ASSESSING THE POSSIBLE EFFECTS OF REVITALISATION OF THE BISHO CENTRAL BUSINESS DISTRICT (CBD) ON FIRE RESPONSE: CASE STUDY BISHO CBD IN EASTERN CAPE

by

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BLOEMFONTEIN

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DECLARATION

I, Nqatyiswa Daniso, proclaim that the content of this dissertation that I hereby submit for the qualification of *Masters of Disaster Management* at the University of Free State is the outcome of my autonomous efforts and that has never been submitted for another qualification at any other institution.

Furthermore, I proclaim that sources and work of others are indicated and acknowledged by means of reference.

_____ ____/____/2021__

Nqatyiswa Daniso Date

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DEDICATION

I dedicate this dissertation to my brothers Mandisi and Khululekile,

my sister Tyhiliwe,

especial my mom Nokhamafu Kaweni Daniso

who always pray for my success,

but the outstanding dedication is going to

my late father, Mlungisi Daniso,

who arranged the leading foundation for my valuable treasure.

ABSTRACT

Bisho Central Business District (CBD) was revitalised in 2016 and is now neat and presentable. However, the refurbishment is a dangerous ticking time bomb caused by the blocking of fire hydrants, narrowing of streets and inaccessibility of high-rise building by fire engines. The study aimed at assessing the probable effects of revitalisation of Bisho CBD on Fire Response, in the quest to ascertain the best methods to diminish the consequences of fire adversity risks of the high-rise building in Bisho CBD and appraising the effect of Bisho CBD revitalisation that lead to narrowing the access roads in Bisho CBD, in Eastern Cape. Structures encompass numerous primary and secondary foundations that add to fire perils; and in the occurrence of a fire adversity the building could be partially or completely destroyed. Quick responses and effective execution of fire-fighters save peoples' lives, reduce the number of injuries and minimize property damages and therefore this is an essential part of their work. Non-probability method using purposive sampling was employed in the selection of eighty four (84) partakers from BCMM Fire Stations. The study acknowledged the mixed method approach, and the data was gathered through questionnaires and documents. One hundred and twenty questionnaires were distributed to the potential partakers with eighty four completed questionnaires returned. Data was analysed using MS Excel. Data from the questionnaires was shown in a quantitative as well as narrative manner and presented clearly in order to conclude the impact evaluated on emergency response in Bisho CBD revitalisation and also ascertain the mitigation measures of the calamity perils caused by fires in a study area. The findings will assist in developing the recommendations of the study.

Keywords: Accessibility of emergency vehicles, Visibility of Fire Hydrants, fire response, High–rise building, Fire safety, Central Business District, Narrow roads.

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ACRONYMS

BCMM	**Buffalo City Metropolitan Municipality**
BEPPs	**Built Environment Performance Plans**
CBD	**Central Business District**
DCOGTA	**Department of Co-operative Governance and Traditional Affairs**
DRR	**Disaster Risk Reduction**
EL	**East London**
f	**Frequency**
GDP	**Gross Domestic Product**
ICS	**Incident Command System**
IDPs	**Integrated Development Plans**
ILO	**International Labour Organisation**
KWT	**King William's Town**
LSDF	**Local Spatial Development Framework**
MFMA	**Municipal Finance Management Act**
NBRBSA	**National Building Regulations and Buildings Standards Act**
NDMC	**National Disaster Management Centre**
NDP	**National Development Plans**
NFPA	**National Fire Protection Association**
OHSA	**Occupational Health and Safety Act**
OTP	**Office of the Premier**
RSA	**Republic of South Africa**
SA	**South Africa**
SABS	**South African Bureau of Standard**
SANS	**South African National Standard**
SAPS	**South African Police Services**
SDBIP	**Service Delivery Budget Implementation Plan**
SDFs	**Spatial Development Frameworks**
USA	**United States of America**
UNDP	**United Nations Development Programme**
UNISDR	**United Nations International Strategy for Disaster Reduction**

DEFINITION OF TERMS

Disaster management

The statute of Disaster Management (South Africa, 2002), explains disaster management as a relentless and assimilated multi-segmented, multidisciplinary practice of scheduling and fruition of engagements anticipated to preclude or lessen the adversity threat, to alleviate the brutality or significances of adversities, emergency alertness, prompt and operative retort to adversity and post-disaster regaining and restoration.

Disaster risk

Disaster risk is the prospective damages, in lives, health conditions, resources and services which could happen to a certain system or society over some definite imminent era (UNISDR, 2017).

Emergency

Emergency is an intimidating situation that needs serious attention. Effective emergency action can circumvent the acceleration of an incident into a disaster (UNISDR, 2017).

Emergency services

Emergency services are the established dedicated agencies that have specified accountabilities and intentions in attending and defending population and assets in crisis conditions (UNISDR, 2017).

Emergency route

Emergency route is explained as that portion of an escape route which affords fire fortification to the occupiers of any structure and which leads to an escape door (South Africa, 2010).

Fire Hydrant

Fire Hydrant is the bulk water vent connected on a street water supply main, premeditated precisely to source bulk water to a fire engine (South Africa, 2011).

Hazard

Hazard is defined as a risky phenomenon, man-made action or situation that may result in life losses, harm or adversely affect health or distract assets, loss of life and services, socio-economic and environmental distraction (UNISDR, 2017).

High-rise building

These are structures that are more than twenty three metres high from the ground to the top floor (NFPA, 2012).

Metropolitan municipality

The statute of Disaster Management (South Africa, 2002), defines metropolitan municipality as the municipality that does not share its municipal area with another municipality, and which is described in section 155 (1) of the RSA constitution as a category A municipality (South Africa, 2002).

Response

It is the establishment of emergency services and population succour through or instantly post an adversity with the aim of saving lives, reducing health effects, guarantee population wellbeing and come across the rudimentary subsistence needs of the calamity victims (UNISDR, 2009).

Risk Assessment:

Practise to ascertain the magnitude of peril through examining probable dangers and assessing prevailing circumstances of susceptibility that could pose a prospective peril or detriment to population, assets, and the situation that they are depending to (South Africa, 2005).

Sustainable development

The improvements associated with the current necessities without negatively affecting the capability of imminent associates that comes across their peculiar prerequisites (UNISDR, 2009).

Vulnerability:

This is the aggregate to which object can be damaged by a certain peril and be influenced by numerous aspects and procedures such as physical, economic, social, psychological, physiological. (UNISDR, 2017).

CHAPTER ONE: OVERVIEW OF THE STUDY

1.1 Introduction

Bisho Central Business District (CBD) was revitalised in 2016. As a result, many streets were closed during the revitalisation process, thus affecting many civil servants, motorists, and visitors. This revitalisation though neat, possesses hazardous challenges caused by the blocking of fire hydrants, narrowing of streets and inaccessibility of high-rise building by fire engines. Hence, the researcher sought to assess the possible effects of the Bisho CBD revitalisation on Fire Response, and recommend the preeminent solution to alleviate dangers caused by fire breakout in the Bisho CBD skyscraper building, and evaluate the impact of Bisho CBD revitalisation. For the collection of data, questionnaires were distributed to Buffalo City Metropolitan Municipality (BCMM) Fire Stations officials.

1.2 Description of the study area

BCMM is the significant urban hub of the eastern part of the Eastern Cape Province with a land area of almost 2,515 km², and 68 km of the seashore. It is the only river port in South Africa and is well-placed to contribute to the Ocean Economy, through the Port development currently underway. BCMM was converted to a metropolitan municipality in 2011 and was named after the momentous terrestrial feature "Buffalo River" that links King William's Town (KWT) and East London (EL). It is one of the eight metropolitan municipalities in South Africa and one of the two in the Eastern Cape Province. BCMM is situated relatively central in the Eastern Cape Province. It is circumscribed by the long coastline along the Indian Ocean to the south-east; by Nahoon River in the north and the Buffalo River to the South (Buffalo City Metropolitan IDP, 2020/21). It has a temperate climate and mostly a summer rainfall region with a typical rainfall of 850 mm annually. The geological state of the region is the Karoo system and much of the geology is of marine foundation. It is an area that has numerous river systems; most are considered "endangered" in terms of environmental danger whilst the Buffalo River system is considered susceptible. BCMM has a wide variety of vegetation types and the main type of vegetation types of Acacia savannah, riverine forest, riverine thicket, coastal forest, coast scrub, dune margin scrub and a xerophytic community spread throughout the BCMM covering 252,577.5 hectares and has a population of 893,157 people.

The statistics per category and Employment in the economic sector of BCMM are shown in Table 1.1.

Table 1.1 BCMM statistics

GENDER	**PERCENTAGE**
Female	51.9%
Male	48.1%
RACE	**PERCENTAGE**
African	86.68%
White	6.68%
Coloured	5.80%
Asian	0.84%
SECTOR	**PERCENTAGE**
Community services	25.5%
Trade	23.6%
Mining sector	0.1%
Electricity	0.9%

Source: Buffalo City Metropolitan Municipality, 2019

The contribution of BCMM to the economy of the country and the province in 2019 was 1.6% and 20.9%, respectively. The government remains the main employer in BCMM, at provincial and local levels. EL works as the crucial node and is the prevailing economic centre in the region. The road network is one of the significant mechanisms of the transportation system enabling mobility to build the economy, but the challenge is the aging of an enormous portion of road infrastructure in BCMM. BCMM has a total surfaced road network of ±1,600 km and a gravel road network of ±1,300 km.

Bisho is the provincial capital of the Eastern Cape, the second largest province in the land area of the Republic of South Africa (RSA) (Siyongwana, and Binza, 2008). It was selected because of its infrastructure, accessibility to major roads, and space for further development. Figure 1.1 shows the political map of the RSA, and Figure 1.2 shows the Eastern Cape Province municipal demarcation Map.

Bisho CBD comprises mostly of government office buildings for the Office of the Premier (OTP), Provincial Legislature, Public Works, Rural Development and Agrarian Reform and other departments.

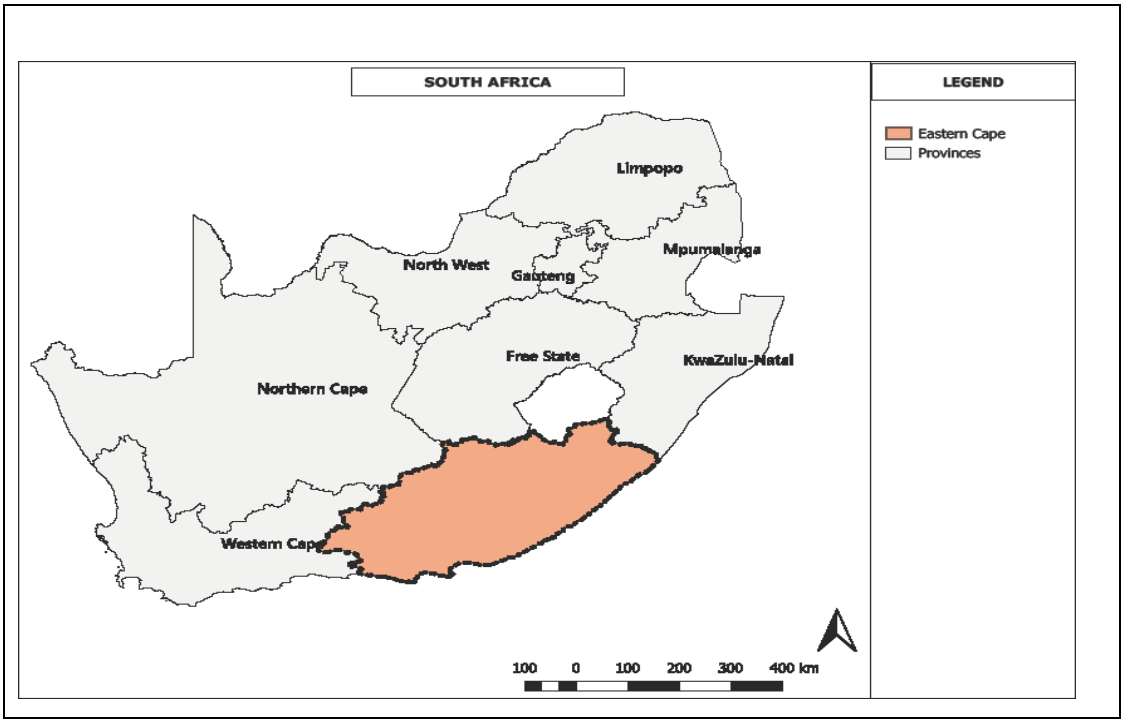


Figure 1.1 Political Map of Republic of South Africa.
Source: ECCOGTA GIS UNIT, 2020 (Accessed: November 2020).

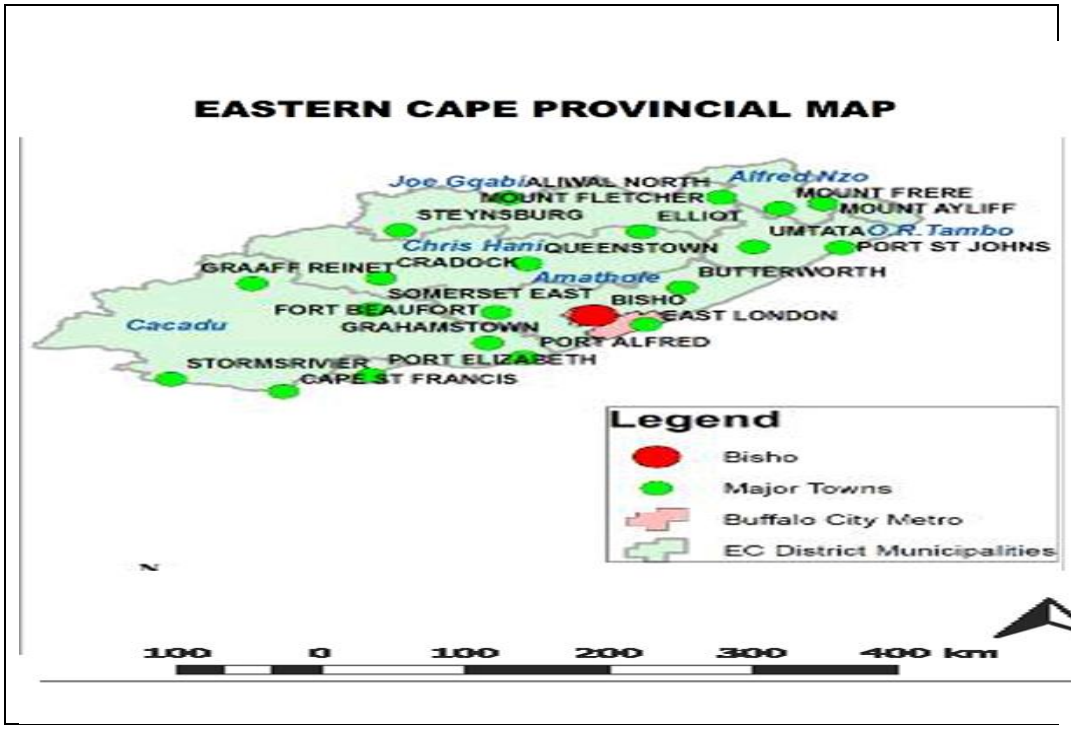


Figure 1.2 Eastern Cape Province demarcations Map.
Source: ECCOGTA GIS UNIT, 2021 (Accessed: May 2021).

Bisho is one of the two cities and a town which include EL and KWT that form part of BCMM. BCMM is situated on the east coast of Eastern Cape Province in South Africa and has two of the largest townships in BCMM, namely Mdantsane and Zwelitsha. It is encircled by the Great Kei, Amahlathi, Raymond Mhlaba, and Ngqushwa Local Municipalities. Bisho is situated just three kilometres from King William's Town and Figure 1.3 shows the map of BCMM.

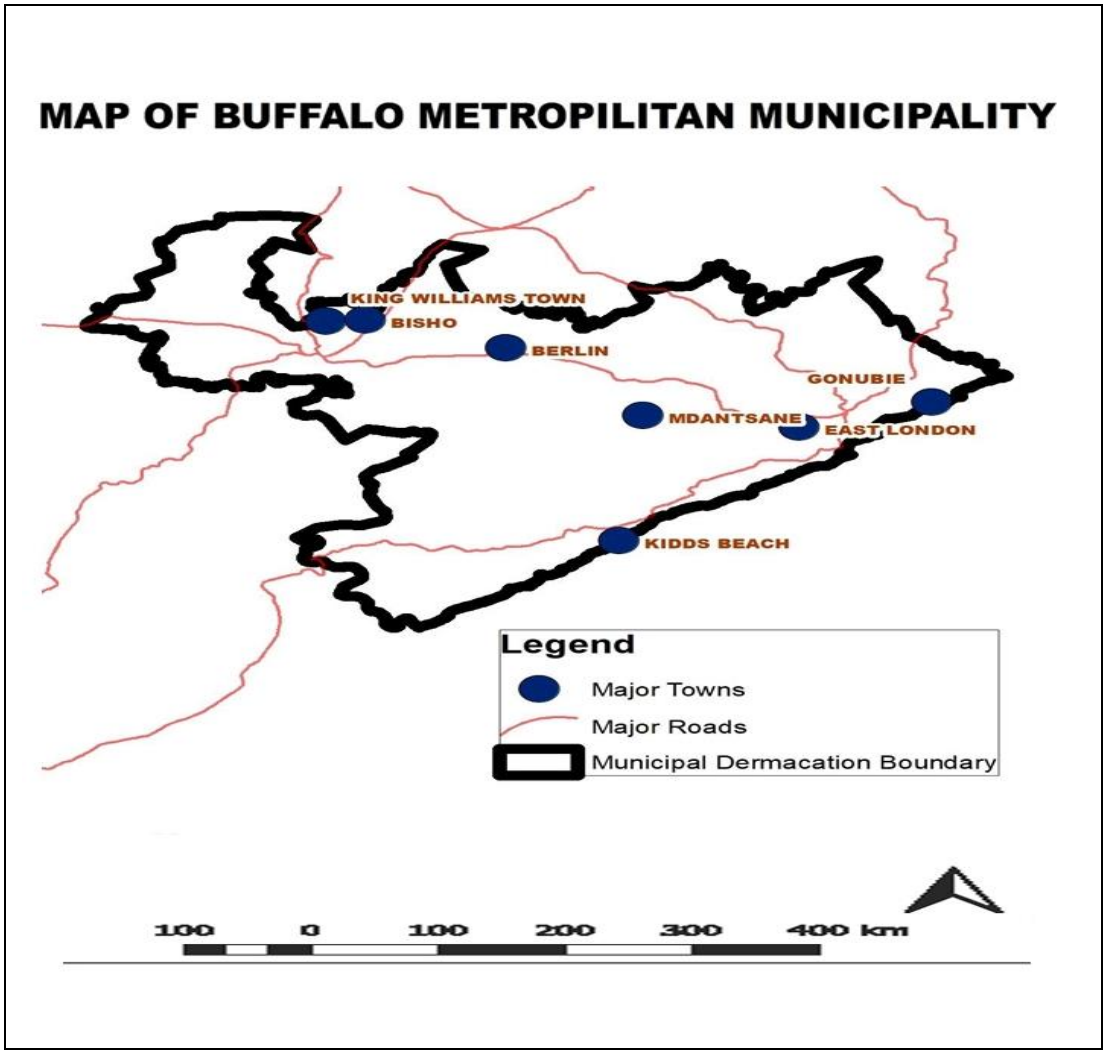


Figure 1.3 Map of Buffalo City Metropolitan Municipality.
Source: ECCOGTA GIS UNIT, 2021 (Accessed: May 2021).

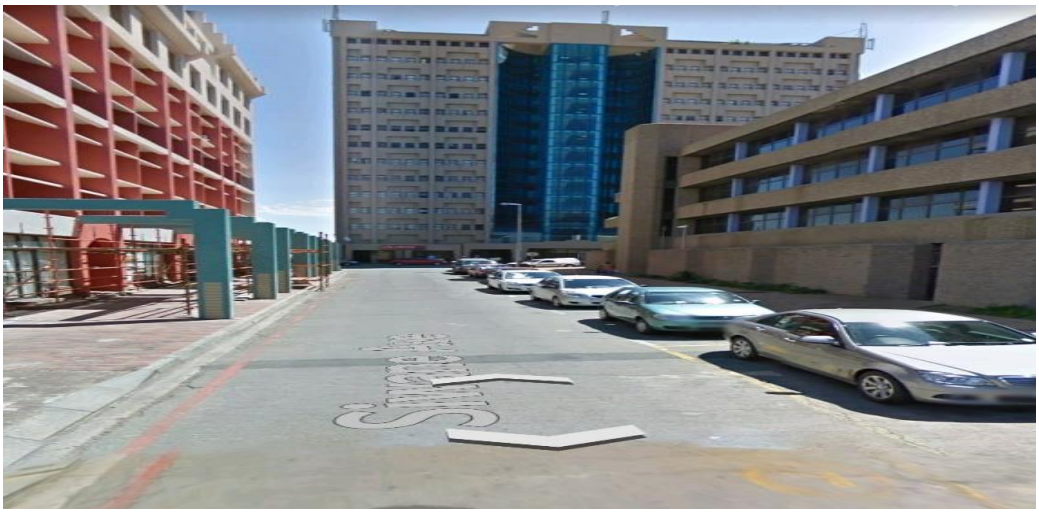
1.3 Architecture and design of Bisho central business district area

When the homeland of Ciskei was granted independence in 1981, Bisho underwent a period of intense development under the leadership of Dr. L.L. Sebe (Southall and De Sas Kropiwnicki, 2003). This intense development included but was not limited to the construction of two hospitals on a flood plain including Bisho Hospital and 10 firms around the capital. Key to this development was the constitution of the central business

district (CBD), which houses most of the government buildings. Figure 1.4 shows the type of buildings constructed, the width of the street designed, and accessibility prior to revitalisation.

