DURBAN UNIVERSITY OF TECHNOLOGY

THE EFFECTS OF RISK MITIGATION AND LOCAL KNOWLEDGE IN DISASTER-PRONE COMMUNITIES IN JOZINI LOCAL MUNICIPALITY

AYANDA MUMETHENI GUMEDE

JUNE 2024

THE EFFECTS OF RISK MITIGATION AND LOCAL KNOWLEDGE IN DISASTER-PRONE COMMUNITIES IN JOZINI LOCAL MUNICIPALITY

Submitted in fulfilment of the requirements of the
degree of Master of Management Sciences
specialising in
Public Administration
in the
Faculty of Management Sciences
at the Durban University of Technology

AYANDA MUMETHENI GUMEDE

JUNE 2024

APPROVED FOR FINAL SUBMISSION

Supervisor: Dr Omololu Fagbadebo DUT (signature) Date: 1 June 2024

DECLARATION

I, **Ayanda Mumetheni Gumede**, do hereby declare that this dissertation is the result of my investigation and research and that this has not been submitted in part or full for any degree to any other university.

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A.M Gumede

Date: 01 JUNE 2024

DEDICATION

This work is dedicated to my husband, Boet Vusi Gumede, my three boys and the memory of my late Dad. They encouraged me emotionally and spiritually to venture into undertaking the study.

ACKNOWLEDGEMENTS

Foremost, I want to extend heartfelt gratitude to my supervisor, Dr. Omolola Fagbadebo, for his invaluable guidance, unwavering support, and remarkable patience throughout my academic journey. His extensive knowledge and abundant experience have been instrumental in fostering my progress in research.

I wish to express my sincere appreciation to Jozini Local Municipality for generously permitting me to pursue my studies. Without their support, the realization of my dissertation would not have been feasible.

A special acknowledgement is due to my late father, Mdikileni “Sgewuzane” Xaba. I am consistently driven to achieve more, aspiring to make him proud. "Rest well Nonkosi."

I extend my deepest gratitude to my husband, "Boet Vusi," and my beloved sons, Hlelo, Muhle, and Ndalo, for their unwavering motivation, steadfast support, boundless love, and personal sacrifices.

Lastly, I want to convey my thanks to God, the source of my strength, as well as to my colleagues, friends and the tribal leaders and elders of Jozini. Their benevolent assistance and support have transformed my academic journey into a rewarding experience. Without their profound understanding and encouragement over the past few years, completing my studies would have been an insurmountable challenge.

Ayanda Mumetheni Gumede

ABSTRACT

Risk mitigation and local knowledge in disaster-prone communities worldwide require an integrated approach to safeguard lives and minimize damages. Climatic changes in the Jozini area, resulting in flooding as well as other related hazards have underscored the necessity for the local government to consolidate its strategies for disaster risk mitigation together with traditional authorities to tap into local knowledge towards disaster management.

Challenges within the Jozini Local Municipality (JLM), include a shortage of trained personnel in risk assessment and disaster response, a lack of suitable community organizations with the necessary skills to participate in the disaster management process, and inadequate disaster preparedness kits. Further, the community of Jozini and its environs have their understanding about the causes and risk mitigation measures that in most instances run counter to the efforts and actions of the JLM disaster management protocols.

This study aims to identify solutions for the practical implementation of risk mitigation and local knowledge efforts and explore its related theoretical aspects. The research explores the existing risk mitigation and local knowledge in disaster-prone communities in use at JLM, along with the pertinent guidelines currently available.

The study adopts an interpretive research philosophy, grounded in a qualitative research approach. The Study draws on the Protection Motivation Theory (PMT) which sheds light on the threat as well as the coping appraisal of people within a community. Specifically, an exploratory research design is chosen to gain a deeper understanding of risk mitigation and local knowledge in JLM.

Convenience sampling was utilized to select ten tribal leaders from selected tribes within the Jozini community as well as 4 personnel from the Jozini safety and disaster management department for interviews. Data gathered from the interviews were transcribed, categorized, and analyzed thematically.

The findings indicated that the daily life practices of tribal leaders (elders) in Jozini, and by extension, the community, are influenced by ancestral wisdom, which sometimes contradicts modern science. There appears to be a strong correlation between cultural wisdom and mystical beliefs. Meanwhile, officials from the JLM are striving to leverage local knowledge to address

disasters by collaborating with the community in decision-making for disaster management. This collaboration aims to ensure effective preparedness and response efforts.

Additionally, the findings underscored the crucial necessity of ensuring the positive impact of controlled practices and municipal initiatives for coping. Collaboration with stakeholders, such as water affairs, the Department of Cooperative Governance and Traditional Affairs (COGTA), and the Department of Basic Education, needs to be pursued to make disaster mitigation efforts a collective responsibility.

Key words: Disasters, hazards, disaster preparedness, disaster management, local government, local knowledge, risk mitigation

ACRONYMS AND ABBREVIATIONS

COGTA	CORPORATIVE GOVERNANCE AND TRADITIONAL AFFAIRS
CVCA	COMMUNITY-WIDE VULNERABILITY & CAPACITY ASSESSMENT
DMA	DISASTER MANAGEMENT ACT
DMC	DISASTER MANAGEMENT CENTRE
DM	DISTRICT MUNICIPALITIES
DPLG	DEPARTMENT OF PROVINCIAL & LOCAL GOVERNMENT
DRR	DISASTER RISK REDUCTION
EPA	ENVIRONMENTAL PROTECTION AGENCY
EPC	EMERGENCY PREPAREDNESS CANADA
ERP	EMERGENCY RESPONSE PLAN
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY
FFC	FINANCIAL AND FISCAL COMMISSION
GIS	GEOGRAPHIC INFORMATION SYSTEM
GDP	GROSS DOMESTIC PRODUCTS
HIRV	HAZARD IMPACT RISK VULNERABILITY
HRV	HAZARD RISK VULNERABILITY
ICDM	INTERGOVERNMENTAL COMMITTEE ON DISASTER MANAGEMENT
IDP	INTEGRATED DEVELOPMENT PLAN
IDRM	INSTITUTE OF DISASTER RISK MANAGEMENT
IPCC	INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
KPA	KEY PERFORMANCE AREAS
KPI	KEY PERFORMANCE INDICATORS
LCDs	LESS DEVELOPED COUNTRIES
MDMC	MUNICIPAL DISASTER MANAGEMENT CENTRE
MSA	MUNICIPAL SYSTEMS ACT
NDMF	NATIONAL DISASTER MANAGEMENT FRAMEWORK
NDMC	NATIONAL DISASTER MANAGEMENT CENTRE
NDMAF	NATIONAL DISASTER MANAGEMENT ADVISORY FORUM
NGO	NON-GOVERNMENTAL ORGANISATION
NIDMC	NATIONAL INTERDEPARTMENTAL COMMITTEE ON DISASTER MANAGEMENT
NOAA	NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
NRP	NATIONAL RESPONSE PLAN
JLM	JOZINI LOCAL MUNICIPALITY
PDMC	PROVINCIAL DISASTER MANAGEMENT CENTRE

PFMA	PUBLIC FINANCIAL MANAGEMENT ACT
PMT	PROTECTION MOTIVATION THEORY
PPP	PUBLIC PRIVATE PARTNERSHIPS
SAWS	SOUTH AFRICAN WEATHER SERVICE
UNDP	UNITED NATIONS DEVELOPMENT PROGRAMME
UNDRO	UNITED NATIONS DISASTER RELIEF ORGANISATION
UNEP	UNITED NATIONS ENVIRONMENT PROGRAMME
UNISDR	UNITED NATIONS INTERNATIONAL STRATEGY FOR DISASTER REDUCTION
UAVs	UNMANNED AERIAL VEHICLES

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2.1 INTRODUCTION

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CHAPTER ONE

1.1 INTRODUCTION

Disasters present substantial disruptions to the daily lives of individuals and communities, leading to disproportionate loss of human lives, infrastructure damage, and environmental devastation (Peters, Peters, Twigg & Walch, 2019:14). Climate change has emerged as a primary driver of disasters, as indicated by multiple sources. The World Bank Group (2023:8) highlights that climate change has amplified the impact of storms, floods, and droughts, placing more people at risk. The United Nations Office for Disaster Risk Reduction (UNDRR, 2021:3) also underscores a significant rise in climate-related disasters and extreme weather events since 2000 compared to previous decades.

South Africa, with its extensive coastline spanning the Atlantic and Indian Oceans, faces additional challenges. Rising sea levels due to global warming and climate change heighten the probability and severity of coastal flooding. Regrettably, during floods, the most impoverished and vulnerable individuals in developing nations often suffer the greatest losses, including loss of life and livelihoods. Despite developing countries in the global south representing only 9% of hazards and disaster-related incidents, they bear 48% of the reported fatalities.

South Africa has recently witnessed devastating disasters of considerable magnitude. In January 2021, Cyclone Eloise, a category 2 tropical cyclone that brought heavy rains and strong winds, severely impacted the communities of Jozini, Mtubatuba, Umlalazi, and Ulundi (Mokhoali, 2021:6). In April 2022, record-breaking rainfall of over 300mm in under 24 hours triggered widespread flooding in parts of KwaZulu Natal, resulting in extensive loss of infrastructure, land, homes, and lives. Tragically, more than 400 people lost their lives as a result.

While completely eliminating disaster risks is a formidable task, their adverse impacts can be mitigated through effective measures. Disaster risk mitigation involves systematic efforts to analyze and manage the factors contributing to disasters, including reducing exposure to hazards, decreasing vulnerability of people and property, responsible land and environmental

management, and enhancing preparedness for adverse effects. Risk mitigation can be achieved through various means, including the application of technology and the incorporation of effective local practices and knowledge.

Over the past six decades, advanced technologies have been employed in disaster risk mitigation efforts, such as high-resolution satellite imagery, digital cartography, and modern engineering in construction. Concurrently, the utilization and integration of local knowledge in disaster risk mitigation have gained recognition since the 1970s. The significance of local knowledge became apparent in scientific research circles following the 2004 Indian Ocean earthquake and tsunami when the Simeulue people of Sumatra, Indonesia, shared their oral stories that served as an early warning system, predicting the disaster and saving lives.

With the combined advantages of science, technology, and the growing understanding and application of local knowledge in disaster risk mitigation, this study aims to investigate the impact of risk mitigation strategies and local knowledge in disaster-prone communities within the Jozini Local Municipality.

1.2. PROBLEM STATEMENT

The Jozini Municipality Disaster Risk Management Advisory Forum (JMDRMAF) was established in 2017 under the provisions of Section 51 of the Disaster Management Act (Act 57 of 2002) to coordinate stakeholder actions related to disaster management. However, the municipality faces numerous hazards, as identified in its Integrated Development Plan (IDP) and rated on a matrix of low, medium, high, and very high risks. The 2020/2021 IDP report highlighted several hazards categorized as very high risk, including drought, animal diseases, HIV/AIDS, veld and forest fires, house fires, and severe thunderstorms. In January 2021, the impact of Cyclone Eloise, originating from Mozambique, significantly affected Jozini and surrounding areas, causing heavy rainfall, localized flooding, power outages, and property damage. This event emphasized the need for effective risk mitigation measures in the municipality.

During community visits and awareness campaigns conducted by the Jozini disaster management team, it was observed that some community members rely on indigenous

knowledge due to the absence of sufficient and timely early warning systems to prepare for disasters. The example of the Simeulue people in Indonesia, who were able to predict the 2004 earthquake and tsunami using local knowledge, further highlights the potential value of incorporating local knowledge in disaster risk reduction efforts. Therefore, this study aims to investigate the impact of risk mitigation strategies and the utilization of local knowledge in disaster-prone communities within the Jozini Local Municipality.

1.3. OPERATIONAL DEFINITION OF CONCEPTS

To ensure consistency and a comprehensive understanding of the central issues addressed in this dissertation regarding disaster mitigation and its relationship to local knowledge, it is crucial to provide precise and concise operational definitions for key concepts used throughout the study. It should be acknowledged that certain concepts or terms are used interchangeably in scholarly articles and various government publications, both domestically and internationally. Thus, in this research, the terms 'mitigation' and 'prevention' are used interchangeably to avoid any contradictory usage. Similarly, terms such as 'Indigenous knowledge,' 'traditional knowledge,' or 'local ecological knowledge' may occasionally be referred to simply as 'local knowledge' (Velasquez, 2017:4).

Disaster

A disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts which exceeds the ability of the affected community or society to cope using its own resources. (Cutter, Susan, Christopher & Emrich, 2016:13; David, 2015:9).

Disaster declarations

Disaster declarations involve the use of established guidelines and procedures. Because disasters mostly begin at the local level, declarations are made by the mayor or city manager in

the case of South Africa (Federal Emergency Disaster Management, 2020:17; Disaster Management Act, 2002:3, Act No. 57 of 2002:9)

Emergency

The terms emergency and disaster are often used interchangeably; however, emergencies usually deal with small-scale and localized disaster-related incidents, whereas large-scale emergencies can escalate into disasters. (Cutter et al, 2016:5)

Indigenous knowledge

Indigenous knowledge is defined as a corpus of information held through generations by a group of people who have lived in close proximity to nature. It speaks of the information still held by the area's first occupants and is a product of many generations of experience and problem-solving by ethnic groups on a local level United Nations Environment Programme [UNEP] (UNEP, 2008:9)

Integrated planning

Planning that takes into account all the conditions and circumstances that contribute to a plan's success and that the plan affects (Integrated Development Planning,2023:8; David, 2015).

Local knowledge

Local knowledge is defined as the knowledge that has been created over time and has grown within each community. It has been evolved via millennia of iterative testing, suited to the local environment and culture, and ingrained in social customs, relationships, and practices (Hilhorst 2003:4).

Mitigation

This refers to actions taken to prevent or reduce the cause, impact and consequences of human actions or natural phenomena that may lead to disasters (Bello, Bustamante & Pizarro, 2021:9).

Non-governmental organisations

Any group that receives funding voluntarily and without reference to any laws. They work frequently with foreign organizations like the United Nations (UN) and other donor organizations and are independent of government agencies (Ebrahim, 2016:21; Edwards, 2010:22).

Preparedness

Preparedness is a phase in disaster management that may include events such as planning, training, educational activities towards phenomena that cannot be mitigated against (Burton, Kates & White, 2002:16).

Prevention

Efforts to offer complete avoidance of dangers and related environmental, technical, and biological disasters and their negative effects (Cutter & Emrich, 2016:4)

Recovery

The recovery period in a disaster is a period where restorative efforts runs concurrently with regular operations and activities. The recovery period can be prolonged depending on the level of damage (Tiernery, 2006:6).

Response

The response phase of disaster management occurs in the immediate aftermath of a disaster. At this phase, businesses and other normal economic activities are halted. Personnel safety and well-being in an emergency and the duration of the response phase depends on the level of preparedness in place (Wisner, Blaikie, Cannon & David, 2004:13).

Risks

The likelihood of negative effects or anticipated losses (of lives, persons, property, livelihoods, economic activity, or environmental damage) brought on by interactions between natural or human-induced risks and weak or strong conditions. Risk is typically expressed using the formula Hazards x Vulnerability/Capacity (Burton, et al, 2002:6).

State of Emergency

A state of emergency is declared when public health or the economic stability of a community is threatened and extraordinary measures of control may need to be put in place by either the provincial or national government (Ebrahim, 2003).

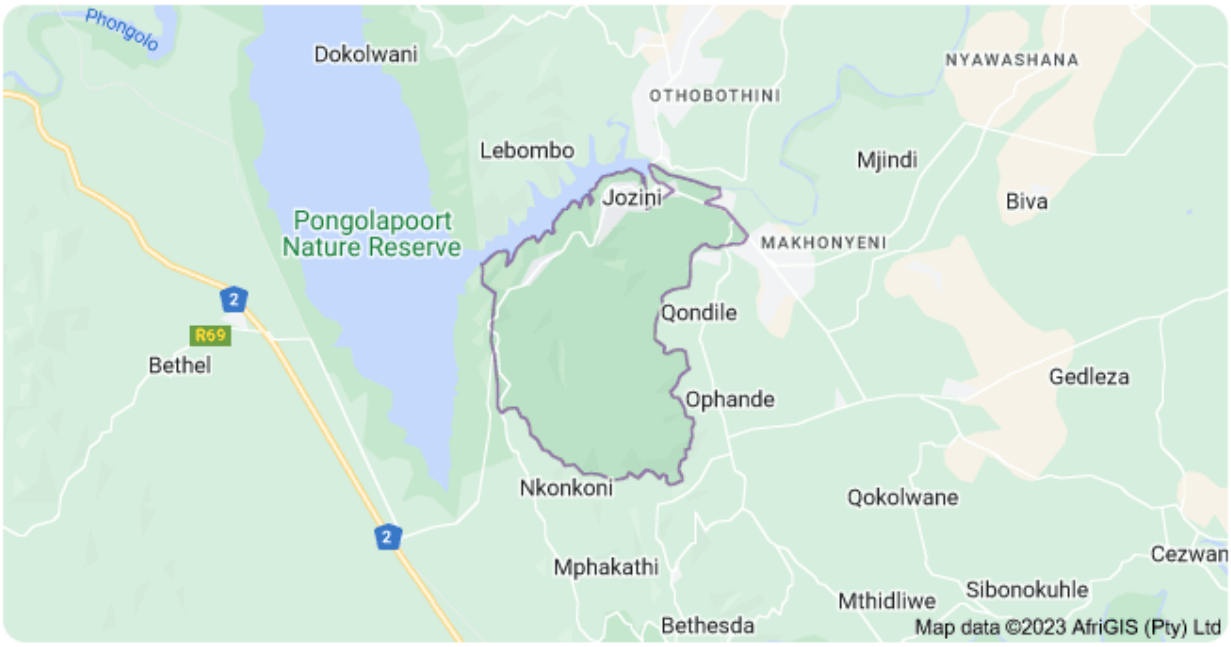
Vulnerability

A group of circumstances and actions brought about by physical, social, economic, and environmental elements that make a community more vulnerable to the effects of hazards (David, 2015).

Jozini Local Municipality

For this study, the concept Jozini Local Municipality will be defined geographically. The Jozini Local Municipality is part of the uMkhanyakude District Municipality in northern KwaZulu Natal and borders Eswatini and Mozambique. Its Municipal code is MDB KZN272. It is a category B municipality which covers an area of 3424 square kilometers with Ingwavuma, Mkuze and Jozini as the main towns. The main economic sectors are tourism, agriculture, industry, manufacturing, wholesale, retail and financial services (Jozini Local Municipality Integrated Development Plan, 2023).

Figure 1.1, details the study area, Jozini



Jozini

1.4. AIM OF THE STUDY

This study aims to explore the effects of risk mitigation and local knowledge in disaster prone communities within the Jozini Local Municipality.

1.5. OBJECTIVES OF THE STUDY

- To find out the traditional risk mitigation measures present in the Jozini Community.
- To explore the impact of disaster management as well as coping mechanisms based on local knowledge and their incorporation into the existing risk mitigation measures offered by the Jozini Local Municipality.

- To examine the effects, challenges and opportunities in integrating local knowledge and related coping mechanisms with the risk mitigation measures offered by the Jozini Local Municipality.

1.6. RESEARCH QUESTIONS

This study will be guided by the following research questions:

- What are the traditional risk mitigation measures present within the Jozini community?

- How can local knowledge and coping mechanisms for disaster management be effectively incorporated into existing risk mitigation measures offered by the Jozini Local Municipality?

- What are the effects, challenges, and opportunities associated with integrating local knowledge and coping mechanisms into the existing risk mitigation measures of the Jozini Local Municipality?

1.7. SIGNIFICANCE OF THE STUDY

The Jozini Local Municipality has had numerous disasters which include floods and droughts that have not only affected the livelihoods of many people residing under the Municipality, but also the environment they live in. The Municipality has limited resources to fully prepare for future disasters as well as react to its aftermath. This study is therefore significant because it will help the municipality discover and develop new systematic approaches which will include disaster policies, business continuity plan (including shelter and infrastructure readily prepared for future disasters) and a firm disaster management framework towards effective disaster risk reduction. On the other hand local knowledge present new opportunities that could be explored to help mitigate the impact of disasters in Jozini. The importance and value of this study where

both science and tradition meet will also contribute towards building a much equipped disaster management centre that will be able to serve the whole Municipality successfully. By using innovative and methodical approaches to disaster risk mitigation, the goal of this study is to support the Jozini Local Municipality's disaster management department in performing its duties in an effective and efficient manner through a much more consultative process with the local communities in Jozini. Due to limited research in South Africa that contribute to lowering catastrophic risk in tandem with local knowledge, this study will offer valuable lessons to the existing body of knowledge on disaster management by assessing present approaches thereby identifying different approaches towards disaster risk mitigation and recommend those approaches towards implementing effective disaster risk mitigation measures. The study will also contribute to the improvement of policies on disaster preparedness and mitigation, to encourage investments, and to safeguard vulnerable groups within the Jozini Local Municipality

1.8. RESEARCH METHODOLOGY

Research design and methodology is briefly discussed in this section. A detailed overview of the methodological framework of the study is given in Chapter 3.

1.8.1 Research design

The phenomenological research design will be adopted for this study. The purpose of the phenomenological approach is to illuminate specific identities and how they are perceived (Qutoshi, 2018). Phenomenology is concerned with the study of experiences from the perspective of individual subjective understanding of events which is notably, their influence, lived situation and reality. A thorough discussion of the research design is given in Chapter 3 of this study.

1.8.2 The research approach

The qualitative research approach is adopted for this study. The qualitative research seeks to provide in-depth, detailed information, which, although not necessarily widely generalized, explores issues and their context, clarifying what, how, when, where and among whom behaviors and processes operate while describing in explicit detail the contours and dynamics of people, places, actions, and interactions (Kumar, 2011). A detailed discussion on the approach to the study is done in Chapter 3.

1.8.3 Population and sampling

Participants for the study will be residents and community members within the Jozini Municipality and its environs. Also, government officials within the disaster risk management department in the Jozini Municipality will be interviewed. The age limit for interviews will be 50 years and above for the residents. A total of 15 residents from each tribal council which has a combined population of about 75 will be conducted. Five government officials within the Jozini disaster management team out of a total of 25 staff members will be interviewed.

1.8.4 Sampling

Convenience sampling will be considered due to the geographical location, time factor and the availability of the participants.

1.8.5 Instrumentation

Semi-structured interview schedule will be used to gather data for the study. The interview schedule will consider the research objectives of the study. The interview schedule will have sections for probing questions to elicit much more detailed understanding view local knowledge

in disaster risk mitigation within the Jozini community. The nature of the research instrument is expanded further in Chapter 3.

1.8.6 Data collection procedures

I sought and received permission from the ethics department of the Durban University of Technology. I also included permission highlighting the principles of voluntary participation, confidentiality, no-harm to participants and anonymity to the respective participants. I personally visited all the participants sampled for this study and introduced myself. I also assured them that findings will be communicated to them after the completion of my research report.

1.8.7 Data analysis

I employed thematic data analysis through the identification of themes, guided by the research objectives.

1.9. CHAPTER ORGANISATION

Chapter One: Introduction

Chapter one introduces and discusses the context and approach of the study. The chapter consists of subsections such as the introduction, statement of the problem, aims and objectives of the study, research questions, significance of the study, and chapter organisation.

Chapter Two: **Literature review**

Chapter two deals with a review of related literature and provides a theoretical framework for the study. The aim of this chapter is to explore previous research on the topic of study as well as

policies and legislative instruments on the concept of risk mitigation and disaster management systems globally, nationally and locally.

Chapter Three: **Research methodology**

This study defines how the study is carry out. A detailed outline of methodology, including the study design, approach, population and sampling, data collection and data analysis are provided in this chapter. Ethical issues, bias, assumptions and limitations of the study are also taken into consideration in this chapter. Lastly, validity and reliability are assured in this section.

Chapter Four: **Results, Discussions and Interpretation of Findings**

This chapter outlines the findings of the study and these findings of the research are discussed in details. In this chapter the findings are explored in line with the research objectives and interpretation of the meaning of the findings.

Chapter Five: **Conclusion and Recommendations**

This chapter gives a general conclusion to the study. In this chapter conclusions drawn from the study are presented in line with the research objectives. Research questions are answered based on the analysis of the research data.

1.10 CONCLUSION

This chapter introduced the study and outlined the introduction to this study, problem statement, significance of the study, and aims and objectives of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter begins with the theoretical framework upon which the study is grounded. The chapter begins by explaining how the theory brings understanding to the concept of risk mitigation and local knowledge in disaster prone communities.

Important aspects of this chapter for discussion include the evolution of the study of disasters and risk and the difference between disaster risk management. A study is also made of the disaster profile of Jozini as well as international risk assessment models around the world. The mitigation of risk as well as mitigation action in disaster risk management is also explained. Comparisons will be made with disaster preparedness of countries such as Canada and the United States that seem to have well suited disaster management strategies. The chapter ends with an understanding of what local knowledge is, as well as the application of local knowledge in disaster prone communities.

2.2 Theoretical Framework

The focus of the theoretical framework in this section is outlined into four subthemes for ease and better understanding. These sub-themes are the introduction to the theory, the context in which the theory emerged, the relevance of the theory and the application of the theory to risk mitigation and local knowledge in disaster prone communities.

The Protection Motivation Theory (PMT) is the theory which underpins this study. The PMT was conceived by Rogers in 1975 to explain why people feel driven to respond defensively when they perceive a health threat. Over the past 40 years, it has become clear that Rogers' prediction that PMT's use will diversify was accurate (Westcott, Ronan & Bambrick, 2017:4). Accordingly Shillair (2020:13) explains that the PMT is a popular framework for analyzing how people react when they sense a potential threat. Especially fear-based cues that urge people to take precautions or stop from actions that could damage them or others as among these triggers.

PMT relies on the principle that the decision to involve local knowledge in risk mitigation concerning protection measures has a number of distinctive features. Clubb and Hinkle (2015:5) explain that, contextual and individual circumstances can both promote and dissuade people from engaging in protective activities, and the impacts of these factors are mediated by people's cognitive processes. These cognitive procedures are designed to set apart from the presumptive direct impact of emotional anxiety on defensive reactions. PMT has been applied in many areas of study, including psychology, criminology, sociology, health sciences and lately disaster management.

First, PMT is characterized by uncertainty and threat, as disasters such as severe storms, diseases (affecting humans and animals), and veld fires in places like Jozini are both low probability and high-risk events. The possibility of such events occurring and their impact on the lives and livelihoods of people in the area is predictable and manageable should they occur (Tasantab, Gajendran & Maund, 2022:6). Second, the cost of disasters can be potentially high and this may include direct and indirect cost which are difficult to calculate. Third, to be effective, resistance and resilience measures are considered as a package in risk mitigation pertaining to disasters (Osberhaus, 2017:3). This can mean that when local knowledge is considered as part of risk mitigation efforts involved in disaster modification prior to their occurring might be low to some extent.

The installation of risk mitigation measures utilizing local knowledge to compliment municipal efforts can also involve significant disruption to what is conveniently known by the Jozini municipality. The inclusion of the features of local knowledge may also make it difficult to generalize risk mitigation measures in instances where different cultural groups or tribal groups hold divergent cultural beliefs. As a result, researchers (Feng, Tang & Chuai 2018:15) have developed models of decision making which attempts to capture how people engage with decisions in the context of threats.

PMT as a framework has been widely used to predict a range of behaviours in many fields. PMT, aims to capture the main cognitive processes that lead to protection motivation. That is a decision to invest in protection against threats. In this instance it is worth noting that studies by

Feng et al. (2018:5), Chen (2020:7) as well as Peng, Zhao, Elahi and Benhong (2021:2) have found positive correlation between the utilization of local knowledge of people within communities to the future frequency and impacts of disasters and the possibility of investing in durable repairs On the other hand, whiles there is an acknowledgment on the level of risk within communities by residents, there are many more within communities including those affected by recent disasters who have shown that even with their knowledge of the likelihood of recurrence the fervor towards protecting their own lives and livelihoods is very low.

This challenge as described can be explained within the PMT by the existence of an important second stage in decision making. The second stage is the coping appraisal. Coping appraisal comprises three elements; these are response efficacy (how effective will a response be?), self-efficacy (how able am I to respond?) and response cost (how costly will a response be?) (Oakley, Himmelweit, Leinster & Casado, 2020:8). In actual fact, this means that people don't actually have to feel at risk within their local communities and vulnerable areas, but also they must be able to take charge or devise their own measures to mitigate the impact of these risks when they occur.

