Exploring the level of preparedness to fire risk in schools in South Africa: A case study of four schools in Kayamandi Township, Stellenbosch

By

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DECLARATION

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DEDICATION

I dedicate this to my family for the sacrifices they have made over the years. They have endured such sacrifices with broad smiles and without complaining. Annie, Scott and Rochelle thank you for standing by me through it all. I love you. God bless you.

ABSTRACT

The overall aim of this study was to explore the extent to which under-resourced schools in Kayamandi, South Africa, are equipped to deal with fire risk. In order to achieve this, it was necessary that three objectives were met: firstly, international best practice for fire-safe schools was explored and compared with South African practice. International case studies included the state of Colorado in the United States of America (USA) and India, with South Africa being the focus of the study. Next, an attempt was made to measure the school staff members' level of awareness of fire risk and fire emergency preparedness in Kayamandi Township schools: Makupula High, Kayamandi High, Ikaya Primary and Kayamandi Primary. Finally, there is a discussion of the challenges limiting the schools' capacity to manage fire risk. The research findings illuminated the existing conditions regarding emergency preparedness in under-resourced schools in South Africa. These conditions revealed a lack of disaster emergency preparedness knowledge in teachers and low fire risk perception that has translated into lack of preparedness to fire risk in all Kayamandi Township schools. These findings can be used as a yardstick to get an idea of similar challenges in other developing countries.

This research adopted a qualitative approach. The data was collected through interviews with school staff from the four Kayamandi Township schools, Stellenbosch Municipality Fire Services personnel and Stellenbosch Municipality Disaster Management Centre staff. Additionally, transect walks, government records, secondary sources and a safety audit checklist were used in the collection of the data.

The results emanating from this study revealed that these schools are unprepared to handle a fire disaster. It was discovered that these schools do not have regular emergency fire drills as stipulated by South African law. The school staff were unaware of the precautionary measures necessary to protect learners in the event of a fire. It was clear that the source of their unpreparedness to fire risk is largely a reflection of their level of fire risk perception. Their fire risk perception is very low because there has never been a major fire incident in the schools. Consequently, efforts to manage fire hazards and enhance schools' preparedness has become the lowest priority for the schools' management, as these schools face many other challenges such as overcrowding and insufficient resources. The school authorities have, however, partly attributed their unpreparedness to insufficient resources as finances are devoted to student teacher support.

KEY WORDS – Preparedness, School staff, Fire-safe, Fire risk, Students.

OPSOMMING

Die algehele doel van hierdie studie was om die mate waartoe hulpbronbeperkte skole in Kayamandi, Suid-Afrika toegerus is om brandrisiko te hanteer, te ondersoek. Om dit te bereik was dit noodsaaklik om drie doelwitte te bereik: Eerstens is internasionale beste praktyk vir brand-veilige skole ondersoek en vergelyk met Suid-Afrikaanse praktyk. Internasionale gevallestudies het die staat Colorado in die Verenigde State van Amerika (VSA) en Indië ingesluit, met Suid-Afrika as die fokus van die studie. 'n Poging is aangewend om die skoolpersoneel se vlak van brandrisikobewustheid en brand noodvoorbereiding in Kayamandi Townshipskole te meet: Makupula Hoër, Kayamandi Hoër, Ikaya Laer en Kayamandi Laer. Laastens was daar 'n bespreking van die uitdagings wat die skool se vermoë beïnvloed om risiko te bestuur. Die navorsingsbevindings het die bestaande toestande rakende noodvoorbereiding in hulpbronbeperkte skole in Suid-Afrika verlig. Hierdie toestande het die gebrek aan kennis van ramprisikovermindering (DRR) en lae brandrisikopersepsie in onderwysers getoon, wat gelei het tot 'n gebrek aan brandvoorbereiding in alle Kayamandi Townshipskole. Hierdie bevindings kan egter as maatstaf gebruik word om 'n idee van soortgelyke uitdagings in ander ontwikkelende lande te kry.

Hierdie navorsing het 'n kwalitatiewe benadering aangeneem. Die data is ingesamel deur middel van onderhoude met skoolpersoneel van die vier Kayamandi Townshipskole, Stellenbosch Munisipale Brandweerdienspersoneel en Stellenbosch Munisipaliteit Rampbestuursentrumpersoneel. Daarbenewens is deursneedatawandelings, regeringsrekords, sekondêre bronne en 'n veiligheidsoudit kontrolelys gebruik in die versameling van die data.

Die resultate uit hierdie studie het getoon dat hierdie skole onvoorbereid is om 'n brandramp te hanteer. Daar is ontdek dat hierdie skole nie gereelde noodbrandoefeninge, soos deur die Suid-Afrikaanse reg bepaal, het nie. Die skoolpersoneel was onbewus van die voorsorgmaatreëls wat nodig is om leerders in die geval van 'n brand te beskerm. Dit was duidelik dat die bron van hul onvoorbereidheid vir brande grootliks 'n weerspieëling van hul vlak van brandrisikopersepsie is. Hul brandrisikopersepsie is baie laag omdat daar nog nooit 'n groot brandvoorval in die skole was nie. Gevolglik word pogings om brandgevare te bestuur en die voorbereiding van 'n skool te verbeter, die laagste prioriteit vir die bestuur van 'n skool, aangesien hierdie skole baie ander uitdagings soos oorbevolking en onvoldoende hulpbronne ondervind. Skoolowerhede het egter gedeeltelik hul onvoorbereidheid aan onvoldoende hulpbronne toegeskryf, aangesien finansies toegewy word aan student-onderwyser ondersteuning.

TREFWOORDE – Voorbereiding, Skoolpersoneel, Brandveilig, Brandrisiko, Beerders.

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CONTENTS

FIGURES

TABLES

APPENDICES

Appendix A: Notice of approval to commence research

Appendix B: Semi-structured interview guide for Kayamandi school staff

Appendix C: Semi-structured interview for Stellenbosch municipality Fire Services and Disaster Management

Appendix D: School safety audit checklist adapted from Bendle (2014)

ACRONYMS

AAASS	:	Ahmedabad Action Agenda for School Safety.
CAQDAS	:	Computer Assisted Qualitative Data Analysis Software.
CSGJC	:	Council of State Governments Justice Centre.
CSSF	:	Comprehensive School Safety Framework.
DMA	:	Disaster Management Act.
DRR	:	Disaster Risk Reduction.
GADRRRES	:	Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector.
IDNDR	:	International Decade for Natural Disaster Reduction.
IFC	:	International Fire Code.
NDMF	:	National Disaster Management Framework.
NIMS	:	National Incident Management System.
NOC	:	No Objection Certificate.
UN	:	United Nations.
UNDP	:	United Nations Development Programme.
UNESCO	:	United Nations Educational, Scientific and Cultural Organization.
UNICEF	:	United Nations International Children's Emergency Fund.
UNISDR	:	United Nations International Strategy for Disaster Reduction.
USA	:	United States of America.
WISS	:	Worldwide Initiative for Safe Schools.

CHAPTER 1: INTRODUCTION

1.1   BACKGROUND TO THE STUDY

Decades of building school classrooms has enabled millions of students all over the world to be educated, however many students are still learning in classrooms at risk of collapsing or being rendered unusable when the ground shakes, floodwaters rise, or when strong winds sweep across the land (Arup International Development and Global Facility for Disaster Risk Reduction 2013). The poor design and construction of buildings, resulting from limited resources, rising corruption and poor planning have made school buildings unsafe, leading to considerable loss of lives, damage to property, destruction of the natural landscape and general economic loss among other issues *(Ibid)*. It is therefore, important for school infrastructure designs to meet building code specifications as this enhances life safety in schools.

The occurrence of disasters is becoming more common across the globe. A disaster is defined as a "serious disruption of the functioning of a community or society which involves widespread human, material, economic or environmental losses and impacts which are beyond the ability of the concerned community or society to cope with, without external assistance which mostly come from developed countries and international aid organisations" (UNISDR 2017:s.p). Gichuru (2013) states that it is important for communities to be always prepared for disaster events as this facilitates a rapid and effective response when a disaster occurs. The establishment of disaster management systems is crucial and these systems should be adjusted to suit local conditions *(Ibid),* which enhances disaster preparedness in communities. Preparedness is defined as "the knowhow and capacity instituted by governments, professional response and recovery organisations, communities or individuals to effectively and efficiently anticipate, respond to, and recover from the impacts of likely, imminent or contemporary hazard events or conditions" (UNISDR 2017:s.p).

When a disaster strikes poorly designed school buildings and under-resourced schools, it can shatter fragile development gains, undermining the hope invested in the educational system (GADRRRES 2015). Selby and Kagawa (2013), in their research on school disasters in Cambodia, China and Indonesia, found out that disasters could unravel hard-earned progress aimed at achieving global educational goals, including the second Millennium Development Goal (MDG2) focused on realising universal primary education by 2015. Nelson R. Mandela, former president of the Republic of South Africa, succinctly explained what education could do for those exposed to it:

> "Education is the most powerful weapon which you can use to change the world. Education is the great engine of personal development. It is through education that the daughter of a peasant can become a doctor, that the son of a mine worker can become the head of the mine, that a child of a farm worker can become the president of a great nation (Patterson 2013)".

The above quotation highlights the important role that schools play in a child's future. Unsafe schools, when destroyed in a disaster, can deprive students of education, putting them at a disadvantage, which negatively affects them later in their lives. In most instances, children from poor families attend unsafe schools looking for a chance to break the vicious circle of poverty through education. Accordingly, it is important for South Africa and other developing countries facing similar issues of poverty and under-resourcing in schools to have high levels of disaster preparedness to avoid disruptions of their school calendars. In South Africa, the right to basic education is entrenched in the constitution and is one of the most important constitutional rights, mainly because it promotes economic and social well-being of its citizens (South Africa 1996).

Although there is a large body of literature regarding disasters that have affected schools, causing injuries, deaths and destruction of property, much of it has focused on natural hazards (Seyle et al. 2013; O'Connor & Takahashi 2014; Usami et al. 2014; Cvetkovic et al. 2015). These disasters include the 2010 Super Typhoon Megi in the Philippines, Bangkok floods in 2012, the 2005 Hurricane Katrina in the USA, and numerous other cyclones that have damaged or destroyed thousands of schools all over the world (GADRRRES 2015). In the Sichuan Province of China, an earthquake in 2008 triggered the collapse of school buildings, killing approximately 10 000 learners; these school buildings were supposed to provide learners with protection *(Ibid)*.

In contrast to natural disasters, numerous human-made disasters have taken place in the past these include, the dormitory fire at Budo Junior school in Uganda where 19 students were lost (Schools Uganda 2015), Dabwali Town fire where approximately 425 people died in a school fire most of them students (Hindustan Times 2006) and, the 2017 Kuala Lumpur, school fire in Malaysia, where 21 students died (Ahmad et al. 2017). These events demonstrate the vulnerability of students and school staff to human-made disasters, which is even worse if they are using structurally unsafe school facilities. Literature about human-made disasters regarding fire includes the research by Greenhalgh et al. (2012) about a fire that broke out at ABC Daycare facility in Mexico in 2009 killing 49 toddlers. Greenhalgh et al. (2012) assessed the factors that contributed to the ABC Daycare fire disaster, care of the survivors, tertiary burn centre triage, patient transport and the treatment process of the casualties. The results emanating from this study indicated that there had been many fire safety and

building code violations by ABC Daycare proprietors. In breach of the law, the day care shared a wall with a stationary warehouse; the shared wall was made of cinderblocks and devoid of concrete filling and the two to three hour fire retardant requirement had not been met. In addition, the roof was made of tin with a polyurethane, which presents considerable challenges for firefighting as it emits much heat and highly toxic fumes *(Ibid)*. This incident demonstrates the importance of complying with building codes. However, while the study focused on the factors that led to the disaster and post event responses, it neglected to investigate whether the caregivers had fire disaster preparedness knowledge or if there had been any emergency fire drills at the day care prior to the fire event.

Cassuto and Tarnow (2003) analysed the 1998 Gothenburg Club fire. They looked at the disaster and the ensuing rescue efforts. In breach of the maximum 150 people club capacity figure, during the celebrations, approximately 375 people were in the club (Cassuto & Tarnow 2003). Their findings revealed that the emergency response units arrived at the disaster scene quickly but were slow to understand the situation. Their research also indicated that the fire escape routes were either locked, blocked or insufficient because event organisers, in order to accommodate more people had stacked chairs moved from the main floor onto the exit stairs. Furthermore, their findings paint a picture of anger, commotion and violence as family members attempted to help. Cassuto and Tarnow (2003) did not address the issue of a glaring breach of building and fire codes at the club. The use of a loudspeaker indicates the absence of a fire alarm. The sound of a fire alarm would have caught the attention of many people and enabled early evacuation, saving at least some of the 63 lives lost.

Kimathi (2011), Gichuru (2013), Karoki (2013) and Kanyi (2014) have all researched disaster preparedness in schools in East Africa. While Kimathi (2011) and Gichuru (2013) looked at more general disaster preparedness in schools, Karoki (2013) and Kanyi (2014) looked at fire risk and preparedness. Of all the aforementioned, researchers Karoki (2013) is the only one who looked specifically at factors militating against fire safety preparedness in schools. Her study was limited to public secondary schools, and she neglected to include public primary schools, which cater for younger students who are more vulnerable because of their ages.

It has been ascertained that the impact of cyclones, floods and earthquakes on schools has received much attention in academic literature, and much has been written, mainly on impacts of earthquakes on schools. However, to date there is scant literature on fire risk in schools in the Global South, save for a few from Tanzania and Kenya, and this leaves a gap in the body of available literature on disaster preparedness that needs addressing.

Over the years, Africa has come to be known as the fire continent, owing to the high number of fires, it experiences (Archibald et al. 2010). Therefore, it is not surprising that fire disasters are of great

concern in South Africa and the entire continent (Artuson 1995). Fires can be highly destructive and can cause high fatality rates (Masellis et al. 1999). According to the Goodwood Fire Station in Cape Town, the 331 structural fires which took place in 2013 were eclipsed by the 2014 figure of 694 (Melville 2015). In 2017 a fire in Knysna, 487.6 kilometres away from Cape Town, killed six people, and destroyed 200 informal dwellings and 408 formal properties (De Villiers 2017). Such figures makes it necessary for schools to not only have structures that are fire safe, but also schoolyards that are devoid of fuel loads as some of the fire can be wildland fires.

Approximately 350 schools caught fire over the period 2015 to 2016 in Kenya, according to a report released by government (Ndiso & Houreld 2017). This wave of fires in Kenyan schools left many with unanswered questions regarding their source, and how they could be prevented (Gichuru 2013). In 2016, 13 schools were destroyed by fire during protest action over demarcation issues in Vuwani, in the Limpopo province of South Africa (Mahopo 2016). Although there were no reported deaths or injuries, many schools were destroyed and this disrupted the learning schedule.

Masellis et al. (1999), in their research, found out that a fire event has a dramatic effect as it induces panic to anybody near a sudden fire. This panic emanates from the realisation that a fire can kill within a short period of time, can cause injuries and permanent disfigurement, and inevitably destroys everything in the vicinity *(Ibid)*. The survivors of a fire often bear serious and extensive burns that require immediate rescue procedures that local resources may not be able to provide *(Ibid)*. Therefore, the moment a violent fire breaks out, people experience a moment of psychological paralysis, and then complete incapacity for logical thought sets in, resulting in instinctive behavioural reactions, with a person's main aim being to save oneself and all that is dearest to them, and reach safety *(Ibid)*. This highlights the need to equip school staff with the appropriate disaster preparedness knowledge so that they know how to respond in a fire emergency at schools because if they do not respond in the appropriate manner, student lives can be lost.

Most township schools are not well resourced in South Africa (Veriava 2012). Bush and Heystek (2003) argue that the demographic and socioeconomic composition of the townships sustain racial segregation and a shortage of resources in township schools. This is a legacy of apartheid education laws, which favoured white schools; the effects of these policies still exist in townships to this day (Fiske & Ladd 2004; Sedibe 2011; Veriava 2012). The situation is made worse as the parents of students who attend township schools pay very little to nothing in school fees because of their low socioeconomic status, which leaves most of the schools depending entirely on government funding (Hoadley 2007; Lam et al. 2010). Bush and Heystek (2003), Fiske and Ladd (2004), Hoadley (2007), Lam et al. (2010), Sedibe (2011) and Veriava (2012) have written about access to resources, quality and number of teachers and learner-teacher ratio in public schools but neglected to highlight the need

for school safety and disaster preparedness. Although public schools are recipients of government funding, it may not be sufficient to fund programmes that address safety issues. This potentially leaves students and school staff exposed to hazards.

