



Community Perceptions of an Early Warning System:

**A Case Study of Swayimane, UMshwathi Local Municipality's Lightning
Warning System**

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DECLARATION

I, Senelisiwe Ndlela, declare that all the work submitted represents my original effort and has not been submitted for any degree in any other tertiary institution. Where the works of others have been used, it is duly acknowledged in the text and reference list.

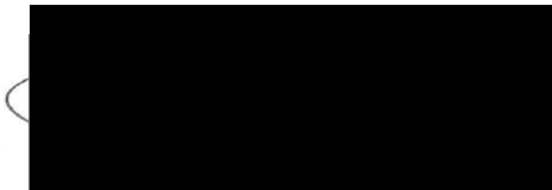
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DEDICATION

This thesis is dedicated most importantly to my late grandmother Oswina Nomalungelo Ndlela, who has been my greatest supporter. This has been the most challenging part of my life. Your wisdom and encouragement has been with me throughout this journey. Praise be to God.

And to everyone in despair, hopelessness:

Trust in the Lord with all your heart, and do not lean on your own understanding.

~ Proverbs 3:5-6

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ABSTRACT

This study attempts to understand community perceptions of a lightning warning system in the community of KwaSwayimane. The study therefore takes a detailed look at the local community's views on and insights into the warning system, and how these are shaped by the cultural practices and beliefs embedded in indigenous/local knowledge. The study was carried out at KwaSwayimane, and adopted a mixed methodology, making it both qualitative and quantitative. It involved 100 participants who engaged in questionnaires, focus group discussions and face-to-face interviews. Social constructionism and symbolic interactionism theories were used to analyze the insights gathered during data collection. Findings revealed that the community has recommendations on how to improve their experience of the lightning warning system installed in the area (especially in the context of the dissemination of the warning messages) and these recommendations involve integrating their local/indigenous understandings for protection against lightning strikes with the existing system.

Keywords: Community, community perceptions, lightning, lightning warning system, indigenous/local knowledge.

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LIST OF ACRONYMS

UKZN	University of KwaZulu-Natal
SAEES	School of Agricultural, Earth and Environmental Sciences
WMO	World Meteorological Organization
STATS SA	Statistics South Africa
EWS	Early Warning System
IFRC	International Federation of Red Cross and Red Cross Societies

Chapter 1

Introduction and outline of the study

1.1 Introduction

Climate change poses a significant threat to people's livelihoods, particularly among vulnerable groups with low adaptive capacity. "Climate change is a natural phenomenon; however, it has become a threat to humanity because the rate of change is more rapid and the range is greater than anything humanity has had to adapt to in the past" (Warburton and Schulze, 2006 cited in Mzimela, 2017, p.21). The changes in temperature caused by climate change affect communities and their capacity to cope and adapt. It is further stated by Crate and Nuttall (2009, p.11) that "climate change magnifies and exacerbates existing social, economic, political and environmental trends, problems, issues, tensions and challenges". Climate change is a threat to communities and exacerbates existing challenges. According to Sibanda (2016, p.131), "in Africa, disaster risk conditions are worsening due to climate change impacts (such as rainfall pattern changes, temperature increase) and the persistent conditions of the vulnerability of most communities".

It is asserted by Ariatti (2013, p.84) that "the rise of climate change as a result of global warming, and its adverse effects on the natural environment pose a threat to a sustainable economy". Climate change increases the probabilities of natural hazards such as lightning strikes, droughts and floods in communities. These natural hazards may affect the community's means of survival, such as the subsistence farming practiced by some community members. Subsistence farmers are also found in KwaSwayimane. Subsistence farmers, who are also active community leaders, comprise some of the participants in the study.

Climate change highlights the adaptive capacity of communities, but it also underlines the various sociocultural aspects that shape communities affected by climate change. The many complex relationships humans have with their environment and each other are also affected by climate variability and change. According to Upadhyay (2016, p.121), "in some cases, movement of people from one community to the next as a result there is a loss of mythological symbols, meteorological orientation and even the very totem and mainstay plants and animals that shape a culture (sic) as a result of climate change".

The skilled fieldwork done by anthropologists can be used to gain insights and knowledge to assist communities with issues such as climate change. Anthropology is vital in studies involving human adaptation to climate change and its impact on livelihoods. "Anthropologists wear multiple 'hats', from being academic researchers to being advocates in communities" (Crate, 2011, p.179). Anthropologists

employ ethnography through understanding different cultural beliefs and traditions from the participant's viewpoint. This is important, as understanding issues from the community's perspective enables us to gain in-depth insights on the livelihoods of participants through the first-hand experience, while maintaining the ability to see issues through an academic lens. The discipline of anthropology is embedded in its study of 'culture'. As asserted by Adger et al. (2014, p.764), "culture also interacts with adaptation through the way that cultural, local, and individual perceptions affect narratives of risk, resilience, and adaptive capacity". Both anthropology and sociology are important in the study of the impacts of climate change, "since sociology and anthropology possess considerable knowledge of social and cultural systems, they have a great deal to offer in helping to understand the societal origins of climate change" (Brulle and Dunlap, 2015, p.24). Climate risks introduced by lightning affect the livelihoods of communities, which also affects their livestock. Therefore, early warning systems were introduced to improve preparedness and awareness of climate risks such as lightning. This chapter will offer an overview of the research study and its structure. The chapter will also highlight the study's focus, which is to explore community perceptions of an early warning system.

1.2 Background and rationale of the study

The study seeks to gather insights on the community's perceptions of the early lightning warning system introduced to assist the community of KwaSwayimane and help mitigate the risks of lightning strikes. The study seeks to gather perceptions of the early lightning warning system used to help the people in the community prepare for and mitigate the risk of lightning strikes, and to help reduce their vulnerability to the danger (e.g. by taking cover indoors). This can be done by utilizing an anthropological understanding of the different issues that communities face while interacting with the community and trying to understand their culture and different beliefs. The study is in KwaSwayimane, Ward 8, in the uMshwathi Local Municipality in KwaZulu-Natal, South Africa. According to Laidler (2014, p.13), KwaSwayimane covers an area of 32 km², and in 2011, STATS SA recorded a population of 6857 (213 people/km²). The rural KwaSwayimane community engages in subsistence farming, which is farming done to sustain the farmer and his/her immediate family rather than to meet larger commercial needs. However, this rural area is in a lightning hotspot region, rendering the people vulnerable to lightning strikes (Laidler, 2014). According to Van Zyl (2012, p.1), "lightning is a large-scale electric discharge in the atmosphere". It is characterized by a lightning flash and a lightning strike.

1.3 Motivation for the study

Climate is a multi-dimensional phenomenon that calls for complex approaches which combines nature, cultural enactments, history, and geography in its study (Kneubusch, 2007). It is argued by Baer and Reuter (2015, p.2) that “anthropologists and other social scientists are now playing a critical role in providing their analytical skills and insights in studies related to human adaptation and climate change”. These scholars assert that the techniques anthropologists use in their fieldwork can be used to gain insights and knowledge to assist communities with issues such as climate change adaptation and mitigation. Social sciences are a vital aspect that needs to be explored in studies concerned with climate change and its resultant effects on human livelihoods; a social scientist is therefore needed to probe closely into the issues that affect the community and to gain an understanding of people’s vulnerability to lightning. According to Poolman et al. (2015, p.1), “natural hazards will always affect communities simply because humans are living in the volatile natural world”. Climate change influences natural hazards and poses a threat to communities by making them more vulnerable to lightning strikes. Lightning disasters fall within the context of climate risks.

Given the risks lightning poses to people living in the community, an early warning system has recently been installed within the area of KwaSwayimane. It is being piloted as part of a broader integrated multi-hazard early warning system aimed at building the KwaSwayimane community’s preparation and response capability to lightning. The lightning warning system was erected in the area as part of the uMngeni Resilience Project due to the area’s vulnerability to lightning, floods and other natural hazards, with multiple stakeholders such as the University of KwaZulu-Natal and the uMshwathi local municipality getting involved (Laidler, 2014). According to the International Federation of Red Cross/Red Crescent Societies (IFRC 2012, p.13), “an early warning system represents the set of capacities to generate and disseminate meaningful warning information to assist communities in preparing for natural hazards”. The lightning warning system erected and situated at Swayimane Secondary School is designed to provide the KwaSwayimane community (within a 32km radius) with warnings of lightning threats through a robot, siren/alarm and SMS system. The ‘robot system’ is easily accessible, as the lights are visible to the community, and the alarm is sound-efficient and audible. While the sound system is accessible to the wider community, for now the SMS system is accessible to only a pilot group of 30 community leaders. This study in turn focuses on the wider community’s perceptions (beyond the pilot group which receives the SMS warning) of the early warning system, which is audible and visible to them in the event of a lightning strike. Therefore, the motivation for this study is to investigate whether the lightning warning system employed in the community is useful, and to what extent. If it is not found to be useful, recommendations are needed from the community to make them more receptive to the early warning system in this case.

This study explores the community's perceptions of a system introduced to assist them; it is necessary to understand the values that shape communities and their importance. Barnes et al. (2019, p.540) assert that "anthropology focuses on how cultural values shape climate-related knowledge creation and interpretation, which forms the foundation of how communities respond to environmental changes". Through in-depth data collection—the foundation of anthropology—researchers gain insight into how communities perceive environmental and climate change. Barnes et al. (2019, p.541) further state that "the holistic view of humans; cultural, social, political and economic changes that take place in our societies are important", as they shape communities' perceptions and views of climate change. Climate change has impacted many aspects of life, including increased risk of weather extremes and climate risks such as lightning strikes. These risks are of concern to the whole world, especially communities more vulnerable to them than others.

1.4 Survey of existing research

The study focuses on understanding community perceptions of the lightning warning system introduced to help the community prepare for lightning strikes. According to Sibanda (2016, p.131), "in Africa, disaster risk conditions are worsening due to climate change impacts (such as rainfall pattern changes, temperature increase) and the persistent conditions of the vulnerability of most communities". Therefore, early warning systems were introduced to help communities mitigate the risk of loss of life associated with natural disasters such as lightning. This study seeks to probe the perceptions of a lightning warning system employed in KwaSwayimane to assist the community in reducing their risks to lightning strikes, thereby helping to protect their livelihoods.

Lightning in South Africa

Lightning is one of the many natural disasters which disrupts lives, as it causes loss of life and property. According to Van Zyl (2012, 1), "lightning is a large-scale electric discharge occurring in the atmosphere". Lightning is characterized by a lightning flash and a lightning strike. A lightning strike occurs when electrical currents hit the ground; the immense heat it carries crashes into the earth and destroys the surface on contact. Lightning flashes occur in clouds hit by the electric current. South Africa's population experiences an average of between 1.5 to 8.8 per million deaths a year because of lightning; the most alarming fact about this statistic is that it places South Africa at four times higher than the global average (Gijben, 2012). This implies that South Africa has a much higher rate of lightning occurrences. Of the many reasons for this, one would be the country's topography. South Africa covers multiple, varying stretches of uneven land. This influences the area's climate, which in turn affects the frequency and intensity of thunderstorms and lightning (Gill (2008).

It is argued by Trengrove and Jandrell (2014, p.2) that “research around the world shows that people who are outdoors during a storm face the highest risk of being killed or injured by lightning. South Africa has a large rural population, with many people involved in subsistence farming, who work outdoors tending the land or herding livestock, who are most vulnerable”. Therefore, this study probes how rural communities such as KwaSwayimane comprehend the phenomenon of lightning. This includes understanding their knowledge of how to protect themselves from lightning strikes, especially in a rural community.

Literature and knowledge of lightning and its impact on rural communities such as KwaSwayimane remain a challenge. Details on lightning strikes are not widely available. The news on lightning strikes is provided by the South African Weather Services in the usual weather bulletins; it would be interesting to gather more knowledge on how this knowledge is useful as compared to the knowledge provided by the lightning warning system, as the latter is a localized system. It is further explored by Jensenius (2016, p.1) that “lightning safety information focuses on what to do in a dangerous situation, rather than how to avoid a dangerous situation”. Therefore, this study seeks to gather more knowledge and to look critically at indigenous insights, further investigating the techniques used in local communities. Indigenous/local knowledge is embedded in the ‘culture’ and traditions that the community inhabits; this is also the main objective in this study and the influences of these cultures on indigenous/local knowledge.

The risk of lightning strikes increases vulnerability to bodily harm or loss of life, especially in identified lightning hotspots. This is especially true for KwaSwayimane, identified as a lightning hotspot upon experiencing several lightning strikes (Laidler, 2014). A system that seeks to reduce risk and personal vulnerability is potentially valuable to a community such as KwaSwayimane. This vulnerability relates to how different communities experience natural disasters; therefore, it is important for those concerned with systems development to help communities take their vulnerability into account. It bears noting that climate change is not only about communities and their adaptability to change, but also involves the different aspects which shape communities, as this is the social and cultural matrix that shapes individuals and communities. The different relationships humans have with their environment are also affected by change. As anthropology is embedded in its study of so-called ‘culture’, these aspects are important whenever climate change is concerned, especially in studies of African communities, where climate change is arguably less researched. The ways in which people perceive the changes around them are influenced by their cultural values. Both anthropology and sociology are therefore important in the study of the impacts of climate change, “since sociology and anthropology possess considerable knowledge of social and cultural systems, they have a great deal to offer in helping to understand the societal origins of climate change” (see Brulle and Dunlap, 2015, p.24). Thus, climate change is a social problem (Bhatasara, 2015)

and not merely an environmental problem. To better understand climate change, there must be an integration of anthropological and sociological approaches to provide insights on climate change.

Early warning systems

An early warning system consists of four core elements: risk knowledge, monitoring and prediction, dissemination, and response capacity. This study will primarily focus on the third core element: dissemination/warning communication, and perceptions of this communication. An efficient warning is defined as “packaging the monitoring information into actionable messages understood by those that need to hear them” (International Federation of Red Cross and Red Cross Societies, 2012, p.15). In order to be safe, the community needs to understand the warnings given to them, and “clear messages containing simple and useful information are important to ensure proper responses” (IFRC, 2012, p.16). Basher (2006) argues that one warning which must be communicated unambiguously/in a way that is understood, is for communities to prepare themselves by getting to shelter and moving indoors. How these warnings are administered into the community and how the community members receive them is important to note when evaluating the community members’ responses to the warning system.

An early warning system used to assist local communities must have a multi-layered approach to understanding communities’ issues. It is asserted by the World Meteorological Organization (WMO) (2018, p.3) that “a multi-hazard early warning system with the ability to warn of one or more hazards increases the efficiency and consistency of warnings through coordinated and compatible mechanisms and capacities, involving multiple disciplines for updated and accurate hazards identification and monitoring for multiple hazards”. To increase the reception to the early warning systems within communities, a multi-disciplinary approach using social sciences is required in order to better understand the communities’ perceptions and develop accordingly conducive solutions to improve their experience.

Another way better communication or response to warnings can be affected, one argues, is by integrating indigenous knowledge or local lay knowledge into the planning and communication of these warnings. Indigenous knowledge has been described by Morris (2010, p.1) as “the knowledge that ordinary or lay people have of their local environment”. This type of knowledge is held by people of an area and can be passed on from one generation to the next, and represents critical intergenerational knowledge. From an anthropological and sociological point of view, this type of knowledge is vital to consider when planning an effective early warning system, particularly one that is community-based, as is the case for this study. An insight into indigenous understandings and cultural constructions of disasters such as lightning strikes will help understand the warning system’s perceptions. Therefore, this study by extension is interested in

probing the potential of integrating indigenous understandings and sociocultural constructions of lightning, thereby understanding the responses to the warning system in KwaSwayimane.

Moreover, this study seeks to investigate the KwaSwayimane community's perceptions of a lightning warning system installed in the area. The lightning warning system needs to consider the community's vulnerability (given that they exist in a hotspot) by exploring the community's perceptions of the warning system and its effectiveness in preparing the community for lightning disasters. Vulnerability here refers to how different communities experience (and manage) natural disasters; it is therefore important for those concerned with systems development aimed at helping local communities to take this into account. The IFRC (2012, p.29) states that "the neglect of vulnerability in EWS is one of the most important weaknesses identified across the globe". In the findings by the IFRC, researchers reveal how in 2003 a natural disaster in the form of a heatwave left Western Europe in shambles. Although warnings were issued to alert the affected communities, several people lost their lives, most of them elderly and in isolated areas. This confirms the importance of developing a warning system that considers the community's evolving vulnerability. The above example of an early warning system is used in a developing country, similar to the one in the study. This shows that early warning systems are used everywhere in both developed and developing countries.

The United Nations asserts (2015) that the Sendai Framework focused on the need for improved understanding of disaster risk in all its dimensions of exposure, vulnerability and hazard characteristics. This framework can be used in understanding the introduction of early warning systems such as the one in KwaSwayimane as well as in other communities, because it advocates for understanding the risks associated with natural hazards. Another framework which can be used to explain the implementation of an early warning system is the Sustainable Development Goals. This framework looks into ways to "strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries" (STATSSA, 2019, p.156). The development goals therefore support techniques and systems that are put in place in an effort to increase the community's capacity to protect themselves from lightning strikes as well as other natural hazards in the country.

Lightning warnings and detection in South Africa

Mahomed et al. (2021, p.1) assert that "lightning was associated with God's anger up until the Middle Ages when the natural interpretation of attributing lightning to collisions between clouds by René Descartes began in the 17th century". It was believed in the popular myth that it would thunder and storm if 'God' was angry. Most people in South Africa are involved in subsistence farming, and those people are at high risk of being struck by lightning; this is also the case in KwaSwayimane. Lightning causes

extensive damage to people's livestock, accidents and injury to people, and can damage the infrastructure. There are many ways to detect lightning, and due to technological advances, these techniques are applied in South Africa by observing climate change and the weather.

According to Mahomed et al. (2021, p.1), "there are now reliable ways for monitoring global and regional lightning activity in near-real time. The ease of monitoring lightning across the globe using ground-based networks is frequently advocated. This ease makes lightning an attractive indicator for tracking changes in severe weather". According to Van Zyl (2012, p.20), "locating lightning with a good accuracy requires the use of multiple-instrument networks. Hence the development of lightning detection networks". There are two ways of detecting lightning: through satellite, and with ground receivers, Van Zyl (2012). Some lightning detectors function in space and rely on optical techniques, and others use the ground via the Magnetic Direction Finder and Time of Arrival. The South African Weather Services also monitors lightning through the South African Lightning Detection Network. Furthermore, Blumethal et al. (2012, p. 625) share that "the South African Weather Service installed a 20-station Southern African Lightning Detection Network (SALDN) comprising of 19 strategically-located sensors in South Africa and one in Swaziland". In developing communities, instruments that detect extreme weather conditions using technological advances are needed, and those that are already piloted should be properly researched. Van Zyl (2012, p.12), "using the lightning detection network, found the highest multiplicity values in South Africa were over KwaZulu-Natal and the Eastern Cape with more than three strokes per flash". More studies about climate change are important worldwide, especially in underprivileged countries and continents such as Africa. Cooper, Holle and Tushmereirwe (2019, p.3) assert that "the African Centers for Lightning and Electromagnetics Network (ACLENet) has been useful in the work it has done to decrease injuries, death and property damage". This network provides lightning information and detection used in some African countries such as South Africa. Like the lightning warning system found in KwaSwayimane, it provides alerts that can be administered to extreme weather conditions such as lightning, droughts and floods.

1.5 Aims and objectives

This study investigates perceptions of the community of KwaSwayimane regarding the lightning warning system erected, which is meant to help prepare the community to move to safety before lightning strikes. One of the broader issues the study will consider is to provide recommendations on how community perceptions can offer insights on their response to other warning systems introduced in the area.

In summary, the objectives of the study are:

- To examine the impact of lightning in the community of KwaSwayimane.

- To investigate the KwaSwayimane community's perceptions of the lightning warning system used to help them prepare for lightning in the area.
- To assess the integration of local and indigenous knowledge in the communication of lightning warnings in the area.
- To assess the roles played by community leaders in the dissemination of early warning communications to the wider community.

1.6 Research questions

1. What are the KwaSwayimane community's perceptions of lightning?
2. What is the community's response to the lightning warning system in KwaSwayimane?
3. Can there be an integration between indigenous knowledge or local knowledge in the communication of lightning warnings?
4. What are the roles played by the community leaders in assisting in disseminating the early warning communications for a better and more effective response amongst the wider community?

1.7 Research design

The concept of research design is important. Neuman (2014) states that research design involves developing a strategy to guide the research study; therefore, for this to successfully happen, the researcher must follow carefully planned and executed steps during the study. For this study, the researcher will use qualitative and quantitative research methods (mixed methodology). Exploratory research is defined as "the study of an unknown area" (Du Plooy, 2014, p.75). This study is concerned with acquiring an in-depth understanding of how the community perceives a lightning warning system introduced to help them prepare for lightning and other natural disasters. The use of qualitative data collection methods is appropriate for this study. This research approach will ensure that the researcher gains a clear picture, and understands the complex aspects of the KwaSwayimane community experience. The use of qualitative data collection methods is also appropriate for this study. According to (Du Plooy, 2014, p.173), "by using qualitative data collection methods, the researcher obtains a richness and depth of data, gathered from complex and multi-faceted phenomena in a specific social context". Through the data collection techniques used in quantitative research methods, the researcher will gain insights and knowledge to assist in answering their research questions. Questionnaires used for this study as part of the quantitative research methods are vital, as they will capture insights for the researcher to probe deeper into when

administering face-to-face interviews and focus group discussions. Therefore, the questionnaires will become a foundation in this study.

1.8 Conceptual definitions

This study intends to investigate the community of KwaSwayimane's perceptions of the lightning warning system used to help them prepare themselves for lightning and other natural disasters, reducing their vulnerability towards these hazards. Key concepts and components such as early warning systems, natural hazards, perceptions, community perceptions, community leaders, and indigenous and local knowledge are frequently used in the study; therefore, it is important to understand them.

An early warning system comprises a set of capacities needed to generate timely and relevant warning information to at-risk individuals, communities or organisations that they may prepare and act appropriately in order to reduce harm or loss from natural hazards.

A natural hazard is a natural event that creates a threat to individuals, causing negative effects which harm them and their livelihoods. A natural hazard may erupt in a natural disaster with knock-on negative effects, such as floods, thunderstorms, earthquakes, etc.

Perceptions are insights which indicate the ways people understand events or phenomenon.

Community perceptions are collective insights shared by people living in a certain area; individual experiences normally influence these insights.

Community leaders are the community members who are also subsistence farmers; they form part of a pilot group of individuals who receive messages from the lightning warning system.

Local/indigenous knowledge is the shared knowledge a collective group of people has of a certain phenomenon; these people normally reside in the same community or area. This knowledge is usually passed on from generation to generation in that area.

1.9 Limitations of the study

By using mixed methods research, the issue of time-sensitive analysis of the insights gathered is a limitation for the study. A huge amount of time is put into analysing the data obtained from these research methods. Another challenge encountered was not being able to interview a large sample of the population of KwaSwayimane; this limited the amount of data gathered by the researcher. Therefore, the researcher employed fieldwork to enrich data from the participants with whom they were able to engage.

1.10 Chapter outline

Chapter One

This chapter outlines the research topic, and spells out the research questions, objectives, aims, study design, conceptual definitions, and limitations for the study.

Chapter Two

This chapter provides the methodological and theoretical approaches that will be used in the study. Instruments used to gather material are discussed, and ethical issues encountered during the study are discussed in this chapter.

Chapter Three

This chapter explores the experiences of the people of KwaSwayimane. This chapter analyses the participants' narratives, and the chapter probes the perceptions and experiences of the community concerning lightning in the area.

Chapter Four

This chapter uses various data collection methods to understand and examine the relationship between indigenous and local knowledge in the social construction of lightning to generate insights on better communication/dissemination of the lightning warning system in KwaSwayimane.

Chapter Five

This chapter presents insights on the vital roles played by community leaders of KwaSwayimane in assisting community members with messages on lightning warnings. This chapter of the study investigates the roles played by community leaders and their impact on the community's response to the warning system.

Chapter Six

This chapter explores the community leaders' insights on the integration of local and indigenous knowledge with the lightning warning system installed in the community of KwaSwayimane. This chapter also looks into the various recommendations made by the community leaders to improve the warning system's functioning and effectiveness.

Chapter Seven

This chapter provides a conclusion of the study. In this chapter, the researcher will draw on critical thematic insights from data obtained in previous chapters. This chapter also provides recommendations for further research.

1.11 Conclusion

This chapter has presented an introduction to community perceptions of lightning and how they impact on the implementation of KwaSwayimane's lightning warning system. It presented the context and background of the study, and the motivation that ignited the need to conduct this study. Furthermore, the chapter outlined the research problem and key questions guiding the study. Thereafter, the chapter outlined the objectives of the study. Finally, this chapter has presented a survey of literature that is relevant to the topic, thus facilitating the study's position in wider research. The following chapter will present the research methodology, the theoretical frameworks, and the ethical guidelines of the research. The chapter will also outline the analytical lenses and interpretation of the study's findings.

Chapter 2

Research methods and theoretical frameworks

2.1 Introduction

Research is “the process of asking questions and finding answers”, Keyton (2001, p.2) cited in Du Plooy (2014, p.2). Research involves asking questions about a certain phenomenon or subject to understand more about that subject. This process is facilitated through different approaches or methods used to assist the researcher in finding the answers to the questions with which they are concerned. This chapter is divided into two sections. Firstly, it will look at the research methods that are used in the study to gather insights. Secondly, it will look at the theoretical frameworks used as guiding principles towards understanding the community’s insights on the lightning warning system employed in their community to assist them in preparing for lightning strikes.