Studies by Wu et al. (2020:9) as well as Chen (2020:6) has shown that among people with low coping appraisal, a high threat appraisal can translate into living in denial of the risks should they occur and to some extent avoidance. Avoidance could be the attitude of those challenged with these risks when they are not given a voice in risk mitigation measures.

The PMT framework can also be used to identify some policy action from the municipalities in tandem with local knowledge that could improve upon resistance and resilience measures. Particularly leading the suggestion that communicating disaster risks and related impacts and the fact that products and services are available to mitigate them (Vermiglo, Noto, Bolivar, & Zarone, 2022:5). In instances where the community does not understand the risks and the impact of disasters, simple communication techniques could be used to improve both the understanding of the risks and the confidence to take action.

Communication between policies from the international, national, provincial, district and municipal levels could be blended into local knowledge and understanding of the various risk

mitigation measures within communities for a comprehensive solution to disasters within local communities.

In practice however, this form of decision making based on a blend of different approaches within most municipalities is non-existent. This study therefore aims to develop a comprehensive approach to risk mitigation efforts that blend in policies from the municipality together with the development and the utilization of local knowledge in disaster prone communities. The study further recommends mitigation measures as well as early warning systems within this blend.

2.3 The evolution of the study of disasters and risks

Disaster as a concept has dramatically changed in meaning throughout time (see Quarantelli, 1998:4; Perry, 2007:7). Many, if not most, societies around the world during the early stages of humankind's history believed that natural disasters were caused by God (Dynes & Drabek,1994:4), or they attributed them to unreliable causes like "Des Astro" or "evil star," "bad luck," and "blind faith" (Dombrowsky, 1981:19).

Disasters were thought to be unavoidable occurrences that affected humanity because we couldn't appease the gods or did something to anger them. Science has progressively begun to cast doubt on these catastrophic perceptions and myths (Dombrowsky, 1981:19). Research into the fundamental causes of catastrophes, as well as human response to and underlying causal factors causing disasters has gained attention as science has advanced in recent years.

2.3.1 Social science perspective

Following the Second World War, a number of activities and events led to the attention being placed on disaster and risk. One such instance is the scientific study of risk and tragedy (Bello, Bustamante, & Pizarro, 2021:3). Therefore, a study of the origins of disaster studies and research within the social as well as the natural sciences is necessary in order to fully understand the development of catastrophe risk reduction and management.

Burger, Kennedy, and Crooks (2021:21), who questioned the impact of catastrophe on social patterns, voiced some of the early concepts on disaster and risk in the social sciences. According

to Quarantelli (1998:1), although writers such as Carr and Sorokin were well-known to some in the field, they were rarely formally acknowledged for their groundbreaking work and they had a significant impact on other disaster related studies later in the twentieth and the twenty first centuries. Studies.

Some of the initial systematic research and studies on disasters were conducted by Eldenman (1952:6), Powell, Rayner, and Finesinge (1952:8), Drabek and Quarantelli (1967:11), and Dynes and Quarantelli (1968:13). There was a noticeable surge in interest during the 1970s, as indicated by Doughty (1971:5), Hewit and Burton (1971:8), and Turner (1978:15). These earlier scholars approached the concept of disaster from both social science and natural/physical scientific perspectives. Moreover, it is evident that European researchers were more engrossed in this subject during the 1970s compared to their American counterparts. Nevertheless, it should be acknowledged that American social scientists have made significant contributions since the 1980.

Gilbert (1998:11) proposed that the social science perspective approached the study of disasters through three distinct paradigms: content research, chronological development, and cleavages. Initially, disasters were viewed as war-like situations where an external agent could be identified, necessitating a coordinated response from all communities.

The second paradigm (chronological development) perceives disasters as a reflection of societal vulnerability. Consequently, disasters are understood as the result of underlying social or communal processes. Thirdly, a disaster is defined as the failure to recognize and define actual or perceived hazards. It represents an admission of uncertainty and challenges our perception of reality (Gilbert, 1998:8).

Cardona (2003:14) and Kreps (1998:33) concur that the aforementioned early paradigms in social science placed greater emphasis on how communities responded to crises and how they perceived them afterwards, rather than focusing on risk management or preventing physical harm and social disruption before a disaster occurred.

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2.3.2 Natural science perspective

When it comes to hydro-meteorological, geodynamic, and technological/anthropogenic phenomena such as earthquakes, floods, mudslides, cyclones, industrial disasters, and nuclear fallout, the natural and physical scientific approach to disasters focused primarily on the hazard aspect (Smith:2002:16).

The objective of the natural sciences was to understand the dynamics of hazards (Smith, 2002:3; Cutter, 1994:13) and, from this perspective, attempt to quantitatively assess and model their potential occurrence and impacts on both humans and the environment. While this approach has proven to be scientifically valid, Dombrowsky (1998:28) cautioned that it is impossible to perfectly replicate reality through algorithms that simulate temporal changes.

Gilbert (1995:232) contends that the scientific approach to risk and disaster is often influenced by the market where the demand for disaster research originates. Previous literature on disaster and risk studies predominantly concentrated on the perspectives of wealthy nations (Sachs, 1990:26), neglecting to address the social, economic, and political realities faced by poorer countries that bear the brunt of disasters.

However, the natural sciences were the first to address concerns related to probability and risk, based on quantifiable hazard variables (Dombrowsky, 1998:6). Additionally, in the late 1970s, there emerged a social phenomenon that focused on risk rather than disaster. According to the definition of disaster provided earlier, the magnitude of the physical event itself is less significant than the affected community's ability to cope with the impact within its appropriate limitations and capacities (Lavell, 1999:15). This realization underscored the importance of shifting the focus of disaster studies and research towards risk rather than solely on disasters.

2.3.3 Contemporary study of disaster risk

The aforementioned early understanding and analysis of disasters, from both social and natural or physical science perspectives, share many similarities with the contemporary study of disaster risk. Theoretical discussions on disaster risk have increasingly centered around diversity, acknowledging the influence of gender, ethnicity, class, age, and other social power dynamics on risk mitigation. Cardona (2003:2), Kelman (2003:8), and Smith (2002:49) highlight two distinct schools of thought on disaster risk that emerged since the 1980s.

Cardona refers to the constructivist and objectivist, or realist, schools of thought. Smith (2002:16) interprets the data through the structural and behavioral paradigms. Kelman (2003:5) briefly mentions the emphasis on risk placed by social scientists and physical scientists. The constructivist school of thought by Cardona, the behavioral paradigm of Smith, and the focus of social scientists like Kelman, along with the objectivist, structural, and physical scientist paradigms, all pertain to the same approach in investigating disasters. This becomes evident after evaluating the works of these three authors.

2.3.4 Constructivism

In the realm of social sciences, the constructivist perspective holds relevance as it views risk as a socially constructed concept, similar to the earlier focus on disasters. This approach recognizes the importance of comprehending social representations, perceptions, and the interactions among different social actors and phenomena.

In recent years, there has been a growing recognition that disasters are inevitably linked to risky situations and deeply rooted societal attitudes towards risk (Seddiky, Giggins & Gajendran, 2021:5). The economic conditions of Less Developed Countries (LDCs) significantly influence these factors and their attitudes towards risk. Such circumstances compel vulnerable societies, particularly those that are underprivileged, to accept the hazards they face, whereas wealthier societies have the luxury to choose to avoid such risks (Seddiky, et al. 2021:6).

2.3.5 Objectivism

The objectivist or realist school of thought is more prominent in the natural and physical sciences (Chipangura, Niekerk & Van der Waldt 2019:6). According to this perspective, risk can be measured and evaluated objectively (Chipangura et al. 2019:9; Seddiky et al. 2021:11). Similar to the earlier focus on quantifying disasters, the natural and physical sciences continued to emphasize the quantification of risk. This approach to risk calculation also influenced the fields of economics and actuarial sciences, which assert that risk can be computed using formulas (Chipangura et al. 2019:11).

Geographer Hewitt (1998:76) acknowledges that the social understanding of disasters holds greater significance in the current landscape of disaster risk. However, it would be unfair to claim that both paradigms and schools of thought mentioned above have equal standing in the global community. Hewitt (1998:77) argues that the constructivist school's exclusive focus on the social construct of catastrophe risk overlooks the hazard or "agent-specific" approach. Even in the work of social scientists from the 1980s, this method of visualizing disasters remained the most popular.

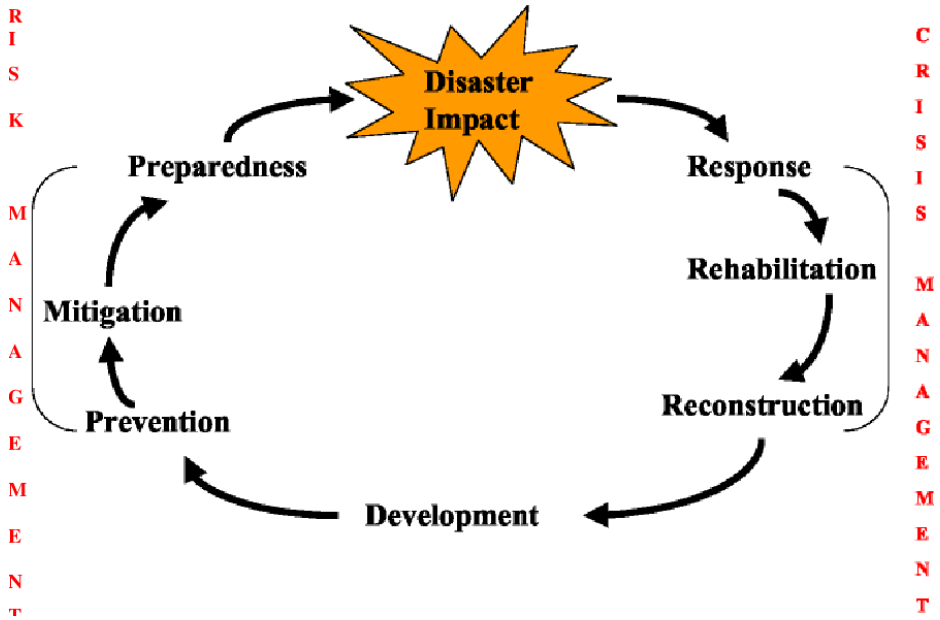
The objectives of the International Decade for Natural Disaster Reduction (1990–1999) support this assertion (Chipangura et al. 2019:8). Both schools of thought have shifted their emphasis from a narrow focus on disasters to considering disaster risk. As our understanding of risk has advanced significantly, researchers from diverse fields such as sociology, anthropology, geography, architecture, agriculture, meteorology, engineering, law, public administration, and development studies are now collaborating to study disaster risk mitigation (Seddiky et al. 2021:9). The distinction between disaster risk management and disaster management remains an ongoing topic of discussion.

2.4 Disaster risk management and disaster management

The relationship between disaster management and disaster risk management should be looked at in order to better understand them (Ward, et al. 2022:7). The field of disaster management, where traditionally the emphasis has been on preparedness for response, has produced prior contributions and previous practices that are relevant to the topic of disaster and risk reduction (Gill, et al. 2020:15). According to Haasnoot, Warren and Kwakkel (2019:7), management of disaster risk includes all operations, both structural and non-structural, that aim to prevent (prevention) or limit (mitigation and preparedness) the negative impacts of hazards. It is evident from a comparison of disaster risk management and disaster risk reduction that one is the application of the other.

Conventionally speaking, disaster management is "the body of policy and administrative decisions and operational activities which pertain to the various stages of a disaster at all levels," according to the UNDP (1992:21).

Figure 2.1 Depicts the various stages of the disaster management cycle



The South African Disaster Management Act 57 of 2002 defines disaster management as a continuous and integrated multi-sectoral, multidisciplinary process of planning and implementing measures with the following objectives:

- disaster risk reduction or prevention;
- reducing the impact or severity of disasters;
- emergency planning;
- a prompt and efficient disaster response and
- recovery and rehabilitation following a disaster.

In order to safeguard people and property from potential disasters, global disaster management involves integrating actions before and after disasters occur (Gill et al. 2020:9; Haasnoot et al. 2019:5). On the surface, it may seem that the definition of disaster management in the South African Disaster Management Act includes disaster risk reduction as a crucial component. However, if that were truly the case, 15 years of disaster management in Africa should have yielded greater achievements, reduced loss of life and livelihoods, and fewer calamities.

Burton (2005:12) points out that the inherent focus on crisis in the disaster management cycle is a major flaw in itself. It indicates that all efforts are geared towards preparing for catastrophic disasters, often neglecting the underlying causes such as risk, hazards, and vulnerability. Bureaucratic ignorance also contributes to this issue (Haasnoot et al. 2019:6). The UNDP Disaster Management Training Programme emphasized "causal factors of disasters" over 20 years ago, yet many disaster managers still adhere to this terminology. However, upon critical evaluation, it becomes evident that most of these "causal factors" can be attributed to human actions that have created vulnerability. Another flaw lies in the application of the disaster management cycle, where some practitioners perceive it as a sequential process rather than understanding that all phases occur concurrently (Gill et al. 2020:17).

The significance and distinctiveness of hazard and risk reduction for the future have become evident through various efforts. Hazard and risk reduction methods involve a broader range of professional disciplines than previous notions of disaster management, and they rely on diverse

information needs. While emergency assistance and response will always be necessary, considering the potential consequences of increasingly severe hazards, it is clear that substantial investments are required to minimize the negative impact of social and economic hazards on vulnerable situations (Seddiky et al. 2021:10).

The challenge for disaster risk management in the upcoming years is to find effective ways to engage a more comprehensive and multi-sectoral involvement of professional disciplines and public interests in reducing disaster risk through a multi-faceted approach. Both political and social efforts are needed to achieve this goal. Commitment can foster local community engagement as well as general awareness. It is not in anyone's best interest to accept the notion that resources, upon which all societies rely, must be lost to hazards before their value is considered worthy of protection, replacement, or restoration. Both building societal resilience to hazards and ensuring that development initiatives do not exacerbate vulnerability to these hazards should be the objectives of disaster reduction policies and practices.

2.5 Disaster risk profile of Jozini

This section provides detailed information on the existing natural hazards, their geographical distribution, and the vulnerability of communities in the Jozini area. It also explores the role of environmental, social, and other factors in the occurrence of disasters in this region. The mountainous terrain and arid climate in Jozini make the area susceptible to natural hazards, which are further exacerbated by the impacts of climate change. The region experiences dry winters and wet summers, with sporadic flooding. Winter temperatures range from 16° to 26° Celsius, while summer temperatures range from 23° to 40° Celsius. The Lebombo Mountains, located in a wet region, receive an average annual rainfall of 600mm to 800mm. Evaporation rates are higher during winter and early spring, with an average of approximately 1660 mm per year (IDP, 2023:39).

Climate change and planning challenges within the local community have increased the exposure of people and assets to natural hazards and disasters in Jozini. This has consequently

led to a rise in the frequency and severity of these hazards (Mthembu & Hlophe, 2020:11). The Jozini Local Municipality established a Disaster Management unit in 2011. Since its inception, the unit has conducted ward investigations to identify a list of 22 priority risks on a disaster risk matrix. These risks are categorized as low, medium, high, and very high.

Table 2.1: List of Priority Risks (Hazards) for Jozini Local Municipality

No	Prevalent hazards and threats	Jozini
01	Road accidents	Very High
02	Droughts	Very High
03	Disease: Animal (Amatele)	Very High
04	Disease: Human (HIV/AIDS)	Very High
05	Pandemic: Covid 19	Very High
06	Disease: Human (Malaria)	Medium
07	Disease: Human (Cholera)	Medium
08	Rail: Accidents	Medium
09	Veld/Forest Fires	Very High
10	House Fires	Very High
11	Severe Storms (Heavy Rainfall)	High
12	Severe Storms (Floods)	High
13	Severe Storms (Winds)	High
14	Severe Storms (Lightning)	Very High
15	Severe Storms (Hail)	Medium
16	Extremely High Temperatures	High
17	Lack of (Adequate) Sanitation	Low

18	Lack of (Adequate) Water	High
19	Lack of Proper Road Infrastructure	High
20	Civil Unrest – Crime	High
21	Water Contamination / Pollution	Medium
22	Drownings	Medium

Recent media reports show that floods severe storms and lightning have caused the most extensive economic damage as well as loss of lives (Ngema, 2021:3; Mkhize, 2023:2). In a rural community such as Jozini these occurrences impact greatly on the lives and livelihoods of the populace.

The rural population which account for almost 90% of the total population of Jozini are at a greater risk of these natural hazards due to poor-quality infrastructure in some cases and limited access to public services. For instance, low lying areas that are crossing narrow paths and places become impassable under heavy floods during heavy down pours, leaving some communities and towns in near isolation.

2.5.1 Disaster risk management roles and responsibilities

According to section 1.2.3 of the National Disaster Management Framework [NDMF] (2005:9), disaster risk management responsibilities must be incorporated into the regular operations of the various sectors and disciplines within the concerned organs of state and their substructures, based on the principle of auxiliary (using existing structures and resources). The job descriptions of the pertinent role players must include references to these duties, and suitable key performance indicators must be offered (NDMF, 2005:18).

Each national (municipal) organ of state is required by the Act to determine its roles and responsibilities in relation to disaster risk management and evaluate its ability to abide by the Act's requirements, particularly with regard to setting priorities for disaster risk reduction initiatives and for response and recovery (Municipal Systems Act 2000:34). When necessary,

this ability must be increased by leveraging the abilities of the private sector and non-governmental organizations (NGOs), pooling resources among state institutions, and providing collateral support. Memorandums of Understanding must explicitly outline the parameters of such support.

2.5.2 Disaster risk assessment models

Disaster risk which mainly includes (hazard, vulnerability, and capacity) only offer a partial picture of reality from a personal viewpoint. No risk assessment model can be created to be used just once before being abandoned (Nkombi & Wentink, 2022:11). Any risk assessment model must inspire action and be followed by routine evaluation and adjustment in order to accommodate for ongoing environmental changes and advancements (Intergovernmental Panel on Climate Change [IPCC], (2012:5). In order for the learning that occurs during the risk assessment process to be internalized and serve as the foundation for risk reduction, full participation in the process is essential.

This assessment could be carried out using a variety of methods, but it must be straightforward and simple to use and comprehend. According to the IPCC (2012:12) report, the proper implementation of any risk assessments depends on uniformity.

The following are some of the well-known risk assessment models around the world:

- EPC: Canada – Emergency Preparedness Canada
- FEMA: USA – Federal Emergency Management Agency
- APELL: Sweden – Swedish Rescue Services
- SMUG: Australia – Emergency Measures
- NOAA: US – National Oceanic and Atmospheric Administration
- UNDRO: UN – UN Disaster Relief Organisation
- HIRV: Pearce, 2000
- CVCA: Canada – OCIPEP Community-wide Vulnerability and Capacity Assessment

EPC: Canada – Emergency Preparedness Canada

The Emergency Preparedness Canada risk assessment follows seven steps detailed below;

1. Examine a list of dangers and make any required updates.
2. Gather historical information that is important (such as whether or how often the hazard has happened, the extent of the damage, the number of people affected, the difficulties faced, and the costs incurred). The data is then evaluated from 1 to 5 on a scale.
3. Take into account alterations to risk variables or situations that impact the likelihood of the hazard. From -3 for greatly decreased risk to +3 for significantly increased risk, these are given a value.
4. Think about the risk factors that are not part of the community. As in the previous stage, these are assigned values ranging from -3 to +3.
5. Community vulnerability can be expressed as a number between 0 and 3 (i.e., no change from the prior assessment to significant change).
6. Determine the values (Steps 2–5), compare the values, and assign priorities for each danger.

FEMA: USA – Federal Emergency Management Agency

Four factors are evaluated by the FEMA model, and each is given a score (High, Medium, or Low). The model requests that planners consider the following factors:

1. History of the incident in the area
2. Human vulnerability. Two things are involved in this:
    - Population (for instance, vulnerable groups, density, and closeness to hazard zones)
    - Property (such as price and distance from hazardous regions)
3. Threat level at its greatest or the proportion of the community most likely to be impacted.
4. Probability of happening during the course of a year.

These four factors are not given the same weight. (They are assigned the values 2, 5, 10, and 7 in that order.). To assign a score to each hazard, planners must multiply the rating in each

criterion by its "value" before adding the four sub-totals. According to the model, dangers with scores of over 100 should be considered "priority" hazards (Federal Emergency Management Agency [FEMA] (2000:43).

APELL: Sweden – Swedish Rescue Services (Awareness and Preparedness for emergencies at the local level)

This model was improved by the United Nations Environment Programme Industry and Environment Program Activity Centre (UNEP) (1992:23) and is based on the 1989 Swedish Rescue Services Board Handbook. Its main goals are to lessen technical mishaps and boost emergency preparation. It includes the following actions:

1. Select the study topic (industrial site, educational institution, or business operation).
2. Find out what activities are taking place at that place (such as manufacturing, selling, or providing services).
3. List the substances (such as chemicals, procedures, or geological features) that can cause hazards along with (if possible) an estimate of their quantity.
4. Determine the different risk categories, such as the potential for explosion, fire, and earthquake.
5. Identify what or who might be in danger. People, the environment, and property are the three main areas mentioned in the guidelines.
6. Think about the effects of the occurrence (such as tainted drinking water or infrastructure damage).
7. Examine and prioritize the four potential effects on life and health, the environment, property, and the rate at which the hazard develops. These topics fall under the "seriousness" category, and each one of them is connected with a range of values:
    - Life and health outcomes can be minor (slight transient discomfort) or disastrous (more than 20 fatalities, hundreds of major injuries, and more than 500 evacuated).
    - Environmental consequences might be minor (no contamination) to catastrophic (extremely significant contamination or widespread effects).

- Property-related consequences can be minor (less than $1,000) or severe (more than $20,000).
- With values ranging from one for an early and unambiguous warning system to five for having no warning system, the pace of development is an attempt to assess whether there is an appropriate warning system.

8. From one for improbable (occurring fewer than once per 1,000 years) to five for probable (occurring more than once a year), the probability is calculated.
9. Compare the outcomes based on these rankings, and then order them according to priority.

SMUG: Australia – Emergency Services

Five criteria, each scored from 1 (Low) to 10 (High), are used in this model to rate each risk. This strategy enables important stakeholders to come to an understanding about the relative importance of each hazard. These five elements are:

1. Seriousness: The relative financial and human cost of the risk.
2. Manageability: Can the neighbourhood take action in advance of the occurrence (High) or merely after (Low)?
3. When is action necessary? When (High) and when (Low)?
4. Risk: What is the likelihood that this danger will materialize?
5. Growth: Will the hazard get worse (High) or stay the same (Low) if nothing is done?

NOAA: USA – National Oceanic and Atmospheric Administration

The NOAA model offers an eight-step procedure for carrying out community-wide hazard risk and vulnerability (HRV) assessments and supports the use of GIS (United States Environmental Protection Agency [EPA], 2017:23). Each phase focuses on a different aspect of the community and encourages a comparison of the data at hand with the "critical" locations or infrastructure. Each step's "input," "process," and "output" are described in the process. The steps and their components are highlighted in the summary that follows.

1. **Hazard Identification**

   Decide which risks should be taken into account; for each risk that is chosen, determine its relative probability, probable region of impact, and likely size. On a scale of 1 to 5, where 1 is Low and 5, High, rate each risk, and list them in a matrix: Total score = (Frequency + Area of Impact) x Magnitude

2. **Hazard Analysis**

   Map "risk consideration" areas for each chosen hazard to identify places with a high potential for effect; assign scores or a relative ranking within the risk areas. (The model recognizes that different scales are used to rank distinct danger areas.)

3. **Critical Facilities Analysis**

   Determine the community's essential facility categories (such as shelters, care facilities, emergency services, utilities, hospitals, schools, communication, government, finance, and transportation); finalize the "critical facilities" inventory; Determine where high-risk zones and key infrastructure overlap; Perform a vulnerability analysis on each crucial facility located inside the hazard risk zones. (Take into account operational and structural aspects.)

4. **Societal Analysis**

   Determine which locations merit extra attention (i.e., those where vulnerable or at-risk populations are concentrated in large numbers); Determine the circumstances where special consideration regions are situated in high-risk locations; the completion of an inventory (counting the number of households) in each area of particular consideration that is situated in a high-risk area is the third phase.

5. **Economic Analysis**

   Determine the main economic sectors and the locations of the major economic hubs; Find the points where high-risk locations and economic hubs connect (or overlap); Make a general list of economic areas at high risk; Determine major employers and where they are located in relation to high-risk zones; Conduct a vulnerability analysis on the "critical facilities"—the structures of significant employers.

6. **Environmental Analysis**

   Determine critical environmental resource sites (such as locations of hazardous or poisonous materials) and secondary-hazard risk consideration sites (such as regions with potential for secondary environmental impacts from natural hazards); Determine where high-risk consideration areas, environmental resource locations, and secondary-hazard risk consideration areas intersect (or overlap); Locate important environmental resource locations and their closeness to secondary risk sites (i.e., places highly vulnerable to secondary hazard consequences); Perform a vulnerability analysis on critical facilities at priority secondary-risk sites.

7. **Mitigation Opportunities Analysis**

   Complete an inventory of high-risk undeveloped land; determine where undeveloped land and high-risk areas connect or overlap; and evaluate the current (US) flood insurance policy.

UNDRO: UN – UN Disaster Relief Organisation

The UNDRO model is only capable of simulating natural risks (split into geological and hydrological occurrences) and one type of technology hazard (namely, pollution from harm to industrial plants).

The model has the following steps:

1. Examine historical documents and current topographical or geological circumstances.
2. Identify hazards (H)
3. Find the items that are vulnerable (E). The model requires an inventory of: buildings; residences; common building kinds; special buildings; infrastructure; waterways; telephone lines; and sewage systems.
4. Roads, railroads, water supplies, electrical supplies, gas and oil sources, etc. are examples of groups of elements that are at risk. Identify the elements at risk's vulnerability (V), or their capacity to endure harm. A scale from 0 (no harm) to 10 (complete damage) is used in the model.

5. Establish the predicted degree of loss (Rs) resulting from each risk, taking into account community services, infrastructure, residential areas, and economic sectors.
6. Sort the hazards into the following categories: Acceptable (added value below safety margin), Marginally Acceptable (added value above safety margin), Marginally Unacceptable, High, Very High, Critical, and Actual Disaster.
7. Map the various risk overlaps. Total risk expressed as: Rt = (E) (Rs) = (E) (HxV).
8. Think about the socioeconomic effects of disaster (both in terms of quantitative and qualitative costs).

The Human Capital Approach, which measures lives and suffering in economic terms, is used in the UNDRO model. It calculates the direct expenses associated with house damage, state investments, and economic effects (United Nations Disaster Relief Organisation [UNDRO] (1984:31).

HIRV: Pearce, 2000

Pearce (2000:6) created the Hazard Impact Risk Vulnerability (HIRV) model as a component of her doctoral thesis. It is a tool made for local communities or regional governments, and it is built on regional expertise added to local knowledge. The concept asks for the formation of a large committee of subject matter experts.

Their combined output yields an assessment of the vulnerability of an area, a community, or even a section of a community:

1. Those dangers that could cause a disaster are to be identified and clarified in the "Hazard Identification" component. Three types are listed in the model: "(1) natural; (2) diseases, epidemics, and infestations; and (3) person-induced." The history of each danger is also reviewed as part of this procedure.
2. The "Risk Analysis" part seeks to give the community a deeper knowledge of the hazards they face. A risk rating (ranging from +3 or "hazard is most likely to occur" to -3 or "hazard is most likely not to occur") is assigned to each hazard based on its history in the area,

current risk factors (i.e., those that exist against a list of potential), the level of certainty of the data used for the analysis, and the likelihood that the hazard will actually occur.

3. The "Vulnerability Analysis" component seeks to make the community's susceptibility to the identified threats more understandable. Each danger is examined for "vulnerability" using the four fundamental criteria of people, places, preparedness, and time. Each hazard's susceptibility is graded for each of its four categories. The scale is from +3 to -3, which is comparable to the "Risk Analysis" presented above.
4. The level of assurance in each risk assessment is then noted.
5. A better knowledge of how each risk affects the population is the goal of the "Impact Analysis" section. The concept suggests taking into account "impact" in four different contexts: social, environmental, economic, and political. The scale ranges from +3 (extremely strong impact) to +1 (no impact). An assessment of the level of "certainty" is added to the effect analysis of each risk after that, and an overall "impact rating" is given.
6. The previous assessments are compiled into one frame in the "Risk Management" component to show the degree of risk and vulnerability for each hazard within each category. The approach promotes using different colors to represent the various levels or classifications.