This study therefore seeks to address the gap existing in literature by exploring the level of preparedness to fire risk in under-resourced public schools in Kayamandi Township, South Africa. Although much of the literature deals with the 'hard' features of the built environment, this thesis focuses on the non-structural measures that are required to ensure children's safety if fires occur. The non-structural measures are measures that do not involve physical construction but rather make use of knowledge, practice or agreement to reduce disaster risks and impacts, particularly through policies and laws, public awareness campaigns, training and education (UN 2016). "Common non-structural measures include building codes, land-use planning laws and their enforcement, research and assessment, information resources and public awareness programmes" (UN 2016:23).

This study specifically focuses on a scenario where a fire breaks out when the school is in session because the school staff and students will be present. The study focuses on the schools' responses and evacuation plans. Such research is important, as schools are places that shelter children of different ages, with some incapable of escaping on their own when the need arises. Failure by some students to escape the fire may be due to a lack of knowledge on what to do in a fire situation, or they could be too young to know what to do in a risky situation. Having regular fire drills to make students aware of the appropriate measures to take in a fire emergency is very important. Equally important is a school staff complement that is equipped with disaster preparedness knowledge who can calm down the students and lead them to safety.

1.4   AIMS AND OBJECTIVES OF THE STUDY

This research aims to explore the level of preparedness to fire risk in schools during school time. The main aim of this research is to assess the preparedness of township schools in the event of a fire breaking out. The findings from this research may help illuminate the existing conditions in under-resourced schools in South Africa and other developing countries. The results emanating from this study can also be used to introduce corrective measures where such needs exist.

To achieve the research aim, the objectives were to:

1. Explore best practice for fire-safe schools globally and then compare this to South Africa (Kayamandi Township schools);
2. Determine staff members' level of awareness of fire risk and fire preparedness across selected 'under-resourced' schools in a township in South Africa; and

3. Discuss the challenges of reducing fire risk and implementing fire preparedness measures in under-resourced/disadvantaged schools in South Africa.

1.5   SIGNIFICANCE OF THE STUDY

The results emanating from this study will be available for use by the schools selected for this research, Stellenbosch education circuit, Municipality Disaster Management and the Fire Services. The study will help in revealing the extent to which under-resourced schools in South Africa are prepared for disasters while operating with limited finances. The findings also highlight the need for the teaching of Disaster Risk Reduction (DRR) to students to improve student awareness of hazards and response actions. The research findings can help highlight challenges or issues that other schools should look into and consider when designing and strengthening their preparedness plans. The research findings can also illuminate the prevailing conditions in most under-resourced schools in Africa and other developing countries. The information generated could also prompt government authorities to rigorously enforce the compilation of school safety plans, provide funding for all staff training and the provision of necessary equipment.

1.6 THESIS OUTLINE

This thesis has six chapters. Chapter 2 contains an extensive review of literature on safer schools and school safety policies in South Africa and globally. Chapter 3 presents the methodology used in conducting the research. Chapter 4 and 5 discuss school emergency preparedness levels and fire risk perception in Kayamandi schools. Finally, the last chapter concludes with an overview of the whole research with a reminder of the initial objectives, limitations experienced in the course of the research and by suggesting further research topics and recommendations.

1.7 SUMMARY

This chapter has introduced the study. It has revealed that most of the literature on school disasters focuses on human-made disasters but not on fire disasters. It has also provided some examples of fire disasters that have taken place, highlighting the dangers of breaching building codes. The chapter also outlined the aim and objectives of the study and the overall organisation of the thesis.

CHAPTER 2: LITERATURE REVIEW

2.1   INTRODUCTION

The main objective of this chapter is to review existing literature regarding disaster preparedness in schools globally and in South Africa. The first part of the chapter focuses on the negative impact disasters have on school infrastructure and learners. There will be a brief look at the causes of fire in schools. The chapter also contextualises and provides an extensive review of literature on safe schools and fire safety policies from the United States of America (State of Colorado), India and South Africa. In addition, global agreements, policies and efforts that aim to enhance the protection of learners from disasters will be highlighted and explained. Key issues concerning teacher capacity and competence to protect learners during a disaster, which include teacher training for disaster preparedness and the importance of school disaster preparedness plans are subjects for discussion. The last section of this chapter unpacks an analytical model, which helps to understand the fire risk situation in Kayamandi schools.

2.2   AN ILLUSTRATION OF DISASTER IMPACTS ON SCHOOLS AND LEARNERS

Disasters have different effects on the safety and well-being of students in unsafe learning environments. Table 2.1 illustrates global fatalities of students and school staff resulting from disasters. These statistics highlight the need for schools to be prepared to withstand disasters and for the responsible people to know the precautionary measures to take in an emergency.

Table 2.1: Examples of disaster impacts on schools and learners from across the world

Year	Country	Hazard	Magnitude of impact
1966	South Wales (UK)	Landslide	A total of 116 students died when a mudslide triggered by coal waste moved onto the school (McLean & Jones 2000).
1995	Dabwali Town (India)	Fire	Approximately 425 people died in a school fire, the majority of them school students (Hindustan Times 2006).
2004	Kumbhkonan (India)	Fire	Lord Krishna School lost 93 school children in a school fire (Hindustan Times 2006).
2005	Kashmir (Pakistan)	Earthquake	Approximately 17 000 students perished at school (UNISDR 2008).
2006	Uganda	Fire	A total of 13 school children died in a dormitory fire (UNISDR 2008).
2008	Sichuan (China)	Earthquake	10 000 students died when the school buildings collapsed after an earthquake (GADRRRES 2015).
2008	Uganda	Fire	Budo Junior School lost 19 children in a dormitory fire (Schools Uganda 2015).
2010	Haiti	Earthquake	The earthquake killed 38 000 students and 1 300 teachers across the island (UNISDR 2012).
2011	Japan	Tsunami	The tsunami killed 74 elementary students and 10 teachers at Okawa primary school (LA times 2012).
2017	Mexico City	Earthquake	Twenty school children died at a primary school following an earthquake (Agren 2017).

As illustrated in Table 2.1, disaster impacts on schools usually come in different shapes and forms affecting countries differently and with varying magnitudes. UNISDR (2008) states that human-made disasters have physical, educational and psychological impacts on schools and its stakeholders. Some of the impacts that disasters have on schools and its learners include the following:

❖ Damaged school infrastructure means students cannot attend school (Petal 2008; Pandya et al. 2009);

❖ School hours can be suspended as teachers participate in recovery activities in the wake of a disaster (Pandya 2009 et al.; Gregario 2010);

❖ Disruptions to school attendance or compromised school infrastructure results in a reduction of education quality and increased stress (Pandya et al. 2009) and

❖ There could be an increase in school dropouts in the wake of the disaster as parents may be fearful to send children to a place they consider unsafe (Pandya et al. 2009).

Looking specifically at fires, there is a need to understand the primary causes of fires in schools. The next section presents some of the main causes of school fires.

2.3   CAUSES OF FIRE IN SCHOOLS

There is a whole range of factors or causes that contribute to the occurrence of fires in schools. The factors covered in the section are not meant to be exhaustive. Fire outbreaks in schools are usually unpredictable – they can occur any time and can be caused by numerous factors (Hassanain 2006). According to Merseyside Fire and Rescue Service (n.d.), an average of three school fire outbreaks occur daily in the United Kingdom (UK), and approximately 75% of these fires are arson attacks. Fire outbreaks at schools in the UK in 2002 resulted in insurance companies paying out a total of 100 million pounds *(Ibid)*. In the UK, approximately 70% of school fire outbreaks take place after school hours, between 7pm and 11pm *(Ibid)*. In Uganda, a similar problem has been noted; between 7 April 2008 and 11 March 2009, there were 95 school fire outbreaks countrywide (Schools Uganda 2015). In 2006, a Ugandan school lost 13 schoolchildren in a dormitory fire (UNISDR 2012) and in 2008, 19 students died in another dormitory fire (Schools Uganda 2015). The deaths of these students in Uganda could have been avoided if there were smoke alarms, and heat detectors working in tandem with fire alarms. The Ugandan police attribute the cause of most of these fires to arsonists *(Ibid)*. Ekbrand and Unhnoo (2015) note that in Sweden, school buildings are popular targets for arsonists, compared to other public buildings. In Sweden, cases of arson in schools have more than doubled in the last 10 years to current levels of 230 cases annually on average, costing the country 50 million euro a year (Ekbrand & Uhnoo 2015).

Other causes of fire in schools besides arson can be the absence of fire prevention notices, which help to remind both the teachers and students that, for example, after lessons all electric plugs must be removed from their sockets, and that equipment and gas supplies in laboratories should be switched off (Hassanain 2006). Malfunctioning electrical apparatus may also result in heavy demands on the school electrical system, particularly aged school infrastructure *(Ibid)*. The existence of overloaded electrical outlets or extension cords to cater for high demands constitute a fire hazard *(Ibid)*, and poses a great danger to the school occupants. Hence, the need for the diffusion of disaster risk reduction (DRR) knowledge in both students and school staff. To prevent fires of electrical origin, electricians should regularly carry out inspections to ensure life safety at schools.

Schools also produce large amounts of waste – like rubbish bins of paper-based waste in learning environments – which pose a fire hazard (Hassanain 2006). It is therefore incumbent upon school authorities to ensure that combustible materials are disposed of continuously. Hassanain (2006) also

cautions against storing rubbish in the school overnight. The presence of such rubbish at night provides ready fuel for arsonists to start fires.

Additionally, although many schools practice a no smoking policy or confine smokers to smoking zones, some children still copy teachers and other adults and smoke (Hassanain 2006). This makes smoking possibly one of the major causes of fires in schools *(Ibid)*. This is especially so, as smoking students can throw away lit cigarettes recklessly when they think they have been discovered. The reckless disposing of lit cigarettes by learners can also be a result of sheer ignorance on their part. Finally, keeping combustible materials or flammable liquids in the school environs serve as ready-made fuel supplies for a fire (Hassanain 2006).

2.4   INTERNATIONAL AGREEMENTS ON THE NEED TO PROTECT LEARNERS FROM DISASTERS

The period between 1990 and 2000 was declared by the UN to be the International Decade for Natural Disaster Reduction (IDNDR). The objective for declaring such a decade was to reduce, through concerted international effort, the loss of life, property damage and economic disruption caused by human-made disasters, especially in the Global South (UNISDR n.d.). During the course of the IDNDR, a World Conference on Disaster Risk Reduction, held in Japan in 1994, adopted the Yokohama Strategy and Plan of Action for a Safer World, presenting a strategy for disaster reduction that prioritised saving lives and protecting property (UNISDR 1994). While these two strategies had a common agenda of protecting lives and property, none of them explicitly referred to the protection of school students.

In 2005, the Hyogo Framework came into existence, aiming to enhance global safety from natural hazards over a ten-year period (UNISDR 2005). Unlike the IDNDR and the Yokohama Strategy, the Hyogo Framework called for the promotion of appropriate DRR knowledge in the school curricula at every level (UNISDR 2005). The framework suggests that this is achievable through the utilisation of both formal and informal ways to equip youths and children with DRR knowledge *(Ibid)*. Furthermore, the Hyogo Framework advocates for the implementation of activities and programmes in schools that enable them to reduce the impacts of hazards *(Ibid)*. The Hyogo framework has three strategic goals that specifically addressed safety in the education sector (UNISDR 2005). These strategic goals call for the:

❖ Inclusion of risk reduction and resilience into sustainable regulations in the education realm;
❖ Development and strengthening of institutional mechanisms and capacities to enhance resilience against hazards and threats in the education sector at all levels and

❖ Systematic incorporation of risk reduction measures in the execution of emergency preparedness, response and recovery plans in the education departments (UNISDR 2005).

The successor to the Hyogo Framework, the Sendai Framework for Disaster Risk Reduction of 2015 is the most recent framework. The Sendai Framework for Disaster Risk Reduction requests governments to understand disaster risk, enhance risk governance to control risks in all sectors, and to make investments in risk reduction actions that improve resilience, increase preparedness and responses to enable building back better in the aftermath of a disaster (UNISDR 2015). Specific reference by the Hyogo and Sendai frameworks to risk reduction in the realm of education, prompted Shiwaku et al. (2016) to argue that the adoption of these frameworks signalled the genesis of consensus on the importance of disaster reduction efforts in schools.

Following global consensus, the Millennium Development Goals (MGDs) were introduced in 2000 (UN 2015). The focus of the second MDG, for example, was to achieve universal primary schooling (*Ibid*). Pursuant to that, the MDG report reveals that by 2015 the school net enrolment rate in the Global South had grown from 83% in 2000 to 91% in 2015 (UN 2015; UNESCO 2015). In addition, the report shows that the number of primary school-going aged children who were not in school decreased by approximately 50% to an estimated 57 million in 2015 from a high of 100 million in 2000 globally *(Ibid)*. The Ahmedabad Action Agenda for School Safety (AAASS) held in 2006 in India was a recognition of the need to provide safety in schools to the huge numbers of children introduced into the education system by the second MDG goal (AAASS 2007). The progress made in bringing millions of children into schools galvanised other stakeholders leading to the proliferation of offshoot organisations that promote safe schools. The Comprehensive School Safety Framework (CSSF), working in conjunction with the Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector (GADRRRES), is a good example of a project that aims to advance the safety of schoolchildren globally (GADRRRES 2017).

One of the CSSF's objectives is to ensure the protection of schoolchildren and staff from incurring injury or death at schools (GADRRRES 2014). Its other objective is to ensure that plans are in place for the non-disruption of education in the event of a disaster *(Ibid)*. The objectives go further with the last one calling for the protection of resources invested in education and strengthening of education that promotes risk reduction and resilience *(Ibid)*. Similar to the AAASS (2007), the CSSF recognises that for comprehensive school safety to be satisfactory, it must incorporate education policies and practices aligned with disaster management at all levels of government down to the local schools (GADRRRES 2014). As a result, it argues that satisfactory school safety hinges on three pillars:

1. The provision of safe learning facilities;

2. The existence of a functioning school disaster management committee working in tandem with the third pillar and

3. The teaching of risk reduction and resilience (GADRRRES 2014).

The Hyogo Framework for Action 2000-2015 for the education sector has a common agenda with the AAASS of 2007 and the CSSF, which is to ensure the safety of learners. At the same time, the UNISDR, in conjunction with the GADRRRES, is also promoting a holistic approach for school safety on a global level (UNISDR n.d. [a]). In an effort to achieve global school safety, GADRRRES presided over the development of the Worldwide Initiative for Safe Schools (WISS) *(Ibid)*. The focus of WISS is to motivate and support governments in setting up national strategies to ensure school safety *(Ibid)*. For WISS to classify a school as safe, the school must have a combination of safe learning infrastructure, a disaster management plan, and DRR and resilience education in place *(Ibid)*. The objectives of the successive frameworks and programmes to enhance school safety across the world are noble, however, since most structurally unsafe schools are in the financially poor Global South, strong financial backing from the developed world and investments by governments and schools in disaster risk reduction is required to achieve global school safety.

2.5   A REVIEW OF THE GLOBAL AND SOUTH AFRICAN FIRE SAFE SCHOOL SAFETY POLICIES. A CASE OF USA, INDIA AND SOUTH AFRICA.

This section gives an overview of policies on fire safety in schools both from an international and African perspective. The first part discusses Colorado in the United States of America (USA). The motivation behind choosing this country is that it is an ideal country to learn from considering it is developed and well-resourced compared with developing countries. Colorado is used as a case study as there is no common federal law governing school safety in the USA. The second part of this section gives an overview of India. India was chosen because it is a developing country like South Africa and it might have a shortage of resources, which is a major constraint of developing nations. Additionally, India was chosen to evaluate their fire safe school safety policies considering that in 2006 they had two deadly fires – one in Dabwali Town which killed approximately 425 people, the majority of them school students) and one in Kumbokonan where 93 school children perished at Lord Krishna School (Hindustan Times 2006), which serves to illustrate the high levels of fire risk in Indian schools. Lastly, fire safety policies for schools in South Africa are discussed. Since South Africa is the focus of the research, it is imperative to give a critical analysis of the country's policies.