2.2 Research methodology and design

This study will use mixed research methods to gather data while emphasising the qualitative aspects. In a mixed method study, both qualitative and quantitative methods are respectively important. It is argued by Ngcobo (2016, p.46) that “the mixed methods approach can be selected based on the assumption that collecting the diverse type of data will best provide an understanding of a research problem. The complexity of the study has created both the need of generalisation of the finding to the identified population (traditional communities) and of developing a detailed view of the research problem form, interviewees participated as targeted by the study”. In this study alike, both these research methods provide room for an extensive understanding of community perceptions and insights. Qualitative research is concerned with understanding and gaining insights into the lives of participants. Because the researcher is concerned with recording in-depth perceptions, the techniques used to gather data must reflect this. Therefore, the researcher conducts face-to-face interviews, focus group discussions and historical research. This study will adopt an interpretive approach to the collection of data. According to Du Plooy (2014, p. 29), the interpretive tradition is ‘based on the importance of gathering people’s interpretation of facts’. In this study, it is important to consider the participants’ views on the matters and issues discussed. The participants’ views on the issues are important, as these shape their interpretation of issues and how they affect their livelihoods. This approach is important as the subject of the study is to gather and explore community perceptions.

To unpack the research topic, a qualitative research approach is employable. According to Subbiah (2016, p.10), “qualitative research is the approach usually associated with the social constructivist paradigm which emphasises the socially constructed nature of reality”. This study aims to understand community perceptions; this will be done using a social construction approach to provide a suitable analysis of the insights gathered in the study. Therefore, qualitative methods of gathering this rich knowledge are useful, as they probe deeper into the nature of reality for participants and for those around them. Through methods such as face-to-face interviews and focus group discussions, the participants are free to share their insights, provided they are in a suitable setting to do so. Subbiah (2016) further argues that this methodological approach is “about recording, analysing and attempting to uncover the deeper meaning and significance of human behaviour and experience, including contradictory beliefs, behaviours and emotions” (Subbiah, 2016, p.10). Understanding deeper meanings and uncovering the meanings attached to people’s beliefs and, in turn, their perceptions and insights, are vital to qualitative research as these details provided by the participants provide a clear personal picture of the community’s experiences. This is also a notable and important subject in this study. It also seeks to understand the beliefs and indigenous knowledge provided by the community of KwaSwayimane on lightning as a natural hazard.

To understand these insights, methodological approaches must be accompanied by the appropriate theoretical frameworks to guide the study. In this case, social construction and symbolic interaction approaches are employed. These approaches will be vital as the researcher seeks to explore the insights and narratives given by the community through engaging participants of the study in dialogue. These theoretical approaches will also be useful in analysing the insights given through the quantitative research approaches also used in the study.

According to (Creswell, 2011, p.32), “quantitative research is an approach for testing objective theories by examining the relationship among variables”. In quantitative research, the researcher is concerned with proving whether a certain phenomenon is related to another. When drawing data from a larger number of people, we acquire knowledge that could be representative of the whole population. If we conduct a study on a small number of people, the data gathered is usually limited to those found in that area. It is important to obtain community insights on a large scale, through questionnaires, for the study to be beneficial.

The use of questionnaires in the study will be useful, especially in the subject of language. Creswell (2003, 6), cited in Mutambara (2015, p.41), states that “the general open-ended questions allow participants to supply answers in their own words”. These questions will allow the participants an opportunity to use their own language when detailing their insights. These questionnaires are crucial in the study, as the data obtained may also provide guidance on further subjects that might be probed to better understand

community perceptions as presented in individual interviews. The quantitative questionnaires were administered to the wider community and community leaders, to capture the insights and intuitions gained through the indigenous/local techniques the community has used to protect themselves from lightning strikes. The questionnaires used in this study have assisted in providing information and insights for the researcher to probe deeper as the study proceeds. The information that was highlighted by the participants in the questionnaires therefore provided a foundation for other questions which the researcher would investigate during face-to-face interviews. The questionnaires further probed into the community's perceptions and insights on the lightning warning system which was installed in KwaSwayimane to assist the community by alerting them of lightning strikes, helping reduce their vulnerability to lightning and other natural hazards.

According to Roncoli (2009), cited in Nelson et al. (2009, p.273), “anthropologists contribute to climate change research through areas such as perception, valuation, knowledge, and response”. Climate change affects communities differently; it is vital to understand these aspects when research is undertaken to develop suitable strategies for communities using anthropological studies and techniques. This is possible as the discipline of anthropology provides a foundation for these studies. The importance of ethnography in anthropological studies as one of the techniques to gather perceptions is vital in studies involving communities.

Case study methodology

This method emphasises the importance of qualitative data collection strategies as a means of gaining an in-depth understanding from participants. This study applies a case study research method, as the findings and insight provided will be specific to the case of the KwaSwayimane area. According to Eisenhardt (1989), cited in (Thlompho, 2014, p.18), “the case study method is used to develop and produce new theories, to challenge theory, to explain a situation, to explore or to describe a phenomenon by scholars from various backgrounds”. In this context, this research study seeks to provide details that will explain KwaSwayimane community members' perceptions of the lightning warning system established in the area. In studies that employ a case study methodology like this one, the “object of the study must be investigated in their natural context with multiple methods” (Johansson, 2003, p.14). The researcher must employ fieldwork as a technique to assist in studying their participants in their environment. The researcher must use multiple data collection methods to obtain insightful knowledge from their objects, namely the participants of the study who are community members. This study will use mixed methods to collect highly qualitative data, as the study seeks to gather insights on the community's perceptions.

With case study methodology, one of the prominent advantages is that this approach focuses attention on an important aspect according to the case under study. It is argued by Cohen et al. (2007) cited in Tshika

(2014, p.38) that “a wider audience immediately understands results of a case study because they report on the reality”, as this approach is specific to a particular area and is the reality of that community. Moreover, it is asserted by Johansson (2003, p.2) that “a case study is expected to capture the complexity of a single case”. This study seeks to gather community perceptions of a lightning warning system and the indigenous/local techniques used by the community of KwaSwayimane. This study will provide a window into the community of KwaSwayimane, uncovering the perceptions of this specific community on the lightning warning system erected in their area. Therefore, a case study methodology is appropriate in this study because of the scope and aim.

2.2.1 Research site

This research study takes place in KwaSwayimane in the uMshwathi Local Municipality, consisting of 13 wards, including Swayimane. There are 6,857 people in KwaSwayimane; the participants in this study are members of the KwaSwayimane community, as it is these community members who have useful knowledge of the lightning warning system due to their proximity to it. It is important to note that KwaSwayimane is a traditional community, which is a factor of some bearing in this study.

2.2.2 Validity and reliability

Validity is the trustworthiness of the research findings obtained once the researcher has gathered material from their sources. It is argued by Zohrabi (2013, p.258) that “it is up to the researcher and the research participants who attempt to build validity into the different phases of the research from data collection through data analysis and interpretation”. For research findings to be accepted in the research field, the findings must be valid and reliable. This study uses both qualitative and quantitative research methods, with an extensive focus on qualitative methods such as focus group discussions and face-to-face interviews.

According to Creswell (2011), reliability is the consistency of the research. The findings must be consistent throughout the study. This study uses mixed methods, focusing more on the qualitative research methods; findings therefore cannot be replicated as they are part of a narrative and subjective to the community members perspectives (Zohrabi, 2013). It is further asserted by Zohrabi (2013) that this is because data collected from qualitative data collection methods such as interviews and group discussions are in narrative form. In this study, reliability is obtained through triangulation. Triangulation is used by the researcher, and is a method whereby the researcher utilises different data collection techniques (Zohrabi, 2013).

2.2.3 Sampling and sample selection techniques

According to (Neuman, 2014, p.246), sampling is a “small set of cases a researcher selects from a large pool and generalises to the population”. Research is conducted using different approaches according to the question proposed in the study; there are different sampling strategies used in research to assist the researcher in selecting those particular individuals from whom they seek to gather knowledge. These are the two main types of sampling strategies, namely, probability and non-probability sampling. The researcher will use a non-probability sampling method to select participants, and this is purposive sampling. According to (Neuman, 2014, p.273), “purposive sampling is a non-random sample in which the researcher uses a wide range of methods to locate all possible cases of highly specific and difficult-to-reach population”. This study is concerned with obtaining insights from participants who are knowledgeable about the issues at hand; the researcher must select participants who fit the criteria (people close to the location of this lightning warning system, i.e., those members of the community who can receive SMSs which alert them to incoming lightning strikes). Moreover, the choice of purposive sampling was influenced by the research questions, the research design, and the research methodology. Understanding community perceptions and insights needed certain criteria from the participants, such as people who are community members of KwaSwayimane, for the questionnaires, focus group discussions and face-to-face interviews. Secondly, the study needed participants who are farmers and community leaders for focus group discussions and face-to-face interviews, as they were more knowledgeable on the subject. The study uses case study methodology “because the purpose of the case study method is to improve the case” (Devare, 2015, p.1). This sampling method allows for the study to present knowledge that is specific and not generalised. This knowledge is therefore gathered from individuals who are knowledgeable on the subject matter. Therefore, in accordance with these requirements, the community members who participated in the study comprised 100 community members and 30 community leaders. The study focused more on the community leaders, as they play a key role in disseminating the lightning warnings to other community members.

2.2.4 Data collection

This study was conducted using both qualitative and quantitative research methods. This study uses highly qualitative methods to gather knowledge on the community of KwaSwayimane’s perceptions of an early warning system used to assist them in preparing for lightning strikes and to reduce their vulnerability to lightning. The research methods used consist of face-to-face interviews, focus group discussions and questionnaires.

It is argued by Pongiglione and Cherlet (2015, p.383) that “a good understanding of socio-behavioural dimensions is crucial for effective policy making”. Understanding the different dimensions and aspects shaping human behaviour is vital for analysing social issues and social problems. The research methods

employed in social sciences are suitable, as they highlight communities' cultural and social dimensions, particularly in African communities such as the one used in this study. Lightning is a common natural hazard for this community, as they live in a lightning hotspot area. In this study, the researcher will employ the valuable underpinnings of anthropology and sociology to gather an understanding of how cultural enactments influence people's perceptions of the system and how this affects the community's reception of the warning system.

a) Face-to-face interviews

In face-to-face interviews, the researcher speaks directly to their participants, asking them questions that are relevant to the research topic as a way of gaining insights. The researcher will conduct face-to-face interviews with 10 out of 6 857 people found in the community. The participants are males and females of ages 18 to 55 from across the area. The researcher will use a non-probability sampling method, which is purposive sampling, to select participants. This study is concerned with obtaining perceptions from participants who are knowledgeable about the warning system, specifically, the community members who receive messages alerting them to potential lightning strikes and those with access to the lightning alarm system. The researcher must select participants who fit the criteria (people who reside close to the place where the lightning warning system is situated, i.e. those members of the community who receive SMSs alerting them to lightning strikes). These interviews will be held at the Swayimane Secondary School, which is in the proximity of participants. The interviews will be 30-40 minutes long, and they will be held in isiZulu and English (as the participants prefer) to ensure the comfort of participants.

b) Focus group discussions

According to (Du Plooy, 2014, p.183), "focus groups are often used to determine participants' experiences regarding products and services, advertisements and television programmes". Focus group discussions will be administered with 6-8 community members (with 30 community leaders/farmers in total) to maintain order among members of the group. The researcher selected four males and four females from ages 19-60 to participate in the focus Group discussion, ensuring a balance of genders in the group. The discussions will take 30-45 minutes. These discussions will be held in a neutral environment where community members have easy access. The participants involved in focus group discussions are also those same participants who will partake in the face-to-face interviews. Focus group discussions will be held in a community hall, where the participants will gather with the researcher. Three research assistants will facilitate the discussions by breaking participants into groups of eight community members each. Because of the COVID-19 restrictions, the discussions will be held in different parts of the community hall, with some taking place outside the hall in order to observe social distancing protocols.

c) Questionnaires

This is a branch of quantitative research methods and methodology. The use of questionnaires is appropriate for this study, as the researcher would be able to provide knowledge from the community which the researcher can use to reach an appropriate conclusion. Questionnaires will be administered across 100 respondents across the area. Participants from ages 19-60 will be eligible to partake and may fill in the questionnaires for themselves; those who may need assistance will be assisted. These questionnaires will be conducted in both isiZulu and English, with the help of three research assistants from the larger project where this study is nested. The researcher will offer further training in the context of adherence to good ethics and researcher practice.

The above sample groups may appear larger than most anthropological studies, where the focus is on small sample groups. However, this study is based on mixed methods; therefore, given the context of COVID, the researcher needed to factor in adherence to in-field data collection restrictions in order to elicit valuable data. The COVID-19 pandemic had an impact on the study, as the different restrictions and lockdowns cause interference with the research process. The pandemic also influenced the number of participants in the study, as some were unavailable for data collection.

2.2.5 Data analysis

This research method involves conducting interviews and focus group discussions. The knowledge acquired from participants might be repeated; therefore, the researcher should ensure that findings emphasise the important aspects. Therefore, coding responses is more appropriate to ensure that those arguments are well presented (Du Plooy, 2014). Coding is a qualitative data analysis method that involves the researcher grouping the data obtained during the research process into small quantities in order for arguments to be passed on. In this study, the researcher will also use coding to produce an analysis that will be useful. Coding is used to analyse data, especially qualitative data collected via methods such as interviews and surveys, as is the case in this study. It is asserted by (Creswell, 2011, p.247) that coding “involves taking text data or pictures gathered during data collection, segmenting sentences into categories and labelling those categories with a term, often a term based on the participants’ language”. Data obtained from qualitative data collection methods such as interviews will be analysed using NVIVO. It is asserted by Alabri and Hilal (2013) that NVIVO is a Qualitative Data Analysis (QDA) computer software package which researchers use to improve the quality of the research by organising the insights obtained from data collection. NVIVO will also assist the researcher by minimising the time they spend analysing qualitative data themselves. The researcher is isiZulu speaking; she will use both isiZulu and English when conducting interviews as required, to assist respondents. It is also important to note that the names and

surnames of the participants throughout the study have been changed; this was done to protect the participants' identities and gain trust between the participants and the researcher by using pseudonyms.

2.3 Ethical considerations

The researcher must gain permission to conduct the study in the chosen area by writing a letter to the gatekeeper seeking permission to conduct their research. Gatekeepers are the mediators between the researcher and participants; in this case, the gatekeeper would be the counsellor of the area of interest. Key informants are experts in the researcher's particular field of interest; in this case, KwaSwayimane. The researcher will use key informants to help them identify more knowledgeable participants in the field of study.

The researcher must adhere to certain guidelines to ensure that the data gathered is valid and useful. According to Du Plooy (2014, p.263), "your ethics are your moral or professional code of conduct that sets a standard for your attitudes and behaviour". There are numerous guidelines that the researcher must follow for their research to be valid. I will focus on informed consent and the misuse of data.

When a researcher has identified the participants, an agreement between the researcher and the participants must be put in place. Participants must formally agree to being asked questions by the researcher in their study, and this agreement is given by signing informed consent forms. If participants are unable to read the terms of the research, the researcher must explain these terms to the participants, ensuring that they understand what is expected of them before signing any agreement.

Another important aspect when ensuring that a research study is true and valid is to avoid falsifying data. Data is falsified when the researcher provides information that is not a true representation of the participants' insights and is instead proffered because the researcher wanted to fulfil their desires for the research. This is not ethical because the knowledge given will not be true, and as such holds no use for the research community. According to (Du Plooy, 2014, p.271), "any data collected from participants for research purposes may not be used for any other purposes unless you have obtained participants' permission to do so". In the study, falsification of data is avoided by reporting honestly. This is done through using the different narratives given by the participants during data collection. Sharing the stories and information given by the participants and presenting them as direct quotes assists in avoiding falsifying data or presenting information which is not a true interpretation of the narratives given.

2.4 Limitations of the study

During the study, the researcher encountered many limitations which may impact the research outcomes. The availability of research participants was one of the major obstacles. The search for participants who

fit the criteria in the topic was not difficult, as the participants had already been identified in the community. Although these participants were readily available, most were not available for the duration of the study. The participants in the study were farmers in the area of KwaSwayimane active both in a programme with the University of KwaZulu-Natal and the uMngeni Resilient Project. As such the university has direct access to the farmers who partook in this study, making it easier for the researcher to conduct their study.

Other participants who were willing to participate in the study did not know the indigenous/local techniques contributing to the study's outcomes. Prior to the actual interviews and discussions, the researcher made it a priority to meet with the participants and form a sense of familiarity. These encounters enabled the researcher to assess the knowledge that potential participants had on the lightning warning system as well as on the indigenous/local techniques central to the study. The researcher notes that even though participants were to some extent willing to engage in the study when the actual questions were asked, some were hesitant to answer and gave yes or no answers, or answers that required explanation and probing in order to elicit details.

2.5 Theoretical framework

Community perceptions are vital to this study as they influence the responses people have to the lightning warning system, and this study probes community perceptions of a lightning warning system. The KwaSwayimane lightning warning system assists the community in preparing themselves for lightning in the area by reducing their vulnerability to lightning, which helps save their livelihoods. There are two theories that the researcher will employ to assist them in their analysis of the findings gathered during data collection. These theories will be useful as the researcher gains an in-depth understanding of the perceptions and insights given by the community. Two theories will be used in this study that are appropriate for the subject of the study, and which use the principles of anthropology to gather vital insights: namely, the social constructionism theory and the symbolic interactionism theory.

2.5.1 Social constructionism

This study will use the social constructionism theory to analyse the literature obtained during the study. "According to the sociological approach called social constructionism, the existence of all cultural and social reality, such as values and meaningful actions, is due to social actions and practices which are collectively performed and generally taken for granted" (Segre, 2016,p.93). This theory contends that the participants' values and cultural beliefs influence their individual realities. This theory can be applied to this study, as it is concerned with how humans interact with their social reality and their values, and this

corresponds to the purpose of this study as it investigates how the community views the early warning system in their area and how it relates to their cultural values.

The social sciences argue, using different techniques, that knowledge is socially constructed (Andrews, 2012). The knowledge that individuals have is taught to them by other individuals in their community. Social constructionism is interested in how individuals and communities construct this knowledge. This study seeks to probe community influences on the perceptions and knowledge that KwaSwayimane community members have of the lightning warning system introduced to them to reduce their vulnerability to lightning.

It is argued by Galbin (2014, p.85) that “social constructionism argues that true objectivity is absent in the human sciences because all methods require one set of subjective humans to rate another set of subjective humans”. This framework is concerned with how human interaction affects human life and how people exist in an objective world whilst themselves being subjective. The study revealed that the participants have high regard for what they see, for their culture and its traditions. The insights that the participants shared emphasised their rich history and knowledge.

Another important aspect of social interactionism is the reflexivity of humans, which is a person’s ability to reflect on the knowledge that they are given by others, causing them to reflect on their own beliefs. According to Camargo-Borges and Rasera (2013, p.8) that “the reflective and creative emphasis promoted by social constructionism stimulates the search for new social intelligibilities that not only describe or prove the existence of certain phenomena but also invite a new look and a different future reality”. The knowledge people gain from each other through interaction provides them with reflection on their own learned knowledge and culture and how these may be useful, which also opens up a new way of seeing things. This affects the individual and those around them, as they will further share the literacy with others. Furthermore, Gergen (1999) cited in Ndaba (2020, p.41), cites that “the development of an innovative means of understanding reality while critically engaging traditional discourse is vital, hence to great lengths, and without projecting researcher personal biases”. The knowledge shared by the participants through the focus group discussions offered perceptions and insights which provided new knowledge for some of the other participants. Through this interaction, they learnt more about their culture and tradition.

2.5.2 Symbolic interactionism

Another theory that will be used to analyse the literature obtained in this study is symbolic interactionism. According to Aksani et al. (2009, p.902), “symbolic interaction examines the meanings emerging from the reciprocal interaction of individuals in a social environment with other individuals and focuses on the

question of “which symbols and meanings emerge from the interaction between people”. This theory contends that people attach meaning through social interactions. This theory further contends that people’s actions are “culturally-dependent, relational and perhaps not objective” (Diaz-Leon, 2015, p.1147). People’s actions are influenced by their culture and by the fact that they are social beings. This is of interest in social science studies, as this discipline is interested in the existing different cultures and how they influence everyday lives and people’s behaviour. This study is concerned with how people perceive a lightning warning system, and this perception of it influences their reaction to it. It is argued by Redmond (2015) that this theory suggests that an individual adapts to changes around them as they continue to interact with others. This study is, in turn, concerned with how the community adapts to the changes brought about by the lightning warning system in the area of Swayimane. Therefore, it is important to understand how individuals perceive it as they interact with one another in a community. Furthermore, it is asserted by Blumer (1969, p.85) that “human interaction is mediated by the use of symbols, by interpretation, or by ascertaining the meaning of one another’s actions”.

Language is also an important aspect of symbolic interactionism because it is a means of communication which conveys how people *see* the world. It is asserted by Burr (1995, p.5) that “language is the passive vehicle for our thoughts and emotions”. Through communication with one another, thoughts and emotions are engineered; the interactions we have affect the actions of others. The perceptions and insights shared by the participants on the lightning warning system, as well as the indigenous techniques used to protect themselves from lightning strikes, were shared using the local isiZulu language. This afforded the participants a chance to articulate and express themselves during the study. Through dialogue with the participants, and through using the language of their choice, the researcher and participants could unpack the various narratives shared and probe deeper into their meanings and how these affect them.

2.6 Conclusion

This chapter provided a detailed description of the research method and data collection methods used in the study to gather literature on the subject matter. The chapter also discussed the theoretical frameworks (symbolic interaction and social construction) which can be used to understand how people are influenced when making decisions. Social constructionism and symbolic interactionism theories were discussed in the chapter. The community’s perceptions and views of the world around them is seen to be influenced by their interactions with one another, as they are social beings. The next chapter will explore the experiences of the people of KwaSwayimane and investigate the history of lightning and other natural disasters in the area.

Chapter 3

Perceptions and experiences of lightning among the community of KwaSwayimane

3.1 Introduction

“It is estimated that lightning strikes the earth about 100 times every second,” Gijben (2016, p.2). Lightning strikes frequently occur around the world. It is important to understand how these strikes may affect communities that are more vulnerable than others. As climate change continues to impact weather conditions such as lightning and thunderstorms, it is vital to understand the impact of lightning strikes in the context of climate change. Climate change is a multidimensional phenomenon that calls for a complex approach which combines critical issues such as vulnerability, cultural considerations, and other factors such as social relations that comprise a key component in almost every aspect of our lives.

Furthermore, it is asserted by (Swai et al., 2012) cited by Mzimela (2017, p.38) that “having established the importance of perception, studies exploring perceptions of mainly mitigation measures have been conducted in developed countries, while developing countries have focused on perceptions of adaptation strategies”. The perceptions and insights on lightning are important to unpack, especially in communities more vulnerable to natural hazards. Insights given by the community will be useful towards reaching effective solutions for lightning as a natural hazard. The approach towards understanding community perceptions on lightning vary from one community to another, as people’s experiences differ. Nigel, Dietz and Broadbent (2010) note that disciplines such as sociology and anthropology should question, and are well-positioned to question, issues such as ‘vulnerability’ in the context of climate change. In a study about farmers in Gaza, Mozambique, and their perceptions of drought, the researcher (Salite, 2019) provided findings which suggest that these small-scale farmers held personal perceptions and beliefs about the causes of drought. This suggests that sociocultural factors influence how communities respond and adapt to behavioural responses. Therefore, anthropologists and sociologists need to understand the societal forces extant in communities in order to gain insightful literature about communities. In this chapter, these insights will be discussed and explored, as they are important.

This chapter will analyse the experiences of the participants of the study who reside in the KwaSwayimane community. The chapter will also probe the beliefs and techniques of the community related to lightning in the area by utilising the knowledge gathered. It is asserted by Mahomed et al. (2021, p.5) that “several cultural beliefs have been associated with lightning strikes (and thunder) in South Africa”. These are interesting insights that will contribute to a better understanding of the indigenous/local techniques used by the community to protect themselves from lightning strikes and other natural hazards.

3.2 Participants' understanding of climate change and its impact on the changing environment

Climate change influences natural hazards, which negatively affect communities and their adaptability to climate change. This impacts the sociocultural aspects that shape individuals and communities. The different relationships people have with their environment are also affected by climate change. Therefore, an anthropological and sociological understanding comes into play as these lenses allow us to look into people's relationships with their communities and their environment. Anthropology is immersed in the study of 'culture' and its importance in the community; these aspects are important especially in studies concerned with African communities, as they are culturally rich. "Communities in Africa regard values as part of culture and culture defines people's identities", Idang (2015, p.99). Culture is an important part of people's lives. There are numerous cultural distinctions in Africa; they shape people's knowledge of their surroundings and how they live their lives. This study is concerned with understanding the community perceptions of a lightning warning system installed to assist the community of KwaSwayimane with the effects of lightning strikes on their livelihood.

It was stated in the previous chapter that participants of this study range from 19-60 years in age. They are all local black community members who reside in KwaSwayimane. Some participants asserted that they have lived in KwaSwayimane all their lives. In contrast, others have lived ten, seven, eleven, and twenty years, respectively. Mrs Mkhize shared that she has lived in the area all her life, and Mr Dube said that he was born somewhere else and had also lived at that place for a time.

Understanding the impact of climate change on the livelihoods of the participants is vital. Similarly, understanding the different changes and experiences associated with these changes is important to appreciate the community's apprehension of the lightning warning system employed to protect their livelihoods. Climate change brings about increased lightning and thunderstorms (Barnes et al., 2019). Knowledge of how the community views lightning aids in comprehending their perceptions of the lightning warning system installed in the area. The study, therefore, looked into gaining insights into how the participants perceive climate change before attempting to understand their experiences of lightning. The following are the narratives of the participants obtained in the study.