CVCA: Canada – OCIPEP Community-wide Vulnerability and Capacity Assessment

Process

1. Hazard Identification
2. Impact Analysis
3. Vulnerability Analysis
4. Risk Analysis
5. Risk Management

The CVCA model is designed to be universally applicable regardless of a community's size, location, or resource availability. However, two essential components are necessary for the model to be used successfully:

1. A collaborative effort by a large number of individuals who represent the community and its major stakeholders; and
2. A persistent, painstaking attempt to learn more about "vulnerability," "the most vulnerable," and the realities of emergency circumstances.

Although the model can be used independently, it is most useful when it is a part of a more comprehensive investigation. Its flaw is that it could be taken for granted that it gives the whole picture and is employed as a complete process. All hazard-risk-vulnerability (HRV) evaluations, sadly, only offer a partial picture of reality from a subjective viewpoint. The purpose of a CVCA analysis is not to perform it once and then discard the results. It must inspire action and be followed by ongoing evaluation and change as needed (Kuban & Mackenzie, 2001:25)

The CVCA model is presented with the assumption that:

1. Emergency planners value the hazard, risk, and vulnerability (HRV) assessment method and include it into their emergency planning process, particularly at the municipal level;
2. A group of major responder organizations performs municipal emergency planning;
3. Municipal emergency planners are adequately informed about their city and its residents, either directly or indirectly;
4. Municipal emergency planners would like to maximize the effectiveness of their budgets, resources, and effort given their limited resources;
5. Municipal elected authorities are in favor of giving specific categories of people special or expedited attention when it comes to prioritizing the receivers of municipal emergency services; and
6. Municipal emergency planners are open to collaborating with neighborhood organizations to better anticipate how emergencies may affect their constituents.

STEPS

Kuban and Mackenzie (2001:11) further list the steps within the CVCA model as follows;

1. assemble a planning team;
2. Set planning constraints;

3. assemble important data;
4. define and depict the population at large;
5. Identify and map densely populated areas;
6. The municipality is divided into "Operational Sectors" and mapped;
7. Map "high-risk" locations and define them;
8. Choose the categories that best describe the "most vulnerable" (see the category list);
9. Locate, classify (as full- or part-time), and map locations associated with or relevant to the designated "most vulnerable" groups (e.g., nursing homes, day-care centers, access points for social assistance, or clinics for the elderly).
10. Find and map more regions where each of the "most vulnerable" groups is numerically significantly represented;
11. Identify the places where "high-risk" areas and "most vulnerable" groups connect or overlap;
12. Determine the vulnerable times for each group (e.g., D=workday hours, N=workday night, H=weekend/holiday);
13. Identify the "most vulnerable" (i.e., each vulnerable group within each sector) and estimate their likely emergency needs;
14. Determine reasonable expectations for each identified group's capacity (take into account physical, cognitive, resource, connections, and support system);
15. Take into account factors (such as population changes during the day) that affect the existence or degree of vulnerability of the aforementioned groups.
16. Sort sectors, facilities, or community segments according to their relative importance (highest, second-highest, or third-highest);
17. Identify situations or groups that merit more thought or action; and
18. Determine situations or organizations that warrant additional thought or action;

2.6 Mitigation of risk in disaster management

Mitigation of risk in disaster management is key to emergency management in every situation. Disaster mitigation can be viewed in two lenses according to (Bello, et al., 2021:9). These are primary mitigation and secondary mitigation. Primary mitigation refers to efforts at reducing the

effects of hazards before they occur (preparedness). Secondary mitigation on the other hand predicts the occurrence of a disaster as well as the requisite measures to reduce the devastating effects of the disaster should it occur (Bello et al. 2021:9). The main aim of mitigation is to reduce to the barest minimum, the impact on the lives and livelihoods of those who are affected.

Risk mitigation encompass all the actions taken by a person or an organisation to reduce the impact of a disaster before the disaster occurs (Tay, Banomyong, Varadejsatitwong and Julagasigon, 2022:4). Risk mitigation in disaster management is a concept that gained traction in the 1990 by the United Nations with the aim of employing protection measures from the physical development of structures such as building construction to the procedural aspects which include compliance and standard techniques in land use planning towards the reduction in loss of lives and material losses in an event of a disaster (Tay et al. 2022:6). According to Mubarak (2019:7) risk mitigation takes into consideration how poorly people living in communities are equipped to handle phenomena such as natural disasters whereas disaster mitigation takes into consideration the planning and implementation of measures to reduce the risks associated with both known natural hazards and human-made hazards towards a proper and an effective disaster response. Risk mitigation goes beyond an individual human effort. It describes an intent together with a sustained action as well as proactive measures by the municipal, district, provincial and national government to lessen the impact of disasters upon families, homes, communities and the socio-economic conditions of people in an area (Mubarak, 2019:5). Saputro, Hasim, Karlinasari & Berk (2023:8) explains that, the most significant aspect of any mitigation measure is understanding the threat or challenge at hand. According to Saputro et al (2023:9), since each community, district or province faces unique threats it is imperative that the nature of the threat faced is well understood for the proper mitigation effort. For example, disaster related threats such as floods, tropical storms, wild fires, lightning, earth quakes and cyclones are peculiar to certain regions or countries, therefore the nature of such threats must be taken into account any mitigation plan.

The United Nations Development Programme [UNDP] (2004:32) report of 2004, explains that, ‘risk’ as a concept in disaster risk mitigation must be understood within a broad framework in order for the proper mitigation measures to be applied. According to the UNDP (2004:32), one

needs to understand the following; where do people live? Why do people live where they live? How do people make a living? What is important for them to protect? Understanding and obtaining the answers to these four fundamental questions can help a person better understand the disaster risk that exists in various systems. The reason for an understanding of the lives and livelihood situation of people as highlighted by the UNDP is that people are complicated individuals, and sometimes their perceptions of the catastrophic risks they confront are greatly influenced by their culture, beliefs, political views, relationship to nature and the environment, economic well-being, and even their social networks. Therefore, an understanding, appreciation and a correct interpretation of this phenomena can be connected to the behaviours associated with their perceptions of disaster risks. In other words, people won't necessarily or willingly take remedial efforts to lessen the disaster risk if they believe that the financial benefit of residing in a flood line outweighs the risk involved with putting themselves in harm's way (Bello et al. 2020:4). A solution to disaster risk mitigation will in effect entail a holistic approach towards its management.

2.6.1 Mitigation action in disaster management

The terms "mitigation" and "prevention" are used interchangeably (World Health Organisation[WHO], 2003:2; United Nations International Strategy for Disaster Reduction [UNISDR], 2009:19; FEMA, 2000:4; Ngcamu, 2022:4). On the other hand some researchers prefer to solely use the word "prevention" instead of the word "mitigation" (Haddow, Bullock & Coppola, 2014:2). Haddow et al (2014:5) the National Response Plan (NRP) and the National Response Framework in the United States of America between 2004 and the year 2008 as one of the documents that sought to explain these concepts based on the local and international disaster management dimensions that pertained in the United States at the time. According to Ngcamu (2022:2) the word "prevention" can be combined with the word "mitigation in most instances.

WHO (2003:3) explain that, mitigation refers to lessening the extent of a disaster's physical and material harm with the aim of preventing a disaster or emergency from being caused by human activity or a natural phenomenon. Haddow et al. (2014:4) on the other hand explain mitigation

as a consistent activity done to lesson or completely remove the danger that hazards and their effects pose to persons and property.

The main goal of prevention is to lessen or completely eliminate any risk or vulnerability, such as overcrowding, deforestation, or the lack of services, in order to minimize or completely eliminate the likelihood that the event will occur. In a healthy atmosphere, more wholesome individuals will be less susceptible to most dangers (FEMA, 2000:34; Ngcamu, 2022:1).

The 1990s became a decade of major effort to encourage the implementation of disaster mitigation techniques in development projects around the world by the United Nations (UNISDR, 2009:19). Based on the state of world affairs with respect to disasters especially in developing countries, the United Nations adopted the decade of the 1990s as the International Decade for Natural Disaster Reduction. The aim was to achieve a significant reduction in the loss of life and material damage caused by disasters by the end of the decade (UNISDR, 2009:20). National governments and non-governmental organisations were therefore encouraged to play a key role in helping to tackle disaster related challenges through projects which specifically aimed to reduce the impacts of hazards and through the incorporation of risks awareness as part of normal operations of development projects.

Disasters today are seen in much the same way as disease was in the early 19th century when public health measures were implemented to control the epidemics such as tuberculosis, typhoid, cholera, dysentery, smallpox and many other death causing diseases (UNISDR, 2009:22). Currently, disasters are unpredictable and an unlucky and part of the everyday risk of living. Concentrations of people and rising population levels across the globe are increasing the risk of disasters and multiplying the consequences of natural hazards when they occur.

However, modern science has proved that the epidemiology of disasters and the systematic science of what happens in a disaster shows that disasters are largely preventable if all countries both rich and poor give it the needed attention. There are many ways to reduce the impact of a disaster and to mitigate the effects of a possible hazard or accident. For example, people in well-planned environments will be less vulnerable to most disaster related hazards (UNISDR, 2009:23). E.g. having defence walls and other emergency alert systems compared to poorly

built or developed environments. According to WHO (2003:4) report, well-planned environments often do incorporate secondary prevention measures. Secondary prevention measures are the means by which people promptly recognize a hazard or a disaster and try to reduce its effects, e.g. by staying alert to possible displacements of population; by being ready to provide immunisation, food, clean water, sanitation and health care to refugees when needed.

Haddow et al. (2014:7) asserts that although individuals must take action to protect themselves, governments can employ public investment to build stronger infrastructure and a physical environment where a disaster is less likely to occur. Public protection depends on personal safety just as much as public health depends on personal hygiene (UNISDR, 2009:34). For instance, a person's choice of cooking stove and awareness that a quick earthquake could overturn it and cause extensive havoc to his or her person and other material damage is relatively more important compared to the maintenance of a large fire brigade which supposedly may have the same purpose.

The following categories describe the methods or actions that a government body might take into account while putting together an effective disaster mitigation package:

- Engineering and construction considerations
- Physical planning
- Economic considerations
- Management and institutional guidelines
- Societal considerations

2.6.2 Engineering and construction considerations in risk mitigation

Suddle (2009:8), explain that disasters can be cited into two groups. These two groups are natural and technological. According to Suddle (2009:8) both natural and technological groups include, but not limited to the following kinds of disasters as outlined in Table 2.2.

Table 2.2. Natural and technological disasters

Natural disasters	Technological disasters
• Atmospheric (e.g. storms, freeze, drought)	• fire
• Hydrological (e.g. flood, melting glaciers)	• war
• Geological (e.g. earthquake, landslide, volcanic eruption)	• Accidents (e.g. car, airplane)
• Biological (e.g. epidemic)	• Explosions)

Engineering plays a crucial role in disaster mitigation by creating a safe and sustainable built environment (Sharma, 2021:2). Furthermore, in the aftermath of a disaster, engineering is needed to ensure that a safe built environment is developed to prevent a future recurrence (Sharma, 2021:2; Suddle 2009:8).

According to Otoikhian and Aluyor (2019:13) engineering controls come in two varieties. These are those that produce stronger, risk-resistant individual structures as well as those that build flood control structures, levees, dikes, and infiltration dams, which serve largely as disaster protection measures (Otoikhian & Aluyor, 2019:2; Sharma, 2021; 6).

Reid (2013:7) explain that the first sort of action with respect to engineering controls is primarily directed at specific buildings and structures and is occasionally referred to as "hardening" facilities against hazard pressures. Besides, Sawalha (2020:16) posits that there are many ways to improve the layout and construction of buildings, agricultural structures, infrastructure, and other amenities. For facilities that engineers develop, design standards, building codes, and performance criteria are crucial networks of infrastructure, industrial facilities, and transportation systems against hazard pressures.

Designing for vibration, lateral loads, load surcharges, wind loads, impact, combustibility, flood resistance, and other safety aspects may be part of engineering design against the many dangers outlined by Sawalha (2020:16). For stronger constructed structures, such as big private

buildings, public buildings, infrastructure, transit networks, and industrial facilities, building regulations are an essential first line of protection.

Xie and Qu (2018; 6) contend that building codes based on disaster resistance are unlikely to produce stronger structures unless the engineers responsible for implementing the code recognize its value and support its application, comprehend the code and the design criteria required of them. The concern expressed by Xie and Qu (2018:6) is shared by Sawalha (2020;4) who explains that it is important for building codes to be fully enforced by authorities by inspecting and fining non-compliant designs. Also, a code needs to work in a setting that is ready to accept it (Sawalha, 2020:5).

Increased levels of training for engineers and designers, explanatory manuals to interpret the requirements of the code, and the establishment of an effective administration to check code compliance in practice may all be necessary measures to achieve the engineering mitigation measures (Gougelet, 2023:4; Xie & Qu, 2018:5; Sawalha, 2020: 8).

For example, hiring ten new municipal engineers to enforce an existing code may have more of an impact on improving construction quality in a city than suggesting higher standards for building (Gougelet, 2023:6). In the same vein, many of the structures most likely to be impacted by a disaster and those that are most susceptible to dangers were not developed by engineers and will not be subject to the safety requirements set forth in building regulations (Sawalha, 2020:4). These are homes, workshops, storerooms, and agricultural structures that the owners, craftsmen, or building contractors erected according to their own plans. These non-engineered structures account for a sizable portion of the global building stock in many countries and are a major contributory factor to disasters and hazards (Gougelet, 2023:3).

Education of builders in real-world building methods is one of the engineering approaches required to increase the disaster-resistance of non-engineered structures. The quality of the joints in the building frame and its attachment to the ground, as well as how effectively the roofing sheets are fastened, will eventually determine a house's resilience to cyclone winds (Gougelet, 2023:8; Xie & Qu, 2018:2). Nowadays, it is possible to teach contractors how to create disaster-

resistant structures practically, and these training methods are included in the menu of mitigation measures that the disaster manager can choose from.

Effective builder training necessitates persuading owners and communities to construct safer, more disaster-resistant structures and to bear the associated expenditures. In this instance, a building contractor may influence clients such as the municipality or individuals to build to higher standards, but unless this is done in the context of widespread public acceptance of the need for protection and understanding of the disaster risk, the contractor is unlikely to attract many clients due to the likelihood of an increase in cost (Sharma, 2021:7).

Rouhanizadeh, Kermanshachi and Nipa (2019:5) explain that the cost escalation in engineering works by contractors to hedge against disasters may be hedged through grant programs, preferential loans, and the provision of building materials have all been utilized as incentives to help non-engineered structures become more hazard resistant. With security of tenancy and a stake in their own destiny, legalizing land ownership and providing tenants with protection rights also stimulates people to update their building stock against the occurrence of a disaster in future.

Large-scale flood control and water supply measures require complex, protracted, and expensive engineering, and their construction frequently has unfavorable effects on the people they are meant to protect (Rouhanizadeh et al. 2019:8). For instance, some people may be evicted from their land, land use patterns may change, and other unfavorable effects may be felt. Experience has demonstrated that community-based groups may effectively administer small-scale flood control measures that can be used to reduce risk while also meeting other development objectives (Rouhanizadeh et al. 2019:8; Gougelet, 2023:8; Xie & Qu, 2018:2).

Evidence point to the fact that community based groups frequently rely on local labor, materials, and managerial resources to strengthen rather than replace traditional mitigation knowledge and the community's capacity for self-reliance (Gougelet, 2020:8; Xie & Qu, 2018:2). Such actions can be crucial in integrated agricultural or rural development programs for disaster mitigation.

2.6.3 Physical planning in risk mitigation

Planning for land use identifies potential land uses and helps choose and implement the best ones that is not risk averse. The basic goal of land use planning is to distribute land uses in a way that satisfies people's economic and social requirements while protecting future resources and the risk of disasters (Que, Wu, Hu, Cai, Jiang & Ning, 2019:7).

Studies by Hidayat and Rasadi (2020:15) and Fatmah, (2022:3) show that that numerous disaster related risks are localized, meaning that their potential consequences are limited to known locations. For example, floods harm flood basins and landslides affect steep, soft slopes. According to If it is possible to keep settlements and significant structures away from the hazardous zones, the consequences can be considerably diminished. The majority of urban master plans an now an increasingly numerous with land use zoning likely to make an effort to keep dangerous industrial activity out from important population centers (Fatmah, 2022:8) The typical processes of planning the growth of a town need to incorporate disaster risk reduction and understanding of natural hazards.

Facilities located in the public sector can be more easily regulated than those in the private sector. Schools, hospitals, emergency rooms, and major infrastructural components like water pumping stations, electrical power transformers, and telephone exchanges make up a sizable portion of a town's functioning, so the careful placement of public sector facilities can help to reduce a settlement's vulnerability. (Hildayanto, 2020:8). De-concentration of risk factors is a key idea; services given by a single central facility are always more at risk than those offered by a number of smaller facilities. During the 1985 earthquake in Mexico City, the major telephone exchange collapsed, entirely cutting off communications in the city. In order to make the telephone system less vulnerable, the central exchange was replaced by a number of micro exchanges spread out throughout the city (Hildayanto, 2020:9). For instance, the same rule holds true for power plants and water treatment facilities as it does for hospitals and schools.

A decentralized design with subsidiary towns, satellite centers, and development dispersed over a larger territory is often more desirable than the concentration of population growth and industrial development in a centralized city at the regional level (Jannah, Daniah & Nur, 2021:4)

To lower the chance of failure, meticulous planning is also required for the construction of service networks, including roads, pipelines, and cables. If a supply line is cut at any point, it could endanger long stretches of it. Provided that particular parts may be isolated when necessary, networks that are interconnected and enable more than one route to any point are less susceptible to local failures. A road barrier is less likely to prevent a vehicle from getting to a certain location in a circular road system than it is in a radial one.

Facilities in the public sector are easier to govern geographically than those in the private sector. It is nearly hard to regulate private sector land use through urban master planning and development approvals in many quickly growing cities (Jannah, et al, 2021:10). The largest risk of disaster is frequently associated with land usage in the private sector, unregulated industries, and slum areas. The marginal lands that are frequently accessible to lower-income households and the most vulnerable social groups are steep slopes and flood plains.

To lower the danger of the effects of disasters, it is important to thoroughly comprehend the economic pressures that push people in communities first in search of employment and opportunity in the city, and then in search of a place to reside in the marginal lands. If the underlying pressures are not addressed, prohibition or actions to remove settlers from dangerous regions are unlikely to be effective for very long. Some indirect solutions, like making safer land available or making alternate sites more desirable, may be successful (Hildayanto, 2020:1)

Lowering the dangers of the effects of disasters could be achieved by greater service delivery, access to public transportation, and the supply of revenue streams (Fatmah, 2022:8). Taking precaution are measures may also be helpful to clearly designate places as hazard zones, deny services, restrict access, and restrict the supply of building materials to prevent further development in vacant regions. However, the local population won't relocate elsewhere or take other measures to protect themselves until they understand the full magnitude of the threat and agree that the risk outweighs the benefits of living there.

2.6.4 Economic considerations in disaster risk mitigation

Economic considerations play an important role in disaster mitigation. As explained by (Tasri, Karimi & Islam, 2021:5), strong economy in which the benefits are shared throughout the community is the best protection against a future disaster. A strong economy means more money by both individuals and the municipality to be able to spend on stronger buildings and larger municipal finances to cope with anticipated losses in future. Mitigation measures that help a community reduce future economic losses, help members withstand losses and improve their ability to recover after a loss through disasters (Tasri, et al. 2017:7; Hallegatte, et al 2020:3; Izevbuwa & Adeolu, 2015:6). These measures make it possible for communities to afford higher levels of safety that are an important element within a disaster mitigation programme.

As explained by Hallegatte et al. (2020:7) it is those who with the least resources and income levels that proportionally, lose most in a disaster. The weakest members of the economy have very limited financial resources to cope in the event of a disaster. For example, if they lose their house or their animals they have no means of recovering them. They are unlikely to have insurance or access to credit and can quickly become destitute. Large scale drought or flood disasters in rural areas can result in an acceleration of urbanization within communities and possibly increased risks as families with their livelihoods destroyed migrate to the towns in search of better opportunities (Izevbuwa & Adeolu, 2015:15). The destruction of farms and loss of jobs and incomes may well make recovery of a region a long and slow process or make it more vulnerable to a future disaster. Skidmore and Tasri et al (2017:4), posit that in circumstances where the scale of disaster disrupts social and economic life of a people, reconstruction must be prioritised in extending grants and loans to victims to aid their recovery. On the other hand, if a family without an income as a result of a devastating disaster goes in for a loan repayments in addition to high becomes a problem. In most cases, since grants are limited, the cycle of poverty sets in again for that family hit by a disaster.

Economic development is likely to be the main objective of a municipality, provincial or national government, regardless of disaster mitigation objectives (Tasri et al, 2017:6). In most cases the processes of economic development with respect to disaster mitigation and management in the

event disasters occur become complex because most local municipalities do not generate enough income on their own to be able to adequately support their citizens in the event of disasters (Fatmah, 2022:8). More often than not, the assistance given out is basic and does not go beyond the provision of tents, mattresses, and clothes

Some aspects of economic planning are directly relevant to reducing disaster risk. For example, the diversification of economic activity is as important economic principle as de-concentration is in physical planning. A single industry (or single-crop) economy is always more vulnerable than an economy made up of many different activities (Sogand, Parisa, Shahnam, Mohsen, & Rahim, 2019:3). Sadly rural communities are often beset with agrarian economies that mostly rely on single crop activities. The linkages between different sectors of an economy such as the transportation of goods, the flow of information, and the labor market may be more vulnerable to disruption from a disaster than the physical infrastructure that is the means of production.

Tourism as an economic sector is extremely vulnerable to disaster, or even the rumor of a potential disaster. A case in point is Durban, where devastating floods in the year 2021 affected the tourist potential of the city (Sogand, et al. 2019:10). The reliance of industry and the economy on infrastructure mainly the roads, transportation networks, power, and telephone services means that a high priority should be placed on protecting these facilities. In the event of a disaster, the consequential losses of failure are costly to the whole community

Economic incentives and penalties are an important part of the powers of any municipal, provincial or national government. Grants, loans, taxes, tax concessions and fines can be used to influence the decisions people make to reduce disaster-related risks (Sogrand et al., 2019:11). Industrial location is commonly influenced by government incentives which can be used to attract industry to safer locations or to act as a focus for and loans can be offered to assist owners to upgrade their property and make buildings more disaster resistant. In places where there is minimal industrial activities such as rural communities the ability to tax to develop to an appreciable level relative to disaster mitigation becomes a mirage.

In industrialized countries, insurance is one of the major economic protection devices (Botzen, Deschenes & Sanders, 2019:2). If the risk of economic loss is spread widely over a large number

of premium payers, the loss is safely dissipated. Commercial insurance is expensive and its viability is determined by accurate calculation of risk (Botzen et al, 2019:4; Shreve & Kelman, 2014:5). With only a small number of premium payers, premiums remain high and are prohibitive to potential policy holders. The more widespread policy holding becomes, the lower the premiums are and the more widespread insurance use is likely to be. Encouragement of people to protect themselves through insurance ensures that a level of protection is built up (Shreve & Kelman, 2014:6). Compulsory insurance schemes have not been successful and national governments rarely have the financial resources to dedicate to disaster insurance guarantees, although many countries build up a disaster reconstruction fund through general taxation. Disaster insurance is high-risk finance and only multi-national insurance companies can gather the resources to cover the losses of any sizeable disaster. It is unlikely to be available to protect poorer or rural communities and their disaster-protection investments unless backed by a large development agency.

2.6.5 Societal considerations in risk mitigation

The mitigation of disasters will only come about when there is a consensus that it is desirable, feasible and affordable. In many places, the individual hazards that threaten are not recognized, the steps that people can take to protect themselves are not known and the demand of the community to have themselves protected is not forthcoming (Leoni, 2017:2). Sithole (2014:29) posits that it is prudent that mitigation planning is aimed at developing a disaster “safety culture” in which the people within a community are fully aware of the hazards they face, protect themselves as fully as they can and fully support efforts made on their behalf to protect them

Researchers such as White et al. (2000:27), Bello et al (2021:15), and Sithole (2014:33) have made the call for public awareness on disaster mitigation matters in a number of ways, from short-term, high-profile campaigns using broadcasts, literature and posters, to more long-term, low-profile campaigns that are carried out through general education. According to Bello et al. (2021:32), education should attempt to familiarize and de-sensationalize matters on disaster management as disaster affects everyone. In effect, everyone who lives in a hazard-prone area should understand hazards as a fact of life. Information about hazards therefore should be part

of the standard curriculum of children at school and be part of everyday information sources, with occasional mentions of them in stories, TV soap operas, newspapers and other common media (Ehnis, 2017:44). The objective is to develop and everyday acknowledgment of hazard safety where people take conscious, automatic precautions through being aware of, but not terrified of, the possibility of hazard occurrence (Ehnis, 2017:42). Their understanding should include being aware of what to do in the event, and a sense that their choice of house, the placement of that bookcase or stove and the quality of construction of the garden wall around their children's area all affect their own safety.

Involvement of the community in mitigation planning processes may involve public meetings and consultations, public inquiries and full discussion of decisions in the normal political forum. Further awareness is developed through drills, practice emergencies and anniversary remembrances. In hospitals, schools and large buildings it is often common to have evacuation practices to rehearse what the occupants should do in the event of fire, earthquake or other hazard as practiced in most developed countries (Glauberman & Qureshi, 2021:8). In schools children may practice fire and flood drills based on the common type of disaster that affects an area. This reinforces awareness and develops behavioral responses. Additional societal measures could be disaster awareness campaigns that is linked to major disasters that have occurred within the community or nationally to bring an awareness to mitigation measures that the community needs to know and practice at all times in the event of a disaster.

2.6.6 Management and institutional guidelines in disaster risk mitigation

Following 1994, the democratic government recognized the necessity and importance of putting in place government structures for disaster management. First, the focus was on creating a national disaster management center (White Paper, 1999:5), which would be in charge of disaster management for the entire republic. Much emphasis was placed on the necessity of expanding the role of disaster management at the local government level through the provinces as the legislative process progressed (White Paper, 1999:7).

The function of disaster management at all three levels of government, which involves both political and administrative actors, will be thoroughly discussed in the part that follows.

2.6.7. Institutional guidelines at the National Level

According to the Green Paper on Disaster Management from 1998, the national government must specify its goals in order to guarantee that specific goals for disaster management are realized. These goals comprise:

I. Including risk reduction strategies in development planning will result in sustainable development.
II. mitigating environmental degradation falls under the purview of disaster management
III. preventing the loss of life, injury, and destruction of vital resources and assets that communities depend on,
IV. guaranteeing efficient cooperation, coordination, and engagement between role-players at all levels of government, civil society, and the international sphere, and
V. putting in place the required infrastructure to lower disaster risk (Green Paper, 1998b)

The South African government has implemented the goals of disaster management through the Department of Provincial and Local Government (DPLG) (DPLG, 2001:4). The DPLG plays a national role in coordinating and executing disaster management strategies. Specifically, the Disaster Planning and Liaison Group (DPLG) oversees the Disaster Management Centre (DMC) to ensure the strategic goals of disaster management are met nationwide (DPLG, 2001:6). The primary disaster management strategy outlined in Section 7 of the Disaster Management Act is the National Disaster Management Framework (NDMF), which guides the country's disaster management objectives and actions for risk reduction (Nkombi & Wentink, 2022:9).

In compliance with the Disaster Management Act, several national structures are established to support disaster management efforts. These include the Intergovernmental Committee on Disaster Management (ICDM), National Disaster Management Framework (NDMF), National Disaster Management Centre (NDMC), National Disaster Management Advisory Forum (NDMAF), and National Interdepartmental Committee on Disaster Management (NIDMC). These structures play crucial roles in coordinating and implementing disaster management activities at the national level (Nkombi & Wentink, 2022:8).

2.7 The National Disaster Management Framework

The National Disaster Management Framework (NDMF) is a legally mandated instrument established by the Disaster Management Act of 2002, Section 7(1). It aims to ensure consistency and provide a comprehensive, transparent, and inclusive policy on disaster management that is suitable for the entire country (Nkombi & Wentink, 2022:3). The NDMF comprises four main components known as "key performance areas" (KPAs) and three supporting "enablers" (NDMF, 2005:2).

Each of the KPAs in the NDMF is built upon the specific objectives outlined in the Disaster Management Act. For effective implementation, all four KPAs must incorporate the three enablers. The framework also includes key performance indicators (KPIs) for monitoring the successful implementation of the KPAs and enablers (NDMF, 2005:2). These indicators serve as benchmarks to evaluate the progress and effectiveness of the various KPAs in disaster management.