2.5.1   Colorado (USA)

The information that was gathered from an extensive search indicates that there is no federal fire safety policies for schools per se in the USA. Instead, fire safety policies are embedded in the school safety

plans of the individual states that have such legislation. The information presented in this section was adapted from the Council of State Governments Justice Centre (CSGC) 2014 document (CSGC 2014). In 2014, 33 States had statutes that clearly made it compulsory for all schools in every district to have a comprehensive school safety plan *(Ibid)*.

Pursuant to the above requirement, every school district education board in Colorado is mandated to have and implement a safety plan in consultation with a range of stakeholders, which include members of the community, parents and school staff. To ensure that all school infrastructure meets the required standards, emergency personnel carry out regular inspections. Furthermore, the emergency personnel evaluate the emergency response systems of each school to make sure they are adequate. Another motivation for inspecting the buildings is to enforce compliance with the building fire code, the division, local fire department and qualified fire inspectors may collaborate with schools in the assessment of implementation of the National Incident Management System (NIMS). This facilitates a seamless national approach to incident management across all functional disciplines.

2.5.2 India

In India, all states are required to adhere to the safety measures as required by the National Building Code of India of 2005 (Bhandary 2012); this differs from the USA, where fire safety policies for schools are embedded in school safety plans of the States that have statutes requiring them. In India, it is also a prerequisite that all schools should have certificates from the fire department before getting a No Objection Certificate (NOC) from the education department (Bhandary 2012). A NOC is a "legal document which is required in many places like government departments, educational institutions, banks and other organizations. This certificate may be issued by any organisation, agency or institute and by individuals where the contents of the NOC means not objecting to the covenants as mentioned in the certificate" (Sachdeva 2015:s.p).

In addition, the Central Board of Secondary Examinations makes sure that schools have effective fire safety rules in place before getting a board certification (Bhandary 2012). Finally, all Indian schools are required, as stipulated by the Education Ministry in 2005 to have compulsory fire drills *(Ibid)*.

India has a proliferation of unregulated private schools (Saha 2017). Dhawan et al. (2014) revealed that 32% of students in India were in private schools. Saha (2017) notes that between 2010 and 2016, government student intake in 20 Indian states dipped by 13 million, while private schools gained 17.5 million new students. In India, "80% of private schools are low fee schools when benchmarked against per capita and daily wagers' incomes" (Asha 2017:s.p). Although Indian private schools do not benefit from any government funding, they should still abide by the strict government regulations regarding fire safety as promulgated by the Indian Supreme Court (Supreme Court of India 2013).

The Indian court ruling makes no distinction between private and public schools in matters of school safety. Some of the regulations that prospective 'edu-preneurs' (those wishing to start a private school) must meet is to register as either a society or trust, own the land and building or have long-term leases for the school premises, and allow for nine square metres per student and 180 square metres classroom size (Ambast et al. 2017).

A look at the Indian media provides an indication that schools are practicing fire drills in both public and private low fee-paying schools. However, in the absence of comprehensive figures regarding the specific number and names of schools practicing fire drills, the full extent of schools abiding by the law is difficult to ascertain. However, Rafah-e-Aam and Zilla Parishad High Schools reportedly held mock fire drills (The Times of India 2017). Bhandary (2012) reported that most schools in India were abiding by the state government rules regarding fire safety.

2.5.3 South Africa

In South African, Enabler 2 of the National Disaster Management Framework (NDMF) encourages the need to promote a culture of risk avoidance through education and training throughout the country (South Africa 2005:156). The National Curriculum Statements also make provision for the teaching of hazards and disasters to grade seven learners (South Africa 2003). Since teaching of hazards and disasters only starts from grade seven, this makes it necessary for all teachers, especially at primary school level, to be equipped with skills on how to respond in the event of a disaster. South African law mandates that public schools take measures to ensure the safety of learners during all school activities (South Africa 2006).

The South African School Act (South Africa 2006) is explicit in singling out the need for public schools to abide by the school safety regulations. The reference to public schools is because the government is responsible for the running and maintenance of public schools only. However, according to the National Education Infrastructure Management System Report (2011), 24 793 public schools nationwide do not have the requisite basic infrastructure. As reported in News 24 on 22 March 2018, a five-year-old girl drowned in a pit latrine at school in the Eastern Cape (Etheridge 2018). This further illustrates the great divide in infrastructure quality between public and private schools in the country compared to Colorado and India, where school safety laws are applied evenly across the board. The wording of the SASA 1996 puts emphasis on the safety in public schools because they are under their mandate, and this does not imply private schools are safe but rather assumes that they adhere to their own safety requirements.

As laid down in 2001, in the South African Government Gazette 22754, titled Regulations for Safety Measures at Public Schools (and amended in 2006) public schools are required to have emergency

14

evacuation procedures in place (South Africa 2006). Such emergency evacuation procedures should be clearly displayed in all offices, classrooms and amenities *(Ibid)*. Where possible, the local fire chief should assess and review all fire evacuation procedures annually *(Ibid)*. This approach is in sharp contrast with the state of Colorado. In Colorado, it is mandatory for the Emergency Personnel to conduct inspections of the buildings to ensure compliance with fire codes and to gauge if evacuation plans are adequate (CSGC 2014). In South Africa, the SASA 1996 says that where possible, the fire chief should assess and review evacuation procedures every year (South Africa 2006). This Act clearly indicates that it is at the discretion of the fire chief whether to assess and review evacuation procedures or not.

Where the Indian government issues an NOC (Sachdeva 2015), in Colorado, they issue occupation certificates and the law there forbids the school board to occupy or use public school infrastructure until being issued such a certificate by the Division of Oil and Public Safety (Code of Colorado Regulations n.d.). In South Africa, the Fire Services also issue occupancy certificates for buildings meeting the requirements of the National Building Regulations and Building Standards Act 103 of 1977 (De Waal 2008). The Fire Services only issues the Occupancy Certificate:

> "Upon completion of the erection or installation of - (a) the structural system or (b) the fire protection system or (c) the fire installation system, of any building the person appointed to design such system and to inspect the erection or installation. The appointed person shall submit a certificate to the local authority indicating that such system has been, designed and erected or installed in accordance with the application in respect of which approval was granted in terms of section 7"
> (De Waal 2008:s.p).

In South Africa, unlike in Colorado and India, the minister may (through a notice in the Gazette) suspend the application of this section in the area of jurisdiction of any local authority for any period (De Waal 2008).Furthermore, in South Africa the law stipulates that public schools should have fire extinguishers, with the onus being on school principals to ensure regular inspections are done to keep them in good working order (South Africa 2006). The law also requires the installation of audible fire alarms in all parts of the school premises *(Ibid)*. However, there is a veiled admission that some schools may not be able to have them, owing to lack of resources. Hence, the statement was qualified with a "funds permitting" clause (South Africa 2006:s.p). This could mean that schools without sufficient funds will not have fire alarms, leaving staff and students vulnerable. Finally, the principal is required to ensure that staff members and, where possible, students from grade 8 upwards, are trained to operate the fire extinguishers (South Africa 2006).

Like India and the USA, South Africa has a national authority responsible for disaster management. This national authority is underpinned by the Disaster Management Act No. 57 of 2002 (DMA) and the National Disaster Management Framework (NDMF) of 2005 (Van Niekerk 2014). The Fire Brigade Services Act #99 of 1987 (South Africa 1987) and the Occupational Health and Safety Act #85 of 1993 (South Africa 1993), mandate the holding of fire drills and preparing for fire emergencies. However, the implementation of the DMA and NDMF is constrained by the absence of a strong institutional basis and funding in South Africa (Van Niekerk 2014).

Under-resourced schools are a reality in South Africa. This can be shown through analysing the mandate given to School Governing Bodies (SGBs) by the education department, which reads as follows:

> "A governing body of a public school must take all reasonable measures within
> its means to supplement the resources supplied by the State in order to improve
> the quality of education provided by the schools to all learners at the school"
> (Fiske and Ladd 2003:6).

Fiske and Ladd (2003) further argue that this directive to generate additional income is not limited to tuition fee charges but also extends to seeking voluntary donations from parents. The directive to public SGBs to raise additional income is an admission by the government that the resources allocated are not sufficient. Some public SGBs use resources generated from school income generating projects to hire more teachers where there is such a need (Fiske & Ladd 2003).

2.6   TEACHER CAPACITY AND COMPETENCE TO PROTECT LEARNERS DURING A DISASTER

When an emergency develops at a school, the school staff are typically the first responders (Kano & Bourque 2007). The capacity and competence of teachers to protect learners during a disaster is dependent on teachers' level of training. However, such competence alone cannot determine the severity of injuries, number of injured and the fatality levels. This is noticeable in the GADRRRES definition of a safe school, which consists of three components, which must complement each other. These components are "safe learning facilities (disaster resilient infrastructure), school disaster management and disaster risk reduction and resilience education" (UNISDR n.d.[b]: 2). Furthermore, teacher capacity and competence is dependent on the quality of their environment, for example, presence of unobstructed emergency exits, alarm systems and the degree to which the school system is integrated into the local community/institutions. The extent of the school's integration in the local community determines how swiftly the fire services' response will be to the school, factoring in accessibility issues. Student awareness and response to disaster also determines the magnitude of the

disaster impact. This suggests that student and staff safety in schools needs a holistic approach to become a reality.

Petal (2008) argues that a background in DRR is a requirement for those training for professions in public administration, public health, public safety, business administration, earth sciences, engineering, architecture, and several other fields, not least of which is in pedagogy itself. A tragic example in India highlights how a lack of competency in DRR put schoolchildren at risk. The following example also highlights the need for teachers to know what precautions to take in an emergency. In 2004, 93 children lost their lives after being locked in a room by their teachers to keep them safe as they tried to put out a fire (Satapathy & Walia 2007). "Upon seeing the fire, they directed children into a classroom approximately 15 feet wide and 115 feet long, locked the door and left to extinguish the fire" (Satapathy & Walia 2007: 115). Such an action revealed the teachers' lack of disaster awareness. Furthermore, owing to the "panic no one realised that 125 children were locked inside a first-floor classroom with a thatched roof (Satapathy & Walia 2007: 115). The mere act of leaving the learners alone in a thatched room locked from the outside demonstrates a severe lack of DRR knowledge. This highlights the need for regular drills, organised by the schools, to ensure children and staff know how to behave in an emergency.

This fire disaster in India also raised serious questions about school building safety rules and regulations, training of schoolteachers in civil defence, school funding and registration mechanisms, and the enforcement of the rules ensuring quality education in safe environments (Satapathy & Walia 2007).

It is paramount that all governments ensure teacher training and curriculum development, among other things, to enable widespread DRR strategies (UNICEF 2009). Both natural and human induced disasters are not predictable and therefore not preventable, but communities should at least plan for them through the implementation of initiatives such as disaster management strategies, which involve preparedness and mitigation measures (Gregario 2010). Long-term and sustainable capacity building for disaster-resilient education and safety of schools depends on embedding these competencies in higher education programmes for teacher-training (Petal 2008). Pursuant to that, UNICEF (2009) states that teacher training in DRR approaches should be both pre-service and in-service. Pre-service training is formal teacher training through institutes, training colleges, face-to-face lectures and activities that lead to certification of teachers in DRR knowledge *(Ibid)*. In-service training involves teachers receiving lessons for short periods of time or on weekends, after school or during vacation and repeated in a series of workshops *(Ibid)*. This strategy aims to keep teachers abreast with the changing circumstances. Izadkhah et al. (2012) argue that in-service training provides a combination of lessons, which expose teachers to new updated knowledge and information.

Disaster prevention knowledge in Japan is the foundation of disaster preparedness in their education system (Chen et al. 2012). As a result, all new Japanese teacher graduates are supposed to enrol in disaster prevention courses, practicing teachers are also required to go for retraining after every five years (Hsu 2007). Sri Lanka and India adopt a similar approach whereby teachers do pre-service and in-service training in DRR.

Regarding school disaster management, schoolteachers play an important role (Shiwaku 2014). The governments of Japan, India, Sri Lanka, Iran and Nepal aim to equip their teachers with the same levels of knowledge regarding disaster preparedness (Shiwaku et al. 2006; Hsu 2007; Donga & Bitter 2008; Chen et al. 2012; Izadkhah et al. 2012). In Armenia, military teachers (using their experience of working in the Armenian army) are responsible for teaching the subject "Preliminary Military Preparation and Safe Lifestyle". This subject has many elements of crisis management and disaster management (Shiwaku et al. 2014). Furthermore, the military science teachers are charged with the responsibility of disaster management activities, which includes event-based training in their school *(Ibid)*. Furthermore, the Crisis Management State Academy trains the general teachers, equipping them with knowledge that is relevant to the grades they teach *(Ibid)*. The training manual for military teachers has more content compared to that of general teachers *(Ibid)*.

Shiwaku et al. (2006) believes that schools have the potential to provide a platform for equal access to disaster education by all students, which makes schools effective mediums for disseminating disaster education. Consequently, to effectively diffuse DRR knowledge, Shiwaku et al. (2006) argue that teacher training is paramount to the whole process.

The literature reviewed about teacher training for disaster preparedness has shown that countries that experience disasters often, have become more proactive in preparing for the disaster. This is noticeable in the way these countries have included DRR education in their teacher training programmes. The experiences from these countries is instructive when compared to the South African situation. The South African Disaster Management Act of 2002 is silent on the need for trainee teachers to be equipped with DRR knowledge. This gives credence to the argument by Van Niekerk (2014) that the implementation of the DMA and NDMF is constrained by the absence of a strong institutional basis and funding in South Africa. According to Van Niekerk (2014), a closer look at the implementation of the DMA and framework within the South African government shows that significant discrepancies exist between ideals espoused in the legislation and the realities within government. For example, there is a "lack of disaster risk management and development planning (a legislative requirement)" (Van Niekerk 2014: 865).

2.7   IMPORTANCE OF DISASTER PREPAREDNESS PLANS

Sutton and Tierney (2006) argue that plans must be aligned to what may potentially happen during a disaster and not on myths and misunderstandings about disasters. Additionally, Sutton and Tierney (2006) believe that planning, education and training should focus preparedness activities in a manner that can positively influence communities to take protective actions when a warning is communicated. Otherwise, as Clarke (1999) argues, plans may just remain theoretical. Therefore, it is important to ensure that adequate resources are available, and that the responsible people should know what to do and be able to do it when disasters strike (Sutton & Tierney 2006).

Several different bodies/entities and individuals, including emergency response agencies, government workers, businesses and the citizenry should conduct disaster preparedness activities as they all play different roles and have different responsibilities to fulfil when disasters occur (Coppola 2015). Pursuant to that, it is a given that preparedness reduces hazards' negative effects through having effective precautionary measures in place that ensures timely, appropriate and efficient organisation and delivery of response and relief action *(Ibid)*.

The AAASS' (2006) top priority for safe schools calls for the mobilisation of all stakeholders, which include students, local community and school staff to champion school safety. Furthermore, it calls for the promotion of active dialogue and idea exchanges between schools and other important stakeholders *(Ibid)*.

An important element of the preparedness effort of a community or state's response is a regime of exercises (Coppola 2015). Rehearsals potentially re-emphasise points made in separate training programmes, and test the system, exposing gaps that otherwise might have been overlooked (UNDP 1994:34). Rehearsing evacuation and response procedures provides opportunities for the evaluation and improvement of preparedness plans (Twigg 2004; Coppola 2015). Drills are most effective, especially when they mimic real-life situations (Coppola 2015) and this potentially makes them the most important component in disaster preparedness. Drills serve an important purpose of bringing several response agencies personnel together in one place and this provides an opportunity for them to meet and establish relationships before an actual disaster occurs.