"Ngike ngibone ukuthi sekuduma noma ingasiphi isikhathi osukwini, kwesinye isikhathi kuduma ngabo 16:00 ntambama kwesinye ke isikhathi libuye lidume ebusuku kakhulu izulu, lokhu ke ikona okwenza ngibone ukuthi isimo sezulu siyaguquka ngempela." This means: "The fact that lightning strikes occur at any time during the day, sometimes they occur at 16:00 in the evening, and at other times they occur at night, this proves that there is a change in the climate around us...." (Mrs Mkhize)

These were the words of Mrs Mkhize, a farmer in the community, when asked about climate change and the changes she had observed in the environment. She associated climate change with the changes in weather patterns that they have observed throughout the year, such as lightning and shifts in rainfall patterns. Other participants (Miss Ndlovu and Mr Dube) also stressed the changes they observed in the weather patterns, mostly on how powerful lightning and thunderstorms were becoming in the area. They associated these changes—such as the sudden increase in temperatures, the observation that lightning strikes occur at any time of the day, and the changes in rainfall patterns—with climate change, as these phenomena are different from before, and have become more severe than in the past.

It is asserted by Gill (2008, p.1) that “South Africa is a lightning-prone country”, meaning that lightning and thunderstorms are likely to happen in the country at any given time. According to (Debela et al., 2015; Van et al., 2015 cited in Mzimela, 2017, p.76) “an individual’s perception of climate change is influenced by climate experience, access to climate information, and beliefs”. People experience climatic changes differently; they attach different meanings to the phenomenon relative to their experience. In African communities, the meanings for different things can be influenced by the collective communities’ experiences of those phenomenon, as people are social beings and constantly communicate with each other. This means that the people of KwaSwayimane may have different opinions of lightning, and also hold different views on the traditional techniques used as protection from lightning. Whilst some community members believe in the different traditional techniques employed to protect them from lightning strikes, this also means they have different views and opinions of lightning. Some participants highlighted beliefs such as using mirrors to protect them against lightning strikes, whilst others named placing lightning sticks on their roofs as effective protection.

Mrs Khambule asserted that she observed climate change as “*Ukushintsha kwesimo sezulu ngama season angafani*”, which means “Changing weather in different seasons”. She suggested that seasons are continuing for much longer than before, similar to the statement from Mrs Khambule. Miss Hlophe further stated that changes in regional and global climate patterns have been observed since the 20th century. According to the participant (Miss Hlophe), these changes “contributed towards the increase in temperatures”. They believe that this change is not just happening in their area, but everywhere. Sometimes, they observed, the winter is longer than the summer. Some participants (Mr Dube) agreed that they also believe climate change makes the weather unpredictable (one moment it is hot, and the next it starts raining), which is a similar sentiment another participant, Mrs Khambule, shared during discussions.

Some participants explained that they had gained their understanding of climate change via different avenues, and some (like Mr Dube) said that they had gathered the knowledge from their

respective schools. The latter cases were mostly those who had attended primary, secondary and high schools. Still others asserted that they sometimes gained awareness of these issues through the television and the radio (Miss Ngcobo). Mr Dube could not fully grasp climate change but noted more generally that it has something to do with the changing weather conditions.

3.3 Participants' personal techniques used as protection against lightning and thunderstorms

The participants in the discussion, the focus group discussion, and the face-to-face interviews all asserted that there are numerous ways in which their 'traditional' techniques are used whenever there will be lightning in the area. Mrs Mkhize explained that she usually observes changes in the clouds, and this alerts them that there will be lightning. She (Mrs Mkhize, a wise, 60-year-old female farmer) explained that "*amafu ayahlangana, ashintsha shintshe*", meaning "the clouds change colour and become dark whenever there is lightning". She further explained that she usually observes this whenever she is outside. On seeing these changes in the clouds, she rushes back home to employ their preferred techniques to protect themselves from lightning. The techniques that she would use are rushing at home and taking shelter and covering mirrors and shiny objects.

It is asserted by Jensenius (2016) that thunderstorms go through stages of growth, development, electrification, and dissipation. Thunderstorms often begin to develop early in the day when the sun heats the air near the ground, and pockets of warmer air start to rise in the atmosphere. When these pockets of air reach a certain level in the atmosphere, cumulus clouds start to form. Cumulus clouds are often described as being similar to floating cotton. This furthers the argument that whenever there is lightning, there are changes in the clouds, as cloud formations undergo visible changes (Jandrell, 2016).

Miss Ndlovu (a female farmer in the community) explained that she normally notes the change that occurs in the water buckets she keeps in her household. She explained that "*endlinienosimende amabhakede amanzi ayajuluka uma lizoduma izulu*". Meaning that, as she stays in a house made of cement, the buckets of water that she keeps start to sweat, and this is how she knows that lightning is beginning to build. In a study conducted by Baquete, Grayson and Mutimucio (2016), they assert that "indigenous knowledge often makes use of sound scientific principles, typically empirically derived, but not necessarily explained in conventional scientific terms". The technique mentioned by the participant is an indigenous method which she believes protects from lightning strikes. These indigenous techniques are methods which one may know and practice according to their belief. This also implies that the community practices techniques according to their own knowledge. The other participants explained that they did not know of the sweating buckets of water and had never observed this in their own homes.

Mr Dube explained that he usually observes the way animals behave, and this alerts them to incoming lightning. In this case, he was referring to birds. He explained that birds chirp more than usual when lightning is about to take place. He could not describe the types of birds or their calls. Mrs Sibiya and Mrs Madlala confirmed that the bird's name is *Insingisi*, a southern ground hornbill. Mrs Sibiya further explained that this bird resembles a chicken, only it is slightly larger. According to Mr Skhakhane, another participant in the study, the *Insingisi* bird is called *inyoni yezulu* (a bird of the weather). He noted that the bird has a 'gift' to foresee weather conditions, meaning that it 'can see weather conditions before they occur'. He explained that the bird was given these powers by 'God', and that the *Insingisi* bird is different from other birds because of this 'gift'. He further explained that whenever there would be lightning or floods, it makes a noise that resembles the noise made by an owl; he also noted that this bird is normally found near the river.

Mrs Madlala asserted that she had never seen the bird, but only knew of it, as she grew up hearing stories about its existence. Mrs Sibiya asserted that she had heard the bird and the sound it makes, as there is a cliff near her home and she thinks the sound comes from this area. Mrs Madlala and Mrs Sibiya confirmed that the bird was associated with lightning and other natural hazards. In the communities where they grew up, it was understood that whenever a person saw or heard this bird in the area, it signalled unusual weather condition such as lightning and floods. Some of the participants (Mrs Madlala, Mr Dube, Mrs Mkhize) agreed that on seeing these signs, they would disperse towards their houses and employ the different techniques they used to help protect them from lightning strikes. These techniques will be discussed in the following passages. Narratives and the insights given by the participants will be further explored.

3.4 Participants' lightning beliefs and lightning protection techniques

The participants shared their different beliefs and the techniques they have used to help protect themselves from lightning strikes. Some of these techniques have been used by them personally, and some they have not personally used but are aware of. Some participants shared techniques in line with traditional teachings and way of life, and shared the same beliefs, such as the burning of sage. Some participants followed techniques in line with religion, such as the sprinkling of holy water, as this is also used in church for other reasons. The local priest takes water and blesses it by praying over it and mixing it with salt; thereafter, it is considered holy water. Participants such as Mrs Sibiya described that while she is aware of these techniques, they are not used in her house. It can be observed that participants hold different notions and stress different aspects of lightning techniques and beliefs. One participant (Mrs Sibiya) also noted some of the techniques she knew but did not follow, whilst some participants (Mr Dube) asserted that these techniques do sometimes work. Some participants follow different traditions and cultural techniques; they shared numerous techniques, some were traditional, some religious, and many were

common knowledge for most of them. The indigenous/local techniques shared by participants are different. This is because of the cultural differences that exist among the participants. Some of them are associated with traditional customs such as the burning of incense, which is normally used as traditional incense. Some techniques are more inclined with religious practices, such as the sprinkling of holy water around the house. Miss Ndlovu asserted that some techniques are regarded as common knowledge in the area, as they are so widely known.

a) Mirrors and lightning

Most participants mentioned a common technique that they use to help protect themselves and their families against being struck by lightning: the covering of mirrors and shiny objects in and around the household. Participants described the belief that when there is a shiny object around, there are high chances that the lightning will enter the building and strike something in the room. These shiny objects could be anything from TV screens to cell phones and covering them prevents the lightning from striking indoors. In a study conducted by Jandrell and Trengrove (2014), most of the participants who resided in a rural area said they cover the mirrors when there is lightning nearby. Trengrove (2012) further argues that there is no scientific rationale to the belief that mirrors attract lightning and covering mirrors does not in any way protect a person from being injured or killed by a lightning strike. Miss Khuzwayo noted that she will normally “*umboza izitsha*”, which means to “cover the dishes” with a dishcloth whenever there is lightning. These would be shiny dishes, as they believe shiny objects attract lightning. Another participant (Amanda) asserted that they make sure they are wearing rubber shoes when lightning is nearby. They believe that the rubber repels lightning strikes. It is stated that the rubber covers found in car tyres act as an electric insulator (Jandrell and Trengrove, 2014). This is not the case, as the rubber found in shoes is thinner than the one found in tires.

b) A tyre on the roof

Miss Hlophe and Miss Phakathi also noted that whenever there is lightning, the tyres commonly placed on top of the roof help protect them from lightning strikes. It was unclear how the tyres protect the houses from being struck by lightning, and a study by Jandrell and Trengrove (2014) argued that when questioned, people following this practice did not know this themselves. Some (Mr Dube) say that the rubber absorbs lightning. Other participants, such as Miss Ngcobo, asserted that just like a car’s tyres protect you when lightning strikes a car, they protect the house in the same way. The insight on tyres’ use is not scientifically supported, as there is no documented evidence that the rubber from tyres contains insulators to protect from lightning strikes. It is argued that car tyres can protect people from lightning strikes because of the car’s metal roof and metal sides (Chachai, 2006).

c) *Ukushisa umsuzwana* / Burning *lippia javanica*

Miss Hlongwane also explained that whenever there is lightning, they burn a traditional herb (*ikhambi*) which is called *umsuzwana*. This herb is taken from a tree that is normally found in the forest. This herb is often used to protect people from evil spirits, because some believe in witchcraft and its belief that lightning can be sent by someone evil; therefore, the act of burning this herb can act as protection from the dangers of lightning. This herb is normally burned inside the household. According to Koopman (2011, p.46), “*lippia javanica* (Lemon Bush, Z. *umsuzwani*, *umswazi*) is “used for ritual cleansing after contact with a corpse and for protection against dogs, crocodiles and lightning”. These herbs are normally taken from traditional healers, as they are not easily accessible to everyone. The herb is burned and placed outside the house when there is lightning.

In the discussion of *ukushisa umsuzwana*, Mrs Mkhwanazi, a participant in the study, explained that a combination of different traditional herbs can protect a person from evil spirits and bad events. These herbs are mixed to create *impepho* (incense). The mixture can also be burned to protect people from lightning strikes, especially the lightning “created by people”. She further explained that when lightning occurs, it is often believed to be unnatural, which is why *impepho* is used to protect against lightning strikes. This is part of the belief that they are in fact protecting themselves from evil spirits, and not just lightning as a natural hazard.

d) *Ukukhishwa kwabafana* / Taking out sticks

Some participants (Mrs Mkhize, Mrs Madlala, Mr Dube, Miss Ngcamu, Miss Phakathi) noted that whenever there is lightning, they take out sticks which are called *abafana* / *izikhonkwane* / sticks and place them on the roof; this is normally done by a male head of the household, as per the Zulu tradition which assigns males the role of head. If the father is deceased or is not at home when lightning occurs, the boy children take the sticks outside. Miss Phakathi explained that these sticks are from a particular tree called *umnyenye* / *Rhamnus prinoides*; she further noted that she had not seen the tree anywhere near her home. Koopman (2011, p.47) explains that “placing pegs (*izikhonkwane*) doctored with protective medicines around a homestead is the standard method used by *izinyanga zezulu* to protect it against lightning”. Koopman (2011) states that the use of plant species protects against the weather, the use of education through sharing knowledge from *izinyanga zezulu*, and the use of *izikhonkwane* (also known as *abafana*) has been noted as useful in the Zulu community. Mr Skhakhane further explained that “*izinduku zichelwa ngentelezi, intelezi isuke yenziwe ngamanzi axutshwe nemithi yesizulu, kubeke sekuthathwa lezozinduku zikhishwe uma sekuduma izulu, ziyathathwa zibekwe ngaphezulu kwendlu*”. This means: “They cover the sticks with *intelezi*, which is water mixed with traditional herbs, store them in their

houses, and take them out whenever there is lightning”. According to Mrs Mkhwanazi, another participant in the study, these sticks are sprinkled with a mixture of herbs given by *uNkulunkulu* ‘God’. She described how they gather these different herbs in the forest. The herbs are then combined with water and sprinkled on the sticks. She explained that, as the sticks are placed outside, the lightning does not strike the house because it “smells the scent of the herbs”, saying “*iphunga ilona elixosha izulu ukuthi lingashayi kuleyondawo*”. This means that “the scent of the herbs and how they are mixed chases the lightning away from the house”. It is important to note that although this method may be the same as other methods, the different names attached to each one of them proves that traditional methods have always been there to provide solutions and strategies for communities to protect themselves from natural hazards such as lightning.

e) Sitting down quietly

Mrs Sibiya explained that from childhood, whenever there was lightning, they were taught to sit down quietly until the storm passed. The windows in the house should be opened before sitting down; following the belief that should lightning enter the house, the current would exit the household through the open window. She added that whenever there is lightning, they should put their phones away. Mrs Shezi noted that although they teach these methods to their children, the young ones do not adhere to this particular technique because they do not believe it works. She also explained that they are not allowed to sleep whenever there is lightning, believing that lightning will not affect them if they are awake. Miss Ngcamu noted that it is important to stay away from water because it “attracts lightning”. They also mentioned that whenever there is lightning, they make sure they are wearing shoes. She could not explain why they wear shoes, but believes they are following what they saw their elders doing when they were young.

“Uma nje liqala ukuduma izulu, singena ezindlini sihlale phansi sithule, obekade ewasha izitsha uyayeka noma ubukade usensimini ungena endlini ngokukhulu ukushesha khona izulu lingeke likushaye.” (Mrs Sibiya)

The statement given by Mrs Sibiya can be translated as, “Whenever there is lightning, we quickly enter the house and whoever is washing the dishes stops, or when someone is in the garden they quickly rush back, and we sit quietly and wait for the lightning to pass. This prevents the lightning from striking you.” During this discussion, Mrs Ngcamu added that “*Ingakho kubalulekile ukuthi uma kuduma izulu singawathinti amanzi, ngoba uma uthinta amanzi lokho kuzodala ukuthi ushawe izulu*” which means, “That is why it is important never to touch water when there is lightning, because that will attract lightning”. As the participants shared local knowledge on the importance of sitting down during electric storms, the discussion progressed into sharing insights on the importance of not only sitting down, but

also how the action of sitting down and not touching water contributes towards protecting oneself from lightning strikes.

An understanding of the perceived link with water and water ‘attracting’ lightning may not necessarily be mere ‘folktales’. The veracity of the belief is not the point here, but the beliefs underpinning the contention, as these beliefs may hold insights around what might work to induce trust in the early warning system, ultimately enabling the dissemination of warnings in a manner that encourages faith between the local community and the scientific community.

f) Sprinkling holy water, Jeyes fluid / Umadubula and salt

When water is prayed over by a priest and mixed with salt, it becomes holy water. It is then sprinkled outside the home whenever there is lightning. Jeyes fluid is a disinfectant fluid used as a household cleaner. Jeyes fluid also is mixed with water and sprinkled outside the house whenever there is lightning. Jeyes fluid is known as *umadubula* in the community of KwaSwayimane. Salt was also identified as useful for protection, and salt is sprinkled both outside and inside the home whenever there is lightning. The salt used is ordinary table salt available at any supermarket. Mrs Phakathi and Miss Hlophe described how whenever there is an electric storm, they sprinkle holy water around the household to keep it from being struck. Miss Khumalo explained that they were taught to mix Jeyes fluid, also known as *umadubula*, with water and sprinkle it outside the house to protect themselves from lightning strikes. Miss Hlophe added that in her home, they sprinkle holy water or ashes outside the household to protect themselves from lightning. She further explained that this was because of their religious affiliations. Alternatively, they would burn their church attire to prevent the household from being attacked by lightning strikes. They mentioned that this technique of burning their clothes is useful because of their belief in ‘God’ protecting them from harm. The burning clothes become their shields.

Mrs Mkhize described how when she was young, her uncle—a traditional healer—would go outside and talk as if he were speaking to the thunderstorm. Eventually, the lightning would decrease in intensity and finally die down. Mrs Mkhize asserted that “*ngisamncane ngiyakhumbula uma kukade kufikeumalume owayeyi Sangoma, uma liduma izulu wayevmisile ukuphumela emnyango bese kubaengathi uyakhuluma nezulu kube engathi uyathetha, alikhombe ukuthi liye endaweni thizeni. Uma esekhulumile ke nalo kuhambe isikhathi esincane ebese liyaphela futhi, ngangivele ngixakeke ukuthi izulu seliyaphela ngenxa yalezinto ebezishiwo umalume noma lalisuke liziphelela lona*” which can be translated to “I remember when I was still small, my uncle would often come to visit our home. If there was lightning when he was around, he would go outside and talk as if he were speaking to the lightning and thunder. I would then see

that after some time, the lightning would die down. I'm not sure whether that was because of what my uncle said; maybe that had nothing to do with the lightning.” (Mrs Mkhize)

Mrs Sibiya added to the discussion by asserting that “Mina ngakhula ngazi ukuthi uma kukhona umuntu oyinyanga kwakuyaye kwenzeke ukuthi akhiphe ijazi lakhe, aliphonse emnyango, uma liduma izulu inyanga ingekho ekhaya yayivamise ukuthi iliphonse kulayini wokuneka izingubo, lokhu ke kwakuvimba ukuthi izulu lingangeni kulowomuzi”, which means, “I grew up knowing that when a traditional healer is not in their home, they will remove their clothing and throw it outside, and this would prevent lightning from entering that house”. She was told that this practice would show respect towards the family's traditions. Another participant (Mrs Madlala) asserted that she knew a traditional healer who would throw their jacket on the washing line if there was lightning when they were not at their home. Mrs Madlala described the belief that traditional healers have been gifted with powers that allow them to control lightning and where it strikes.

On further probing of this interesting theme, I observed that although this knowledge was common among the group, some of the participants could not fully approach the subject. Instead, they pointed out that “*Lokhu abakwazi kahle, umuntu oyinyanga noma isangoma uyena onolwazi oluningi, kuyinto nje abakhula betshelwa yona*” (Mrs Mkhize, in the focus group discussion). This could be translated as “We don't know much about this, although we were told and have some sort of knowledge of these things, normally someone who is a traditional healer would have more knowledge on this”. One participant (Mrs Mkhwanazi) explained that traditional healers, or ‘*izinyanga*’, remove their clothes to prevent lightning from striking them and their homes (as previously stated). As these clothes have been worn, they have the grime from their bodies. This ‘grime’ helps protect them from lightning strikes, as they are traditional healers, and they are given power by the ‘Gods’. She further explained that if lightning strikes the clothing, this will mean that “the lightning was directed to them”. This is to say that as the lightning strikes someone's clothing, they believe that the lightning was ‘sent’ to them, meaning that it was not natural lightning. This contradicts their belief that, it is not normal for someone to be able to speak to lightning.

g) Ukushisa inyamazane, impepho / Burning incense

Mrs Khambule, a participant, offered that whenever there is lightning, they would sprinkle salt around the house or burn “*izinyamazane*”. This is a Zulu traditional herb. According to Friend-Du-Preez, Cameron and Griffiths (2009, p.16), “it is a powder made up of various dried animal parts”. *Izinyamazane* is burned and sprinkled across the house and in every room. *Ukushisa izinyamazane noma impepho* / burning incense protects against evil spirits. According to the participant, it can also protect people against lightning strikes. *Impepho* is a traditional Africa sage that is normally used to communicate with the ancestors; it also serves to protect from bad spirits. In protecting a person from lightning strikes, it is burnt and sprinkled throughout the inside of the household, similar to the way in which *izinyamazane* is used. This is also similar to the burning of *umsuzwana*. Techniques such as these are important to understand the complexities of the individuals’ community. As traditional communities maintain strong relations with their ancestors, the burning of traditional African sage is important to them as a traditional practice. In this case, burning the sage protects them from bad spirits. The burning of herbs such as *umsuzwana* is important, as the participants feel protected when burning these herbs. They believe it is effective in protecting them from lightning strikes, as they have practiced this technique before.

Mr Dube noted that “*njengoba sikholelwa kulezindlela zokuzivikela uma kuduma izulu, eminye imithi esiyisebenzisayo sisuke sinikwa isangoma*”, which means that “As they (Mr Dube and other community members) believe in traditional ways of protecting themselves, therefore they use the *imithi* and *amakhathakhatha* provided to them by their traditional healers”. The *umuthi*/traditional medicine referred to here is *amafutha evimbela*. Much like entress drops used for babies, they apply it to their bodies to protect them from bad spirits. It is asserted by Ngubeni (2015) cited by Mbongwa (2018, p.75) that “plants from the wild are specifically required for rituals, such as those done to prevent lightning from striking homes, protecting homes from ‘witchcraft’, and ridding a person of bad luck.” These medicines are normally found in the deep forest where traditional healers obtain the plants that they use.

h) Imithi kanye namakhathakhatha esiZulu / Traditional Zulu medicines

Miss Khoza mentioned *umanyazini* (manganese). Some people refer to *umanyazini* as ‘bluestone’; they mix it with water and sprinkle it through the house. They believe that it can also protect against lightning strikes. In a study conducted in Mtubatuba North of Richards Bay, Sibiya (2019), a respondent suggested that they put *umanyazini* in a basin and leave it outside in their yard whenever there is lightning. According to Street, Kabera and Coanolly (2018, p.187), “potassium permanganate (KMnO_4) is industrially significant manganese (Mn) compound of economic importance. At room temperature, it exists as a fragrance-free, dark purple crystalline substance with a metallic sheen. It is readily water-soluble, and

aqueous solutions are pink to violet in colour, depending on the strength”. In traditional communities *umanyazini* has different uses, with some using it to release stress and chase bad spirits away (Mlangeni, 2017).

i) Lightning conductor / Rod in the house

Mrs Shezi said that they have lightning conductors in her house, and these protect them from lightning strikes. The lightning conductors are metal rods that are said to protect from lightning strikes. According to Berger (2015), an iron rod is normally placed on the top of a building and runs its length down into the moist part of the earth. Whenever there is lightning, the electric charge will not enter the house but instead be directed straight into the earth. Some participants stated that not all homes in the area have lightning rods. Mrs Shezi further stated that although they have lightning rods at home, they also use traditional techniques to protect themselves. Another technique they follow is to sit quietly to ensure that lightning does not strike them. This shows that although the community of KwaSwayimane is a traditional community, some people have adopted techniques that are to some extent technological/scientific to protect themselves from lightning strikes and thunderstorms. There are links between scientific and local knowledge. In this instance, the lightning rod is a scientific technique, but it is also linked with a local technique used by community members to protect them from lightning strikes.

3.5 Analysis of participants’ beliefs and techniques

One can argue that some of the above-mentioned techniques are not stated in scientific studies, as they are regarded as myths. Still, they offer important insights for understanding the different ways in which people view the world. Certain traditional techniques and methods are regarded as ‘myths’ by the scientific community; this may not be the case in traditional communities. These so-called ‘myths’ are techniques viewed in the community as methods that help protect community members from lightning strikes. These techniques are not recognised in science because of their deep cultural and traditional foundations. As they are practiced in traditional communities, some techniques cannot be explained in the scientific community, but this does not mean that they are untrue. Myths are regarded as widely-held stories that are not based in fact and cannot be considered scientifically true. According to Basdew et al. (2017, p.57), “scientific knowledge and information is a formalised process which validates itself using empirical evidence”. This knowledge is different to the traditional techniques discussed by the participants, because their techniques are instead embedded in their cultural background and their relationship with the environment.

Traditional techniques and methodologies are important in that they capture different meanings towards people’s lives. Understanding of these techniques and methodologies is important as they are shaped by

culture and tradition, which is important for most African communities. According to (Upadhyay, 2016, p.116), “thoughts are culturally shaped”. In communities such as Swayimane, people have different cultural affiliations with which they associate. In the discussions, the participants noted that they have and know of different techniques that can protect them from lightning strikes, and they follow the techniques they are comfortable with. They further stated that they continue to follow the techniques taught to them by their elders, as these methods are familiar to them.

3.6 Sharing the techniques with other members of the community

The community of KwaSwayimane uses different indigenous and local techniques to assist in protecting themselves against lightning strikes, and some members share their knowledge of these techniques with other members of the community. Sharing the literature allows community members to discover alternative techniques to protect themselves from lightning strikes. In the discussions with the participants, when asked whether they share these understandings with other community members, one participant (Miss Chiliza) responded that they share these techniques with others, and the methods are usually considered common sense. Mr Dube explained that while they share insights with their neighbours and other family members, they are selective of the knowledge they share with others. Mr Dube described that as they live in a community where different religions are followed, some believe in traditional solutions. Some identify best with the methods that align with their religious affiliations. This makes it hard to share some methods with others, as they may not be familiar with other ways of doing things. This reveals a concern that some people may be judged by others according to their beliefs. Mr Dube concluded that this was why they preferred to share knowledge with those people they are close to and feel they know well.

Mrs Mkhize offered that she does not share the ‘facts’ with other community members because it is their ‘family secret’; a tradition that has been in the family for a long time. Members of her family would only share this knowledge with their own children, and not anyone else. She added that if they were to share this knowledge, the concern would be that other community members would judge them for their beliefs and label them as ‘witches’ without understanding their traditions. When asked whether the participants used all these techniques to protect themselves from lightning strikes, the participants (Mrs Sibiya and Mrs Mkhize) asserted that they did not use all of them. These techniques have proven to be useful only ‘sometimes’; there have been instances where they used some of these techniques, but lightning still managed to strike.

