer of hazard knowledge, and coping and adaptation strategies from one generation to the next	• How did you learn the methods you used towards the prevalent hazards? • (If applicable) do you teach your children/grandchildren these methods? • Do you talk to your children/grandchildren about your experiences with the hazards that you have experienced over the years? • What type of relationship do you have with your child/grandchild (or parents/grandparents)? • Do they implement the methods you have taught them to use towards the prevalent hazards? ➢ *Do you think the type of relationship that you have has an impact on this?* ➢ *Have you noticed any changes in the way in which they implement these methods that you have taught them over the years?* *-If yes why do you think that is*

ADDITIONAL COMMENTS