In the aftermath of the 2011 earthquake and subsequent tsunami, the students in Japan specifically credited the regular emergency drills for saving their lives (Kamiya 2011:sp):

> "According to the drills they had practiced, the teachers were supposed to gather
> the students on the school grounds and immediately do a head count. Once it was
> confirmed that everyone was present the teachers would then lead the students
> to a designated evacuation site on higher ground. That day however, the
> microphone was knocked out by a power outage and the teachers were unable to

issue instructions to the entire school, according to Saito. Without being told what to do, the students gathered on the school grounds and began running toward the evacuation site located about 1 km away".

The preceding quote demonstrates the importance of having regular emergency drills. It is probable that if the school staff and students in India had regularly participated in fire emergency drills as the Japanese do, the tragic deaths of students in 2004 could have been avoided.

2.8   SAFE SCHOOL FACILITIES

"A school building's capacity to protect its occupants relies not only on the effective design of the structure, but on the environment in which it is built" (UNISDR 2009: 40). It follows therefore, that even if a school building is designed to meet hazard resistant specifications, it may not offer much protection to its users if situated on a vulnerable site *(Ibid)*. ISDR (2012) argues that to ensure school safety, school sites should be carefully selected.

According to the New Zealand Ministry of Education's (NZME) Requirements and Guidelines for Designing Schools, education buildings should be of consistently exceptional quality, regular in shape and easy to construct and maintain (NZME 2015). The schools should be designed to meet at least "infrastructure protection" performance objectives to withstand known hazards (ISDR 2012:53). Furthermore, the construction of school facilities should comply with the building codes and be built by a construction workforce possessing disaster resilient construction and non-structural mitigation skills under the supervision of a qualified engineer *(Ibid)*. The school buildings should be sufficiently resistant to wear and tear so as not to necessitate regular and extensive maintenance (NZME 2015).Fire safe school facilities

The International Fire Code (IFC 2015) requires that school safety be promoted, therefore school staff are supposed to inspect all exit facilities every day to check that all stairways, doors and other exits are working properly. It must be possible for all exit doors to open easily from the inside, and only a single latching or locking device should be installed on exit doors *(Ibid)*. Locking systems that use a key, tool or special skill to open from the inside are not permitted *(Ibid)*.

Escape routes should be clearly marked with bright signs, except in instances where the exit points are obvious (IFC 2015). To facilitate rapid evacuation from the building, it is recommended that the escape routes must not be used to store anything (International Finance Corporation 2010; IFC 2015), and combustible materials should not be found anywhere close to the exit. Handrails should not stick out to 114 mm from the wall, to ensure that the minimum width of accessible routes is not reduced (IFC 2015). Finally, the escape route floor should be slip resistant to prevent people from falling as

they rush to evacuate *(Ibid)*. The quick evacuation from the school buildings cannot be possible if there is no effective fire alarm systems in place that warns students and staff of the presence of a fire. As important as equipment to fight the fire is, it is equally important that as part of fire disaster preparedness, it is as easy as possible to leave the building in a hurry.

Access to buildings by fire-fighting apparatus should comply with the following rules, as set down in the IFC (2015):

a. Where there is only one access point, the width of the gate must not be less than 6.9 metres.
b. The available gates must be of the swinging or sliding type.
c. The gates should allow for operation by one person.
d. Electric gates should have an allowance for manual opening by the fire services personnel.

Finally, it is also important for the schools to be manned by school staff that have knowledge of using fire suppression equipment.

2.9   HAZARD AWARENESS AND HUMAN AGENCY IN DRR: PELLING'S ENVIRONMENTAL MODEL OF RISK

The reduction of risk from hazards of natural origin is a great challenge currently and extending into the future, especially under conditions of global climate change (Birkmann et al. 2013). In the past, researchers focused on understanding the hazard and preventing the hazard, but over the years, there has been a paradigm shift towards recognising that simply 'stopping' the hazard is only part of the problem (Wisner et al. 2003). It became obvious that understanding the underlying root causes and vulnerabilities that put certain people/communities at risk needs to be addressed, and is in fact more important than simply understanding the physical hazard *(Ibid)*.

Pelling (2003) developed a model to systematically examine relationships between the environment, location, people and their socioeconomic position vis-à-vis hazards and resulting disasters. In this model, Pelling (2003) seeks to explain and explore the integrated nature of the physical hazard, vulnerability and resilience, which is very important in trying to analyse or unpack disaster events and risks in different regions. Pelling's (2003) model will serve as the theoretical framework in this study. Furthermore, Pelling (2003: 47) reckons that "the challenge today is to integrate agency and structure in examinations of the production of vulnerability". Consequently, to aid his explanation, Pelling (2003) identified what he calls 'The components of environmental risk', as presented in Figure 2.1.
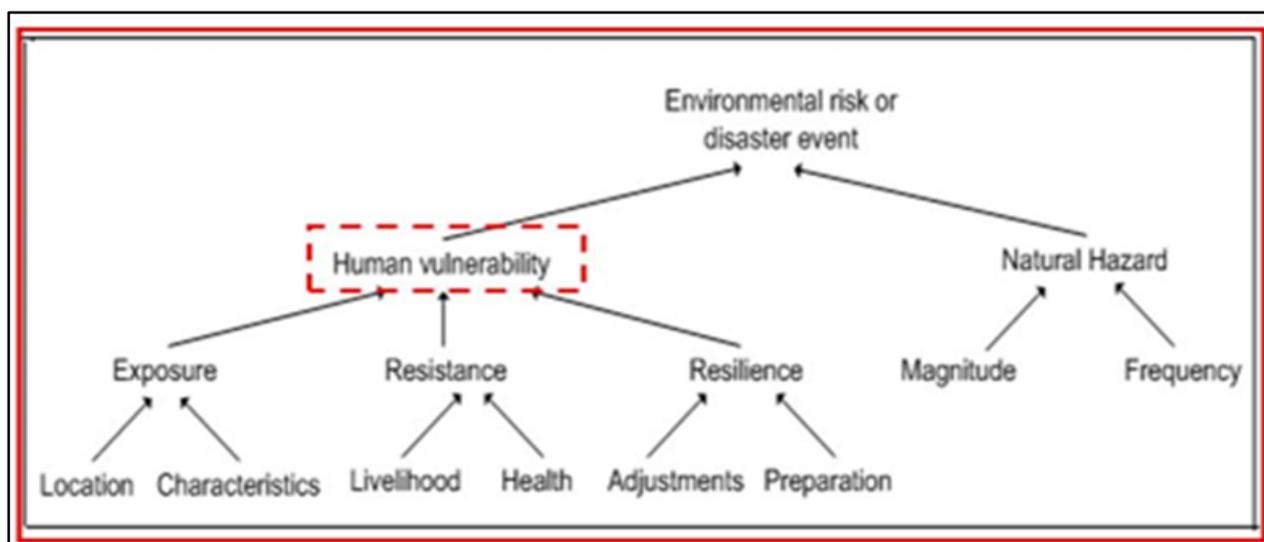
Figure 2.1 Components of environmental risk.   Source: Pelling (2003: 48).

Pelling (2003) asserts that environmental risk is the outcome of physical pressures in the form of environmental hazards and human pressures experienced as vulnerability. Wisner et al. (2004), in agreement, argue that disasters are the result of the progression of vulnerability, which emanates from root causes, which may have origins in the global political economy and climate change. This vulnerability occurs through intervening changing forces, which link global and historical forces with prevailing conditions like an absence of institutions, increasing levels of urbanisation and local topography *(Ibid)*.

Vulnerability is defined as "the characteristics and circumstances of a community, system or asset that makes it susceptible to the damaging effects of a hazard" (UNISDR 2009: 30). Pelling (2003) divides vulnerability into three components: exposure, resistance and resilience. Exposure is largely a function of the physical location and the make-up of the surrounding's built and natural environment *(Ibid)*. UNISDR (2009: 15) defines exposure, "as people, property or other things found within hazard areas that are subject to potential losses".

The second component of human vulnerability according to Pelling (2003) is resistance. He argues that resistance reflects economic, psychological and physical health and their systems of maintenance, which represent the capacity of a person or community to absorb the impact of a hazard *(Ibid)*. He asserts that to succeed in enhancing resistance, focus should not be on directly tackling disaster vulnerability, but rather efforts should be on wider goals that foster economic, social and political inclusion *(Ibid)*.

The last component as presented by Pelling (2003) is resilience, which defines as the capacity of an individual or community to cope with or adapt to hazard stress. Pelling (2003) further explains resilience to be an outcome of the extent of deliberate preparation undertaken in the light of a possible

hazard and of spontaneous adjustments made in response to the hazard, including relief and rescue *(Ibid).* Resilience is a new analytical dimension to disaster risk assessments (Bujones et al. 2013). "A community does not need to be resilient to every shock or stressor but it should have mechanisms in place to address the shocks and stressors it is most likely exposed to" (Bujones et al. 2013: 10). Bujones et al. (2013:6) further suggest that "To analyse a community's resilience, it is important to look at ten factors of resilience within three broad categories: institutions, resources and adaptive facilitators. The ten factors, grouped into three categories are: the legitimacy and effectiveness of institutions; the availability, performance, diversity and redundancy of resources; and the networks, values and behaviours, innovation, and institutional memory, which comprise the adaptive facilitators. Institutions provide the rules and regulations that govern communities; resources are the tangible assets available to them; and adaptive facilitators are intangible elements of social capital and patterns. Institutions, resources and adaptive facilitators are critical because together they constitute the means by which all actors are able to mitigate, adapt and recover from shocks and stressors. However, efforts by individuals or communities to institute hazard mitigatory measures, hinge on their risk perception of the potential danger and its likelihood to occur (Pennings & Grossman 2008; Wachinger et al. 2013). Risk perception and danger awareness is the subject of the following section.

2.10   RISK PERCEPTION AND DANGER AWARENESS AS DETERMINANTS OF PREPAREDNESS LEVELS

According to Wachinger et al. (2013) and Tancogne-Dejean and Laclemence (2016), risk perception has a large bearing in risk management and risk control, as well as in crisis anticipation and in the community's support for prevention strategies. According to Pratt (1964); Maccrimmon & Wehrung (1986); Slovic (1987); Pennings & Wansink (2004), there are two dimensions that influence decision makers' response to risk: the content of the risk and the likelihood of real exposure to that content. "The first dimension deals with the impact of an event while the second dimension reflects the likelihood of the risk content actually becoming manifest" (Pennings & Grossman 2008). Risk perceptions, according to Pennings and Grossman (2008), range from high to zero perception.

Arguments have been put forward suggesting that people with low risk perception are less likely to heed warnings and institute preparedness measures compared with people with a high-risk perception (Ruin et al. 2007; Hung et al. 2007). Tancogne-Dejean and Laclemence (2016) contend that people, who have been in a dangerous situation before, such as a fire, develop strategies after the event; they become hyper-aware of their surroundings, they look for signage that point to emergency exits and look for fire extinguisher locations. Tancogne-Dejean and Laclemence (2016) argue that the memory of a fire changes risk perception. Wachinger et al. (2010), in support of Tancogne-Dejean and

Laclemence (2016), believe that personal experiences of a hazard are a strong determinant of risk perception.

The UK's Department of Communities and Local Government (2008), in their quest to understand people's attitude towards fire risk, discovered that risk perception varies among people. This variation can be attributed to the individual's subjectivity nature of vulnerability, level of care and protection, the possible deadly effects, as well affective features like the imagined control over the risk and its predictability. For example, their research revealed that there appeared to be a link between people's self-evaluation of these factors and their ability to assess the factors exposing them to higher risk like smoking and physical disabilities. Additionally, the belief by citizens that they do not possess sufficient knowledge about potentially effective preparation strategies makes them unwilling to prepare for disasters (Tierney 1989).

Helsloot and Ruitenberg (2004) note that people tend to prepare only for threats they perceive as imminent and require the risk to be worth their time and effort to prepare for. Paton et al. (2008) argues that the moment people consider their environment safe, simultaneously their risk perception and their level of perceived need to adopt protective measures decline. Tierney (1989) remarks that sometimes the lack of disaster preparedness can be attributed to the remote chances of the disaster happening to be worthy of preparation. Literature has shown that low risk perception often leads to lack of preparedness by the exposed communities. As a result, risk perception has become an important component of this research in Kayamandi schools to gauge their fire risk preparedness, especially considering the lack of records of any notable fires in the participating schools in the past.

2.11   SUMMARY

This chapter provided a review of existing literature regarding disaster preparedness in schools globally and in South Africa. Literature draws attention to arson as a leading cause of school fires, as in the case of India where 93 students perished at Lord Krishna School; in Sweden, where arson costs the country on average 50 million euro annually; and in England where 75% of school fires are a result of arson. The importance of international agreements like the Hyogo Framework and the Sendai Framework for Disaster Risk Reduction on the need to protect the learners from disasters was indicated. The chapter also discussed global and South African school safety policies, with major attention having been on Colorado, in the USA, and India. Teacher capacity and competence to protect learners during a disaster, teacher training for disaster preparedness, importance of disaster preparedness plans, safe school facilities and perspectives and definitions of Pelling's (2003) model have also been analysed. The chapter concluded by analysing how risk perception influences levels of preparedness to disasters in communities.

CHAPTER 3: METHODOLOGY

3.1   INTRODUCTION

This chapter provides the research methodology of the study. According to Newing (2011:63), a methodology is "a plan of carrying out a particular piece of research in order to address the overall aim". The research was aimed at exploring the level of preparedness to fire risk in Kayamandi township schools based on the perspectives of the school staff and conditions at the schools. This was approached using Pelling's (2003) model as a theoretical framework to understand to the situation in Kayamandi schools. A qualitative research approach was used in this research because it helps to interrogate the subjective nature of perceptions. A qualitative research approach produces a detailed description of interviewees' feelings, opinions, and experiences, and interprets the meanings of their actions (Denzin 1989).

3.2   STATE OF PUBLIC SCHOOLS

The main purpose of this study is to explore the level of preparedness to fire risk at schools in Kayamandi Township, South Africa. "The term township, has no formal definition but is commonly understood to refer to the underdeveloped, usually (but not only) urban, residential areas that during apartheid were reserved for non-whites (Africans, Coloureds and Indians) who lived near or worked in areas that were designated 'white only' (under the Black Communities Development Act [Section 33] and Proclamation R293 of 1962, Proclamation R154 of 1983 and GN R1886 of 1990 in Trust Areas, National Home lands and Independent States), (Pernegger & Godehart 2007:2).

Kayamandi Township was selected specifically because it is home to under-resourced schools as it is a township. It is possible that disaster preparedness levels are not uniform in South African schools mainly due to unequal infrastructure development and unequal access to resources by public schools compared to private schools. The National Education Infrastructure Management System Report (NEIMS 2011), which contains statistics gathered between 2009 and March 2011, reported that out of 24 793 public schools countrywide:

- ❖ 3 544 did not have electricity while 804 had unreliable electricity;
- ❖ 2 402 had no water supply and an additional 2 611 had unreliable water supply;
- ❖ 913 did not have ablution facilities;
- ❖ 22 938 schools did not have stockpiled libraries while 19 541 schools did not even have space designated as a library;
- ❖ 21 021 did not have science laboratory facilities;
- ❖ 2 703 schools did not have any fencing and

❖ 19 037 schools did not have a computer laboratory.

Furthermore, as reported in the Mail and Guardian newspaper (Soon-Shiong 2017), the recent National Education Infrastructure Management System data in the Eastern Cape revealed that 1 955 schools use pit latrines or have no ablution facilities at all, 53 schools have no water supply and 177 schools do not have electricity. The NEIMS statistics and the Mail and Guardian story by Soon-Shiong (2017), which address priority issues regarding school facilities, resources, and access to critical services, do not mention issues relating to school safety, beyond a reference to perimeter fencing. The NEIMS (2011) report highlights the poor conditions in the public schools which emphasises the importance of exploring the extent to which public schools are equipped to deal with fire risk considering that they operate within limited budgets.

