

**FACTORS INFLUENCING PREPAREDNESS FOR DISASTER
RISK MANAGEMENT WITHIN THE CONSTRUCTION
INDUSTRY IN NAIROBI COUNTY, KENYA**

CAROLINE S. GAKII NGONDI

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DECLARATION

This thesis is my original work and has not previously been presented in any other University or institution of higher learning for any kind of award.

Signature

Date.....

Ngondi Gakii S. Caroline

Reg No: L50/82738/2012

This research project report has been submitted for examination with my approval as University Supervisor.

Signature

Date

Dr. John Mbugua

Department of Extra Mural Studies

University of Nairobi

DEDICATION

I dedicate this work to my mother Jane Nkuene Ndegwa, and my sister Damaris Mwendwa Ngondi.

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ABBREVIATIONSAND ACRONYMS

CBD	:	Central Business District
CRED	:	Centre for Research on the Epidemiology of Disasters
FAO	:	Food and Agricultural Organization
FGDs	:	Focused group discussion
MDGs	:	Millennium Development Goals
NACOSTI	:	National Commission for Science, Technology & Innovation
NCA	:	National Construction Authority
OLS	:	Ordinary Least square
UNEP	:	United Nations Environmental Program
UNISDR	:	United Nations International Strategy for Disaster Reduction
USAID	:	United States Agency for International Development
WHO	:	World Health Organization

ABSTRACT

Disasters have been a detriment to development in society causing extensive destruction, disruption of people's lives and causing human suffering with communities unable to cope under these conditions. Disaster preparedness is the most appropriate way to avert and minimize the damage safer in case of disaster occurrence. This study sought to investigate the factors influencing the preparedness for disaster risk management within the construction industry in Nairobi County, Kenya, with the objectives of establishing the influence of the level of knowledge; vulnerability of the building; regulatory framework; and demographic characteristics on preparedness for disaster risk management in the construction industry in Nairobi County. This was done through a descriptive research design on a population of 45,000 buildings in Nairobi County from which a sample of 138 buildings were sought using stratified random sampling technique. Data was collected by use of a semi structured questionnaire offered to the building managers and owners. The study applied both descriptive and inferential statistics to come up with the findings and conclusions from which policy recommendations were made. The study established that preparedness for disaster risk management is statistically significantly influenced by building owner's knowledge level, vulnerability of building, existing regulatory framework, and the prevailing demographic characteristics of owners with positive regression coefficients confirming that the four factors have a positive influence on disaster preparedness within the construction industry. The study therefore recommends that stakeholders in the sector should increase and widely advertise training on disaster risk management in enhancing their awareness and hence improve disaster preparedness and while at it introduce aspects of knowledge, vulnerability of building, regulatory frameworks, and demographic characteristics so as to ensure that they are able to maximize on ensuring disaster preparedness.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Disasters occurrence have claimed many lives and led to the destruction and loss of a great deal of property globally. This has led to an exigent need to lessen disaster risk and cultivate an irrepressible community able to recover from or avoid disasters in many countries. Disasters occurrence have led to widespread destruction, disrupting the lives of people affected by causing suffering, with such affected groups finding it hard to cope under these circumstances. People may lack the muscle to stop disasters from happening, they however have the power and ability to adapt, survive, and minimize the negative effect of the disaster on their lives (Deshmukh *et al.*, 2008). Annually, disasters have been identified as the cause to an extensive amount of damage globally (Ofori, 2004). Over the past few years, statistics indicates an increasing trend in the number of disasters occurrence and the impact on economic, human and structural state has tremendously increased. Going by the official statistics and issued by the United Nations International Strategy for Disaster Reduction (UNISDR) in 2010 and Centre for Research on the Epidemiology of Disasters (CRED) and natural disasters have led to loss of more than 780,000 lives in the last ten years and damage of at least US\$960 billion worth of property and infrastructure (UNISDR 2008).

The construction and built environment sectors are keen disaster management issues. According to (Kelly, 1996), disaster management can be described as the activities designed to mitigate the emergence of emergency situations and disasters and to provide a framework of securing those under risks. Disaster management is an integrated process of planning, organisation, coordination and the implementation of measures required for effectively dealing with its impact on people. This comprises of practices such as preparedness, mitigation, prevention, response, assessment, capacity building, rehabilitation and rescue (Deshmukh 2008). Additionally, the task of disaster managers in evading, salvaging, clearing, rehabilitation and reconstruction fully or partly necessitates serious inputs by the construction industry. Warfield (2004) opined that disaster management efforts aims at avoiding, or otherwise, reducing the possible losses due to hazards, promoting quick response to disaster management, and seeking to accomplish a rapid and effective recovery. Therefore, disaster management involves handling of the circumstances prior, during, and after the occurrence of disasters and in all these phases, the role-played by the construction industry is essential.

Disaster preparedness, which is mainly in the ‘prior’ phase, is an integral part of disaster management. Disaster preparedness refers to actions and measures undertaken in advance to warrant effective reaction to the occurrence of hazards, comprising the provision of timely and convenient early warnings, temporary evacuation plans of people and property from threatened locations (Rees 2009).

Natural phenomena like earthquakes, hurricanes, landslides, volcanic eruptions, and floods affect buildings and constructions. Buildings and constructions are also predisposed to anthropogenic (man-made) events such as collapse, fires, gas leaks or explosions which can also damage them (WHO, 2000). There are varying measures of disaster management directed to mitigating both natural and manmade disasters with various methods of implementation and costs. The most economical and easiest is the non-structural, organizational and administrative aspects; the structural measures are however the most complex and costly. Through the policies managing building procurement, design and construction of disaster proof buildings, the construction industry is essential to disaster resilience advancement. The role of the industry in disasters response cannot be underestimated –the removal of collapsed and damaged infrastructure and buildings and creating temporary services and shelter in the affected societies - and reconstruction after the disasters.

A framework that includes planning and formulation of policies, training and exercise; acquisition of important equipment and infrastructure needed for emergency response; and the acquisition and improvement of knowledge and capabilities of staff can be applied towards the achievement of disaster preparedness (Aldunate *et al.* 2006; Rees 2009). Despite the fact that among the key constituents of disaster preparedness practises is planning, it’s essential to note that the written plan does not warranty preparedness achievement (Rees 2009), but rather can be viewed as one of the foundations of disaster preparedness designed to enhance emergency response (Aldunate *et al.* 2006). Progress towards the achievement of the objective of a “culture of prevention” has previously been made in numerous countries leading to the advancement of laws and policies, institutional frameworks and planning, and a growing number of risk reduction initiatives (Lorch 2005).

Most of African disaster management initiatives tend to a large extent to focus on the national and to small extent sub-regional levels. Majority of these disaster preparedness efforts in

Africa have actually focused on responses instead of mitigation (UNEP, 2002). Disaster preparedness and management is a vital tool in saving lives of individuals involved in various disasters and other risky situations. The Kenya Disaster Management Draft Policy (2009) recognized the importance of disaster preparedness and underscored the need for proactive and preventive approaches of addressing disaster circumstances gained from the experiences and lessons learnt while managing previous hazards and disasters (Republic of Kenya, 2010). The Kenyan disaster profile comprises of fire, droughts, terrorism, floods, diseases, technological accidents, and epidemics that disrupt and in some instances, destroy livelihoods and infrastructure, leading to diversion from the planned use of resources and interruption of economic activities, and eventually end up destroying development (Murage, 2012). In the last two decades, Kenya has been a scene of various construction disasters which have caused many deaths and destruction of properties. The disasters have brought out the need for Kenya to create more awareness of the threats posed by poorly done construction projects.