“... *sijwayele ukusebenzisa izindlela esibona engathi ziyasebenza siziyeke lezi ezinye.*” / “We use the ones that are effective and disregard the others.” (Mrs Madlala)

“Njengoba sisebenzisa izindlela ezingafani, sisebenzisa lezi esizithandayo. Lokhu kusho ukuthi lokhu esingakujwayele futhi esingakuqondi kahle asiwayele ukuxoxela abanye abantu ngakho njengoba sikholelwa ezintweni ezingafani, noma sihlala phela la KwaSwayimane sonke umuntu nomuntu unezinkolelo zakhe, abanye bakholelwa ezintweni zesintu nesizulu abanye bakholelwa kulokhu kwasesontweni. Konke lokhu kunomthelela ekutheni izimpilo zethu siziphila kanjani.” This means that “Even though we believe in different techniques, we use those that we are comfortable with. This also means that we become hesitant to share knowledge of other techniques, because in this same community we have different religious and traditional beliefs, and this influences how we live.” (Mrs Ngcamu)

These were the insights shared by some members of the community. We further discussed whether they share this knowledge with their children and grandchildren. Mrs Khambule and Mrs Madlala, who are elders in the community, explained that their grandchildren take it upon themselves to sprinkle holy water in their house whenever there is lightning, and they do this without being told. They noted that they do share this knowledge but, in some instances, their children do not believe in some of the techniques, arguing that they are ‘superficial’ techniques which do not work. In the discussions with the younger community members (between ages 20-25), they confirmed that these methods have been passed down to them by their elders and are common knowledge in the community. Participants have observed that these methods work, and that is why some continue to be used. Mr Dube shared other techniques that he has heard of and observed in other communities, “In Newcastle, they hit pots and make noise to make the lightning go away” (an example provided by Mr Dube). Miss Hlophe added that some communities ask married women of good standing to wear “*Isikigi* to stop the thunder”. Mrs Mkhize added that the techniques discussed in the group are also used in other communities and are very common.

Miss Hlophe mentioned that these techniques are taught to their children to ensure they will be able to protect themselves from lightning strikes in the future when the elders are no longer there. This shows the relevance of these techniques, as they are consistently used by the community in this day and age and beyond. An early warning system is important, because it integrates local and scientific knowledge by providing the community with timeous warnings of natural hazards, allowing community members to take the necessary measures, traditional or otherwise, to protect themselves.

3.7 Conclusion

In this chapter, I have explored the participants’ experiences of lightning and their different perceptions of lightning in the area. It is important to consider that people’s beliefs and experiences shape how they view and understand natural phenomenon. It is argued by Quesque et al (2020) that social cognition is shaped by individual factors as well as culture; the cognition containing the thoughts that people inhabit

is shaped by their cultural affiliation. In the chapter, from the participants' insights, it was noted that the inclusion of traditional healers in the methods and content of the warning dissemination might garner more trust from the community, especially if the scientific community were known to value the local understanding, and was inclusive of those who the community felt were local experts on natural phenomena such as lightning. The next chapter will look into the relationship between indigenous and local knowledge in the social construction of lightning, to generate insights on better communication/dissemination of the lightning warning system in KwaSwayimane.

Chapter 4

The relationship between indigenous/local and scientific knowledge in the construction of the lightning warning system in KwaSwayimane

4.1 Introduction

Lightning is a phenomenon that threatens people's livelihoods where they are vulnerable to lightning strikes. According to Jandrell and Trengrove (2014, p.1), "something should be done to raise awareness about lightning safety in southern Africa". Lightning strikes threaten people's livelihoods; therefore, it is vital to create and implement strategies to protect the community. Strategies such as the early warning system installed in KwaSwayimane reduce the community's vulnerability to lightning strikes. However, it is also important to understand the community's perceptions of and insights into the early warning system and its relationship (if any) with the community's existing local/indigenous knowledge. This knowledge influences the community's socially constructed understanding of the system, as people's constructed understandings influence their beliefs and actions. According to Settee (2011, p.436), "indigenous knowledge is inherited knowledge included in the traditional forms of knowledge developed by parents and other elders about ways of knowing relationships/codes of conduct, and information that helped in daily living". In this study, the terms 'indigenous knowledge' and 'local knowledge' are used interchangeably. This local knowledge is passed on from generation to generation. It is considered vital, as different meanings are attached to different activities, often stemming from local and traditional beliefs and customs.

This chapter will attempt to examine the relationship between indigenous or local knowledge in the social construction of lightning to generate insights on better communication/dissemination of the lightning warning system in KwaSwayimane. The chapter will explore the concept of indigenous knowledge and its importance. The chapter will further discuss the participants' views and perceptions of integrating indigenous or local knowledge in developing a lightning warning system in their community. According to Moji (2009) cited in Trengrove (2012, p.26), "indigenous knowledge in Africa is a way of doing things and of thinking about things that developed over a long time as people learned to adapt to the environments where they were living". Thus, this chapter ushers in insights into how the community members of KwaSwayimane view the warning system installed in their community.

4.2 Indigenous and local knowledge

“Indigenous knowledge is an essential component of communities which is passed through generations and in this way so is the culture of the community” (Basdew and Mafongoya, 2017,p.57). This type of oral ‘literature’ is vital, as it is passed through generations, meaning that as the participants learn it, it is shared on with their children and family members. This is true, as identified in the previous chapter where a participant confirmed that they share their knowledge of lightning protection methods with their children. ‘Culture’ is an important aspect of the African and traditional way of living, and as such, people prioritise their cultural practices and traditions. The notion of ‘culture’ as constructed and open to interpretive understanding, allows us to discern that it shapes people’s perceptions and ways of thinking. According to Geertz (1973, p.4), “culture is a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop their knowledge about and attitudes toward life”. Culture is an important aspect to consider, as it influences people’s knowledge of the world around them and influences their everyday lives.

According to Franks (2014, p.11), “the role of culture is to ‘fill in the details’ of a capacity whose foundations are constituted by a non-cultural (biological) capacity, with different results in different settings”. Culture teaches individuals how to behave globally, and does so via the different techniques and traditions attached to those particular cultures. The role played by what is termed as ‘culture’ would be to enforce those ideas in individuals, in turn influencing their lives.

An integral part of what is construed and constructed as ‘culture’ is language, as it is a medium through which people communicate. According to Khuphe (2017, p.102), “including the participants’ home language enhances community engagement”. The messages that the community members (farmers) receive is written in isiZulu; this is important, as language is also important in traditional communities such as Swayimane. It is asserted by the World Wide Fund (WWF) (2013, p.30) that “indigenous knowledge is by definition highly contextual knowledge, which is developed and negotiated in specific social, economic, and environmental contexts”. This type of knowledge is shared through the community because it is knowledge concerning situations or events that take place in that particular area and not anywhere else; this is to say that certain events may be understood by different terms or jargon from one place to another, although they are the same thing. Therefore, it is important to note the knowledge that the people of KwaSwayimane may have regarding lightning and how this indigenous knowledge is integrated into the warning system.

According to Nugroho, et al. (2017, p.90), “local knowledge is embedded in practice, action, morality and spirituality; it has a central role in social relations and reciprocity among people”. This is to say local knowledge is rooted in the traditions and actions that people practice and in the rituals that they perform. This is also the case for the community of Swayimane, as the participants of the study asserted numerous traditional, spiritual and religious practices which they respectively perform. This knowledge is rooted in people’s shared experiences and traditions. Local knowledge is important in African communities (as in many other largely oral and intergenerational and passed on orally), as people share an understanding of their existing social relations and value the influence these relationships have on their lives. It is important to note how vital local knowledge can be in studies where understanding the social relations that exist in society is a component. The local and indigenous knowledge of the community of KwaSwayimane is important in comprehending the community’s response to the warning system introduced to them.

Indigenous and local knowledge is important in studies that also include scientific aspects and strategies, especially here where the strategies introduced would assist the community in reducing their vulnerability to lightning strikes and similar natural hazards. It is argued by Basdew and Mafongoya (2017, p.56) that “indigenous knowledge can be used as a tool to adapt to the changes in daily climates and weather”. This knowledge is vital to this study, as it potentially contains tools and techniques which may assist in protecting against lightning strikes. It will provide insights into how local indigenous knowledge and so-called ‘scientific’ knowledge can be integrated, ensuring that the warning system fulfils the purpose for which it was built, namely, to help reduce people’s vulnerability to natural hazards. In issues such as preparing for natural disasters, such knowledge is vital. In a study of Msinga village (in KwaZulu-Natal) and the rural community’s perception of and response to government strategies for drought management (2010), the findings suggested that the community has indigenous or critical lay knowledge which they use to assist them in their daily practices. In that study, it is evident that the community members apply their indigenous knowledge to help prepare themselves for the droughts that they encounter.

4.3 Participants’ insights on indigenous and local knowledge

For most of the participants in the focus group discussions, indigenous and local knowledge was understood as the cultural traditions and knowledge that the community holds. The discussion on indigenous and local knowledge and its importance is vital in traditional communities such as KwaSwayimane. In the discussions with the participants, it was clear that they are aware of the importance of this knowledge, as they identified numerous traditional techniques which come from indigenous knowledge. In the dialogue with participants regarding the different techniques that they use to protect themselves and their families from lightning, most of the techniques mentioned are traditional and indigenous (such as *ukukhishwa kwabafana*/taking out sticks, *ukushisa umsuzwana*/burning lippia

javanica or ukushisa impepho, inyamazane/burning incense or sage). These techniques use traditional methods (mentioned by the participants in the focus group discussions) to help them and their families prepare against lightning striking their homes.

Miss Ngcobo, a participant in the focus group discussion, shared her distress over not preparing for heavy rainfall and said “*Senigjahile nami ukuthi ngikwazi ukuthola lama message ngoba azoba usizo kakhulu*” (“I am now eager to receive these warnings as they will be very helpful”). When we started the discussion, this became an interesting aspect, and during the discussion, we were able to converse on it. As the discussion continued, we talked about the SMSs that the community leaders receive, and Miss Ngcobo pointed out that she did not receive these SMSs as she had only recently joined this group of farmers. She suggested that it would be better if the robot poles that are at the school were also installed in other parts of the area for community members like her who cannot see or hear the alarm, or who are not part of the farmers. Other participants also agreed with this; Mr Dube, a wise male farmer in the community, added that “*Loko kungasiza ngempela njengoba akusiyena kuphela uMiss Ngcobo ohlala kude nesikole nabanye abantu bangasizakala*” (“It would be helpful, as Miss Ngcobo is not the only farmer who lives away from the school where the robot is located”). As we further discussed this, other community leaders present agreed with this statement, that they would be able to hear the alarm when it goes off and know to seek shelter and practice the appropriate protection technique.

One of the participants, Mrs Mkhize, noted that she uses both traditional and science-based methods, such as watching the weather forecast on television. She further noted that this does not mean she does not take note of the traditional indigenous knowledge, but that she uses scientific methods as a form of validation. Most of the techniques mentioned by the participants are indigenous because of their nature and language. Some of the techniques are understood in the isiZulu language (the participants used this language to explain these techniques), as this is the main language spoken in the community of KwaSwayimane.

The participants noted that these traditional and religious techniques (the sprinkling of holy water would be considered religious, as it is obtained from church) were passed down from their parents. Mrs Madlala, a participant who participated in a face-to-face interview, asserted that she knew these techniques since child, as she would observe them being done at her household by her parents, a clear demonstration of the intergenerational nature of this knowledge. She further added that she remembers how visitors at her home would throw their clothing outside whenever there was lightning but noted that she does not remember this very well (clearly), as it was a long time ago.

One participant (Mrs Mkhwanazi) explained that traditional healers, or ‘*izinyanga*’, remove their clothes to prevent lightning from striking them and their homes. This means that as these clothes have been worn,

they have the grime from their bodies. This ‘grime’ helps protect them from lightning strikes, as they are traditional healers, and they are given power by the ‘Gods’. She further explained that if lightning strikes the clothing, this will mean that “the lightning was directed to them”. This is to say that as the lightning strikes someone’s clothing, they believe that the lightning was ‘sent’ to them, meaning that it was not natural lightning

Another technique discussed with the participants was the *Insingisi* bird and how it is known to warn the community of lightning strikes and other natural hazards. When asked about the *Insingisi* bird (which was discovered as an interesting example of traditional forewarning techniques, as numerous participants made mention of this bird) she recalled the bird and its name, and also remembered being taught about it by her parents. In a study conducted by Koopman (2011) he asserts that although modern science and technology have been pivotal to providing techniques which will protect the community from lightning strikes, the Nguni culture has numerous preventative measures such as the use of animal by-products and symbolic birds and animals.

Mrs Madlala further noted that even though she has chosen not to practice any of these traditional techniques at her home, she makes sure that her children and grandchildren know them. Other participants also noted that they pass this knowledge on to their children and grandchildren. Mrs Zondi, a participant from the questionnaires, noted that as she was newlywed, she gained familiarity with these techniques via her husband and in-laws, who would share and explain these methods to her. The awareness and local intuitions shared among individuals is vital, as it influences their actions. The participant (Mrs Zondi) explained that she obtained the knowledge and practices these techniques as she trusts them. The techniques that she practices will be shared with her family, as she is a newlywed, the family that she will interact with daily, as she will live with them.

Mr Dube, a participant in the focus group discussion, noted that he had moved to KwaSwayimane after retiring from work in the city. He explained that as he had stayed in the city, he only knew of a few traditional techniques but had obtained further knowledge from other community members, who would explain them to him. He further made an example of when he had visited a household in Newcastle, where he saw people practice different techniques from those he knew (he mentioned that they banged pots to make the lightning go away, he further mentioned that the noise from the pots “keeps lightning from striking that particular house”). Mr Dube noted that these conversations and interactions with other people helped him, and he continues to share these insights with other people. According to Galbin (2014, p.85), “in the social construction theory, knowledge evolves in a space between people, in the realm of the common world”. The community members share the different techniques they use to protect themselves and their families from lightning; the knowledge is shared among them as they communicate with each

other. In this case, Mr Dube shared that as he conversed with other members, he gained a deeper understanding of how the people of Newcastle protect themselves from lightning; this is an important aspect in traditional communities such as KwaSwayimane. The community members share insights with each other and explain their techniques with others, they find meanings in these techniques, and are inspired to practice them.

Local knowledge also entails the use and understanding of the local language and jargon used in that particular community. This is a medium through which people converse and communicate. Most of the traditional techniques have names that are common among the people of KwaSwayimane. Some of the techniques and methods are not only common in the community of KwaSwayimane, but also to other communities as well. In some instances, the researcher would note that the participants in the focus group discussions, face-to-face interviews, and questionnaires referred to some techniques in their own local jargon that might have been identified by a different name by a person from another community.

Techniques such as *ukushaywa kwabafana*, in other areas *abafana* (referring to sticks) are called *izikhonkwane*. Here they cover the sticks with *intelezi*, which is water mixed with traditional herbs, and then store them in their houses, ready for when an electric storm arrives. According to Mrs Mkhwanazi, another participant in the study, these sticks are sprinkled with a mixture of herbs which they are given by “*uNkulunkulu*” ‘God’, she further explained that these different herbs are found in the forest and are mixed together with water and sprinkled on the sticks. She also claimed that as they place the sticks outside, the lightning does not strike the house as it “smells the scent of the herbs”. She explained that the “*Iphunga ilona elixosha izulu ukuthi lingashayi kuleyondawo*”. This means that “the scent of the herbs and how they are mixed chases the lightning away from the house”. Although these methods are the same, they are phrased and named differently across different places; and the same applies to other methods discussed. For this study, it was vital that the participants choose their preferred words and phrasing to express themselves comfortably and explain their insights easily in the group discussion and individually.

4.4 Participants understanding of the lightning warning system in KwaSwayimane

In the discussions with the participants, they expressed different views and perceptions of the warning system that was put in place in Swayimane. In discussions, some participants fully demonstrated and explained how the robot (lightning warning system) works, how it changes colours and the meanings of these different colours. In the questionnaires, some participants noted that they *understood that the robot system was installed by the University of KwaZuluNatal (UKZN) and delivers warnings using the robot’s colours*. The system was put in place in 2017 as part of a partnership with the UMngeni Resilience Project with UKZN’s Centre for Transformative Agricultural and Food Systems. This lightning

warning system is aligned with a larger early warning system's project, alerting the community to natural hazards so that people can prepare and protect themselves from threats such as droughts, floods, and others of that nature. Some of the participants (such as Mrs Madlala, Mr Dube and Miss Buthelezi) stated that they understood the different colours that the robot displays. They asserted that whenever the robot turns blue and red, they anticipate that lightning strikes may occur at any given time and become more alert towards thunderstorms.

Miss Sokhela noted that although she does not receive the SMSs, she often hears the alarm as she resides near the school. She further asserted that this assists her and her family in their awareness of lightning strikes and danger. She further noted that she remains vigilant of the warning system because she believes that lightning may occur at any given time, as climate change has exacerbated these forms of weather. Similar to this, another participant (Miss Ngcobo) noted that the system is helpful as it can prepare for other natural hazards aside from lightning strikes. Miss Khumalo noted that ever since the lightning warning system was put in place, "lightning is no longer harmful, as it was before". Since the warning system was introduced, they explained that they feel as though they are safer than they were before. She further noted that the warnings sometimes help, as they require a person checks for a red light constantly, but when they are not in a place or position where they are unable to observe the robot, they would not have otherwise been warned of lightning strikes as they do not receive the SMSs.

Another participant (Mrs Mkhize) noted that she uses both scientific and indigenous methods. She asserted that they take note of the lightning warning system in the school. Whenever they hear the alarm go off, they "use the traditional techniques to help protect them from lightning strikes", she further noted that the techniques they normally use the burning of incense (*impepho*). Mrs Mkhwanazi explained that *impepho* is a mixture of different traditional herbs which are combined to protect a person from evil spirits and bad things. These combined herbs are then burned to protect people from lightning strikes, especially the lightning "created by people", which is a reference to curses and witchcraft. She further explained that when lightning occurs, it is often believed to be unnatural, and this is why they protect themselves from lightning strikes using the *impepho* (incense) which is also used against the influence of evil spirits). Miss Gasas explained that they cover shiny objects and mirrors in the belief that these objects attract lightning, and so must be covered to prevent the lightning strikes from entering their homes, etc. They noted that since the installation of a lightning warning system, they are able to prepare themselves more efficiently and employ their techniques in time to avoid panic when lightning starts. Another participant (Mr Dube) also asserted that the scientific method uses "*ubuchwepheshe kwesintu*/scientific technology", meaning that the participant understands the robot system, which is of a technological origin. Other participants (Mr Sokhela, Miss Zungu and Mr Zuma) in the questionnaires noted that they lived far from the warning

system in the school and did not receive SMSs. Therefore, they do not understand its system but had heard of it in the community. Hence, they depend on traditional or more accessible techniques, such as observing the *Insingisi* bird and following the news on the TV and radio.

4.5 Participants' insights on the impact of the lightning warning system on their livelihoods

The lightning warning system was introduced in KwaSwayimane in 2017 to assist the community in preparing for lightning and other natural hazards by alerting them of electric storms ahead of time. There are numerous ways in which the lightning system installed in KwaSwayimane issues warnings to the community, such as through the robot system, SMSs and emails. However, this study focused first on the SMSs which are only available to a pilot group, and second on the robot system accessible to those who reside near the school where the system is situated. Focus group discussions and interviews were conducted with the farmers who are part of the pilot group that receives SMSs, and some who reside near the warning system. This would provide understanding on their perceptions of the warning system and how their lives have changed since it was implemented. The following are the different narratives shared by participants in the focus group discussions and interviews.

Mrs Mkhize (a farmer in the community) asserted that she receives the SMSs but does not stay near the school. She claimed that the SMSs that she receives have been helpful for her and her family. She added that the warning system has been of assistance whenever a natural hazard was afoot, stating that the messages that she receives are helpful in alerting her household to prepare themselves. She further made an example of a recent instance where she received a message alerting her of heavy rainfall in the area. She explained that with this early alert, she could store the rainwater in containers to use for irrigation in the future.

Another participant (Mr Dube) added to Mrs Mkhize's positive sentiment by providing an example where the warning system also assisted him. When he was alerted of lightning strikes and heavy rainfall, he added that as the material is written in isiZulu, it is easy to understand and act upon its message. Other participants (Miss Hlophe, Mrs Shezi and Mrs Khambule) explained that the messages they receive assist them promptly, as when heavy rainfall or drought would occur, they receive a message telling them to expect the natural hazard. Mrs Khambule detailed an example when they received a message alerting them of heavy rainfall that would occur "during the week". She explained that the message did not specify as to which day the rainfall would occur, and other participants added that though the message did not specify the day, they were assured that the heavy rainfall would occur in the week as advised. The rainfall came on a Friday. They further asserted that the system is useful for them, as the messages they receive are "accurate" and straight to the point.

Another participant (Mrs Sibiya) explained that she does not receive SMSs because of cell phone problems, but she can hear the alarm system when it goes off as she resides near the school. She added that this is helpful, as she can take shelter in her home whenever the alarm goes off, further explaining that she cannot see the robot as “the light is not clearly visible” from her home. She asserted that whenever the alarm goes off, she sprinkles holy water to protect her household from lightning strikes and sits down quietly. According to Mrs Sibiya, she uses the robot system, religious beliefs and local knowledge to protect her household from lightning strikes.

Mrs Madlala, also a female farmer in the community, shared that she receives SMSs which alert her of natural hazards. She explained that with regards to the lightning warning system, she does not believe in the local and indigenous techniques used by the community to protect themselves from lightning strikes. She further noted that she is aware of these methods and strategies and how they are done, as she grew up in a household where they would practice techniques such as *ukukhishwa kwabafana*/taking out sticks but chooses not to practise them in her own home. She also shared that whenever there is lightning in her area, they only unplug electrical appliances and sleep. According to Mrs Madlala, “we don’t cover the mirrors; we just sleep and wake up when the lightning has passed, and then continue with whatever we were doing”. She said that in her home, they were uncomfortable with the indigenous techniques; therefore, they do not practice them. Other participants had different views compared to the ones presented by Mrs Madlala.

4.6 Analysis of participants’ views and perceptions of the lightning warning system

It is worth noting that the community members’ views and opinions are important, as they play a role in shaping how others view the early warning system installed in Swayimane. The views and opinions expressed by the participants in the focus group discussions and face-to-face interviews are vital to this study, as they give an understanding of how the community views the integration of science with the indigenous local knowledge and techniques which they have used in their lifetime. The community of KwaSwayimane is a ‘traditional’ community in KwaZulu-Natal, where isiZulu is the dominant language spoken in communities. It is important to investigate the role of language in understanding the community’s perception of the warning system. It is noted that some participants applauded the use of isiZulu in the messages that they receive containing these warnings. Participants also noted that this makes understanding the message easier for them, therefore helping them to take the necessary precautions for protecting themselves. In the interviews for this study, the researcher conversed with the participants. This affected the study in terms of facilitating easy communication where the participants were able to express themselves in their own language.

The participants also re-emphasised the importance of indigenous and traditional knowledge and techniques, describing practices such as the burning of incense (*impepho*) and how the different herbs mixed in *impepho* assist in protecting them from lightning strikes. Also described was the practice of taking out sticks (*izikhonkwane*) sprinkled with herbs, believing that lightning would not strike near the sticks because of the scent of the herbs. Similarly, Mr Skhakhane (a participant) described the sprinkling of holy water as a method of protecting against lightning strikes, believing that “as the water is blessed by a pastor of their church” who is anointed by the ‘Lord, God’, the water would have potent protective powers.

The participants noted that these techniques are helpful to them, as they explained the meanings attached to each traditional technique and how it protects them from lightning strikes. It is important to note that these techniques could be integrated into the functioning of the warning system (such as the robot system, as it has an alarm which alerts the nearby community). This would mean that the warning system integrates the indigenous techniques which are known in the community of KwaSwayimane which it is designed to assist. Even though the warning system is in place, their traditional techniques remain important to the community members. Some noted that they use both methods; and others mentioned that they observe the weather forecast on the television and radio station news. Mrs Madlala further explained that the messages they receive regarding lightning strikes contain messages advising them to take cover indoors. Currently, they continue to make use of their traditional techniques, meaning that as they understand the warnings, they are empowered to protect themselves.

4.7 Participants’ views on the integration of local/indigenous knowledge with the construction of the lightning warning system

The participants follow their own local/indigenous and traditional techniques associated with lightning, as detailed in the previous chapter. It is important to understand the community’s understanding of the functioning of the warning system and how this aligns with their local/indigenous knowledge and techniques. Mr Dube continued to point out that the warning system uses “*ubuchwepheshe*/scientific technology” to predict weather changes. Their indigenous techniques are built from local knowledge; these are different but are both used to protect against the dangers of lightning strikes. Mrs Madlala added that the warning messages received via SMS are normally short and straightforward, and it was noted that this was good. However, participants also mentioned that the messages do not contain any information on how the system works. They further noted that they would like it to contain more vital knowledge on the strategies they should implement in the event of electric storms and lightning strikes.

Mrs Phakathi asserted that the message from the warning system does normally advise them on what to do when that particular natural hazard appears, such as taking shelter and moving away from trees when there is lightning. This is similar to the insight that they understand about lightning strikes. She further noted that it is common knowledge (in fact, as one of the community's better-known techniques) to stay indoors during electric storms, and as this advice is also given in the message, this is an instance where the common method and the scientific method go hand-in-hand. Another participant in a face-to-face interview (Mrs Sibiya) also noted that the techniques used by the warning system and their local knowledge align with each other, because whenever they observe a change in clouds (as explained in the previous chapter) lightning would occur, and they would receive warning messages alerting them of lightning strikes in the area. This has helped to enforce their trust in the efficacy of these methods.