Figure 1.4 Independence Avenue and Siwane Avenue in 2014 prior to revitalisation and types of buildings within these avenues.
(Independence and Siwane Drives Google Maps) (Accessed: October 2019).

Though the CBD streets have always been narrow by design, Figure 1.5(a) shows a wider street (Siwane Avenue) compared to the present Figure 1.5(b), before the recent developments under the revitalisation programme of the Bisho CBD. Figure 1.5 (b) also shows that there is not sufficient space for emergency vehicles to move should a major incident occur.



(a)

(b)

Figure 1.5 Siwane Avenue (a) before and (b) after revitalisation. (Bisho CBD, Google Maps) (Accessed: June 2020).

Figure 1.5 and Figure 1.6 show street views of Siwane Avenue and Independence Avenue before and after revitalisation of the CBD. It is noteworthy that, the size of the street and emergency lanes leading to a structure should allow all emergency vehicles free passage, especially fire engines. Thus, spaces wide enough for the usage of emergency vehicles may be required to enable other engines to go past one another if required to expedite mounting and escalating manoeuvres (USA, 2015).

Figure 1.6 Independence Avenue (a) before revitalisation and (b) after revitalisation of the CBD.
(Bisho CBD, June, 2020).

Figure 1.7 shows the study area and the street view of the Bisho CBD, where the high-rise building and most of Government buildings are clustered, as well as the street layout of the CBD and the proximities of the buildings in the area after revitalisation.

Figure 1.7 Bisho CBD street view, showing study area and focal avenues after revitalisation of the CBD in 2018.
(Source: (Dispatch live, 16 February 2016) (Accessed: March 2020).

It is noteworthy that, fire disaster is a distressing occurrence that results in loss of life and assets. Ibe et al., (2014) stated that typical recurrence of fires has occurred coast-

to-coast. Recorded fires in structures include burning of the Office of the Premier in Bisho in 2016; fire in the bank of Lisbon which used to house many government departments in Johannesburg CBD in 2018 resulting in loss of three fire-fighters; and fires in Durban and Cape Town buildings and the Munitoria building, a municipal building in Pretoria in 1997 with no causalities recorded. Moreover, skyscrapers accommodate many officials, non-officials, and other valuables. As a result, many stand to lose more in case of fire in such buildings in the event of a fire breakout compared to one-floor structures. The most crucial factor in skyscraper safety in a fire crisis is the ability to escape securely.

1.4 Problem statement

Bisho CBD was refurbished in 2016 and these refurbishments lead to narrowing of and inaccessible for large fire- fighting vehicles navigation through the streets. As a result, the response time was affected thereby limiting the effective use of equipment. When responding to a fire, the building could be destroyed due to the inaccessibility of the fire hydrants obstructed by the paving. King William's Town-Bisho Local Spatial Development Framework (LSDF) Report (Umhlaba Consulting Group (PTY) Ltd, 2013) revealed that the vehicular access would be limited, but emergency vehicles were included in the list of those which would be permitted to enter the CBD (South Africa, 2013). In the recommendations, the researcher noted that the King William's Town-Bisho LSDF focus is for pedestrians walking within Bisho CBD. The pedestrian route would be created while nothing indicated information about creating emergency vehicle accessibility. This development overlooked the hazards imposed by narrowing access roads and the safety of the high-rise building users putting workers at risk when there is a fire breakout.

Through observation of this development, susceptibility of the people using these high-rising buildings is observed and shows that proper risk assessment has not been undertaken. The concealing of hydrants is a clear indication that decision-makers ignored the link between disaster and development (Stephenson, 1994). Hence, this study seeks to look at the dangers of disregarding the link between disaster and development, the dangers of constricting the Bisho CBD streets, and the consequences associated with inadequate consultation with appropriate stakeholders within the

development programs. This research subsequently outlined recommendations on how to overcome the aforesaid challenges.

1.5 Research questions

- What are the impacts of Bisho CBD revitalisation and beautification on emergency response services?
- How should BCMM prepare for possible resulting dangers of the revitalisation of Bisho CBD and narrowing of access roads in Bisho CBD?
- How would the fires be suppressed effectively in the high-rise building that is situated within the narrow roads of Bisho CBD?
- What is the correlation between the narrow roads and the high-rise building in Bisho CBD, in the event of emergency?

1.6 Aim of the research

The aim of this study was to assess the possible effects of revitalisation of Bisho CBD on Fire response.

1.7 Research objectives

The study was led by these intentions.

- To assess and evaluate possible impacts of revitalisation of Bisho CBD that resulted in narrowing the access roads in Bisho CBD, Eastern Cape Province.
- To assess and evaluate possible impacts of revitalisation of Bisho CBD on fire response.
- To determine mitigation of fire disaster risks of the high-rise building in Bisho CBD.

1.8 Significance of the study

The research was influenced by a number of high-rise building fire incidents nationwide, ensuing in lives threatened and mortality in some cases, which could have been prevented. According to News24, the Bank of Lisbon building in Johannesburg had a safety rating of 21%, far less than the 85% required for compliance regulation (News24, 2018). The construction of this research study is based on the fact that the

Disaster Management Act (DMA) (South Africa, 2002) requires the enactment of risk reduction measures in order to decrease the vulnerability of communities at risk. The importance of this study is to assist BCMM to develop a strategy that will increase the safety of emergency responders especially fire-fighters, as well as the safety of the building occupants, reduce property damage, and limit indirect losses.

1.9 Methodology

1.9.1 Research approaches

According to Lwoga et al., (2010) as quoted by Bryman & Bell (2014) qualitative and quantitative methods are used to triangulate various data gathering mechanisms with the purpose that they will all converge to support the research objectives of the study. According to Maree (2007) and Creswell (2014), there are three acknowledged methodologies for the techniques of conducting research which are quantitative, qualitative, and mixed methods approach. In this dissertation, the researcher used a mixed methods research approach that synthesizes features of qualitative and quantitative methods within one study (Bergman, 2008). The use of the combined approach guarantees that the study is definite, positive, and inclusive (De Vos, 2002).

1.9.1.1 Quantitative research approach

The quantitative method enables the researcher to look for relationships between the variables and generalise results for the main population (Maree, 2007). Bryman & Bell, (2014) described the quantitative research approach as a distinguishing research approach that involves the assortment of statistical data, concerning the association among concept and research as logical, generally favours a natural science approach, and embraces the objectivist notion of societal authenticity. In this dissertation a quantitative research approach was used in order to attain demographic information, using a questionnaire.

1.9.1.2 Qualitative research approach

The purpose of qualitative research is to understand the social phenomenon from a partakers' viewpoint (Maree, 2007). According to Creswell (2003), the qualitative research approach is an investigation method of understanding an anthropological

challenge, based on a general portrait shaped with words, reporting comprehensive understandings of informants, and conducting the study in a normal situation. Qualitative research was used in order to describe in detail the specific situations and expressing the data acquired from the respondents in a descriptive form, therefore research tools such as questionnaires, and documents were employed.

1.9.1.3 Mixed method approach

Bazeley (2009) explained this approach as the practice of diversified data (statistical and writing) and alternate tackles (figures and scrutiny), by employing the identical technique. It is a kind of exploration in which a researcher practises the narrative exploration pattern for one stage of a study and a numerical exploration pattern for another stage of the study. When using the mixed-method approach, the researcher mixes both a quantitative approach that amasses figure data and a qualitative approach that amasses word data in a single study (Creswell, 2007; Denscombe, 2001; Maree, 2007). Given that, these research methods have both potential and challenges, and the research experiences problems when relying on just one method, however combining them, offers a more comprehensive approach to finding answers to the research questions (Maree, 2007).

According to Johnson & Onwuegbuzie (2004), the goal of mixed methods research is to entice from the strong points of qualitative and quantitative approaches and to curtail conceivable imperfections. Therefore, for the purpose of this dissertation, the researcher utilized a mixed-method approach to amass numerical data and, and text, respectively. The benefit of choosing this research approach is it allows initial qualitative consideration of the research topic on a slight scale, in order to gain an understanding of the research condition; collecting of information for the development of a measuring tool (Creswell & Plano Clark, 2011). Leedy & Ormrod (2013) and Maree (2007) indicated several advantages of utilizing this research approach as inclusiveness, corresponding, triangulation, and tenacity of perplexing judgments. These advantages also encouraged the researcher to embrace the usage of this approach in this dissertation.

The study is grounded on a case study that covers a high-rise building in Bisho. This area is the pivotal region since it is where the structure affected by the CBD revitalisation is situated. Advantages of using a mixed-method approach

- The mixed-method approach accords the researcher assurance of having addressed the most important issues (Saunders et al., 2009).
- It enhances triangulation. Thus, the combination of quantitative and qualitative research methods offers the advantage of the respective qualities of both approaches (Shank & Brown, 2007).
- This method offers an inclusive signal for studying a research problem than either qualitative or quantitative research only (Creswell & Plano Clark, 2011).
- This method assists response to inquiries that could not be answered. (Creswell & Plano Clark, 2011).
- This method allows the use of pertinent means, expertise, and rationale to address a research problem and problem statement. (Creswell & Plano Clark, 2011).
- This method empowers the use of an inclusive pattern (Creswell & Plano Clark, 2011).

1.9.2 Research design

Leedy & Ormrod (2001) noted that research design is the tactic embraced to methodologically attempt a study plan. Groat & Wang (2002) and Yin (2003) also defined research design as a tactic of moving from one position to another; the lucidity that associates the facts to be gathered and the assumption to be taken; a logical plan of getting from here to there, where here may be defined as the initial set of questions to be answered and there is some set of conclusions. Using the definition of Yin (2003) which conforms to that of Groat & Wang (2002), to answer the research questions the logical plan involves certain methods, which are meant to address various features of the questions and achieve the research aim and objectives. Research designs are sorts of probes within the three research approaches that offer precise trends for measures in a research design. Others have named it the strategies of inquiry (Denzin & Lincoln, 2011). According to the researcher's perspective, a research design is a strategy charting how the information will be amassed for the evaluation that includes ascertaining the data amassing means, the mechanism to be utilized, how the

instruments will be administered, and how the information will be structured and scrutinised. The mixed-methods design was applied to consider the research phenomenon using qualitative data before endeavouring to measure it quantitatively (Delport & Fouche, 2011).

1.9.3 Population and sampling

For the researcher to come up with effective data there is a need to outline the population that was employed for the purpose of the exploration. The researcher needed to take a sample population of study which is a true representation of the actual population (Bryman & Bell, 2014). The target population for this study was the BCMM Fire Station officials (employees and management) in Eastern Cape, as they have the responsibility for issuing consent permits for the state structures. De Vos et al., (2005) defined sampling as the taking of percentage of inhabitants as the illustrative of common people. A definite portion of people was drawn from the population for the investigation to represent the entire study population; therefore one hundred and twenty employees were selected from Buffalo City Metropolitan Municipality Fire Station officials in the Buffalo City Municipality.

Anderson (1993), Creswell (2003), and Babbie (2010) agreed that sampling has two types, namely probability, and non-probability, each type comprises different methods. According to Surbhi (2016), non-probability sampling is the principal method and can be defined as a method where the population does not have an equivalent opportunity of being drawn. More than that, Showkat & Parveen (2017), stated that sampling is done based on judgement or simple accessibility. Maree (2016) reflected four kinds of non-probability sampling.

- **Convenience sampling**: the focus of the researcher is on the respondents that are obtainable and eager to partake in the dissertation (Frey et al., 2000).
- **Quota sampling**: this procedure is utilized to make sure that the sample is likely signified in the sampling cluster (Surbhi, 2016). This technique is grounded on the belief that the sample is a small depiction of the population.
- **Purposive sampling**: in this technique, the selection of partakers is based on their knowledge and expertise in an industry (Surbhi, 2016).

- **Snowballing sampling**: Lohr (2010), affirmed that in this method the mainly recognised partaker is used to identify another partaker for the sample to achieve the sample size.

According to Lohr (2010), probability sampling is another sampling technique and is defined as a method applied where each unit of the population has a similar opportunity of being the portion of the sample. Choice of sample is done by using random selection and making sure that each feature of the people has an equivalent possibility of being chosen (Showkat & Parveen, 2017). Lohr (2010) indicated that this method consists of 4 types, which are as follows:

- **Random sampling**: an unsystematic technique to select the sample as each factor of the population has an equivalent possibility of being selected (Showkat & Parveen, 2017).
- **Systematic sampling**: According to Lohr (2010) it involves an initial point that is selected randomly from the population list and some figure after the initial point can be chosen methodically to be part of the sample.
- **Cluster sampling**: population members are grouped and unsystematic selection is made from the group to choose the factors that form the sample (Shao and Zhou 2007).
- **Stratified sampling**: the population is shared amongst similar and non-overlapping sets so-called strata and the components are chosen from strata, unsystematically or methodically to form the sample (Maree, 2016).

The probability sampling technique requires more resources in terms of time, cost, and determinations as compared to non-probability. The quality of implications drawn in the probability sampling technique is general to the population, unlike in non-probability sampling. Probability sampling is more costly compared to the non-probability method (Biemer & Lyberg, 2003). Non-probability sampling is simple and inexpensive to conduct, but probability samples have found to be more precise than non-probability samples (Shao and Zhou 2007). A purposive sampling method is employed so that characters are nominated due to particular outlining physiognomies that mark them the owners of definite data required for the study (Maree, 2007). In purposive sampling, the participants are selected with the purpose in mind and are

selected according to their relevance to the topic (Kitchin & Tate, 2000). Bryman & Bell (2014) stated that the goal of purposive sampling is to sample participants strategically so that those sampled are relevant to the research questions. Therefore, the applicable sampling method for this research is the non-probability method using purposive sampling.

1.9.4 Data collection tools

Data collection procedures allow the researcher to methodically amass facts for the subject of this dissertation. Both primary and secondary data were considered for this dissertation. Creswell (2009) noted that a data collection tool is a research instrument utilized to calculate, scrutinise or report data. The instruments utilized for data collection in this dissertation are documents/newspapers and questionnaires where documents are well-known techniques of qualitative data collection.

1.9.4.1 Documents

Document analysis is one of the procedures which were implemented in this study. Materials such as newspaper reports, magazines, journals, newsletters were studied. De Vos et al., (2005) termed documents as those transcribed typically devoid of a view of research. Denscombe (2010) perceives secondary analysis as the experiential exercise on data formerly congregated and the investigator commonly originates where the main analysis of the data has been completed. The process includes the adjustment of previously studied data over which the contemporary researcher had no control or in which there was no direct contribution (Babbie, 2010 & Neuman, 2006). Documents and newspapers were used to evaluate the impact and rate of burning buildings globally as is reported.

1.9.4.2 Questionnaires

Self-administered questionnaires were distributed by the researcher to gather data. The Researcher communicated with the Head of the Fire Stations through telephone to introduce the study before sending the questionnaire. According to Pandey & Pandey (2015:62), a questionnaire is “a form premeditated and disseminated to probable partaker with the intentions of acquiring responses of predefined questions”.

According to Bryman & Bell, (2014) questionnaire is a compilation of well-structured questions given to respondents to answer. This study utilized one hundred and twenty questionnaires to acquire data from the respondents in the BCMM Fire Stations. Structured questionnaires consisting of closed-ended and open-ended questions were distributed to BCMM Fire Stations officials. The respondents were purposely chosen because they are the ones who are directly affected by the revitalisation when responding to emergencies. Some parts of the questionnaire include statements that require a Likert scale, where the prospective partakers were given an opportunity to reflect the level of their perception (Creswell, 2014). The questions in the questionnaires have been drafted with the objectives of addressing the problem acknowledged after the revitalisation of Bisho CBD.

1.9.5 Data analysis

The gathered data was examined by forming outlines, tendencies, and correlations from the information collected. Chronicle and elucidation reports were produced with the intentions of revealing the circumstances as it is on the ground. Mouton (2011) stated that analysis comprises grouping data into controllable themes, configurations, tendencies, and connections. The summaries and connections revealed by the data were combined to finalize the dissertation. The quantitative scrutiny was presented by employing figures, whilst the qualitative analysis was presented by descriptions. In the report, a suggestion of what is unlikely to change by the exploration was clarified. Microsoft Excel was used to record and consolidate the gathered data to ease the analysis and reporting. Tables, graphs, and charts (bar charts, cross-tabulations, frequency polygons, and pie charts) were used as part of the quantitative analysis to present data.

1.9.6 Data validity and reliability

The notion of validity and reliability are explained by a variety of terms in qualitative and quantitative studies. Even if it were possible, it is unnecessary to amass data from everyone in a community in order to attain valid conclusions. In this dissertation, two sources of data were applied to maximize legitimacy and trustworthiness. These sources enabled the researcher to secure an in-depth understanding of views from different sources that were utilized. This research engaged two data collection methods

such as questionnaires and documents/newspapers which led to other appreciated and trustworthy assorted construction of friendliness.

The power of the documents is their consistency, preciseness, and extensiveness of coverage. The researcher used self-administered questionnaires and considered the theoretical hypothesis that was acknowledged during the literature review. Questionnaires were utilized to gather data and comprise closed-ended and open-ended questions. Open-ended questions allow the respondent to elaborate his or her response. They assist to establish links, collect data, and enhance understanding. Questions included in the questionnaire were wisely developed to make sure that they created both powerful contributions to the study and avoided irrelevant interrogations.

- Validity: Kumar (2011) defined validity as the ability of a mechanism to quantify only what it is expected to measure. Validity refers to the precision without which research measurement becomes pointless. Briefly, according to De Vaus (2002) and Singh (2007), validity denotes to:
- The magnitude to which a practical measure precisely replicates the concept it is envisioned to quantify; and
- Reliability: Pandey & Pandey (2015) defined reliability as a replicated uniformity in the effects of a measurement motion. Reliability shows that if similar aspects are measured under the same situations, a consistent dimension will produce similar, or almost the same results (Neuman, 2013).

1.10 Limitations and delimitations of the study

The situation that confines the research is called limitation. Conducting research carries with it several encounters and it is imperative to discover means of tumbling the challenges at the proposal period of the research (Mouton, 2011). This study has its own anticipated challenges and the researcher identifies the solutions. The survey emphasises the assessment of the possible effects of the revitalisation of the Bisho CBD on Fire Response. The target population of the study is BCMM Fire Services officials and so the results are restricted in some ways as the eagerness of the potential partakers to partake in the study and their level of certainty and reliability was at stake. The most important factors that have been affecting the study is funding and time limit.

A researcher is a full-time employee, so some problems might be encountered with time off from work in order to gather the data.

1.11 Ethical considerations

Ethics are described as a set of extensively acknowledged decent ideologies that offer rubrics for, and behavioural anticipations for the exact demeanour towards tentative themes and respondents, sponsors, other research assistants, and students (De Vos et al., 2005). Ethical clearance was requested at the University of Free State Ethics Committee prior to amassing the facts from the prospective respondent. The study warranted that necessary steps are taken to watch the human rights and welfare of persons partaking in the study by considering ethical procedures as suggested by investigation ethics on ethical values governing research with humans. Permission to undertake this survey has been obtained from BCMM. The researcher guaranteed the partakers' concealment of the information collected by furnishing an affidavit in respect of trustworthiness to the effect. The researcher respected the rights to privacy of the participants informed the participants on the purpose and the processes to be followed throughout the survey. Information concerning the purpose of the study research was availed to the partakers so that they were fully aware of the connotation of their participation. No intimidation of participants in the research was done; their participation was voluntary, based on the information given to them.

1.12 Chapter Summary

This chapter reviewed the systematic routine that was utilized in this survey. It emphasises the lucidity of the study and provides a brief impression of the study area by giving an overview of Bisho encompassing access roads, architecture, and design of the CBD area. The chapter offers a summarized problem statement. Moreover, the research questions, the aim of the research, and the research objectives that guided the data collection were discussed.

In the next chapter, the focus is on reviewing existing literature related to high-rise building fires. This chapter investigates the findings of other researchers regarding fires in high-rise buildings.

1.13 Structure of the dissertation and chapter summaries

Chapter one: gave the overview of the study, what the study covered, concepts and definitions of terms, background and study area description, research problem, research questions, objectives, the significance of the study, the methodology adopted by the study, data collection tools, data analysis, data reliability and validity of the study, limitations and delimitations of the study and ethical considerations
Chapter two: reviewed the literature to examine similar research, best practices, other experiences and lessons learned. Chapter three: looked at the South African legislations and regulations. The chapter covered the legal and theoretical framework that is relevant to the topic of the research.

Chapter four: Research methodology chapter brings to light the research methods used and justifications of using such methods, and also the data collection process and techniques employed throughout the entire research, while considering the ethical clearance to ensure that no respondent's rights are violated. Chapter five: data presentation, analysis and discussion of results chapter breaks down what was gathered as per Chapter 4 in order to obtain results, analysis and findings of the objective and assumptions of the research addressing the effects of revitalisation of the Bisho Central Business District (CBD) on fire response . Chapter six: Conclusions and recommendations chapter presents the overall summary, key findings, the implications of the study with areas of further research and recommendations of the research that will enhance the proper planning of city revitalisation to cater for fire response and fire- fighting in the Eastern Cape Province and South Africa at large

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of literature on the effects of revitalisation of cities on fire response and related studies that have been undertaken on high-rise buildings. It includes philosophies, notions, theories, basic outlooks, analysis, and findings of significant dissertations. The chapter starts with the overview of high-rise buildings on international, national, and local levels and then moves on to discuss fires in high-rise buildings. This chapter also discusses another means of managing disaster effectively and concludes by summarising the rationalisation of this study.