Disaster occurrence is common in Nairobi County with cases of building collapse, fires, road accidents, hazard material, floods and waterborne diseases outbreaks being a common phenomenon, (Kiongo 2015). Actually, the preparedness levels and proficiency of Nairobi County to minimize vulnerability to disaster is dependent on an institution which is at its developmental stage of management and the balance between its strengths and inadequacies in the functioning of its departments and the relevant structures tilts towards the weak side. The rising occurrences of buildings collapsing in the county is an alarming indication in the weakness of the disaster preparedness structures given the slow response and management of these disasters, and confirms a low level of disaster preparedness given the existing capabilities.

1.2 Statement of the Problem

Disasters cause a considerable amount of damage around the world every year. Occurrence of disasters disrupts the lives of those directly and indirectly affected through displacements, destruction of livelihoods and property, deaths, injuries and mental stress (Ofori, 2001). It is associated with human interactions with nature, technology and other living entities. Disaster preparedness is a preventive strategy effective through development of legal and institutional frameworks, implementation of policies and good coordination of the planned activities, (Khan 2008). Kenya has experienced many forms of disasters, either natural such as floods, hurricanes, drought and famine; or manmade such as the Sinai fire tragedy where 100 people

lost their lives, the Sachanguan Petrol Tanker fire tragedy in which more than 300 people lost their lives, various bomb attacks, fire, intercommunity invasions; and the more recent cases of buildings collapsing while tenants still in them and the dozens of buildings which have come down in Nairobi have left a pile of destruction and loss of life.

Some of the disasters observed to occur in Kenya include diseases and epidemics, fire, droughts, terrorism, technological accidents, floods, and building collapses which have adverse effects on the general populace. The response to these disasters has clearly shown a lack of preparedness in managing the disaster among the affected communities and the responding institutions. Notwithstanding the many important construction industry disaster management programs initiated in Kenya in the last two decades, the country is far from achieving adequate preparedness level needed to address its significant risk profile.

Many researchers have looked at disaster preparedness in the construction industry in recent past, such as Prieto (2002) Hecker *et al.* (2000), Liso *et al.* (2003), Godschalk (2003), Rees (2009), Aldunate *et al.* (2006), Amaratunga and Haigh (2010) and Dainty and Boshier (2011). They offered varying insights on disaster preparedness in the construction sector. However, studies done on disaster management in Kenya (Kiongo 2015; Murage 2012; Gicheru 2011; Nabutola 2004, etc.) have mainly dwelt on other disasters such as fire, flooding, and famine leaving out the disasters related to the construction industry. Despite the frequent occurrences of construction related disasters in Kenya in the recent past and the important role of the construction industry in disaster preparedness and management, the study found no evidence of studies investigating factors influencing disaster preparedness in the construction industry in Kenya. Therefore, this study sought to establish the factors influencing disaster preparedness in the construction industry in Nairobi County, Kenya.

1.3 Purpose of the Study

The study purpose is to examine the factors influencing preparedness for disaster risk management within the construction industry in Nairobi County, Kenya.

1.4 Research Objectives

The objectives of the study are:

- i. To examine the influence of knowledge level on disaster preparedness in the construction industry in Nairobi County;
- ii. To explore the influence of vulnerability of the building on preparedness for disaster risk management in the construction industry in Nairobi County;
- iii. To determine the influence of regulatory framework on preparedness for disaster risk management in the construction industry in Nairobi County;
- iv. To establish the influence of demographic characteristics on the preparedness for disaster risk management in the construction industry in Nairobi County.

1.5 Research Questions

The study was guided by the following research questions:

- i. To what extent does knowledge level influence the preparedness for disaster risk management within the construction industry in Nairobi County?
- ii. How does the vulnerability of a building influence the preparedness for disaster risk management within the construction industry in Nairobi County?
- iii. To what extent does the regulatory framework influence the preparedness for disaster risk management within the construction industry in Nairobi County?
- iv. How do demographic characteristics influence the preparedness for disaster risk management within the construction industry in Nairobi County?

1.6 Significance of the Study

Findings of the study are beneficial to various groups who are directly involved when losses occur due to disasters occurrence. The study findings might enable construction industry players to put in place mechanisms to mitigate losses in case of a disaster by highlighting the preparedness status in the industry. The safety measures put in place can also reduce the amount of premiums charged by insurance companies in the long run if their claims reduce significantly over the years. In addition, insurance companies would benefit from reduced cases of claims as a trickle effect from the improved disaster awareness within the city construction industry. Findings from the study inform security and safety consciousness

hence help to avoid panic in the event disaster strikes and drastically reduce injuries and losses.

Policy makers may also use the study outcomes to come up with relevant policies for curbing and mitigating losses caused by disasters in the country. Research of this nature contributes to the field of disaster management at all levels of government, but in particular is valuable to the executive level by providing an autonomous and impartial analysis of the current disaster preparedness capabilities as well as recommend enhancement areas. The expected product of this endeavor will aid in the development of a more proactive and consistent approach to disaster preparedness and management. The government now has access to the actual facts of the situation and the available equipment to check incidences of disaster. Additionally, future studies may use the findings of the study as the basis for their research in this area. The study provides ready data for reference in future to various scholars and policy makers.

1.7 Basic Assumptions of the Study

The study presumes that the target respondents were able to give reliable and valid information that can be used to inform the study objectives and make conclusions in relation to the study variables. It was also assumed that the study would realize a reliable response rate and the questionnaires would be returned in time duly completed.

1.8 Limitations of the Study

There are some limitations that the study faced. There was a scope limitation; hence the generalization of the study results is limited to the study scope and any wider generalization of the study outcomes may prove impossible. Another limiting factor to the study is the inaccessibility of information. The study expected restricted or strict accessibility to disaster related reports, data, and facilities, which greatly affected the quality and quantity of information accessed for this study. Also, information shared by those in management role was limited to what is viewed as being unclassified hence some form of selectiveness in data provision was observed limiting the possible achievements of the study especially in relation to the situation of Nairobi County disaster management which is the target area of study. The study was also limited by inadequate literature on disaster preparedness especially on the construction sector and worse still in the Kenyan context. Further, funds required to conduct the study to the final stage were limited and time was observed as another key constraint.

1.9 Delimitation of the Study

The study scope is limited to the assessment of disaster preparedness within the construction sector in Kenya. Further narrowing the scope, this study gives more attention to the Nairobi County section of the industry. Therefore, the study primarily focused on drawing its respondents from Nairobi County. The study targeted business proprietors and landlords/ladies or construction managers in all the commercial buildings within the County.

1.10 Definition of Significant Terms used in the Study

Disaster Management: It is a systematic process of applying administrative, organizational and operational directives aimed at skills and capacities improvement in implementing strategies, policies and coping capacities in a bid to lessen the adverse effects and the possibility of disaster occurrence.

Disaster Mitigation: This refers to the measures taken to minimize the adverse effects of a disaster occurrence.

Disaster preparedness: This refers to the pre-disaster occurrence activities aimed at increasing the level of readiness or improving operational capabilities to respond to a disaster. It relates to the enhancement of capacities prior to the occurrence of a disaster so as to minimize the adverse effects.

Disaster Risk: The prospective loss to disaster occurrence in form of livelihoods, assets, lives, health status, and services, which could befall a specific community or society in some specified future time.

Disaster Vulnerability: A condition of susceptibility of a structure or society to a given disaster by virtue of their state or proximity to hazardous environment indicating the extent of risk to disasters.

Knowledge Level: This refers to the individual's level of understanding of preparedness practices either through experience of disaster management practices or acquisition of the skills through training or learning

Regulatory Framework: Regulatory framework refers to the laid down structures of control provided by institutions mandated to management of disasters including policies, rules and regulations, procedures and legal bidding facing the construction industry.