3.3   SITE DESCRIPTION

Kayamandi Township is part of Stellenbosch Local Municipality. The majority of the residents of Kayamandi are of African descent (Cain 2004). Stellenbosch is situated 30 kilometres east of Cape Town in the Western Cape Province of South Africa. Figure 3.1 shows the location of Kayamandi Township relative to broader Stellenbosch.
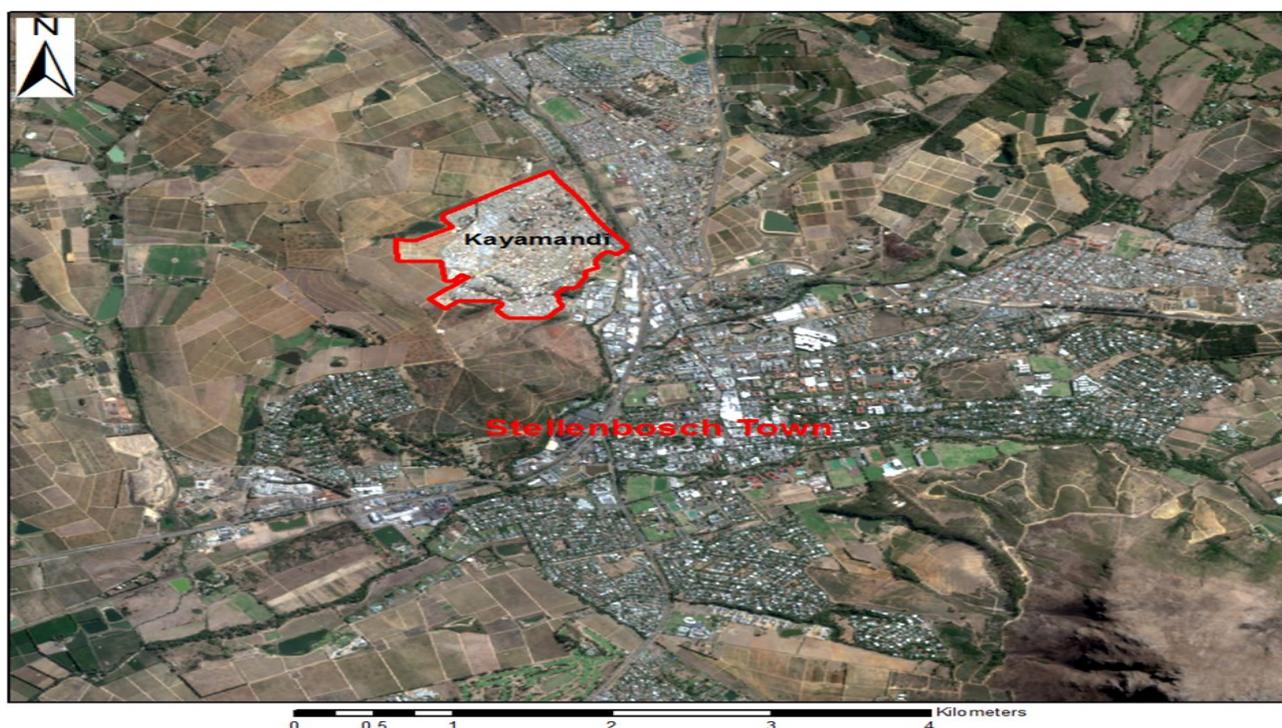
Figure 3.1 Position of Kayamandi Township within Stellenbosch

For a comprehensive illustration of the demographics and socioeconomic situation in the four wards that make up Kayamandi Township, see Table 3.1 below. In Table 3.1, only the dominant racial group

is included, but please note that the ward characteristics are applicable to all race groups that live there (Stellenbosch Town Integrated Development Plan [IDP], 2017-2022).

Table 3.1: Demographics and socio-economic situation in Kayamandi

Ward characteristics	Ward 12	Ward 13	Ward 14	Ward 15
Demographics	97% African	50.1% Coloured	94% African	92% African
Employed	67%	85%	61.9%	69.3%
Unemployed	32%	15%	30.9%	30.7%
Monthly income	R801-R 3200	R801-R6400	R801-6400	R801-6400
No matric above 20 years	69.1%	55.3%	64%	69.3%
Matriculated	26.6%	29.7%	29.6%	27.2%
Tertiary education	4.0%	9.5%	6.3%	3.3%
House or brick dwelling	13.9%	70.7%	27.6%	14.1%
Semi-detached house	11.2%	-	-	-
Informal in backyard	8.9%	9.8%	19.9%	-
Informal dwelling in informal settlement	64.3%	9.8%	47.9%	59.9%
Electricity for cooking	28.3%	67.3%	39.4%	51.9%
Electricity for lighting	59.3%	100%	92.6%	99.8%
Paraffin for cooking	51.0%	22.8%	42.9%	30.2%
Paraffin for lighting	39.9%	-	-	-
Potable water	100%	100%	99.7%	100%
Flush toilets/sewerage	98.6%	98.9%	95.5%	97.3%
Refuse removal	85.4%	98.6%	96.6%	98.0%

Source: (Stellenbosch Town Integrated Development Plan 2017-2022)

Although Kayamandi Township has patches of middle class households, most of its residents are poor to very poor. The monthly incomes for Kayamandi residents range between R801 and R6 400

(Stellenbosch IDP 2017-2022). There is high unemployment in the area, as can be seen in Table 3.1, and three out of four wards have an unemployment rate above 30%. In terms of health services, Kayamandi Township has one clinic which is staffed by 14 nurses and on average a single medical doctor caters for approximately 4 000 patients every month (Linder 2003). Even though there is a high proliferation of informal dwellings in Kayamandi, all four wards have high access to potable water, flush toilets connected to sewerage systems and their refuse is collected at least once a week (Stellenbosch IDP 2017-2022).

There are four schools in Kayamandi Township: Kayamandi Primary, Ikaya Primary, Makupula Secondary and Kayamandi High. These schools, for ethical reasons, henceforth shall not be referred to by their names to protect the identity of the research participants. As a result, the schools shall be referred to as school #1 up to school #4, in a random order. The school enrolment figures in the area currently range from between 890 and 1 650 students. The two primary schools cater for learners from grade R to grade 7 while the high schools have students from grade 8 to grade 12. In the four wards the percentage of people in the 0-14 age group is as follows: Ward 12, 27%; Ward 13, 22.8%; Ward 13, 26. 6%; and Ward 15 27.6%. The teacher-learner ratio is between 1:43 and 1:45. Figure 3.2 below shows the location of the schools in Kayamandi and Stellenbosch in relation to the Western Cape Province.
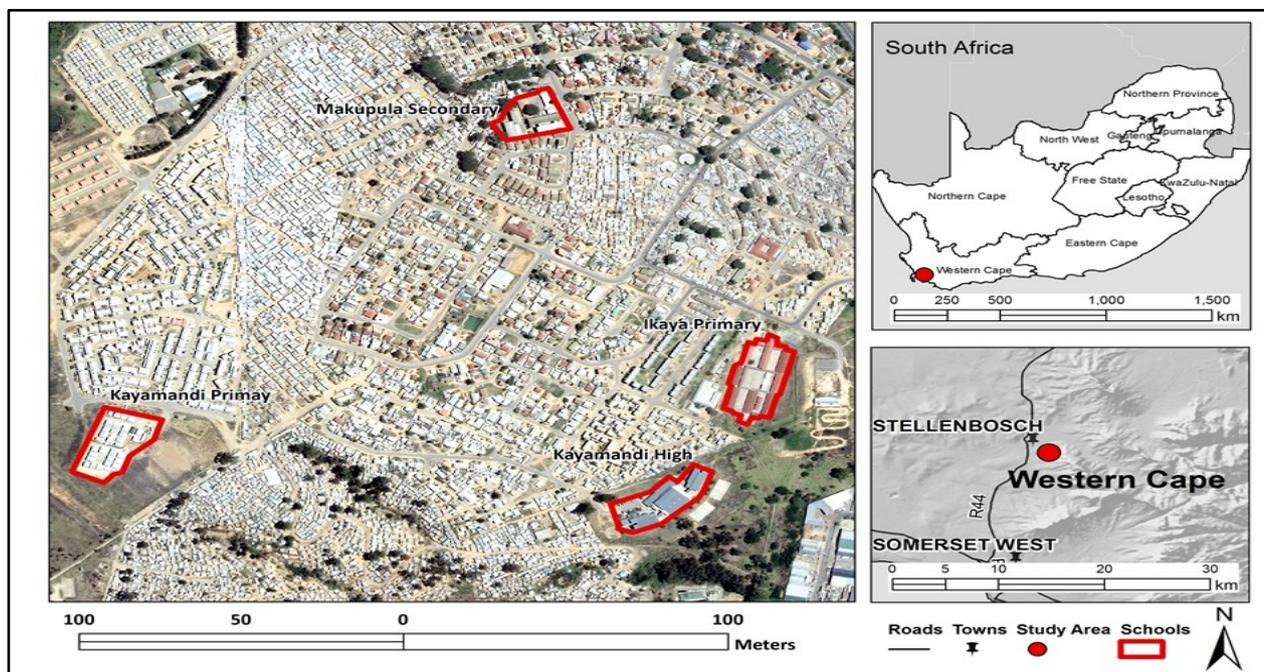

Figure 3.2 the geographical locations of schools in Kayamandi

3.4 SITE SELECTION

Kayamandi was chosen because, importantly, it is a township. As demonstrated in the NIEMS report (2011), township schools are not well resourced and most of them still do not have infrastructure that meets basic standards. This is irrespective of whether the public schools are in urban or rural areas. Secondly, the schools in Kayamandi are not fee paying, which means most, if not all, of their resources are allocated to them by the government and are mostly geared toward learner-teacher support. Thirdly, Kayamandi is a fire prone area, which heightens the fire risk to students, school staff and the school buildings. According to the Stellenbosch Municipality Fire Services' records, between 2015 and 2017, 104 informal dwellings and 22 houses were destroyed by fire (Fire services log books, 2015-2017). Two fatalities were recorded from these fires, and over the same period, the Fire Services Reaction team was called to Kayamandi 151 times to put out fires, which included grass, bush and rubbish fires *(Ibid).* Over the same period, the Fire Services Reaction team had to put out grass fires, five times in the schoolyard of school #1 *(Ibid).* All four schools in the area were included in the study because the use of multiple sites in the research made it possible for the researcher to explore the same phenomenon at different sites. This was beneficial in that it enabled the researcher to gauge the differences in their level of preparedness to fire risk, especially, since these schools share a common trait of being under resourced.

3.5   RESEARCH APPROACH

This research adopts a qualitative and case study approach. The qualitative approach is useful in that it allows the researcher to collect open-ended, emerging data with the primary intention of developing themes from the data (Creswell 2003: 18). As Creswell (2003) explains, qualitative approaches can consist of narratives, phenomenologies, ethnographies, grounded theory studies or case studies.

The advantage of this research technique is that respondents can be open minded and hence be more forthcoming in their answers. This research adopts a case study approach, as Stake (2006), Merriam (2009), Simons (2009), and Yin (2014) argue its fundamental goal is to enable an in-depth analysis of an issue, within its context, with a view to understanding the issue from the perspective of participants. As in other forms of qualitative research, the researcher seeks to explore, understand and put forward the respondents' perspectives by getting close to them in their natural setting (Creswell 2014). This interaction between respondents and the researcher is necessary to generate first-hand data, which indicates the researcher's level of connection and immersion in the field (Harrison et al. 2017).

3.5.1   Methods

The data was gathered through holding interviews with school principals, teachers, and non-school teaching staff from four Kayamandi Township schools (henceforth to be referred to as school staff), as well as the Stellenbosch Municipality Fire Services, Stellenbosch Municipality Disaster Management Centre personnel and Stellenbosch Education Circuit staff personnel. Additionally, transect walks, government records, media reports and other secondary sources were used during data collection. The rationale for adopting multiple methods to obtain data was to triangulate evidence, increase reliability and serve to corroborate the data gathered from other sources (Baxter & Jack 2008; Yin 2014).

According to Jones (2010), qualitative research methods make it possible to undertake in-depth, flexible engagements with research respondents. In-depth interviews were held utilising semi-structured questions to get the perceptions of how prepared the respondents were to deal with an outbreak of fire during class time. Semi-structured questions were very beneficial in that they afford the respondents some flexibility to give their own opinions and unprompted responses, without having to feel pressurised to choose from preselected responses (Packer 2011).

As alluded to earlier, semi-structured questions were used during interviews with school staff (see Appendix B). For the school staff, the thrust of the interview was to ascertain their preparedness levels, to act to protect the schoolchildren under their care in the event of a fire during class time. The Municipal Fire Services personnel and Stellenbosch Municipality Disaster Management Centre semi-structured questions (see Appendix C) centred on the history of fires in Kayamandi Township in general and in schools in order to understand their roles insofar as school fire safety is concerned.

The interviews were recorded and interpreted/transcribed, watching out for potential common themes and patterns. The interviews were 45 minutes to an hour long. All the interviews were conducted at the respondents' workplaces.

3.5.2   Sampling method

A purposive sampling method was adopted to select participants in this research. Purposive sampling is applied where people are chosen for a purpose, for example, people can be chosen on the basis that they are 'typical' of a group or those who represent diverse perspectives on an issue (Patton 1990; Leedy & Omrod 2001; Ravitch & Carl 2016). In this instance, the school staff were chosen because they could provide insight into the school's preparedness and response to fires as they worked in these schools. The Stellenbosch Municipal Fire Services personnel and Stellenbosch Municipality Disaster Management Centre staff were chosen because they could provide insight into fire risk and other risks in Kayamandi Township.

Furthermore, the Fire Services and Disaster Management personnel were chosen on the assumption that they were aware of the challenges and priorities for fire risk reduction in Stellenbosch and its schools. The Stellenbosch Education Circuit personnel were also chosen because of their important role as being the overseers of the Kayamandi schools. This group of people made up the participants who took part in interviews, as was assumed that they possessed the required information, which made them potentially credible sources for the research topic. The researcher had no option to choose participants within the schools, but had to work with those available.

The sample size comprised of twenty school staff; this meant the research drew five participants from each school in Kayamandi Township. Three interviews were held with the Disaster Management Centre and Stellenbosch Municipal Fire Services personnel. One Disaster Management Centre staff member participated in one transect walk at one of the schools. It would have been interesting and enriching to understand the perspective of students on the emergency processes, however, owing to strict ethical considerations by Stellenbosch University, especially with regard to minors, a decision was, made not to include them. Cognisant of that, the research was then shaped to focus more on the institutional arrangements and processes rather than only on individual responses and perceptions, including those of children. It is, assumed that the input from teachers reflects the knowledge students have about the precautionary measures to take in an emergency. The assumption is that the reaction of the students during a fire would largely be determined by the way the responsible school authority that is present acts.

Genuine attempts were, made to ensure gender parity in all situations. However, this was not possible as the teaching profession is still largely, dominated by women, with men still occupying most of the management positions in school. Table 3.2 depicts the gender distribution of the participants from the four Kayamandi schools.

Table 3.2: Gender distribution and responsibilities of respondents in Kayamandi schools

Position	Gender		Total
	Male	Female	
Principal	1		1
Vice principal	2	1	3
Safety officer	3	1	4
Groundsman	1		1
Teacher		7	7
Administration staff		4	4
Total	7	13	20

3.6   DATA ANALYSIS

The recorded interviews were transcribed. All the interview transcripts were examined and summarised for analytical purposes. During data analysis, emerging themes and patterns were identified for every transcript and categorised. The portions of each transcript were categorised according to identified themes. Unsurprisingly, owing to the sensitive nature of the topic there were glaring contradictions in the information provided by the respondents. The high levels of discordance exhibited by members of the same school in their responses prompted further probing. The probing was done through approaching the Stellenbosch Education Circuit personnel, having transect walks and self-completing a safety audit check list at every school checking what they had and did not have. The researcher was cognisant of the sensitivity of the research topic.

As Miles et al. (2014) suggest, as one searches for patterns it is also important to look out for gaps in the code set. The inductive constant comparison analysis method popularised by (Glaser & Strauss 1967) was, used in analysing the data. Fram (2013) explains that, constant comparison assures that all data are systematically compared to all other data in the data set. This is to ensure that all available data are equally analysed as opposed to some being over-looked or discarded on thematic grounds *(Ibid).* In instances where no similar themes existed a new category was formed. Glaser and Strauss (1967) believes it is through the constant process of making comparisons that aids the analyst in identifying a conceptual category and eventually define its properties and dimensions.