The participants described and shared the different techniques they use to protect themselves from lightning strikes, such as burning incense (*impepho*), and discussed how the different herbs mixed in *impepho* (incense) assist in protecting them from lightning strikes. Also discussed was *izikhonkwane*, the practice of taking out sticks which have been sprinkled with herbs and/or holy water to protect from lightning strikes. These techniques are important to these community members, as they have been handed down by their parents. The participants also shared insights and understanding of the meanings behind these methods, attempting to describe how these strategies assist in protecting them from lightning strikes. The burning of incense guards against evil spirits, and according to the participant (Mrs Khambule) it can also protect people against lightning strikes. Also discussed was the belief that mirrors attract lightning. Some of the participants in the group discussion also noted that they to date still practice these traditions and techniques, and others noted that they do not practice them as they have chosen not to.

4.8 The impact of the lightning warning system on the livelihood of the community of KwaSwayimane

The implementation of the lightning warning system in the area of KwaSwayimane has influenced the community in numerous ways. It has assisted them in being better prepared for any natural hazard that may occur. The study has also touched upon the participants' views of their lives after the warning system was installed, to understand the impact the system has had on their way of life. The following are the different participants' views on the impact of the warning system,

Mrs Mkhize, a farmer in the community, recalled that when the warning system was first installed in 2017, she was certain that life would not be the same. She noted that since the warning system came into existence, she feels safer than before whilst also noting that natural hazards such as lightning do still occur,

but since there has been a warning system and they receive messages warning them, they have sufficient time to prepare themselves. She further made an example using droughts; noting that the messages provide forewarning, and this prompts them to store water in their homes.

Another participant (Mrs Madlala) shared Mrs Mkhize's sentiments, adding that the warning system had helped them to become more prepared for lightning strikes and other natural hazards. Mrs Ngcamu, a farmer who shared her experience with lightning, confirmed that the warning system has had a positive impact on her family. They feel safer than they did before because of the warnings they receive.

Another participant, Miss Khumalo, stated that the warning system has been useful, noting that recently it had been having problems and was not visible enough for her to see. Sometimes, the alarm does not go off. She further pointed out that she understood that it had been placed in the area for a long time because it would occasionally glitch. Miss Khumalo further explained that this does not impact her and her family very much, as they continue to use their local indigenous techniques and strategies to help protect them from lightning strikes. The participants also noted how it is helpful that the warnings are written in isiZulu, making them easy to understand. They further pointed out how these warnings could provide more details. The symbolic interactionism theory points out the importance of meaning in terms of how it is derived from human interaction (Aksani et al., 2009). This means that as people interact with one another and exchange understanding, their communication with each other adds meaning to these interactions.

4.9 Conclusion

This chapter has explored the participants' views on the relationship between indigenous knowledge and the warning system installed in Swayimane. The chapter has also looked at the participants' views and opinions of the warning system, and its impact on their lives since its installation. It is vital to understand these insights, as they shape how the community views and uses the warning system. The chapter has also looked at how these insights are shared among community members, as people are social beings and their interactions can influence one another. The next chapter will focus on the vital roles played by community leaders of KwaSwayimane in assisting community members with information on lightning warnings. This chapter of the study will investigate the roles played by community leaders (in this case, farmers) and their impact on the community's response to the warning system, as these community leaders are part of the pilot group that receives warning messages.

Chapter 5

Community leaders' key roles and influences on the dissemination of the lightning warnings in the community of KwaSwayimane

5.1 Introduction

Lightning strikes affect individuals in communities who, as social human beings, engage in interactions with each other. As a part of frequent interaction within their community, they share similar concerns and experiences, such as vulnerability to lightning strikes. KwaSwayimane is a traditional community. According to Laidler (2014, p.10), “Swayimane community is vulnerable to lightning strikes”. According to the United Nations Office for Disaster Risk Reduction (2006, p.2), “the use of multiple communication channels is necessary to ensure as many people as possible are warned, to avoid failure of any one channel, and to reinforce the warning message”. The warning system utilises multiple dissemination strategies, namely, the robot system, SMSs and emails. These multiple channels are useful, as they help to increase the number of people the warnings would reach and the number of people the warning system would then assist. This chapter will investigate the roles played by community leaders who are also farmers in the community. These farmers receive SMSs informing them of lightning predictions (as well as predictions of other natural hazards), and they play a potentially vital role in disseminating the lightning warnings to other community members. Therefore, it is important to investigate these roles. This chapter will also probe the importance of additional channels, such as SMSs, which were introduced to increase the community's preparedness for lightning strikes and other natural hazards.

The chapter will probe the relationships between community leaders and other community members, and the ways in which they are important. According to Davies (2008) cited in Tshika (2014, p.18), “African leadership is a multi-layered social and cultural activity in the sense that a single person does not dominate it but rest with entire leadership”. Leaders in African communities are important as they play certain vital roles. This means that they influence the community in numerous aspects. In this study, the community leaders are the farmers who receive SMSs on natural hazards. This chapter seeks to explore their influences on the other community members and their perceptions of the lightning warning system installed in the area.

5.2 The dissemination of lightning warnings in the lightning warning system

Dissemination is a key component of early warning systems. As mentioned in earlier chapters, this study focuses on disseminating and communicating these warnings, especially the lightning warnings in the community. According to the World Meteorological Organization (2018, p.5), “clear messages containing simple, useful and usable information are critical to enabling proper preparedness and response by organizations and communities that will help safeguard lives and livelihoods”. Messages and warnings need to be simple and understandable if they are to assist the community. In the community of KwaSwayimane, the messages are written in isiZulu, which is a local language; this assists in the communication, ensuring that messages are clear for the community and therefore are of assistance to them.

People interact with one another in their respective social relations to each other, as they live in the same community. They share the same experiences and are known to each other; this establishes trust between individuals as they have been familiar with each other for a long time. The community leaders receive these early lightning warnings and share them with other members of the community. When these warnings are shared, it is easier for the wider community to trust the news if they receive it from other community members who they have known for a long time.

5.3 Key roles of community leaders

According to the World Meteorological Organization (2018, p.1), “to be effective, early warning systems need to actively involve the people and communities at risk from a range of hazards, facilitate public education and awareness of risks, disseminate messages and warnings efficiently and ensure that there is a constant state of preparedness, and that early action is enabled”. For a lightning warning such as the one in Swayimane, there needs to be community engagement. The community needs to be involved in order to better facilitate the dissemination of the warning messages to other community members. This can be done in the third aspect of the early warning system, which is disseminating and communicating the warnings to the community. Community members are social human beings who interact with one another constantly. This critical social reality would be helpful to increase the community’s preparedness for lightning strikes. This is where community leaders are helpful and influential, as they can share the material with other community members.

Community leaders are important in any community. The community leaders of KwaSwayimane involved in the study are farmers who practice subsistence farming and collaborate with the University in numerous projects on the uMngeni Resilience project, which is the larger project in which this study is nested. These

farmers are a pilot group of individuals who receive SMS notifications whenever lightning and other natural hazards occur in the area. Community leaders are the individuals in the community who (potentially) influence the other community members and are socially capable of influencing other members' lives (perceptions/responses). According to Ricketts (2005, p.13), "viable communities may not only have effective, efficient leaders, but these same leaders also work towards a purpose that is positive for community members". These individuals are the go-between for other community members and policymakers alike. In this study, community leaders are individuals (the farmers) who are in contact with facilitators of the warning system and can influence the functioning of the warning system; they can communicate with the facilitators on their behalf. Therefore, it is important to understand their insights on the warning system, as they are also members and social beings, and their interactions with other community members carry influence. Community leaders also help give people purpose and direction for the future. Community leaders play an important role in research. They are a bridging gap between the person conducting the study and the participants; they also reserve the right of permission for the study to be conducted. The insights offered by the community leaders are crucial.

The farmers who are direct beneficiaries of the uMngeni Resilience Project are also community members. They are involved in additional community-based structures such as religious affiliations and other social affiliations. In these affiliations, they interact with other community members, some of whom are not farmers in KwaSwayimane. As social beings, they share experiences with other members of their community in these interactions. It is noted that the community leaders who participated in the study were mostly female; there were only two male community leaders available at the time of the study. These community leaders play equal roles in the dissemination of warnings to other members of the community.

5.4 KwaSwayimane community leaders' roles in the dissemination of the warning system to other community members

Community leaders play a significant role in the dissemination, sharing local knowledge with other community members. Dissemination relies on communicating/sharing the lightning warning information with other members of the community. It is important to understand their insights as they can influence those members with whom they are in contact. It is asserted by Mbokazi (2015, p.18) that "leaders include the notion of influence in one form or another". This also confirms the notion that leaders often have significant influence in the community.

The following section looks at these roles and the influence leaders have on community members by analysing their opinions and insights shared during the interviews and focus group discussions the researcher conducted with the farmers. The participants listed different practices (such as covering

mirrors, *ukushisa umsuzwana*/burning *lippia javanica*) and ways that they share knowledge (through telling other members and their families). It is also important to note that in the focus group discussions (when the participants were sharing their insights on the warning system), some of the participants realised that they do not receive SMSs like other farmers, and numerous possible reasons for this were offered. The community leaders receive warnings of natural hazards such as lightning. They become aware of these lightning strikes in advance, taking the necessary precautions to protect themselves from lightning strikes. They receive these warnings as a small group, whilst the wider community does not receive them. These warnings are useful as they contain messages on the preventive measures which one can take to decrease vulnerability to these natural hazards. As the community leaders receive these messages, they are more likely to be prepared for the hazards than the wider community. Therefore, this section probes more into the roles that these leaders play in alerting the other members in advance whenever a natural hazard occurs. The following is a small sample of the different insights given by this category of participants.

Mrs Mkhize, a female farmer in the community, noted that she does receive SMSs when natural hazards occur and when lightning strikes. She asserted that these were helpful for her and her family. She further noted that she would share messages with other members of the community when droughts or floods would occur, such as her neighbours or other farmers who are not part of the group. She also noted that when lightning occurs and she receives an SMS, she cannot share that message as the lightning storm would soon arrive, and she would not have enough time to warn others living further away. As much as the community members interact with each other, they are not in constant communication, as they stay in different households. This means that the community leaders cannot warn the other community members in time; in turn, some of the warnings do not reach them. This argument reveals a grey area in which practical solutions can be developed to enhance the warning system and disseminate the warnings to the wider community.

Miss Maphumulo, another participant who is also a community leader, noted that she does not receive SMSs. Still, whenever there would be droughts or heavy rainfall, Mrs Mkhize would call her and alert her of the coming natural hazards. The researcher travelled to Mrs Mkhize's house and observed that the area's houses are spaced apart in distance, attesting to Mrs Mkhize's assertions. Another participant, Mrs Madlala, noted that she also receives SMSs, and they are helpful. She explained that she also shares these insights with other community members to help them be able to prepare themselves for lightning strikes and other natural hazards. She added that as these messages are detailed, they offer guidance on preparing for other natural hazards apart from lightning strikes. She further described how, as she shares this knowledge with her children, they share it with other community members through channels such as WhatsApp (as they also have WhatsApp groups), conversations with other community members and their friends. Mr Dube,

another participant in the focus group discussions, said that as he also receives the SMSs, they are helpful to his family and other members of the community. He asserted that he shares the information with other people.

Another participant (Miss Sokhela) in the focus group discussions shared that she had received SMSs sometime in the past, which would alert her of lightning, but she was no longer able to receive them as she had lost their phone. She explained that she now relies on the robot to alert her of lightning as she lives close by. She described how receiving these SMSs would be helpful to her and her family. Another participant, whom the researcher was able to visit, claimed that though she always receives SMSs, she is not always able to check her cell phone. Therefore, she is sometimes unable to ‘see and check for messages’. She continued to explain that she is normally outside as she has ‘chores’ she has to do and sometimes she is in the farming fields. She offered an example: just as I was to arrive, she and the other farmers received SMSs informing them of my visit, though she was unable to check her messages at that time.

Other participants in the group discussions (Mr Dube, Miss Ngcobo) noted that they do not receive SMSs as they are new in the group; they had not been with the farmers before. Nevertheless, they had submitted their details to the project facilitators who captured their details into the system in the University of KwaZulu Natal (UKZN) and recorded their cell phone numbers. Another participant in the focus group discussion (Miss Ngcobo) noted that her daughter receives these SMSs; she explained that her daughter passes the necessary information on to her, such as when there is a farmers’ meeting and when they are alerted of natural hazards. She also noted that the messages on natural hazards are helpful.

5.5 Analysis of the roles played by community leaders towards the dissemination of warnings in the community of KwaSwayimane

The abovementioned aspects are important as the roles that community leaders play are vital to understanding their social interactions with other community members and how these interactions affect their lives. Community leaders’ interactions with other community members are important, as they are social human beings living in a traditional community with constant interaction. One participant (Mrs Mkhize) noted that she shares the warning messages with other community members primarily through word of mouth. While in conversation, she alerts them to the warnings (if any) which she has received. According to De Lamater et al. (2018, p.280), “the process of communication is both creating and reflecting a shared context between people”. Community members interact with each other as they reflect on their shared experiences; these interactions are essential because, this is how they share the insights which would be helpful for each other. Mrs Mkhize explained that she shares her knowledge with other

community members by telling her neighbors whenever she receives these warnings. She further noted that these communications are helpful for others who otherwise may not have access to messages or warnings when lightning and other natural hazards occur.

The participants (Mrs Mkhize, Mrs Madlala) noted that they share the messages with other community members, those they are in contact with, and their families. This means that as the community leaders interact with other members, they communicate information about the warning system. Another participant, Miss Khumalo (a community leader), asserted that she does not receive SMSs. Still, she receives the communication through messages and phone calls from the other community members who do receive them.

Miss Nhlapo, a participant in the questionnaires who is not a community leader but who does receive the SMSs, is also often told of warnings by her children, as they are in contact with other children whose mothers are community leaders. She also explained that her children receive messages in a WhatsApp group and, in turn, tell her. She explained that these warnings are helpful, especially when they alert her to heavy rainfall, as the alert gives them time to prepare to store water which they will later use for irrigation in their home gardens. Mr Ngubane, another participant, mentioned a time when he received a drought warning through a community leader. After receiving this message, he gathered as much water as he could. He used this water for his garden, and this action saved his crops. He also noted that the storm warning included advice on how to store the water, teaching him a technique which he still uses to this day. It is argued by Franks (2014, p.22) that “we depend on contingent aspects of our social selves”. This means that individuals attach meaning/importance to the interactions that we have as social beings. The knowledge shared by community members when they interact with each other is important, as there is trust among individuals. Mr Ngubane received the warning and made preparations, he was able to save his crops, and now continues to use the water storage technique taught to him. This means that trust has been established between Mr Ngubane and the community leader who shared the message.

It is noted that these farmers live in different areas. While they interact with different people, they also come together as a group of farmers in the community. This means that as they share knowledge with different people, they can interact and influence people in other social groups. Those people interact with other people in their social groups, such as in church groups, at community meetings and other gatherings. The symbolic interactionism theory suggests that “the source of information is human interaction” (Aksani et al., 2009, p.902). One important aspect of social constructionism is that “there is no definite truth to the nature of the world or of people” (Burr and Dick, 2015, p.3). The different insights that the community leaders provide also contribute towards community perceptions. The different indigenous/local techniques

raised during the discussion contribute to the understanding that there may be numerous “truths” which to some degree appear to be different to each other. However, they exist within the same community. In this study, it is also noted that the farmers expressed contrasting views during the focus group discussions, and these differences were revealed to a deeper extent in more intimate settings such as in the individual discussions.

Furthermore, “social constructionism also argues that human behaviour and experience cannot be properly appreciated when it is detached from its social context” (Burr and Dick, 2015, p.10). Therefore, probing the indigenous/local knowledge in a social context such as in a focus group discussion is important, as this reveals knowledge and insights with regard to the behaviour and experience of these techniques. The community leaders in the focus group discussion were in a social context that, as in the case of Mrs Ngcamu, allowed for the sharing of personal experience with lightning, therefore emphasising the importance of this lightning warning system to other community leaders.

5.6 Community leaders’ influences on other members of the community

The community leaders who receive SMSs and who comprise a pilot group in the study asserted that they share the material they receive with other community members. This increases their trust in the warning system, influencing their perceptions of it by sharing its related communications with the wider community. The community members (community leaders) communicate the warning messages to the individuals they come into contact with, thereby spreading the information into the wider community. Those individuals trust them as they are familiar with each other, and so they in turn share the knowledge of the warning system, resulting in other community members becoming actively aware of its use in their community. This enforces the wider community’s perceptions of the warning system as a system equipped to decrease their vulnerability to natural hazards. The knowledge shared with the wider community assists them in preparing themselves for natural hazards; therefore, as they alert the wider community, they become less vulnerable to these natural hazards. Even though they do not receive the SMSs themselves, they are alerted to incoming lightning warnings by the robot system installed at the school. It is therefore important to take note of these insights and how they are shaped. These community leaders are not only farmers in the community, but they are also members of their respective families. This means that even though they are not in direct communication with other community members, they nevertheless maintain indirect influence by passing this knowledge on to the people and family members with whom they are in direct contact. This goes back to the social constructionism theory, which states that communication influences people’s behaviour. It is asserted by Segre (2016,p.95) that “in order to make reality subjectively meaningful, individuals must be made members of society through primary and secondary

socialisation”. This means that those around them influence people. Primary socialisation occurs at home through interaction with other family members, and secondary socialisation occurs in the wider community through interaction with other community members.

In the discussion on the SMS warnings, the farmers further explained the different messages they receive for different natural hazards. Mrs Madlala explained that the messages for lightning would contain messages about the robot’s colour (from yellow to red). They also confirmed that they had been taught what each colour meant. Mrs Mkhize noted that red meant danger, and that lightning would strike at any moment. They also noted that they would receive messages for other natural hazards such as droughts or heavy rainfall. These messages would contain directives such as “there will be heavy rainfall, so we should store the water in containers for future use”. The farmers asserted that mutually shared approaches benefitted other community members, as they would likewise store water as advised. It is important to note that the community leaders also suggested a technique that could be integrated into the warning system, adding to its efficacy. Miss Ngcobo, a community leader, explained that as the warning system contains a warning message and advises them to “stay indoors, move away from trees”, it could be more culturally comprehensive if their traditional techniques were also be included in the warning message. Another participant, Mr Ngubane, a community leader who does not reside near the school, asserted that it would be better if the “alarm poles were also placed in other areas in the community, as we cannot hear it”. These insights are important in this warning system as, due to it being community-based; the system needs to be inclusive of the community’s perceptions and views.

5.7 Conclusion

This chapter has discussed the key roles of community leaders in KwaSwayimane and how they assist other community members in preparing for lightning strikes and other natural hazards. The chapter also looked at how social bonds, trust and interaction influence the other members of the community and how these impacts assist them in preparing for natural hazards in the area. It is important to understand these interactions, as the community leaders (farmers) and other community members play a role in how effective the warning system is in ensuring that the community members are less vulnerable to lightning strikes. Furthermore, Mbokazi (2015, p.22) adds that “the community leaders also help us examine how these leaders establish a form of partnership with educational institutions”. In studies such as the one carried out in KwaSwayimane; these insights contribute to fostering change in disseminating warnings to the wider community. The insights given by the community leaders in this chapter have highlighted their importance in the dissemination of these lightning warnings.

The chapter has also underscored the different dynamics which could be integrated into the warning system. As a participant who is a community leader highlighted, while she might receive the warnings through SMS, she cannot constantly be on the phone checking for a warning message as it is not practical to do so. This lead the discussion deeper into more inclusive methods which may best ensure that these warnings reach the community members they are meant to assist. Another participant noted that they could not constantly alert the wider community, as community leaders are not necessarily in close proximity to their neighbours and the wider group. This reveals a point where solutions may be needed to optimise the warning system. The next chapter will explore the community leaders' insights on the integration of local and indigenous knowledge in the functioning of the lightning warning system. The chapter will also look into their various recommendations for a more effective lightning warning system.

Chapter 6

Community leaders' insights on the integration of local and indigenous knowledge in the lightning warning system of KwaSwayimane

6.1 Introduction

This chapter looks at how the impact of lightning in the community is or may potentially be reduced by the local/indigenous techniques used to protect the community members from lightning strikes. According to Basdew et al. (2017, p.56), “indigenous knowledge can be used as a tool to adapt to the changes in daily climates and weather”. In this study, the different indigenous/local knowledge discussed in the previous chapters is important, as the study seeks to gather the community's perceptions. These indigenous techniques are important as the study aims to probe deeper into the integration of this indigenous knowledge with the lightning warning system, making it more effective in the community of KwaSwayimane. It is asserted by Bohensky and Maru (2011, p.1) that “recognition of traditional knowledge in natural resource management has importance beyond scientific or broader societal merit: it is tantamount to social justice, sovereignty, autonomy, and identity of indigenous people”. The integration of both indigenous/local and scientific (in this case, the lightning warning system) is an exciting theme in this study, as insights provided by the community suggest numerous approaches which, according to them, would make the lightning warning system function better.

Amadou et al., 2015, (cited in Mzimela, 2017, p.39) states that “sustainable/successful adaptation rests on the integration of both local perceptions of climate change and scientific ideas”. The knowledge and collective agency provided by community members is important in integrating these knowledge systems together, to produce a feasible programme that will benefit all those concerned, especially the local communities prone to lightning strikes. This, therefore, proves these insights to be vital, as this lightning warning system was designed to assist local communities such as KwaSwayimane. Understanding these insights through an anthropological lens is also of key importance. It is further shared by Lahsen (2007, p.19) that “to maximize interest and understanding of our work in other disciplines, however, some adaptation can be the necessary, especially restrained and strategic use of ethnographic details and longwinded storytelling”. The importance of ethnography and anthropological studies as vital in studies that concern communities is highlighted in this section of the study.

This chapter will discuss the community leaders' understanding of local/indigenous knowledge and its significance, integrating local/indigenous knowledge and scientific knowledge into the lightning warning system. The chapter will also look into different recommendations made by the community leaders and

participants in the study for a more effective lightning warning system. These recommendations are important because they provide a different understanding, shared by the community, of the scientific system used by the community of KwaSwayimane.

6.2 Community leaders understanding of local/indigenous knowledge

Local farmers are seen as community leaders. As per Laidler (2014, p.36), these farmers consist of “400 small-scale farmers with whom the UKZN SAEES has previously worked will be divided into groups of ~20 farmers, who will work collaboratively in different target areas...they share the lessons learned with all other farmers and other community members”. These farmers were also part of a pilot group within the warning system; they, in turn, pass their knowledge on to the wider community that is not part of the pilot group. The community leaders (farmers) are important in KwaSwayimane because they are the primary social agents in their homes (as mentioned by participants in the focus group discussions). The community leaders who partook in this study were the only mothers, fathers, or ‘elders’ in their homes. This means that they are prominent individuals in their homes who may be sources of oral input, not just in the social groups where they engage with other community members, but also with their own children and grandchildren. While gathering material on the different indigenous/local techniques they use to protect themselves from lightning strikes and other natural hazards, the perceptions of indigenous knowledge they divulged were intriguing. The community leaders pointed out numerous indigenous techniques in the focus group discussions. They explained the significance of each method, such as *ukukhishwa kwabafana*/taking out sticks, *ukushisa umsuzwana*/burning *lippia javanica* or *ukushisa impepho*, *inyamazane*/burning incense or sage (these have also been discussed in previous chapters). When I engaged with the community leaders as we discussed the local/indigenous techniques, they named and detailed both traditional and religious techniques.

The community leaders used several terms to refer to indigenous/local knowledge. Some refer to this knowledge as ‘*amasiko*’ and ‘*izinkolelo*’, which are ‘tradition’ and ‘culture’, and in some less frequent instances, ‘religion’. According to Jacob et al. (2010, p.866), “culture is something people have been doing for generations, and it is a way in which they continue to practice their traditions”. The notion of ‘culture’, or what is popularly termed as culture, is embedded in the community’s practices. These are the different rituals that are practiced (in certain periods) and are specific to different communities. Indigenous techniques are likewise cultural because they have been enacted for many generations, and they are also associated with traditions followed by the participants. ‘Culture’ and ‘tradition’ are important in the community, as it is a ‘traditional’ community. The indigenous techniques mentioned by the participants during discussions were mostly influenced by culture and tradition. One notable technique mentioned, which seemed both local but also religious (in a Christian sense), was that of sprinkling holy

water on the outside of the house. This water was prayed over by the pastor, an authority believed to have been given powers by ‘God’. It was noted that religion is part of the culture in the community of KwaSwayimane, as the community leaders asserted that they share the lightning warnings they receive with other community members they interact with in religious settings such as at church. It is further stated by Idang (2014, p.97) that “the culture of a people is what marks them out distinctively from other human societies in the family of humanity”. In the community of KwaSwayimane, several indigenous/local techniques were identified by participants (such as *ukukhishwa kwabafana*/taking out sticks, *ukushisa umsuzwana*/burning *lippia javanica* or *ukushisa impepho*, *inyamazane*/burning incense or sage). These techniques, which are their ‘culture’, are indigenous to them, and as such are the characteristics by which this community may be identified; therefore, they distinguish this community from other traditional communities. These terms are similar, as they describe the same techniques that participants may classify as indigenous/local knowledge in the focus group discussions. An example of this may be the burning of ‘*impepho*’ (incense), which is regarded as a traditional technique as the contents used to make it are traditional, mixing local herbs found in the forest. In some instances, participants would point out the same techniques using different terms or names.