2.2 Overview of high-rise buildings

According to Stephenson (2017), across the globe, one hundred and six newly built high-rise buildings were recorded in 2015, which is an increase from the ninety-nine that were recorded in 2014. The majority of these high-rise buildings were erected in Asia, specifically in China, with the USA in sixth place with two high-rise buildings completed with an average of eighty-eight floors. In South Africa, the average number of floors for the tallest buildings (Northern Cape, Limpopo, Mpumalanga, North West, and Free State) is merely sixteen, whereas the average height for the tallest buildings in the economic hubs (Kwazulu-Natal, Western Cape, Gauteng and disputably, the Eastern Cape) stands at thirty-three floors (Google, 2020).

2.2.1 High-rise building fires: Global

The first documented consequential fire instance in the antiquity of the United States occurred in James Town in 1608 within a year of its formation which resulted in an enormous loss of lives, assets, and money. Boston city, however, had devastating fires four times within the years 1630 and 1676, which aided as an eye-opener for the management to rethink their fire combating and preclusion techniques. Subsequently, new rules concerning fire combating comprising regulations connecting to the utilization of open spaces and fire resilient structure resources were established. Sections for fire combating were also developed. These were the first ‘written’ guidelines relating to fire combating and deterrence (Singh, 2007). Akhter (2014) confirmed that the major fire incident in Rawalpindi city took the lives of 13 fire-

fighters during rescue and fire-fighting operations in 2008. This was the first incident in the ancient history of Pakistan, where fire-fighters lost their lives due to collapsed concrete structures.

The high-rise buildings constructed without safety measures required by building by-laws affect the response of fire-fighters and make their task more risky (Pakistan Observer, The News & Dawn, 2011). Brushlinsky et al., (2017) reflected that from 1993 to 2015, an overall number of 86.4 million fire instances have resulted in fire mortality of greater than one million, and the overall yearly cost to worldwide fire menace, account for about 1% of the world GDP (Bulletin 29, 2014). On average, 3.8 million fires caused 44,300 fire decreases yearly in industrialized and unindustrialized nations throughout the world (Brushlinsky et al., 2017). Between 2010 and 2014 extreme figures of fires (600,000 – 1,500,000 each year), followed by the inexact data of fire mortality (1,000 – 10,000 each year) in the world occurred in a developed country such as the United States of America (Brushlinsky et al., 2016).

2.2.2 Fires in the Republic of South Africa

In 2009 only, it was indicated that additional effort is needed by all role-players headed by the regime to deal with fire and decrease the number of resulting mortalities and injuries. The Integrated Strategic Framework for the Prevention of Injury and Violence in South Africa (Department of Health, 2012) revealed that the fire-associated burn mortality ratio in South Africa (SA) of 8.5 per 100,000 is bigger than both the world average, which is five per 100,000, and six for Africa, respectively. The National Development Plan (NDP) vision 2030 outlined that to reach sustainable and comprehensive progression by 2030, RSA requires capitalising a strong fiscal policy to upkeep the country's medium and long-term intentions (South Africa, 2016). Fire services play a vital role in the maintenance of this network of infrastructure. It is therefore imperative to endlessly escalate the capability of fire services to distribute on its precarious obligation, as failure to do so may deleteriously affect the socio-economic improvement (South Africa, 2016). This is critical as socio-economic infrastructure requires reliable and well-organized fire services throughout the nation with the capability to offer sufficient protection from fire and the aptitude to manage them when they occur. According to South African Insurance Association, deficiency

of obligatory countrywide principles, insufficient responsibility at some municipalities, ineffective management, and deprived preservation of equipment, fire safety challenges, and insufficient finance were identified as the root causes of the problems within fire brigades (South Africa, 2016). The difficulties of fire eruption in the RSA are within the uppermost in the world and express through the damages of fire, harm to the populace, the costs of an asset, and other primary and secondary monetary losses (South Africa, 2016).

As quoted in the white paper on fire services (2016) the fire challenge is further convoluted by living environments categorized by narrow streets which are unapproachable to fire services apparatus and intricate actions to reach societies in need. Writer (Cape Times, 28 August 2019) wrote that the City of Cape Town's Fire and Rescue Service statistics showed an encouraging decline in most categories for the year 2018, mostly in informal and formal residential fires. Although Writer (Cape Times, 28 August 2019) showed appreciation towards the Fire and Rescue Services for the obedience of informal dwellers in maintaining at least three meters distance between the informal structures to slow down the fire spread, this does not happen in many instances. Other challenges indicated in this newspaper article are the narrow streets, and lack of street names, which would hinder fire-fighter services to do their work.

2.2.3 Fires: Buffalo City Metropolitan Municipality

Bisho CBD is the home of four government buildings where one is a high-rise building. The high-rise building in Bisho has 12 floors. The rest are classified as low-rise buildings with 7, 5 and 4 floors respectively. All of these buildings are at risk as they are a source of fire. Not one of these buildings has ever been on fire. In BCMM, buildings that hold the record for a number of fires in are in EL and KWT, which are the Kelsaf Packaging building, the Car Spares building, and the Longfellow Lodge. Suspected causes of fire are faulty electrical appliances (Anonymous, 2020). On 10 December 2019, Beacon Bay shopping complex was engulfed by fire. Keenan wrote in the Dispatch Live (10 December 2019) that if BCMM fire-fighters were delayed five shops could have been destroyed by fire and the whole shopping complex would have been gone. The quick response of the fire-fighters saved lives, reduced the

number of injuries, and minimized property damages. Keenan (Dispatch Live, 10 December 2019) wrote that one of the fire-fighters indicated that the intensity of the fire was possible due to a stack of highly flammable mattresses. The three elements of fire occurred in this business area and are as follows: fuel (plastics, paper, and wood) oxygen (blowing wind), and heat and ignition source (powerlines).

2.3 Basic elements of fire

According to Levy (2005) for burning to occur, three elements of fire must be present and these elements are fuel, oxygen and a heat or ignition source in these three elements. Voelkert (2015) adds chain of combustion as the fourth element of fire as shown in Figure 2.1.

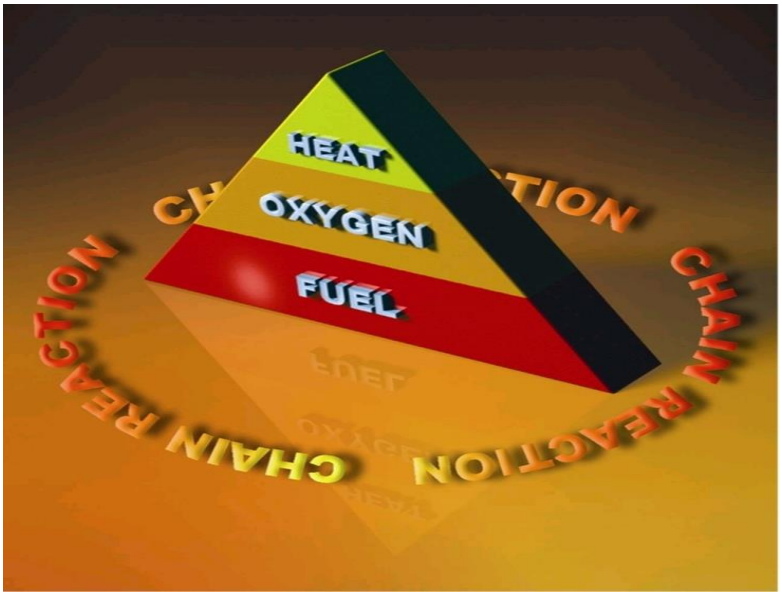


Figure 2.1 Tetrahedron of fire.
(Source: Voelkert, 2015).

Pyne (2004) reflected that heat or ignition source is anything capable of generating heat, for instance, lightening, powerlines, electrical energy, heaters, etc. According to Pyne (2004) fuel source is any kind of combustible material for instance paper, wood, plastics, straws, etc. Oxygen is part of the ambient air and makes up approximately 21% oxygen. Most fires require at least 16% oxygen content to burn (Pyne, 2004). Most offices have these elements that are required to start the fire such as printing papers, printing machines, computers, cabinets, carpets, and also the partitioning

material used to divide the offices. Fires are quenched by the abstraction of heat, fuel, or air or by interfering with the chemical reaction of combustion.

2.4 Fire hazards

According Vermaak and Van Niekerk (2004), the value of assets demolished by fires in South Africa is growing. The preclusion and preparedness of fires contained in the inner-city location are preserved through statutes such as the National Buildings Regulations (NBR), by-laws, and any other means such as codes of practice issued by the South African Bureau of Standards (SABS). Fire hazards become a disaster once people, physical assets, infrastructure, built environment, and other resources are threatened or destroyed by the hazard. Human beings, physical assets, infrastructure, the built environment, and other resources can be affected due to a lack of stakeholder awareness before, during, and after a disaster (Bosher et al., 2009).

Fire-fighters should suppress the fires promptly before it burns out of control. Emergency service units of a local authority are likely to be the first professional responders, followed by the occupants, to come across a series of occurrences connected to fire such as structural fire combating. In responding to fires, the local authority mobilises the rapid response teams which in turn supports intergovernmental cooperation (South Africa, 1998).

2.5 Risk

According to Jenkins & Poulier (2006) risk is gauged in terms of magnitudes and probability and is calculated based on a q3u [trio factors, namely hazard, exposure, and susceptibility. The magnitudes are gauged in terms of lives lost, inhabitants harmed, destruction of assets, and interruption to monetary action. Crichton (1999) used the risk triangle to interpret each factor as equivalent with jeopardy being denoted by space of the three-way relationship and the interpretation as depicted in Figure 2.2. The magnitude of risk may be lessened by dropping the proportions of the causal factors. Risk can be reduced by lessening the exposure and vulnerability factors and equally, an upsurge in any one of the features will surge the risk. Therefore, to reduce risk, appropriate measures should be considered as it assists in widening the approaches taken by the government and also allows an extensive complexity of

contemplation to be established that will not negatively influence the atmosphere and socio-economic aspects.

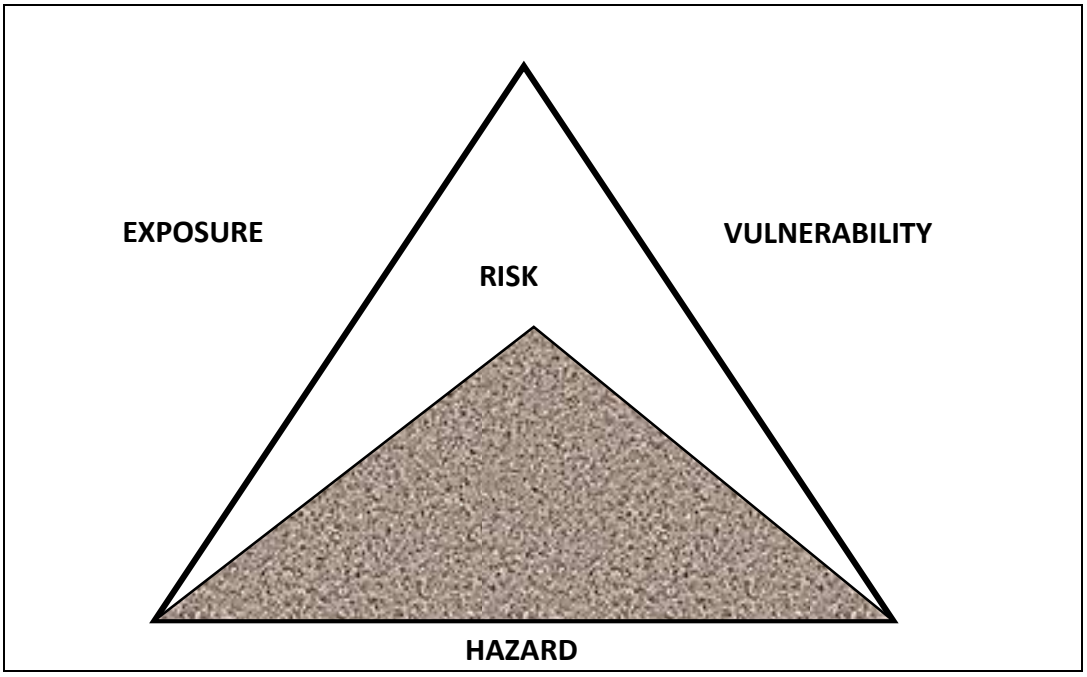


Figure 2.2 The risk-hazard exposure-vulnerability relationship. (Source: Jenkins and Poulier, 2006).

It is necessary to develop a mentality of the long-term rationale for all stakeholders involved in the development of programmes including government, experts, legislators, inspectors, etc. the Inclusion of acceptable development principles in risk reduction contributes to the broadening the methods considered by the state (Jenkins & Poulier, 2006). For example, in addition to all the other criteria, development programmes should be evaluated from the perspective of disaster risk or calamity, or the consequence of a probable calamity on the development project, or whether the development projects increased either the likelihood of a disaster or increase the prospective damaging effects of a disaster.

2.6 Effective urban governance

RSA has a series of statutes, rules, and strategies to guide cohesive arrangements. They assist in providing principles of incorporating and arranging regime strategies, such as spatial development frameworks (SDFs), integrated development plans (IDPs), built environment performance plans (BEPPs), growth and development strategies, and sectoral plans. Their anticipations are to confirm that execution takes place in a combined, operative, effectual and viable manner (South Africa, 2016).

2.7 Occupant conduct during building fires

High-rise building fires have many characteristics, such as the diversity of fire ignition, various ways of fire spreading, the difficulty of evacuation, and lifesaving. High-rise building fires are a type of risk event that is a threat to the life and property of people. Numerous fires in buildings have revealed that the conduct of occupants is vital for the endurance of a construction fire (Kobes, et al., 2008). The notion of fire risk can be described as the prospect of fire causing a fatality or harm and destruction to assets (Tillander, 2004).

The assistance of qualified Emergency Management Services (EMS), such as rescue procedures led by fire-fighters can only be delivered just after the first and most important period of fire. Therefore the chances of surviving a fire are ascertained on the fire reaction enactment of the population. Skyscrapers have unique challenges related to fire protection such as long egress times and distance, evacuation strategies, fire department accessibility, smoke movement, and fire control (Ronchi and Nilsson, 2013). Each of these unique problems should be resolved before a designer can achieve a fire-safe high-rise building design (Kodur et al., 2019).

- **Egress time and distance**

Recent studies on the evacuation of high-rise office buildings reveal that the movement speed people exiting the building is generally slow if the building is completely occupied (Proulx, 2007). According to Jin (2002), the existence of crowding and slow movement in exit stairs is possible in high-rise buildings, due to the bigger number of levels and also because exit stairs do not normally increase in width as they descend. The height of the building increases the time taken by the building occupants to exit the building using the stairs, which increases the potential for smoke exposure.

- **Evacuation strategies**

The efficiency of the technique for evacuation should be assessed during the risk assessment. Total phased evacuation is a shared method that is accepted in high-rise buildings. The number of occupants, travel distance, a limited number of stairs, and exits complicate the practicality of concurrent evacuation of occupants in high-rise

buildings. In this strategy, the evacuation of occupants starts on the floor affected by fire and the floor immediately on top, and then the rest follow in pairs. For the safe acceptance of this strategy, it is essential to provide and uphold fire protection measures (Furness & Muckett, 2007).

- **Fire department accessibility**

Response to a multitude of emergencies by the fire department in numerous types of buildings and occupants is obligatory. However, for the department to provide effective fire-fighting operations, it must be able to reach all structures through the approved access roadways, streets, or driveways (USA, 2015). Thus, for fire-fighters to gain access to the building with fire appliances as well as reasonable assistance there must be sufficient vehicle access and internal access to the building. Generally, the large structures need to be accessible on many sides well as clear and more access for fire service vehicles. During the assessment of the appropriateness of access for fire service vehicles, the assembly points for the building should be considered. They need to be placed appropriately far from the premises to lessen meddling with the fire service or threats from falling debris (Furness & Muckett, 2007).

According to Berlin & Carlstrom, (2011) at an incident site, the function of a fire department is to ensure safety for people, property, and the environment. Hence, the shorter the time taken between response and actual equipment set up, the faster it becomes to save lives and building. However, for skyscrapers, the time taken to mount the equipment can be longer than low rise buildings (USA, 2015).

- **Smoke movement**

According to Craighead (2009), smoke from burning buildings possess a health hazard to the general population and the lives of the building occupants are at stake. Therefore, it is important to take into consideration the means of smoke control and dispersal. Stack effect which occurs when hot air rises, so the warmer, indoor air is buoyant and presses upward to exit the building through a variety of openings in the upper floors and winds mainly affect the smoke movement in high-rise buildings. The stack effect escalates with the increase in height of the building. Wind speed and direction also affect the path of fire (Butcher & Parnel, 1979).

- **Fire control**

According to Voelkert (2015), once a fire begins, fuel, oxygen, heat, and chemical chain reactions are required to sustain the combustion reaction as shown in Figure 2.1. In the case of fire ignition, fire development is controlled by limiting fuel supply or inhibiting oxygen, or absorbing heat, and/or inhibiting chemical chain reaction (Della-Guistina, 2014). According to Kodur et al., (2019), the most effective way of controlling fire is suppressing the use of automated or manual fire protection provisions.

2.8 High-rise buildings fire response

According to Rawalpindi Development Authority Government of Punjab (2007), the construction of by-laws are the established ethics which have been established by local government safety of the structure, and high-rise building term denotes structure of building above 11 metres. The fire-fighters professionalise their response by introducing Incident Command System (ICS). Therefore they perform their work through that system as it assists them to deal with different scales of emergencies and manage them effectively. Through ICS, managers from other departments included in decision-making know the importance of fire-fighting as well as their role and responsibility in case of fire emergencies (Taber et al., 2008).

Lack of synchronization in case of major adversity is a big reason for sluggish reaction to fire emergencies in Greece (Eftichidis, 2007), based on the fact that intergovernmental cooperation involving police, paramedics and firefighters is necessary to suppress fire outbreak before it becomes a disaster. The quicker a fire service can react and mount their equipment, the earlier they can extinguish a fire outbreak or an occurrence. This should convert into improved safety for fire-fighters and occupiers as well as lessened property damage and secondary business damage. The time taken to set up and sustain fire-fighting operations can be considerable for high-rise buildings. This time can be prolonged when the fire location is not observable. Appropriately setting fire apparatus at a fire can simplify fire response as it eliminate struggles and promote active utilisation of stepladders (USA, 2015).

Impediments and perils that are often surrounding high-rise buildings may hinder fire-fighter access therefore; appropriate plans can eradicate or reduce numerous hindrances (USA, 2015). Access streets for fire devices, such as Independence Avenue and Siwane Avenue in Bisho CBD should have an unhindered width of not less than 6 metres (Snyder et al., 2013). Proportions are developed to provide fire devices uninterrupted and unhindered access to structure and amenities (USA, 2015). In the event that fire-fighters are not familiar with the buildings or if the buildings have been subject to unauthorised (no approved building and fire management plan) refurbishment this may lead to inadequate resources being mobilised. This may cause a delay in fire-fighting and search and rescue operations (Cacadu District Municipality Fire Brigade Services Assessment Report, 2009).

Alterations to the extent of perimeter access can cause the structure to be non-compliant although the dimensions of the structure are not altered at all (USA, 2015). For example, the revitalisation of Bisho CBD focused on the upgrading of the access roads. The results of this revitalisation are dangerous conditions due to the inaccessibility of fire hydrants, constricting of streets, and the unreachability of high-rise buildings by fire engines.

2.9 Fire response performance

Gwynne et al., (1999) defined fire response performance as the ability of an individual to recognize and confirm signal of danger and to implement decisions that are operational linking to sustain a fire situation safely or with little health complications afterward. According to O'Connor (2005) the fire response performance of human beings are guided by people, the building and the fire.

Tong & Canter (1985) mentioned three strategies to survive a fire, and are:

- To dowse the fire
- To shelter and to wait for rescue/save
- To vacate

Kobes et al., (2008) stated that in the strategy of 'shelter & wait' it is found in a number of fires that people sometimes tend to walk through smoke or even choose to jump out of the building instead of shelter and wait to being saved. The strategy to instruct occupiers to stay is likely to be operative for the endurance of a fire (Bryan, 1992).

2.10 Fire safety

The fire safety requirements provided in a structure are clustered as active (dynamic) and passive (prevention) fire protection systems. The active fire protection systems refer to the control of fire by taking some action by a person. Passive fire protection systems denote the processes which are built into the structure itself and do not need any manual action. If the fire starts, the urgency is to vacate the occupiers from the structure as breathing in contaminated fumes from a fire can be fatal within minutes (Nelson, 1998; Alarie, 2002). Fire marshals are essential for the good management of fire safety (Furness & Muckett, 2007). According to fire triangle theory, the existence of flammable materials, heat, and oxygen can ignite a fire disaster. Exclusion of one aspect usually leads to the fire being extinguished therefore; it also lessens the probabilities of fire occurrence (Craighead, 2009).

According to Craighead (2009), high-rise buildings have various kinds of fire safety systems and equipment that can be installed to address precise fire life safety intimidation. Their prime determination is to help certify that a building is safe to occupy, that occupants are able to escape safely and swiftly in the event of a fire or other emergency, and that the first responder has the ability to access all areas within the building so that applicable control procedures are promptly instigated. A variety of detectors to sense the presence of smoke, heat, and flames should be installed and arrangements should be made for all fire protection systems to be regularly inspected and properly maintained (Furness & Muckett 2007). The choice, setting up and upkeep of the suitable detector are all critical factors to circumvent false alarms (Craighead, 2009).