1.11 Organization of the Study

This study is presented in five chapters of the research process with chapter one being the introduction, chapter two comprising of the literature review and chapter three covering the study methodology. Chapter one offers the study's background, statement of the problem, purpose of the study, research questions and objectives, the value of the study, challenges experienced in the execution of the study and the definitions of the used terms. Chapter two covers review of literature related to disaster preparedness, a theoretical review and conceptual framework. Chapter three consists of research design, research methodology, data collection techniques, and data analysis methods. Subsequently, chapter four present the results of data analysis and presentation of findings while chapter five offers a summary and discussion of findings, conclusions, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Chapter two presents a review of literature related to disaster preparedness in Nairobi County. Both theoretical and empirical literature has been extensively explored and culminates with the presentation of conceptual framework for the study presented in this section. The section starts off with the review of literature on various objectives related to the study.

2.2 Preparedness for Disaster Risk Management

The construction industry has a strong connection with disaster preparedness and management. “Disaster management “is defined as the array of activities intended to sustain control over disasters and emergency cases and give a framework for aiding those at risk to evade or recover from effects of disaster occurrence (Kelly, 1996). Apparently, in case of disasters, majority of the physical destruction has been on engineering related facilities in the disaster areas such as roads, bridges, buildings, communication infrastructure, water supply plants, electric lines, harbours etc. Salvaging, clearing, reconstruction and rehabilitation efforts wholly or partially rely on the construction industry. Disaster management comprises of practices that are carried out prior to, during, and after disaster occurrence and within then three phases, the role of the construction industry is very important.

Occurrence of disasters lead to extensive destruction, disruption of people’s lives and leave the affected human and animals experiencing a lot of suffering. Even though one may lack the power to stop disasters from occurring, one certainly have the power and ability to adapt, survive, and minimize the adverse effects of the disaster on their lives (APHA, 2010). Due to the frequency of disasters occurrence in the recent past and the impact disasters have on development, disaster risk reduction has become a vital consideration globally. A study done by Bowker (1999) noted that training people on safety approaches and procedures is essential in ensuring effective disaster preparedness for high-rise buildings, further observing that educational and teaching programmes related to safety measures aid in availing essential information regarding the various facets of a disaster. The author noted that training on disaster preparedness prevents a situation where one is ill equipped on the course of action in the event of a disaster hence literally doesn’t know what to do leading to formation of a state of confusion, occurrence of a greater damage and loss of life.

Disaster preparedness undertakings focus on the development and uptake of formalized disaster plans and agreements that facilitate coordinated response activities hence require multi-organizational disaster response systems for organizations and communities. McEntire (2006) found that the concept of mutual aid involving sharing resources such as personnel, equipment, and facilities when available resources are insufficient to cover the needs during disaster preparedness is present within a wide spectrum of community groups, organizations, and jurisdictions. For disaster preparedness to be effective, it necessitates that materials, personnel, funds, equipment, and the methods of assistance delivery when responding to disasters, especially those required on emergency or temporary basis. Consequently, disaster management agencies require acting instantaneously to warrant that resources are found and made available to meet the necessities in an emergency (Haigh & Amaratunga, 2010).

Disaster preparedness for all hazard types prioritize life safety and property protection which emphasized four key undertakings: assembling disaster supplies kit; conducting structural mitigation activities (ensuring good roof condition, retrofitting buildings, and removal of any combustible and flammable materials), the non-structural mitigation activities include, (ensuring that the walls are firm, storing heavy materials on lower shelves), and the establishment of secure maintenance schedules for all equipment and items, (Chmutina & Boshier, 2014). The Kenyan National Disaster Management Policy draft encourages and seeks to empower a culture of a well-structured disaster management system, supported and delivered by a select and well-trained response team provided with appropriate, well sourced requisite materials and equipment (Kiongo 2015). Kiongo (2015) further pointed out that institutional capacity building envisaged in disaster preparedness plan has to be supported with adequate investments in human capital. Institutional capabilities for disaster preparedness are strengthened by generating new structures, streamlining old ones and availing financial resources for necessary facilities, equipment, supplies and personnel.

2.3Regulatory Framework and Preparedness for Disaster Risk Management

Disaster preparedness regulatory framework in most instances is part of the Municipal or County by-laws. Municipal bylaws are public regulatory decrees applied in a specified municipality area. They are created by anon-sovereign entity deriving its authority from other government bodies and can only apply on limited matters and locality (Dailey, 2000). The bylaws are created with a purpose of lessening the prospective risk in land and buildings usage and in addressing arising public safety concerns (Dailey, 2000).The construction safety

measures in Britain have several requirements for builders that cover all activities including the construction site, design, materials, and that a building can only be offered a permit to operate when the structure has been certified to be disaster proof and compliant with construction safety regulations (Hall, 1997). On top of the disaster proof certification, the British safety regulations enforce a compulsory safety training to all personnel working within a building, a construction zone, or any busy area which aids in offering vital information, improve skills especially those related to operating disaster management equipment and appropriate escape behaviours (Sime, 2001).

Disaster preparedness practices involve development of plans and processes and the procurement of facilities, materials and equipment required to offer active protection in times of emergency response (NRC, 2006). According to Nonaka (1988), construction safety engineers have to be employed to prevent disaster occurrence within each of the high-rise buildings and those buildings that are higher than a given height in Japan. The building owners are required to establish internal disaster risk management team who furnish the buildings with applicable disaster preparedness and warning mechanisms and equipment. The disaster management equipment must be easily accessible and simple to operate with ample signage.

The need for enhancing the role of the construction industry in readiness for disaster resilience, such as those made by Prieto (2002), Hecker *et al.* (2000), Liso *et al.*, (2003), Lorch (2005), Godschalk (2003), Rees (2009), and Haigh and Amaratunga (2010) among others confirms the need for greater incorporation of disaster resilience into the education curricula of construction professionals. Additionally, there are suggestions of utilization of existing opportunities for the expansion of research and construction education into the realm of disaster management. A number of studies gives particular construction industry position in relation to disaster resilience such as the design of buildings in regards to seismic activity. However, there is relatively low availability of literature related to general frameworks to define the scope adopted professionals in disaster resilience. Therefore, there is currently no basis on which research and education programmes towards enhancement of disaster resilience in the built environment can be built.

Many researchers have suggested the creation of inbuilt resilience in the construction sector to enhance disaster preparedness. A study done by Haigh *et al.* (2006) suggested a widened understanding of the construction life cycle to include anticipation, assessment, prevention,

preparation, and response to and recovery from disruptive challenges. They proposed the assessment of methods the construction industry could apply to improve its resilience to disasters. This entailed creation of a framework involving integration of typical construction life cycle (planning - design – construction – operation – decommissioning) with disaster management cycle (pre-disaster - prevention / mitigation – disaster – post-disaster response / recovery). Chmutina and Boshier, (2014) have undertaken assessments into the contribution of key stakeholders (architects, engineers, developers, clients) with respect to disaster risk reduction. From their investigations, emphasis of the actual and ideal inputs of key stakeholders have come out forming gaps in existing practice, policy, legal and regulatory framework. Conversely, these studies dwelt on the 'inbuilt' resilience related to the preventative /mitigation-oriented, pre-disaster interventions aspects within the construction life cycle hence disaster response and recovery / reconstruction are beyond the scope of their research.

Some studies such as Gavieta and Onate (1997) and Chmutina and Boshier (2014), have noted the value of suitable building regulations and land-use zoning in disaster mitigation. Chmutina and Boshier (2014) observed that their absence and lack-of or poor enforcement has been key a contributory factor in many disasters, more so in developing countries. Furthermore, the future is anticipated to be more hazard-prone and dynamic, hence current regulations (even the current best), codes, practices and preparations will need to be revised. There is therefore a need to understand the interdependencies of infrastructural systems and the underlying linkages between the built environment and the dynamic characteristics of the wider technical – biophysical – social systems. This has effects on the design of the built environment with requisitions for multidisciplinary and multi-hazard approaches, and occurrences of regular reviews (and tightening) of urban planning policies and building codes and the continuous re-assessment of design management and the vulnerability of existing assets, (Benson and Twigg, 2007; Chang, 2009; Anderies, 2013; Boshier, 2013).