I. KPA 1: Integrated institutional capacity for disaster risk management,
II. KPA 2: Disaster risk assessment,
III. KPA 3: Disaster risk reduction,
IV. KPA 4: Response and recovery,
V. Enabler 1: Information management and communication
VI. Enabler 2: Education, training, public awareness and research,
VII. Enabler 3: Funding arrangements for disaster risk management.

According to the Disaster Management Act, the NDMF is required to identify the different catastrophes, risks, and hazards that can happen in southern Africa as well as their severity. The NDMF oversees the execution of plans and initiatives for development in southern Africa. The National Disaster Management Center oversees both administrative and disaster management plans (executive) (NDMF, 2005:54).

2.7.1 The Provincial Disaster Management Framework

According to Sections 28 (1) and (2) of the Disaster Management Act of 2002, "each province shall establish and implement a framework for disaster management in the province (NDMF, 2005:34). This framework will have the objective of ensuring an integrated and uniform approach to disaster management in the province by all provincial organs of state, provincial statutory functionaries, non-governmental organizations engaged in disaster management in the province, and by the private sector" (NDMF, 2005:17). The provisions of this Act and the federal disaster management framework must be complied with by the provincial disaster management framework, according to Section 28(2) of the Act.

The province of KwaZulu-Natal designed the provincial disaster management framework in accordance with federal law, which consists of four key performance areas (KPAs) and three complementary enablers necessary to accomplish the KPAs' stated goals. As mandated by the Act, specific objectives as well as key performance indicators (KPIs) to direct and track progress inform the KPAs and enablers.

2.7.2 The Provincial Disaster Management Centre (PDMC)

In order to adhere to the requirement stated in section 29(l) of the Disaster Management Act, which stipulates that "each province must establish a disaster management center," the province of KwaZulu-Natal has established its own disaster management center. The primary responsibility of this center is to provide assistance and support to District Municipalities (DM) during times of emergencies or crises.

Furthermore, the KwaZulu-Natal disaster management center has recently allocated grant funds to district municipalities to aid in the establishment of their own centres, advisory forums, and disaster management plans. Currently, there are dedicated operational disaster management centers in four out of the ten district centers. The remaining six district municipalities are in the process of setting up their respective centers, with completion expected in the near future.

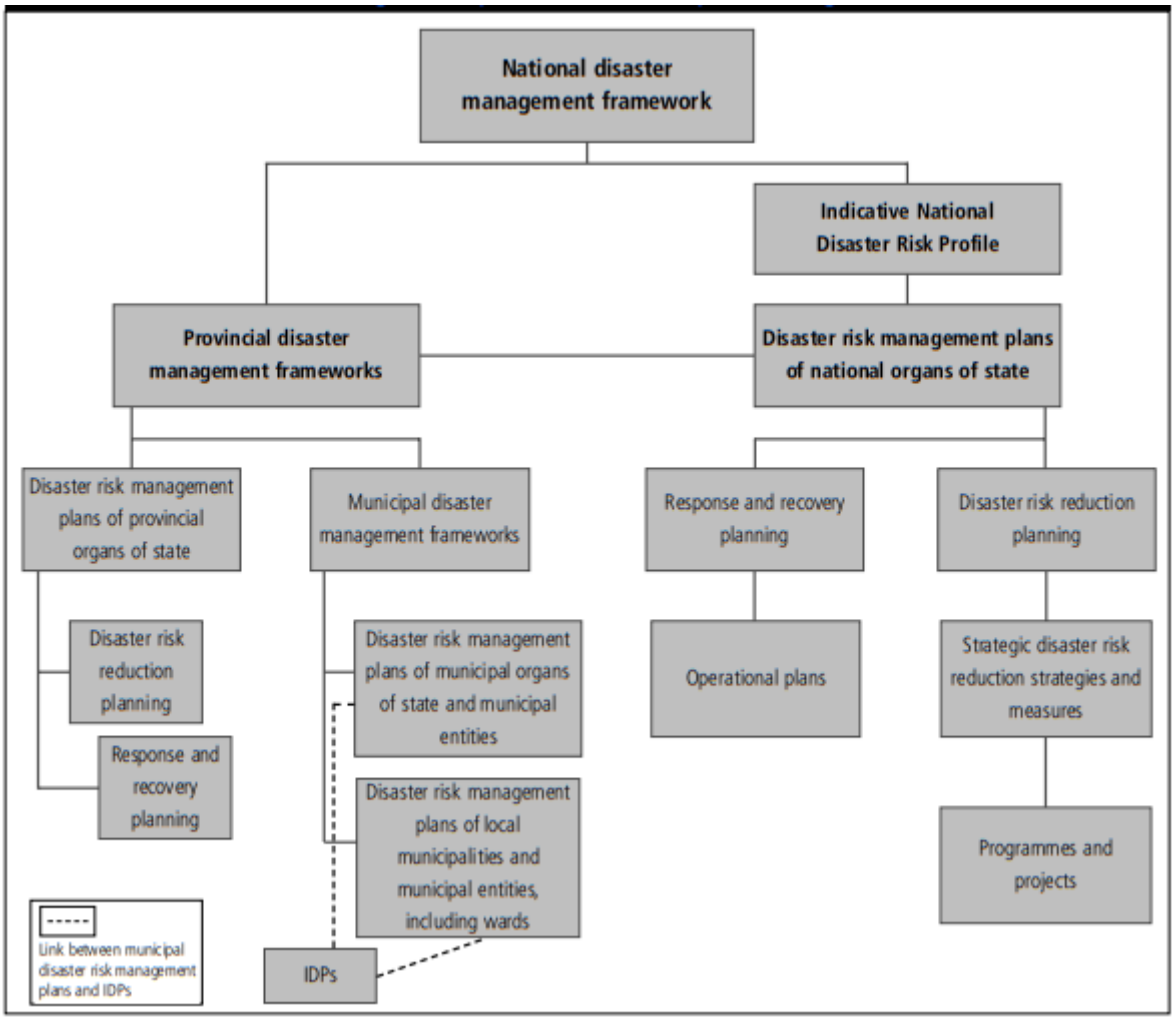
2.7.3 The Municipal Disaster Management Centre (MDMC)

Each metropolitan and district municipality is obligated to establish the necessary institutional capacity for managing disaster risks within its jurisdiction. These arrangements should align with national and provincial agreements and incorporate appropriate mechanisms that promote cooperative governance, facilitating collaboration between intergovernmental departments, municipal departments, and community engagement in reducing disaster risks.

Within metropolitan and district municipalities, the Metropolitan Disaster Management Centre (MDMC) assumes a pivotal role in disaster risk management. It is responsible for providing guidance in the implementation of disaster risk management policies, legislation, and the coordination of municipal activities and priorities. Additionally, the MDMC supports the National Disaster Management Centre (NDMC) and the relevant Provincial Disaster Management Centre (PDMC), contributing to the overall disaster risk management efforts.

In the event of an ongoing or impending disaster, the MDMC is tasked with supporting and guiding the relevant sub-administrative entities within metropolitan municipalities, and local municipalities in the case of district municipalities. It must also mobilize municipal infrastructure and other necessary resources to bolster local disaster risk management capabilities. It is essential that the institutional frameworks for disaster risk management in metropolitan and district municipalities adhere to both the applicable provincial disaster management framework and the national disaster management framework.

Figure 2.3: National, provincial and municipal disaster management frameworks and disaster management plans across the spheres of government



2.8 Local knowledge in disaster management

Indigenous knowledge, also referred to as traditional knowledge or local ecological knowledge, can be defined as the knowledge specific to a local community (Kihwelo, 2005:4; Schipper, Van Der Pol, & Botter, 2022:7). While these terms are often used interchangeably, researchers such as Schipper et al. (2022) and Hilhorst (2003:6) provide distinctions. According to

McLachlan, Wong, and MacIntyre, (2020:15), "traditional knowledge" encompasses the practices, skills, and knowledge that have been established, maintained, and adapted across generations within a community, often forming an integral part of its cultural or spiritual identity. On the other hand, Hilhorst (2003:7) defines "local knowledge" as the knowledge developed by individuals within a community over time and continuously evolving. It is based on repeated tested experiences over centuries, adapted to the local culture and natural environment, and embedded in community practices, relationships, and rituals. Local knowledge is often contrasted with expert or scientific knowledge, which is viewed as formalized, explicit, rational, systematized, placeless, non-contextual, and transferable (Schipper et al. 2022:9; McWilliam, Leonito Amaral, & van der Zanden, 2022:3). Additionally, local knowledge is primarily tacit and is often communicated through narratives and stories to enhance understanding, explanation, and meaning-making in everyday life (Kihwelo, 2005:4).

2.8.1 Importance of local knowledge in disaster management

Local knowledge and practices have received limited attention in the literature on disasters and hazards. However, since the 1970s, there has been increasing recognition within academia, international development and funding agencies, NGOs, and policy makers of the importance of incorporating local knowledge into poverty reduction projects and decision-making processes (Rai & Khawas, 2019:4). The interaction between western conventional science and local knowledge is not a new concept, as the history of science demonstrates that these two knowledge systems have often been intertwined rather than separate (Zidny, Sjostrom & Eilks, 2020:6). What is new is the broader acknowledgement of local knowledge, including indigenous knowledge and practices, and knowledge systems (Rai & Khawas, 2019:9).

Despite the significance of local and indigenous knowledge, much of the existing literature is scattered across various fields such as anthropology, geography, natural resources management, rural sociology, urban planning, and engineering (Rai & Khawas, 2019:9). However, local knowledge and practices have been largely overlooked in the context of disaster literature, particularly in discussions of disaster preparedness (Dekens, 2007:20). Historically, the focus was primarily on relief aid, but there has been a gradual shift in attention. The impact

of the 2004 tsunami in South Asia provides an example where the media highlighted how certain communities utilized local knowledge to save lives and protect property by recognizing early warning signals through local songs and observing changes in animal behavior patterns (Dekens, 2007:22).

The failure of relief aid following the 2004 tsunami can largely be attributed to a lack of understanding of the needs and practices of affected communities (Dekens, 2007:22). Despite acknowledging the existence and importance of local knowledge and practices in disaster preparedness, there is limited documented evidence of their inclusion in disaster preparedness planning by implementing organizations. A better understanding of local knowledge can empower communities and improve disaster preparedness efforts (Adhikari, et al. 2023:5). According to Adhikari et al. (2023:6), incorporating local knowledge, practices, and contextual factors can enhance the planning of disaster preparedness initiatives by implementing organizations. Furthermore, proper utilization of local knowledge in disaster management can contribute to project performance within local communities by fostering acceptance, ownership, and sustainability (Allen, 2011:7). This approach not only enhances the value and significance of local knowledge but also provides insights into identifying and collecting the relevant information pertaining to local knowledge.

2.8.2 Understanding local knowledge in disaster management

Understanding local knowledge requires recognizing that people are influenced by what they know (Maharjan et al. 2022:4). To comprehend local knowledge, one must consider the different ways people acquire knowledge (such as technological and ecological knowledge) as well as their practices, beliefs, perceptions, and values (Nugroho, Carden & Antlov, 2018:45).

It is essential to have a comprehensive understanding of the vulnerability context and the specific local knowledge practices and experiences of a community regarding disasters. Nugroho et al. (2018:30) explain that local knowledge is shaped by the type, frequency, and intensity of past and present natural hazards, as well as other unpredictable shocks and global trends.

In relation to disaster preparedness, Hadlos, Opdyke, and Hadigheh (2022:5) identify four key dimensions of local knowledge. Firstly, it involves individuals' observations of natural hazards based on their daily experiences in their local surroundings. Secondly, it encompasses their ability to anticipate natural hazards by identifying and monitoring local indicators such as early warning signs, environmental signals, time thresholds, escape routes, safe havens for humans and animals, and key skills and actors. Thirdly, it involves communication strategies among community members and across generations regarding natural hazards. Lastly, it encompasses adaptation strategies, including how people adjust, experiment, innovate, and learn from natural hazards.

2.8.3 Application of local knowledge in disaster management

The existing literature reflects a disconnect between local knowledge and disaster management, mirroring the lack of integration between poverty reduction and disaster management and the dominance of a sector-based approach (Adhikari, et al. 2023:9). As disaster management is a means of reducing poverty, a more comprehensive approach is needed to ensure that local knowledge is understood and effectively utilized. Furthermore, issues related to local knowledge in disaster preparedness must be considered within the broader context of sustainable livelihoods and poverty reduction. Within this framework, local knowledge can serve as a crucial entry point (Hadlos et al. 2022:7).

Local communities have historically employed their own approaches to disaster risk reduction based on indigenous knowledge, even before the advent of scientific knowledge (Hadlos et al, 2022:8). Unfortunately, this knowledge has often been overlooked in favor of scientific knowledge, possibly due to politics, ignorance, and the influence of particular scientific ideologies (Alcantara & Gastelumendi, 2018:6). Scientific researchers often work within established theories and assumptions passed down through generations, some of which have been applied in the African context due to their longstanding credibility (Alcantara & Gastelumendi, 2018:6). However, these assumptions sometimes overlook important questions and dismiss significant historical data from Africa. For instance, the "wood fuel crisis" theory attributing deforestation in Africa solely to cutting trees for local fuel ignores the fact that much

of the wood used for fuel comes from land clearing for agriculture (Hadlos et al. 2022:7). It is crucial to acknowledge that some of these theories and assumptions originated during the colonial period, when the concept of "environmental conservation" was introduced as a form of social control benefiting European settlers. This approach became known as colonial science (Fairhead & Leach, 1996:23) and despite the lack of evidence supporting these ideas, they influenced agriculture, livestock, and forestry management (Beinart, 1984:14; Nelson, 2002:23), disregarding the relevance of indigenous knowledge systems.

In the 1970s and 1980s, famine struck the Sahel region due to drought, resulting in the death of approximately a hundred thousand people from hunger (Nelson, 2002:16). The West attributed this disaster to harsh climatic conditions and locust infestations that destroyed crops. Foreign observers swiftly blamed the local farmers in Africa, labeling their farming practices as "inadequate" and accusing them of neglecting natural resources. This blame game directed towards the local people can be traced back to the colonial era when they were deemed ignorant and negligent of their environment, necessitating assistance to become civilized and modernized (Fairhead & Leach, 1996:23). Colonialism significantly altered the African continent, impacting the mind-set, cultural heritage, and development of its people.

Disaster management experts have developed various mitigation approaches to reduce the vulnerability of those most at risk from hazards, but these approaches, championed by the elite within the economy, have often failed to address the needs of the local people most directly affected by disasters. There is a tendency to overlook the knowledge and experiences of local communities. Now, there is growing advocacy for the implementation of bottom-up approaches that enable local people to utilize their indigenous knowledge in developing disaster risk reduction (DRR) initiatives tailored to their specific circumstances (Smit & Wandel, 2006:6). The mitigation strategies employed by governments and disaster management experts are not sufficiently effective as they fail to recognize the dynamics of the local community. Community-led DRR adaptation initiatives are better suited to the African context, as they provide platforms for like-minded individuals to engage, share values and knowledge

2.9 Conclusion

This chapter emphasized the importance of comprehending disaster risk mitigation from both a historical and contemporary viewpoint. It also brought attention to the variations in the definitions of terms related to disaster risk management and disaster management. Furthermore, the chapter delved into the necessity of mitigation and explored international perspectives on its implementation, particularly in developed countries and its potential replication in developing countries. The frameworks at the national, provincial, and municipal levels that govern disaster management were clearly delineated. The chapter underscored that in order for disaster management and mitigation endeavours to be effective, it is crucial to understand and effectively apply local knowledge, as it plays a critical role in achieving the objectives of any disaster management initiatives.

CHAPTER 3

3. Research Design and Methodology

3.1 Introduction

The aim of this study was to investigate how risk mitigation strategies and local knowledge impact disaster-prone communities in the Jozini Local Municipality. In Chapter 2, the theoretical framework and relevant literature on disaster risk mitigation, disaster management, and local knowledge in disaster-prone communities were presented. This chapter primarily focuses on the research design and methodology, discussing the investigative methods and instruments employed in the study. It highlights the research paradigm that underlies the study, the chosen research design and approach, the data collection tools, the data analysis process, and the ethical considerations taken into account.

3.2 Research Methodology

Research methodology encompasses the study's design, methods, approaches, and processes, which are systematically implemented to achieve the research objectives (Sellin & Keeves, 1997:14). Sarantakos (1998: p465) further defines research methodology as the means by which research provides understanding of the object being investigated. This comprehensive field includes data collection from study participants, the tools employed, and data analysis (Maree, 2016:216).

To gain a deeper understanding of a research problem, a well-defined research methodology is necessary to outline the logical and systematic procedures undertaken in a research project. Additionally, research methodology elucidates the underlying assumptions, challenges encountered, and how they were addressed during the study. Methodology focuses on the process of acquiring knowledge about the world or a specific aspect thereof (Sharma & Vredenburg, 1998:23). It plays a crucial role in selecting an appropriate research paradigm, design, and approach, allowing the researcher to gather the required information, expertise, and

comprehension necessary to effectively address the research questions at hand (Denzin & Lincoln, 2011:54).

3.3 Research Paradigm

Scholars such as Kumar (2011:5) and Creswell (2015:12) describe a paradigm as the lens through which a researcher perceives the world. According to Kumar (2011:19), a researcher's worldview shapes their beliefs and practices that form the foundation of their research. Furthermore, a researcher's worldview influences how they interpret research meaning, as well as the collection and analysis of data.

This study is guided by the interpretivism paradigm. Interpretivism utilizes the subjective experiences of research participants to derive conclusions (Maree, 2016:34). Interpretivists strive to understand participants' actions as they are and assign meaning through interpretation. Maree (2016:33) explains that interpretivism is attuned to individual participants' perceptions of situations and gives due consideration to their perspectives. According to Creswell (2015:11), interpretivism as a paradigm actively involves participants and incorporates their contributions in finding solutions to the research objectives. I will therefore ensure that I remain objective as possible even as I try to bring a thorough understanding and different perspectives of my participants in this study.

3.4 Research Design

Research designs encompass the procedures employed to gather, analyze, interpret, and present data in a research report (Creswell, 2015:7). According to Kumar (2011:9), a research design is a plan devised by a researcher to address a research question or problem.

For this study, the phenomenological research design was adopted. The central concept in phenomenological inquiry is describe. In a phenomenological research design, the researcher aims to provide a thorough description of the phenomenon under investigation while avoiding preconceived frameworks and remaining faithful to the facts. Phenomenologists strive to comprehend social and psychological phenomena from the perspectives of those directly involved (Kumar, 2011:6).

The chosen research design focuses on the research questions and corresponding objectives that the researcher aims to explore. In summary, the research objectives aim to study traditional risk mitigation practices in the Jozini Community, assess how disaster management and local coping mechanisms impact the municipality's existing risk mitigation measures, and analyze the effects, challenges, and opportunities of integrating local knowledge and coping mechanisms into the municipality's risk mitigation strategies. Within the framework of the phenomenological research design, the subjective viewpoints of the participants will be central to the study.

3.5 Research Approach

According to Kumar (2011:7), a research approach is a well-defined plan and procedure consisting of broad steps for data collection, analysis, and interpretation. This plan involves making careful decisions. Informed by my interpretivism worldview or paradigm, I considered the procedures of inquiry (research design) and specific research methods for data collection, analysis, and interpretation. Grover (2015:13) identifies three primary research approaches: quantitative, qualitative, and mixed methods. Tewksbury (2009:6) defines the qualitative approach as aiming to provide in-depth and detailed information. Unlike quantitative approaches, the findings of a qualitative approach cannot be generalized, but rather focus on exploring issues within the specific context of the study phenomenon. Denzin and Lincoln (2011:15) state that qualitative research involves an interpretative and naturalistic approach to the world.

In this study, the goal is not to generalize results, but rather to gain a deeper understanding of the experiences and perspectives of the participants regarding their perceptions of how local knowledge can complement conventional methods in disaster risk mitigation. By adopting a qualitative approach, I sought detailed insights from participants on their understanding of this topic. The qualitative approach allowed me to engage with the subjective ideas of the participants in an unbiased and sincere manner, facilitating a comprehensive understanding of the phenomenon under investigation and recognizing the valuable contributions of local knowledge in the context of ever-changing and dynamic climatic conditions.

3.6 Population and Sampling Procedures

Creswell (2015:25) provides a definition of a study population as a comprehensive group of individuals, institutions, or objects that are of interest to a researcher. In this particular study, the population under investigation consists of all the communities within the Jozini Local Municipality, namely Bhekindoda, Ingwavuma, Mkuze, Oshaneni, and Ubombo. The estimated population of these communities is 166,257 (IDP, 2023).

For this study, the preferred sampling technique is purposive sampling, also known as selective or judgmental sampling, which is a non-probability sampling method. The population and sample selection were in two parts based on the research objectives. The target population for the first section was from the community members of the Jozini Local Community. Whiles the section target population was from the Jozini Community Safety Department. This was because the research objectives speaks to different participants. The first research objective explores the traditional risk mitigation measures present within the community. And this specifically is to the elders within community.

With the first research objective, three communities were selected. The reason for choosing this approach is that the communities within the Jozini Local Municipality share homogeneity in terms of their culture. For the purposes of convenience and ease, the communities of Ingwavuma, Bhekindoda, and Mkuze were selected. Ingwavuma and Bhekindoda are predominantly rural, while Mkuze, being the district municipality, and has experienced significant flooding in the first quarter of 2023.

A total of 9 elders were sampled. Three elders were selected from each of the three communities namely, Ingwavuma, Bhekindoda and Mkuze. To ensure a comprehensive understanding of the selected communities' history and changing climate patterns, the oldest members of the councils in the selected communities were approached for interviews. The desired age range for the interviewees was 70 years and above. This age group was chosen because it is assumed that,

they might have first-hand experience of powerful cyclones and significant climate events that occurred within Jozini between the 1970s and early 1980s.

Although the councils in these communities did not include female representation due to the patriarchal system, efforts were made to contact elderly women aged 70 years and above for interviews. Thus, each of the three communities had one elderly female participant and 6 males, resulting in a total of three interviewees per community and a total sample size of 9 participants for this study.

The second part of the population and sampling focused on departmental officials within the Jozini Local Municipality in charge of safety and disaster management. The Jozini Local Municipality has 25 staff members in the disaster and safety management department. Of this number, the 4 most experienced staff members with extensive knowledge in disaster management were interviewed. Research objective one and two sought to understand the local knowledge that pertains to disaster risk mitigation within the Jozini community, whiles research objective three focused on how the Jozini Local Municipality can incorporate local knowledge on disaster risk mitigation to coping mechanisms offered by the municipality.

The total sample for all the interviews was 13 participants. There were some challenges encountered before the interviews took place, including two elders needing to reschedule due to health issues. However, these challenges did not hinder the progress of the study. Despite occasional difficulties in coordinating appointments with participants, the researcher successfully managed to achieve a response rate of 100%.

Table 3.1: Number of participants

Elder	Pseudonym	Gender	Community	Remark
1.	Mr. Mdletshe	Male	Bkhekindoda	
2.	Mrs. Zulu	Female	Bhekindoda	
3.	Mr. Sibiya	Male	Mkuze	Ill-health

4.	Mrs. Myeni	Female	Bhekindoda	
5.	Mr. Mpontshane	Male	Ingwavuma	
6.	Mr. Mhlongo	Male	Bhekindoda	
7.	Mr. Ndimande	Male	Ingwavuma	
8.	Mr. Mathenjwa	Male	Mkuze	
9.	Mr. Gumede	Male	Mkuze	Ill-health
10.	Mrs. Mthembu	Female	Mkuze	
11.	Mrs. Mthombeni	Female	Municipality	
12.	Mr. Zulu	Male	Municipality	
13.	Ms. Khoza	Female	Municipality	

3.7 Data Collection Instruments (Semi structured interviews)

The interview serves as a versatile tool for collecting data, leveraging multi-sensory channels such as verbal, and non-verbal, spoken, and heard as described by Cohen, Manion, and Morrison (2007:6). According to Creswell (2015:89), an interview is defined as a method of data collection, facilitating direct communication between two individuals: the interviewer and the interviewee. The former employs questions and interactive dialogue to extract information, opinions, and feelings.

Distinguishing itself from casual conversations, an interview is a purposeful, planned interaction aimed at achieving specific objectives through systematic questioning and eliciting responses from the interviewee. The choice of interviews for this study is grounded in their acknowledged advantages outlined by Cohen et al. (2007:7) and Lincoln and Guba (1985:32), including depth, flexibility, and the ability to be rescheduled to accommodate the interviewee's time and location.

The researcher opted for interviews as they proved to be the most suitable method for gaining an in-depth understanding of the effects of risk mitigation and local knowledge in disaster prone communities within the Jozini area.

Within the interview sessions, the interviewer actively listens to individuals involved in the studied phenomenon. Semi-structured interviews were employed to gather information from selected elders within the Jozini community as well as departmental officials in charge of safety and disaster management.

3.8 Data collection procedure

The semi-structured interview schedule used in the study was prepared in advance, taking into consideration aspects such as the theoretical framework and the research objectives to ensure the collection of relevant data. An audio voice recorder, along with a research journal in the form of a notebook, was organized to record all proceedings, capturing discussions and observations to enrich the data for thorough analysis.

Permission to use the audio recorder during semi-structured interviews was included in the consent forms provided to all participants before their involvement in the study. Consequently, each participant had to grant permission for the use of an audio recorder during the semi-structured interview sessions. The advantages of utilizing an audio recorder include its ability to retain natural language, allowing the interviewer to maintain eye contact and observe body language during interviews. Additionally, the recorder can be rewound, especially during the data analysis stage (Kumar, 2011:86). Consequently, the researcher was able to write field notes during semi-structured interview sessions. Both field notes and data collected through the audio recorder were transcribed during the data analysis stage.

For the recording of the interview, several devices were made available and prepared in advance. Firstly, a Smart Lav+ (RODE microphone) was used to capture quality audio directly from the smartphone. Secondly, a Lapel Mic Kit (Dixon) was employed, and thirdly, two smartphones were set up as backups to safeguard the collected data.

3.9 Individual Interviews sessions

Based on the paradigm and research design, I chose to employ a qualitative research approach to collect data, opting for face-to-face interviews. This method proved beneficial for my study, considering the dynamic nature of the topic under investigation. The interview format was particularly apt as participants engaged in discussions that held significant relevance to the outcomes expected from the research objectives. Consequently, the non-linear direction of the interviews demanded thorough probing of posed questions to gain a comprehensive understanding of the views of the elders. This approach ensured that interviewees provided accurate and honest answers.

Before commencing the interviews, I requested participants to complete a declaration of consent, and they affirmed their willingness to be recorded. This practice aligns with the definition provided by Creswell, (2015:78) and Maree (2016:104), who characterize the informed consent form as a mechanism to ensure participants comprehend the implications of their voluntary involvement in the study, emphasizing its non-monetary nature.

The interviews, lasting between thirty to forty-five minutes for each participant, were scheduled at the convenience of the participants because they are of age and needed particular attention and time. All interviews were conducted in IsiZulu and recorded for future reference

3.10 Data Analysis Procedure

Maree (2016:56) asserts that analysis involves the breakdown, separation, or disassembly of research materials into distinct pieces, parts, elements, or units. Throughout this process, factual information is deconstructed into manageable components. Subsequently, the researcher meticulously sifts and organizes these components, exploring for types, classes, sequences, processes, patterns, or wholes. The overarching goal of this analytical procedure is to assemble and reconstruct data in a meaningful manner.

Thematic analysis, as described by Braun and Clarke (2013:6), is the method of identifying themes within qualitative data. In this study, I conducted data analysis using a thematic content analysis approach. The verbally recorded words were transcribed into written texts, and related topics were grouped together to minimize errors. Prior to formal coding, the data underwent multiple readings. This aligns with Seale's (1999:14) acknowledgment that data may initially appear disjointed during the coding process.

During data analysis, particularly in qualitative research, the steps outlined below are to be adhered to when employing the thematic content analysis method (Terre Blanche, Durrhein, & Painter, 2012:12). The following steps were utilized in the course of thematic analysis: [continue with the specific steps].

Step 1: Familiarisation and immersion

I reviewed the participants' descriptions multiple times. The transcripts were scrutinized and carefully re-read to grasp the intended meaning behind the spoken words. I took notes consistently throughout the process of reading the transcribed text, aiming to immerse myself fully in the gathered data.