After the identification of categories, coding followed which enabled easy interpretation. Ravitch and Carl (2016: 248) define coding "as the assigning of meaning to data". Although there are numerous methods of data coding, the manual method of 'open coding' was used, which involved using sticky notes or different colour markers (*Ibid*) to highlight emerging themes. In this research, the method used involved manual identification of themes in each paragraph of every transcript. Thereafter, the themes were grouped and the meaning of each theme was analysed. Great caution was exercised to ensure minimum transformation of the data from its natural form. The findings were then analysed in relation to available literature relevant to the research topic. In the end, the data was interpreted and presented in a descriptive format.

3.7   LIMITATIONS

The researcher was constrained by the lack of availability of participants. The school staff could only be accessed at school during school time. It was discovered that the school staff were genuinely busy fulfilling their teaching duties. This was true especially at the end of the academic year in December and the beginning of the new academic year in January. Although it would have been beneficial to get the perceptions of students to fire risk, owing to time and resource constraints, as well as ethical

considerations, a decision was made not to include them. It was not possible to follow the stringent and rigorous process as demanded by the university's research ethics committee and meet their requirements within the short space of time that was available. The researcher was also worried about conducting research with minors, especially on such a sensitive topic as fire considering that many of them reside in informal settlements where fires are common and have widespread and devastating effects. It was feared that interviewing the children might potentially bring back traumatic and sad memories of past fire events they experienced. In the end, solace was found based on the assumption that all the information regarding fire risk and preparedness possessed by students reflects what the teachers know. As Barber and Mourshed (2007: 11) remarked, "The quality of an education system cannot exceed the quality of its teachers, and the only way to improve outcomes is to improve instruction".

During the interviews, it became clear that the topic was a sensitive one. This may explain why some of the school staff withdrew from the interviews upon hearing the questions that were being asked. Amongst those who agreed to participate some displayed visible signs of discomfort despite assurances that the interviews were confidential. Therefore, their contributions were made in hushed tones. To ensure credibility of the research, triangulation was adopted to broaden the data sources seeking to verify some of the participant contributions. This was done through looking at reports, having transect walks and interviews with multiple people from different backgrounds to get closer to the 'truth'.

3.8   ETHICAL CONSIDERATIONS

Ethical issues were considered to ensure the confidentiality of the research participants. The names of participants and schools involved are not used in the presentation of findings. Participants are referred to as teacher #1 or #2 and school #1 or #2 to ensure their anonymity. As argued by Creswell (2003), the participants should participate without undue pressure being put on them, and participants have the right to terminate their participation without being penalised. As a result, in this research all participants were made aware of their rights, as required by the ethics committee. All the participants signed consent forms agreeing to be recorded in the interviews. This followed the successful application for ethical clearance to the Humanities Research Ethics Committee at Stellenbosch University. As mentioned above, no students or minors were interviewed for ethical reasons.

3.9   SUMMARY

This chapter has presented the methodology, which outlined the qualitative research methods used in the study, and comprised the collection of primary and secondary data for Kayamandi Township schools. The chapter also looked at the state of public schools in South Africa for the period 2009 to

2011 which reveals that most public schools still lack basic necessities like ablution facilities, libraries, and reliable electricity to mention a few. The chapter also provided a comprehensive description of the collection, analysis of the data, and socio-economic and site description of the study area. The data was collected through questionnaires from school staff, Stellenbosch Disaster Management personnel, Stellenbosch Fire Services staff, and through an interview with a Stellenbosch Education circuit staffer. Analysis of the data has, among other things, shown that Kayamandi Township is a predominantly African community, with a significant number of informal settlement dwellers; a large proportion of Kayamandi's population is poor and lacks tertiary education. The researcher found himself limited to working with the school staff presented to him by the school, as the teachers could only be accessed during school times. Lastly, ethical clearance to conduct the research was sought for and granted by the university ethics committee. No students were part of the research as the ethics clearance permission granted excluded the interviewing of minors without guardian consent.

CHAPTER 4: KAYAMANDI SCHOOLS FIRE EMERGENCY PREPAREDNESS LEVELS

4.1   INTRODUCTION

This chapter looks at how prepared Kayamandi schools are to protect both the students and school staff in the event of an emergency. This is important as school staff agency or preparedness knowledge alone is not sufficient to protect students and school staff, and the environment must be favourable for the implementation of emergency procedures and precautions by the school staff.

4.2   RESULTS OF THE SCHOOL SAFETY AUDIT CHECKLIST

The information presented here is a product of a checklist that was adopted from the Emergency Procedures for Schools: Regulations, Guidelines and Templates (Bendle, 2014). According to Bendle (2014), the guide was designed to help schools in the process of developing their emergency procedures based on legislative requirements as well as international best practice. The intention was not to adopt the guide in its entirety for the purposes of this research, and only the 'School Safety Audit' part was used (see Appendix D). The school safety checklists were given out at each school to a member of staff whom the school considered the most knowledgeable in terms of school safety. Unsurprisingly, three of them were safety officers and one was a principal. The responses from the School Safety Audit checklists are presented in Table 4.1.

Table 4.1 School Safety Audit checklist for Kayamandi schools.

Question	Yes	No
1. Do you have a school safety committee?	4	
2. Do you have an evacuation plan?	1	3
3. Do you have regular emergency drills?		4
4. Do you know the emergency telephone numbers?	3	1
5. Do you know past emergencies at the school?		4
6. Do you know how these emergencies were handled?		4
7. Do you know the hazards you may encounter in the future?	2	2
8. Do you know the effects of each hazard? *(Continued overleaf)*	2	2

Question	Yes	No
9. Do you have a contingency plan for each hazard?	1	3
10. Do you know how to raise an alarm in an emergency?	2	2
11. Do you know what action to take after the alarm has gone off?	3	1
12. Are exits free from obstructions?	2	2
13. Do you know where the evacuation area is?	3	1
14. Do you have fire-fighting equipment at school?	4	
15. Is the fire-fighting equipment sufficient?	2	2
16. Is the position of the equipment clearly marked?	4	
17. Do you know where the equipment is located?	3	1
18. Is the equipment, serviced regularly?	2	2
19. Do you know how to operate the equipment?		4
20. Do you have a first aid room?	1	3
21. Do you have up to date first aid boxes?	1	3
22. Do you know the amount of first aid boxes you have?	2	2
23. Do you have staff trained to perform first aid?	3	1
24. Does everyone know where to get the get the first aid boxes?	2	2
25. Do all teachers have a copy of the emergency procedures manual?		4
26. Does each class have a copy of the evacuation plan displayed for ease of use?		4
27. Does each class have a class register of the learners in that class and is it checked every day?	4	
28. Absentee Register: Is it updated daily so that, in the event of an emergency it can be used as a reference to track down the missing children?	4	

As can be seen from Table 4.1, all the schools have school safety committees, however, only one school claimed to have an evacuation plan. A request to see the evacuation plan did not yield a

positive result, as the school that claimed to have one could not locate it. As a result, it could not be ascertained what the contents of their plan were. Therefore, the school cannot be considered to have an evacuation plan. In an interview with the Fire Services, it was discovered that in the entire Stellenbosch Education Circuit, only three schools out of twenty-three had submitted their school safety plans to them for approval. Two out of the three school safety plans submitted to the Fire Services were approved.

Regarding the holding of regular emergency drills as stipulated by the Disaster Management Act #57 of 2002, Fire Brigade Services Act #99 of 1987 and the Occupational Health and Safety Act #85 of 1993, it is clear, as depicted in Table 4.1 above, that none of the schools are having regular drills.

Another important item on the School Safety Audit checklist was a question about alarm systems. Only two school representatives indicated that they knew how to raise the alarm in the event of an emergency. Regarding the issue of raising alarm in an emergency, the principal from School #2 said:

> "Since we do not have a fire alarm, we have told the learners that if the school bell rings three times consecutively they must all evacuate. However, I must hasten to add that since we had our last emergency drill a long time ago, not many of them may remember the meaning of the school bell ringing three times. Considering also that every year we enrol new learners it stands to reason that only a few learners will know that they should evacuate when the bell rings three times".

At school #1, they indicated that in an emergency, they use a public-address (PA) system, however the respondent was not sure if the PA system was audible in all classrooms. A teacher at school #4 said she has a whistle but doubted its effectiveness as she was fully convinced that no one would know the meaning if she blew it. Essentially, none of the four schools had a real fire alarm or smoke detectors. In these schools, it was also discovered that in the event of a fire, one of the staff members upon discovering the fire should make a phone call to the fire services. The time spent by a school staff member making a call to the fire services to deploy takes some valuable time as the fire may be getting out of control. In addition to the lack of effective fire alarm systems, the interviews revealed that none of the interviewees had the emergency services contact number saved in the cell phone. The emergency services number was only displayed in the administration office at all the schools. Therefore, upon discovering a fire, one has to go to the office to get the emergency services contact number – meanwhile the fire could be spreading, endangering students and destroying school property.

On the question relating to whether exit points or passages were obstructed or not, the responses were split equally. At one of the schools, during a transect walk, the researcher discovered that some exit doors were locked. Upon enquiring why the exits were locked, the researcher was told that it was a way of accounting for all people who accessed the school premises. They stated that one staff member was robbed at gunpoint in the school premises, therefore, the locking of some doors was meant to protect the school staff and students in an area they perceive as having high crime rates.

On the question of evacuation areas, research revealed that three of the four school safety officers interviewed knew where the evacuation area was at their respective schools. It was surprising to find that one school safety officer did not know where the evacuation area was. At another school, although their school representative knew where they have to evacuate to, their school does not have a real evacuation area – in an emergency, the students and school staff are required to gather in two streets. This site potentially endangers the students, as they must use roads used by vehicles as an evacuation area. However, even for those schools that have evacuation areas, some teachers expressed doubts over whether the available space will be sufficient to accommodate all the learners, considering the huge numbers at the schools. They pointed out that in an emergency, the students panic and get agitated. To demonstrate what they have witnessed during some fire events, which fortunately did not take place inside classrooms, but outside in the schoolyard, teacher #2 from school #3 said:

> "When there are small grass fires in the school yard, the learners show signs of anxiety and they become difficult to control. I am convinced this has something to do with the fires they have experienced at home. As you know many of our students live in informal dwellings that regularly burn down".

Vice principal #2 from school #4, supporting the above sentiments explained that:

> "When it starts burning in the township all the students who live in the informal settlement leave the classroom running without permission. Just imagine what it will be like if the fire was in the classroom. Honestly without training I will not know how to calm them down".

The views expressed above demonstrate that both the school staff and students need training on how to respond in the event of a fire. Lack of knowledge, regarding the precautionary measures to take in the event of a fire may have fatal consequences – as in India, where schoolteachers at the Lord Krishna School, in an attempt to calm down and control panicking and agitated learners, resorted to locking them in a classroom and 93 people died (Hindustan Times 2006).

Although all the schools indicated that they had fire-fighting equipment, two schools felt it was not sufficient. The transect walks and responses on the displaying of signage depicting the location of fire-fighting equipment showed that all was in order. However, at one school, there was a sign indicating that there should have been a fire extinguisher in the school library. Upon enquiring about the missing fire extinguisher, the researcher was told that it had been removed by some unscrupulous students who had been discharging the fire extinguishers.

It became clear from results of the school safety checklists and other interviews with school staff that the fire-fighting equipment was not regularly inspected. The school staff reported that the only time they saw the person responsible for fire extinguishers was on the days they were installed or the days they were replaced upon their expiry. In response to this lack of regular inspections, the Fire Services personnel reported that they did not have the capacity, as there was only one person responsible for carrying out such inspections. As established earlier, all the four schools representatives agreed about their inability to use the fire-fighting equipment. During the interviews, one respondent, when asked if she could use a fire extinguisher, said:

> "To be honest the only time I see the fire extinguisher is when I hang my jacket
> on it or dust it. It has never occurred to me that there is a need for me to know
> how to use it".

Of all the schools under study, only one has a first aid room, and only one school has up to date first aid boxes. Three out of the four schools have trained staff who are able to perform first aid procedures in the event of an emergency. However, out of the four schools, only schools #2 and #3 indicated that everyone knew where the first aid boxes were stored in their schools.

It was discovered that none of the schools had given teachers copies of the emergency procedure or displayed evacuation plans in the classes. All the schools were found to be keeping registers of the students in the respective classes and checking them every day. The school staff at all schools also reported that the absentee register is updated daily. Updating of the register is important as it enables the school authorities to identify the missing children and track them down in the event of an emergency.

When asked whether they thought their schools were ready to handle a fire emergency, most of the respondents said the schools were not ready. When asked to justify such a belief, most of them pointed to the lack of resources. Vice principal #3 from school #3 lamented that:

> Since we are a no fee-paying school our resources are already stretched. The
> funds allocated to us by the Education Department are, specifically geared

toward the provision of teacher learner support. This has the effect of pushing

school safety needs to the bottom of our priorities.

To ascertain the extent to which these township schools were under-resourced, an interview was conducted with a Stellenbosch Education Circuit staff member. In the interview, the assertion by the concerned schools that there was no budget for school safety was contradicted. He revealed that: "There is an office with a budget specifically meant to finance those kinds of things. The school governing bodies also have money which can be directed toward financing school safety".

A former member of a local SGB corroborated the sentiments expressed by the Stellenbosch Education Circuit staff member. The former SGB member alleged that at one point, school #3 had R1.3 million at its disposal. However, although the Kayamandi schools may have access to such an amount of money, these funds are used to finance the most pressing needs at the schools, thereby relegating safety issues. This is not surprising considering that one school in Kayamandi at last count had 1 530 students. Such a high number of students correspondingly require many resources to cater for all of them. However, one would argue that the holding of fire drills does not require money. While the purchasing and installation of fire warning systems, fire-fighting equipment and stocking of the first aid room requires money. As a result, the reason for not holding regular fire emergency drills by schools becomes elusive. Such a response then points to the issue of risk perception and the apparent lack of perceived risk.

4.3   SUMMARY

This chapter evaluated the fire emergency preparedness levels in Kayamandi schools based on the results of a safety audit checklist completed by the researcher during a transect walk with representatives of the respective schools. The results of the school safety audit checklist revealed the schools and school staff themselves were not prepared if a fire breaks out during school hours. The respective school representatives confessed that they could not operate fire-fighting equipment and the classes did not display copies of evacuation plans on their walls. However, three of the schools had teachers who had received first aid training, checked their class registered and updated them daily, ensuring easy tracking of missing students in the event of an emergency. Finally, the schools attributed their lack of preparedness to lack of funds.

CHAPER 5: FIRE RISK PERCEPTION IN KAYAMANDI SCHOOLS

5.1   INTRODUCTION

In this chapter, the perceptions to fire risk by school staff are presented and discussed. These perceptions were analysed utilising the methodological approach and analytical framework presented in chapter 3.

5.2   FIRE RISK PERCEPTION

One of the interview questions required the respondents to make a risk perception judgement regarding the likelihood of a fire breaking out at the school, or affecting the school from an external source. To achieve this, the school staff were asked to rank the potential hazards they believed the schools faced. Surprisingly, most respondents ranked crime at the top of the list, with fire mostly occupying the last position. When asked to give reasons for putting fire hazard at the bottom of the list, Teacher #3 from school #3 said:"I have been at this school for more than a decade. In all those years, there has never been a fire here. What I have experienced is crime and that is what needs to be fixed". This was a recurring theme throughout the interviews at the schools. Responding to the same question, safety officer #1 from school #4 reported that:

> "We have had a lot of burglaries here. Crime is high in the area considering that our school is in a township. At one point, two alleged criminals were burnt to death in full view of learners by community members; hence we have now employed security guards to provide a semblance of safety".

These findings are consistent with those made by Ruin et al. (2007) and Huang et al. (2007), who argue that people with low risk perception are less likely to heed warnings and institute preparedness measures, compared to people with a high-risk perception. The behaviour exhibited at school #4 of hiring security personnel to provide security at the school in response to high crime levels, support the findings made by Tancogne-Dejean and Laclemence (2016), who assert that personal experiences of a hazard are a strong determinant of risk perception.