2.4 Knowledge Level and the Preparedness for Disaster Risk Management

Individual's ability to identify the vulnerability of disaster occurrence capacity to discern course of action to prevent disaster and course of action when disaster does occur. Construction disaster preparedness relies to a large extent on the knowledge about disasters, the probability of diverse reasons of disaster occurrences, and the possible impact the disasters would have on the built and natural environment (Comolotti, 2004). Comolotti

(2004) observed that individuals in society who have knowledge about a specific disaster will make an attempt obtain all the requisite equipment to support response activities, and ensure preventive measures are instituted based on their perception of the disaster risk or vulnerability. Whenever the disaster vulnerability is high, these individuals take an initiative to prepare the users of the building on immediate action to be taken to avert or minimize death injury and destruction of property whenever a disaster occurs. According to Wood (1990) who evaluated awareness and preparedness levels for disaster among community members in Queensland, safety awareness directly affects disaster preparedness. Wood views ignorance to risks of disaster as what makes societies disregard the preparedness measures mounted to avert construction disaster. Poor disaster awareness led to heightened risk upon disaster occurrences while knowledge on disasters facilitated the populace to have awareness of the likely risks they face and prepare themselves to face or prevent the disaster (Wood, 1990). The study therefore observes that intensive and comprehensive capacity building is needed to inculcate preparedness in society.

In spite of huge and rising losses from disaster occurrences annually, a considerable shortfall in the level of investment towards disaster resilience exists even within the richest and high disaster risk nations (Hill, *et al.*, 2012). Unwillingness has been observed among building owners to finance disaster risk management measures. Only a small percentage of disaster-associated property loss is insurance covered (estimated 30% in developed countries and much less in developing countries), which is more of a government regulation failure than proprietors' initiative (Kenny, 2012; Chmutina and Boshier, 2014). Therefore, substantial effort needs to be undertaken in a bid to raise the level of disaster risk and vulnerability awareness among key stakeholders, especially government and private actors. Undertaking periodical economic and financial assessments of disaster resilience programs and engendering a disaster resilience culture would very productive (Egbelakin, *et al.*, 2011; Boshier, 2013). Many researchers such as Kaluarachchi (2013) have undertaken assessments of stakeholders' awareness levels of the vulnerability of the built assets to extreme weather events, where it was found that the construction industry is far from realizing full awareness to disaster risk management.

In some instances, disasters simply occur due to lack of knowledge of how to prevent or get out of harm's way among the vulnerable people, generally due to lack of awareness or lack of access to the right information (Kuhlicke, *et al.*, 2011). Higher level of disaster

preparedness has been observed to be linked to factors such as experience from previous disaster occurrence (Sattler, *et al.*, 2000, Horney, *et al.*, 2008, Tekeli-Yeşil, *et al.*, 2010), and higher perceived risk and exposure to information (Basolo *et al.* 2009, Murphy, *et al.*, 2009) all indicators of the value of higher awareness and knowledge levels on disaster preparedness. Generally, education is treated as a gauge of socioeconomic status in existing vulnerability and disaster preparedness studies but is rarely considered one of the dimensions of vulnerability (Kuhlicke, *et al.*, 2011). Majority of the studies approach education factor from the viewpoint that highly educated persons are in possession of better economic resources to carry out disaster preparedness initiatives as the basis of the view that disaster preparedness increases with education (Horney *et al.*, 2008), hence overlooking the aspects of education impact such as its enhancement of knowledge levels, enhancement of information accessibility, and enhancing awareness.

Individual's perception and actions on the risk information has a close relationship with disaster preparedness (Tierney *et al.* 2001). People who can be considered educated have a greater level of awareness of disaster risks within their immediate environment as they have better access to information sources and are in a prime position to weigh the information received and derive exploitable insights (Asfaw and Admassie 2004). Therefore, educated individuals are bound to perceive disasters risk information better and are bound to act on it than less educated individuals. Education enhances the attainment of general knowledge and influences the values, priorities, and the capability to strategize for the future and enhance resource allocation (Burchi 2010). Knowledge and competency acquired through training are useful in mitigating a disaster crisis since: disaster preparedness undertakings have a close relationship with an individual's perception and the arising action on the risk information (Tierney, *et al.*, 2001); and since they have broader accessibility to information sources and healthier ability to assess the risk information, educated individuals have higher awareness levels of risks (Jamison and Mook 1984, Rogers 1995, Asfaw and Admassie 2004). It is also evident that education escalates the ability to acquire general knowledge that inculcates values, priorities, capacity to plan for the future, and the capability to fittingly apportion the resources available (Thomas *et al.* 1991, Glewwe 1999, Burchi 2010). Education is therefore central in the access to knowledge and competencies useful in disaster preparedness.

In the ideology of knowledge creation lays the concept of 'learning' towards realization of disaster risk reduction which particularly relates to capturing post-disaster lessons and

creating experiences thereof (Gregory et al., 2012). As a consequence of any disaster occurrence, diagnostic surveys can only be done by an experienced person with the intention of reviewing land-use plans, regulations, building codes, design criteria, and construction requirements (Benson and Twigg 2007). Restoration efforts after disaster occurrence offers both challenges and potential opportunities for the construction initiatives in disaster training and knowledge dissemination, (WEF 2010; Chang et al. 2011; Haigh & Sutton 2012; Tatum& Terrell, 2012). The construction sector especially the larger multinational enterprises have a lot to offer in terms of expertise, resources and networks. Nonetheless, unlike the acceptance given to humanitarian post-disaster engagement, strategic post – disaster engagement is seen as being problematic, with suggestions for clear and transparent terms of agreement forming the foundation of partnerships with the construction enterprises (Haigh and Sutton, 2012). This offers the prospect of developing training and knowledge engagements precisely for the post-disaster context discussed at the procurement level.

2.5 Demographic Characteristics and the Preparedness for Disaster Risk Management

The demographic characteristics within the study group have been observed to have direct impact on peoples' risk perception. Perceived risk is defined as how much risk or damage individuals might incur from a disaster occurrence (Sherman et al., 2011). Majority of people think they are safe from disasters with the view that either disaster won't occur or if it occur they won't be affected, hence decline to take any precautionary measures. This is due to the fact that natural disasters are considered to be periodical phenomena and doesn't happen randomly (Motoyoshi, 2006; Kano *et al.*, 2009). Furthermore, the degree of mortality triggered by disasters occurrence differs subject to disaster type, location, and timing, while the risk of mortality as a result of disasters vary by age and sex across disasters (Frankenberg *et al.*, 2011). All these are demographic characteristics within the society which are observed to have an impact on disaster preparedness.

Due to observed variations in socio-demographic characteristics within different population groups, there are disparities at individual level on disaster preparedness based on their race, age, education, income level, and gender. Previous studies revealed that disaster preparedness show a relationship with socio-demographic characteristics such as education, income, gender and age (Mulilis et al., 2000; Motoyoshi, 2006; Schmidlin, 2010; Reese et al., 2010; Digian, 2005; The Macaulay Land Use Research Institute, 2011; Fothergill et al., 1999; DESA, 2004; Baker, 2011). Other studies observed that people within high income brackets

are more prepared and less vulnerable to natural disasters occurrence than the low-income bracket (Baker, 2011; Rowel et al., 2011; King, 2000). Similarly, Kim and Kang (2010) expressed the significance of income level on disaster preparedness where they based it on the ability of higher income population ability of amassing disaster management resources unlike the lower income groups who are unable to purchase the requisite disaster preparedness resources.

The role of gender has been in the minds of many researchers with many studies dwelling on its influence. Most of these studies confirmed that the inequalities within various genders have brought about variances in disaster preparedness, where studies examining the gender difference effects on disaster preparedness at the individual level found that women are less prepared when faced by a disaster than men (Kano et al., 2009), though some studies have refuted this finding such as Austin, (2010). Variances in the role and responsibilities offered to different genders whether male or female within the society in addition to inequalities in level of involvement in disaster preparedness practices, having decision-making roles within society, and factors of unemployment, all which creates gender disparities (WHO, 2002; MARC, 2011).