Step 2: Inducing themes

To enhance grammatical correctness and ensure coherence in the text, consider the following revision: "I extracted underlying themes from interviews, categorizing them into main themes and sub-themes."

Step 3: Coding

I marked different sections of data as being examples, or relevant to one or more themes. Then coded important statements with different colours (e.g., the general sentiments of elders in understanding how local knowledge can be utilised alongside modern science).

Step 4: Elaboration

Afterwards, I corrected all the mistakes made during coding. Immediately thereafter, I explored or examined more themes closely.

Step 5: Interpretation and checking

Ultimately, I compiled the interpretation, established, and labeled the themes. This process involved addressing deficiencies in the written account through careful examination and correction.

3.11 Measures to Ensure Trustworthiness

Credibility

Credibility in quantitative research is similar to internal validity, focusing on the truth value aspect (Korstjens & Moser, 2017:24). To uphold the study's credibility, I ensured accurate identification and description of participants through the use of pseudonyms (Connelly, 2016:13). Pseudonyms were also applied to the elders and departmental officials in charge of safety and disaster management who were interviews, safeguarding the principle of confidentiality.

Confirmability

Shenton (2004:6) and Lincoln and Guba (1985:12) assert that the confirmation of a study hinges on its demonstration of credibility and fittingness. According to Shenton (2004:8), researchers must take deliberate steps to ensure that their research findings reflect the genuine experiences and ideas of participants, rather than being influenced by the researchers' personal biases or preconceived notions. The establishment of an audit trail, documenting the procedures employed in interviews and data analysis, is deemed crucial for conformability.

Creswell (2015:15) provides a recommended framework for creating an audit trail, which includes recording interviews, noting impressions, segmenting data into meaningful chunks, and explaining the construction of themes, codes, and categories. In my study, I adhered to this outline by audio recording interviews, transcribing them, and scrutinizing the content for underlying ideas, assumptions, and ideologies to generate thematic insights.

Transferability

Transferability is challenging to ascertain in a qualitative study, as highlighted by various scholars (Creswell, 2015:8; Denscombe, 2010:12; Golafshani, 2003:6; Shenton, 2004:33). Despite this challenge, Denscombe (2010:12) contends that a degree of transferability can be achieved when a thick description is available, elucidating both the sending and receiving contexts. Such comprehensive details enable a reasoned judgment on the applicability of a study's findings. In line with this perspective, I conducted interviews with the participants and meticulously documented every step of the interview process.

Dependability

Dependability, as defined by Golafshani (2003:14), pertains to the consistency of findings when a study is replicated using the same methodological framework. Notably, parallels exist between credibility and dependability in practical application, as highlighted by Lincoln and Guba (1985:17). Nevertheless, dependability places particular emphasis on meticulously documenting the entire research process, with a heightened focus on the methodological framework.

In the context of this study, I ensured dependability by providing a comprehensive, step-by-step account of all processes and steps undertaken in the final research report. This meticulous documentation allowed readers to scrutinize and appreciate the rigor inherent in the dissertation's outcomes.

3.12 Ethical Considerations

Fleming (2018:5) asserts that researchers must engage in negotiations with authorities to secure entrance to the research field before initiating their studies. In my case, prior to data collection, I sought permission from the Head of Department for Safety and disaster management in the Umkhanyakude District. Subsequently, I applied for an ethical clearance certificate from the Research Ethics Committee (REC) at the Durban University of Technology.

To ensure transparency and ethical practice, participants were briefed on the study's purpose, enabling them to make an informed decision about whether to consent or decline participation. Throughout the study, I maintained a professional demeanor, underscoring participants' freedom to engage in or withdraw from the interview process. Additionally, I explained the use of a voice recorder to ensure accurate recordings and provided consent forms for participants to voluntarily read and sign.

De Vos, Strydom, Fouche, and Delport (2005, p.57) define ethics as "a set of moral principles suggested by an individual or group, subsequently widely accepted, offering rules and behavioral expectations regarding conduct towards experimental subjects and participants, employers, sponsors, other researchers, assistance, and students." Participants were assured of confidentiality, and their names were not disclosed, emphasizing the respect they deserved.

Before initiating the data collection process, letters seeking permission for interviews, along with invitations to participate and consent forms, were distributed. These letters, which delineated the purpose of the research, were delivered to all the participants in the IsiZulu language. Elders and departmental officials involved in the study received courtesy calls that specified dates and times for participant involvement, reinforcing their commitment. Participants were assured that the personal identity would not be disclosed to the public, aligning with Seale's (1999:16) recommendation to identify interviews only through a coding system. This approach aimed to safeguard participants from potential harm, underscoring the importance of researchers being cognizant of established norms in scientific research (Creswell, 2015:45).

Data collection did not interrupt participant’s normal tribal and other related duties that they performed daily. In this study I adhered to the following ethical standards of research:

• The participants were informed about the objectives of the study.

• The participants were also informed that they should participate voluntarily and that they were free to stop participating at any stage.

• Participants were assured of their anonymity and in this regard, I further assured participants that their names or identities would not be disclosed. Confidentiality was also ensured by protecting all data gathered and by not making the data available to outsiders.

• All data were stored in a locked cabinet and destroyed after completion of analysis. Electronic data was stored on a computer requiring password access.
• I assured the participants that the participation in this research would not cause them any physical discomfort, humiliation and emotional stress.

3.13 LIMITATION

The study was limited to the Jozini Local Municipality, with a focus on the population and sample drawn from within Jozini. The sample consisted of 9 elders, including 4 officials from the safety and disaster management department. While the rural communities in Jozini is relatively homogeneous compared to other districts, a larger sample size could have enhanced the ecological validity of the findings. Nevertheless, the sample size of 9 for the elders and 4 departmental officials was deemed sufficient, considering the qualitative nature of the research study.

CHAPTER FOUR

4. DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

In the preceding chapter, I provided a comprehensive overview of the research methodology utilized in the data collection process for this study. This encompassed a detailed exposition of the research paradigm, study design, ethical considerations, and the trustworthiness of the instruments. Additionally, I outlined the systematic procedures employed in gathering data to address the research questions posed in this study.

This chapter is dedicated to the thematic analysis and interpretation of the data collected through interviews conducted with the participating elders and as well as safety and disaster management officials from the Jozini Municipality.

The focal point of the data analysis was the generation of meanings through the methodical organization of data. The presentation of the analyzed information was carefully structured to accentuate comparisons, contrasts, and insights drawn from the data, as elucidated by Creswell (2014:23).The analysis of data and findings of this study are hereby presented in a qualitative approach based on the following research objectives for the study:

- To find out the traditional risk mitigation measures present in the Jozini Community.
- To explore how coping mechanisms based on local knowledge are incorporated into the existing risk mitigation measures offered by the Jozini Local Municipality.
- To critically analyse how learners' right to safety affects disciplinary procedures in secondary schools.

4.1. THE QUALITATIVE DATA ANALYSIS

Research Objectives	Themes from data analysis
a. To find out the traditional risk mitigation measures present in the Jozini Community.	• Cultural significance and symbolism. • Ancestral knowledge and practices • Communion with natural forces. • Scepticism and Accusations
b. To explore the impact of disaster management as well as coping mechanism based on local knowledge and their incorporation into the existing risk mitigation measures offered by the Jozini Local Municipality.	• Community empowerment and information sharing. • Disaster preparedness and public education. • Knowledge dissemination and internal training. • Cooperation with traditional healers.
c. To examine the effects, challenges and opportunities in integrating local knowledge and related coping mechanisms with the risk mitigation measures offered by the Jozini Local Municipality.	• Geographic challenges in emergency response. • Importance of awareness campaigns • Integration of cultural practices • Setbacks due to risky beliefs.

Table 4.1 Themes from analysed data

4.2 DISCUSSION OF THE THEMATIC FINDINGS

Discussion of the eleven (11) themes from the interviews is presented below. Themes were first presented, with findings from each theme offered, interpreted, and related to the study and extant literature. Extractions of the verbatim quotations from the data were indicated with letter codes to protect the identity of the participants. The letter 'E' denoting Elders and a designated number from (1-11) therefore represents respondents letter codes used in this chapter:

4.3 Themes from Research objective 1; to find out the traditional risk mitigation measures present in the Jozini Community.

4.3.1 Cultural significance and symbolism

The interviews conducted showed that culture played a key role in how the elders and the community in general understood issues of disaster risk mitigation. Their perception of nature informed how some of them prepared and responded to disasters. Since most people in the rural areas were more traditional in terms of religion they had a strong connection to nature and how the forces of nature affects the environment in which they lived. They suggested that sudden changes they saw in their environment signalled an impending disaster.

Another cultural significance of disaster prompters and alarm systems discovered was the term "boys of heaven" (Adhikari, et al. 2023:5). These are believed to be a group of young men who are believed to have supernatural powers. They are often associated with either the source of disasters and may also possess the powers to bring disasters to an end.

Elder 1, commented as follows;

There are groups of children who have gone through certain ritual training according to our culture and have the power to protect the communities from all forms of disasters. Disasters as you are telling us is not only related to the environment but goes beyond other forms of disasters that people in offices do not know about. Elder one recounts that the boys of heaven are used

by traditional healers within some communities. These boys move in the forests and beat tins to inform about disasters.

Elder 2, opined that disasters such as fires are announced by the boys of heaven whose duty it is to inform the community in the event of a disaster. According to Elder 2, nowadays if you go announcing or prompting people of impending disasters, they may accuse you of witch craft. It is believed that some of these boys also have the power to chase away lightning. Generational knowledge is very beneficial to the tribal communities.

On the same theme another Elder said the following;

When the clouds get heavy, the elders gather the people together and talk to them about impending rain. The community is warned to move away from areas that are flood prone. Normally the oldest and wisest among the tribes speaks his mind based on what he sees in nature. The views of men are much more respected as they are seen as the heads of the family. It is believed that God communicates with men first. Also, since the local communities are predominantly farmers the safety of their livestock and their crops is of interest to them.

Elder 3 recounts the following;

During public meetings, the headman or councilor often recounts past events and accidents. The community has wisely relocated away from hazardous areas. One unique feature of the community is a door that opens when the sky thunders, releasing hot air and allowing cool air to enter. This door also serves as a signal for the presence of hail, leading to rains of tins or ganja. A set of guidelines emphasizes the importance of not falling or swimming in the river while intoxicated, urging residents to carry protective amulets home. Additionally, the use of sticks known as "sky boys" is prevalent. The significance of these meetings lies in addressing ways to reduce accidents at home and control unauthorized access to certain areas. The size of the community meeting is attributed to discussions about documented dangers in Lana, where walking is prohibited in specific places due to potential hazards depicted in images. Social networks play a role in spreading information about accidents, emphasizing the importance of entering charges to notify others about potential risks. The community places a strong emphasis

on educating farmers about the dangers of unnecessary fires, highlighting the potential threat to homes and livestock pastures.

Elder 5, had this to say concerning cultural significance;

To prevent the spread of wildfires in the mountains, it is advised to stay away from these areas by the “Izinduna” or tribal chief. Additionally, there is a set of guidelines advocating against burning papers between houses, both during the day and at night. Proper care of fires is emphasized to avoid significant disasters, such as fires between houses and the rapid spread of flames in mountainous regions. Notably, some homes abstain from burning incense or lighting fires indoors which also has a cultural connotation. Certain residences have been strategically relocated away from forests and mountains. The community acknowledges the cyclical changes that occur annually, including seasons like spring, winter, and summer. The ability to extinguish mountain fires is attributed to rain, which is effective during the winter when the grass is less susceptible to ignition (Hadlos, et al. 2022:4). The perceived smallness of the community is linked to ongoing fire incidents in homes. Recognizing the importance of fire prevention, there is a suggestion to erect large billboards warning of the risk of fire spreading in new homes. Historical differences are highlighted, where fires were once ignited with tree leaves and soil in homes. The community is proactive in spreading awareness, utilizing hook papers, rental advertisements, radios, and television warnings to keep residents informed.

Elder 6, recounts the following;

To enhance community preparedness, it is essential to communicate with councilors and chiefs, seeking their assistance. Notably, there is an acknowledgment that cows are not herded when the sky is thundering. The government has taken proactive measures by increasing the number of volunteers in the disaster department, aiming to provide first aid to the community. Reflecting on the progression of time, it is observed that in the past, candles were used for illumination, whereas today, electricity fulfils that role. The existence of a dedicated group of volunteers is highlighted, showcasing the government's commitment to prompt disaster response. The statement emphasizing a high level suggests a collective effort or achievement within the community. Additionally, there is recognition of the importance of preserving both current and

traditional practices, ensuring that if contemporary methods fail, older ones can be employed. This serves the purpose of imparting knowledge about the social life process to future generations.

Some of the Elders interviewed looked at the issue of disaster mitigation much more broadly, for example, **Elder 7**, raised concern about disasters both within her local community and Jozini town in general as follows;

In the Jozini community, various measures can be implemented to reduce risks. One effective approach is to ensure the presence of adults on the road, providing assistance to children and overseeing traffic. However, it is noted that some individuals do not actively contribute by participating in meetings addressing community risk reduction. Unfortunately, there is a lack of specific risk mitigation measures in place. The impact of COVID-19 is acknowledged, as many people stayed at home during the pandemic. Measures related to disease prevention highlight the importance of restricting children from playing in pools to prevent the spread of certain illnesses. The presence of robots is considered beneficial in preventing accidents, especially when individuals attempt to cross roads. The overall quality is deemed low, potentially due to limited job opportunities released by the government. Accompanying children during rainfall when rivers may overflow is identified as a necessary precaution. A shift in technological advancements, such as the introduction of robots, is recognized, emphasizing their role in working when electricity is available. Lastly, reminders are in place to caution people against engaging in dangerous activities.

Elder 8 also concurred with Elder 7, in observing the issues of disaster mitigation as follows;

To reduce risks in the community, volunteers from the Department of Disasters in the Jozini Council are actively engaged. They circulate and caution the public against building houses in hazardous areas, which may be prone to water and fire incidents. Residents are advised to exercise caution by extinguishing fires in fields or pastures and turning off lights, particularly candles, in their homes.

Members of the public, including volunteers from the Ministry of Planning and the Ward Committee, communicate with the Disaster Management Committee in case of incidents, especially concerning house fires, drownings, and other potential emergencies.

Precautionary measures involve avoiding the use of shiny objects, like glasses in homes, conserving water, and turning off cell phones. Additionally, people are advised not to use electrical appliances during thunderstorms.

It is emphasized that proactive education, particularly directed at children, contributes to effective risk reduction. The decreasing rate of fires is linked to the success of the program, impacting the housing allocation from the program department.

This collective effort significantly reduces societal damage, as reflected in the high level of awareness within the community. Awareness is raised through community meetings and school sessions, where disaster department members actively contribute.

Traditional methods of fire control are contrasted with modern, more technical approaches. While traditional methods involved carrying water in buckets, the contemporary fire brigade employs specialized trucks and vehicles designed for efficient fire extinguishment.

Volunteers from the disaster department play a vital role in ensuring community safety by regularly assessing potential damage and promptly responding to incidents, transferring the necessary resources for assistance.

Elder 9. Recounts his experiences follows;

Teaching children in schools about the proper use of electricity is crucial for ensuring safety. Mothers at home also play a pivotal role by instructing their children not to go near the river, emphasizing the potential dangers. It is emphasized that staying informed is essential for both children and adults; they should regularly watch the news or listen to the radio, as these sources provide valuable information about potential societal dangers.

Efforts are made to educate the community about these risks by visiting schools and going from house to house to disseminate knowledge. Unfortunately, there is a lack of comprehensive

awareness among the public regarding the potential dangers. In situations where immediate assistance is unavailable, individuals work collaboratively and resort to traditional methods for first aid or legal aid.

The necessity for dedicated individuals to educate about risks is underscored, emphasizing the importance of thorough information dissemination. Community leaders and hired personnel contribute significantly to this educational process, addressing concerns related to theft of electricity, appropriate building locations, and the importance of planting trees around houses to mitigate wind impact.

To further enhance community safety, clear guidelines are provided, such as avoiding building near rivers or dams, refraining from using multiple electrical extensions (snakes), and ensuring children are not left unattended with burning candles. These precautions contribute to a safer environment and help prevent potential hazards in the community.

Elder 3 observed the following;

Ensuring community safety requires immediate reporting to emergency responders when starting or witnessing a fire. It is crucial to refrain from unnecessary fire ignition and the careless disposal of cigarette butts. Practical measures include maintaining gaps between fields to prevent the rapid spread of fire risks.

Specifically, spaces separating pastures from fields serve as a strategic fire containment measure, recognizing that pasture fires are less likely to spread to cultivated fields. Community engagement with the disaster department is emphasized as a proactive approach to managing potential risks.

However, a challenge is acknowledged, as the narrative approach demands constant attention. Despite this, the disaster department has successfully raised awareness within the community, reaching a high level of consciousness.

While traditional methods are recognized as having inherent risks, modern approaches are praised for their speed and reduced risks. This difference highlights the importance of adopting

contemporary practices to enhance safety and efficiency in risk management. Overall, a comprehensive and cautious approach is essential for preventing and addressing fire-related risks in the community.

4.3.2 Ancestral knowledge and Practices

Ancestral knowledge and practices have played a significant role in disaster risk mitigation in the Jozini area of South Africa. These traditional methods have been passed down through generations and have proven effective in reducing the impact of natural disasters such as floods, droughts, and wildfires. Natural disasters such as floods, droughts and wildfires are the most prevalent in Jozini. One of the most common natural disasters in the Jozini area is flooding.

Elder 1, recounts that ancestral knowledge has helped communities to identify flood-prone areas and develop strategies for avoiding them. For example, the tribal authorities often advice communities to build their homes on higher ground and avoid planting crops in low-lying areas. They also have traditional methods for forecasting floods, such as observing the behavior of animals and changes in weather patterns.

On the issue of droughts, **Elder 2**, expresses the view that droughts according to her is the most life threatening as it can destroy yields and lead to food insecurity. Drought is also a common natural disaster in the Jozini area. **Elder 3** *reports that Ancestral knowledge through local deities has helped communities to conserve water and cope with periods of drought. For example, communities often use traditional irrigation methods that are more efficient than modern methods. They also have traditional methods for storing rainwater, such as building dams and reservoirs.*

Droughts ultimately leads to wildfires. To this Elder 4, recounts traditional measures that the tribal authorities ensures that all community members especially farmers adhere to. According to Elder 4, community members who have the habit of burning bushes without recourse to the tribal guidelines may have their land leases not renewed. Ancestral knowledge has helped communities to prevent and control wildfires. For example, communities often use traditional

methods for clearing brush and creating fire breaks. They also have traditional methods for extinguishing wildfires, such as using water and sand.

In addition to these specific examples, ancestral knowledge has also helped communities to develop a general understanding of disaster risk and how to mitigate it. For example, communities often have traditional beliefs and practices that promote environmental conservation and sustainability. These beliefs and practices can help to reduce the risk of natural disasters in the long term.

The use of ancestral knowledge and practices in disaster risk mitigation is an important part of the cultural heritage of the Jozini area. These traditional methods have proven effective in reducing the impact of natural disasters and can continue to play an important role in the future.

Some of the elders specifically spoke to the types of disasters common in Jozini and the efforts to combat them.

According to **Elder 5**, most communities within Jozini have traditional methods for forecasting the weather, such as observing the behavior of animals and changes in weather patterns. These methods help communities to prepare for natural disasters such as floods and droughts. This is the reason why most households keep domesticated animals even if they might not be interested in it slaughter. In effect some of these animal behaviour acts as an alarm system to the communities.

Elder 6 records that traditional building techniques are often used in rural areas as a mitigation measure. According to Elder 6, communities often use traditional building techniques that are designed to withstand natural disasters. For example, homes are often built on stilts to avoid flooding and made of materials that are resistant to fire.

Food methods are also not left out in disaster mitigation efforts. Elder 7, who is an old lady in her 70s recounts that predicting drought or any other kind of disaster cannot be done in isolation.

According Elder 7, when they begin to lose livestock as a result of severe droughts they take counter measures in preservation since most people in rural settings do not own fridges.

Elder 8, concurs with **Elder 7** and puts it this way, we start most of our preservation during summer when the animals are at risk of dying. Those that we think we can sell we do so without a problem, otherwise we preserve food for the lean season. Some of the methods for food preservation such as drying and smoking. These methods can help communities to cope with food shortages during times of drought or other natural disasters.

Ancestral knowledge and practices are a valuable resource for disaster risk mitigation in the Jozini area. These traditional methods are effective, sustainable, and culturally relevant. They can play an important role in helping communities to prepare for, respond to, and recover from natural disasters.

4.3.3 Communion with natural forces

Elder 5, recounted similar opinions as Elder 1. The expressed sentiments were as follows: There can be no science without spiritualism and or African traditional religious practices. They contend that based spirituality or animism, plays a significant role in disaster risk mitigation in the Jozini area of South Africa. Elder 5 is of the view that the interconnectedness of all living things and the importance of maintaining a harmonious relationship with nature. Through various practices, communities in Jozini seek to understand and appease natural forces, thereby reducing the likelihood of disasters

A fundamental aspect of communion with natural forces is the understanding of natural cycles and patterns. Communities closely observe the behavior of animals, the changes in weather patterns, and the movements of celestial bodies to predict upcoming events. This knowledge helps them anticipate potential disasters and take proactive measures.

Elder 6, says that, changes in the weather is of significant importance to people in rural communities. Particularly those who rely on the weather for farming. And since Jozini is predominantly a farming area, a critical study and understanding of the weather is key.

Elder 9, for example says; I watch and study the weather carefully each morning and late in the evening. Those on TV have little idea how we get ahead of them and have been reading the weather since the times of our forefathers.

Elder 8 echoed the following sentiments, communion with natural forces instills a deep respect for the boundaries of the natural world. The government and municipality must avoid encroaching on sacred sites, disturbing natural habitats, or overexploiting natural resources. By respecting nature's limits, they minimize the risk of triggering disasters.

Elder 9, highlighted the importance of appeasing the spirits when issues of disasters and related risk have to be contended with. He echoed the following sentiments;

Most tribal communities in Jozini believe that natural forces are guided by spirits or deities. In order to maintain harmony with nature, they must perform various rituals and ceremonies to appease these spirits. These rituals may involve offerings, prayers to deities, or songs, all aimed at seeking favor and protection from natural disasters.

Elder 5, once again gives an outline of some of the rituals that local communities are obliged to perform towards disaster risk mitigation.

He recounts the following; during periods of drought, we perform rainmaking ceremonies to invoke the spirits of rain and bring much needed rain. We believe that the rain may come from any water body either within the area or from other areas as commanded by the gods. Also, **appeasing the river gods b**efore crossing rivers or engaging in fishing activities, communities often perform rituals to appease the river gods, ensuring safe passage and bountiful harvests. The Jozini Dam and other water ways serve such purpose.

Elder 2, emphasized the importance of respecting sacred groves in the community. According to Elder 2, we must avoid cutting trees or disturbing wildlife in sacred groves, believed to be inhabited by powerful spirits. She said these groves serve as natural buffers against floods and soil erosion.

In effect, the practice of communion with natural forces goes beyond mere superstition, it reflects a deep ecological understanding and a commitment to environmental stewardship. By maintaining harmonious relationships with nature, communities in Jozini have developed effective strategies for disaster risk mitigation, fostering resilience and sustainability in the face of natural hazards.

4.3.4 Skepticism and accusations

Skepticism and accusations towards the traditional practices of communion with natural forces in disaster risk mitigation are not uncommon in the Jozini area. Some individuals and organizations question the effectiveness of these practices and argue that they are based on superstition rather than scientific evidence. They believe that modern scientific methods and technologies are more reliable for predicting and mitigating natural disasters. On the other hand the elders who were interviewed disagreed with some of the mitigation measures that modern science offers.

Elder 6 argues that some of the contested traditional practices have been passed down through generations of communities in Jozini and have proven effective in reducing the impact of natural disasters. He points to the rich cultural heritage and ecological knowledge embedded in these practices. Elder 6 believes that these practices should be respected and incorporated into modern disaster-risk mitigation strategies.

The debate between proponents and opponents of communion with natural forces in disaster risk mitigation reflects the broader challenges of incorporating traditional knowledge into modern

development practices. On the one hand, there is a need to respect and value the cultural heritage and ecological knowledge embedded in traditional practices. On the other hand, there is a need to ensure that these practices are evidence-based and contribute to the development of effective disaster-risk mitigation strategies.

For example, Elder 9 calls for a balanced approach that recognizes the strengths and limitations of both traditional and modern approaches to disaster risk mitigation is essential. Elder 9 contends that such an approach should involve collaboration between traditional healers, community leaders, scientists, and government officials to develop and implement strategies that are culturally sensitive, ecologically sound, and effective in reducing the impact of natural disasters.

Here are some specific examples of how the skepticism and accusations towards traditional practices have manifested in the Jozini area as highlighted by some of the Elders.

Elders 3, 4 and 5 lamented the following by the provincial government and the lack of support thereof. These are the **The closure of traditional rainmaking ceremonies, d**uring periods of drought, when some communities have been prohibited from performing traditional rainmaking ceremonies by government officials or non-governmental organizations. These organizations argue that these ceremonies are ineffective and a waste of resources but that is not true.

The Elders also lamented the, **the denigration of traditional healers. They contend that** traditional healers who practice divination and healing are often accused of being charlatans or frauds but like in any profession they concede there are charlatans but that must not lead to all of them being painted with the same brush. They lamented their practices being dismissed sometimes just on the basis of superstition and not taken seriously by the government or the medical community.

Another concern by Elders 7, 8 and 9, is the destruction of sacred groves: the Elders said there was the need for the provincial government under COGTA to give them a hearing and assist them spread local knowledge.

The Elders commented as follows; sacred groves are very important and serve as natural buffers against floods and soil erosion. However, they are mostly cleared for agricultural purposes or development projects, often without the consent of the communities that hold them sacred. Therefore disasters may occur because nature is angry with us.

Addressing these challenges requires a shift in mindset from one of skepticism and accusations to one of respect and collaboration. Traditional knowledge and practices should be seen as valuable resources for disaster-risk mitigation, not as obstacles to progress. By working together, we can harness the strengths of both traditional and modern approaches to develop effective and sustainable strategies for reducing the impact of natural disasters in the Jozini area.

4.4 Themes from Research objective 2; to explore how coping mechanisms based on local knowledge are incorporated into the existing risk mitigation measures offered by the Jozini Local Municipality.

4.4.1 Community empowerment and information sharing

Community empowerment and information sharing are crucial aspects of disaster risk mitigation (DRM) in the Jozini area of South Africa. By empowering communities to take ownership of DRM efforts and fostering open communication channels, local knowledge and traditional practices can be effectively integrated into modern DRM strategies. The need for information sharing was highlighted by some of the Elders during the interviews.

Elder 4, remarked as follows;

There is the need to empower the community with what we do not know. Ours is the traditional practices handed over generations from our fore-fathers and these have helped us a lot. But

then if the municipality is brining something new they must tell us and not get ask us to do away with what we know and has worked.

The remarks of Elder 4, was echoed by Elders 5 and 6 who were of the opinion that the municipality train them if possible in their new methods.

Elders 4 and 5, remarked as follows;

Nothing stops the municipality from coming to us when we have tribal meetings. Disaster is very important to us because our very lives depend on it. We are all farmers in this locality and so when one is affected we are all in trouble. The problem is we cannot go and sit at the municipality and wait for meetings, they must see that we are old. Our young people are also not very interested in the farming that has kept us for all these years so a direct communication with the municipality will help us a lot.

Elder 7, was very concerned about the onset of disasters and what happens after. According to Elder 7, the communal way of living has broken down and each community member is concerned about his or her business. Elder 7, also lamented the politicization of disaster assistance although that was not part of the interview questions. On the other hand such an issue being brought up by elders shows that it is of great concern to them.

Elder 7, remarked as follows;

We do hope that your coming here to talk to us on disasters and how you are going to assist us is not because of elections. It is now difficult to discuss issues of community and the very things that affect us because everything is now politics. It is not as we use to know it. Therefore when disaster strikes we need the municipality to prepare for us all and respond in time as well as provide us some money or items as we recover from those disasters.

Some elders asked if they could be assisted financially when disaster struck. They actually saw the mandate of the municipality as more far-reaching than what is known.

Elder 9, asked the following;

What do I do when drought strikes and my livestock die? In 2015, I lost two-thirds of my livestock to drought and most of my neighbours also suffered the same fate but very little help came from the municipality. They are telling us to pay rate but then what are they using our money for when they cannot help us whenever we are in trouble. This is not fair.