2.11 Fire safety performance

According to Kobes et al., (2008) fire safety performance of buildings has three factors namely human features, building features and fire features. Interaction between the behaviour of people, structure and impacts of fire occurs throughout the sign corroboration period, the decision-making period and locomotion period. When the occupant sees and smells the fire, smoke and fumes he or she perceives it as a sign of unsafe conditions (Proulx, 2001). Numerous floors provided in high-rise buildings

require people to travel vertical distances to vacate the building, but most people use the lifts and are not familiar with the stairs (Averill et al., 2007).

It is noteworthy that, preparing in advance to safely evacuate the building is critical to the safety of employees who work in high-rise buildings. Regardless of the superiority of the means of escape within a building and the related systems, it is always essential to conduct fire drill with the intentions of practising an evacuation method, to ensure the adequacy of its meaning. All parties have a role in achieving a rational state; where there is need to be involved in fire drills (Furness & Muckett, 2007).

2.12 Restrictions of fire-fighting

The available resources for fire-fighting contribute significantly in decreasing mortality and fatalities caused by fire. The efficiency of fire-fighting depends on:

- Typical reaction period
- Importance and extent of existing means to supress the fire
- Acquiescence with efficiency of fire safety protocols.

The response time is explained as the smallest period that the fire-fighting department has used to arrive at the scene of the fire and activate fire-fighting process, after receiving the fire incident notice. Shorter response time provides numerous benefits to life safety, as the probabilities of removing, as well as restricting fires completely are greater in the early phases of the fire (Brushlinsky et al., 2017).

During site renewals and accompaniments, engineers should implement precise thoughtfulness to confirm that the perimeter access remains to meet pertinent codes (USA, 2015). Altering the extent of perimeter access can cause the structure to be non-compliant although the dimensions of the structure are not altered at all (USA, 2015). For example, if the revitalisation of Bisho CBD completely affects the effective operation of the fire services in responding to emergencies, Dukumbana building can be regarded as non-compliant to health and safety of building occupants.

The Star newspaper (ANA Reporter) reported in September 2018 that, City of Johannesburg Member of the Mayoral Committee for community safety confirmed that South Africa has the challenge of not having fire engines with extra length ladders that can reach heights of 23 storeys and more. Based on that challenge, the fire that was affecting a 26 floor Bank of Lisbon building was not contained effectively and

resulted in loss of lives and property. However, the researcher noted that, Bisho CBD does not have buildings that are more than 23 floors but appearance of the CBD after revitalisation minimizes the space between streets and buildings, and lessens car parking space for the public.

Figure 2.3 Aerial apparatus showing outrigger extended to support the aerial ladder (Aerial truck, Independence Avenue Bisho, May, 2019).

The minimization of dimensions obstructs access of the fire engines, rotation of ladders, etc. The researcher further noted that, concrete balls that are on the pavement are too close to the streets and are also close to each other, therefore the space required for the fire engines, fire trucks and aerial ladders to extend outriggers to support the aerial ladder, so that operations can start is not very efficient. Figure 2.3 shows that the outrigger support is too wide for comfortable access.

2.13 Theoretical framework

Wanjohi (2014) noted that a theoretical framework is an arrangement of conceptions that subsist in literature as a directorial plan for the study. It is imperative to have a proper outline due to the fact that it offers direction to the researcher, as it helps study questions to be tweaked and can be utilized as a judgment once data has been amassed and evaluated (Wanjohi, 2014). UNDP (2018) refers to a framework as a tool to enhance understanding of the environment in which people reside and the potential hazards likely to be experienced within that particular community. It is, therefore, deemed important that this study adopts a framework that will act as a guideline, in

terms of potential hazards, unsafe conditions, dynamic pressure, and root causes. Hai & Smyth (2012) reveal that the disaster Pressure and Release model assists experts in apprehending and retorting the defencelessness of people to adversities, such as fires. Based on the above statements the main theoretical framework approved in this study is the Pressure and Release (PAR) Model that was developed by Blaikie et al. and modified by Wisner et al., (2004).

It is important at this juncture to note that disaster management (South Africa, 2002) has five aims which are as follows:

- Preventing or reducing the risk of disaster; in this instance, government departments and municipalities can better avert a calamity by conducting certain activities before a disaster occurs. In the Local Government Land Use Planning and Risk Mitigation national research paper (2006) the process of risk reduction is linked to sustainability as it must address social, economic, and environmental factors to ensure effective and sustainable outcomes.
- Alleviating the brutality or significance of adversity; in this instance the strategies to manage adversities and the structures that should be developed to curtail the occurrence of hazards and consequently lower the scale of probable adversity, for example, building codes and zoning.
- Emergency preparedness; should be an ongoing logistical willingness to deal with adversities and could be heightened by having reaction gadgets and techniques, for example, preparedness plans and warning systems.
- Prompt and operative response to adversity; Rapid response needs to take place immediately after adversity occurs without any delay. Delays can be seen where fire responders have haphazard procedures in managing incidents, for example, search and rescue and emergency relief.
- Post-disaster recovery and rehabilitation. These include the interventions needed after a disaster occurs, for example, search and rescue, and medical care.

The activities of these aims are conducted before, during, and after disasters. These aims can be achieved through the implementation of multi-sectoral and multi-disciplinary measures. Through peril assessment, the base for the inclusive crisis controlling platform is offered. Risk Assessment: Practise to ascertain the nature and

magnitude of peril by examining probable dangers and assessing prevailing circumstances of susceptibility that could pose a prospective peril or detriment to population, assets, and the situation that they are facing (South Africa, 2005).
The peril evaluation contained by the forecasting practice provides the outline for conclusions that are made in the attentiveness stage (India, 1996) and these decisions would be activated during and after the disaster. In the course of peril evaluation, possibilities for which readiness is necessary will be identified and the alternatives of reducing menace and their efficiency will be taken into account (Carstens & Minnie, 2014).

Carstens & Minnie (2014) affirm that when adversity transpires, the adversity usually includes crisis and crucial services, safety services, and assistance associations and also comprises numerous diverse disciplines, and to ease their cooperation, joint incident management should be established. In foremost adversities, reaction includes various institutes and equipment operation is problematic and treacherous situations to be as swift as possible to defend life, assets, and surroundings. Various equipment may be in usage by responding people with distinct upbringings, qualification used to distinctive organisational beliefs, controlling schemes, classifications, and practises. With so much intricacy, synchronization is noticeably obligatory to make sure that calamity victims that need to be aided are supported swiftly and proficiently and that effect on life, assets, the situation, and socio-economic commotion is restricted. In the situation where the line functions go beyond the managing capability, and on the condition that multi-disciplinary and multi-sectoral harmonization is essential, adversity controlling harmonizing contrivance may be used to resolve the condition. For instance, in case of a fire disaster, the response of the fire brigade can be supported by the traffic police or the water department.

2.13.1 Disaster management Continuum model

The Disaster management continuum model in Figure 2.4 views the management of disaster as an ongoing process rather than an event. According to ADPC (2000), the disaster management continuum model comprises four different phases known as mitigation, preparedness, response and recovery. This model is delineated into the stage before adversity and stage after adversity. The stage before the adversity is when

approaches and ideas are conscripted to diminish and formulate for adversity threat or perils. The post-disaster recovery phase embraces tactics available to empower businesses and societies to be resilient to disaster. Vermaak & Van Niekerk (2004) state that the challenge with the disaster management continuum is that, most stakeholders overlook the foundations of calamities such as risk, hazards and susceptibility, yet in most cases there is a shift from being reactive to proactive.

Hence the researcher noted that, disaster risk reduction (DRR) programmes should be introduced. According to UNISDR (2009), DRR can be explained as, the theory and practice of plummeting adversity jeopardies through logical attempts to scrutinise and manage the pivotal aspects of adversities, comprising through concentrated revelation to hazards, decreased helplessness of societies and belongings. In agreeing with the UNISDR explanation of DRR above, Van Niekerk (2014:858) noted that, the South Africa disaster management framework (SANDMF) views disaster risk reduction as "all the features that are obligatory to diminish susceptibilities and adversity risks all over the public."

The fundamental expressions in the above definitions are reducing disaster risks and minimising vulnerabilities. Disaster risk reduction signifies an interchange from a traditional approach of retorting to adversity to focus on preclusion of adversities (Vermaak & Van Niekerk, 2004). DRR arrangements should be assumed at the stage before adversity peril lessening and after the stage of adversity recovery (Hansford et al., 2007). Concern (2005) summarised that DRR is a means of associating the development and altruistic platforms and can be seen as a means of strengthening livelihood security. Development can only be interminable if there is a suitable understanding of and response to the deleterious effect of adversities. DRR intercessions pursue to contribute to the development of this understanding, to support livelihoods, and to protect assets.

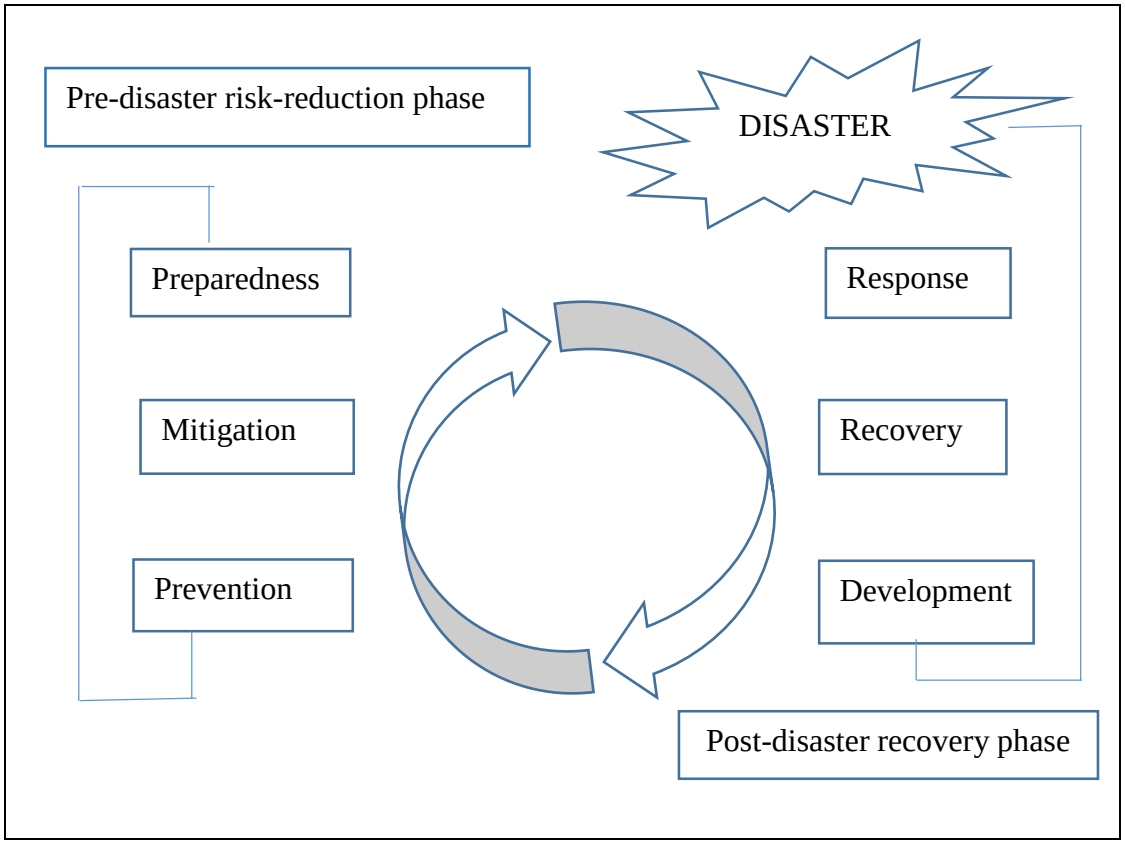


Figure 2.4 Disaster management continuum model.
(Source: Coburn et al., 1994).

The focus of DRR interventions will be the reduction of community vulnerability and rise in their prospects of pursuing sustainable livelihoods. Disaster preparedness is vital in disaster risk reduction and it comprehends eagerness to solidify applicable reactions and swift reclamation (Ejeta et al., 2015). For that reason, preparedness becomes an imperative facet for accomplishing sustainable disaster management. Disaster preparedness embroils likelihood, where probable avoidance, vindication, applicable reactions, and operative surviving mechanisms against the implications are mobilised. According to Spadaccini (1998), once the fire is ineffectively managed, societies may become injured and mortally wounded.

According to Forsyth et al., (2019), a structured reaction to disaster management is vital to vindicating loss of lives and damage to infrastructure. Intergovernmental relations (IGR) are necessary for the management of disaster, as the IGR is defined as the relationships that arise between different governments or between organs of state from different governments in the conduction of their affairs (South Africa, 2005). Through the IGR the arrangement which considers comprehensive situations and

circumstances that will play a part in the efficacious effect of the strategy, and which includes whole populaces or associations which have the influence to make is promoted and encouraged. According to Huissain (2013), the establishment of this disaster management continuum model is on the understanding of disaster as the momentary disruption to development processes, and that the job of disaster practitioners is to take appropriate action to quickly return to the normal course of development.

2.13.2 Pressure and Release (PAR) model

Wisner et al., (2004) affirm that adversity transpires when a substantial extent of exposed, defenceless populations experience a hazard and agonising destruction and/or commotion of their livelihood system in such a way that recovery is implausible without extra assistance from other disaster management stakeholders. For the purpose of this study, fire is regarded as a hazard and the vulnerable people referred to are the high-rise building users and civil servants that will be exposed to this hazard. Extra assistance from other disaster management stakeholders will comprise all the stakeholders such as police, traffic, and ambulance services that will be amplifying the fire and rescue service available at BCMM.

Wisner et al., (2004) refer to the disaster Pressure and Release (PAR) model as a progression of vulnerability, in which root causes are connected with the affectivity or non-affectivity of the public, proficiency of the management and are formed by the orders of dynamic pressures which can cause upwelling to unsafe conditions. The "progression of vulnerability", affords an elucidation for the correlations concerning different components that source defencelessness. Experts of adversity risk management utilised the PAR model to scan the origins of defencelessness throughout the evaluation of adversity disaster risk (Hai & Smyth, 2012). PAR model; as exemplified in Figure 2.5 has three elements, creating exposure on the social side; meanwhile, the other part contains the hazards.

The three elements of the progression of vulnerability are enlightened as follows:

- **Root causes**

According to the PAR model, root causes are those that hinder the allocation of resources amongst people (Wisner et al., 2004). In this case, the government's negligence on the width of roads, the hydrant's position, the lack of government policy on land use planning, and the lack of emergency response preparedness are the root causes. Government negligence revolves around the expertise and competency of officials assigned to plan, approve and monitor road construction. The incompetence of officials amounts to negligence and negatively affects the quality of projects. The lack of government policy enforcement refers to the absence and deliberate ignorance of regulations, by-laws, monitoring, and evaluation mechanisms.

Critical to the lack of government's land use planning, is the will to implement land use in accordance with the existing laws and regulations. Greed and corruption of political office bearers and officials (top- and low ranking) that is experienced by the country has overwhelmed the country and renders the provisions of the existing laws and regulations useless (Boholm and Lofstedt, 2013). This also compromises the objectives and authenticity of developmental projects and programs. Lack of emergency preparedness is also attributed to poor competencies, lack or absence of risk avoidance and response planning. This resulted in poor development and excess of funding support and human capital responsible for emergency response and preparedness. Lack of detail in plans where they exist and monitoring of the implementation of such plans as well as Government negligence and lack of government policy enforcement are amongst the root causes (Hai & Smyth, 2012).

- **Dynamic pressures**

In the accumulation of the evolution of defencelessness, dynamic pressures are the processes and activities that transform the effects of root causes into vulnerability. These channel the root causes into particular form of insecurity that have to be considered in relation to the type of hazards facing vulnerable people (Wisner et al., 2004). The Bisho community has no organisation for collective efforts to reduce fire risks, and rapid migration tendencies into Bisho add to the dynamic pressures. With overpopulation in the area, many people become vulnerable to risks coupled with the

obstruction of the fire hydrants in the CBD which would have assisted in the case of a disaster.

- **Unsafe conditions**

These are the specific forms in which a people's vulnerability is expressed in time and space in conjunction with a hazard. This may occur through such processes as fragile local economic conditions, lack of disaster planning and preparedness and a harmed environment. With the revitalisation of Bisho CBD, unsafe conditions were created by the narrowing of the roads limiting the emergency vehicles' mobility in case of a hazard. This development indicates the lack of disaster preparedness skills, thus creating unsafe conditions for the people in the high-rise building. Unsafe conditions could be precarious situations, risky livelihoods, and a lack of disaster preparedness skills (Hai & Smyth, 2012).

2.14 Chapter summary

In the sight of suppressing fires, the furthermost imperative technique is to preclude the intersection of the fire features. When an intersection cannot be eluded, the situation should be monitored perfectly to inhibit their collaboration. A range of adversity control was explicated to exemplify the linkage with disaster management aims stipulated in the definition of disaster management and also assists in establishing a mutual indulgence amongst several contributors incorporated in administrating adversities. It also affords the unfluctuating combination of adversity assistance and recovery attempts.

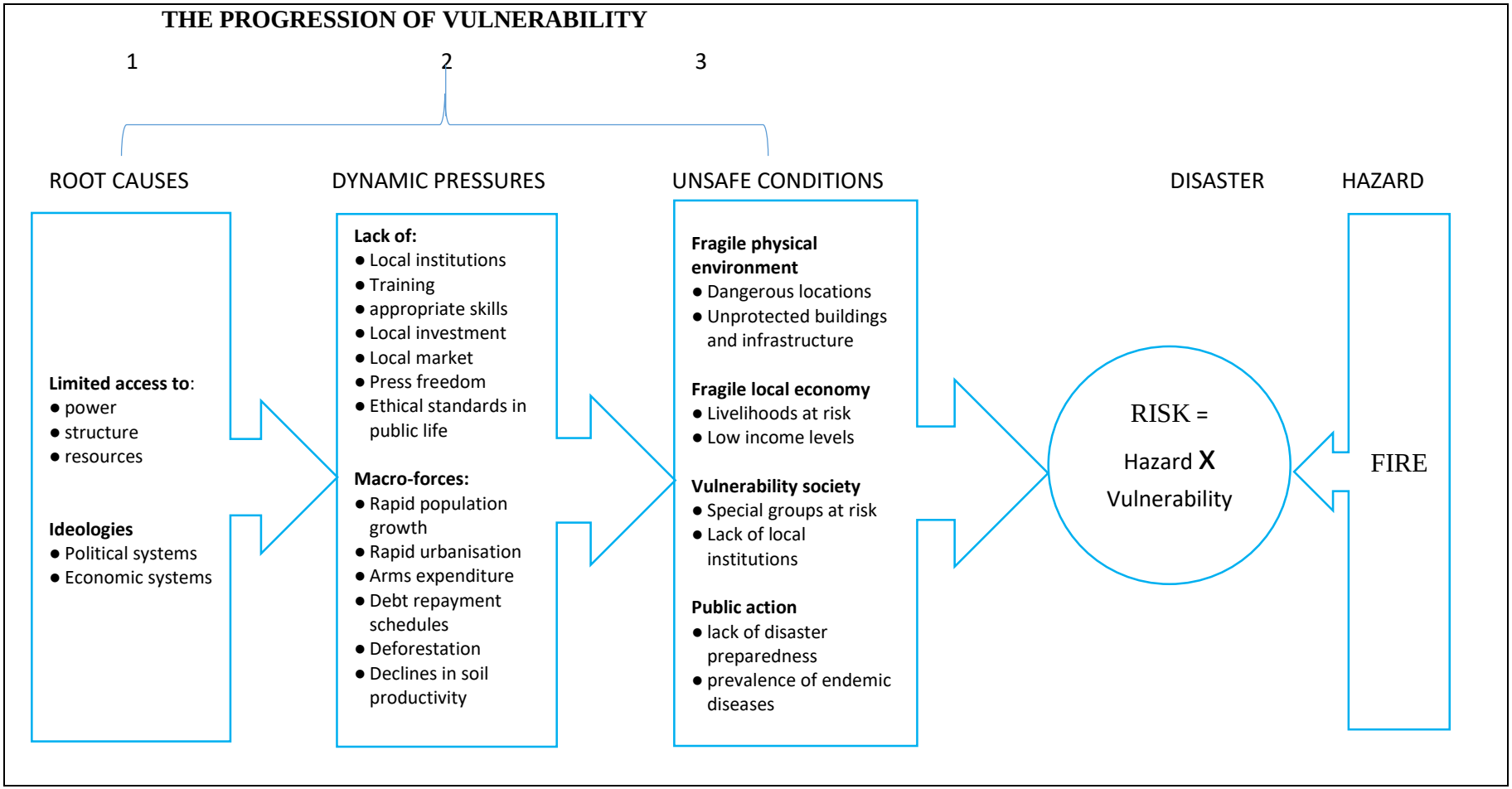


Figure 2.5 **PAR Model.**
(Source: Wisner et al., 2004).

CHAPTER THREE: SOUTH AFRICAN LEGISLATIONS AND REGULATIONS

3.1 Introduction

RSA has a robust statutory outline to control, direct, guide, and encourage lessening the perils of calamity and influence on the provision of fire taskforce services legislation. Some Acts have a straight bearing on the effectual provision of a service and also relate to fire brigade service operations.