A minority of respondents believe there is a high likelihood of fire breaking out at the schools. The list of the people who are convinced that the possibility of a fire breaking out is high consists of a disaster management official, vice principal at school #4, groundsman from school #2, teacher from school #2, principal from school #4 and an administrator from school #2. The respondents who strongly believe in the possibility of fires occurring in schools were asked to identify possible sources of that fire. Most of the respondents identified the gas stoves in the school kitchens – despite their

knowledge that the women who worked in the kitchen undergo constant training on the use of the stoves and putting out fire.

The groundsman at school #2 firmly believed the chances of the school experiencing a fire were very high. He attributed his fears of a fire at the school to the existence of informal settlements situated within a few metres from the school and dry grass separating the school from the informal settlement. At school #1, vice principal #1 had this to say about the high possibility of a fire at that school: "I firmly believe the school is exposed to fire risk. The threat comes mainly from the low hanging illegal electrical wire connections made by the community and from the grass surrounding the school". When asked what they were doing as a school to manage the fire risk, the groundsman at school #2 said there was not much they could do about it, as they had no authority to remove the informal dwellers. School #1's vice principal argued that apart from cutting some grass surrounding the school structures, their hands were tied regarding illegal electrical wire connections. He indicated that hiring a tractor to cut the grass contributed to the depletion of their meagre resources, therefor they could not cut the grass as often as they preferred. The vice principal's reference to the cost of cutting grass shows that the school's decision to manage the hazards is dependent on the availability of resources.

Although most of the respondents did not consider the students and school staff to be in immediate fire danger, they expressed a strong willingness to be ready for any eventuality. The school authorities in Kayamandi vowed to take corrective measures to enhance fire safety levels in their respective schools.

It was interesting to note that none of the respondents mentioned arson as a potential source of fire at the schools. Literature and media stories have revealed that in most countries experiencing school fires, these are mostly arson related. The perpetrators behind the school fires in most cases are either current students, former students or neighbourhood delinquents (Merseyside Fire & Rescue Service n.d.; Schools Uganda 2015; Ekbrand & Unhnoo 2015). The groundsman from school #2 had this to say about the possibility of fire at that school being a product of arson:

> "Our policy at this school is that we must treat and we do treat all our learners
> and the community fairly and with respect, hence there is no motivation for them
> to intentionally start a fire".

All the school staff admitted that participating in this research had given them a new perspective regarding fire risk. This was shown by their enthusiasm to know more, eagerness to manage fire risk, and the admission that they needed help. The vice principal #1 from school, #4 had this to say:

> "I must admit that my knowledge about fire risk was very minimal. That may
> have caused me to be complacent about the dangers of fire at this school. Now
> that you have brought up the issue, I must thank you for opening my eyes. Being
> truthful believe me can save lives".

The principal at school #2 was also forthcoming in his admission that his perception of fire risk had suddenly risen during his interaction with the researcher. His new perspective of fire risk made him aware of the gaps in fire preparedness at the school. He admitted that the school on its own lacked the skill set and competence to be fire safe. The situation at the school seem to corroborate findings by Tierney (1989) who argues that when citizens believe they do not possess sufficient knowledge about potentially effective preparation strategies, it makes them unwilling to prepare for disasters.

Based on the information from the various stakeholders, it became clear that there was a lack of communication between the various stakeholders. The schools stated that they were waiting for Fire services and Disaster Management personnel to have fire drills or to enhance their safety, while Fire Services and Disaster Management stated that they were waiting for invites from the schools, as they believed going there without being invited was not proper. It seemed it was also not clear whose responsibility it was to ensure that students, school staff and school infrastructure were protected from potential disasters. Through this process, the researcher ended up acting as an intermediary between the Municipal Fire Services, Disaster Management Centre and schools, and this resulted in the re-establishment of communication lines between the stakeholders. Better communication between the groups will result in greater safety of students and school staff in Kayamandi schools.

Another interesting finding was that all the Kayamandi schools, since their inception, have not experienced any notable fire emergencies; school staff who have been at these schools since they were established and the Municipal Fire Services have no record of having attended to any major school fire in Kayamandi in the past.

The school staff were asked whether they knew the hazards they were likely to face in the future; two respondents cited drought as the most likely, and one stated climate change was a pressing hazard. This response is not surprising considering that the world is currently grappling with disasters attributed to climate change. The citing of drought as a potential hazard of the future was not surprising considering that News24 on 2 February 2018 reported that the Theewaterskloof Dam which serves as the main reservoir of water for Cape Town was only 10% full (Chabalala 2018). In response to the low water levels in the main water reservoir, the Western Cape Province has, since been declared a national disaster area by the National Government (Magubane 2018). This state of affairs may have heightened the perception of the school staff about the drought hazard as they were

experiencing its effects. Respondents also stated that they did not know how they would tackle such hazards. They argued that for the most part it was beyond the control of the schools but the responsibility of the Education Department.

5.3   SCHOOL STAFF CAPACITY TO PROTECT STUDENTS DURING A FIRE EVENT

The findings from the interviews held with the school staff indicate that they have no knowledge or training on how to protect the learners if a fire breaks out during class time. Their inability emanates from their lack of knowledge of DRR in general and of fire risk awareness in particular. Some of the school staff were not sure of the meaning of the word 'hazard'. To enable effective communication, a definition was provided for each of the respondents. The school staff justified their lack of capacity to protect learners by claiming that they have not been equipped with the necessary skills. As teacher, #1 from school #4 confided in the researcher: "In my 25 years as a teacher and 10 years at this school, I have not received any in-depth education or training in emergency issues be it about fire or anything". This finding contrasts with the call by UNICEF (2009) that all governments ensure a high diffusion of DRR knowledge through teacher training and school curricula. The admission made by teacher #1 contrasts with the Japanese experience where all teachers are required to do disaster prevention courses (Hsu 2007). This research has highlighted the need for school staff to get training on how to administer first aid in emergencies and the operation of fire extinguishers. Furthermore, research has revealed that the school staff should be equipped with some knowledge of the appropriate precautionary measures to take during a fire emergency; these measures include, but are not limited to how they can calm down and control the students while guiding them toward the evacuation area.

The issue of dealing with fire drills in Kayamandi schools elicited conflicting responses – this was especially regarding the last time these schools had fire drills and the frequency they had them. This question proved to be a very sensitive one and a source of disagreement. Safety officer #1 from school #1 reported that there had been no fire drills at the school in the last six years. However, vice principal #1 at the same school argued that although he could not remember the exact year they had their last fire drill; it was not a long time ago. A similar finding and contradiction was recorded at school #2 where safety officer #2 and principal #1 contradicted each other. The principal believed they had their last fire drill in 2014, while the safety officer was adamant that they have them every year. Curiously, one teacher from school #4 who has been teaching at the school for a few years contradicted teachers who have been at the school since its inception almost a decade ago; the new teacher claimed she had participated in fire drills while veterans of that school said there had been no fire drills. Her claim can be attributed to her belief that she was duty bound to speak positively about the school and defend it whenever possible. These contradictions highlight the sensitivity of the topic.

In India, all schools are obliged to perform compulsory fire drills (Bhandary 2012). Ever since the holding of fire drills was made compulsory, Indian schools have been adhering to the rules (The Times of India 2017; Bhandary 2012). In Japan, disaster prevention knowledge is treated as the bedrock of disaster prevention in their education (Chen et al. 2012). However, contrary to the Indian and Japanese experiences cited above, research in Kayamandi schools has shown that disaster risk prevention or preparedness is not a priority, as they are not holding fire drills as prescribed by South African law. Chief among the reasons for not holding the fire drills was the confusion regarding the roles of the school principals and the Fire Services. It seems it was not clear who was supposed to initiate the move to hold the fire drills.

According to a small number of school staff from Kayamandi who reported that they participated in fire drills, there was unanimity in their view that the training they received and subsequent fire drill they took part in was too short and shallow. They claimed that the fire awareness training and the fire drills together took between 45 minutes to an hour to complete. The school staff were unanimous in their need to get training on all aspects of fire emergency preparedness, which could improve their approach and reaction during a fire. Topping the list of the needed competencies by the school staff was fire extinguisher operation training and techniques to calm down the students to avoid a stampede as they lead them to the evacuation area. There was also agreement by those who claimed to have taken part in fire drills and awareness campaigns about the relevance of the fire awareness and training provided by the Stellenbosch Disaster Management Centre in coordination with the Stellenbosch Fire Services. Principal #1 from school #2 felt that for the fire awareness training and drills to be effective: "…the fire awareness training and fire drills need to be comprehensive and much longer. At the moment the training is designed like a crash course". Since there was a general admission by the schools that they had their last fire awareness training and drills a long time ago, the respondents were asked to furnish a reason for that. The school safety officers and school management said they had been waiting for the Fire Services and Disaster Management personnel to make the first move. When asked to comment on this the Municipality Fire Services personnel said: "As the fire services we cannot go to the schools uninvited. It is the responsibility of the schools to invite us and when that is done we will be happy to go". This finding shows that even though there are clear guidelines regarding the responsibilities of the School Municipal Fire Services and Municipal Disaster personnel, there was still some confusion. Legally however, it is the prerogative of the school principals to initiate the holding of fire drills. Part of Section 16A of the Schools Act stipulates that the duties of the principal include but are not limited to the management of staff affairs; the curriculum (instructional leadership); administrative affairs; physical facilities and school community relations (South Africa 1996b).

The lack of training to protect students in the event of a fire was amplified by the responses from two administration staff. In their responses to a question on whether they felt competent to protect learners or knew what to do when there was a fire, administration staff #1 from school #3 felt it was not her responsibility to protect students as every class has its teacher. She argued that it is the responsibility of those teachers to make sure their students are safe. As a result, since she was not responsible for any class, she saw no reason to be an expert in fire safety issues. Administration staff #2 demonstrated her lack of knowledge of the precautionary measures to take in the event of a fire saying that in a fire situation she would run for her life, leaving everything and everyone behind.

5.4   THE KAYAMANDI SCHOOLS' SITUATION EXPLANATION: ADAPTED VERSION FROM PELLING (2003) MODEL

An adapted version of Pulling's (2003) model is used to explain what could be happening in Kayamandi schools regarding fire risk preparedness; this is specifically regarding their state of preparedness, which by their own admission indicated their unpreparedness to protect the students and the school staff in a fire emergency. Figure 5.1 below is a representation of the adapted version of Pelling's (2003) model, as applied to the Kayamandi situation.
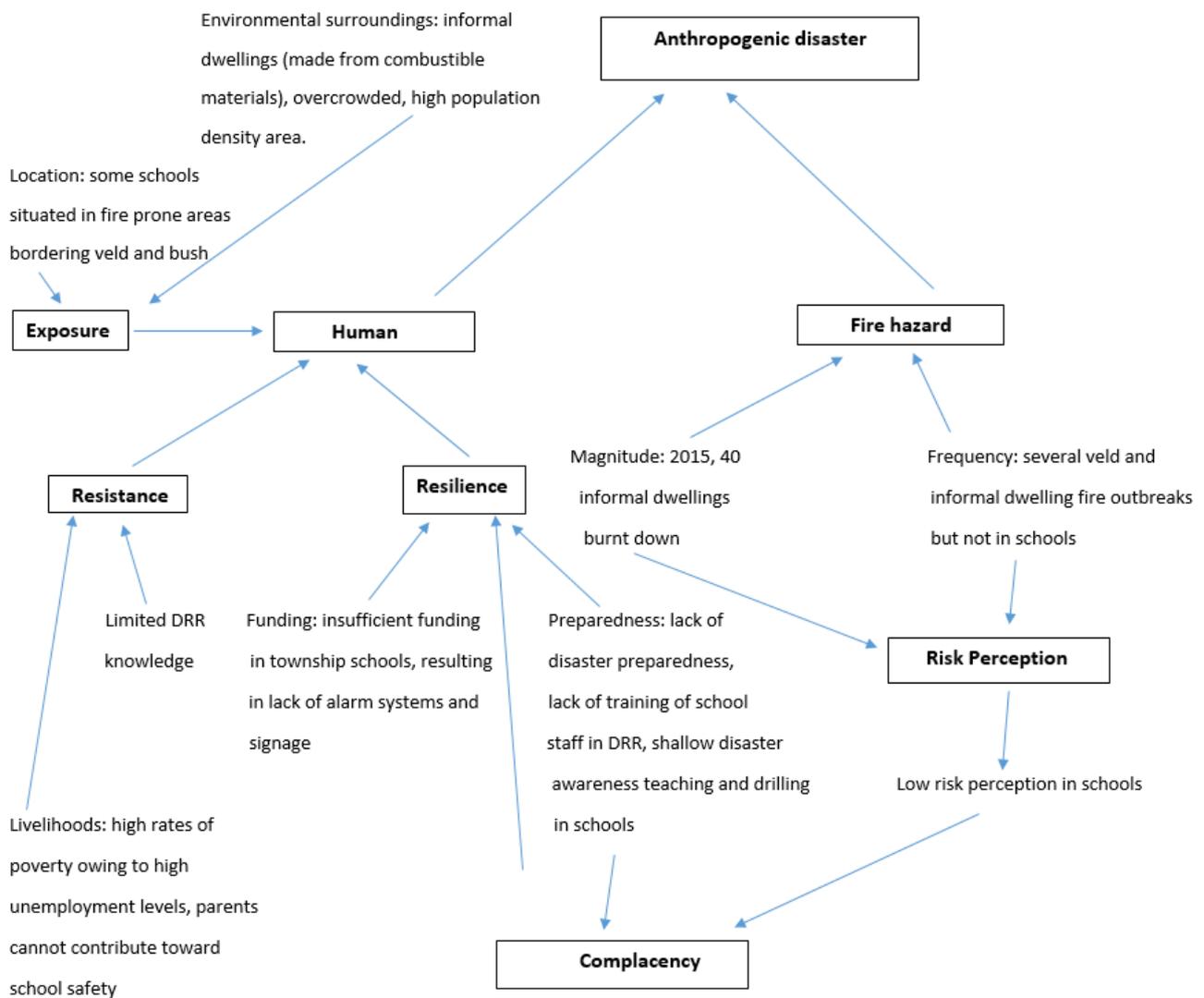
Figure 5.1: The components of fire risk in Kayamandi schools, adapted from Pelling (2003: 48).

As can be seen from Figure 5.1, this adapted version compared to Pelling's (2003) has anthropogenic disasters, whereas Pelling's (2003) model focusses on natural hazards. As a result, in his compilation of the components of risk and analysis of hazards, Pelling (2003) did not include fire risk, which can either have anthropogenic or technological origins.

Although Pelling's (2003) model includes important components that determine the preparedness of communities and individuals, he omitted two important components: risk perception and complacency. Risk perception and complacency have an important bearing on whether communities or individuals prepare for potential disaster emergencies or not. As mentioned earlier, most of the respondents in the Kayamandi schools were of the view that fire risk in the schools is very low. Consequently, this may have translated into a sense of complacency, resulting in the relegation of fire safety prioritisation to the fringes. In such a situation, the SGB would rather use the available limited resources to hire extra teachers or spend it on other pressing issues.

Risk perception is the other important component that Pelling (2003) omitted in his model. Risk perception plays an important role in shaping people's decision-making processes. This low perception to fire risk by some of the respondents is surprising, considering that these four schools are in an area with a history of fire devastation - a case in point is the blaze that razed to the ground 1 357 informal dwellings leaving 4 500 people homeless in Zone O on 14 March 2013, (Mposo 2013; Walls et al. 2017). It seems that all the fires that have occurred in Kayamandi have not heightened the fire risk perception of some members of the school staff, possibly because none of these devastating fires have been at the schools. Moradi (2016: 999) argues that "Fire spread between buildings occurs rapidly due to the proximity of dwellings, and is caused by a combination of convective and radiative heat transfer, which includes flame extension, direct contact and wind born fire brands". It is possible that owing to their lack of DRR knowledge, some respondents are not aware how easily a fire can spread from one structure to the other, and this could be the reason for their low fire risk perception, especially for the schools located within a few metres of informal settlements.

As illustrated in Figure 5.1, low risk perception engenders complacency. Complacency has resulted in low or non-prioritisation of fire safety in Kayamandi schools – especially since the participating schools have not experienced any fires before, and only a minority believe that fires will happen at their schools.