During the discussion, participants understood indigenous/local knowledge as part of ‘traditions’ and ‘culture’. In one such discussion, Mrs Mkhize, a female farmer in the community, pointed out that these techniques were not only local but were also known in other communities around the area, adding that these techniques are a part of their ‘culture’. This means that when they practice these techniques such as *ukukhishwa kwabafana*/taking out sticks, *ukushisa umsuzwana*/burning *lippia javanica* or *ukushisa impepho*, *inyamazane*/burning sage, they are simultaneously practicing or enacting their culture. These further merits that as they pass these techniques on to the younger generation, they also pass on ‘culture’. This has pointed out the importance of indigenous knowledge in this community, as it is regarded as ‘culture’ and tradition. In traditional communities, these are vital aspects of life.

In the discussion, it was also noted and pointed out by the participants that some of the techniques which were shared are not well known to others; this may be because of differences in knowledge, stemming from what their parents shared. Some were only taught traditional indigenous techniques (*amasiko*) and others were taught religious techniques (*izinkolelo*). This was pointed out by Mr Dube, a male farmer who had migrated to KwaSwayimane from a different community. Mr Dube asserted that although he was familiar with some of the shared techniques, his participation in the discussion groups made him more aware of other techniques he only partially knew, such as *ukushiswa komsuzwana*/burning *lippia javanica*. Mr Dube added that he will teach his children the traditional techniques he learned in the discussion so that they may also know them. “They are important,” he said.

6.3 The integration of local/indigenous knowledge to a lightning warning system

According to Liang (2017, p.8), it is important “to ensure the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge”. The use of indigenous/local techniques is important for the community, as this warning system seeks to assist the community. It is essential for the warnings that are administered to incorporate the themes presented in local techniques. This can be done by incorporating some of the indigenous/local techniques which are well-known in the community. These can be incorporated into the messages sent out to the community leaders, such as including an instruction that people must take out *abafana bezulu*, which are the sticks that the community members usually put on the roofs of their houses to protect them from lightning strikes. In the case of the KwaSwayimane’s lightning warning system, as communication of the warnings is done through the robot system (and the pilot SMS system), adding these components of local knowledge may increase the warning system’s utilisation in the community and, in turn, help decrease vulnerability towards lightning and other natural hazards.

Local/indigenous knowledge is the rich knowledge of tradition and culture of a particular local community. According to Liang (2017, p.2), “indigenous knowledge is a knowledge system developed over time and is used by community members to make appropriate decisions”. This knowledge can also be seen as traditions, culture and religion, which influences people’s decisions. Scientific knowledge differs from local/indigenous knowledge as it is not influenced by the location or particular place in which it is found. Liang (2017, p.3) further states that “scientific knowledge consists of testable explanations and predictions about the universe”. This knowledge is also important, as it is based more on ‘facts’ as opposed to the opinions and perceptions that indigenous knowledge is known for. The lightning warning system installed in the area alerts the community to natural hazards such as lightning. The lightning warning system administers these warning in numerous ways, such as through SMSs received by the community leaders, as part of a pilot study. The lightning warning system also administers these warnings through a robot alarm system. This final method is most accessible to community members, as the robot is situated at the local school in the community (Swayimane Secondary School).

An integration of both knowledge systems consists of numerous factors that should be considered when using the indigenous/local techniques and incorporating them into the messages sent out to the community. The lightning warning system is a local warning system that caters for the community of KwaSwayimane. It can be pointed out that efforts made to incorporate these two knowledge systems should be specific for this area. This would benefit the current community and future generations, as these indigenous techniques are seen as ‘culture’ and ‘tradition’; therefore, their addition to the system can also be seen as preserving culture and traditional enactments for the community’s children and grandchildren. This should not ignore

the fact that the SMS warnings are already administered in isiZulu, which is spoken in the area. It is asserted by Burr (2015, p.5) that “language is of great interest to social constructionists”. In the community of KwaSwayimane, language is a medium of expression; it influences how community members see the world around them and the challenges they face in daily life. Language has also been highlighted as a social construct of the community members’ livelihoods, as evidenced by its importance in explaining their indigenous techniques. The rich knowledge that is carried by these techniques (such as *ukushisa umsuzwana* (which is burning *lippia javanica*) or *ukukhipha abafana bezulu* (which is taking out wooden sticks and placing them on top of the roof, sprinkling with holy water, etc.) helps ‘protect’ the community from lightning strikes. Understanding aspects such as local language are important to incorporate, and other areas pointed out by the community leaders have revealed the shortcomings of the messages they already receive. The next section will unpack these themes as discussed by the participants in the study.

6.4 Recommendations made by the community

Recommendations were also discussed with the participants, to hear how they felt their insights could be incorporated. These recommendations made by the community come from local knowledge held by community leaders and the wider community on how the lightning warning system can be improved for them using their own solutions. Before starting the focus group discussions, the researcher and the community leaders discussed recent weather events in the area. Mrs Khumalo, one of the farmers, recalled recent heavy rainfall in the area, saying that “It would have been better if the warning system alerted me of the heavy rainfall, as my phone is faulty”. This caused her some distress, as the other members shared that they had received the messages in time to prepare themselves. She added that “As we don’t meet regularly, it is very hard for me to know of the rainfall.” This became an interesting topic, as the discussion branched into the different recommendations that Mrs Khumalo had on how the warning system might be improved.

Mrs Mkhize, a community leader, shared that “*Kwesinye isikhathi njengoba ngibuye ngiwathole ama message uma kuzoduma, uma sengixoxela abantu ngibatshengisa, bavele bathi phela mina ngiyintandokazi yase Nyuvesi ngithola imilayezo ngesimo sezulu bona bebe bewubuka kumabonakude belalele nama radio, engabe ngenza ngani.*” (“When I interact with other members of the community and share my experience of the warning system, as I show them the messages they become more curious and shocked, and say that I am special as I receive a message from my cell phone, unlike them who watch the news and listen to the radio to get the weather forecast.”) Mrs Mkhize further shared that “*Ngabe sengibachazela ke ngama message ngokuthi aqonde ukuthini.*” (“I then explain the messages to them and also explain their meanings and differences). After Mrs Mkhize shared this, the other members began to feel more comfortable and shared that they have received similar comments from other members in the

community. This subject, therefore, highlights the importance of community leaders in KwaSwayimane. The following recommendations also contain the narratives given by the participants during the discussions. These recommendations provide local insights into what the participants need as community members and community leaders.

6.4.1 Installing more alarm poles around the community

In the focus group discussion and with some of the questionnaire respondents, ideas on how the lightning warning system might be improved for the community leaders and the wider community were shared. Installing more alarm poles was noted as a common recommendation made by the participants. It was a sunny morning on the day of the focus group discussions, and participants had gathered outside the community hall. Whilst we were still gathering outside, I began talking with some of the farmers as we waited for the others to arrive. In this brief discussion, the topic turned to the weather, as there had been heavy rainfall in the area days before the meeting. Miss Ngcobo, a female farmer, shared her experience and how she had not received a warning about the heavy rainfall. The other participants, however, stated they had all received messages.

In a brief conversation I had with one of the youths (Nokuthula) accompanying me in the community as I travelled to the farmers' houses doing face-to-face interviews, she described the *Insingisi* bird for me. She shared that “*Mina ngiyakhumbula kancane kukhulunywa ngensingisi, ngikhumbula ngiyibona ngisayingane encane ngizihlalele ekhaya abantu abadalabeyikhomba bexoxa ngokuthi inyoni yezulu.*” (“I remember an instance which happened when I was still a young girl in the village, I remember hearing the elders in the household talking about the bird.”) On further encouragement as we continued on our walk; she expanded by saying, “*Lokhu ngikukhumbula kahle ngoba kwathi emva kokuthi siyizwe lenyoni, kwabe sekwenzeka isiphepho sango 1987 lesi esashiya umonakalo omkhulu kabi emphakathini, kwakukubi kakhulu ngalesiyasikhathi imizi yabantu ibhidlikile.*” (“I also remember the sound very well, as after we had heard the *Insingisi* bird there were floods in the area. This was in 1987, the floods left many houses damaged.”) She further shared that she still remembers the noise made by the bird, even though it has been a long time since she has heard of it in the community of KwaSwayimane. This insight could be incorporated into the lightning warning system, as the noise made by the alarm system could be replaced by a noise like that made by the *Insingisi* bird. Like Nokuthula, it might also trigger the memories of other community members when hearing a familiar sound associated with lightning or other natural hazards. The *Insingisi* bird is important in this study, as it highlights the importance of the relationship between human beings and their natural environment, including the animals around them. In another study done by Ubisi (2020) it was revealed that in some rural areas, animals are regarded as weather indicators.

According to Ubisi (2020, p. 104) “it was revealed that animal indicators (birds) ranked the most used indicator than others”.

In the discussion I had with Nokuthula, it became clearer that when a tragic incident occurs, a person may associate the event with a certain entity; when Nokuthula hears the *Insingisi* bird, she thinks of lightning. The story shared by Nokuthula reminded me of another anecdote shared by the community leaders in the community. Increasing awareness on natural hazards was a common recommendation provided. Another community leader (Mrs Ngcamu) shared an incident when she was struck by lightning and lost her child as a result, and how lightning strikes are now a constant reminder to her of this tragedy. These insights also reminded me of the importance of this warning system in rural communities such as KwaSwayimane. These insights bear considering, as they outline the community’s needs and how community members and their leaders feel incorporating this literature would improve the lightning warning system for them.

6.4.2 More time to prepare for lightning strikes

The participants further noted that the warnings could be more effective if they were sent out earlier, providing community members with more time to prepare themselves. In the focus group discussion with the community leaders, we compared the warnings for lightning and the other natural hazards. Mrs Mkhize, a female farmer, explained the different types of warnings they receive. Lightning strikes, heavy rainfall and droughts were commonly mentioned by Mrs Mkhize, Mrs Skhakhane, Mr Dube as the warnings they receive most often. The farmers further described how the warnings and alerts for heavy rainfall would normally be received timeously, before the rainfall occurred. Mrs Mkhize noted that the warnings would typically read as “*Kuzoba khona izimvula kulezinsuku bezilandelayo*”, meaning “*Heavy rainfall is expected to occur in the next weeks or months*”, and the message would go on to advise them to store water for irrigation. She further explained that this was useful as they “trusted” the news they received and would be certain of the fact that rainfall would indeed occur.

The other participants (Mr Dube, Mr Hlongwane and Miss Ngcobo) suggested that it would be helpful to receive the messages well in advance of lightning strikes, allowing enough time to prepare their indigenous techniques. They further noted that the messages are helpful, as they are written in isiZulu, making it easier to comprehend the information and advice given therein. During this discussion, the participants also noted that the messages contain material on the robot’s colours and their meaning, which was impressive, them being able to fully explain the colours of the robot system. Mrs Mkhize also proceeded to note that “The messages contain the colours of the robot, from when the robot turns blue, we receive a message, when it turns yellow, we also receive another message and when it turns red, we also receive another

message which alerts us to stay indoors and cover our mirrors.” The participants also noted that it would further be helpful if the messages also included their indigenous techniques for protection against lightning strikes. This suggestion by the community leaders would link local knowledge with the lightning warning system.

In these recommendations, I also noted the insights shared by Mrs Madlala, a more conservative female farmer in the community who I visited in her home for a face-to-face interview. Mrs Madlala noted that it would be better if the messages were sent at standardized times, saying that she may receive the warnings through SMS, but cannot constantly be on the phone checking for a warning message, as it is not practical. This was a very insightful comment, as most of the community leaders I interacted with are elderly and have numerous chores and activities to complete each day. Whilst in my visit, as I was having a general discussion with Mrs Madlala, she shared that she was “just coming from the garden” and when I asked her if she’d had any prior knowledge of my visit, she noted that she had “read the message the facilitators sent the day before”. When I alerted her to the fact that a message had also been sent on the day, she responded, “*bengingakaze ngisithole isikhathi sokubuka ifoni njengoba ngikhuluma nje ngiphuma engadini.*” (“I haven’t had any time to look at my phone, as I am coming from the fields.”) This means that there may be other farmers who do not frequently check their phones. If they were to receive messages at a fixed time, they would know when to expect a message and would therefore be ready to check for it.

In the discussion of integrating more indigenous knowledge into the warnings, one participant (Mrs Mkhize) suggested that replacing the lightning warning system’s siren warning with a familiar sound such as that made by the *Insingisi* bird (which was described as a “lightning bird”) may help to alert people when lightning and other natural hazards are incoming. In the discussion, a concern arose of “what about those people who have never heard the sound made by the *Insingisi* bird, how would they know what is meant by the noise”. Mr Dube added to this matter by noting that this would require more education on indigenous techniques, that everyone may be familiar with them. The insights shared by Mr Dube highlight the importance of strategies which would satisfy the community’s needs.

6.4.3 Include more indigenous/local information on the messages

As discussed in the above section, the participants suggested that the warning system may be improved if the warning messages were to contain mention of their indigenous/local techniques. The discussion on indigenous techniques interested the researcher. During the focus group discussion, as the participants were mentioning the indigenous techniques such as *ukushisa umsuzwana* (which is burning *lippia javanica*), and *ukukhipha abafana bezulu* (which is taking out wooden sticks and placing them on top of the roof, sprinkling sticks with holy water, etc.), some participants were reluctant to comment on or further

explain some of these methods, such as when a traditional healer takes off their coat and puts it outside to prevent lightning from striking their house, or the idea of a person being able to talk to the lightning. These techniques were seldom discussed, and when I probed further into them, the participants would assert that “they do not clearly understand the technique”, as it was taught to them by their parents when they were young (Mrs Mkhize, Mr Dube, Miss Ngcobo). As the discussion progressed, the farmers would not focus on these techniques and instead focused on the others, which they named “common and popular”. The participants further described how, as the messages contain more “scientific” techniques such as instructing the participants to take cover indoors, it would be helpful to have material on more indigenous/local techniques incorporated (in some manner) into the messages. In this part of the discussion, the farmers also noted that “*lezizinto zijwayelekile, ziyaziwa emphakathini*”, meaning that these techniques are “well-known in the community” and can be written in common jargon or terms which will be easily understood by others. Mr Dube further explained that during the discussion, he found he knew about “*uku khipha abafana bezulu*”, which is taking out wooden sticks, but that he knew this practice by the term “*izikhonkwana*”, he further noted that in the messages it would be useful to use all these terms, as someone might know the latter but not the former. This was a very insightful point. These insights from the farmers suggest that they collectively share techniques which they term “common”, and this is a well-known notion in social construction. This principle of social construction can be used to explain the perspectives shared by the participants in the study.

6.5 Analysis of the recommendations made by the community leaders

The recommendations mentioned above are very insightful and important, as the farmers are considered community leaders in KwaSwayimane, which means they influence other community members. The insights and perceptions shared by these participants are important, as the scientists have perceived them as being relatively familiar with the warning system, and the results of these discussions provide a picture of the local community’s understanding in more practical terms. These insights are also important because along with their more general insights, the participants have offered their opinions on how the warning system could be improved. Discussions regarding this perspective were insightful. It is asserted by Camargo-Borges and Rasera (2013, p.4) that “dialogue, in contrast, constructs a space for conversation that welcomes participants to bring in a multiplicity of voices”. The participants’ diverse opinions and perceptions on the indigenous techniques they use were important, as these reveal the differing interpretations shared by the community leaders. In these recommendations, it is evident that the community leaders also share ideas on some strategies which could be used. Using common jargon/terms when integrating the indigenous techniques into the existing warning system is an important example in this regard.

These insights hold further significance in that community leaders share their knowledge on the lightning warning system with the wider community, meaning proposed strategies and plans can likewise be shared. The farmers engage with other community members within different settings and sceneries which take place in the community, such as in church gatherings, and here the approaches and strategies from the perspective of a person who does not receive these messages and who does not live near the school where the lightning warning system is located can also be heard and passed on. The perceptions shared by the farmers are also of interest, especially those related to conservative local/indigenous techniques. It is asserted by Camargo-Borges and Rasera (2013, p.2) that “individual rationality is not conceived of as an attribute of individual thinking but as a consequence of cultural convention”. The different perceptions and meanings attached to the indigenous techniques may be conceived as having individual meanings, such as the conservative comments made by Mrs Madlala. Still, these can be seen as having also been influenced by the information gathered through obtaining knowledge from others.

The suggestion on the particular indigenous techniques which could be included in the message was also insightful (the participants felt it would be important to agree on which of the wider-known techniques could be included in the messages, having named numerous methods from their own use), as some of the participants were conservative about sharing their views on the subject. During the discussion on whether the participants share some of the techniques with each other, Mrs Madlala said that she does not share ‘her knowledge’ with other members of the community because it is their ‘family secret’; the tradition has stayed in her family for a long time. As such, in her family the method would only be shared with their children and not anyone else. Other participants (Mr Dube, Mrs Mkhize) further stated that if they were to share their own methods, they feared other member of the community would judge them for their beliefs and label them as ‘witches’ without understanding their traditions. They also stated that this was the reason why they only shared the techniques with their own family members. In symbolic interactionism, it is asserted that “the self is social and reflexive” (Fink, 2016, p.5). In this study, this was shown by the participants’ cognisance and pride in their indigenous techniques (such as *ukukhipha abafana bezulu*, which is taking out sticks and placing them on top of the roof, and *ukushisa impepho*, which is burning incense, etc.) as they explained these methods and how they are of use. This awareness was also displayed by their insights on how the actions they take as soon as they are alerted of lightning will work (they make use of the indigenous techniques that have been mentioned). This, therefore, suggests that the warning system should try to accommodate these views and come up with a strategy that will be most suitable for most of the community.

6.6 Conclusion

This chapter has explored the community leaders' important insights on how the lightning warning system could be improved, making it more inclusive of local understanding of its effectiveness. It is asserted by Maluleke (2012, p.1) that "traditional cultural practices reflect the values and beliefs held by members of a community for periods often spanning generations". The indigenous techniques shared by the participants reveal their clear dependence on culture, tradition and religion. In this chapter, the community leaders also reflected on the invaluable cultural practices inherent in the indigenous/local techniques used to protect against lightning strikes, and how these practices influence their beliefs and values. Their insights have also highlighted the notion of independence and individuality. This was shown by the comments from Mrs Madlala, a community leader in the study who highlighted their differences in beliefs across individuals. "These insights provide effective approaches to communicate lightning data, threats and advance warnings in a manner appropriate for rural communities, as well as increasing awareness in the locality on how to reduce lightning damage in rural dwellings. Such literature is vital to assessing risk knowledge as part of early warning systems, which is accounted for in the dissemination aspects to build response capabilities that will enable mitigation" (Mahomed et al., 2021, p.5).

In this section of the study, one maintains that the theoretical premise that "the symbols used in interactions, and the settings in which interactions take place are important" (Subbiah, 2016, p.97). The depth of the insight obtained in a more intimate setting with the participants afforded more clarity on the techniques (such as *ukushiswa kwempepho* (burning incense), *ukukhipha amajazi* (taking out coats) and the *Insingisi* (the lightning bird and how it detects lightning) which were shared in the focus group discussion. As the setting became more relaxed, participants felt free to share insights they would not have otherwise shared in a group setting, which is why the face-to-face interviews were insightful in this study. The chapter has also analyzed these recommendations and their influence on the perceptions of the community leaders and the wider community alike.

Chapter 7

General conclusion and recommendations

7.1 Introduction

According to Kizito (2019, p.2), “lightning is one of the most dominant and great natural phenomena (sic) that manhood has ever met”. The impact lightning has on people is a critical subject. This is because lightning is a natural hazard that affects everyone, but which is not necessarily largely discussed in lay contexts, as people have different ideas and perceptions of it. Therefore, this study sought to understand the impact of the lightning warning system on the livelihoods of the community of KwaSwayimane, a traditional community found in the uMshwathi local municipality KwaZulu Natal. The study gathered the community’s perceptions of the lightning warning system in order to understand its impact on their livelihoods. People’s cultural beliefs have an impact on their livelihoods. In the study the Sendai framework and Sustainable development goals can be considered important frameworks to understand the impact of the lightning warning system in communities. These frameworks are embedded in the reduction of the risks associated with natural hazards such as lightning strikes.

According to Darong (2014, p.83), “embedded beliefs and practices have an impact on people”. People who are living in ‘traditional’ communities such as KwaSwayimane place significance and importance in traditional and indigenous knowledge. It is vital to understand the impact these traditions and beliefs have on the community, and as such this study seeks to understand the community’s perceptions of the lightning warning system introduced in the area, as “KwaSwayimane is a lightning hotspot” (Laidler, 2014, p.32), with the objective to assist them in becoming less vulnerable to lightning strikes. This study has used both qualitative and quantitative data collection methods, focusing more on extensive qualitative methods such as face-to-face interviews and focus group discussions on probing into these perceptions and gaining insight into the imperative role that the warning system has played in the community. In the study, the ‘cultural traditions’ and indigenous or local, situated knowledge and insights from the area play a significant role in the community’s views and perceptions of lightning and the lightning warning system. It is important to understand these perceptions, as they also shed light on the different social bonds in the community. This chapter presents the findings and analysis from the study and draws critical thematic insights from previous chapters. The chapter will also provide necessary recommendations for further research in the field.

7.2 Understanding community perceptions

The community perceptions discussed and explored throughout the study provide insightful information from the community members of KwaSwayimane. As a discipline, social sciences and anthropology were useful in this study as they analyse the importance of indigenous/local knowledge in the community. It is asserted by Fiske et al. (2014, p.18) that “anthropology gains insights into alternative systems of thought that do not fit neatly with the Western scientific perspective”. The discipline of anthropology is rooted in so-called ‘culture’, or sociocultural and constructed understandings. The different insights that people as cultural beings bring show the differences in how they think about their everyday lives, including their shared experiences on natural hazards such as lightning. This indigenous/local knowledge therefore influences community perceptions of the lightning warning system installed in the area to assist in reducing their vulnerability to lightning by alerting them of lightning strikes, with the aim of enabling them to take necessary measures to protect themselves.

Tradition, cultural beliefs and indigenous/local knowledge influence community members’ perceptions and insights on matters around them. According to Liang (2017, p.12), “the community-based approach allows for more risk knowledge at the community level to achieve the goal of benefitting the concerned community”. It is important to ensure that the warning system is helpful to the community for which it was designed. In this study, this is explored by seeking to understand the community’s perception of the warning system. In this study, community perceptions are those insights provided by the community members and farmers (who are community leaders in this study). As shared by Mahomed et al. (2021, p.5), “it has been shown that in rural areas using participatory research methodologies, as well as community-based participatory research, that adaptation can become an iterative co-learning process and facilitate transformative adaptation through the integration of indigenous knowledge with science-based systems”. Studies which seek to understand and provide informative insights on how scientific-based approaches and strategies affect people’s livelihoods are vital, as they contribute towards the efficacy of the scientific strategy implemented. In KwaSwayimane, the effectiveness of the lightning warning system is measurable by the community’s perceptions of the system and its value and benefit to the community members’ livelihoods.

These insights are the personal and shared views of the community members and leaders on lightning in the community of KwaSwayimane. There is a communal component to these views, as the community is a traditional one consisting of individuals who constantly interact with each other, thereby further influencing one another. It is also worth noting that the insights gained in the study highlighted this community’s communal nature, where the participants shared experiences with each other and how these experiences are important to them. Community perceptions are valuable to this study, as it seeks to gather

these insights to outline the impact of the lightning warning system on the community it was intended to assist.

Community perceptions of the lightning warning system consist of people's understanding of lightning in the community. These perceptions contain the situated knowledge which the participants possess, and how they have comprehended and passed this knowledge on among themselves and to future generations through conversation. These perceptions were vital in this study, as they also point out different traditional and religious beliefs and how these influence people's decisions in everyday lives. In the community of KwaSwayimane, which is a traditional community where isiZulu is a local language, most of the indigenous techniques mentioned were explained in isiZulu. In some instances, this made it difficult to fully translate and explain them in a manner that would be understandable for the reader. Most existing traditional techniques and indigenous/local knowledge has been passed on from older generations and continues to be passed on to future generations. This understanding further emphasised the importance of social interaction among community members, which is also vital towards analysing the insights gathered throughout the study.

7.3 Critical review of key findings

This study was guided by four research questions: the foundation guiding the whole study, the different insights arising from the study, and how these would be analysed. The research questions were as follows:

1. What are the KwaSwayimane community's perceptions of lightning?
2. What is the community's response to the lightning warning system in KwaSwayimane?
3. Can there be an integration between indigenous knowledge or local knowledge in the communication of lightning warnings?
4. What are the roles played by the community leaders in assisting in disseminating the early warning communications for better and effective response amongst the wider community?

At the beginning of the study, as I embarked on data collection, I recognised that it was important to understand the participants' understanding of climate change before probing into their insights on lightning in the area. The participants engaged with this subject, and some understood climate change as "*ukushintsha shintsha kwezulu*" (the constant increase in temperatures), another participant (Miss Ngcobo) mentioned that "The fact that lightning strikes occur at any time during the day, sometimes they occur at 16:00 in the evening, and at other times they occur at night, this proves that there is a change in the climate around us". In their understanding of climate change, I noted that the participants explain climate change in accordance with their lived experiences, and the different weather conditions they

associate with these experiences. The symbolic interactionism approach asserts that the experiences people have influence how they view the world around them (see Fink, 2016). This means that the participants' (Mrs Mkhize and Miss Ngcobo) experiences with the changing weather conditions and with lightning have influenced how they view climate change, which they describe as a contributing factor to the weather conditions they have experienced. It was vital first to get the gist of how the participants understood climate change, as this understanding provided the foundation for discussing lightning as a natural hazard; although lightning is common, the increased occurrences of lightning are attributed to climate change.