3.2 Related legislation and regulations

3.2.1 Constitution of the Republic of South Africa Act No. 108 of 1996 (RSA, 1996)

The provisions in Section 24 of this Act states that citizens have a right to a safe environment that is not harmful to their health or well-being. In terms of Schedule 4, Part B of this Act, fire-fighting services are the responsibility of local government with national and provincial oversight. Also, indicates that the local sphere of government has the power to develop by-laws.

3.2.2 Basic Conditions of Employment Act (BCEA) No. 75 of 1977 (South Africa, 1977)

This act was enacted to provide the rights to fair workforce practice denoted in the Constitution of RSA by forming and providing for the legalization of rudimentary employment environment, and thereby act in accordance with the commitments of RSA as a member state of the International Labour Organisation (ILO), and offer for matters linked thereto. The outline of this Act had momentous impressions on fire services which is fundamentally a shift-based service.

3.2.3 National Disaster Management Framework (NDMF) of 2005 (South Africa, 2005)

This is the framework that was promulgated in April 2005, for the provision of DMA. It is a lengthy and complex document that entrenches and expands upon the commitment to developmental measures that reduce the vulnerability of disaster-prone

areas, communities, and households. This Act stimulates a comprehensive response meant to decrease the probability of catastrophe and better handling catastrophes that do occur.

3.2.4 Disaster Management Act (DMA) No. 57 of 2002 (South Africa, 2002)

This Act is governed by the Department of Co-operative Governance and Traditional Affairs (DCOGTA). The provision of this Act is for cohesive and harmonized calamity supervision rules with emphasis on inhibiting or decreasing the threat of calamities, alleviating the rigorousness of calamities, crisis vigilance, prompt and operative retort to calamities, and after calamities recovery among others. Fires are foremost a death-trap to RSA and are considered as one of the impending calamity zones. Fire services play a significant part in all the stages of calamity supervision mostly because all kinds of fires are the foremost death-trap encountered by the state. The Act requires national, provinces, and municipalities to formulate a disaster management plan and mandates the spheres of government to respond to such disasters (NDMC, 2018).

3.2.5 Fire Brigade Service Act (FBSA) No. 99 of 1987 (South Africa, 1987)

This Act is governed by DCOGTA. The Act is the principal portion of the statute legalizing fire services and provides for the establishment, preservation, engagement, harmonization, and calibration of fire brigade services.

In terms of the Act, the local sphere of government is required to form and preserve the services of combating fires with the aim of:

a) Inhibiting the fire occurrence or blowout;
b) Combating or quenching a fire;
c) Safeguarding of life or assets from a fire or intimidating peril,
d) Saving of lives or goods from all types of peril;
e) Focusing on the necessities of the Health Act 63 of 1977;
f) The enactment of another task linked with whichever issues denoted to in subsections (a) to (e).

Every fire brigade should implement a suitable occupational health and safety programme according to National Fire Protection Act 1500. Section 16 of this Act

provides that, municipalities are empowered to develop guidelines or procedures which are not deviating to whichever verdict for its dominion concerning whichever issues that may reckon essential or advantageous in engaging its services effectually. These guidelines and principles may in respect of violation thereof or not conforming therewith offer a reprimand.

3.2.6 Municipal Systems Act (MSA) No. 32 of 2000 (South Africa, 2000)

Among others, the establishment of this Act, the MSA provides for the fundamental ethics and procedures that are obligatory to allow municipalities to move increasingly to the socio-economic development of indigenous populations, and guarantee entire accessibility of critical services. The mechanisms outlined from Section 76 to Section 80 of this Act regulates the structures (entities or internal) of services provision by municipalities.

3.2.7 Municipal Structures Act (MSA) No. 117 of 1998 (South Africa, 1998)

The provision of this MSA is for the formation of municipalities according to the necessities linking to classifications and kinds of the municipality. It also arranges for the proper splitting up of roles and supremacists amongst classifications of municipalities.

Section 84 of this Act pact with the splitting up of tasks and authorities amongst constituency and resident municipalities. In relation to fire-fighting services, Section 84 (1) states that the district and metropolitan municipalities have the powers and functions of:

a) Scheduling, synchronization, and directive of fire facilities;
b) Dedicated fire combating services such as peak, grassland, and substance fire services;
c) Harmonizing of the normalization of substructure engine, facilities, and procedure; and
d) Capacitation of fire officers.

3.2.8 Occupational Health and Safety Amendment Act (OHSAA) No. 181 of 1993 (South Africa, 1993)

As indicated in this Act (1993), this act has the provision of health and safety of persons at work; the safeguarding of individuals other than personnel at work against dangers to well-being rising out of or in association with the undertakings of personnel at work; to form a consultative committee for occupational health and safety, and to offer for issues related therewith.

This Act puts specific responsibility on people managing establishments to adhere to health and safety in the workplaces and it also puts an emphasis on self-regulation hence every workplace should have safety committees. OHSA No 85 of 1993, South Africa (South Africa, 1993) as amended in 1993 affords health and safety of personnel in the workplace; safeguarding against dangers to health and safety arising out of the undertakings of personnel at work and offers for issues related herewith. Based on the provision of this act workers must work in a protected and safe environment.

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

Section 30 of this Act focuses on the director of crisis occurrences. Amongst others, Section 30 stipulates that, wherever there is an occurrence, the responsible person reports the event using the supreme operative methods. The responsible person will in turn inform the relevant authority through the designated channels accessible to South African Police Services (SAPS) and the applicable fire preclusion services. The relevant authority will report the occurrence detailing the nature of the instance and any jeopardy posed by the instance to public health, safety, and property. Finally, the relevant authority will give directions on any actions that should be engaged to evade or curtail the effects of the instance on public health and the environment.

3.2.10 National Building Regulations and Buildings Standards Act (NBRBSA) No. 103 of 1977 (RSA, 1977)

This Act offers for the advancement of the consistency in the commandment linking to the construction of structures in the zones of the dominion of local authorities as well as for the advocating of constructing criterion. In South Africa, the National

Standards are established and circulated by the South African Bureau of Standards (SABS) and provide information of several significant South African National Standards (SANS) that relate to constructing a house and overall construction plan.
National Building Regulations (NBR) specify the minimum requirements for design and construction to which all buildings must comply. The regulations are essential to ensuring the safety and longevity of buildings. Numerous necessities in this statute are for the subjects interconnected to fire services. Section 17 (e) allows the Minister to establish principles to be acknowledged as nationwide construction protocols to offer for the necessities with which structures shall conform in so far as counteractive processes against fire or other crises are concerned containing the resistance of structure against the outburst of fires, safeguarding of the occupiers or users of structures or other fittings to be in a structure for the stopping or inhibition of fires and for the evacuation of such structures in time of fires or other crises.

3.2.11 Municipal fire safety bylaws (RSA, 1996)

The municipality fire safety by laws was established under the provisions of section 156(2) of the Constitution of the Republic of South Africa, 1996. The purpose of this by-law is to establish and maintain a service for the area of jurisdiction of the municipality, to promote the achievement of a fire-safe environment for the benefit of all persons within the area of jurisdiction of the municipality and to provide for procedures, methods and practices to regulate fire safety within the area of jurisdiction of the municipality. This by-law is applicable to all persons within the area of jurisdiction of the municipality and includes both formal and informal sectors of the community and economy. Notwithstanding the provisions in either the Hazardous Substances Act or the Occupational Health and Safety Act, and in addition to any other applicable national or provincial law, this by-law regulates flammable substances in the area of jurisdiction of the municipality so as to prevent and reduce fire hazards or other threatening dangers.

Establishment and maintenance of service area of jurisdiction of the municipality is established as contemplated in section 3(1) of the Act, read with section 156(1)(a) and Part B of Schedule 4 of the Constitution. Under this Act, the municipality must maintain the Service, which includes:

a) appointing a chief fire officer and the necessary members of the Service;
b) ensuring that such officer and members are properly trained; and
c) acquiring and maintaining the necessary vehicles, machinery, equipment, devices and accessories to ensure that the Service is effective and able to fulfil its objects. The objects of the Service are
a) to prevent the outbreak or spread of a fire;
b) to fight and extinguish any fire that endangers any person or property;
c) to protect any person or property against any fire or other danger as contemplated in this by-law;
d) to rescue any person or property from any fire or other danger as contemplated in this by-law; or
e) to perform any other function connected with any of the matters referred to in subsection (a) to (d).

The Service may provide any service related to its objects to any other person. Any service contemplated in subsection (2) may, at the discretion of the chief fire officer, be terminated without notice if the municipality's equipment or members involved in providing that service are required to deal with an emergency situation, fire hazard or other threatening danger.

The provision of this Act on reporting a fire hazard and other threatening danger stipulates that,

1) An owner or the person in charge of premises, upon discovering any evidence of a fire hazard or other threatening danger as contemplated in this by-law, must immediately notify the Service.
2) An owner or the person in charge of premises must provide all details pertaining to the incident as contemplated in subsection (1), to the Service as requested.
3) Any person who contravenes subsections (1) and (2) commits an offence.

Administration and enforcement of the Act states that

1) The chief fire officer is responsible for the administration and enforcement of this by-law.
2) Where no chief fire officer has been appointed, or where no acting chief fire officer has been appointed by the municipal manager as contemplated in

section 9(3), the municipal manager is responsible for the administration and enforcement of this by-law.

3.2.12 Integrated Development Plan

Integrated Development Planning is a participatory process aimed at developing a five-year strategic plan that guides all planning, budgeting, management and decision-making in the Municipality; it involves the entire municipality and its citizens finding the best solutions to achieve sustainable long term development; it views development problems and solutions in an integrated, multi-dimensional way. The IDP has three segments which are:

- Integrated which is a process of linking and merging components in order to ensure adherence and a holistic response. An integrated process links strategic targets with tactical and operative planning at all levels of the municipality.
- Development is the ability to influence and address problems affecting individuals, a community or society at large. Development can also refer to improving the quality of life.
- Planning is defined as an organised, conscious and continual attempt to select the best available alternatives to achieve a specific goal. It is a process of weighing up or evaluating the alternative ways of achieving the objectives or meeting the goals.

Integrated development planning is a process by which municipality prepares a strategic development plan which extend over a period of five- years. Integrated development planning as an instrument lies at the centre of the new system of developmental local government in South Africa and represents the driving force for making municipalities more strategic, inclusive, responsive, and performance driven in character. The IDP is the principal strategic planning instrument which guides and informs all planning, budgeting, and all development in a municipal area. It aims to co-ordinate the work of local municipalities and other spheres of government in a coherent plan to improve the quality of life for all the people living in an area.

The IDP process and the performance management process must be seamlessly integrated. The IDP fulfils the planning stage of performance management. Performance management in turn, fulfils the implementation monitoring and

evaluation of the IDP. The organisational performance will be evaluated by means of a municipal scorecard at organisational level and through the service delivery budget implementation plan (SDBIP) at directorate and sub-directorate levels. The SDBIP is a plan that converts the IDP and budget into measurable criteria on how, where and when the strategies, objectives and normal business processes of the municipality will be implemented. It also allocates responsibility to directorates to deliver the services in terms of the IDP and budget. The MFMA Circular No.13 prescribes that: The IDP and budget must be aligned; the budget must address the strategic priorities; The SDBIP should indicate what the municipality is going to do during the next 12 months; The SDBIP should form the basis for measuring the performance against goals set during the budget /IDP processes. Risk Management is one of Management's core responsibilities according to section 62 of the Municipal Finance Management Act (MFMA) and is an integral part of the internal processes of a municipality. It is a systematic process to identify, evaluate and address risks on a continuous basis before such risks can impact negatively on the service delivery capacity of the Municipality. When properly executed risk management provides reasonable assurance that the institution will be successful in achieving its goals and objectives. A Risk Assessment is compiled to determine the magnitude of risk exposure by assessing the likelihood of the risk materializing and the impact that it would have on the achievement of objectives. The identified risks are prioritized which enables Management to focus more time, effort and resources on higher risk areas (Municipality, B.C.M. and Shepstone, 2016).

3.3 Chapter summary

These South African laws and legislation are essential as it provides detailed rules, regulations, and code of practice in a particular sphere of government. These laws and legislation have the overall purpose of securing the health, safety, and welfare of workers. They determine the rights and responsibilities of individuals and authorities to whom the legislation applies.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

The research approach is presented in line with the study problem and significance and it includes the research design, population and sampling, data collection tools, data analysis, and data validity and reliability. The decision of the researcher to select the research approach is informed by the philosophical assumptions, research designs, and definite techniques of data gathering, exploration, and elucidation.

4.2 Preliminary literature review

A Literature review was conducted to obtain clarity of the nature of the study and the problem that had been identified. The researcher approached the study by viewing related studies that have been undertaken in high-rise buildings using the funnel approach by starting to review related studies from international, national, provincial, and local cases. Mouton (2001) stated that, when one embarks on a study, the primary aim should be to find out what has been done in the field of study. Mouton (2001) also suggested that, when conducting research, the researcher should start with a review of the existing documents, books, or available body of knowledge to see how others have investigated the research problem in which one is interested. According to Mouton (2001), one wants to learn from other scholars, how they have theorized and conceptualized issues, what they have found empirically, and what instrumentation they have used, and what the effect was. For this study, the researcher solicited the assistance of the fire services cadres, as well as other graduates to help with a search of relevant books and information and also the internet. The researcher reviewed newspapers, statutes, paperwork, and the relevant dissertations on city revitalisation and fire response to assist in attaining facts. The researcher also reviewed the legislation related to the study.

It is noted that workers employed in high-rise buildings are generally impacted by hazardous environments of their operational atmosphere. A guide to Integrated Fire Management (Charlton, 2016) reflected the prominence of bearing in mind the monetary, environmental, and communal jeopardies when forecasting on fire-fighting. The outcome of fire inhibition arrangements and the fire itself can disrupt safety, the ecology, and the long-term sustainability of the livelihoods of people depending on assets and buildings destroyed by fires.

The Occupational Health and Safety Act (OHSA) 1993, South Africa (South Africa, 1993) as amended in 1993 affords health and safety of persons at work. The Act covers protection against hazards to health and safety arising out of the activities of persons at work and provides for matters connected herewith. [The Occupational Safety and Health Administration (OSHA) require employers to implement fire protection and prevention programs in the workplace. The regulations that apply to fire protection and prevention can be found mainly in Subpart F of the construction standards, though the requirement for a fire prevention program is first set out in Subpart C]. National Building Regulations and Building Standards Act 1977, has indicated that the buildings shall be planned, erected, and prepared in such a way that adequate means of access and apparatus for sensing, fighting, monitoring, and drenching of such fire is offered (South Africa, 1977). SANS 10400 T building codes (South Africa, 2011) indicate requirements for fire hydrants for higher building structures. Hydrants are required for structures beyond 12 m in height (South Africa, 2011).

4.3 Research design and methodology

To elaborate more on research design and methodology it is important to define research, differentiate research design and research methodology.

4.3.1 Research

According to Kumar (2011), once a person decides on starting a research study to solve a certain problem, one must bear in mind that the process being applied is being assumed within an outline of a designed idea; practice procedures, methods, and techniques that have been verified for their cogency and consistency; is considered to be impartial and detached. Observance to those factors that should be borne in mind qualifies the process to be named ‘research’.

Kumar (2011) indicated that:

“Research involves systematic, controlled, valid and rigorous exploration and description of what is not known and establishment of associations and causation that permit the accurate prediction of outcomes under a given set of conditions. Basically, research is the process of discovering new knowledge; this knowledge can either be

the development of new concept or the advancement of existing knowledge and theories, leading to a new understanding that was not previously known."

This research adopted Saunders et al., 2016's research onion process as its building block and is discussed in 4.3.

4.3.2 Research design

McMillan & Schumacher (2001) noted that; a good research design delivers outcomes that are presumed sincere. Neuman (2011) stated that a research design aims to deliver a method with concrete value in order to reply to queries about social challenges. A research design concentrates on the outcomes and all the steps in the route to attaining that outcome. According to the definitions given in Chapter 1, the researcher viewed research design as the efficient plan in which certain research methods and procedures are interconnected to attain a consistent and effective body of data for practically grounded analyses, conclusions, and concept preparation. In the current study, the research was conducted by means of empirical research, data amassed through the use of a questionnaire that comprised closed and open-ended questions. The nature of the research problem, research questions, and related research aim called for a purposeful research design to meet the requirements of these research intentions. For this reason, a mixed methods research design was chosen to conduct this research.

A mixed methods research design was adopted to increase the scope and range of the research, in order to address the research problem and the related research questions. The station commanders were first called to ask permission for gathering data from their employees, inclusive of them, and the purpose of the study was explained. Due to technical challenges, the researcher distributed the questionnaire face to face and observed the COVID-19 protocol regulations. The questionnaires were then analysed using Microsoft Excel for analysing the data. The research design ensured that the evidence obtained enabled understanding the possible effects of the revitalisation of the Bisho CBD on fire response. The research design used in this study was quantitative in nature which is in line with a positivist research paradigm. However, a qualitative dimension was also included to enable the researcher to probe the viewpoints and understanding of the participants.

4.3.3 Research methodology

Rajasekar et al., (2013) defined research methodology as the measures whereby the researchers go about their work of defining, elucidating, and forecasting phenomena. MeInikovas (2018) defined research methodology as a general idea that outlines the way the research should be assumed. It is a fundamental part of a dissertation that assists in confirming the uniformity between chosen tools, systems, and underlying viewpoints. According to MeInikovas (2018), research methodology has its initial point with outlining the core viewpoint, selecting approaches, means, and tactics as well as defining time horizons, which completely take the research rationality to research design and focal methods and processes of data gathering scrutiny. Research methodology in this study refers to the approach adopted to follow in gathering and analysing data. In this dissertation, an investigative mixed method was used in order to assess the possible effects of revitalisation of Bisho CBD on fire response.

4.4 The research process

According to Saunders et al., (2016), the research process can be represented as an onion, therefore Saunders's research process onion was analysed and adopted for this study. This research adopted Saunders et al. (2016)'s research onion process as its building block. The research process onion depicted in Figure 4.1 has six layers that provide the summary of the essential issues that need to be considered and reviewed before conducting any research. These layers of the onion serve as a starting point of considering the following in this order: the philosophical orientation of the researcher; the research approach adopted; appropriate research strategies; the choices adopted; the research timelines that are under evaluation; and the data collection systems employed by the researcher.

4.5 Research approaches

4.5.1 Quantitative research approach

Cant et al., (2005) reflected that this method engages scientific exploration for the extent of variables and is achievable through the use of closed ended questionnaires. Burns & Grove (2005) indicated that this method is utilized for various purposes such as for describing elements, examining correlations between elements, and determining cause-and-effect collaborations between elements.

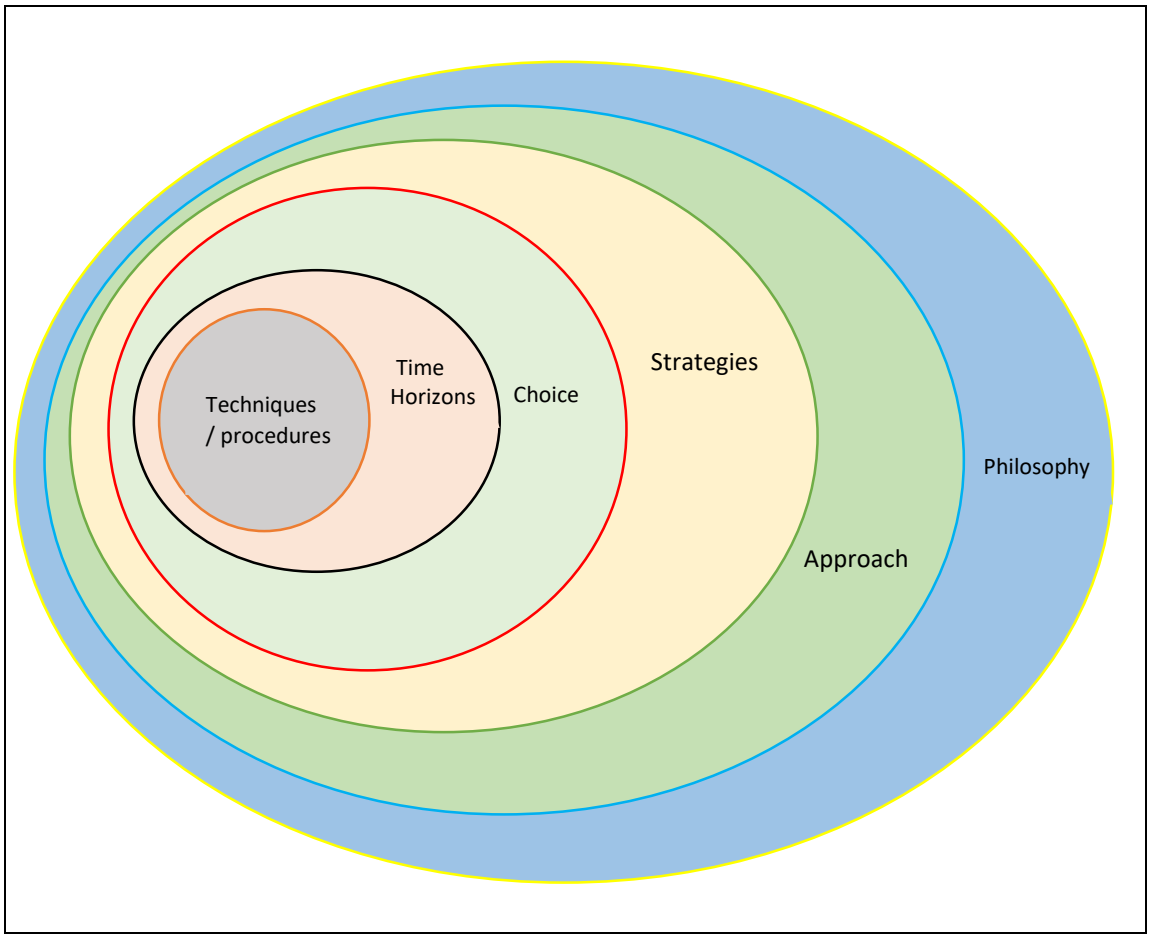


Figure 4.1 Modified research process onion. (Source: Saunders et al., 2016).