Another study by Coulston and Deeny (2010) stressed the positive influence of form of ownership and disaster preparedness, though they found insignificant correlation between the two factors. Another study found that home owners are more prepared than renters due to the higher responsibilities level that owners takes than renters who prefer to avoid some of the responsibilities (Mulilis et al., 2000). Homeowners invest towards protecting their property in form of disaster proof construction, offering emergency equipment or insuring their property. This relationship between property ownership and disaster preparedness is not restricted to only residential area, but traverses into the businesses realm where those who own their business premises are more prepared than those whose ownership is in form of leasehold or rental (Dahlhamer and Souza, 1997). This is due to the fact that owners consider that they have more assets in danger, thus preferring to participate in various disaster preparedness activities so as to minimize the risk (Austin, 2010).

2.6 Vulnerability of the Building and the Preparedness for Disaster Risk Management

In the creation of disaster preparedness, functional vulnerability is a key consideration for institutions, particularly the case of vital amenities such as hospitals, emergency operation

centres, and communication centres to guarantee that the services delivered by the facilities would be sustained to meet the needs of the community during the disaster occurrence periods (Leon and Villagran, 2006). Therefore, there is high functional vulnerability for the vital institutions so as to attain disaster preparedness. As observed by Jain et al, (2008), functional vulnerability ranges from site to service accessibility. Other factors indicating vulnerability based on location and accessibility is such that location in a congested area of a city with vulnerable buildings around, roads leading to the area being narrow secondary roads, and presence of a bridge separating the building from the other areas, in which case there is expectation of high vulnerability levels to disasters (Holvorsen & Hamilton, 2007). Vulnerability in building and construction in some aspects pertains to the structural features of the building, for example, columns, beams, floor, load bearing walls, and roof (Allen, 2006). These structural elements are appropriate to the achievement of disaster preparedness due to building location and the natural hazards common in the region (Birkmann, 2006). The terrain where the building is situated is an indicator of potential threats such as flooding in when houses are constructed in valleys or landslides when constructed along the slopes (Haider, 2006). Non-structural elements in a building include architectural elements (such as ceilings, windows and doors). If these are damaged, they would not be able to function and may even cause physical injury (Cannon, 2008).

Businesses perceive their vulnerability to disasters depending on the risks they face which is the reason why big investors pay greater attention to disaster preparedness within their premises. Senior leaders and decision makers are mainly the ones who deal with disaster preparedness related matter (Eakin and Semchuk, 1998). However, there is a gap concerning companies' awareness of the possible disruption by disasters occurrence and the level of preparedness they have. This gap pinned on the perception that the disasters would not be severe enough to permit resources investment into the preparedness activities (Eakin & Semchuk, 1998).

Studies done on disaster management in urban centres in India observed a difference in the level of disaster preparedness of small businesses from those of large businesses (Quarantelli, 1992). Quarantelli observed that disaster preparedness is ranked among the most burdensome and difficult difficulties faced by small businesses viewing it as a threat to their success and ultimately the survival of the business. Contrary, the large businesses comply with safety regulations despite the great financial obligations demanded (Quarantelli, 1992). According to

Cropp (1994), small firms experience a higher percentage of property damage caused by disasters as compared to larger businesses. He attributed this to the fact that huge investments are followed by sound safety precautions as compared to the small investments. Similar observations were made by Donnel (1980), a disaster specialist, revealing that a large proportion of small businesses are not sufficiently ready for disaster with forty five percent of respondents admitting to not plan to institute disaster preparedness plan. Therefore, disaster occurrences hit the small business more adversely than their large business counterparts given the high level of disaster preparedness of the latter (Deakin, 1999).

2.7 Theoretical Framework

This section looks into underlying theories, principles and general research findings of disaster preparedness models that are closely related to this study. The study is grounded on stakeholder theory, Chaos Theory, Decision theory and Systems theory.

2.7.1 Decision Theory

Decision theory acts as a guide to the analysis of behaviours for individuals faced with non-strategic uncertainty. This refers to the uncertainty due to what is termed as 'natural occurrence' or where other individuals get involved, the uncertain behaviour of the decision maker. This theory is based upon the principles of the probability theory, formulated by Blaise Pascal, Daniel Bernoulli, and Thomas Bayes. Decision theory provides insights into the various forms of decision making and the decision outcomes expected. In relation to disaster management, decision theory postulate that due to the uncertain and risky nature of disasters affecting the society and necessitating participation of various individuals, organizations, sectors and stakeholders, partnership has a very vital role to play in the ultimate achievement of positive outcomes (Roe, *et al.*, 2001). Roe, *et al.*, (2001) observed that it is likewise expected that different entities cooperates in a bid to enhance effectiveness and minimize fatalities. As far as decision making and partnership in disaster response is concerned, it is a tough job for societies to address. Persuasive discourse aligned to decision theory based on human behaviours show that individuals infringe on the principle of anticipated utility in a systematic way. This doesn't mean that individuals infringe upon 'preference consistency' over the suitable choice but rather have incorrect beliefs derived from what is termed as "folk probability theory" and making systematic performance blunders in some cases (Levy, 2008).

When decisions are made by an agency or a coordinating body, it is critical to have comprehensive mechanism facilitating and enhancing decision-making processes through different structural, administrative, and behavioural changes (Raiffa, Richardson, & Metcalfe, 2002). The way disasters are defined and viewed are influenced by Governments including how their subjects attain disaster preparedness. As discussed by Geis (2000), government often find themselves disconnected from certain societal zones and hence are unable to cater for the eco-socio-economic necessities desired by these societies. He therefore concluded that the decision-making authority imperatively defines the effect disaster occurrence will have on a community. One unique feature of disasters is their character of lacking information in most instances. This uncertainty makes it hard to achieve disaster preparedness while the disaster response teams and inhabitants become susceptible to injury, disruption death, among other adverse effects of disasters occurrence. The peoples' perceptions, bureaucracy, and politics within the society which forms the basis of decision making among individuals within the society influences the society's disaster risk, susceptibility, resistance and resilience levels. Decision making for disaster preparedness therefore should adopt a contemporary approach and tools characterized by non-hierarchical structures and flexibility.

2.7.2 Stakeholder Theory

This theory was postulated by Freeman (1984) is informed by the view that a stakeholder is an individual or group affecting or being influenced by goals and objectives of an institution. He reiterated that the role of stakeholders is to formulate methods of administering optimal relationships that result in optimal strategies. Harrison et al. (2010) observed that stakeholder's theory ought to be deliberated upon in every decision-making position, while assessing the decisions and when considering who benefits from the outcomes of those decisions. Therefore, for disaster management role in built environment, it is the responsibility of stakeholders to effectively handle the devastating effects of disasters occurrence. The stakeholders of the built environment are individuals and institutions embroiled in the built environment life cycle and whose interest is affected by the construction phase of built environment commissioning, operation and maintenance. Profound integrated understanding is required for the built environment decision making process on how to evade and alleviate disasters impact (Bosher et al. 2009). So as to have a resilient built environment, there should be a systematic consideration of stakeholders' approach in planning and execution of pre-occurrence disaster preparedness measures and

post-disaster mitigation and reconstruction measures within a natural disaster management process.

2.8 Conceptual Framework

The relationship between dependent and independent variables is shown within the conceptual framework espoused in the study. Various indicators based on the literature were adopted as measures of these variables. The study used various indicators to measure both the dependent and independent variables as indicated in the framework. A conceptual model is provided in a pictorial view indicating the relationships as presented in Figure 2.1.