After probing the concept of climate change, the conversation further moved towards lightning as a natural hazard. In this part of the study, I inquired into the experiences that the participants may have had of lightning and lightning strikes. To my surprise, some of the participants shared their personal experience with lightning strikes. Mrs Ngcamu shared her personal experience of lightning, when it struck her while she was at home several years back. She shared that *“Kona angikhumbuli kahle ukuthi kwenzeka kanjani, koda ngiyakhumbula ngiwela phansi endlini, ubaba waseKhaya wabe eseyobiza umakhelwane owayeyinyanga eyaziwayo emphakathini ukuthi eze ezame ukuzosiza, ngabe sengiquleka emuva kwalokho ngaphaphama esbhedlela, ngabuza o nurse ukuthi kwenzekeni base bengichazela”* (“I don't remember much about that day, but I remember there was lightning, I fell on the ground. I remember my husband going out to the neighbour who was a well-known traditional healer to seek help, and then I remember waking up in a hospital bed. After waking up, I asked the nurses what had happened, and they explained it to me”). She further explained that lightning had caused the death of one of their unborn children; she was carrying twins, and one was stillborn. Fortunately the other child survived, although according to the mother s/he constantly faces physical difficulties. Another participant (Mrs Mkhize) described how her neighbour's houses had been negatively affected by lightning strikes in the past, whether by striking their livestock or injuring a person. This was useful information to obtain, as it pointed out how these experiences made the participants thankful to have the lightning warning system in place, as they were better protected from lightning strikes and other natural hazards (Mrs Ngcamu and Mrs Mkhize shared that they feel safer now knowing that they get alerts of incoming electric storms).

Over the course of the study, several themes emerged which revealed great insights regarding these questions through interaction with participants and the insights they provided. The themes that emerged mainly concerned the importance of local/indigenous traditional techniques to protect against lightning strikes and their significance in KwaSwayimane. The next critical theme was the integration of the traditional indigenous techniques into the lightning warning system, which further emphasised the importance of the key roles of community leaders. The last key research question was the community's

education on the lightning warning system; this theme arose after engaging with the participants. These research foci or themes make up both the qualitative and quantitative parts of the study, where they have been discussed. I will endeavor to analyse these findings further in this section.

7.3.1 Indigenous/local techniques and their importance in traditional communities

One of the indigenous techniques revealed by the participants in the study was *ukukhipha abafana bezulu* (taking out sticks), which can be described as sprinkling wooden sticks with a mixture of traditional herbs which protects from lightning, as the lightning is believed to be repelled by the smell given off by the herb and water mixture. The males in the household place these sticks on top of the roof. Another method described was *ukushisa umsuzwana/impepho* (burning *lippia javanica*; burning incense), a mixture of traditional herbs also believed to give off an odor that repels lightning. A third possible technique was *ukuchela ngentelezi* or *ukukhipha amajazi* (taking out coats). These coats are normally worn by a male traditional healer; the belief is that the lightning would not strike their clothes, because their ancestors give them powers, and these powers are transferred to their clothes when they wear them. Following this logic, the participant explained that if lightning were to strike the clothing, this would indicate that lightning was sent to strike that particular person. Another method given to ward off lightning was sprinkling holy water/jeyes fluid/*umadubula* and salt throughout the house before an electric storm. The holy water is normally prayed over by a local pastor. Therefore, lightning strikes would not enter that house because the presence of this water would mean it was protected by 'God'. *Ukukhuluma nezulu* (talking to and directing the lightning) was briefly explained by the participants as being practiced by traditional healers, as ordinary people do not have the power to talk to lightning. It was further noted that it would be 'witchcraft' for someone to 'speak to the lightning' and direct the strikes away from them. Another method given was *ukuchela ngomanyazini* (sprinkling manganese); this is much the same as *ukuchela ngentelezi*. A tyre on the roof was also believed to work, following the belief that the rubber found in tyres repels lightning strikes, ensuring that a household with a tyre on the roof would not be struck by lightning.

This research question looked at the participants' perceptions and insights on the techniques that they use to protect themselves from lightning strikes in this community. Their shared experiences on lightning strikes revealed the ongoing importance of these techniques, even though the lightning warning system has been installed in the community. Some of these techniques were discussed in Chapters 3 and 4. These are the *Insingisi*/lightning bird and how it alerts them to lightning, *ukushisa umsuzwana*/burning *lippia javanica*, *ukushisa izinyamazane*, *impepho*/burning incense, *ukukhipha abafana bezulu* (*izikhonkwane*)/taking out sticks, sprinkling holy water/jeyes fluid/*umadubula*/salt, *ukukhuluma*

nezulu/speaking with lightning and *ukukhipha amajazi nento yokgqoka*/taking out coats. The techniques mentioned above were explained by the participants in different narratives, which will be discussed.

Mrs Sibiya and Mrs Madlala shared that the bird's name is "*Insingisi*", a Southern ground hornbill. They described it as a bird similar to an owl. Mr Skhakhane further explained that the *Insingisi* bird is called *inyoni yezulu* (a bird of the weather). He further noted that the bird has a 'gift' to foresee weather conditions. He explained that the bird was given these powers by 'God' to foresee weather conditions before they occur. Mr Skhakhane also noted that the *Insingisi* bird is different from other birds because of its 'gift'. The participants further explained that whenever the bird was visible in the community, they would know that lightning or some other natural hazard was due to occur. Mr Skhakhane provided an understanding of how the bird can 'foresee' weather conditions. According to him, the bird was given powers by 'God'. This knowledge has influenced how the participant perceives 'God', which he named '*uMvelinqangi*' and described as a higher being that gives power. From this insight, I also understood that the knowledge of the *Insingisi* bird was understood to be a more traditional prediction technique, being influenced by traditional beliefs that are known to the participants. It is also noted that this insight is influenced by the participants' interaction as "traditional practices aim to construct community identity, to define how one relates to others, and to instruct how one experiences the group to which one belongs" (Hsin-Chao, 2014, p.5). Acknowledging the participants' insights is useful, as they are known among other community members. This would make incorporating them into the design of the lightning warning system, or at the very least design of the dissemination of the warnings, effective in contributing towards conserving the traditions of the community. By incorporating these local techniques into the warning system, the community will also be able to preserve these methods for future generations and for other communities.

Other participants shared thoughts concerning *ukushisa umsuzwana*, which could be translated as burning *lippia javanica* and mixed herbs traditionally used to protect people from malicious spirits. The burning of *impepho/izinyamazane*, incense/sage, is like the burning of *umsuzwana/lippia javanica*. Mrs Mkhwanazi, a participant in the study, explained that in this incense (*impepho*), there is a mixture of different traditional herbs combined to protect a person from evil spirits and bad things. These herbs are then mixed to create *impepho*. They can also be burned to protect people from lightning strikes, especially the lightning "created by people". She further explained that when lightning occurs, it is often believed that it is not natural, which is why they protect themselves from lightning strikes using the same *impepho* that is used to ward off evil spirits.

Other participants also noted that they sprinkle 'holy water' outside their houses to protect themselves from lightning strikes. Mrs Phakathi and Miss Hlophe explained that they obtain this holy water from

their pastors in their respective churches. Mr Skhakhane explained that as they have faith that the pastors can connect with ‘God’, therefore, as the ‘holy water’ is blessed by these pastors, it would be imbued with the power to protect against lightning strikes. The participants asserted that sprinkling jeyes fluid, which is known as *umadubula*, in their houses would also protect them from lightning strikes. This follows the idea that sprinkling jeyes fluid or *umadubula* is similar to sprinkling water and mixed herbs, as the lightning would be repelled by the smell of *umadubula* (Mrs Phakathi). The belief in ‘God’ influences the belief in techniques such as sprinkling holy water. As explained by the participants, these are methods which someone would have taught them through interaction; this is explained in the social interaction approach by Galbin (2014, p.84), saying that “knowledge and systems are inherently dependent upon communities of shared intelligibility and vice versa”.

The *ukukhipha amajazi/ingubo* (takes out a coat or clothing) and *ukukhuluma nezulu* (translated as ‘speaking to the lightning’) methods were not so easily explained. As I attempted to have the participants elaborate on this theme, I observed that although this knowledge was seemingly common among some of them, they could not fully engage on the subject, instead pointing out that “*Lokhu abakwazi kahle, umuntu oyinyanga noma isangoma uyena onolwazi oluningi, kuyinto nje abakhula betshelwa yona*” (Mrs Mkhize in the focus group discussion). This could be translated as “We don’t know the exact local understandings on this, although we were told of it and have some of knowledge of these things, normally someone who is a traditional healer would have more to share on this”. I pushed on, and one participant (Mrs Mkhwanazi) explained that traditional healers, ‘*izinyanga*’, remove their clothes to prevent lightning from striking them and their homes. She explained that as traditional healers wear these clothes, the grime from their bodies is transferred to the clothing. As traditional healers are given power by the ‘Gods’, and since the ‘grime’ from their bodies is on the clothing, they are able to ‘trick’ the lightning by removing these items of clothing and laying them outside. Therefore, instead of themselves being struck by lightning, the lightning will target the clothes. She added that this follows the belief that if lightning strikes someone’s clothing, the lightning was in fact ‘sent’ to them via witchcraft, meaning that it was not natural lightning. From the insight provided by the participants on speaking to lightning, it may also be an advantage for the scientific field to engage more with traditional healers to gain their insights and perceptions about early warning systems. These traditional healers could also be leaders who contribute towards disseminating the messages sent via the lightning warning system; their insights may also be important, as they contribute towards indigenous/local knowledge as given by the community members. It is asserted by Hlabano (2013, p.121) that incorporating knowledge of traditional healers “will go a long way in moving traditional medicine towards being formally recognised”. The knowledge that traditional healers ‘*inyanga noma isangoma*’ (which is a traditional healer) hold is also important in the scientific field. They have a deeper understanding of the local community; therefore, incorporating their knowledge will be useful.

Participants also explained the subject of “a person being able to speak/talk to lightning”. Mrs Mkhwanazi explained that in her knowledge, “*a person who could talk to lightning is umuntu othakathayo/a person who practices witchcraft*”. She further explained the belief that they can speak to lightning because the lightning has been created by someone and sent to someone else. She also explained that as the person would speak to lightning, they would speak as if they were directing it somewhere (this was where they would know that they practice witchcraft because a traditional healer does not do this). It was also noted that like the explanation of clothing in the above paragraph, this was not ‘common knowledge’, as some of the participants did not know this. These themes were interesting, as they pointed out the importance of interaction and information sharing among communities. In the focus group discussions, some participants (here, Mr Dube) noted that some of the insights shared were not previously known to them. Still, they were more enlightened in those subjects’ reception because of the discussion, such as the techniques used by traditional healers which they were of aware of, though did not understand how the coat might protect against lightning strikes. Efforts towards integrating local/indigenous knowledge into early warning systems would be important in improving the community’s reception to the warning system. In this study, it would be vital to understand the community members’ perceptions of the lightning warning system, which is visible to them, in future efforts to improve community perceptions of the lightning warning system.

7.3.2 The integration of these indigenous/local techniques in the lightning warning system

As I proceeded with the study, the theme of traditional techniques sharpened an interest in the integration of these indigenous/local techniques into the lightning warning system. Increasing its inclusivity within the community by incorporating familiar techniques and integrating them into the system would have a positive impact on the community of KwaSwayimane. Insights obtained highlighted the importance of collaborating between indigenous/local knowledge and scientific knowledge in the form of a lightning warning system. The participants named numerous recommendations, such as installing more alarm poles in the area, having more time to prepare for lightning strikes by sending out messages well ahead of time, and including community members’ indigenous knowledge in the warning system.

These themes were discussed in Chapter 6 of the study. The participants highlighted the importance of incorporating their indigenous/local knowledge with the lightning warning system. The insights given by the participants were to install more alarms in the area; to maintain the upkeep of the SMSs sent out to the community leaders and, when this is done, centralise the SMSs by also including the wider community; to include more descriptive data in the messages; and also to include ‘common’ techniques which are

well-known to the community. The participants confirmed that they noted the use of their local language in the messages and applauded this decision.

7.3.3 Key roles played by the community leaders in the dissemination of the lightning warning system

The importance of the community leaders, who are also local farmers, came into play. The farmers in the project, of which the early warning system project is one part, are also members of the community, meaning that they are likewise involved in other community structures such as religious groups and other social affiliations. The community leaders are important in this study, as they are part of the pilot group in the community who receive the warning SMSs. As leaders, they play a crucial role in disseminating the warnings to the wider community. The community leaders interact with the other community members, which influences the wider community perceptions of the warning system. Mrs Mkhize shared that, as she receives the messages, a group of other farmers would tease her by saying, “She is special, we receive the weather forecast by listening to the radio and watching TV, but for Mrs Mkhize, she is updated on her phone”. She said that she would then explain how she receives the messages and how they are helpful to her and other community leaders.

The subject also engaged the social bonds, trust, and interaction among community leaders and how they influence the ways in which other community members prepare themselves for natural hazards in the area. There is trust among community members, as they are familiar with each other. These social bonds exist among the community as they have shared experiences, having lived in the same area for an extended period. The participants also noted that the community leaders have created other means of communication. Miss Ngcobo, a female farmer and a community leader, noted that she receives updates through a WhatsApp group. As she does not receive SMSs, this puts her at ease, as she can prepare herself for natural hazards even without receiving an official SMS.

7.3.4 Education on the lightning warning system

Lightning is a natural hazard that affects everyone, especially those who are more vulnerable than others. Because of this vulnerability, a lightning warning system was introduced to assist the community of KwaSwayimane as it is particularly vulnerable to natural hazards such as lightning strikes. The warning system is meant to be community-based, meaning it contains knowledge specific for the community in this area. Educating the community on the lightning warning system is vital to ensure that they understand

the message contained in the warning. Providing the community with this critical local level knowledge is vital. According to Basdew et al. (2017,p.67), “indigenous indicators can be mainstreamed into the scientific literature to create a robust system for farmers to use”. This can be done through educating both the community and the lightning warning facilitators on these indigenous techniques such as *ukukhishwa kwabafana*/taking out sticks, *ukushisa umsuzwana*/burning *lippia javanica* or *ukushisa impepho, inyamazane*/burning incense or sage. Educating the local community on these initiatives could also contribute to the scientific community, as the importance of these indigenous techniques will provide motivation for documenting their existence and significance in local communities.

7.4 Theoretical integration

7.4.1 Social constructionism

Galbin (2014, p.85) postulates that “to say of something that it is socially constructed is to emphasise its dependence on contingent aspects of our social selves”. From this position, the study gathers that although the community leaders share the warnings with other community members, this does not mean that they have abandoned the indigenous techniques taught to them by their parents and elders. Instead, they try to ‘infuse’ their indigenous/local techniques with the lightning warning system’s information to feel more protected from lightning strikes. The social environment in their community allows them to consciously share their knowledge with other community members because of their social values and the bonds created via their shared experiences. In the study, the participants subsequently revealed the importance of indigenous knowledge and techniques shared through mutual cultural and traditional understanding, and the socially constructed realities and insights shared. In the study, the reflexivity of the community members was also revealed in the instance where a community leader shared her views on the indigenous techniques shared by others, sharing that their different belief systems are reason for them using different techniques. In the study, participants also revealed the deeper meanings carried by the isiZulu language, as it was not only a language of instruction within the community of KwaSwayimane, but also carries the different meanings of the indigenous techniques that were discussed. The use of the isiZulu language by the participants allowed them to explain the indigenous techniques and their different meanings. In the process of defining what each technique meant, its significance to their ‘culture and tradition’ was also important, as these traditions provide meaning to people as social beings.

7.4.2 Symbolic interactionism

The theoretical approach of symbolic interactionism emphasises the importance of “social networks, social structure, and social organisation among communities” (Fink, 2016, p10). The participants of this study also expressed insights on the shared social organisation in their community. The insights obtained from the roles played by community leaders highlighted the social structure in KwaSwayimane. The shared techniques noted in the study also highlighted the debate on the different indigenous techniques and their importance. It is shared by Burr (1995, p.65) that “change is possible through opening up marginalised and repressed discourse”. The integration of indigenous/local techniques with the lightning warning system discussion revealed that an open discussion within the community would be beneficial for community members to share their insights on the importance of these indigenous techniques with others.

7.5 Recommendations and further research

After critical engagement with the participants in the study, there was an opportunity to gain from their invaluable insights by coming up with future recommendations for community-based early warning systems. The recommendations provided by the community and the community leaders which could be implemented to improve the community’s experience of the warning are found in the fourth core component of early warning systems, which is response capability. The Third Conference on Early Warning (2006, p.8) asserts that this component aims to “strengthen the ability of communities to respond to natural disasters through enhanced education of natural hazard risks, community participation and disaster preparedness”. These strategies are an advantage, as they influence the community’s experience of lightning and other natural hazards. Careful consideration of these strategies and proposed plans would assist one or multiple community members who previously would have been more vulnerable to lightning strikes.

The recommendations discussed are those that would be put in place to improve the experience for the community, as the crux of this study is to understand the community’s perceptions and to garner insights on the lightning warning system installed in the area of KwaSwayimane. The most common recommendation among other warning systems which could feasibly be done is to offer response options for inclusion in annual updates of the warning system’s strategies, and to discuss these possible inclusions with the community members. This involves ongoing engagement with the community on plans which can be used to make the warning system more compatible with the community’s needs. The International Federation of Red Cross and Red Crescent Societies (2012, p.64) asserts that “contingency or response plans to cover the needs of the whole community are a good idea, but so are response plans at the

household level”. It would be a good idea to have ideas that involve both the community elders and the younger generations of the community. This interaction is very useful, as indigenous knowledge shared among these individuals will yet be used by future generations.

Another method where this system could be improved is through enhanced/added communication channels. It is noted that the system already uses multiple channels such as SMSs and the robot/alarm system, both of which are centralised to the wider community. Additional communication channels would, however, be advantageous, as existing channels may not be easily available to everyone, such as those who do not have phones, and/or those who stay far away from the school. These added channels may be found through local radio stations. It is further asserted by the Third International Conference on Early Warning (2006, p.5) that “multiple communication mediums can be used for warning dissemination (e.g. mass media and informal communication)”. It is applauded that the system already caters for multiple channels. Still, adding to the channels would be an advantage for the community (such as issuing these alerts on a local radio station, as this would increase the number of people who receive the warnings) as this system was installed to assist the community of KwaSwayimane.

Similar to the community leaders’ recommendations of ‘more education and workshops’ on these strategies and the functioning of the warning system, “Public awareness is an important aspect of the communication of warnings” (see Liang, 2017, p.32). Educational programmes which could be aimed at school children and the general community are needed. In my minor engagement with facilitators on the warning system, before embarking on data collection, I became aware that a school programme was administered in the Swayimane Secondary school where the warning system is located. During this programme, the school children were taught about the system and about climate change. Programmes like these are important not just for the schoolchildren but for the whole community, as these would allow the community to be taught about climate change and natural hazards such as lightning, making it easier for them to learn about lightning and techniques that they can use to protect themselves from lightning strikes. This would also be an important space for them to share their local knowledge and insights on their understanding of climate change and constructed understandings of lightning—the scientific community designed the warning system.

Another aspect that would be a point for future research in community perceptions is more/greater inclusion of the community in programmes such as the lightning warning system. A clear understanding of the system and education on issues such as climate change are important in traditional communities such as KwaSwayimane. While embarking on this study, the importance of the children’s roles in the community became an interesting subject. This study probed the perceptions of the ‘more knowledgeable’ older generation. There needs to be more research on the potential of educating the younger generations,

as they are the community's future. It is also shared by Mahomed et al. (2021, p.5) that "to raise awareness of lightning, a national lightning awareness week should be introduced to coincide with that run internationally, to promote the magnitude of risks associated with lightning and how to minimise risks, especially in rural communities". This is a good insight for further improvement into the impact and response to the warning system, as education on climate change is needed in communities, especially rural communities such as KwaSwayimane.

Another aspect that could be considered for future research would be gender and how this influences the debate on indigenous/local knowledge. In this study, I noted more female community leaders partook in the study compared to their male counterparts. This was of interest, as the female participants and farmers shared their traditional/local 'know-how' around the indigenous techniques; it was clear that the males in the focus group discussions were also vocal in explaining the techniques in more depth. These gender differences were visible in this study as the male participants, although they were lesser in number, had knowledge. As a master's study, this study did not consciously focus on the gendered dimensions, which would be critical for larger doctoral and post-doctoral research.

It would be interesting to have studies that examine gender differences in traditional communities, and how the perceptions of these differences influence perceptions of the lightning warning system within families. Gender differences play prominent roles as primary socialising agents in respective households.

7.6 Conclusion

It is argued by Mahomed et al. (2021) that lightning remains poorly understood, primarily due to its spontaneous occurrence. Research on lightning as a natural hazard leaves much to be desired in the context of the primacy of social sciences, and the critical approach which can be used to contribute to studies similar to this one. This study has covered numerous aspects regarding the understanding of lightning as a phenomenon and how it affects livelihoods. One example may be the experience shared by Mrs Ngcamu, which was deeply insightful as it highlighted the importance of early warning systems such as this one and how useful they are for the community. The findings in the study have highlighted the rich local/situated knowledge that traditional communities have concerning lightning and their indigenous knowledge on how to protect themselves from lightning strikes. This chapter has also provided a detailed overview of the study, covering the key findings discussed in the study. The chapter has also outlined the recommendations drawn from the study, as well as general recommendations for future research. This chapter has also drawn attention to the importance of community involvement and consideration in strategies such as the lightning warning system employed in KwaSwayimane which seek to assist the community. The study has highlighted the importance of community engagement and social interaction.

The warning system which was employed in KwaSwayimane has been noted to be useful. In this study, the vital role of indigenous/local knowledge and its influence on culture and tradition has been clear. Gould (2011) calls for interdisciplinary engagement of studies in climate change, where social studies and technological studies should work hand-in-hand to produce collectively beneficial knowledge. In studies that probe to understand the community, this collaboration is needed to ensure that the community's voices and opinions are heard.

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Humanities and Social Sciences Research Ethics Committee

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: +27 (0)31 260 8350/4557/3587 Email: hssrec@ukzn.ac.za Website: <http://research.ukzn.ac.za/Research-Ethics>

Founding Campuses:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville

Miss Senelisiwe Ndlela (216031126) School
13 October 2020
Of Social Sciences

Mrs. Ndlovu Howard College
c/o Swayimane Traditional Council
Ward 8 Swayimane, UMshwathi Municipality

RE: Permission to conduct research
Protocol reference number: HSSREC/00002019/2020

Project title: Community Perceptions Of An Early Warning System: A Case Study Of Swayimane, UMshwathi Local
Dear Mrs. Ndlovu
Municipality's Lightning Warning System

My name is Senelisiwe Ndlela, a Master of Social Sciences Student at the University of KwaZulu Natal, Howard College. My student number is (216031126). I am conducting a research for my master's dissertation. The topic of the research is Community Perceptions of An Early Warning System: A Case Study of Swayimane, UMshwathi Local Municipality's Lightning Warning System. The research seeks to get views of the residents of Swayimane on their perceptions of lighting early warning system.

I am hereby seeking your consent to conduct this research in the Swayimane area I will need to perform face to face interviews, focus group discussion, online interviews and telephonic interviews with members of the community. This letter serves to notify you that your application received on 02 October 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted FULL APPROVAL on the following condition: In case of face to face interviews, I will strictly observe social distancing rules.

I have provided you with a copy of my proposal which includes copies of the data collection tools and questionnaires to be used in the research process. Any amendments to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please contact me at Cell: 081 093 4905 and email: 216031126@uqn.ac.za. PLEASE NOTE: Research data should be securely stored in the matter, discipline/department for a period of 5 years.

Yours sincerely,
Senelisiwe Ndlela
This approval is valid until 10 November 2021.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2-3 months before the expiry date. A close-out report to be submitted when study is finished.

Date

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines. HSSREC

is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,



Professor Dipane Hlalele (Chair)

/dd

Mrs Albertina Zuma Ndlovu

Address: P.O. Box 35604
Wartburg 3233

Tel: 079 105 0770

Appendix 3: Informed Consent Document

Dear Participant,

My name is Senelisiwe Ndlela. I am a master's candidate studying at the University of KwaZulu-Natal, Howard College Campus. I am researching Community Perceptions of An Early Warning System: A Case Study of Swayimane, UMshwathi Local Municipality's Lightning Warning System. The study aims to provide knowledge and gain insights about the effects of lightning on the livelihoods of community members of KwaSwayimane in Pietermaritzburg. This research seeks to understand the community's perceptions of the lightning warning system towards risk reduction in the area. This study is also concerned about the role of indigenous/local knowledge in the formulation of strategies for reducing risks and vulnerability to natural disasters such as lightning. I am interested in interviewing you to share your experiences and observations on the subject matter.

Please note that:

- The information that you provide will be used for scholarly research only.
- Your participation is entirely voluntary. You have a choice to participate, not to participate or stop participating in the research. You will not be penalized for taking such an action.
- Your views in this interview will be presented anonymously. Neither your name nor identity will be disclosed in any form in the study.
- The interview will take about 30 minutes.
- The record, as well as other items associated with the interview, will be held in a password-protected file accessible only to myself and my supervisors. After 5 years, in line with the rules of the university, it will be disposed of by shredding and burning.
- If you agree to participate, please sign the declaration attached to this statement (a separate sheet will be provided for signatures).

I can be contacted at School of Social Sciences, University of KwaZulu-Natal, Howard College Campus, Durban. Email: 216031126@stu.ukzn.ac.za. Cell: 081 093 4905

My supervisor is Prof. Maheshvari Naidu who is located at the School of Social Sciences, Howard College Campus, Durban of the University of KwaZulu-Natal. Contact details: email: naiduu@ukzn.ac.za Phone number: 031 260 7657

My co-supervisor is Prof. Tafadzwanashe Mabhaudhi who is located at the School of Agriculture, Earth and Environmental Science, Pietermaritzburg Campus of the University of KwaZulu-Natal. Contact details: email: mabhaudhi@ukzn.ac.za Phone number: 031 260 5442

The Humanities and Social Sciences Research Ethics Committee office, telephone: 031 260 8350/4557/3587. Email address: hssrec@ukzn.ac.za.

Thank you for your contribution to this research study!!