According to Johnson & Christensen (2014), quantitative research relies on the collection of quantitative (i.e. numerical) data primarily follows the confirmatory scientific method because its focus is on hypothesis testing and theory testing. A quantitative research approach has been used in order to attain demographic information.

4.5.2 Qualitative research approach

Johnson & Christensen (2014) indicated that there is an option of mixed research that should always be considered when evaluating mixed research. Conferring to this principle, researchers should considerately and tactically combine qualitative and quantitative methods, tactics, measures, notions, and other paradigm features in a way that produces an inclusive design with numerous and complementary benefits and non-overlapping disadvantages. Mixed research offers an outline for conducting a study that integrates quantitative and qualitative research approaches. Normally, in

each mixed research study, a combination of quantitative and qualitative data is composed, scrutinised, confirmed, and interpreted using methodical principles.

According to Maree, (2007) a qualitative method enables the researcher to acquire an in-depth understanding of respondent experience and views. Johnson & Christensen (2014) noted that, qualitative research depends on the gathering of qualitative data that follows the investigative scientific method.

4.5.3 Mixed method approach

Creswell & Plano Clark (2011) indicated that mixed-methods research combines techniques, a viewpoint, and a research strategy orientation, which finally appears to highlight the significant mechanisms that go into designing and conducting a mixed-methods study. This study adopted a mixed-methods research approach.

According to Johnson & Christensen (2014) researchers advocating mixed research state that it is important to use both the exploratory and confirmatory methods, in one research. In this dissertation, to resolve the identified problem, accomplish the research objectives, and reply to the research questions, the researcher put the research questions at the core of the study. To conduct the mixed research approach, the researcher followed the steps shown in Figure 4.2 reflected by Johnson & Christensen (2014).

4.6 Research philosophy

It is defined (Creswell, 2007) as credence about the mode in which data of the impression should be congregated, scrutinised, and used. According to Henning et al., (2004) research has two philosophies that have been recognised in the Western tradition of science. These philosophies are called positivism and interpretivism.

- **Positivism:**

Khazanchi & Munkvold (2002) stated that positivism is where data have to be perceived. Positivism maintains that it is possible and essential for the researcher to adopt a hostile, unbiased, and non-interactive location (Morris, 2006). According to this philosophy, researchers are attentive to assemble data from an enormous community sample instead of focusing on the details of the research

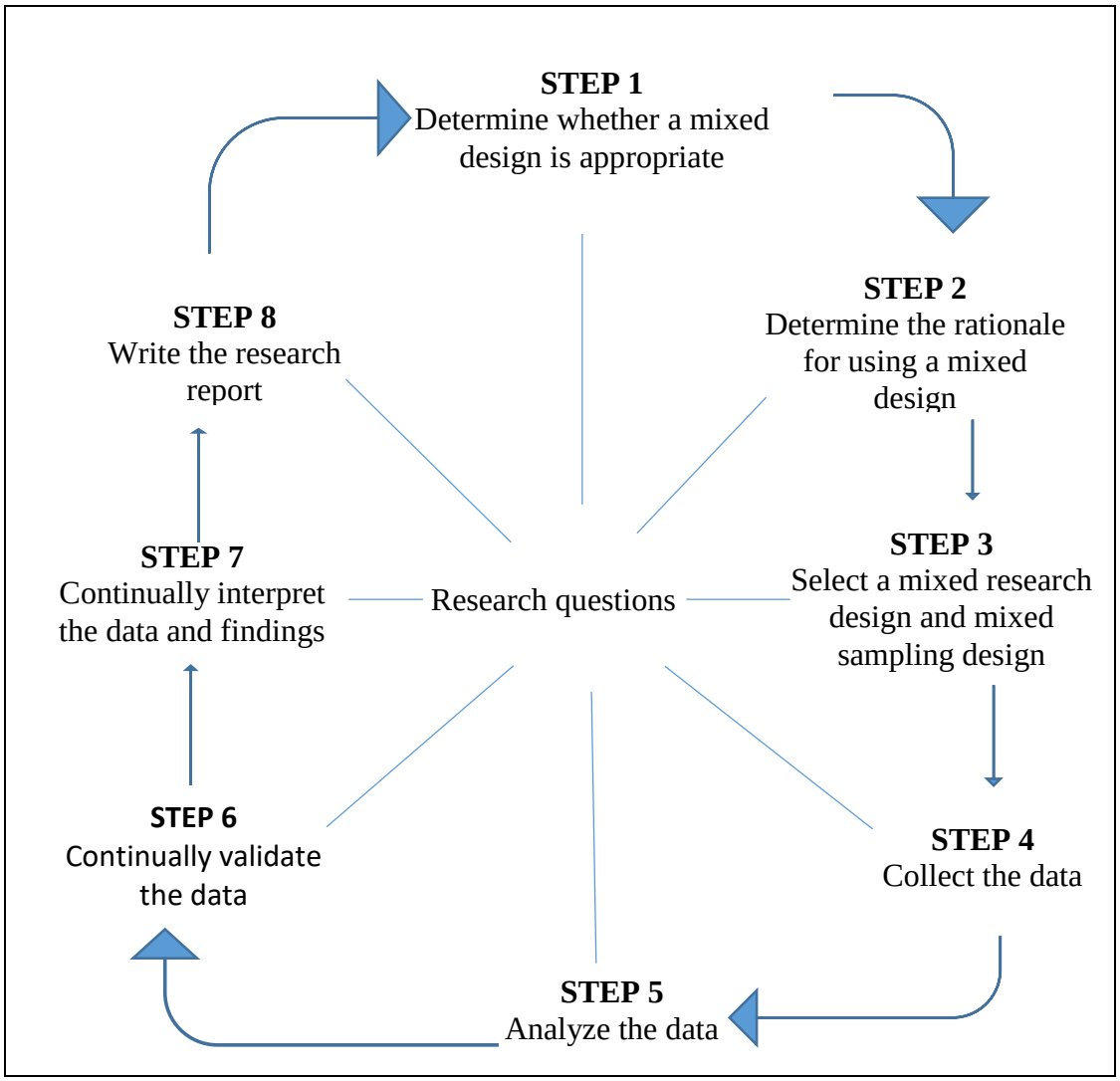


Figure 4.2 Steps to conduct mixed research study. (Source: Johnson & Christensen, 2014).

This philosophy is related to quantitative data gathering procedures and arithmetical scrutiny. According to Neuman (2007), positivism perceives social science as a prearranged technique for combining deductive logic with detailed practical observations of individual behaviour in order to discover and approve a set of probabilistic changing laws that can be used to forecast general arrangements of human movement. Positivists consider that knowledge can be disclosed or perceived through the practice of a scientific method. This study followed a positivist paradigm since the researcher was concentrating on preserving a non-collaborative position while looking for new knowledge in order to recommend reasons for the end-products of the research.

- **Interpretivism:**

Khazanchi & Munkvold (2002) indicated that interpretivism concentrates on people rather than fixed physical items. In this philosophy, the assessor should attempt to apprehend the sphere from the viewpoint of the populace being researched. According to Babbie & Mouton (2001), interpretivism preserves that all people are included in the system of concluding the universal connotation while, unceasingly construing, describing, verifying, and justifying their regular activities.

The interpretive researcher focuses on the understanding of the study as it develops during the study and thus starts with an area of study and what is pertinent to that area for a complete understanding thereof. Researchers in this philosophy typically believe in various sentiments from participants rather than in sole authenticity (Creswell, 2009). Based on the advantage of attaining various sentiments from the participants, the researcher of this dissertation decided to involve a small qualitative aspect in an interpretivist philosophy. In this way, the plan was to reinforce the data amassing and scrutiny process. Furthermore, observing this philosophy would allow for the finding of information that would have been challenging to acquire with the application of the positivist philosophy only. In this research, the positivism and interpretivism philosophy methods were utilised due to the fact that the structure of the research combines both.

4.7 Population and sampling

4.7.1 Population

Babbie (2010) defined population as the hypothetically quantified accumulation of study elements. Struwig & Stead (2013) state that a population is the combined total of all the components on which the research is focused. For the current research, the researcher chose topic-specific experts in the field of study as participants.

4.7.2 Selection and sampling

Bless & Higson-Smith (1995) also described a sample as a division of the whole populace which is truly explored by a researcher and whose features will be indiscriminate to the cohesive populace. A sample is the collection of persons selected from all potential respondents in a populace in which the investigation is being undertaken (Tuckman, 1994). Sampling refers to the process of selecting a sample as

a small portion or subset from a defined population — with the intention of representing the particular population (Hoy, 2010). After choosing the population for the study, the researcher has to choose between two sampling techniques, which are non-probability sampling and probability sampling. Those two techniques were discussed in Chapter 1 (Section 1.9.3). A non-probability sampling procedure (Cozby, 2009) was used for the selection of knowledgeable and experienced participants. For this reason, a purposive sample was used to select the participants and the selection was based on their involvement in fire-fighting and issuing of occupancy certificates.

The researcher identified contact persons in the fire stations in Buffalo City Metropolitan Municipality, who were phoned to make appointments to discuss the study. Due to fact that Bisho, East London, and King William's Town have telephone technical challenges, the researcher met respondents face to face and discussed the study. One hundred and twenty questionnaires were distributed in Buffalo City Metropolitan Municipality. The researcher collected 84 questionnaires of the 120 anticipated questionnaires from the Buffalo City Municipality fire stations. This is because some potential respondents were not found due to reasons of leave, refusal of others to participate, non-returning of distributed questionnaires, and other commitments during the period of data collection.

4.8 Data collection procedure

One of the crucial tasks of research is the collection of data required for research because data collection is an important phase and it empowers the researcher to complete the research objectives (Kabir, 2016). The researcher of this dissertation chose questionnaires as the method of crucial data collection. In the questionnaire, the title of the study was indicated with the intention of making participants aware of the aim of the study. Questionnaires had clear and short instructions on how participants should complete them. To put the respondent at ease, the questionnaire started with biographical details and then moved on to the topics relevant to the study.

4.8.1 Documents

Documents are a secondary source of data. Secondary data refers to existing information, also called data which has been taken from previous researchers, in other

words, it is a set of data gathered in the past for purposes other than those of the current research that is readily available to researchers (Struwig & Stead, 2013). For this dissertation information was taken from textbooks, journals, newspapers, and government documents. Furthermore, additional information was sourced from Google and Google scholar for the diversity of information.

4.8.2 Questionnaires

Babbie (2014) defined a questionnaire as a document covering interrogations planned to implore data suitable for analysis. A questionnaire is the source of primary data. Primary data is the collection of new data for the research being conducted (Struwig & Stead, 2013).

4.9 Data analysis

Data analysis is known as the act of bringing order to analysing, summarising, and interpreting information to achieve the research objectives (Johnson & Christensen, 2012). The Microsoft Excel (MS Excel 2013) software was used to analyse the data. All 84 completed questionnaires were recorded and analysed. MS Excel was only used to capture quantitative data that came from closed-ended questions on the questionnaire. Furthermore, the qualitative data were presented through perceptive answers from participants answering both open-ended and closed-ended questions on the questionnaire.

4.10 Chapter summary

The chapter explored the philosophical assumptions, to indicate the association among the chosen techniques. The deliberation of these different techniques intended to afford support to the aims of utilizing two methods simultaneously. Population and sampling manner were also deliberated in the exploration. A selected population was fire management officials. This chapter involved a research design to display the system of accumulating and capturing the facts to make an inclusive examination of the facts possible.

CHAPTER FIVE: DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

5.1 Introduction

This chapter provides data analysis and practical findings of the study. The results presented here are used as the base for the conclusions and recommendations for the whole dissertation. The intention of data analysis is to interpret and give valuable information and reliable evidence concerning the paradigms and aspects under study. Walliman, (2005) indicated that data analysis must be carried out in relation to the research problem, relevant to the aims of the study. A combination of narrative description and visual summaries is employed to present research outcomes and judgments. The presentation of data starts with the demographic data, followed by the perception of the participants concerning the impact of emergency response in Bisho CBD revitalisation and lastly with mitigation measures for disaster risks of the high-rise building in Bisho. Quantitative analysis of section one enables the researcher to describe the participant's demographics and to assess the frequency of certain categories in the quantitative data. Such data is presented graphically to show the trends in bar graphs, pie charts, figures, and tables. Qualitative results are presented in a word-based format. The ethical responsibility in data analysis, interpretation, and reporting was considered by not overlooking the data where the participants left it blank. These were included and calculated in the analysis, interpretation, and report of research findings. Findings from both qualitative and quantitative data were presented and analysed. The meaning of the raw data was made through themes and sub-themes which were supported by tables and direct quotations from respondents. The outcomes were presented and aligned with the study's objectives. Data analysis revealed an important insight on the impact of the Bisho CBD revitalisation process on emergency response systems.

Findings were analysed using MS Excel 2013 and presented systematically to address the objectives of this study. The overall aim of this study was to assess the possible effects of the revitalisation of Bisho CBD on fire response. A questionnaire comprised three sections with a total of 28 questions that were developed to ensure the impartiality of data. Table 5.1 shows the Questionnaire response rate.

Table 5.1 Questionnaire response rate

	Circulated	Returned	Not returned	Scrutinised
Quantity	120	84	36	84
Percentage	100%	70%	30%	70%
Response rate	70%			

5.2 Section 1

This section covers the demographic information of study respondents and participants.

5.2.1 Gender

The distribution of the gender is shown in Figure 5.1.

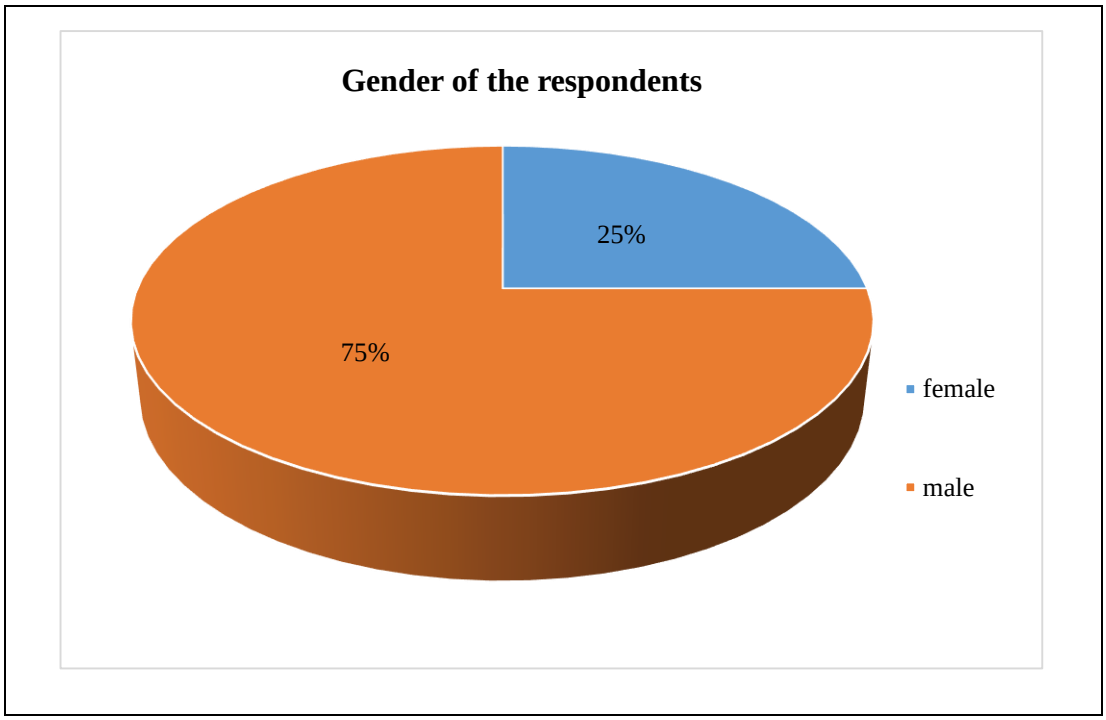


Figure 5.1 Gender of the respondents who answered the questionnaire distributed to BCMM fire station officials in KWT, EL and Mdantsane.

The findings show that the majority of participants were male numbering 63, which represent 75% of the total respondents whose questionnaires were returned, while 21 which represent 25% of the total respondents were female participants. This shows that more males are employed at BCMM fire stations than females. The next section analyses the age group of the respondents.

5.2.2 Age

Figure 5.2 portrays the age distribution of the respondents.

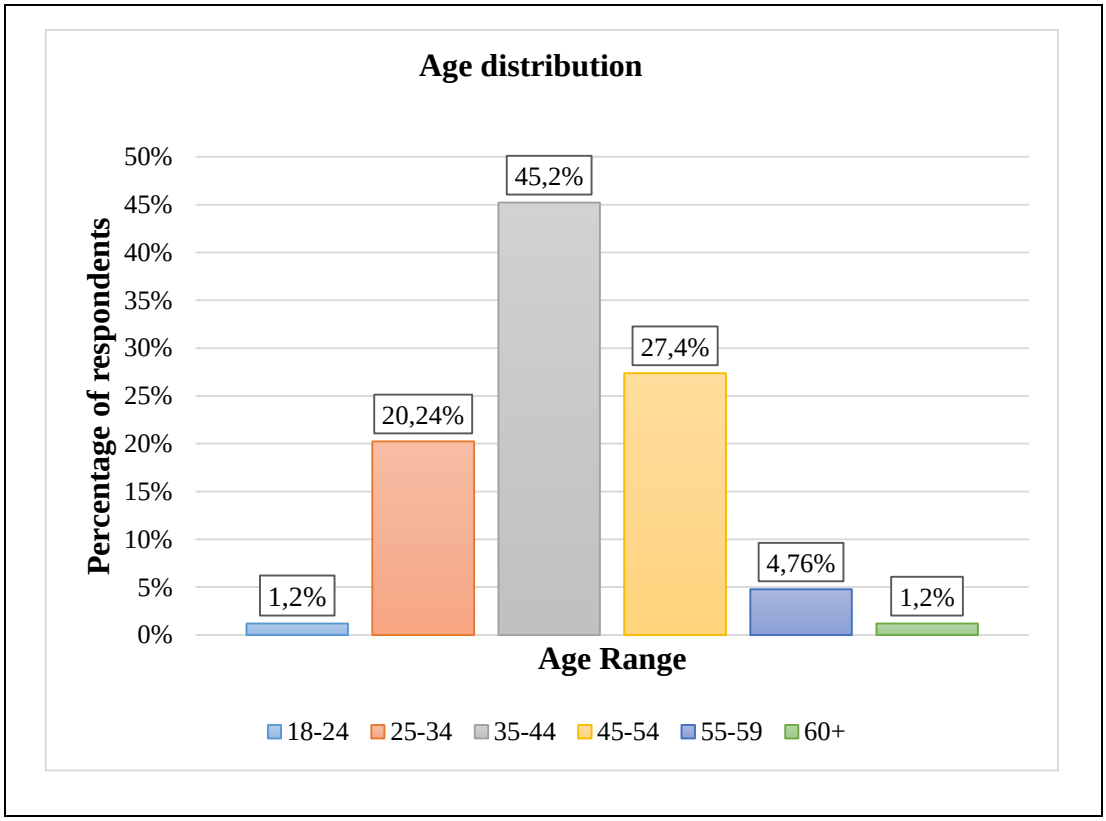


Figure 5.2 Age of the respondents who answered the questionnaire distributed to BCMM fire station officials in KWT, EL and Mdantsane.

The results proved that many participants were within the age group of 35 – 44 years with 38 participants which represent 45.2% of the total respondents, followed by an age group between 45 and 54 years with 23 participants which represent 27.4%; then the 25 – 34 age group with 17 participants which represents 20.24% of the total respondents; 4 participants which represent 4.76% of the total respondents were in the age group of 55 to 59 years old. Respondents in the age group between 18 and 24 and 60 years and above were few, registering 1.2% respectively. It is noteworthy that, many participants were middle-aged members of the society, which is typically the experienced and productive fragment of the society.

5.2.3 Marital Status

Figure 5.3 depicts the marital status of respondents. This was relevant to this study for the researcher wanted to gain information on the work force preference for fire-fighting according to gender. Those who were single numbered 45 which represent

53.6% of the total respondents, followed by 36 married respondents representing 42.9% of the total respondents.