Some elders were interested when asked if they would like to be part of the decision making panel that attends to the issues of disaster in their area. Elders 8 and 10 were of the opinion that modern science cannot solve all the problems related to disaster mitigation and management without consulting the ancestors. They believed that the ancestors must first grant permission for any other secondary action concerning the local community to be taken. They advised that in situations where people failed to consult the ancestors, the wrath of the gods came upon the community.

Elders 8 and 9 opined as follows; we have seen it happen when you people who claim to know too much do not respect our traditions. People of today are failing to make sacrifices to the ancestors saying tradition has no place today. But that is why we see disasters every day. The ancestors are angry with us. Long ago when we were much younger we never saw disasters as they are happening today because our forefathers were spot on in making sacrifices to the ancestors for protection. It is therefore important that you allow us to make inputs whenever issues of disaster mitigation and management are being discussed. We need the sacrifices. We have a lot of rivers here and the river gods are angry.

The need to share information was also highlighted. The elders felt that the actions of the municipality was more authoritative and disregarded their views on disaster risk mitigation. This highlighted the need to share information to avoid miscommunication. Some of the elders thought that age was a factor in understanding changes in the weather. They therefore wanted better engagement with disaster management personnel to really appreciate their intentions whenever they initiated disaster mitigated events.

4.4.2 Disaster preparedness and public education

Disaster preparedness and public education in disaster risk mitigation, incorporating local knowledge, is crucial for communities in Jozini, South Africa, to effectively prepare for and respond to natural hazards. By understanding and integrating local knowledge with scientific expertise, communities can develop effective disaster risk reduction strategies that suits their specific context.

Local communities in Jozini possess valuable knowledge about their environment, natural hazards, and traditional coping mechanisms. This indigenous knowledge, passed down through generations, provides insights into disaster patterns, warning signs, and effective survival strategies. By incorporating local knowledge into disaster risk mitigation planning, communities can:

It was observed during the interviews that since most of the people in the Jozini community are into agriculture, their traditional farming practices which they contend was important to fighting disasters.

Elders 1 and 3, shared the following sentiments;

Since what happens in the skies has a direct impact on the land, the municipality must understand our farming practices too. Am not sure if the municipality has people who know farming but we farmers do have some traditional farming indicators based on historical occurrences that we take seriously. Not only do we observe what happens in the skies, but as well what happens on our land.

The elders also recounted their own early warning systems in practice. Some of these they said included patterns in the weather, strange behaviours observed in their animals and also through ancestral communication.

Elders 5 and 9, said most people in the rural areas do not have access to television sets and hardly follow anything about the weather on T.V. but then right from the generation of our fore fathers we have been able to accurately predict disasters and save our people from them. Sometimes the disasters are very severe, but the gods and our ancestors have helped us. We do admit that in some cases people died and the extent of the disaster was more than we anticipated, but then such extremes could be because someone among us is not doing something right to appease the ancestors. In such cases rituals would have to be performed to make the community more resilience and disaster proof

There was also the need to use the local radio station. It was realized during the interviews that the local radio station which is the Maputaland Community Radio Station was a station that most of the elders listened to. What made them have particular interest in the Maputaland Community Radio station was that it offered it programmes in IsiZulu which is the predominant language of the people in Jozini.

Elders 4, 5, and 7, expressed the following sentiments;

Since us the elders do not have money to travel to you to hear these wonderful ideas you have and are giving us, please do use the Radio station that we know and you can send your people to our tribal meetings to assist us in preparing for disasters and we will also assist you with some of what we have from our ancestors.

The elders also asked for a prioritization of their concerns relative to disasters. They said not all disasters are the same and some were more important to them because it affected their lives and livelihoods more. They ranked severe floods, and droughts as much more extreme followed by bush fires. Issues of HIV/AIDS which the municipality considers as disaster according to them is more of a life style disease that affect young people more and so young people must be counselled to change their lifestyle.

Elder 8, made the following assertion;

We have no problem if you talk to the youth about their own disasters which they create sometimes. But know that when our crops are destroyed and animals die we become poorer and will not have the means to cater for these very young people who do not listen to us and get themselves always a mess. Therefore we urge you to prioritize our problems which bothers on food security and survival in Jozini

4.4.3 Cooperation with traditional rulers

Effective disaster risk mitigation (DRM) in the Jozini area relies significantly on collaborating with traditional leaders. These leaders, esteemed in their communities, possess extensive understanding of local customs, beliefs, and practices. Integrating them into DRM initiatives can greatly improve community involvement, foster cultural sensitivity, and guarantee the incorporation of traditional knowledge into contemporary DRM strategies.

Elders lamented the lack of respect for their office as well as recognition given them by government agencies and departments. For example,

Elder 5, lamented that the image of traditional leaders within the community was not as before. He said long time ago, the office of traditional leaders and tribal authorities dictated events in their communities and the people always gave an ear when communal issues were brought up.

Some of the elders were of the opinion that the only way to earn the respect of their community back was through the government and related department not undermining their authority.

Elders 7, 8, 9, highlighted cooperation with traditional leaders. This they said must come in the form of recognition and respect. Also the authority and the expertise of traditional leaders within communities must be taken serious.

According to the elders, consultation and engagement must encompass all the stages of DRM planning and implementation, from identifying hazards to developing preparedness plans and implementing recover measures.

The accumulation of local wisdom through generations of observation and experience plays a crucial role in Disaster Risk Management (DRM). In Jozini, this knowledge is deeply rooted in the community's awareness of specific risks like flood patterns, drought cycles, and wildfire threats. Traditional forecasting methods, including observing animal behavior, interpreting natural signs, and consulting with traditional healers, are integral to this understanding. Disaster preparedness has evolved in these communities, with practices such as constructing homes at higher elevations, storing rainwater, and forming community watch groups.

Incorporating local knowledge into DRM strategies offers valuable insights into the distinct vulnerabilities and capabilities of these communities. For example, engaging traditional leaders in early warning systems ensures the effective dissemination of alerts and appropriate community responses. Moreover, traditional knowledge aids in hazard mapping, identifying high-risk areas for disaster preparedness planning. It is crucial to reinforce traditional disaster preparedness practices, like community watch groups and traditional building techniques, and integrate them into formal DRM plans. Collaboration with traditional leaders and the integration of local knowledge are essential for fostering resilient communities in the Jozini area.

Through cooperative efforts involving communities, traditional leaders, and external organizations, culturally sensitive and sustainable DRM strategies can be developed. These

strategies aim to reduce the impact of disasters and safeguard the well-being of Jozini's residents.

4.5 Themes from Research objective 3; To examine the challenges and opportunities in integrating local knowledge and related coping mechanisms with the risk mitigation measures offered by the Jozini Local Municipality

4.5.1 Geographic challenges in disaster risk mitigation in Jozini

Officials from the safety and disaster management department interviewed raised issues concerning the landscape of Jozini which they think negatively impacts their ability to decisively deal with disasters.

Safety officer 1, described the situation in Jozini with regards to disaster mitigation as follows;

The low-lying coastal areas makes Jozini vulnerable to a number of natural disasters such as flooding. We have also observed marked climatic changes in Jozini that makes it difficult to use the old methods of disaster mitigation measures. This year alone due to excessive rainfall the Jozini Dam level has been opened to let out water more than twice. This situation impacts farming communities that stay along the banks of the dam right through the Makhatini areas. As a result animals and stock have been severely impacted.

Apart from floods, another challenge in the mitigation of disasters and its management thereof is drought. Jozini is located in a semi-arid region. This means that it experiences periods of drought. Indeed droughts can be severe in Jozini in the summer season.

Safety officer 2, gives a description as follows;

Indeed Jozini is a dry area. It is both dry and hot. This kind of experience in the summer especially leads to water shortages, food insecurity and wildfires. The municipality has tried to get water tanks at many vantage points where lots of people reside and also bore holes to ensure water availability as well as livestock survival. Sometimes these things are beyond our control

but the community think we must provide. For example between 2015 and 2017, there was serve drought leading to the loss of thousands of livestock. Families within the community were negatively impacted.

Safety officer 3, also recounted how droughts become a catalyst to other disasters as well;

This pertains to drought easily turning into veld fires. Arsonist do take advantage of the situation sometimes. But some are unintentional. For example, we know that South Africans like braai, and so after a braai in the forest or anywhere close where fires are not put out properly this can lead to wild forest fires. Unfortunately some community members think that the municipality must compensate them for the loss of their stock or farms which is not our responsibility. That is why disaster mitigation is very important. We need to let them know how to prevent these things before they happen.

Safety officer 3, said that there was the need to get familiar with the well-designed early warning systems that will mitigate against disasters. According to Safety officer 3, this must involve communities in its design as well as implementation. The local knowledge of the people within the Jozini community is also very important. This will help in the design and implementation of early warning system with the inputs of the community. According to safety officer 3, plans are far advanced to set up more community based committees to facilitate dissemination of information towards disaster mitigation.

The structural make of the buildings in rural Jozini are also a hindrance to disaster mitigation efforts. Safety officer 4, says most of the houses in the deep rural areas are made of mud and sticks in low-lying areas which is flood prone. Therefore early warning systems will help with giving residents enough time evacuate before disaster occurs

Building early warning systems: Early warning systems can be used to warn residents of impending disasters, giving them time to evacuate or take other protective measures and rescue measures in case of emergency.

The natural ecosystem is of paramount importance and acts as a bulwark towards disaster mitigation in most cases. Especially using correct farming practices and methods. Over the years, it has been noticed that a lot of people in the Jozini community are raising livestock. On the other hand they are not ensuring that the carrying capacity of their area accommodates the right number of livestock.

Safety and disaster management officer 1, remarked as follows;

The people in rural areas have the habit of not only bad farming practices which is on the increase because of the increase in population, but also they do cut down lots of trees for use as firewood. They do forget that the trees act as wind breaks to protect their houses and prevent erosion of the used for farming. The community seem to sometimes forget that there is a lot of interconnectedness with their practices and its effect on the environment.

Also, local knowledge still has a role to play when it comes to geographic challenges. Since it is people know what exactly pertains to where they reside, they are best placed to let the disasters management team from the municipality know in advance the seasonal occurrences in their areas to assist with mitigation measures.

4.5.2 Importance of awareness campaigns

Awareness campaigns play a crucial role in disaster risk mitigation and local knowledge in Jozini, South Africa. By educating communities about potential hazards, preparedness measures, and evacuation plans, awareness campaigns can significantly reduce the impact of disasters and save lives. The municipality has initiatives to sensitise the local communities about the changing climate and global warming as well as it effect on the environment, lives and livelihood.

Safety officer 2, highlighted the following;

We have expanded our outreach to more remote areas to implement disaster mitigation related programmes through awareness campaigns and drills. We use play acts to make it more

entertaining whiles at the same time sensitizing the community on how to prevent disasters. We also learn more about their traditional practices and try to understand them.

Safety officer 4, recounts the following;

We have seen through our outreaches that there is the need for our campaigns to be targeted instead of for everyone. We have seen that what works for the elders may not work for the youth. What we have seen is that, such methods makes specific age groups within the community learn about the specific risks they face, such as floods, droughts or wildfires. Interestingly what will prompt a youth to start a fire may be different from what will prompt an elder to start a fire.

According to Safety officer 3, they are also becoming very effective and forthright with their communication with rural communities. This we do through incorporating local wisdom, blending traditional practices with science to create a detailed disaster risk reduction strategy. Another advantage observed by our team is that the awareness campaigns ensures that the communities receive timely and accurate information about potential hazards, evacuation routes and emergency response plans. Working with them has built a lot of trust in recent times.

4.5.3 Integration of cultural practices

Integrating cultural practices into disaster risk mitigation and local knowledge in Jozini, South Africa, is crucial for building resilience against natural hazards and promoting sustainable development. Cultural practices often reflect traditional knowledge and understanding of the environment, which can be highly valuable in informing disaster risk reduction strategies.

For example safety officer 2 remarked as follows;

We have observed that indigenous communities often have knowledge of using local materials and construction methods that are resilient to extreme weather events in building. For instance some of the elders said that the Zulu people naturally have a gift in reading the weather.

Therefore, traditionally they use thatched roofs and mud brick walls with the view that these building materials are well suited to withstand heavy rains and floods.

Safety officer 3, also recounted the following: Some communities have long-standing practices of shifting cultivation or temporary settlements in response to changing seasons or environmental conditions. According to these communities these practices help them to reduce the risk of crop losses or livestock mortality during periods of drought or flooding.

Safety officer 4, highlighted the use of social media in disaster mitigation. He said, Social networks and mutual support have been created especially among the youth since the elders are not very fond of using mobile phones except for calls. We have seen that strong community bonds and social networks play a vital role in disaster preparedness and response. In times of crisis, neighbors and extended family members provide assistance with evacuation, shelter, and food distribution.

Relative to integrating cultural practices safety officer 4 added as follows; apart from training and capacity building we have moved to the stage of documentation and archiving of knowledge. In this instance we record and archive knowledge especially best practices that are deemed humane and reasonable to practice,

4.5.4 Setbacks due to risky beliefs

The safety and disaster officers observed that most elders they come across and talk to concerning disasters and how they occur attribute it to acts of nature and by God. They claim a person has no role to play in how disasters particularly severe rain leading to flooding and extreme drought occur. This kind of reasoning was also observed during the interviews with the elders.

Safety officer 4, observed the following;

Some people in Jozini believe that disasters are God's will and that there is nothing they can do to prevent them. They think that their traditional practices are sufficient and must be done first to appease the gods to prevent a recurrence. Some hold the view that if the right thing is not done when a severe disaster occurs to appease the gods then a more serious one will recur.

This belief often leads to a fatalistic attitude that discourages people from taking steps to mitigate disaster risk. Steps that the municipality offers are also not adhered to sometimes especially by the elders. For those members of the community who are becoming more understanding with modern science the message from the disaster officers is received well.

Safety officers 2 and 3 observed the following;

There is the belief that traditional practices are sufficient. Initially we thought people build houses next to a river or big water body just to have a kind of mini-ocean view or breeze because Jozini is a hot and arid place and it can get really hot in summer. But to our surprise some say they build close to rivers for protection against natural disasters. But they do forget that getting too close to these rivers can actually cause disasters when the rivers overflow. For some of them they said it was an ancestral belief and practice so that’s what they know.

From the interviews we see that many people belief modern warnings are unreliable, and often exaggerated. They rather want to complement modern warnings from the safety and disaster teams with their traditional practices but in extreme cases they put themselves in danger by ignoring warnings from the safety and disaster teams.

We also realized from the interviews the distortion of local knowledge. This is because local knowledge as valuable as they may seem are passed from generation to generation and are not written down or properly documented. So there is the possibility that oral knowledge can be misinterpreted.

All four disaster and safety officers, raised the myth surrounding some natural features in Jozini such as the Jozini Dam. They observed and recounted the following from elders and community members;

We believe that the gods have placed a huge snake in the Jozini Dam. This means that we must observe certain rituals and practices. Nobody is just allowed to swim or fish in the dam on specific days. The gods in the form of a snake in the dam ensures that our community is protected. If the snake is harmed, there will be disaster in our community.

Other myths observed included opening houses during lightning and avoiding shiny surfaces in this regard.

4.6 CONCLUSION

I presented and discussed the data collected for the study in this chapter. I also summarised the findings of the study on the effects of risk mitigation and local knowledge in disaster prone communities in Jozini Local Municipality. The research seeks to study traditional risk mitigation practices in the Jozini Community, assess how disaster management and local coping mechanisms impact the municipality's existing risk mitigation measures, and analyze the effects, challenges, and opportunities of integrating local knowledge and coping mechanisms into the municipality's risk mitigation strategies.

Data were collected from 9 elders from the Jozini tribal councils as well as 4 disaster and safety officers from the Jozini Disaster Management Department. Responses to the interview were audio-recorded and analysed through thematic analysis to determine the similarities and differences in terms of their responses. Emerged themes from the data analysis were presented accordingly and were extensively analysed and discussed according to the research questions for the study. The findings revealed that the daily life practices of the tribal leaders (elders) in Jozini and by extension the community is guided by ancestral wisdom which at times are in direct apposition to modern science. There also seem to be a strong connection between cultural wisdom and mystical beliefs. On the other hand officials of the JLM are trying to build on local

knowledge in an effort to mitigate disasters through collaboration with the community in disaster management decision making to ensure effective preparedness and response efforts.

The findings also highlighted the critical need to ensure positive impact of controlled practices, municipal initiatives for coping and collaboration with stakeholders such as water affairs, The Department of Cooperative Governance and Traditional Affairs (COGTA) and the Department of Basic Education to make disaster mitigation efforts every body's business. The next chapter presents the summary, findings and recommendations for the study.

CHAPTER 5

SUMMARY, FINDINGS AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter 4 presented the data analysis and the results of this study. These included the data collected during interview with all the participants. In this chapter, an overview of the field of study is presented, followed by the research questions. Recommendations are made under each generated theme as discussed in chapter 4. The limitations and significance of the study are then presented. The conclusions based on the findings of this study will be presented in the last part of this this chapter.

5.2 OVERVIEW OF THE STUDY

This study was conducted with the aim of exploring the effects of risk mitigation and local knowledge in disaster prone communities in the Jozini Local Municipality. Obtaining views of relevant participants comprising of elders of tribal councils in Jozini communities who had extensive local knowledge in diverse disaster mitigation measures as well as officials of the safety and disaster department was crucial in arriving at acceptable findings with respect to disaster mitigation efforts in the Jozini Local Municipality. The use of purposive sampling technique helped data collection in accordance with the objectives of the study as well as ensuring the trustworthiness of the interview schedule adopted to achieve the requisite aims and objectives of this study.

Furthermore, the study also sought approaches which could be used in the management of disasters should they occur in a much more collaborative way. Another important aspect that was thoroughly discussed was the misunderstanding between safety and disaster management officials and elders from the local community on how to effectively and timeously combat disasters. Also mentioned at the beginning of this paragraph was the use of interviews.

Interviews had provided data from the participants in a concise, rich and thorough manner. In addition to the interviews, purposive sampling was used with the aim of selecting participants through a qualitative approach for data collection purposes. The approach of data collection, which was face to face, offered the participants an opportunity to freely answer questions posed to them thoughtfully, confidently, honestly and even emotionally in some instances.

The study specifically focused on elders and disaster management officials within the Jozini Local Municipality. Consideration was made for only participants whose experiences could assist the study to be contacted. This mode of participant selection enabled the collection of data in a simple and much more effective way because they know what was at hand to be discussed and freely shared their experiences. A profound advantage was that some of the elders in the Jozini tribal council who participated held portfolios that necessitated their participation or being directly involved in disaster mitigation efforts and management within their council. Their extensive experience played a pivotal role in making the findings of this study valid and reliable. This chapter therefore presents a summary of the findings developed from the data collected from 10 elders and 4 officials from the safety and disaster management department within the Jozini Municipality.

5.2.1 How the participants responded to the research questions.

The study was informed by the following research questions;

- What are the traditional risk mitigation measures present within the Jozini Municipality?
- How can coping mechanisms based on local knowledge that is offered by the Jozini Local Municipality be incorporated into the existing risk mitigation measures offered by the Jozini Local Municipality?
- What are the challenges and opportunities in integrating local knowledge and related coping mechanism with the risk mitigation measures offered by the Jozini Local Municipality?

Research question 1: What are the traditional risk mitigation measures present within the Jozini community?

The interviews conducted revealed that cultural beliefs and practices play a crucial role in shaping the way elders and communities in Jozini, South Africa, perceive and respond to disaster risk mitigation. The elders emphasized the strong connection between their traditional religious beliefs, especially in relation to nature, and their preparedness for disasters. They highlighted the significance of cultural prompts, such as the belief in "boys of heaven" with supernatural powers, who signal impending disasters by beating tins in the forests. Elders stressed the importance of generational knowledge, community meetings, and traditional practices in addressing various disasters, including fires and floods. Ancestral knowledge was particularly emphasized, showcasing its role in identifying flood-prone areas, conserving water during droughts, and preventing wildfires. Additionally, elders underscored the communal understanding of weather patterns and the practice of rituals to appease natural forces, reflecting a deep ecological understanding and commitment to environmental stewardship. Despite the effectiveness of these cultural practices, scepticism and accusations towards them were noted, with some government measures and modern scientific approaches conflicting with traditional beliefs. The elders argued for a balanced approach, advocating collaboration between traditional practices and modern methods for comprehensive disaster-risk mitigation in Jozini. They expressed concerns about the closure of traditional ceremonies, denigration of traditional healers, and the destruction of sacred groves, emphasizing the need for mutual respect and collaboration between traditional knowledge and contemporary strategies to enhance community resilience.

Research question 2: How can coping mechanisms based on local knowledge that is offered by the Jozini Local Municipality be incorporated into the existing risk mitigation measures offered by the Jozini Local Municipality?

The text discusses the importance of community empowerment, information sharing, and collaboration with traditional leaders in disaster risk mitigation (DRM) in the Jozini area of South Africa. Elders emphasize the need for a two-way communication channel between the municipality and the community, expressing concerns about the lack of information and the politicization of disaster assistance. Some elders also request financial assistance during disasters and express a desire to be part of decision-making panels related to disaster issues.

Local knowledge, especially traditional farming practices, is highlighted as crucial in disaster risk reduction. Elders emphasize the significance of incorporating indigenous knowledge, such as early warning systems based on weather patterns, animal behavior, and ancestral communication. The elders express a preference for information dissemination through the local radio station, which broadcasts in IsiZulu, the predominant language in Jozini.

The text underscores the elders' belief that modern science alone cannot address all disaster-related challenges and emphasizes the importance of consulting ancestors for guidance. Elders stress the need to prioritize concerns related to severe floods, droughts, and bush fires, which directly impact their lives and livelihoods.

Cooperation with traditional leaders is deemed essential for effective DRM. Elders lament a decline in respect for traditional leaders and emphasize the need for recognition and collaboration with government agencies. The elders propose that traditional leaders be involved in all stages of DRM planning and implementation, citing their expertise and authority within the community.

The conclusion emphasizes the deep-rooted local wisdom in Jozini, incorporating traditional forecasting methods and disaster preparedness practices. The collaborative efforts of communities, traditional leaders, and external organizations are seen as vital for developing culturally sensitive and sustainable DRM strategies to protect Jozini's residents from the impact of disasters.

Research question 3: What are the challenges and opportunities in integrating local knowledge and related coping mechanism with the risk mitigation measures offered by the Jozini Local Municipality?

Officials from the safety and disaster management department in Jozini, South Africa, expressed concerns about the region's landscape affecting their ability to effectively handle disasters. Safety officers highlighted the vulnerability of Jozini to natural disasters such as flooding due to its low-lying coastal areas and noted the challenges posed by climatic changes. Drought, common in the semi-arid region, leads to water shortages, food insecurity, and wildfires. The structural makeup of rural buildings, often flood-prone, poses hindrances to disaster mitigation efforts. The importance of early warning systems involving community participation was emphasized. Livestock practices, deforestation for firewood, and poor farming practices were identified as contributing factors to disasters, emphasizing the need for awareness campaigns.

Officers underscored the significance of awareness campaigns in educating communities about hazards and preparedness. Tailoring campaigns to specific age groups and incorporating local wisdom and cultural practices proved effective. Integrating cultural practices, such as indigenous construction methods and traditional knowledge of weather, emerged as crucial for resilience. The use of social media and community bonds in disaster preparedness was highlighted. However, setbacks were noted in the form of risky beliefs, with some attributing disasters solely to acts of nature or God, hindering proactive measures. Traditional practices, sometimes influenced by myths, were observed to coexist with modern warnings, posing challenges in disaster mitigation. The need for documenting and archiving local knowledge and addressing misconceptions about natural features, like the Jozini Dam snake myth, were also emphasized. Overall, a holistic approach involving community engagement, cultural integration, and targeted awareness campaigns was deemed essential for effective disaster risk reduction in Jozini.

5.3 THE MAIN FINDINGS OF THE STUDY

This study explored the effects of risk mitigation and local knowledge in disaster prone communities within the Jozini Local Municipality. A number of important issues pertaining to how elders understood disaster mitigation measures using local knowledge and how that affected the work of disaster management officials has been discussed.

Below, are the major findings that emerged. These findings emanated from the interviews conducted with the participants who are all elders and disaster management officials form the Jozini Local Municipality as displayed in the previous chapter through selected themes. The main findings of this study were as follows:

Cultural beliefs and practices in disaster risk mitigation

- Cultural beliefs and practices significantly shape the perceptions and responses of elders and communities in Jozini, South Africa, regarding disaster risk mitigation.
- Traditional religious beliefs, especially those related to nature, are strongly connected to disaster preparedness.
- Cultural prompts, like the belief in supernatural powers signaling disasters, play a crucial role in community preparedness.
- Generational knowledge, community meetings, and traditional practices, including ancestral knowledge, are emphasized in addressing various disasters.

Challenges and conflicts

- Despite the effectiveness of cultural practices, skepticism and conflicts arise, with some government measures conflicting with traditional beliefs.
- Elders advocate for a balanced approach, calling for collaboration between traditional practices and modern methods for comprehensive disaster-risk mitigation.
- Concerns are expressed about the closure of traditional ceremonies, denigration of traditional healers, and destruction of sacred groves.

Community empowerment and collaboration

- Importance of community empowerment, information sharing, and collaboration with traditional leaders in disaster risk mitigation.
- Elders stress the need for a two-way communication channel between the municipality and the community.
- Concerns about the lack of information, politicization of disaster assistance, and requests for financial aid during disasters are highlighted.

Role of local knowledge

- Traditional farming practices and indigenous knowledge are crucial in disaster risk reduction.
- Elders emphasize the significance of incorporating local knowledge, including early warning systems based on weather patterns and ancestral communication.
- Preference for information dissemination through the local radio station in IsiZulu, the predominant language in Jozini.

Integration of traditional and modern approaches

- Elders believe that modern science alone cannot address all disaster-related challenges.
- Cooperation with traditional leaders is deemed essential for effective disaster risk management.
- Traditional leaders' expertise and authority within the community are highlighted, proposing their involvement in all stages of DRM planning and implementation.

Concerns of safety and disaster management officials

- Significance of awareness campaigns in educating communities about hazards and preparedness.

- Tailoring campaigns to specific age groups and incorporating local wisdom and cultural practices proves effective.
- Setbacks include risky beliefs attributing disasters solely to acts of nature or God, hindering proactive measures.
- Coexistence of traditional practices, influenced by myths, with modern warnings poses challenges in disaster mitigation.
- Need for documenting and archiving local knowledge and addressing misconceptions for effective disaster risk reduction.

Holistic approach to effective disaster risk reduction

A holistic approach involving community engagement, cultural integration, and targeted awareness campaigns is deemed essential for effective disaster risk reduction in Jozini.

5.4 CONCLUSION

In conclusion, the research underscores the profound influence of cultural beliefs and practices on disaster risk mitigation in Jozini, South Africa. The elders' emphasis on the interconnectedness of traditional religious beliefs, generational knowledge, and community practices highlights the critical role played by local wisdom in addressing disasters. Despite the effectiveness of these cultural practices, the text reveals a challenge in reconciling traditional beliefs with modern scientific approaches. Elders advocate for a balanced approach, calling for collaboration between traditional practices and contemporary strategies to enhance community resilience. The importance of community empowerment, information sharing, and collaboration with traditional leaders is emphasized, pointing to the need for a two-way communication channel between the municipality and the community. Additionally, the research highlights the significance of incorporating indigenous knowledge, such as early warning systems based on weather patterns and animal behavior. The collaboration of communities, traditional leaders, and external organizations is deemed vital for developing culturally sensitive and sustainable disaster risk reduction strategies. The findings stress the importance of awareness campaigns tailored to specific age groups, integrating cultural practices, and addressing misconceptions for effective

disaster preparedness in Jozini. Overall, a holistic approach involving community engagement and the integration of traditional wisdom with contemporary methods emerges as essential for mitigating the impact of natural disasters in the region.

5.5 Recommendations

The recommendations drawn from this study emphasize a holistic and collaborative approach to disaster risk mitigation (DRM) in Jozini, South Africa. It is crucial to recognize and integrate the cultural beliefs and practices of the community, particularly those of the elders, into DRM strategies. This involves fostering a two-way communication channel between the municipality and the community, addressing concerns about information scarcity and the politicization of disaster assistance. Financial support during disasters and involving elders in decision-making panels related to disaster issues are also key considerations. Traditional knowledge, especially in farming practices and early warning systems, should be incorporated into DRM planning, with an emphasis on information dissemination through local radio stations in the predominant language, IsiZulu. Collaboration with traditional leaders is essential, requiring recognition and involvement in all stages of DRM planning and implementation, given their expertise and authority within the community. Additionally, officials from safety and disaster management departments stress the importance of awareness campaigns tailored to specific age groups, incorporating local wisdom and cultural practices, and utilizing social media for effective disaster preparedness. Overcoming setbacks related to risky beliefs, documenting local knowledge, and dispelling misconceptions are crucial components of a comprehensive strategy. Ultimately, a collaborative effort involving communities, traditional leaders, and external organizations is vital for developing culturally sensitive and sustainable DRM strategies to protect Jozini from the impact of natural disasters.