5.5   SUMMARY

This chapter has provided the responses from the school staff regarding their capacity to protect students in the event of a fire emergency. Insights into the fire risk perception in Kayamandi by school staff has established that fire risk perception is low; this has been attributed to the fact that there has not been any school fire incidences in the area. The research revealed the lack of role awareness by the relevant stakeholders on whose responsibility it was to conduct fire drills (schools indicated that they had been waiting for the Disaster Management Centre and the Stellenbosch Municipal Fire Services to have fire drills and to effect other general safety measures at the schools). An adapted version of Pelling's 2003 model was used to explain the fire emergency unpreparedness in Kayamandi schools. Perception is believed to play a role in either helping to prioritise a risk or in the way people choose to prepare for a risk. Finally, the responses and confessions by the school staff indicated that they do not have the capacity to protect the students in the event of a fire emergency.

CHAPTER 6: CONCLUDING THOUGHTS ON THE SAFETY OF LEARNERS AND SCHOOL STAFF TO FIRE RISK

6.1   INTRODUCTION

The aim of this research has been to explore the level of preparedness to fire risk in Kayamandi Township schools in Stellenbosch, South Africa using a case study approach. Colorado in the USA, India and South Africa's fire safety policies for schools were scrutinised. This chapter summarises and synthesises the findings, revisits the objectives and identifies the key limitations of the study. Thereafter there will be recommendations on how to enhance the safety of students and school staff against fire risk. Finally, suggestions for further research will be stated.

6.2   SUMMARY AND SYNTHESIS OF MAIN FINDINGS

The need to ensure the safety of students and school staff within the school was identified in the literature. This study focused on the exploration of the level of preparedness to fire risk in under-resourced township schools in South Africa. Various stakeholders took part in the study, and participants included school staff from four Kayamandi schools, Stellenbosch Municipal Disaster personnel, Stellenbosch Municipal Fire Services staff and Stellenbosch Education Circuit personnel. To aid in the understanding of the level of preparedness in the schools, Pelling's 2003 model was used to explain the factors that may influence the schools' agency to prepare for disasters. An adapted version of the same model with additional components such as complacency and risk perception, which were overlooked by Pelling in his 2003 model, helped in explaining the research findings. It emerged during the research that risk perception and complacency have shaped the decision making process of the Kayamandi school authorities regarding fire risk preparedness. The incorporation of risk perception and complacency into Pelling's (2003) model can be useful in emergency preparedness research, as it prompts researchers to consider other aspects that are often not considered. The main findings of the study were presented according the following lines of inquiry of the research: school emergency preparedness levels, fire risk perception in Kayamandi schools and school staff capacity to protect students.

6.3   KAYAMANDI SCHOOLS' EMERGENCY PREPAREDNESS LEVELS

The results of the school safety audit list, responses from participants and the discoveries made during transect walks have all suggested an element of unpreparedness in the schools. The school staff themselves were forthcoming in admitting that they were not ready to face a disaster anytime soon. It was established that none of the schools have held fire emergency drills in the recent past. It was

interesting to note that the stakeholders who are supposed to participate in the fire emergency drills could not say with certainty when they last had drills.

Although some schools in the study area claimed to have school safety plans, there was no evidence to support those claims at the Municipal Fire Services. Fire Services claimed that only three schools in the Stellenbosch Education Circuit had submitted school safety plans for approval. This was surprising considering that the area under the jurisdiction of the Stellenbosch Municipal Fire Services is not only composed of under-resourced schools but is also home to some very well resourced schools. This reflects a bigger problem of unpreparedness that is not only common in under-resourced township schools in South Africa, but across schools more generally in South Africa.

6.4   FIRE RISK PERCEPTION IN KAYAMANDI SCHOOLS

The discovery that only three schools in the Stellenbosch Education Circuit submitted school safety plans disproves the claim by Kayamandi school authorities attributing fire safety unpreparedness to precarious financial positions. The revelation that most of the schools do not have approved school safety plans may be a result of low levels of fire risk perception. The study has established that low fire risk perception is the product of a lack of fires in the schools past. Therefore, lack of resources and low risk perception has relegated the issues of fire safety to the background. This has resulted in school management not prioritising fire safety in schools, which leads to a lack of preparedness for fire emergencies.

Fire risk perception was discovered to be low in all the Kayamandi schools, which is a product of the absence of any recorded major fires at those schools. However, literature has revealed that the chances of a fire spreading from an informal dwelling to a nearby structure are high (Moradi 2016). The fact that some informal dwellings are located within metres of school classrooms at one Kayamandi school heightens the fire risk at that school.

The low fire risk perception identified in the study area has been a real surprise, considering the fire history and devastating impacts experienced in the Kayamandi area over the years, especially in the informal settlements. The Stellenbosch Municipality Fire Services logbook shows that between 2015 and 2017, 104 informal dwellings and 22 houses were destroyed by fire and two fatalities were recorded. As reported by Mposo (2013), a fire blaze left 4 500 people homeless after razing 1 357 informal dwellings to the ground. The study has shown that despite this evidence portraying Kayamandi as a fire prone area, some school authorities still doubt the possibility of fire affecting their schools.

6.5   SCHOOL STAFF CAPACITY TO PROTECT LEARNERS

Lack of training in disaster preparedness was identified as constraining the ability of the school staff to protect students in the event of a fire at school. This issue of lack of disaster preparedness knowledge was a common denominator in all Kayamandi schools.

During the course of the research, it emerged that the school staff did not have any DRR knowledge. They had not received sufficient training to enable them to protect students in the event of a fire emergency. This is inconsistent with practices in countries like Japan (Hsu 2007), Armenia and Sri Lanka (Shiwaku 2014) where teachers receive pre-service and in-service DRR education. The research in Kayamandi revealed that pre-service and in-service training in DRR ranged between non-existent and limited, depending on the interviewee. This lack of DRR training exposes students and school staff to great danger if a fire breaks out during school time, especially considering that most of the Kayamandi school staff do not know how to operate the firefighting equipment, calm down the students and in some cases did not even know the location of the evacuation area.

6.6   REVISITING THE OBJECTIVES

The first objective of the study was to explore international best practice for fire-safe schools and compare this to a South African case study. The aim of this comparison was to gauge how South Africa fares in terms of protecting students and school staff against fire disaster in schools. It was established that although South Africa has laws to provide protection to students and school staff, such laws are not stringent enough, nor are adhered to, compared to other countries. In Colorado, for example, the Fire Services enforce the fire safety rules through conducting rigorous fire safety inspections at schools (CGSS 2014). In South Africa, although the law mandates the installation of fire alarms in schools, there is a clause that says that this is if funding permits (South Africa 1996). This shows that some important things like alarms, which provide a warning about the presence of fire, are not always a priority. The schools lack the financial resources to pay for the installation of alarms as their budgets are geared toward meeting their more immediate basic needs. Schools, for example, are always looking to hire more teachers to ensure manageable teacher-student ratios. While in India, fire drills are now compulsory for all schools, and they have started complying with that regulation (Bhandary 2012), this study has established that schools in Kayamandi are not having regular fire drills.

The second objective was to determine staff members' level of awareness of fire risk and fire preparedness in their respective schools. The study revealed that their level of awareness of fire risk is very low which translated into very limited individual preparedness.

The last objective sought to discuss the challenges of reducing fire risk and the implementation of fire risk preparedness measures in under-resourced schools in South Africa. In this regard, conflicting reasons have been advanced as mitigating against the proper implementation of fire preparedness measures in Kayamandi schools. The school authorities pointed to a lack of funds as impeding efforts to make schools fire safe, while other stakeholders point to the lack of initiative by school authorities. The Stellenbosch Education Circuit staff made it clear that the school principals had the primary responsibility to ensure schools were prepared for fire emergencies and other hazards. This research also found that low risk perception and no previous experience of fires in these schools has led to complacency and a lack of prioritisation of fire emergency preparedness.

6.7   LIMITATIONS OF THE STUDY

The study encountered some challenges, which included but were not limited to the following:

1. Owing to resource and time constraints, the study was limited only to Kayamandi schools.
2. The research topic was a sensitive one, and engaging with the topic resulted in some glaring inconsistencies in the answers given during the interviews. The inconsistent responses were possibly a result of respondents trying to protect themselves from blame, or protect the image of the school. In some cases, the potential respondents were outright reluctant to participate while some opted out after hearing the questions.
3. Due to the stringent rules applied by the University Ethics Committee, it was not possible to get the students' perspectives regarding fire safety in schools.

6.8   FURTHER RESEARCH AND RECOMMENDATIONS

This study focused on exploring fire risk preparedness in Kayamandi Township schools; further research is recommended which focuses on a bigger area with a larger sample of schools from different socio-economic backgrounds. The scope of the study ideally should get the perspective of students regarding fire risk preparedness to gauge their DRR knowledge.

A finding during the study revealed that only three schools in the Stellenbosch Education Circuit had submitted school safety plans. Another potential area of research would be to look at the levels of preparedness between well-resourced and under-resourced schools in the area to ascertain whether they have the same or different constraining factors preventing them from achieving fire safe school status.

The study has revealed that there are no rigorous fire safety inspections in schools. It has also been, established that the schools are not submitting school safety plans for approval to the Fire Services. I recommend that instead of the Fire Services waiting for schools to be compliant with the law, they

should enforce compliance by asking to see the school safety plans. The Education Circuit Manager should also play a greater oversight role and should get evidence from schools of compliance with the fire safety rules. This research finding has therefore highlighted the need for effective warning systems such as smoke detectors and fire alarms to be installed in all Kayamandi schools.It became clear during the study that some stakeholders were not aware of the full extent of their responsibilities, particularly the issue of fire emergency drills. The school principals and safety officers it seems were not aware that it was their responsibility to initiate the holding of fire drills. It is therefore, recommended that the Stellenbosch Education Circuit Manager should ensure that the school principals are made aware of their full responsibilities.

Finally, it was found that at one of the schools in Kayamandi, there is no evacuation area because part of its yard was converted into an informal settlement by community members. Furthermore, the same school has a single access point, which is also too narrow. This makes the schoolyard inaccessible by fire trucks. I recommend that the Department of Human Settlements prioritise the allocation of formal housing to communities who have built on land belonging to the school. The relocation of these community members would free up space for the setting up of a wider access point to the school and enable the school to have an evacuation area.

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APPENDICES

APPENDIX A: APPROVAL LETTER TO COMMENCE RESEARCH

UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

NOTICE OF APPROVAL

REC Humanities New Application Form

16 November 2017

Project number: GEO-2017-1863

Project Title: Exploring the level of preparedness to fire risk in schools in Kayamandi township, South Africa.

Dear Mr Eunison Mugamu

Your REC Humanities New Application Form submitted on **06 November 2017** was reviewed and approved by the REC: Humanities.

Please note the following about your approved submission:

Ethics approval period: 16 November 2017 - 15 November 2020

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: Humanities, the researcher must notify the REC of these changes.

Please use your SU project number (GEO-2017-1863) on any documents or correspondence with the REC concerning your project.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

FOR CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD

Please note that a progress report should be submitted to the Research Ethics Committee: Humanities before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary)

Included Documents:

Document Type	File Name	Date	Version
Research Protocol/Proposal	To Go Proposal 2017.docxTO GO	04/11/2017	
Informed Consent Form	Staff Members U HUMANITIES Consent form template_Written 1 (1).doc TO GO	04/11/2017	
Data collection tool	Question guide 2017	04/11/2017	
Data collection tool	Question Guide for Disaster Management Centre Personnel	04/11/2017	
Proof of permission	Research approval letter (1)	04/11/2017	
Proof of permission	Makupula	04/11/2017	
Proof of permission	Kayamandi high	04/11/2017	
Proof of permission	Ikaya primary	04/11/2017	
Proof of permission	Kayamandi Primary	04/11/2017	
Data collection tool	Questionnaire for Disaster Management Centre Personnel	04/11/2017	
Data collection tool	Question guide 2017	04/11/2017	

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za.

Sincerely,

Clarissa Graham

REC Coordinator: Research Ethics Committee: Human Research (Humanities)

APPENDIX B: SEMI-STRUCTURED INTERVIEW GUIDE FOR KAYAMANDI SCHOOL STAFF

<u>Semi-structured Question Guide: Staff at Kayamandi Schools</u>

<u>Section A: Background information</u>

1. Gender
2. Type of school
3. What is your role at this school?
4. Can I ask how old you are – if you are not comfortable with giving exact age please just give approximate figure i.e. younger or older than 30.
5. What is your area of competence at this school?
6. What age group do you teach?
7. How long have been at this school?
8. Since when have you been a teacher?

<u>Section B: Fire management training/Fire risk in class</u>

1. Have you been trained to handle an emergency in the class?
    a. If YES, how do you do it?
    b. What kind of training did you have?
    c. How long was the training?
    d. When was it and do you think it was relevant?
    e. If NO, would you like training?
    f. What kind of training would you like?
2. What do you do if a fire breaks out during school time?
3. Does the school have fire extinguishers and do you know how to use them?
4. Have you received training on how to operate any other fire-fighting equipment? If YES, please give details.
5. Is there a fire alarm at this school?
    a. Is it within your reach from every class or office?
6. Do you feel prepared to handle a fire? Please explain.
7. Do you know the fire emergency number? If you do if you don't mind can you please share it with me?

1

8. Is there an evacuation area at this school?

    a. If YES, do you think it can accommodate all the students?

    b. If NOT do you feel there is a need to have an evacuation area?

9. Have you participated in fire drills?

    a. Was it at this school?

    b. How long ago was that?

Section C: General disasters/hazards

1. Which hazards do you think learners are most exposed to at this school?
2. Please explain your choice of hazard?
3. Could you please rank the hazards; which ones do you think need the MOST attention? Please explain.
4. Which hazards do you think are least important? Please explain?
5. Is the school doing anything to manage those risks you identified?
6. Has there been a fire before at this school?
7. What could be the reason there has never been a fire here?
8. Apart from electricity what other fuel types do you use?
9. Do you believe fire risk is significant at this school? If YES or NO – please explain.

2

APPENDIX C: SEMI-STRUCTURED INTERVIEW GUIDE FOR STELLENBOSCH MUNICIPALITY FIRE SERVICES AND DISASTER MANAGEMENT

Semi-structured Question Guide for Stellenbosch Municipality Fire Services and Disaster Management

1. What role do you play to ensure that schools under your jurisdiction are safe for the students and school staff alike?

2. Whose responsibility is it to initiate the holding of emergency fire drills in schools?

3. Do you remember the last time you had such emergency fire drills in Kayamandi schools?

4. Who is responsible for the installation and inspection of fire-fighting equipment in schools?

5. How often is the firefighting equipment inspected to ensure it is in perfect working order?

6. Do you have any records or recollection of school fires that have occurred in Kayamandi schools?

7. If there were such fires would you rate them as having been:
   a. Deadly
   b. Moderate
   c. Very minor

APPENDIX D: SCHOOL SAFETY AUDIT CHECKLIST ADAPTED (Bendle 2014)

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School Safety Audit

QUESTION Tick or Cross

1. Do you have a school safety committee?

2. Do you have an evacuation plan?

3. Do you have regular emergency drills?

4. Do you know the emergency telephone numbers?

5. Do you know of previous emergencies at the school?

6. Do you know how these emergencies were handled?

7. Do you know what hazards you may have to face in the future?

8. Do you know the effects of each hazard?

9. Do you have a contingency plan for each hazard?

10. Do you know how to raise an alarm when there is an emergency?

11. Do you know what to do when an alarm has been raised?

12. Are the passages free from obstruction?

13. Do you know where to assemble after an evacuation?

14. Do you have fire-fighting equipment at the school?

15. Is the fir-fighting equipment adequate?

16. Is the position of the equipment clearly marked?

17. Do you know where the equipment is situated?

18. Is the equipment serviced regularly?

19. Do you know how to use the equipment?

20. Do you have a first aid room?

21. Do you have up-to-date first aid boxes?

22. Do you know how many first aid boxes you have at your school?

23. Do you have people trained in first aid?

24. Does everyone know where these first aid boxes are?

25. Do all teachers have a copy of the emergency procedures manual?

26. Does each class room have a copy of the evacuation plan displayed for ease of use?

27. Does each class have a class register of the learners in that class and is it checked every day?

28. Absentee Register: is it updated daily so that, in the event of an emergency, it can be used as a reference to track down children who are missing?