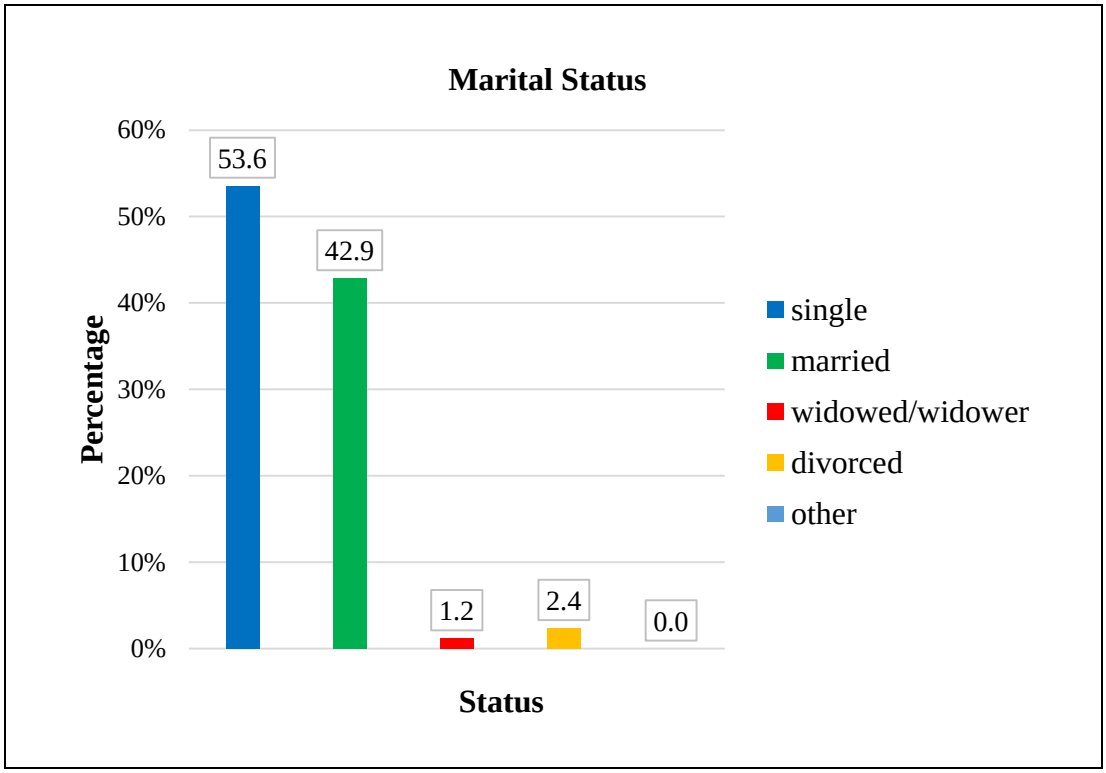


Figure 5.3 Marital status of the respondents who answered the questionnaire distributed to BCMM fire station officials in KWT, EL and Mdantsane.

Only one widowed respondent which represents 1.2% of the total respondents and two divorced representing 2.4% of the total respondents answered the questionnaire. This study established that most participants and respondents were largely single followed by a few married individuals. This, however, mirrored the South African demographic profile where the majority of the citizens are single and therefore not married (Ned et al., 2020). The next section analysed the race of the participants.

5.2.4 Race

The distribution of the race is shown in Figure 5.4. This question was relevant to this study so as to establish the composition of the fire- fighting workforce. The results as indicated in Figure 5.4 show the race of the respondents who answered the questionnaire distributed to BCMM fire station officials in KWT, EL, and Mdantsane. Findings revealed a disparity ratio between black and other races. A majority of 71 respondents, which represents 84.5% of the total sample, indicated that they were African; seven respondents which represent 8.3% of the total were whites; five respondents which represent 6.0% of the total population were coloured and one

respondent which represents 1.2% of the total sample was other. The researcher noted that, these results reflect the demographics of the area under study which is dominantly African.

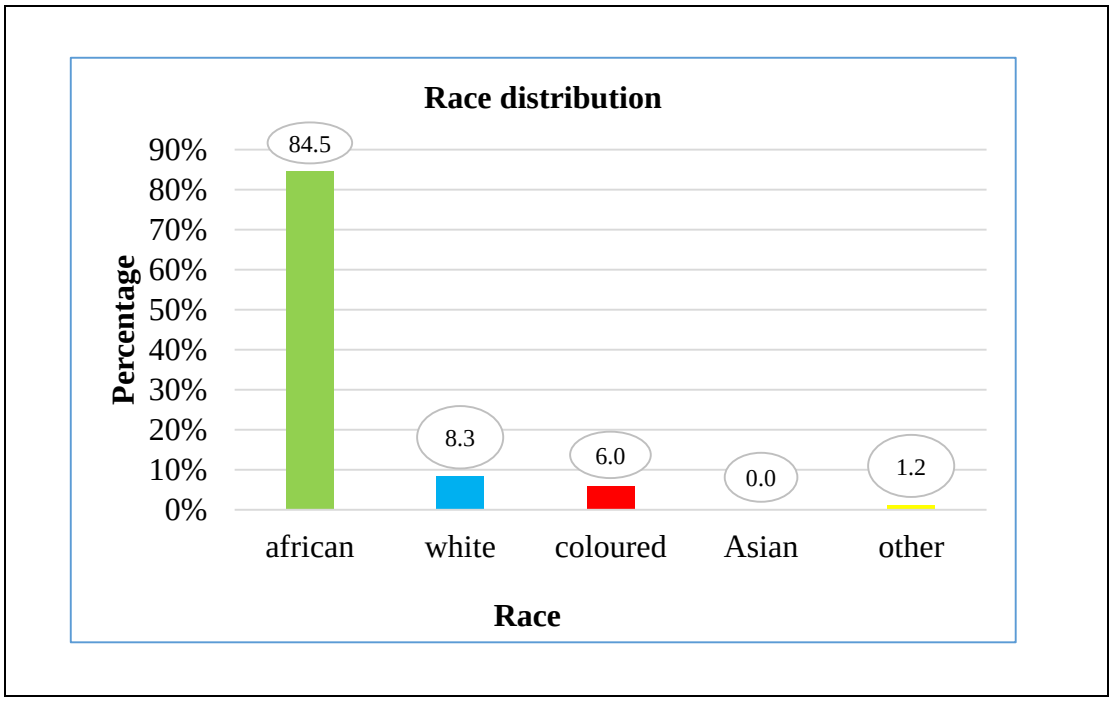


Figure 5.4 Race of the respondents who answered the questionnaire distributed to BCMM fire station officials in KWT, EL and Mdantsane.

5.2.5 Level of education

The level of education is illustrated in Figure 5.5.

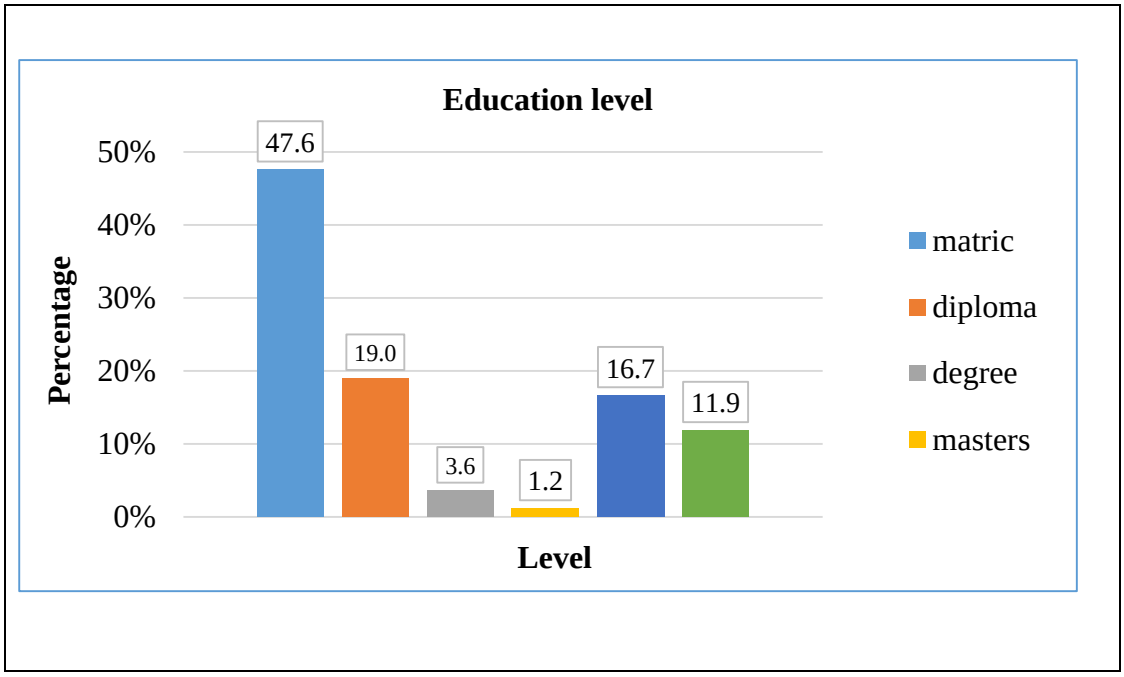


Figure 5.5 Education levels of the respondents who answered the questionnaire distributed to BCMM fire station officials KWT, EL and Mdantsane.

The study indicated that for the level of education 40 respondents representing 47.6% of the total sample had matric and 16 respondents representing 19% of the total sample under study had a Diploma. Only 14 participants representing 16.7% of respondents indicated other as their level of education, while 10 respondents which represent 11.9% of the total participants did not indicate their level of education. Only 3 which represent 3.6% of the total participants had a degree and one which represents 1.2% of the total population had Masters. The researcher noted that the nature of disaster management tasks requires a certain level of education as it involves making prompt and calculated decisions.

5.2.6 Occupation position

The Occupation position of respondents is illustrated in Table 5.2.

Table 5.2 Occupation positions of respondents who answered the questionnaire distributed to BCMM fire station officials in KWT, EL and Mdantsane

Occupation position	f	%
Chief Fire Officer	1	1.2
Deputy Chief Fire Officer	1	1.2
Divisional Commander	1	1.2
Station Commander	2	2.4
Platoon Commander	10	11.9
Senior Fire-Fighter	50	59.5
Fire-Fighter	9	10.7
Junior Fire-Fighter	4	4.8
Trainee	0	0.0
Other	0	0.0
Missing data	6	7.1
Total	**84**	**100**

As depicted in Table 5.2, Senior Fire-Fighters numbered 50 which represent 59.5% of the total respondents. Ten which represents 11.9% of the total respondents were Platoon Commanders; nine which represents 10.7% of the total respondents were Fire-Fighters; four which represents 4.8% of the total sample were Junior Fire-Fighters; two representing 2.4% of the total respondents were Station Commanders and one representing 1.2% of the total sample under study was Chief Fire Officer; Deputy Chief Fire Officer and Divisional Commander, respectively. Six participants representing 7.1% of the total sample did not indicate their occupation position. The frequency of the respondents illustrated that most responses were obtained from the

Senior Fire-Fighters. It is noteworthy that, the demographic data on occupational rank established that respondents occupied diverse positions with different knowledge packages and that emergency response embraces different levels of expertise. The next section analysed the work experience of the participants.

5.2.7 Work experience

The work experience distribution is illustrated in Figure 5.6.

Figure 5.6 indicates that 31 participants which represent 36.9% had 10 - 19 years of working experience, while 18 participants representing 21.4% of the total sample.

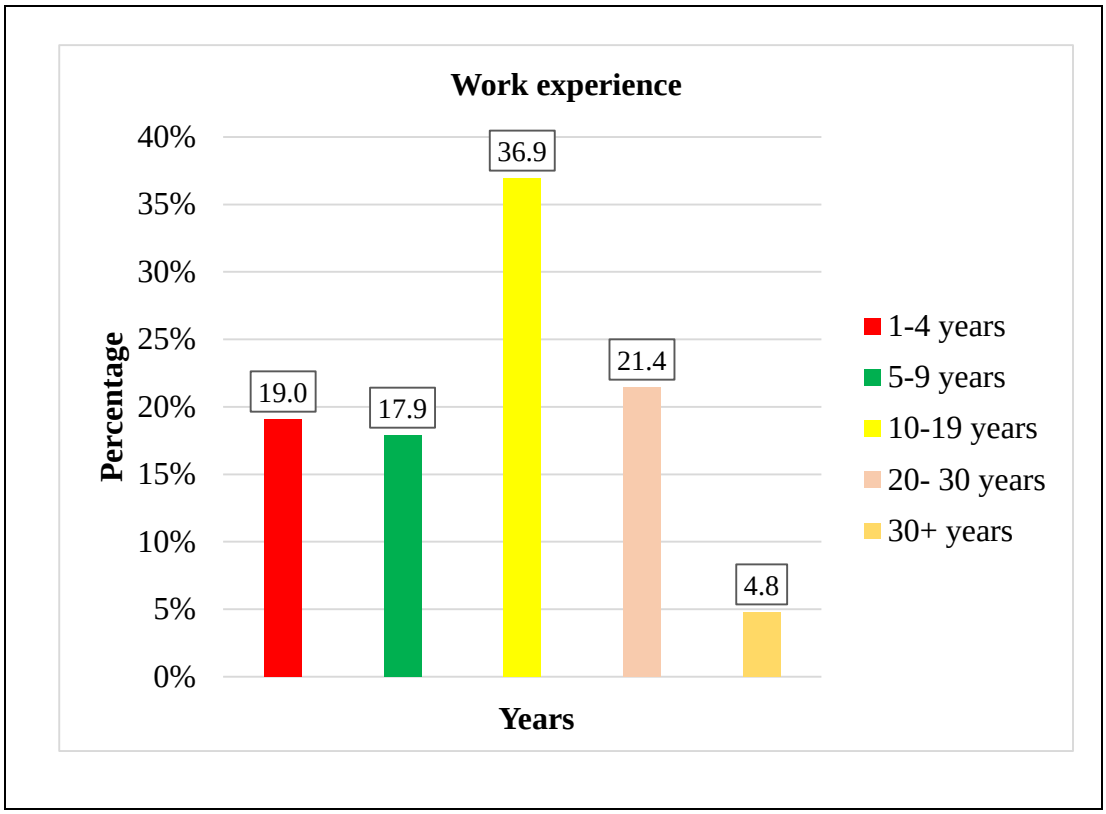


Figure 5.6 Work experiences of the respondents who answered the questionnaire distributed to BCMM fire station officials in KWT, EL and Mdantsane.

under study had 20 - 30 years of work experience in the fire services; 16 participants representing 19.0% had 1 - 4 years of work experience; 15 representing 17.9% of the participants had 5 - 9 years of work experience and four which represents 4.8% of the respondents had 30 years or more working experience in the fire services. The work experience of the respondents implies that they have knowledge of fire response, e.g. 63% of respondents had 10 or more years of work experience.

5.3 Section 2

This part presents combined results from the qualitative and quantitative sections of the questionnaire. Narratives from participants are included to support and validate statistics from views of respondents whose responses were on the quantitative sections of the questionnaire. Qualitative methods are generally related to the evaluation of social dimensions, normally present thorough outcomes for the study, and offer ideas and concepts to add to the research. This method can tell how people feel and think, but it cannot always express the number of responses as in the quantitative method (MacDonald and Headlam, 2014). This section presents the narrative analysis of the responses given by 84 participants.

5.3.1 Impact of Bisho CBD revitalisation on emergency response services

Results on the impacts of Bisho CBD revitalisation on emergency response services show that the revitalisation process had myriad effects in the area, but for the emergency response teams, the revitalisation process resulted in new challenges. Respondents were asked to share their views on whether the Bisho CBD revitalisation affects the response time to emergencies.

Table 5.3 Participant responses on the impact of CBD revitalisation to emergency response service

Variable	Values	f	%
Does the Bisho CBD revitalisation affect the emergency response services?	Yes	71	84.5
	No	13	15.5

Table 5.3 shows that the majority (84.5%) of respondents agreed that Bisho CBD revitalisation affected the time of responding to emergencies. This marked by the number of respondents who selected yes in response to the question above, while 15.5% disagreed.

The following qualitative responses were given by respondents in Section 2 of the questionnaire.

5.3.2 Poor accessibility to buildings

Findings indicated that the new revitalisation of Bisho CBD has caused challenges to emergency response service as some buildings have become inaccessible due to road adjustments which make the movement of vehicles difficult. Respondents were requested to share their views on how the new revitalisation affects emergency response and below are some views by respondents:

> **Respondent 1***: "There is no parking space for the emergency vehicle. Insufficiency of parking space for other vehicle resulting in random parking by some vehicle owners, cars are often parked anywhere."*
>
> **Respondent 2:** *"It minimized the space for us when we responding."*
>
> **Respondent 3:** *"It has very small roads for our fire response machines and most streets are one way, which cannot accommodate two machines to the same direction."*
>
> **Respondent 4:** *"The streets have been narrowed and making it difficult to operate our vehicles."*
>
> **Respondent 5:** *"Cars that parked parallel to each other have a negative effect and narrow streets in front of Dukumbana building can complicate our response ability."*

Clearly, the findings point to the challenges associated with accessing some buildings around Bisho CBD. The construction of pavements among other developments did not make provision for emergency response teams to manoeuvre. The study revealed that respondents were not satisfied with the location and placement of fire hydrants; hydrants are too far from the high-rise building. Their dissatisfaction is in line with the arguments of Pakistan Observer, The News & Dawn (2011) who noted that skyscrapers built with no safety precautions as per building by-laws affect the response of fire-fighters and make their task infinitely riskier.

It was however evident that, at the actual fire-fighting sites, the fire brigade is equipped with fire-fighting pumpers and tankers, and fire hydrants are secondary facilities for the supply of fire-fighting water.

This is in line with the arguments of Furness & Muckett (2007) who noted that fire hydrants are critical to ensure a sufficient supply of water. Fire hydrants that are well-

placed enable quick positioning of fire apparatus and efficiency of hydrants (USA, 2015). Results of the study showed that there were no dedicated fire lanes in the streets of Bisho CBD. According to Furness & Muckett (2007), non-dedication of fire lanes can minimize required space around fire hydrants and lessen room for emergency vehicles. Results revealed that the turning radius is not appropriate; the inappropriateness of the turning radius complicates the proper movement of fire trucks around other emergency response apparatus at the fire scene.

5.3.3 Time consuming road network

Findings reveal that the revitalisation of Bisho CBD increased the likelihood of delays during emergency situations. The effectiveness of every emergency response team is hinged on the amount of time taken to respond to an emergency. This is supported by the direct quotes from study respondents:

> **Respondent 6:** *"Art pillars/ concrete balls stopping us from reaching our destination. We take a lot of time to respond because the concrete balls placed in the pavement obstruct us to move quickly, hydrants are few and the one that are available are far from the buildings."*
>
> **Respondent 7:** *"Bisho CBD revitalisation affect our response time due to the narrow streets and concrete balls placed in front of the buildings."*
>
> ***Respondent 8:*** *"The concrete balls that are placed on the pavement make it difficult for fire engine to access the building so it takes time to look for a better place to park."*
>
> **Respondent 9:** *"It does not allow easy access and movement between the buildings."*

In order to prevent huge losses during emergency situations, the response systems should be efficient. Responses should take place within the shortest possible time. Though the revitalisation process was necessary, important aspects such as emergency response to disasters seem to have been overlooked.

Findings reveal that the revitalisation of Bisho CBD increased the likelihood of delays during emergency situations. However, the effectiveness of every emergency response team is hinged on the amount of time taken to respond to an emergency. Findings reveal that the reduction of road lanes limits the simultaneous use of two response

vehicles. In addition, the findings pointed out the challenge of parking spaces which forces other drivers to park anywhere, and this haphazard parking can delay response time significantly. Random parking often causes challenges for emergency vehicles by reducing the space required by emergency responders. This agrees with Snyder et al., (2013) who confirm that responders require physical space in order to deploy their apparatus at the scene, space which may be inhibited by street design. Thus, emergency responders often oppose narrower, slower streets, as they perceive that these street designs will delay response times and hinder their ability to respond at the scene. The goal of an emergency service provider is to reach an incident site safely and as quickly as possible to provide the required assistance and lessen the harmful impact of the incident. When responding to a life-threatening emergency such as a rapidly spreading fire, small delays resulting in an increase of response time can result in increased injury severity or loss of life. Delayed response time can also result in greater property damage. Open spaces are required at building entrance locations to provide clearance for emergency service provider staging and operations.

5.4 Section 3 Respondents' level of agreement

5.4.1 Effectiveness of Bisho CBD revitalisation in mitigating fire disaster risks

The findings point out the need for responsible authorities to devise ways in which to mitigate fire disaster risks especially for the high-rise building in Bisho CBD.

Table 5.4 Effectiveness of Bisho CBD revitalisation

Variable	Values	f	%
Does the revitalisation cater for fire hydrants?	Yes	42	50
	No	42	50

The findings indicated that there was no definite answer as to whether the revitalisation of Bisho CBD did or did not consider key issues in fire disaster management such as fire hydrants. Feedback from the respondents indicated that 42 which represent 50% of respondents said "No"; the revitalisation of Bisho CBD does not cater for fire hydrants, while the other 42 representing 50% of the total respondents said "Yes" they were certain that fire hydrants were catered for in the revitalisation process. This reflects that in this question the feeling of the respondents was equal and so this implies that the opinions of the respondents fell into two clear categories. Statements depicted

in Table 5.5, Table 5.6, and Table 5.7 were included in the questionnaire to evaluate the level of agreement of the respondents. The responses for strongly disagreed and disagreed will be reported together using the word “disagreed” and also for agreed, moderately agreed, and strongly agreed using the term “agreed”. Those that were left blank will be reported using the word “not sure”. As depicted in Table 5.5 many respondents pointed out that they were not satisfied with the new revitalisation of Bisho CBD, particularly concerning the emergency response mechanism. The new road network in the Bisho CBD poses serious impediments to disaster response teams as the roads have become narrow, and they limit the free movement of disaster management vehicles. Table 5.5 indicates that 74 which represent 88% of the total respondents disagreed with the notion that two emergency vehicles can pass each other on these roads. Five respondents representing 6% of the total population under study do agree with the idea that two emergency vehicles can pass each other on these roads. The other 5 participants representing 6% said they were not sure whether two emergency vehicles can pass each other on the roads under study.