5.6 Limitations of study

Navigating through the community and meeting tribal leaders for data collection was difficult due to their age, the patience with which I had to have which meant that the stipulated time for some of the interviews were exceeded.

Another challenge was that some elders saw their views as sacrosanct and not willing to hear about alternatives that have been communicated to them through the community radio stations.

Since this study was subjective and used interpretative method to the lived experiences of elders' and their understanding of local knowledge and it effect on disaster mitigation, and the limited number of participants selected for in-depth analysis of the qualitative data, the study cannot be generalized further.

Despite the above mentioned limitations displayed, the study was very rich and will add value to what is already known concerning risk mitigation and local knowledge in disaster prone communities within the Jozini Local Municipality.

6.0 REFERENCES

Adhikari, M., et al. (2023). Where does local and indigenous knowledge in disaster risk reduction go from here? A systematic literature review. International Journal of Disaster Risk Reduction, 81, 103328.

Alcantara-Ayala, I., & Gastelumendi, G. (2018). Combining indigenous and scientific knowledge in disaster risk reduction: The case of flooding in the Andean highlands of Peru. International Journal of Disaster Risk Reduction, 28, 271-280.

Allen, K. M. (2011). Community-based disaster preparedness and climate change adaptation: Local knowledge and the cultural dimensions of risk and resilience. International Journal of Disaster Risk Reduction, 2, 18-32.

Bello, O., Bustamante, A., & Pizarro, P. (2021). Planning for disaster risk reduction within the framework of the 2030 Agenda for Sustainable Development (Project Documents (LC/TS.2020/108)). Santiago: Economic Commission for Latin America and the Caribbean (ECLAC), 2021.

Clubb, A. C., & Hinkle, J. C. (2015). Protection motivation theory as a theoretical framework for understanding the use of protective measures. *Criminal Justice Studies, 28*(3), 336-355. DOI: 10.1080/1478601X.2015.1050590

Beinart, W. (1984). “Soil Erosion, Conservationism and Ideas about Development: A Southern African Exploration, 1900-1960.” *Journal of Southern African Studies*, vol. 11, no. 1, 1984, pp. 52–83. *JSTOR*, http://www.jstor.org/stable/2636546. Accessed 1 Dec. 2023

Botzen, W. J. W., Deschenes, O., & Sanders, M. (2019). The Economic Impacts of Natural Disasters: A Review of Models and Empirical Studies. *Review of Environmental Economics and Policy, 13*(2), 167-188.

Braun, V & Clarke, V. (2019) Reflecting on reflexive thematic analysis, Qualitative

Research in Sport, Exercise and Health, 11(4), 589-597

Burger, A., Kennedy, W. G., & Crooks, A. (2021). Organizing Theories for Disasters into a Complex Adaptive System Framework. *Urban Science, 5*(3), 61. DOI: 10.3390/urbansci5030061

Burton, I. (2005). The social construction of natural disasters: An evolutionary perspective. In Know Risk (Ed.), UNDRR. Geneva, Switzerland, 35–36. ISBN 9211320240, 2005.

Burton, I., Kates, R. W., & White, G. F. (2002). The environment as hazard. Routledge.

Cardona, O. D. (2003). Indicators for risk measurement: fundamentals for a methodological approach. Manizales: Inter-American Development Bank. [Online] Available at: http://magic.un.org.mx/www3/ricardo/rzapata/PROYECTO%20BID%20CEPAL/COMPONENTE%20II%20(CARDONA)/Formulation%20of%20indicators%20Ph%202%20draft1.21.10.03.pdf

Chen, C. (2020). A Glimpse of the First Eight Months of the COVID-19 Literature on Microsoft Academic Graph: Themes, Citation Contexts, and Uncertainties. *Frontiers in Research Metrics and Analytics, 5*, 607286. doi: 10.3389/frma.2020.60728

Chipangura, P., Van Niekerk, D., & Van der Waldt, G. (2019). An exploration of the tractability of the objectivist frame of disaster risk in policy implementation in Zimbabwe. *Jàmbá: Journal of Disaster Risk Studies, 11*(1), a604. https://doi.org/10.4102/jamba.v11i1.604

Cohen, L., Manion, L., & Morrison, K. (2007). Research Methods in Education (6th ed.). London and New York, NY: Routledge Falmer.

Connelly L. M. (2016). Trustworthiness in Qualitative Research. *Medsurg nursing official journal of the Academy of Medical-Surgical Nurses*, *25*(6), 435-436.

Creswell, J. W. (2015). A concise introduction to mixed methods research. Thousand Oaks, CA: Sage

Cutter, S. L. (Ed.). (1994). Environmental risk and hazards. New Jersey: Prentice Hall.

Cutter, Susan L., and Christopher T. Emrich. (2016). Mapping social vulnerability to environmental hazards. Routledge.

Cutter, S. L., & Emrich, C. T. (2016). Mapping social vulnerability to environmental hazards. Routledge.

Osberghaus, D. (2017). Prospect theory, mitigation and adaptation to climate change. Journal of Risk Research, 20*(7), 909-930.

David, A. (2015). Principles of disaster risk reduction. Cambridge University Press.

Department of Provincial and Local Government (DPLG). (2001b). Integrated Development Plan guide pack. Pretoria: DPLG.

Dekens, J. (2007). Local knowledge for disaster preparedness: A literature review. Kathmandu: International Centre for Integrated Mountain Development (ICIMOD).

Denzin, N.K. & Lincoln, Y.S. (2011). Handbook of qualitative research, Sage, London. Sage.

Denscombe, M. (2010). *The Good Research Guide: For Small-scale Social*

Research Projects. Open University Press.

Department of Provincial Affairs and Constitutional Development [South Africa] (1998). Disaster Management Green Paper (p. 12). Retrieved from Government of South Africa website: https://www.gov.za/documents/green-papers/disaster-management-green-paper-01-feb-1998

De Vos, A.S., Strydom, H., Fouché, C.B., & Delport, C.S.L. (2005). Research at grassroots: For the social sciences and human service professions. 3rd ed. Pretoria: Van Schaik Publishers.

Dombrowsky, W.R. (1981). Another step toward a social theory of disaster. Newark, DE: Disaster Research Center Preliminary Paper Number 70.

Dombrowski, W.R. (1998). Again and again: Is a disaster what we call a disaster? In E.L. Quarantelli (Ed.), What is a disaster? Perspectives on the question (pp. 19-30). London: Routledge.

Doughty, P. (1971). From disaster to development. Americas, 23(5), 25-35.

Drabek, T.E., & Quarantelli, E.L. (1967). Scapegoats, villains and disasters. Transaction, 4, 12-17.

Dynes, R.R., & Drabek, T.E. (1994). The Structure of Disaster Research: Its Policy and Disciplinary Implications. International Journal of Mass Emergencies & Disasters, 12(1), 5–23. https://doi.org/10.1177/028072709401200101

Dynes, R.R., & Quarantelli, E.L. (1968). Redefining property norms in community emergencies. International Journal of Mass Emergencies and Disasters, 3, 100-112.

Ebrahim, Y. (2003). NGOs and civil society: From participation to power. London, UK: Routledge.

Edwards, M. (2010). Civil society and the politics of development: An agenda for the future. In: M. Edwards (Ed.), Civil society and the politics of development: An agenda for the future (pp. 1-24). New York, NY: Palgrave Macmillan.

Ehnis, C. (2017). Social media within emergency management organisations – a case study exploring social media utilisation for emergency and disaster management. University of Sydney. Retrieved from https://ses.library.usyd.edu.au/handle/2123/17938

Eldenman, R. (1952). An approach to the study of disaster. (Unpublished paper).

Fairhead & Leach (1996). Misreading the African Landscape: Society and Ecology in a Forest-Savanna Mosaic (African Studies). Cambridge: Cambridge University Press.
Doi: 10.1017/CBO9781139164023

Fatmah, F. (2022). Effect of disaster training on knowledge regarding flood risk management amongst families with older people. Jàmbá: Journal of Disaster Risk Studies, 14(1), a1262. https://doi.org/10.4102/jamba.v14i1.1262

Feng, J., Tang, S., & Chuai, X. (2018). The impact of neighbourhood environments on quality of life of elderly people: Evidence from Nanjing, China. Urban Studies, 55(9), 2020–2039. https://doi.org/10.1177/0042098017702827

Fleming, J. (2018). Recognizing and Resolving the Challenges of Being an Insider

Researcher in Work-Integrated Learning.

Gilbert, C. (1998). Studying disasters: A review of the main conceptual tools. International Journal of Mass Emergencies and Disasters, 13(3), 231-240.

Gill, L. N., Renault, R., Campbell, E., Rainville, P., & Khoury, B. (2020). Mindfulness induction and cognition: A systematic review and meta-analysis. Consciousness and Cognition, 84, 102991. https://doi.org/10.1016/j.concog.2020.102991

Glauberman, G., & Qureshi, K. (2021). Community/Public Health Nurses' Awareness of Residential High-Rise Fire Safety Issues. SAGE Open Nursing, 7. https://doi.org/10.1177/23779608211040597

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The*

Qualitative report, *8*(4), 597-606.

Gougelet R. M. (2023). Disaster Mitigation. In Ciottone's Disaster Medicine (pp. 160–166). https://doi.org/10.1016/B978-0-323-28665-7.00027-3

Grover, V. K. (2015). Research approach: An overview. *International Multidisciplinary*

Research Journal. Vol.4, (8), 1-8

Haasnoot, M., Warren, A., & Kwakkel, J.H. (2019). Dynamic Adaptive Policy Pathways (DAPP). In V. Marchau, W. Walker, P. Bloemen, & S. Popper (Eds.), Decision Making under Deep Uncertainty (pp. 4-17). Springer. https://doi.org/10.1007/978-3-030-05252-2_4

Haddow, G.D., Bullock, J.A., & Coppola, D.P. (2014). Introduction to emergency management. Science Direct. https://doi.org/10.1016/C2012-0-03544-2

Hadlos, A., Opdyke, A., & Hadigheh, S. A. (2022). Where does local and indigenous knowledge in disaster risk reduction go from here? A systematic literature review. International Journal of Disaster Risk Reduction, 77, 102792.

Hallegatte, S., et al. (2020). From poverty to disaster and back: A review of the literature. Econ. Disaster Clim. Change, 4(1), 223–247.

Hewitt, K., & Burton, I. (1971). The hazardousness of a place: A regional ecology of damaging events. Toronto: University of Toronto University Press.

Hewitt, M. (1998). Social Policy and Human Need. In N. Ellison & C. Pierson (Eds.), Developments in British Social Policy (pp. 5-24). Palgrave.

Hidayat, A. Rasadi, S. (2020). Disaster-based participatory development planning. E3S Web of Conferences, 156, 01010. https://doi.org/10.1051/e3sconf/20201560101019

Hildayanto, A. (2020). Knowledge and preparedness of the community against flood disasters. Higeia Journal of Public Health Research and Development, 4(4), 77–586.

Hilhorst, D. J. M. (2003). The real world of NGOs: Discourses, diversity and development. London: Zed Books.

Integrated Development Plan. (2023). Umkhanyakude District Municipality. Retrieved from www.kdm.gov.za/review2016-2017-pdf

Integrated Development Plan (2023). Umlazi District Municipality.Umlazi, Durban

www.kdm.gov.za/review2016-2017-pdf

IPCC. (2012). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Cambridge University Press.

Izevbuwa, O. D., & Adeolu, A. R. (2015). Economic analysis of the effect of flood on income distribution among farmers in Edo state, Nigeria. International Journal of Research in Agriculture and Forestry, 2(3), 7–13.

Jannah, I., Daniah, & Nur, A. (2021). Analysis of older people preparedness to face flood disaster in Kebalen Village, Jambi. STIKES Mitra Ria Husada X(2), 1–11.

Kelman, I. (2003). Defining risk. FloodRiskNet Newsletter, 2, Winter.

Kihwelo, S. (2005). Indigenous knowledge: What is it? How and why do we protect it? *The Journal of World Intellectual Property, 8(5), 577-603.*

Kreps, G. A. (1998). Disaster as a systemic event and social catalyst. In E. L. Quarantelli (Ed.), What is a Disaster? Perspectives on the Question (pp. 31-55). Routledge.

Korstjens, I., & Moser, A. (2017). Series: Practical guidance to qualitative research. European Journal of General Practice, 23(1), 271-279. doi:10.1080/13814788.2017.1375090

Kuban, R., & MacKenzie-Carey, H. (2001). Community-wide Vulnerability and Capacity Assessment. Government of Canada, Office of Critical Infrastructure Protection and Emergency Preparedness.

Kumar, S. (2016). Research methodology: A step-by-step guide for beginners. Sage

Publishers. London

Lavell, A. (1999). The impact of disasters on development gains: Clarity or controversy. IDNDR Programme Forum. Retrieved from http://www.desenredando.org/public/articulos/1999/iddg/IDDG1999_mar-12002.pdf

Leoni, B. (2017). Prevention Web: Media call for a bigger disaster risk reduction role. Retrieved from https://www.preventionweb.net/news/view/53597

Lincoln, Y. & Guba, G. (1985). Naturalistic inquiry. Beverly Hills: Sage.

Maharjan, S. N., et al. (2022). Integrating local and scientific knowledge in disaster risk reduction: A systematic review of motivations, processes, and outcomes. Journal of Environmental Management, 307, 114674.

Maree, K. (2016). *First steps in research*. Van Schaik Publishers.

McLachlan, A., Wong, S.W., & MacIntyre, M. (2020). Local knowledge and practice in disaster relief: A worldwide cross-cultural comparison of coping mechanisms. International Journal of Disaster Risk Reduction, 50, 101641.

McWilliam, A.M., Leonito Amaral, A., & van der Zanden, E.H. (2022). Where does local and indigenous knowledge in disaster risk reduction go from here? A systematic literature review. International Journal of Disaster Risk Reduction, 77, 103023.

Mkhize, M. (2023, February 10). Heavy rains flood northern KZN town. Times Live. https://www.timeslive.co.za/news/south-africa/2023-02-10-watch-heavy-rains-flood-northern-kzn-towns

Mokhoali, L. (2021). Tropical Cyclone Eloise: A preliminary assessment of the humanitarian impact in South Africa. United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Southern Africa Regional Office.

Mthembu, A., & Hlophe, S. (2020). Building resilience to climate change in vulnerable communities: A case study of uMkhanyakude district municipality. Town and Regional Planning, 77, 42-56. doi:10.18820/2415-0495/trp77i1.4

Mubarak, A. F., Amiruddin, R., & Gaus, S. (2019). The effectiveness of disaster prevention and mitigation training for students in disaster-prone areas. Earth and Environmental Science, 235, 01.

Nelson, J. (2002) 'Melissa Leach and Robin Mearns (eds), The Lie of the Land: challenging received wisdom on the African environment', *Africa*, 72(2), 336+, available: https://link.gale.com/apps/doc/A111465949/AONE?u=anon~4344157f&sid=googleScholar&xid=40ed9109 [accessed 01 Dec 2023].

Ngcamu, B. (2022). Climate change and disaster preparedness issues in Eastern Cape and Kwazulu-Natal, South Africa. Town and Regional Planning, 81, 53-66. doi:10.18820/2415-0495/trp81i1.5

Ngema, T. (2021). Jozini flooded as tropical Eloise leaves a trail of destruction. Retrieved from https://www.iol.co.za/dailynews/news/jozini-flooded-as-tropical-storm-eloise-leaves-trail-of-destruction-0e96a5c2-5edf-4309-95d5-f1da11ac89dd

Nkombi, Z., & Wentink, G. J. (2022). The role of public participation in disaster risk reduction initiatives: The case of Katlehong township. Jamba (Potchefstroom, South Africa), 14(1), 1203. https://doi.org/10.4102/jamba.v14i1.1203

Nugroho, K., Carden, F. & Antlov, H. (2018) Local Knowledge Matters: Power, Context and Policymaking in Indonesia by Jessica Cockburn (2020) in Sage Journals: https://policy.bristoluniversitypress.co.uk/local-knowledge-matters

Oakley, M., Mohun Himmelweit, S., Leinster, P., & Casado, M. (2020). Protection Motivation Theory: A Proposed Theoretical Extension and Moving Beyond Rationality—The Case of Flooding. Water, 12(7), 1848. http://dx.doi.org/10.3390/w12071848

Otoikhian, S. K., & Aluyor, E. O. (2019). Disaster risk management in engineering and technology with a focus on chemical engineering. Global Scientific Journals, 2(8).

Pearce, L. D. (2000). An Integrated Approach For Community Hazard, Impact, Risk and Vulnerability Analysis: HIRV. University of British Columbia.

Peng, B., Zhao, Y., Elahi, E., & Wan, A. (2023). Investment in environmental protection, green innovation, and solid waste governance capacity: empirical evidence based on panel data from China. *Journal of Environmental Planning and Management, 66*(6), 1229-1252. DOI: 10.1080/09640568.2021.2017866

Perry, R. W. (2007). What Is a Disaster? In Handbook of Disaster Research (pp. 1-15). Springer. https://doi.org/10.1007/978-0-387-32353-4_1

Peters, K., Peters, L. E. R., Twigg, C., & Walch, C. (2019). Disaster risk reduction strategies: Navigating conflict contexts. London: Overseas Development Institute

Powell, J., Rayner, R., & Finesinger, J. (1952). Response to disaster in American cultural groups. Symposium on Stress. Army Medical Services Graduate School.

Quarantelli, E. L. (1998). What is a Disaster? Natural Hazards, 18, 87–88. https://doi.org/10.1023/A:1008061717921

Que, T., Wu, Y., Hu, S., Cai, J., Jiang, N., & Xing, H. (2022). Factors Influencing Public Participation in Community Disaster Mitigation Activities: A Comparison of Model and Nonmodel Disaster Mitigation Communities. International Journal of Environmental Research and Public Health, 19(19), 12278. https://doi.org/10.3390/ijerph191912278

Qutoshi, S.B. (2018). Phenomenology: A Philosophy and Method of Inquiry. *Journal of Education and Educational Development*.

Rai, P., & Khawas, V. (2019). Traditional knowledge system in disaster risk reduction: Exploration, acknowledgement and proposition. Jàmbá: Journal of Disaster Risk Studies, 11(1), a484. https://doi.org/10.4102/jamba.v11i1.484

Republic of South Africa. (1998). National Environmental Management Act, No. 107 of 1998.

Republic of South Africa. (2002). Disaster Management Act, 2002 (Act 57 of 2002).

Republic of South Africa. (2005). Municipal Systems Act, 2000 (Act 32 of 2000).

Republic of South Africa. (2005). National Disaster Management Framework of 2005. Government Gazette.

Republic of South Africa. (2005). Electronic Communications Act No. 36 of 2005. Cape Town: Government Gazette.

Republic of South Africa. (2008). Regulation of interception of communications and provision of communication-related information Amended Act. Government

Republic of South Africa. (2003). Disaster Management Act, 2002 (Act No. 57 of 2002). Pretoria: Government Printer.

Republic of South Africa. (1998). Green Paper on Disaster Management. Pretoria: Government Printer.

Reid, B. (2013). Science and Technology for Disaster Risk Reduction: A review of application and coordination needs.

Rouhanizadeh, B., Kermanshachi, S., & Nipa, T. J. (2019). Identification, Categorization, and Weighting of Barriers to Timely Post-Disaster Recovery Process. In Proceeding of ASCE International Conference on Computing in Civil Engineering, Atlanta, Georgia, US, June 17-19, 2019.

Schipper, E.L.F., Van Der Pol, B., & Botter, J. (2022). Integrating local and scientific knowledge in disaster risk reduction: A systematic review of motivations, processes, and outcomes. International Journal of Disaster Risk Reduction, 80, 103025.

Seale, C. (1999). Quality in qualitative research. *Qualitative inquiry*, *5*(4), 465-478.

Sharma, S. and Vredenburg, H. (1998) Proactive Corporate Environmental Strategy and the Development of Competitively Valuable Organizational Capabilities. Strategic Management Journal, 19, 729-753. https://doi.org/10.1002/(SICI)1097-0266(199808)19:8<729::AID-SMJ967>3.0.CO;2-4

Shenton, A.K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*. *22* (2004), 63-75.

South Africa. (1999). White Paper on Disaster Management Government Gazette, 19676 of 1999. Pretoria: Government Printer.

Sachs, W. (Ed.). (1990). Development: The development dictionary. London: Zed Books.

Saputro, K. E. A., Hasim, K., Karlinasari, L., & Beik, I. S. (2023). Evaluation of Sustainable Rural Tourism Development with an Integrated Approach Using MDS and ANP Methods: Case Study in Ciamis, West Java, Indonesia. Sustainability, 15(3), 1835. https://doi.org/10.3390/su15031835

Sarantakos, S. (1998) Social Research. 2nd Edition, MacMillan Education Australia, South Melbourne.

Seddiky, A. M., Giggins, H., & Gajendran, T. (2021). Philosophical underpinnings of disaster risk reduction research: The case for social constructivism, 39(10).

Sellin, N., & Keeves, J. P. (1997). Path Analysis with Latent Variables. In J. P. Keeves (Ed.), Educational Research, Methodology, and Measurement: An International Handbook (2nd ed., pp. 633-640). Oxford: Pergamon Press.

Sharma, S. (2021). Exploring Disaster Mitigation in India: A Financial Viewpoint. Emerging Economy Studies, 7(1), 7–22. https://doi.org/10.1177/23949015211057915

Shreve, C., & Kelman, I. (2014). Does mitigation save? Reviewing cost-benefit analyses of disaster risk reduction. International Journal of Disaster Risk Reduction, 10(A), 213-235. ISSN 22124209

Shillair, R. (2020). Protection Motivation Theory. https://doi.org/10.1002/9781119011071.iemp0188

Sithole, B. E. (2014). Municipal disaster management in South Africa: Intergovernmental relations as a planning instrument. Bloemfontein: Central University of Technology, Free State.

Smith, K. (2002). Environmental hazards: assessing risk and reducing disaster (3rd ed.). London: Routledge.

Smit, B. and Wandel, J. (2006) Adaptation, Adaptive Capacity and Vulnerability. Global Environmental Change, 16, 282-292. http://dx.doi.org/10.1016/j.gloenvcha.2006.03.008

Sogand, T., Parisa, M. M., Shahnam, S. M., Mohsen, D., & Rahim, A. S. (2019). The importance of education on disasters and emergencies: A review article. Journal of Education and Health Promotion, 8(85), 1–7.

Suddle, S. (2009). The risk management of third parties during construction in multifunctional urban locations. Risk Analysis: An Official Publication of the Society for Risk Analysis, 29(7), 1024–1040. https://doi.org/10.1111/j.1539-6924.2009.01213.x

Sawalha, H. I. (2020). A contemporary perspective on the disaster management cycle. Foresight, 22(4), 469–482.

Tasri, E. S., Karimi, K., & Muslim, I. (2021). The effect of economic variables on natural disasters and the impact of disasters on economic variables. Heliyon, 8(1), e08678. https://doi.org/10.1016/j.heliyon.2021.e08678

Tasantab, C. J., Gajendran, T., & Maund, K. (2023). How the past influences the future: flood risk perception in informal settlements. *Environmental Hazards, 22*(3), 201-220. DOI: 10.1080/17477891.2022.2130854

Tay, H.W., Banomyong, R., Varadejsatitwong, P., & Julagasigorn, P. (2022). Mitigating Risks in the Disaster Management Cycle. Advances in Civil Engineering, 2022, Article ID 7454760, 14 pages. https://doi.org/10.1155/2022/7454760

Tierney, K. (2006). Down from the mountain: The long journey of disaster research. Island Press.

Terre Blanche, M. J., Durrheim, K., & Painter, D. (2012). Research in practice: Applied methods for the social sciences (2nd ed.). Cape Town, South Africa: Juta.

Tewksbury, R. (2009). Qualitative versus quantitative methods: Understanding why qualitative methods are superior for criminology http://doi.acm.org/10.1145/1323651.1323656 (Accessed 20 January and criminal justice. Journal of Theoretical and Philosophical Criminology, 1(1): 38-58

Turner, B. (1978). Man-made disasters. London: Wykeham.

United States Environmental Protection Agency (EPA). (2017). Public participation guide: Introduction to public participation. Retrieved from https://www.epa.gov/international-cooperation/public-participation-guide-introduction-public-participation.

US Federal Emergency Management Agency. (2000). Individual assistance open disaster statistics. Available at: https://www.fema.gov/media-library/assets/documents/132213.

Westcott, R., Ronan, K., Bambrick, H., et al. (2017). Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. BMC Psychology, 5(13). https://doi.org/10.1186/s40359-017-0182-3

UNDP (United National Development Programme). (1992). An overview of disaster management. Geneva: UNDP-DMTP.

UNDRR Disaster Risk Reduction and Health in the Pandemic. [(accessed on 7 March 2021)]; Available online: https://www.undrr.org/event/disaster-risk-reduction-and-health-covid-19-pandemic

United Nations (1992). The United Nations Conference on Environment and Development (UNCED). Retrieved from UN Conference on Environment and Development: https://www.un.org/en/conferences/environment/rio1992

United Nations Development Programme (UNDP). (2004). World Vulnerability Report. New York.

United Nations International Strategy for Disaster Reduction (UNISDR). (2009). Disaster risk reduction, concepts and measures. http://www.unisdr.org/files/disaster risk reduction concepts

UNEP (2008) Indigenous Knowledge in Disaster Management in Africa. UNEP, Nairobi.

UNDRO. (1984). Disaster Prevention and Mitigation. New York: Office of the Disaster Relief Coordinator, United Nations. Preparedness Aspects, Vol. 11.

Velasquez, M. G. (2017). *Business ethics: Concepts and cases* (9th ed.). Pearson.

Vermiglio, C., Noto, G., Bolivar, M. P. R., & Zarone, V. (2022). Disaster management and emerging technologies: a performance-based perspective. https://www.emerald.com/insight/2049-372X.htm

Ward, P., Ayvazo, S., Dervent, F., Iserbyt, P., & Kim, I. (2022). Correcting the record: A response to Backman and Barker. Quest. https://doi.org/10.1080/00336297.2021.1967173

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). At risk: Natural hazards, people's vulnerability and disasters. Routledge.

World Health Organisation - Western Pacific region (Who-WPR). (2003). WHO-WPR Emergency Response manual guidelines for WHO Representatives and Country Offices in the Western Pacific region. Geneva, Switzerland: WHO.

World Bank Group (2023). Disaster Risk Management and Climate Change Adaptation: A Practitioner's Guide" (2023). https://policy-practice.oxfam.org/resources/toward-resilience-a-guide-to-disaster-risk-reduction-and-climate-change-adaptat-297422/

Wu, Y., Yu, W., Wu, X., et al. (2020). Psychological resilience and positive coping styles among Chinese undergraduate students: a cross-sectional study. BMC Psychology, 8(79). https://doi.org/10.1186/s40359-020-00444-y

Xie, L., & Qu, Z. (2018). On civil engineering disasters and their mitigation. Earthquake Engineering and Engineering Vibration, 17, 1–10. https://doi.org/10.1007/s11803-018-0420-6

Zidny, R., Sjöström, J., & Eilks, I. (2020). A multi-perspective reflection on how indigenous knowledge and related ideas can improve science education for sustainability. Science & Education, 29(1), 145-185. DOI: https://pubmed.ncbi.nlm.nih.gov/37909030/

ANNEXURE A: RESEARCH INSTRUMENT

ANNEXURE A: INTERVIEW SCHEDULE

DUT DURBAN UNIVERSITY OF TECHNOLOGY INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE	**DURBAN UNIVERSITY OF TECHNOLOGY** **RESEARCH PROJECT**

The effects of risk mitigation and local knowledge in disaster prone communities in Jozini Local Municipality

For the degree of

Master in Public Administration

INTERVIEW SCHEDULE

NAME OF PARTICIPANT:……

DESIGNATION WITHIN THE COMMUNITY:……

DATE:……

Description of project:

Thank-you for sharing your time with me today. The purpose of this study is to explore the effects of risk mitigation and local knowledge in disaster prone communities within the Jozini Local Municipality

This study has the following objectives:

1. To find out the traditional risk mitigation measures present in the Jozini Community.

2. To explore how coping mechanisms based on local knowledge are incorporated into the existing risk mitigation measures offered by the Jozini Local Municipality.