Independent Variables

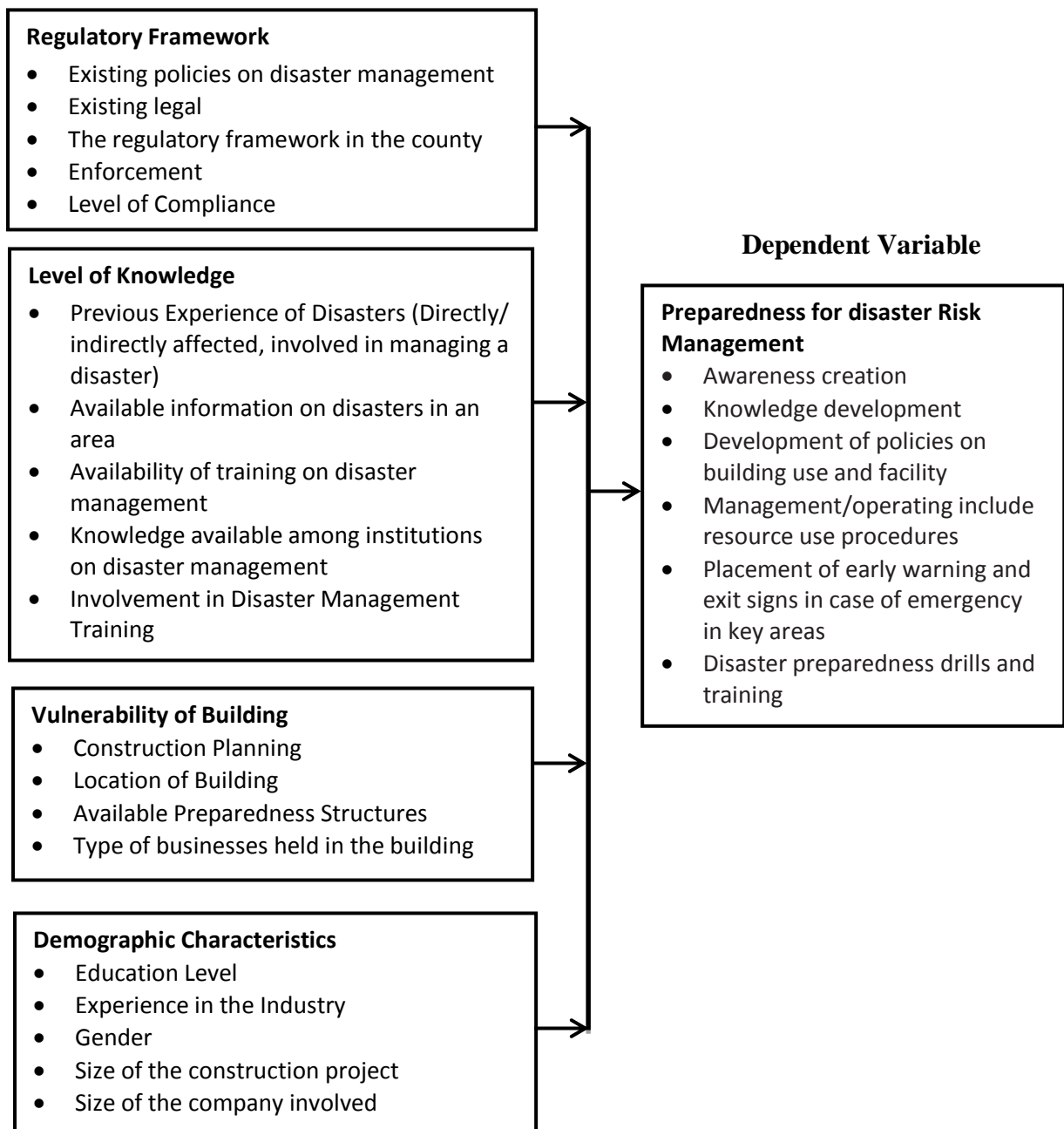


Figure 1: Conceptual framework

2.9 Summary of Literature Review

Chapter two provide the literature review of related studies that seeks to find out the factors that influence the preparedness for disaster risk management within the construction industry. The chapter provides empirical and theoretical discussion based on each objective of the study after which a conceptual framework is presented. Empirical results that support this study include that of Warfield (2008), Brandt, et al., (2009), Haigh et al. (2006), McEntire (2006), among others. Various studies done were reviewed offering different findings on the determinants of disaster preparedness in construction industry. The study presented findings where the study variables have been treated differently, indifferent parts of the world, used different research methodology or even played different empirical roles in the study. All these led to different results and realization of a study gap that further cements the need to undertake this study. The different studies done provide the study with the research gap that the current study is focusing on. The next chapter, Chapter Three, contains the methodology adopted within the study. This includes the research design adopted, study population and sample size and sampling design, data collection techniques and data analysis methods.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Chapter three provides an overview of specific procedures and strategies to be followed by the researcher in conducting the study. It specifically focuses on the research design that was used, the population target, sample size and sampling procedures, data collection techniques and instruments for data collection, validity and reliability of study tools and the procedures for data collection and data analysis.

3.2 Research Design

A descriptive survey research design was adopted which seeks to obtain information that describes existing phenomena by enquiring individual's perceptions, attitude, behavior and values (Mugenda & Mugenda, 2003). A descriptive survey design gives precise profile of the target persons, events or situations in a bid to expound on a given phenomenon (Cooper and Schindler, 2003). According to Denscombe (2007), descriptive survey emphasizes on generating data centered on real world situations in a structured and resolute technique. By adopting this design, the researcher was able to draw inferences of the relationship between the study independent variables from related variations of the dependent variable with simple descriptions of the relations hence the descriptive research design was the most applicable.

3.3 Target Population

A population is the total set of elements about which a researcher wishes to make some inferences; where population elements refer to the subject on whom the measurement is being taken (Cooper & Schindler, 2005). The target population of the study comprised of all the commercial buildings in Nairobi County. According to National CA, there are 45,000 commercial buildings in Nairobi County, and therefore the population was considered exceptionally large being above 10,000.

3.4 Sample Size and Sampling Procedure

Researcher picks individuals from a population to create a sample used informing inferences that can be said to be representative of all the units within the population, (Hart, 2005). Study sampling is undertaken using identified procedures and methods so as to identify adequate data sources, analysis of which informs the phenomena. The process applied in the study to acquire a sample size and the sampling procedures used to acquire the sample from the population of interest are discussed in this section.

3.4.1 Sample Size

The study applied Cochran's formula for determining sample size for large populations to determine the sample size since the study has a large population. An equation that yields a representative sample for population proportions that are too large (above 10,000) was developed by Cochran (1977). The study sample size was determined using this equation:

$$n_o = \frac{Z^2 pq}{d^2}$$

Where: n = sample size; z = degree of confidence (set at 95% confidence level for this study); p = estimated proportion of population having characteristics being measured (90%); q = (1-p) estimated proportion of target population lacking characteristics being measured (in this case 1-90% = 10%); d= set statistical significance or desired precision level (for this study is 0.05). Z is the value of area under the normal curve, in this case determined from the statistical tables given as 1.96 (at 95% confidence level, double tail). In this case, $Z_{(0.95,2)} = 1.96$; p=0.1; q=0.9; and e = 0.05, hence gives the outcome as:

$$n = \frac{Z^2 pq}{d^2} = \frac{(1.96)^2 (0.9) (0.1)}{(0.05)^2} = 138.25n = 138$$

Therefore, the study targeted a sample of 138 buildings from the study population of all the commercial buildings in Nairobi County.

3.4.2 Sampling Procedure

Sampling techniques are chosen depending on the theoretical and practical issues within the research context (Hair et al., 2003). The study applied stratified random sampling method in selecting sample elements from the target population. The study population was stratified based on the buildings' proximity to Nairobi Central Business District (CBD) [Commercial buildings within CBD - 1km radius from city centre; Commercial buildings in close proximity to CBD – 2km radius from CBD; and Commercial buildings relatively far from CBD – 5km radius from CBD] and number of floors. The stratified random sampling method was chosen as it is beneficial in that it optimizes a sample's statistical efficiency, offers sufficient data to be analyzed, and enables usage of diverse research methods and procedures in varying strata (Cooper & Schindler, 2001). Table 3.1 gives the sampling frame for this study.