Table 5.5 Efficacy of the Bisho CBD revitalisation

Variable	Values	f	%
Two emergency vehicles can pass each other on these roads?	Disagree	74	88
	Agree	5	6
	Not sure	5	6
Turning radius is appropriate.	Disagree	74	88
	Agree	7	8
	Not sure	3	4
Building has a properly designated Fire Lane.	Disagree	69	82
	Agree	5	6
	Not sure	10	12
Fire hydrant spaces are adequate	Disagree	59	70
	Agree	20	24
	Not sure	5	6

(Agree = 3, Disagree = 2, Not sure = 1). The Likert scale answers were allocated numbers during coding thus, Agree was allocated as 3, Disagree as 2 and Not sure as 1.

It was also evident in this study that 74 participants representing 88% of the total sample under study disagreed with the notion that turning radius on the newly revamped Bisho CBD is appropriate. Seven participants representing 8% of the total

population under study agreed that the turning radius is appropriate. The other 3 respondents which represent 4% were not sure. Results presented in Table 5.5 further indicate that more than half of the respondents which is 69 representing 82% of the total population under study disagreed with the notion that the fire lanes were properly designated. Five participants representing 6% of the total population under study agreed that the fire lane was properly designated. Ten participants representing 12% of the total population under study were not sure about whether the buildings in Bisho CBD have properly designed fire lanes or not. It also indicates that 59 which represent 70% of the total respondents disagreed that the fire hydrant spaces were adequate whereas twenty participants representing 24% of the total respondents agreed that the fire hydrant spaces were adequate. Five participants representing 6% of the total respondents did not indicate their level of agreement.

5.4.2 Inefficient provision of fire services

The findings reveal that access to buildings to enable efficient fire suppression and rescue operation is inadequate. Table 5.6 indicates that more than half of the respondents which is 54 which represents 64% of the total respondents disagreed that the provision of fire services with access to buildings to enable efficient fire suppression and rescue operation is sufficient. Thirty participants representing 36% of the total population under study agreed that the provision of fire services with access to buildings to enable efficient fire suppression and rescue operation is sufficient.

Table 5.6 Inadequate provision of fire services.

Variable	Values	f	%
Provision of the fire services with access to buildings to enable efficient fire suppression and rescue operation is sufficient	Disagree	54	64
	Agree	30	36

Agree=2, Disagree =1. The Likert scale answers were allocated numbers during coding thus, Agree was allocated as 2, Disagree as 1

Table 5.7 indicates that 56 which represent 67% of the total respondents disagreed that the available fire engines have the ability to operate effectively within narrow access roads to reach the high-rise building. Twenty-eight participants, representing 33% of the total respondents agreed that the available fire engines have the ability to operate effectively within narrow access roads to reach the high-rise building.

Table 5.7 Ability of available fire engines to operate effectively

Variable	Values	f	%
Available fire engines have an ability to operate effectively within narrow access roads to reach high-rise building.	Disagree	56	67
	Agree	28	33

Agree =2, Disagree =1. The Likert scale answers were allocated numbers during coding thus, Agree was allocated as 2, Disagree as 1

The questions in Table 5.8 permitted the respondents to choose between Yes or No, to which all respondents chose yes for the first two questions. However, on the third question, 62 which represent 74% of the total population under study stated the non-compliance of Bisho CBD revitalisation with BCMM fire safety by-laws, while 22 representing 26% of the total respondents thought the Bisho CBD revitalisation complies with BCMM fire safety by-laws.

Table 5.8 Bisho CBD revitalisation

Variable	Values	f	%
Does your municipality have a fire safety unit?	Yes	84	100
	No	0	0
Does your municipality have fire safety by-laws?	Yes	84	100
	No	0	0
Do you think the Bisho CBD revitalisation complies with your fire safety by-laws?	Yes	22	26
	No	62	74

No=1, Yes = 2. The Likert scale answers were allocated numbers during coding thus, No was allocated as 1, Yes as 2

The findings, therefore, revealed that BCMM has a fire safety unit as well as fire safety by-laws. The researcher found that in terms of non-compliance of Bisho CBD revitalisation to municipal fire safety by-laws, there were no measures in place to make that revitalisation compliant. This shows non- adherence to the Occupational Health and Safety Act 1993 (South Africa, 1993). The Act affords health and safety of persons at work; protection against hazards to health and safety arising out of the activities of persons at work and provides for matters connected to health. The BCMM has the laws in place, but they have not been applied.

5.4.3 Strategies to improve emergency service in Bisho CBD

5.4.3.1 Annual inspection of buildings

Findings reveal that there is a need for coordinated building inspections annually to ensure all materials required during emergencies are replaced and serviced. The majority that is 72 Respondents which represents 85.7% of the total sample indicated that the BCMM buildings were inspected annually, while the other 12 which represent 14.3% indicated it is supposed to be inspected annually, but due to the challenge of staff insufficiency, it is inspected only once every second year.

5.4.3.2 Regular fire drills

The study findings indicated that Bisho or BCMM has a need for regular fire drills to keep the emergency response teams abreast of developments in fire-fighting. The findings showed that 72 respondents which represent most of the respondents indicated that the fire drills were conducted quarterly, while the rest revealed that they are conducted yearly. Findings revealed that drills were conducted, which is a positive practice. However, respondents emphasised the need for intensification of fire drills. This resonates with the Pan American Health Organization, (2011) that indicated that drills are essential for assessing preparedness and response. They are operative methods for training, assessment, and authenticating preparedness and response efforts in a variety of areas. Fire drills also provide emergency responders with an opportunity to develop their skills and knowledge and it also provides a valuable opportunity for the various stakeholders to meet and work together to enhance coordination (Pan American Health Organization, 2011). In addition, Carstens & Minnie (2014) emphasise that peril evaluation improves readiness, and any hindrances will be identified, as well as taking into account the alternatives of reducing risk and their efficiency.

5.4.4 Availability of the fire protection systems in the Bisho CBD

The findings as depicted in Table 5.9 indicate that there are fire protection systems in the Bisho CBD's high-rise buildings within Independence Avenue and Siwane Avenue. Responses showed that the fire extinguishers, smoke detectors, fire marshals, fire detector, and assembly points were available, although there were other respondents, 5 representing 6% of the sample that indicated that they did not know anything about the availability of the fire protection systems in the stated buildings.

When asked about the presence of the Fire Extinguisher, 5 respondents representing 6% of the total population under study indicated that they don't know. Eight respondents which represent 10% indicated that they don't know anything about the availability of a Fire Marshal, while 10 respondents representing 12% of the total respondents indicated that they don't know about the availability of the Fire detector. At the same time, 4 respondents representing 5% of the total population under study indicated that they don't know about the Smoke detector as well as Assembly point, respectively.

The findings indicated that there are fire protection systems in the Bisho CBD's high-rise building. The findings revealed that the availability of a fire protection system such as fire extinguisher, fire detection, smoke detection, fire hydrants, and fire marshal shows that necessary precautions were taken to prevent the spread of a fire, within the high-rise building.

Table 5.9 Knowledge of the availability of the fire protection systems in the Bisho CBD

System	Option	f	%
Fire Extinguisher	Not available	5	6
	Available	72	92
	Don't know	5	6
	Missed data	2	2
	Total	84	100
Smoke detector	Not available	8	9.5
	Available	70	83
	Don't know	4	5
	Missed data	2	2
	Total	84	100
Fire marshal	Not available	0	0
	Available	74	88
	Don't know	8	10
	Missed data	2	2
	Total	84	100
Fire detector	Not available	0	0
	Available	72	86
	Don't know	10	12
	Missed data	2	2
	Total	84	100
Assembly point	Not available	0	0
	Available	78	93
	Don't know	4	5
	Missed data	2	2
	Total	84	100

5.4.5 Limited vehicle movement in Bisho CBD

Findings point out the need for readjustment of some parts of Bisho CBD to ensure swift movement of emergency vehicles. This was supported by the following assertions by study respondents:

Respondent 1*: No measures*

Respondent 2: "*Concrete balls in front of the buildings should be removed then widen the access roads*."

Respondent 3*: "Access to the building can be made more available for emergency services."*

Respondent 4*: "Traffic engineers to take note of the narrow streets, so to accommodate emergency vehicles."*

Respondents 5: *"Remove anything that blocks accessibility to work in the building. Also the fire hydrants are too far apart."*

Respondent 6: *"Take off any distractions at the streets and widening the streets, put fire hydrants closer to one another."*

Respondent 7*: "Fire safety inspections to be carried out annually."*

Respondent 8*: "To remove those big concrete balls in front of Dukumbana building and prohibit parallel parking on the streets and in front of the Dukumbana building."*

Respondent 9: "*Streets must be broadened to make fire engines gain access to respond to the emergencies. Hydrants need to be brought closer for the fire engines to operate effectively."*

Respondent 10*: "More smoke detectors required."*

Respondent 11: *"Fire safety by-laws were not considered, in so much that no space reserved for emergency vehicles, no visible and enough fire hydrants."*

Non-compliance with municipality by-laws is one of the key aspects that were noted by the respondents. This necessitates the need for road planners to revisit and adjust some roads in Bisho CBD, especially where the movement of two vehicles has been restrained.

5.5 Final summary table of results

It is noteworthy that this study had the following objectives: To assess and evaluate possible impacts of the revitalisation of Bisho CBD that resulted in narrowing the access roads in Bisho CBD, Eastern Cape Province; To assess and evaluate possible impacts of the revitalisation of Bisho CBD on fire response; To determine mitigation of fire disaster risks of the high-rise building in Bisho CBD. All these objectives were answered as depicted in Table 5.10 which presents how all the results and how they link the objectives of this study.

Table 5.10 Summary of the results linking with study objectives

Study objectives	Questionnaire results
To assess and evaluate possible impacts of revitalisation of Bisho CBD that resulted in narrowing the access roads in Bisho CBD, Eastern Cape Province.	1. Inefficient provision of fire services. 2. Poor accessibility to buildings.
To assess and evaluate possible impacts of revitalisation of Bisho CBD on fire response.	1. Time consuming poor road network. 2. Limited vehicle movement in Bisho CBD.
To determine actions needed in mitigation of fire disaster risks of the high-rise building in Bisho CBD.	1. Annual inspection of buildings. 2. Regular fire drills such as: i. The transmission of a fire alarm signal. ii. Complete evacuation of the smoke compartment containing the area of simulated fire origin and all occupants (actual or simulated) moved to a safe location (e.g. an adjacent smoke compartment is preferred or another floor if necessary). iii. Accounting for employees and occupants (including visitors) after evacuation has been completed. iv. An ALL CLEAR signal has been given by the person in charge of the drill.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

Chapter five introduced and examined the empirical results of the study. The main aim of the study was to assess the possible effects of the revitalisation of Bisho CBD on Fire response. This was achieved by reviewing existing literature relating to the fires in high-rise buildings and through a constructed questionnaire designed with the appropriate methodology and research instrument. Chapter six is the last and concluding chapter; therefore, an overview of the previous chapters will be given. Consequent to that is the conclusion, and recommendations of the study.

6.2 Overview of the chapters

Chapter one provided an outline of the study, introduction, and description of the study area and background to the study. Furthermore, the research problem, the research objectives, and the research questions were presented. The study aimed to assess the possible effects of the revitalisation of Bisho CBD on fire response. Chapter two discussed the literature of the existing related studies that have been undertaken in high-rise buildings and provides a brief review of the existing literature. In addition, another means of managing disaster effectively and concludes by summarising the rationalisation of this study were discussed. Fires in high-rise buildings were discussed firstly from a global perspective, secondly, in RSA, thirdly, in provincial then finally in a BCMM perspective. Chapter three focused on the South African related legislation and regulations outlined to control, direct and guide and encourage lessening the perils of calamity and influence on the provision of fire taskforce services legislation. Chapter four focused on the research design and methodologies selected for the study. The research methods, data analysis, and data collection tools used in the study were described. The study made use of the mixed research method; data was collected using an open-ended and closed-ended questionnaire. The questionnaire was divided into three sections. A total of 84 questionnaires that were returned as completed were analysed in this research. Chapter five of the study dealt with the discussion of the findings from data gathered to accomplish the objectives of the study which were, to assess and evaluate possible impacts of the revitalisation of Bisho CBD that resulted in narrowing the access roads in Bisho CBD, Eastern Cape Province; to assess and evaluate possible impacts of the revitalisation of Bisho CBD on fire

response, and to determine mitigation of fire disaster risks of the high-rise building in Bisho CBD. Chapter six describes how the objectives of the study were met, and recommendations and conclusions will be given based on the findings of the research.

6.3 Conclusions

The main aim of this study was to assess the possible effects of the revitalisation of the Bisho CBD on Fire Response. The research study was formulated with three objectives and four research questions to acquire the possible effects of the revitalisation of the Bisho CBD on fire response. The questions and statements that were included in the questionnaire focus on BCMM officials revealing these possible effects.

When a building is subjected to a fire, it has a negative impact on the sustainability of the building, as well as the broader environment and community. Therefore, efficiently and effectively addressing the risks associated with building fire incidents is important. Further to this, an insufficient supply of water significantly increases the difficulties associated with fire-fighting activities, which poses an additional threat to life and property.

To summarize, the research findings revealed that the Bisho CBD revitalisation created challenges regarding emergency responses. The narrowing of access roads creates challenges for emergency response teams which could compromise public safety, health, and quality of life. Therefore, in any improvement that would be made, it is imperative to carefully consider the impacts of the development from the perspective of fire adversity. Considering the connection between adversities would serve as a drastic improvement and can assist in dealing with death traps caused by that development before it possibly results in a calamity.

6.4 Recommendations

The outcomes of the dissertation might provide the basis for proposals and plans to be considered for engagement gatherings with Fire Services to debate concerns of reduction in the size of the roads or developing emergency strategies to lessen the life-threatening fire prevalence that could occur. The findings might also assist BCMM to develop a strategy that will increase the safety of emergency responders especially

fire-fighters as well as the safety of the building occupants, reduce property damage, and limit indirect losses. The following are recommended:

- Revision of fire emergency regulations.
- Installation of standpipe fire and pillar post hydrants.
- Improvement of fire apparatus equipment that is suitable to operate efficiently and effectively in narrow lanes.
- Improving the accessibility of fire operations by reducing the response time of fire-fighting operations.
- Widening of narrow lanes should be considered as an approach to improve accessibility for fire-fighting operations.
- Restricting parking to one side of the streets.

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APPENDIX A: QUESTIONNAIRE

INTRODUCTION AND BRIEF INSTRUCTION

My name is Nqatyiswa Daniso; I am a Masters' student in Disaster Management at the University of the Free State. I am conducting a study titled: assessing the possible effects of revitalisation of the Bisho Central Business District (CBD) on fire response: case study Bisho CBD in Eastern Cape Province in South Africa.

The aim of this study is to evaluate the possible effects of revitalisation of Bisho CBD on Fire response.

Your institution is selected to participate in this study. I humbly request you to answer the questions honestly.

Please note the following regarding your participation in the study:

- It is predicted that the questionnaire will take approximately 10 minutes to complete.
- Participation in this survey is voluntary, you may withdraw from participating at any given time, with no penalties and there will be no form of incentive is given.
- Information provided in this questionnaire will be treated confidentially and no personal information will be given to any third party.
- Your honesty response will assist significantly in accomplishing the purpose of this research.
- The information that you will provide will be used for academic purposes only.

Please sign the form to show that:

You have read and understood the information provided above and you give your consent to participate in the study on a voluntary basis.

_____ _____

Respondent's signature Date

Please mark with a (×) next to the box that is relevant to you. Where explanation is required, use spaces provided.

SECTION 1

A. DEMOGRAPHICS OF THE RESPONDENTS

1. Gender

Female	
Male	

2. Age

18 -24	
25 -34	
35 -44	
45 -54	
55-59	

3. Marital status

Single	
Married	
Widowed/widower	
Divorced	
Other:	

4. Race

African	
White	
Coloured	
Asian	
Other, Specify:	

5. Level of education.

Matric	
Diploma	
Degree	
Masters	
Other	

6. Occupation Position

Chief Fire Officer	
Deputy Chief Fire Officer	
Divisional Commander	
Station Commander	
Platoon Commander	
Senior Fire Fighter	
Fire Fighter	
Junior Fire Fighter	
Trainee	

Other	

7. Work experience

1 -4	
5 -9	
10 -19	
20 -30	
30+ years	

SECTION 2 (Impact evaluation of emergency response in Bisho CBD revitalisation)

8. Does this Bisho CBD revitalisation affect your response time to emergency?

Yes	
No	

9. If yes, how does it affect?

.....

.....

.....

10. If no, what can be done to improve the situation?

.....

.....

.....

.....

SECTION 3 (to determine mitigation of fire disaster risks of this high-rise building in Bisho CBD)

11. Does revitalisation cater for fire hydrants?

Yes	
No	

Please circle one number below to indicate the level of your agreement.

12. Two emergency vehicles can pass each other on these roads.

Strongly Disagree	**Disagree**	**Agree**	**Moderately Agree**	**Strongly Agree**
1	2	3	4	5

13. Turning radius is appropriate.

Strongly Disagree	**Disagree**	**Agree**	**Moderately Agree**	**Strongly Agree**
1	2	3	4	5

14. Building has a properly designated Fire Lane.

Strongly Disagree	**Disagree**	**Agree**	**Moderately Agree**	**Strongly Agree**
1	2	3	4	5

15. Fire hydrant spaces are adequate.

Strongly Disagree	**Disagree**	**Agree**	**Moderately Agree**	**Strongly Agree**
1	2	3	4	5

16. Provision of the fire services with access to building to enable efficient fire suppression and rescue operation is sufficient.

Strongly Disagree	**Disagree**	**Agree**	**Moderately Agree**	**Strongly Agree**
1	2	3	4	5

17. Available fire engines have an ability to operate effectively within narrow access roads to reach high-rise building.

Strongly Disagree	**Disagree**	**Agree**	**Moderately Agree**	**Strongly Agree**
1	2	3	4	5

18. Does your municipality have a fire safety unit?

Yes	
No	

19. Does your municipality have fire safety by-laws?

Yes	
No	

20. If yes, do you think the Bisho CBD revitalisation comply with your fire safety by-laws?

Yes	
No	

21. If no, what measures in place to make that revitalisation to comply with fire safety?

.....

.....

22. How often does the municipality inspect the buildings?

Quarterly	
Biannually	
Annually	
Every Two years	
Every Five years	
Other, specify: ……	

23. How often does the municipality conduct fire drills?

Quarterly	
Biannually	
Annually	
Every Two years	
Every Five years	
Other, specify: ……	

Please circle one number below to indicate your knowledge of the availability of the fire protection systems in the Bisho CBD high-rise building within the Independence Avenue and Siwane Avenue.

24. Fire extinguisher in a building.

Not Available	**Available**	**Don't know**
1	2	3

25. Smoke detectors in a building.

Not Available	**Available**	**Don't know**
1	2	3

26. Fire marshals in a building.

Not Available	**Available**	**Don't know**
1	2	3

27. Fire detector in a building.

Not Available	**Available**	**Don't know**
1	2	3

28. Assembly points during fire outbreak.

Not Available	**Available**	**Don't know**
1	2	3

29. Views on vehicle movement in Bisho CBD due to revitalisation

……

……

……..

Thank you for your cooperation and participation.

APPENDIX B: ETHICAL CLEARANCE LETTER

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

18-Nov-2020

Dear Ms Nqatyiswa Daniso

Application Approved

Research Project Title:
ASSESSING THE POSSIBLE EFFECTS OF REVITALIZATION OF THE BISHO CENTRAL BUSINESS DISTRICT ON FIRE RESPONSE: CASE STUDY BISHO CBD IN EASTERN CAPE,

Ethical Clearance number:
UFS-HSD2020/0676/1711

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Dr Adri Du Plessis
Chairperson: General/Human Research Ethics Committee

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APPENDIX C: LANGUAGE EDITING CERTIFICATE

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3521 Golf Course

Alice, 5700

LANGUAGE EDITING CERTIFICATE

To whom it may concern

I hereby confirm that I have proof read and edited the following dissertation using Windows 'Tracking' System to reflect my comments and suggested corrections for the author to action:

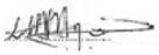
ASSESSING THE POSSIBLE EFFECTS OF REVITALISATION OF THE BISHO CENTRAL BUSINESS DISTRICT (CBD) ON FIRE RESPONSE: CASE STUDY BISHO CBD IN EASTERN CAPE.

By **Nqatyiswa Daniso**

.

Although the greatest care was taken in the editing of this document, the final responsibility for the product rests with the author(s).

Sincerely

Signature  Date: 25/06/2021

Dr. L Moyo

Director

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APPENDIX D: SIMILARITY REPORT

assessing the possible effects of revitalisation of the Bisho Central Business District on fire response: case study Bisho CBD in Eastern Cape

ORIGINALITY REPORT

19%	16%	3%	12%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University of the Free State Student Paper	2%
2	Submitted to North West University Student Paper	1%
3	hdl.handle.net Internet Source	1%
4	uir.unisa.ac.za Internet Source	1%
5	www.fireservices.gov.za Internet Source	1%
6	www.emerald.com Internet Source	1%
7	ijhssnet.com Internet Source	1%
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	natagri.ufs.ac.za	