DECLARATION

I..... (*full names of participant*) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participate in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.
I understand the intention of the research. I hereby agree to participate.

I consent/do not consent to have this interview recorded (if applicable)

SIGNATURE OF PARTICIPANT

DATE

.....

Isithasiselo 4: Idokhumenti Yemvume Efundisiwe

Mhlanganyeli othandekayo,

Igama lami nginguSenelisiwe Ndlela. Ngingumfundi we-Masters ofunda eNyuvesi yakwa KwaZulu-Natal, eHoward College Campus. Ngicwaninga imibono yomphakathi yezinhlelo zokuqwashisa ngengozi ngaphambi kwesikhathi: Ucwangingo lokuphendula komphakathi wase Mshwathi wendawo ukuphendula ngezinhlelo zokwexwayisa kwangaphambi kokwenzeka kombani kwaSwayimane, KwaZulu Natali. Lolu cwaningo luhlose ukuhlinzeka ngolwazi nokuthola imininingwane ngemiphumela yombani ezimpilweni zamalungu omphakathi wakwa KwaSwayimane uMshwathi. Lolu cwaningo lufuna ukuqonda umbono womphakathi ngohlelo lokuqwashisa ngombani ngokunciphisa ubungozi kule ndawo. Lolu cwaningo futhi lukhathazekile ngendima yolwazi lwendabuko / lwendawo ekwakhiweni kwamasu wokwehlisa ubungozi kanye nokulimazeka enhlekeleleni yemvelo njengokukhanya kombani. Nginentshisekelo yokuxoxa nawe ukuze wabelane ngolwazi lwakho nokubona kwakho ngalolo daba.

Sicela wazi ukuthi:

- Imininingwane oyinikezayo izosetshenziselwa ucwangingo lwezezazi kuphela.
- Ukubamba iqhaza kwakho kungokuzithandela ngokuphelele. Unokukhetha ukubamba iqhaza noma ukuyeka ukubamba iqhaza ocwanningweni. Ngeke uthole inhlawulo ngokuthatha isenzo esinjalo.
- Ukubukwa kwakho kule ngxoxo kuzokwethulwa ngokungaziwa. Alikho igama lakho noma ubunikazi bakho obuzodalulwa nganoma yiluphi uhlobo ocwanningweni.
- Ingxoxo izothatha imizuzu engama-30.
- Amarekhodi, kanye nezinye izinto ezihambisana nengxoxo, zizoba kwifayela elivikelwe ngephasiwedi elitholakala kuphela kimi nakubaphathi bami. Ngemuva kweminyaka emi-5, ngokuya ngemiyalo yenyuvesi, kuzokulahlwa noma kuhlulwahlulwe ngomlilo noma kushiswe.
- Uma uvuma ukubamba iqhaza sicela usayine isimemezelo esifakwe kulesi sitatimende (kuzonikezwa iphepha eliseceleni labasayinile)

Ngingathintwa eSikoleni SezeSayensi Yezenhlalo, eNyuvesi yaKwaZulu-Natali, iHoward College Campus, eThekwini. I-imeyili: 216031126@stu.ukzn.ac.za. Iselula: 081 093 4905

Umphathi wami nguProf Maheshvari Naidu otholakala eSikoleni seSayensi Yezenhlalo, eHoward College Campus, eThekwini eNyuvesi yaKwaZulu-Natali. Imininingwane yokuxhumana: i-imeyili: naiduu@ukzn.ac.za Inombolo yocingo: 031 260 7657

Umpathi engibambisene naye u Dr. Tafadzwanashe Mabhaudhi utholakala eSikoleni se Agriculture, Earth and Environmental Science, Kwi Pietermaritzburg Campus yase-University of KwaZulu-Natali. Imininingwane yokuxhumana: i-imeyili: mabhaudhi@ukzn.ac.za. Inombolo yocingo: 031 260 5442

Imininingwane yokuxhumana neKomidi leSayensi Yezenhlalo kanye nezeSayensi Yezenhlalo ihamba kanjena: inombolo yocingo: 031 260 8350/4557/3587. I imeyili: hssrec@ukzn.ac.za.

ISINQUMO

Mina (bhala amagama akho aphelele) ngiyavuma ukuba ingxenywe yephrojekthi yocwaningo, futhi ngiyavuma ukubamba iqhazakulephrojekthi yocwaningo.

Ngiyakuqonda ukuthi senginenkululeko yokuhoxa kulephrojekthi nganoma yisiphi isikhathi, uma ngifisa kanjalo. Ngiyayiqonda inhloso yocwaningo. Ngiyavuma ukubamba iqhaza.

Ngiyavuma / ngiyavuma ukuthi le ngxoxo iqoshwe (uma ikhona)

.....

Ngiyabonga ngeqhaza lakho kulolu cwaningo

Appendix 5: Questionnaire for participants

University of KwaZulu Natal, Howard College Campus

My name is Senelisiwe Ndlela from the University of KwaZulu Natal in Durban. I am currently studying towards a master's degree in Anthropology, it is therefore required to complete a research study of interest. This study aims to understand community perceptions of lightning early warning system: A case study of Swayimane, uMshwathi Local Municipality. I aim to understand community perceptions of the lightning warning system and gain information about the livelihoods of participants. The information you provide in this questionnaire will be used for educational purposes. This study will take about 30 minutes to complete. Your participation in this study is voluntary if you wish to remain anonymous you can unless you wish your name to be known. Your participation in this study will be helpful and appreciated. If you have any questions regarding the study or require clarity on anything, feel free to ask, I will assist you.

Section A

(please tick in the appropriate box)

	Yes	No
1. Have you experienced severe lightning or thunderstorms in the past 5 years?		
2. Has agriculture been affected by the lightning in the area?		
3. Does lightning affect food production and security in the community?		
4. Are there any strategies that are used to predict severe thunderstorms that you are aware of?		

Section B

1. What are the main sources of food production in the community?

.....
.....

2. What are the strategies used to prepare for climate change in the community?

.....
.....

3. What are the strategies used to prepare for severe lightning and thunderstorms in the community?

.....
.....

4. Are there any strategies introduced to help farmers prepare for the negative impacts of lightning if there are please elaborate.

.....
.....

5. How does the community obtain information on climate change?

.....
.....

6. Are strategies given helpful in preparing the community for severe lightning?

.....
.....

7. Is the information given familiar to the communities' strategies for preparedness for lightning? Please explain.

.....
.....

8. Are there any strategies that you know of personally which are used to prepare for lightning? Please elaborate.

.....
.....

9. How do you know of these strategies?

.....

10. How did you know of these strategies, who told you?

.....
.....

11. Do you use one or more of these strategies to help you prepare for lightning and other natural hazards in the area?

.....
.....

12. Are these strategies helpful in preparing for severe lightning?

.....

.....

13. Are there any other strategies that you are aware of which are used to help people prepare for natural hazards?

.....

.....

14. Do you share any of this knowledge with other members of the community?

.....

.....

15. Is this knowledge integrated in the lightning warning system in the community?

.....

.....

.....

Section C

1. Age group

19-20 years	
21-30 years	
31-40 years	
41-50 years	
51-60 years	

2. Gender

Female	
Male	
Prefer not to disclose information	

Married	
Divorced	
Widowed	
Separated	
Other	

3. Religious Affiliation

Christianity	
African religion	
Muslim	
Other	

4. Educational information

Informal education	
Primary	
Secondary	
High school	
Tertiary	
Other	

5. Household information

One	
Two-four	
Five-seven	
Eight- above	
Other	

6. Marital Status

Single	
--------	--

7. Employment status

Employed	
Unemployed	
Retired	
Pensioner	
Farmer	
Other	

Thank yo for your participation.

Isithasiselo 6: Uhlu lwemibuzo lwabahlanganyeli

Inyuvesi yaKwaZulu Natali, iHoward College Campus

Igama lami nginguSenelisiwe Ndlela ovela e-Nyuvesi yakwa KwaZulu Natal eThekwini. Njengamanje ngifundela iziqu ze-masters in Anthropology, ngakho-ke kuyadingeka ukuthi ngenze ucwaningo lwenzalo enentshisekelo. Lolu cwaningo luhlose ukuqonda imiqondo yomphakathi yohlelo lokuxwayiswa ngaphambi kombani: Ucwaningo lwakwaSwayimane, uMasipala waseKhaya waseMshwathi. Ngihlose ukuqonda imiqondo yomphakathi yohlelo lokuxwayisa ngombani futhi ngithole imininingwane ngempilo yabahlanganyeli. Imininingwane oyinikeza kuleli phepha lemibuzo izosetshenziselwa izinjongo zokufundisa. Lolu cwaningo luzothatha imizuzu engama-30 ukuqeda. Ukubamba iqhaza kwakho kulolu cwaningo kungokuzithandela, uma ufisa ukuhlala ungaziwa ungakwazi ngaphandle uma ufisa ukuthi igama lakho laziwe. Ukubamba iqhaza kwakho kulolu cwaningo kuzosiza futhi kuthokozise. Uma unemibuzo mayelana nocwaningo noma udinga ukucaciseleka kunoma yini uzizwe ukhululekile ukubuza ngizokusiza.

Isigaba A

(sicela ubeke uphawu ebhokisini elifanele)

	Yeb o	Ch a
1. Wake wezwa imibani noma ukuduma okukhulu kweminyaka emihlanu edlule?		
2. Ngabe ezolimo zithintekile ngumbani endaweni?		
3. Ngabe umbani uthinta ukukhiqizwa kokudla kanye nokuphepha emphakathini?		
4. Ngabe akhona amasu asetshenziselwa ukubikezela ukuduma kwezulu?		

Isigaba B

1. Imiphi imithombo ebalulekile yokukhiqiza ukudla emphakathini?

.....
.....

2. Yimaphi amasu asetshenziswayo ukulungiselela ukuguquka kwesimo sezulu emphakathini?

.....
.....
3. Yimaphi amasu asetshenziswa ukulungiselela umbani omkhulu nokuduma kwezulu
emphakathini?

.....
.....
4. Ngabe akhona amasu angenisiwe ukusiza abalimi ukuthi balungiselele imithelela emibi
yombani, uma kukhona ongacacisa kahle.

.....
.....
5. Umphakathi uluthola kanjani ulwazi ngokushintsha kwesimo sezulu?

.....
.....
6. Ngabe lamasu anikeziwe asiza kanjani ekulungiseleleni umphakathi umbani omkhulu?

.....
.....
7. Ngabe ulwazi olunikeziwe luyasiza ekuqikeleleni ukuthi umphakathi uyaphumelela
ukuzilungiselela nokuzivikela ekudumeni ngamandla kwezulu? Sicela uchaze kabanzi.

.....
.....
8. Ngabe akhona amasu owaziyo uqobo asetshenziswa ukulungiselela umbani? Sicela
uchaze kabanzi.

.....
.....
9. Uwazi kanjani la maqhinga?

.....
.....
10. Uwazi kanjani ngamasu, kungabe ubani owakuthekesela ngalolulwazi?

.....

11. Ngabe usebenzisa eyodwa noma ngaphezulu kwalawa masu ukukusiza ulungiselele umbani nezinye izingozi zemvelo endaweni?

.....

.....

12. Ngabe amasu la ayasiza ekulungiseleleni umbani omkhulu?

.....

.....

13. Ngabe akhona amanye amasu owaziyo ukuthi asetshenziswa ku-hep abantu balungiselela izingozi zemvelo?

.....

.....

14. Ngabe uyabelana nalolu lwazi namanye amalungu omphakathi?

.....

.....

15. Ngabe lolu lwazi luhlanganiswe ohlelweni lokuxwayisa ngombani emphakathini?

Isigaba C

1. Imininingwane yeminyaka yobudala

19-20 iminyaka	
21-30 iminyaka	
31-40 iminyaka	

40-45 iminyaka	
45-50 iminyaka	

51-60 iminyaka	
-------------------	--

2. Imininingwane yobulili

Owesifazane	
Owesilisa	
Oncamela ukungaphenduli	

3. Imininingwane mayelana nesimo semishado

Ongathathiwe	
Oshadile	
Ohlukanisile	
Ongumfelokazi	
Ohlukanisiwe	
Oncamela ukungaphenduli	

4. Imininingwane mayelana nokuzihlanganisa kwezenkolo

Ubu Kristu	
Inkolo yaseAfrika	

Muslim	
Okunye, cela usichasisele	
Uncamela ukungaphenduli	

5. Imininingwane mayelana nezemfundo

Imfundo engahlelekile	
Eyokuqala	
Okwesibili	
Isikole samabanga aphezulu	
Isikole sezemfundo ephakeme	
Okunye, cela usichasisele	

6. Imininingwane yasendlini

Munye	
Babili- Bane	
Bahlanu-	
Bayisikhombisa	
Bayisishiyagalombili- kuya phezulu	
Uncamela ukungaphenduli	

7. Imininingwane mayelana nokuqashwa

Oqashiwe	
Ongaqashiwe	
Othathe umhlalaphansi	
Othathe impesheni	
Umlimi	
Okunye, cela usichasisele	
Uncamela ukungaphenduli	

Siyabonga ngokubamba kwakho iqhaza kulolucwaningo

Appendix 7: Questionnaire for focus group discussions

University of KwaZulu Natal, Howard College Campus

My name is Senelisiwe Ndlela from the University of KwaZulu Natal in Durban. I am currently studying towards a master's degree in Anthropology, it is therefore required to complete a research study of interest. This study aims to understand community perceptions of lightning early warning system: A case study of Swayimane, uMshwathi Local Municipality. I aim to understand community perceptions of the lightning warning system and gain information about the livelihoods of participants. The information you provide in this questionnaire will be used for educational purposes. This study will take about 30 minutes to complete. Your participation in this study is voluntary if you wish to remain anonymous you can unless you wish your name to be known. Your participation in this study will be helpful and appreciated. Please note that the focus group discussion will be recorded, and notes will be taken during the discussion

1. How long have you been living in the area of KwaSwayimane?
2. How has food production been affected by severe thunderstorms in the area?
3. How does the community predict and prepare for severe lightning and thunderstorms?
4. Are the methods currently used by the community effective to prepare for severe thunderstorms and lightning?
5. How do community members ascertain the information they use to prepare themselves for lightning?
6. Are there any scientific strategies that you know of used by other community members to help prepare for lightning and other natural hazards?
7. In your knowledge who issues these lightning warnings.
8. Are you familiar with the administered warnings for lightning?
9. Are these warnings easily accessible to everyone?
10. How are these warnings effective towards preparing the community for lightning?
11. Are there any methods that are used by members of the community which, are unique to this community, strategies that you have known to help you prepare for lightning in the area?
12. Are these strategies effective in helping the community prepare for lightning and other natural hazards?
13. How are these strategies shared with other members of the community?
14. Are there any means put in place to share these strategies with the coming generations to continue being in place to help the community prepare for natural hazards?
15. Are these strategies integrated into the lightning warning system available in th

Isithasiselo 8: Uhlu lwemibuzo lwezingxoxo zamaqembu okugxilwe kuwo

Igama lami nginguSenelisiwe Ndlela ovela e-University of KwaZulu Natal eThekwini. Njengamanje ngifundela iziqu ze-masters kwi Anthropology. Lolu cwaningo luhlose ukuqonda imiqondo yomphakathi mayelana nohlelo lokuxwayiswa kwangaphambi kokuba kwenzeke umbani: Ucwangingo lwakwaSwayimane, uMasipala waseMshwathi. Ngihlose ukuqonda imiqondo yomphakathi ngohlelo lokuxwayisa ngombani futhi ngithole imininingwane ngempilo yabahlanganyeli. Imininingwane oyinikeza kuleli phepha lemibuzo izosetshenziselwa izinjongo zokufundisa. Lolu cwaningo luzothatha imizuzu engama-30 ukuqeda. Ukubamba iqhaza kwakho kulolu cwaningo kungokuzithandela. Uyacelwa uqaphele ukuthi ingxoxo yeqembu elizogxila izorekhodwa futhi kuthathwe namanothi.

1. Unesikhathi esingakanani uhlala endaweni yakwaSwayimane?
2. Ukukhiqizwa kokudla kuthinteka kanjani lapho kuduma izulu kakhulu endaweni?
3. Ngabe umphakathi uqagela kanjan futhi uzihlinzekela kanjani ekuzeni kombani omkhulu nokuduma kwezulu?
4. Ngabe izindlela ezisetshenziswa ngumphakathi njengamanje ziyasebenza ukulungiselela ukuduma okukhulu nokuduma kombani?
5. Amalungu omphakathi aluthola kanjani ulwazi alusebenzisayo ukuzilungiselela umbani?
6. Ngabe akhona amasu esayensi owaziyo ukuthi ayasetshenziswa ngamanye amalungu omphakathi ukusiza ukulungiselela umbani nezinye izingozi zemvelo?
7. Ngokwazi kwakho ubani okhipha lezi zixwayiso?
8. Ngabe ujwayelekile ngezexwayiso ezilungiselelwe zokukhanyisa umbani?
9. Ngabe lezi zexwayiso zitholakala kalula kuwo wonke umuntu?
10. Zisebenza kanjani lezi zixwayiso ekuhleleni umphakathi ngokwenzeka komubani?
11. Ngabe kukhona izindlela ezisetshenziswa amalungu omphakathi, ahlukile kulo mphakathi, amasu owazile ukukusiza ulungiselele umbani endaweni?
12. Ngabe lawomasu ayasebenza ukusiza umphakathi ukuthi ulungiselele umbani nezinye izingozi zemvelo?
13. Lamasu abiwa kanjani namanye amalungu omphakathi?
14. Ngabe kukhona izindlela ezenziwayo zokwabelana ngalezi zindlela nezizukulwane ezizayo ukuze ziqhubeke nokuba sendaweni ukusiza umphakathi ukulungiselela izingozi?
15. Ngabe lamasu ahlanganiswe ohlelweni lokuxwayisa ngombani ayatholakala emphakathini?

Appendix 9: Face-to-face interview questions

University of KwaZulu Natal, Howard College Campus.

My name is Senelisiwe Ndlela from the University of KwaZulu Natal in Durban. I am currently studying towards a master's degree in Anthropology. This study aims to understand community perceptions of lightning early warning system: A case study of Swayimane, uMshwathi Local Municipality. I aim to understand community perceptions of the lightning warning system and gain information about the livelihoods of participants. The information you provide in this questionnaire will be used for educational purposes. This study will take about 30 minutes to complete. Your participation in this study is voluntary if you wish to remain anonymous you can unless you wish your name to be known. Your participation in this study will be helpful and appreciated.

1. How long have you been living in the area of KwaSwayimane?
2. How has food production been affected by severe thunderstorms in the area?
3. How does the community predict and prepare themselves for severe lightning and thunderstorms?
4. Are the methods currently used by the community effective to prepare for severe thunderstorms and lightning?
5. How do community members ascertain the information they use to prepare themselves for lightning?
6. Are there any scientific strategies that you know of used by other community members to help prepare for lightning and other natural hazards?
7. In your knowledge who issues these warnings.
8. Are you familiar with the administered warnings for lightning?
9. Are these warnings easily accessible to everyone?
10. How are these warnings effective towards preparing the community for lightning?
11. Are there any methods that are used by members of the community which, are unique to this community, strategies that you have known to help you prepare for lightning in the area?
12. Are these strategies effective in helping the community prepare for lightning and other natural hazards?
13. How are these strategies shared with other members of the community?
14. Are there any means put in place to share these strategies with the coming generations to continue being in place to help the community prepare for natural hazards?
15. Are these strategies integrated into the lightning warning system available in the community?

Isithasiselo 10: Imibuzo vengxoxo yobuso nobuso

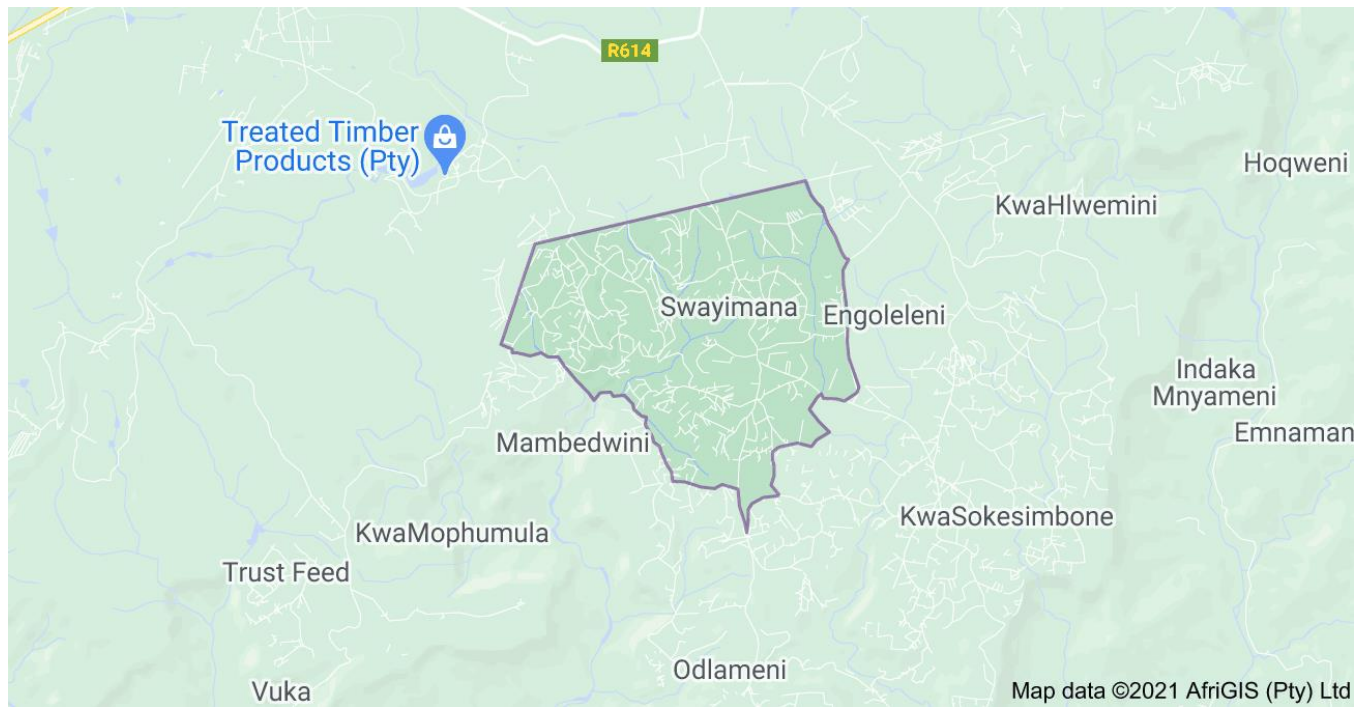
Inyuvesi yaKwaZulu Natali, iHoward College Campus.

Igama lami nginguSenelisiwe Ndlela ovela e-Nyuvesi yakwa KwaZulu Natal eThekwini. Njengamanje ngifundela iziqu ze-master in Anthropology. Lolu cwaningo luhlose ukuqonda imiqondo yomphakathi mayelana nohlelo lokuxwayisa mayelana nokwenzeka kombani: Ucwangingo lwakwaSwayimane, ongaphansi kwaMasipala waseMshwathi. Ngihlose ukuqonda imiqondo yomphakathi yohlelo lokuxwayisa ngombani futhi ngithole imininingwane ngempilo yabahlanganyeli. Imininingwane oyinikeza kuleli phepha lemibuzo izosetshenziselwa izinjongo zokufundisa. Lolu cwaningo luzothatha imizuzu engama-30 ukuqeda. Ukubamba iqhaza kwakho kulolu cwaningo kungokuzithandela, uma ufisa ukuhlala ungaziwa ungakwazi, uma unesifiso sokuth imininingwane yegmama lakho yaziwe naloko ungakwenza. Ukubamba iqhaza kwakho kulolu cwaningo kuzosiza.

1. Unesikhathi esingakanani uhlala kulendawo yakwaSwayimane?
2. Ukukhiqizwa kokudla kuthinteka kanjani lapho kuduma izulu kakhulu endaweni?
3. Ngabe umphakathi uqagela kanjan futhi uzihlinzekela kanjani ekuzeni kombani omkhulu nokuduma kwezulu?
4. Ngabe izindlela ezisetshenziswa ngumphakathi njengamanje ziyasebenza ukulungiselela ukuduma okukhulu nokuduma kombani?
5. Amalungu omphakathi aluthola kanjani ulwazi alusebenzisayo ukuzilungiselela umbani?
6. Ngabe akhona amasu esayensi owaziyo ukuthi ayasethsenziswa ngamanye amalungu omphakathi ukusiza ukulungiselela umbani nezinye izingozi zemvelo?
7. Ngokwazi kwakho ubani okhipha lezi zixwayiso?
8. Ngabe ujwayelekile ngezexwayiso ezilungiselelwe zokukhanyisa umbani?
9. Ngabe lezi zexwayiso zitholakala kalula kuwo wonke umuntu?
10. Zisebenza kanjani lezi zixwayiso ekuhleleni umphakathi ngokwenzeka komubani?
11. Ngabe kukhona izindlela ezisetshenziswa amalungu omphakathi, ahlukile kulo mphakathi, amasu owazile ukukusiza ulungiselele umbani endaweni?
12. Ngabe lawomasu ayasebenza ukusiza umphakathi ukuthi ulungiselele umbani nezinye izingozi zemvelo?
13. Lamasu abiwa kanjani namanye amalungu omphakathi?
14. Ngabe kukhona izindlela ezenziwayo zokwabelana ngalezi zindlela nezizukulwane ezizayo ukuze ziqhubeke nokuba sendaweni ukusiza umphakathi ukulungiselela izingozi zemvelo?

Ngabe lamasu ahlanganiswe ohlelweni lokuxwayisa ngombani ayatholakala

Appendix 11: Map of KwaSwayimane



Map of KwaSwayimane: Source AfriGis 2021.