Table 3.1: Sampling frame along the buildings strata

STRATA	4 Floors & Below	5-10 Floors	Above 10 Floors	Sample Size	Percentage
Commercial Buildings within CBD (1km radius)	17	27	14	58	42%
Commercial Buildings in close proximity to CBD (2km from CBD)	24	13	7	44	32%
Commercial Buildings Relatively far from CBD (5km from CBD)	25	7	4	36	26%
TOTAL	66	47	25	138	100%

NB. Proportions dependent on size of strata

3.5 Data Collection Instruments

These are tools adopted in a bid to collect data that informs the study phenomena (Creswell 2003). Research instruments employed in the study as tools for data collection were mainly research questionnaires which is a list of standard questions set to fit a specific inquiry (Mugenda and Mugenda, 2003). The usage of questionnaire ensures that respondents are faced with identical stimulus and thus facilitating reliability. The researcher preferred the use of questionnaire because it is a convenient tool to applicable in a study having a large number of subjects as it facilitates easy and quick access to information from the study respondents. Open-ended and close-ended questions were introduced to target respondents. This type of questions allowed the respondents to offer their opinions, suggestions and insights on factors influencing preparedness towards disaster management in Nairobi County. These types of questionnaire do not restrict the target population from providing their thoughts on the problem at hand. For that reason, the researcher gathers massive information and compares the responses leading to an all-inclusive study.

3.5.1 Pilot Study

A pilot test of the research instruments was administered to about 10% of study sample size in the Nairobi CBD before the actual study commenced using simple random sampling. A sub-sample equivalent to 10% of the study target sample is enough to pilot a research instrument. Pilot test helps establish quality and effectiveness of instruments used in a study to yield required data for the study besides determining field experiences. The study thereafter made necessary corrections and adjustments of the instruments after undertaking the pilot test to enhance the reliability levels of the study instruments.

3.5.2 Research Instruments Validity

This study was very conscious about the need to ensure the validity of the study content. Content validity refers to the extent to which a research instrument offers sufficient coverage of the study topic (Kothari 2004). Instruments validity is concerned with ensuring the appropriateness, correctness, and meaningfulness of certain inferences on the expected study outcomes (Frankel and Wallen, 2008). To ensure content validity the researcher sought the input from the research supervisors and experts in the field of research from university of Nairobi who are free to examine and critique the representativeness of the instruments.

3.5.3 Reliability of the Research Instruments

Reliability refers to the measure of the extent to which a research instrument consistently yields results from data after repeated trials (Mugenda and Mugenda, 2003). Reliability of instruments indicates the stability and the consistency with which the data collection instruments measures the variables. So as to measure the reliability, Cronbach alpha (α) coefficient was used. The value of the coefficient alpha varies from zero, which denotes no internal consistency, to one representing presence of perfect internal consistency which shows the degree to which a set of test items can be considered as measuring a single latent variable. If an individual in the same test given twice have similar scores, a measure can be considered to be reliable. Pilot testing was done on 5 questionnaires which were issued to selected respondents out of the study area. The five questionnaires were then coded and their responses input into the data analysis system used to produce reliability coefficient. A coefficient of 0.7 and above was considered the cut-off point above which reliability was considered to be achieved for this study as recommended by Cronbach (1951) for a newly developed tool. If Cronbach's alpha for some items fall below 0.7, relevant questions in the scale were deleted or reviewed to ensure that a 0.7 alpha was maintained for the study data.

Prior to data analysis, the study undertook a reliability testing of the research tools as presented in Table 3.2. Disaster preparedness was observed to have a reliability coefficient of 0.845, level of knowledge had a reliability coefficient of 0.816. Vulnerability of the building had a reliability coefficient of 0.759 and regulatory framework was observed to have a coefficient of 0.709, and finally demographic characteristic has a reliability coefficient of 0.822. The overall reliability coefficient of all the study variables was observed to be 0.867. This is consistent with Nunnally (1978) who recommended value of 0.7. The study

measurement scale had internal consistency and was confirmed as reliable. These outcomes are presented in Table 3.2.

Table 3.2: Summary of Cronbach’s alpha Test Results

Variable	Measure	Cronbach's Alpha	Cronbach's Alpha standardized	NO. of items
Disaster Preparedness	Awareness creation Knowledge development Development of policies on building use and facility Management/operating include resource use procedures Placement of early warning and exit signs in case of emergency in key areas	0.845	0.840	11
Level of Knowledge	Previously Directly Affected by Disaster Witnessed a disaster Involved in a disaster Managed a disaster before Available information on disasters in an area Availability of training on disaster management Knowledge available among institutions on disaster management Involvement in Disaster Management Training	0.816	0.813	17
Vulnerability of the Building	Construction Planning Location of Building Available Preparedness Structures Type of businesses held in the building	0.759	0.757	12
Regulatory Framework	Existing policies on disaster management Existing legal The regulatory framework in the county Enforcement Level of Compliance	0.709	0.712	9
Demographic Characteristic	Education Level Age of the Owner Experience in the Industry Gender Size of the construction project Size of the company involved	0.822	0.814	12

Overall	0.814	0.808	61
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3.6 Data Collection Procedures

The researcher acquired a research permit and a collaborative letter from University of Nairobi. With granted authority, permission was sought from the local administration to conduct the study at their region. The study applied personal interviews of the building managers and owners to provide extensive details on factors affecting preparedness against disasters in Nairobi County where questionnaires were filled. The researcher interviewed a sample of the population, in an effort to acquire concrete information able to inform the study. Personal interviews, as survey technique aids the researcher gather a variety of content that are useful in the analysis of the research. The study also used focus group discussions (FGDs) to acquire information from interviewees, with reference to their emotions, thoughts, opinions, and regards to the factors influencing preparedness towards disaster management in Nairobi County. Observations were also used to provide the status of observable features in the study.

3.7 Data Analysis Techniques

Data analysis refers to a process systematically utilizing statistical tools to describe and illustrate, compress, review, and assess information (Mugenda & Mugenda, 2003). Data analysis involved assembling information and thereafter entering numbers, narratives, and other information into the software (SPSS version 20), where they are coordinated and worked on in several ways. The study used descriptive statistical techniques to analyze data collected from the respondents. Cross checking of questionnaires was conducted to ensure that all questions were answered. The data was coded into themes before undertaking analysis. Ordinary least square (OLS) regression was carried out to establish and assess the existing relationship between preparedness and disaster management. The regression models helped to determine the total variation in the independent variable associated to the independent, intervening and moderating variables. The OLS regression was applied to express the link between predictor and dependent variables. OLS regression includes models

where choice of predictive variables is undertaken through an automatic process which takes the form of a sequence of F-tests and t-tests, though other techniques are possible, such as adjusted R-square, Akaike Information Criterion, Bayesian information criterion, Mallows's CP, PRESS, or false discovery rate (Draper and Smith, 1981). SPSS software (version 20) was used for analysis as it has capability to analyze complex statistical models simultaneously. The multivariate model was represented expressed as:

$$DP = \beta_0 + \beta_1 KL + \beta_2 VB + \beta_3 RF + \beta_4 DC + \varepsilon$$

Where DP= Disaster Preparedness

KL= Knowledge Level

VB= Vulnerability of the Building

RF= Regulatory Framework

DC= Demographic Characteristics

ε = Error Term

The identified regression model was appropriate since the number of trained or sensitized people living or operating from the buildings is continuous in nature as expected in the regression. The analyzed data was interpreted and presented through descriptive statistics including figures and tables.