3. To examine the challenges and opportunities in integrating local knowledge and related coping mechanisms with the risk mitigation measures offered by the Jozini Local Municipality

This interview will take approximately one (1) hour. Questions will focus specifically on your experience in disaster risk mitigation within the Jozini Local Municipality. Please read the consent form and ask any questions before signing.

[Digital audio device turned on]

RESEARCH QUESTION – 1

What are the traditional risk mitigation measures present within the Jozini community?

1. Can you describe any traditional risk mitigation measures that are currently practiced within the Jozini community?

…….

Probe: How useful were these mitigation measures in your opinion?

……..

2. How do community members in Jozini perceive and engage with traditional risk mitigation measures?

……..

Probe: How was that done or ensured?

…….

3. Are there any specific cultural or traditional practices that are associated with risk mitigation in the Jozini community?

……..

Probe: may you give examples?

……...

4. Have there been instances where traditional practices risk mitigation measures have been effective in preventing or reducing the impact of disasters in the Jozini community?

……..

Probe: How did you determine their effectiveness?

……..

5. How do traditional risk mitigation measures complement or interact with formal risk management efforts in the Jozini community?

…….

Probe: examples of this interaction if any?

……..

6. Are there any challenges or limitations associated with relying on traditional risk mitigation measures in the Jozini community?

……..

Probe: What are some of these challenges?

…….

7. What is the level of awareness and knowledge about traditional risk mitigation measures among community members in Jozini?

…….

Probe: If yes, to what extent is this level of awareness and knowledge?

……..

8. Have there been any efforts to document or preserve traditional risk mitigation practices in the Jozini community?

…….

Probe: To what extent has this been done?

……..

9. How do traditional risk mitigation measures align with or differ from modern approaches to disaster risk reduction in the Jozini community?

…….

Probe: Give practical examples of this alignment where possible

……..

10. Are there any initiatives or programs in place to promote the integration of traditional risk mitigation measures with contemporary strategies in the Jozini community?

……..

Probe: Give practical examples of some of the integration of traditional risk that

you know.

……..

RESEARCH QUESTION – 2

How can coping mechanisms based on local knowledge that is offered by the Jozini Local Municipality be incorporated into the existing risk mitigation measures offered by the Jozini Local Municipality?

1. Can you provide examples of coping mechanisms based on local knowledge that are currently practiced within the Jozini community?

…….

Probe: Could you give examples of this coping mechanisms where possible?

……..

2. How do community members perceive the effectiveness of coping mechanisms based on local knowledge in addressing risks and hazards in Jozini?

……..

Probe: would you explain that further?

……..

3. Are there any specific cultural or traditional practices that are considered as coping mechanisms in the Jozini community?

……..

Probe: Would you explain the specific cultural and or traditional practices in context?

……

4. How can the Jozini Local Municipality integrate and incorporate local knowledge-based coping mechanisms into their existing risk mitigation measures?

……

Probe: ideas of integration and cooperation from your side?

……

5. What are the challenges and opportunities in incorporating local knowledge-based coping mechanisms into the Jozini Local Municipality's risk mitigation efforts?

……

Probe: Would you explain that further?

……

6. Are there any existing initiatives or programs that aim to promote the integration of local knowledge-based coping mechanisms with the municipality's risk mitigation measures

……

Probe: Could you expand on such programmes where possible?

……

7. How can the Jozini Local Municipality ensure the inclusion and participation of community members in decision-making processes regarding the incorporation of local knowledge-based coping mechanisms

……

Probe: would such integration be beneficial?

……

8. What are the potential benefits and drawbacks of integrating local knowledge-based coping mechanisms into the existing risk mitigation measures offered by the Jozini Local Municipality?

……

Probe: Would you explain that further?

……

9. Are there any lessons or best practices from other regions or communities that have successfully incorporated local knowledge-based coping mechanisms into their risk mitigation strategies?

……

Probe: Would you explain that further?

……

10. How can the Jozini Local Municipality ensure the sustainability and long-term effectiveness of incorporating local knowledge-based coping mechanisms in their risk mitigation efforts?

……

Probe: Would you explain that further?

……

RESEARCH QUESTION – 3

What are the challenges and opportunities in integrating local knowledge and related coping mechanism with the risk mitigation measures offered by the Jozini Local Municipality?

1. In your opinion, what are the main challenges faced in integrating local knowledge and related coping mechanisms with the risk mitigation measures offered by the Jozini Local Municipality?

……

Probe: Could you give practical examples of such challenges?

2. Can you identify any specific barriers or obstacles that hinder the integration of local knowledge and coping mechanisms into the municipality's risk mitigation effort?

……

Probe: Would you explain that further?

……

3. From your perspective, what opportunities exist for effectively incorporating local knowledge and related coping mechanisms into the existing risk mitigation measures provided by the Jozini Local Municipality?

……

Probe: Would you explain that further?

……

4. Have there been any successful instances where local knowledge and coping mechanisms have been integrated into the municipality's risk mitigation measures? If yes, can you provide examples and explain their impact?

……

Probe: Would you explain that further?

……

5. How do you perceive the role of community engagement and participation in addressing the challenges and seizing the opportunities associated with integrating local knowledge and coping mechanisms into the risk mitigation measures of the Jozini Local Municipality?

……

Probe: Would you explain that further?

……

6. Are there any specific cultural or traditional practices that could be considered as valuable assets in the integration of local knowledge and coping mechanisms with the municipality's risk mitigation impact?

……

Probe: Would you explain that further?

……

7. What are the potential benefits that can arise from successfully integrating local knowledge and coping mechanisms into the risk mitigation measures of the Jozini Local Municipality?

……

Probe: Would you explain that further?

……

8. Are there any concerns or potential drawbacks associated with incorporating local knowledge and coping mechanisms into the existing risk mitigation measures? If so, how can they be addressed or mitigated.

……

Probe: Would you explain that further?

……

9. can the Jozini Local Municipality collaborate with community members and relevant stakeholders to overcome the challenges and leverage the opportunities in integrating local knowledge and coping mechanisms with their risk mitigation

……

Probe: Would you explain that further?

……

10. What recommendations or strategies would you propose to ensure the effective integration of local knowledge and coping mechanisms into the risk mitigation measures offered by the Jozini Local Municipality?

……

Probe: Would you explain that further?

……

ANNEXURE - B

INTERVIEW SCHEDULE – ISIZULU TRANSLATION

UNGQONGQOSHE A: IZINGQIKI ZOKUVAKASHA

DUT DURBAN UNIVERSITY OF TECHNOLOGY INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE	**UNIVERSITY OF TECHNOLOGY YASE-DURBAN: ISIKHUNGO SEZOKUHLANGANYELWA**

IZIMO EZINGAPHAMBILI ZOKUBANDAKANYWA KONKE OKUNAMANDLA NOBUSISO LEMINDENI YAMANTUNGWA EMASOMINI AJOZINI MUNCIPALITY.

NGE-GREYEDI YEMKHAKHA

UMKHAKHA WOKUQALA WOKUQASHISA NGEMIBONO YOMPHAKATHI

ISIKHUNGO SEZINGQIKI SOKUVAKASHA

IGAMA LOMNQATSHI:……

UKUZIQONDIRA ENKULUMENI:……

USUKU:……

UKWENZAKALELA KOMSEBENZI:

Ngiyabonga ngokuthuthukisa inyanga yami nawe namuhla. Isizathu seyokufundisa kuyokuqala ukuthola izimo ezibandakanya nokwazi kwemindeni yamantungwa ezingamandla ngaphansi komasipala wase-Jozini.

Lesifundo sifuna ukufinyelela izifiso ezihamba phambili zikuleli khophi.:

4. Ukufumana izindleko zokubandakanya izimo zemindeni yamantungwa ezinamandla ekomphakathini wase-Jozini.

5. Ukuthola ukuthi indlela yokuhlanganyela ngamandla ayiphathelene nokwenza kwezindlela zokuhlanganyela ebandakanya ngezifo zomphakathi kanye nezindleko zokubandakanya izimo ezikhona ezithunyelwe yiMasipala waseJozini.

6. Ukuhlolwa izinkinga nokuphucula ezweni lomphakathi nokuqinisekisa izinhlaka zokuhlanganyela ngezifo zomphakathi nangokwezinye izindleko zokuhlanganyela ekhombisa izindleko zokubandakanya izimo ezithunyelwe yiMasipala waseJozini.

Lezincwadi zokuvakashelwa ziyahlanganyela ngokuphakathi kwesikhathi esingakanani (1) owodwa. Izimpendulo zizobe zimemelela ngokwesobunxele ngokusebenzisa izimo zakho kwiNkantolo yaseJozini. Sicela uthathe uhlelo lokubhaliswa futhi ukucabanga kabanzi ngaphambi kokubeka isandulela.

[Isitoreji yesikhathi yamandla yokungena isakhwele se-audio.]

UMYALEZO WOKUFUNDISA – 1

Izinto ezintambo zobumemezelo zokubandakanya izimo ezithunyelwe yiMasipala waseJozini?

1. Ungathumela izinkomba ezinjengazo zokulungiswa kwengxenye yezinkampani eJozini?

_____

2. Abantu abahlala eJozini banikeza yini umqondo futhi bahlale nabasizele ngemakethe zokulungiswa kwengxenye yezinkampani?

_____

3. Kukhona yini ezinye zezigaba zomdabu noma zomdabu ezinokulungiswa kwengxenye yezinkampani eJozini?

_____

4. Kukhona yini ezinye izikhathi ezahlukene zokulungiswa kwengxenye yezinkampani ezinikezwe futhi zikhombisele ukugqokwa noma ukulahlekelwa kwezinqumo eJozini?

_____

5. Izinkomba zokulungiswa kwengxenye yezinkampani zikhombisa yini futhi zikha noma zibambisana kanjani nabafundi bomdabu abakhokheli ekungaqondweni kwenzuzo yezinqumo eJozini?

_____

6. Kukhona yini ezinye izinkinga noma amalungelo atholakalayo ezenzweni noma ekungakwezinzuzo zezinkomba zokulungiswa kwengxenye yezinkampani eJozini?

_____

7. Umlingo futhi ukwazi kuqinisekiswa kangakanani mayiphi izinkomba zokulungiswa kwengxenye yezinkampani phakathi kwabahlali eJozini?

_____

8. Kukhona yini ezinye izindlela ezintsha ezitshintshwe ukufaka kanye nokufundiswa kwezinkomba zokulungiswa kwengxenye yezinkampani ezinjengalezo eJozini?

_____

9. Izinkomba zokulungiswa kwengxenye yezinkampani ziyafanana noma ziyakhathazeka kanjani ngezimiso ezivamile zokukusiza noma ukulungiswa kwezintsha emkhubulweni wokulungiswa kwengxenye yezinkampani eJozini?

_____

10. Kukhona yini ezinye izilungiselelo noma izifundazwe ezithintekayo ezikhona ukufakela umlando kanye nokusondela ezinqumeni zezinkomba zokulungiswa kwengxenye yezinkampani ngokuzithintela kwesizwe esijwayelekile eJozini?

_____

UMYALEZO WOKUFUNDISA – 2

Ngabe ningathini ukuthi ukweluleka kwezindlela zokuhlanganyela ngokwazi lokuhlenganyelela kwezakhamizi lokumuntu emandleni kokufinyelela ngokwenkulumo yamaphakathi okuthunyelwe yiMasipala waseJozini kudingekaphiwa enqanabaqashi ezinkinobho zokubandakanya izimo ezikhona ezithunyelwe yiMasipala waseJozini?

Lungisa ngemigomo:

1. Ungakwazi ukunikeza amaphuzu ezenhlalakahle zokukhululwa ezisebenza ngendlela yelwazi elokuzalwa ezingasetshenziswa kakhulu kuJozini?

_____

2. Abahlali basekhaya babambelele njani ithuba lokuzwa kwenhlalakahle yokusebenzisa imigomo yokukhululwa ezisebenza ngendlela yelwazi elokuzalwa yokugxila nezinkinga kuJozini?

_____

3. Kukhona yini imfihlo nezizathu zokuzalwa ezithengwa njengamagomo yokukhululwa emaphandleni aseJozini?

_____

4. Ungakanani indawo yokuhluthisa kanye nokugcizelela izinto ezingasetshenziswa kuJozini Local Municipality ezohlanganisa ngezimo zokukhululwa ezisebenza ngendlela yelwazi elokuzalwa?

_____

5. Yini imibandela nezingenza ezinomthelela eziphathelene nokuhluthisa izinto ezingasetshenziswa kuJozini Local Municipality kuze kube yinkinga yokugcizelela izindlela zokukhululwa zomthelela?

_____

6. Kukhona yini izindlela ezithengiswa njengemibono noma izinsizakalo ezihambisana nokubambisana izinto ezingasetshenziswa kuJozini Local Municipality ngezimo zokukhululwa zomthelela?

_____

7. Ungakanani iJozini Local Municipality ikwazi ukunciphisa nokuthuthukisa ukunciphisa nokunciphisa izinhlelo zokuphathelene nokuhluthisa izinto ezingasetshenziswa ngendlela yelwazi elokuzalwa ngemikhakha yezinkinga eziseJozini?

_____

8. Yini imiphumela ephakeme kanye nenkinga yokuhluthisa izinto ezingasetshenziswa kuze kube yinkinga yokugcizelela izindlela zokukhululwa eziphathelene kuJozini Local Municipality?

_____

9. Kukhona yini izifundo noma izidingo ezihambisana nokuthuthukisa izingxenye zokukhululwa ezisebenza ngendlela yelwazi elokuzalwa ezisezindaweni noma ezizwe ezifanele zibe nenkambiso yokuhluthisa izinto ezingasetshenziswa ngendlela yelwazi elokuzalwa eziseJozini?

_____

10. Ungakanani iJozini Local Municipality ikwazi ukunciphisa nokuthuthukisa ukunciphisa nokunciphisa izinhlelo zokuphathelene nokuhluthisa izinto ezingasetshenziswa ngendlela yelwazi elokuzalwa emiphakathini yomthelela?

_____

UMYALEZO WOKUFUNDISA – 3

Izidingo nokunikezwa kwesibopho futhi amathuba ekulungisela ngokuhlanganyela kwemvelo lokuziphatha nezindlela zokuhlanganyela ezithunyelwe yiMasipala waseJozini zifanele ziphathwe ngokuhlanganyela nesifunda semphakathi kanye nesimo sokweluleka esithunyelwe ngaphansi komasipala waseJozini?

1. Ngaphakathi kwesikhathi sakho, izidingo ezikhona ezikhona ekulungisela ngokuhlanganyela kwezifundo zemvelo nokunakekela zokubandakanya ezithunyelwe yiMasipala waseJozini?

_____

2. Ungayithola yini imibono yokuqinisekisa ezidingeki noma imibono efanele efihlwe kulezi zinhlelo zokukhululwa ngemibono yasekhaya kanye nemikhumbi yokukhululwa kwamandla anikezelwe ngumnyango weJozini Local Municipality?

_____

3. Kwakunini okungokwesokwenziwa kwakho, kuwukuthini amathuba anakekela ngokuhlukanisa izifundo zemvelo nemicabango yokwelulekwa ezithunyelwe yiMasipala waseJozini?

_____

4. Kukhona imizamo eqhakazile eyenziwe njengokuthi izindleko zemphakathi kanye nezindleko zokubandakanya zizibandakanye ezithunyelwe yamasipala waseJozini? Uma yebo, ungakunikeza imibono nesikhathi sokulandela?

_____

5. Ungathini ngokubhekelela imisebenzi yokuhlukunyezwa kwezwekazi nokunakekelwa kwabantu ekusenzeni ukubhekana nokungenisa amathuba okuhlanganyela izifundo zemphakathi kanye nezindleko zokubandakanya ezithunyelwe yiMasipala waseJozini?

_____

6. Kungenzeka kube nezindleko ezahlukene zokwenza ngokwesiko noma ngokwemvelo ezikhona ezikhombisa ukuthi zingaba yingxenye yezinkinga ezikhuthazekileyo ekulungiseni izifundo zemphakathi kanye nezindleko zokubandakanya ezithunyelwe yiMasipala waseJozini?

_____

7. Ziningi ezindlela ezintsha zokwenza ngcono uma kuqinisekiswa ukuthi izifundo zemphakathi nokusekela ezinhlelweni zokubandakanya zizikhethe ezinye izimo ezifanele zizibe yingxenye yezindleko ezikhombisa ukuphucula nokuhlanganyela ngokwenkulumo yamaphakathi nokuqinisekisa ukuthi kuzokwenzeka ukugcizelela kwenhlangano yakho noma kunobuhlakanipha obungcono.

_____

8. Kungenzeka kube nokuzimisela noma izinto ezingatheni ezisezingeni eliphakeme ezizithunyelwe ukuthi zihlanganise izifo zomphakathi nokweluleka kwezindleko zokubandakanya ezikhona ezithunyelwe. Uma kukhona, zingakwazi ukuthuthukiswa noma zizimiswe kanjani?

_____

9. Jozini Local Municipality ingakwazi ukuthuthukisa isandulela sokuzibandakanya nabantu basephakamiseni kanye nababhali abahlobene futhi abanezinqumo ezifanele zisebenzisane nabo ukuze kwenzekelele ukukhulisa ezidinga nokuhlanganyela kwezifundo zemphakathi nemicabango yokwelulekwa ezithunyelwe yabo?

_____

10. Imininingwane noma izinhlaka zokwenziwa okuncane, kumele uqonde ukuthi zingakwazi ukunikezwa yini ezokwenza ngcono ukuhlanganyela kwemvelo nokunakekela kwemikhumbi emphakathini ngaphansi kokusekela kwezindleko zokubandakanya ezithunyelwe yiMasipala waseJozini?

_____

ANNEXURE – C

REQUEST FOR PERMISSION FROM THE TRIBAL COUNCIL

NTSINDE YEZINDLOVU TRADITIONAL COUNCIL

NOHHIHHI AREA; UBOMBO 3970
INKOSI: S.S. MYENI

P O BOX 187, UBOMBO 3970
CELL: 072 3184 444

DATE : 18 JANUARY 2023

Durban University of Technology
Durban
4001

Dear sir/Madam

RE:SUPPORT OF PROJECT PROPOSAL

The purpose of this letter is to inform the Durban University of Technology Institutional Research Ethics Committee that the Ntsinde Traditional Council gives Mrs Ayanda Gumede permission to do research project tittled"the effect of risk mitigation and local knowledge in disaster prone communities:Jozini Municipality "an integrated approach to the development of disaster preparedness and management system.a case of Jozini Local municipality.

Upon a review of your correspondence requisting permission, Jozini Municipality is glad to permit the researcher to conduct the study in this area. All interviews and observations within the jurisdiction of Ntsinde Traditional council are approved.

Yours Sincerely

S.S Mvepi Hqkosi)

N.I Nkosi (secretary)

DATESTAMP

Ntsinde Traditional Council

2023 -01- 18

ANNEXURE – D

REQUEST FOR PERMISSION FROM THE JOZINI MUNICIPALITY

23 November 2021
The Municipal Manager
Jozini Municipality
3969

Request for Permission to Conduct Research

Dear Sir/Madam,

My name is Ayanda Gumede, a Masters in Public Administration student at the Durban University of Technology. The research I wish to conduct for my Masters dissertation is titled, "the effects of risk mitigation and local knowledge in disaster prone communities in Jozini Local Municipality".

I hereby request your permission to collect data from municipal officials in the Jozini Disaster Management Department for this study. Confidentiality and anonymity of information is guaranteed in this study. Participation is voluntary and participants have got the right not to participate or withdraw if they wish to.

Upon completion of the study, I will provide a copy of my research report to the municipality to assist in disaster mitigation and management.

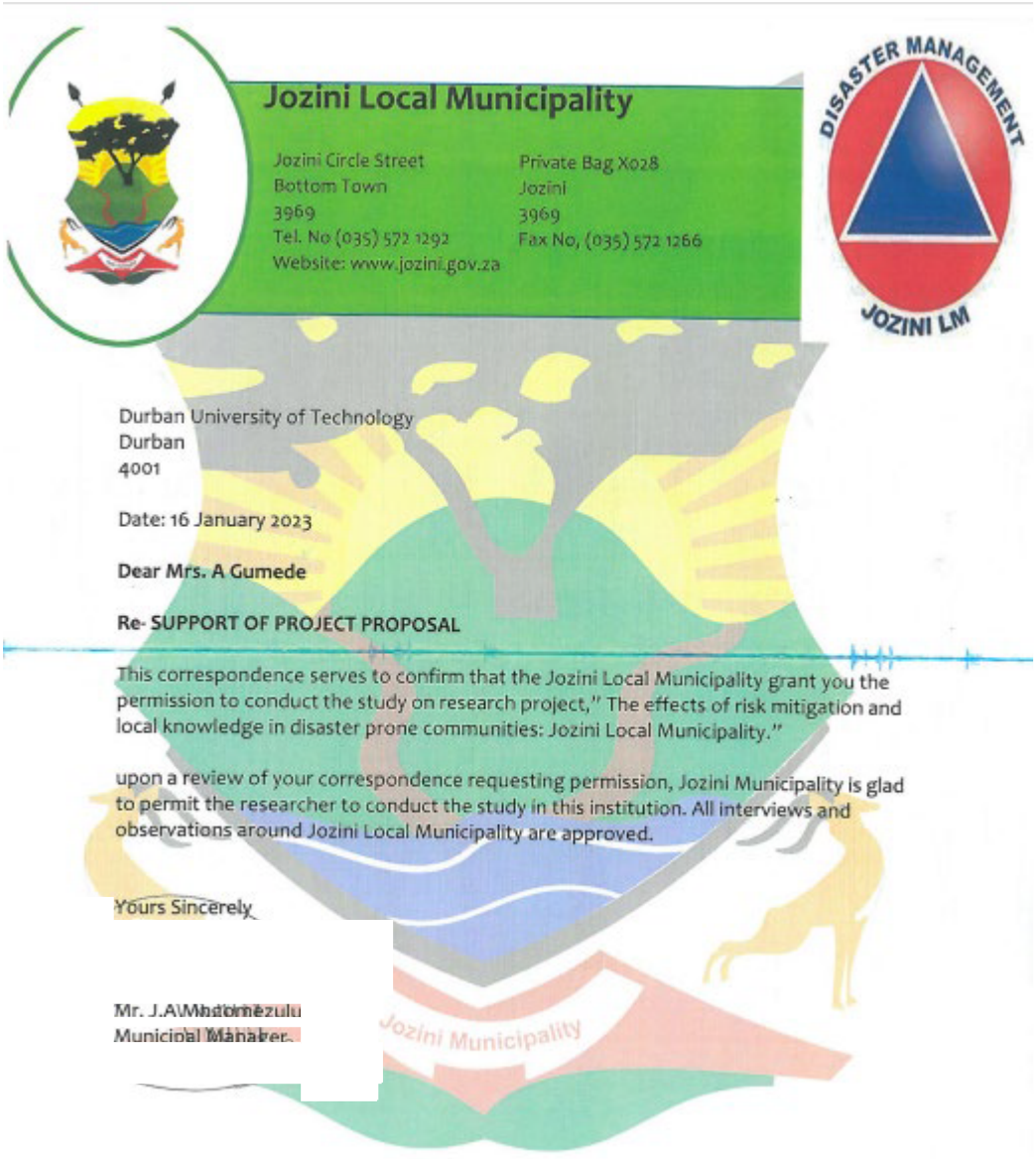
If you require any further information, please do not hesitate to contact me 071 3518083, 035 572 1292 and ayandamume@gmail.com. Thank you for your time and consideration in this matter.

Yours sincerely,

Ayanda Gumede
Durban University of Technology

ANNEXURE – E

PERMISSION FROM THE JOZINI MUNICIPALITY TO CONDUCT RESEARCH



Jozini Local Municipality

Jozini Circle Street
Bottom Town
3969
Tel. No (035) 572 1292
Website: www.jozini.gov.za

Private Bag X028
Jozini
3969
Fax No, (035) 572 1266

DISASTER MANAGEMENT
JOZINI LM

Durban University of Technology
Durban
4001

Date: 16 January 2023

Dear Mrs. A Gumede

Re- SUPPORT OF PROJECT PROPOSAL

This correspondence serves to confirm that the Jozini Local Municipality grant you the permission to conduct the study on research project," The effects of risk mitigation and local knowledge in disaster prone communities: Jozini Local Municipality."

upon a review of your correspondence requesting permission, Jozini Municipality is glad to permit the researcher to conduct the study in this institution. All interviews and observations around Jozini Local Municipality are approved.

Yours Sincerely

Mr. J.A Mhlongo
Municipal Manager

Jozini Municipality

ANNEXURE – F

INFORMED CONSENT FORMS FOR PARTICIPANTS

CONSENT

Statement of Agreement to Participate in the Research Study:

- I ------- hereby confirm that I have been informed by the researcher, Ayanda Gumede about the nature, conduct, benefits and risks of this study – with Research Ethics Clearance Number: **IREC 281/22**
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, Ayanda Gumede Herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Ayanda

Full Name of Researcher	**Date**	**Signature**
Full Name of Witness (If applicable)	**Date**	**Signature**
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

Imvume

Isitatimende sesivumelwano sokubamba iqhaza esifundweni socwaningo:

- Mina ___ngiyaqinisekisa ukuthi ngazisiwe ngu Ayanda Gumede, ngesimo,ukuziphatha, inzuzo kanye nobungozi balesisifundo – imvumo yezimiso zokuziphatha kucwaningo

- Ngiphinde ngathola, ngafunda ngaphinde ngaqonda lolulwazi olubhaliwe olungenhla (incwadi yolwazi ngomhlanganyeli) mayelana nesifundo
- Ngiyazi ukuthi imiphumela yesifundo ,ukuhlanganisa imininingwane yami siqu mayelana nobulili, iminyaka, usuku lokuzalwa ,iziqalo zamagama ami kanye nokuxilongwa kuyokuba imfihlo emigudwini yomubiko walesisifundo
- Ngokwezimfanelo zocwaningo ,ngiyavuma ukuthi ulwazi oluqoqiwe ngesikhathi socwaningo lungafakwa kwikhumpuyutha ngumcwaningi

- Ngingakwazi kunoma yisiphi isigaba ,ngaphandle kokuphazamisa , ngihoxise imvume yami nokuhlanganyela esifundweni.

- Ngibenethuba elanele lokubuza imibuzo ngokukhululeka futhi ngiyaqinisekisa ukuthi ngikulungele ukuhlanganyela kulesisifundo

- Ngiyaqonda ukuthi okubalulekile okusha okungavela ucwaningo lusaqhubeka okweyamana nokuhlanganyela kwami ngiyonikwa khona.

Amagama aphelele omhlanganyeli	Usuku	Isikhathi	iSiginesha/isithupha sokudla

Mina, Ayanda Gumede ngiyaqinisekisa ukuthi lomhlanganyeli ongenhla wazisiwe ngokuphelele ngesimo,ukuziphatha kanye nobungozi besifundo esingenhla.

Ayanda		
igama lomcwaningi	**usuku**	**isiginesha**
Igama likafakazi (uma ekhona)	**usuku**	**isiginesha**
igama lombheki osemthethweni	**usuku**	**Isiginesha**

ANNEXURE – G

ETHICAL CLEARANCE LETTER

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

20 January 2023

Mrs A M Gumede
P.O Box 21
Pietermaritzburg

Dear Mrs Gumede

The effects of risk mitigation and local knowledge in disaster prone communities: Jozini Local Municipality
Ethical Clearance number IREC 281/22

The Institutional Research Ethics Committee acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the DUT-IREC according to the DUT-IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the DUT-IREC as outlined in the DUT-IREC SOP's.

Yours Sincerely

Prof J K Adam
Chairperson: DUT-IREC

ANNEXURE – H

EDITOR'S LETTER

Dr Catherine Hutchings
Freelance Editorial Services

51 Bathurst Road
Kenilworth
7708
Cape Town
Western Cape
South Africa

Telephone/Fax: + 27 21 7618522
Mobile: + 27 82 9702219
E-mail: catherinehutchings@gmail.com

To whom it may concern

I hereby confirm that I edited the dissertation entitled,

The effects of risk mitigation and local knowledge in disaster prone communitiesin Jozini Local Municipality.

By Ayanda Mumetheni Gumede
in November 22, 2023

Dr Catherine Hutchings