3.8 Ethical considerations

The researcher had an introductory letter explaining to the respondents that the research will mainly be used for academic purposes and hence can participate willingly. The respondent's consent was first sought to ensure voluntary participation in the study. The study respondents were guaranteed anonymity and confidentiality of the information they gave as no respondent was allowed to write his or her name on the questionnaires and the researcher assured them that information given was not disclosed to anybody else other than the researcher.

3.9 Operationalization of Variables

The study key objective was to assess factors influencing preparedness for disaster risk management within the construction industry in Nairobi County, Kenya. Factors such as Policy, Legal and Regulatory Framework; Previous Experience; Vulnerability of the Building; Knowledge and Training; and Social Demographic Characteristics was assessed in this study on

their impact on Disaster Preparedness. The table below provides the operational definition of these variables. The study variables were operationalized as given in Table 3.2.

Table 3.3: Operationalization of Study Variables

Variable	Type of Variable in study	Variable Indicators	Measure	Analysis Technique	Questionnaire Item
Disaster Preparedness	Dependent	<ul style="list-style-type: none"> • Awareness creation • Knowledge development • Development of policies on building use and facility • Management/operating include resource use procedures • Placement of early warning and exit signs in case of emergency in key areas 	Nominal and Ordinal Scales	<ul style="list-style-type: none"> • Descriptive statistics (Percentages, Mean, Standard deviation) • Inferential Statistics (OLS Regression) 	Section B
Level of Knowledge	Independent	<ul style="list-style-type: none"> • Previously Directly Affected by Disaster • Witnessed a disaster • Involved in a disaster • managed a disaster before Available information on disasters in an area • Availability of training on disaster management • Knowledge available among institutions on disaster management • Involvement in Disaster Management Training 	Nominal and Ordinal Scales	<ul style="list-style-type: none"> • Descriptive statistics (Percentages, Mean, Standard deviation) • Inferential Statistics (OLS Regression) 	Section C
Vulnerability of the Building	Independent	<ul style="list-style-type: none"> • Construction Planning • Location of Building • Available Preparedness Structures • Type of businesses held in the building 	Nominal and Ordinal Scales	<ul style="list-style-type: none"> • Descriptive statistics (Percentages, Mean, Standard deviation) • Inferential Statistics (OLS Regression) 	Section D
Regulatory Framework	Intervening	<ul style="list-style-type: none"> • Existing policies on disaster management • Existing legal • The regulatory framework in the county • Enforcement • Level of Compliance 	Nominal and Ordinal Scales	<ul style="list-style-type: none"> • Descriptive statistics (Percentages, Mean, Standard deviation) • Inferential Statistics (OLS Regression) 	Section E
Demographic Characteristic	Moderating	<ul style="list-style-type: none"> • Education Level • Age of the Owner • Experience in the Industry • Gender • Size of the construction project • Size of the company involved • Age of the Building 	Nominal and Ordinal Scales	<ul style="list-style-type: none"> • Descriptive statistics (Percentages, Mean, Standard deviation) • Inferential Statistics (OLS Regression) 	Section A&F

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

Chapter four is a presentation of analyzed data and interpretation of the study outcomes. The outcomes are presented in form of charts (bar chart and pie charts) and tables. The chapter provides information on the questionnaire return rate, the demographic outlay of the study, level of disaster preparedness, knowledge level and disaster preparedness, vulnerability of building and disaster preparedness, regulatory framework and disaster preparedness, demographic characteristics and disaster preparedness, and culminates with the inferential statistics.

4.2 Questionnaire Return Rate

The study targeted 138 respondents as its key respondents comprising of buildings with varying number of floors, and with varying proximity from the CBD. However, the study was unable to acquire the entire targeted sample in the study only being able to access 109 respondents. The questionnaire return rate for the study is presented in Table 4.1.

Table 4.1: Questionnaire return rate

STRATA	4 Floors & Below		5-10 Floors		Above 10 Floors		Overall Sample Size		Target Sample	
	Res.	Rate	Res.	Rate	Res.	Rate	Res.	Rate	Sam.	Per
Buildings within CBD (1km)	14	82%	22	81%	12	86%	48	83%	58	100%
Buildings in close proximity to CBD (2km)	18	75%	10	77%	7	100%	35	80%	44	100%
Buildings Relatively far from CBD (5km)	17	68%	6	86%	3	75%	26	72%	36	100%
TOTAL	49	74%	38	81%	22	88%	109	79%	138	100%
Target Sample	66	100%	47	100%	25	100%	138	100%		

Among its targeted study sample, the study realized an overall return rate of 79% (109 out of 138 respondents). The return rate for owners of buildings within CBD was 83% (48 out of 58), while that of those in close proximity to CBD was 80% (35 out of 44 targeted) and that of those relatively far from CBD was 72% (26 out of 36). In terms of building size strata, the study found that those with below 5 floors were 74% (49 out of 66 targeted), those with 5-10 floors were 81% (38 out of possible 47), and 88% (22 out of 25 respondents) were for above 10 floors. This return rate is high enough since Mugenda and Mugenda (2003) suggests an

ideal return rate of above 60 to 70%. This return rate is therefore considered adequate to meet the study needs.

4.3 Respondents Demographic Characteristics

The demographic characteristics depicted within a study sample is important as it assists in bringing out better understanding of the population under study in terms of character, behavior and culture. The study collected data from respondents who came from different backgrounds. The following sections discuss their demographic characteristics.

4.3.1 Respondents Gender

One demographic factor considered is that of gender. There has been overemphasis on the gender representation in various echelons of the organization. This emphasis has been motivated by the need to empower women through affirmative action. This study was not left behind in capturing the women representation in the study population. The gender representation among the respondents who took part in the study was as shown in Table 4.2.

Table 4.2: Respondents gender

Gender	Frequency	Percent
Male	80	73.4%
Female	29	26.6%
Total	109	100.0%

Majority of the respondents who took part in this study were men (80; 73.4%) while women accounted for the rest(29; 26.6%). It indicates that the female gender has low representation in the construction industry with very few being observed among the sampled respondents. It was observed that male respondents are the majority within this sector and are the most within the studied sample. Therefore, even though the genders were not even, the representation can be said to be representative of the construction population targeted in the study since similar gender ratio is expected in the study population.

4.3.2 Age of the Respondents

The age structure data and information is a very important data. It can be used to inform the proportion of the productive population and the dependent population involved in the study, which comprise of the young and the elderly. The age distribution of the respondents is shown in Table 4.3.

Table 4.3: Percentage age distribution of respondents

Age Group	Frequency	Percent
Under 30 Years	9	8.3%
31-45 Years	21	19.3%
46-60 Years	43	39.4%
Above 60 Years	36	33.0%
Total	109	100.0%

The views given in this study were mainly from respondents between 46-60 years (39%) followed by those with above 60 years (33%). Those within the age group 41-50 years were observed to be 19% while those below 30 years were observed to be 8%. This indicates representation of all age-groups in the study, though most of the house owners accessed were above 45 years (72%) – far more than those below 45 years (28%), an expected outcome given that this is the age where people invest in real estate.

4.3.3 Highest Education Level Attained among Respondents

A person's level of education is widely considered a measure of their literacy based on their higher ability to process and comprehends information provided to them. The education level of the house owners interviewed is shown in Table 4.4.

Table 4.4: Distribution by level of education

Education Level	Frequency	Percent
None	0	0.0%
Primary School Level	4	3.7%
Secondary School Level	9	8.3%
Certificate Level	18	16.5%
Diploma Level	43	39.4%
Bachelor Degree Level	27	24.8%
Postgraduate Degree Level	8	7.3%
Total	109	100.0%

The construction owners who took part in this study had various education qualifications. Most of them had reached the diploma level of education (39%) followed by those who had bachelor degree (25%) and thirdly those who had reached certificate education level (17%), secondary level (8%), post graduate level (7%) and primary level (4%). This confirms that majority of the building owners have tertiary level of education (88%) an indication that most of those involved in building ownership are well educated.

4.3.4 Position Held by Respondents

The study considered the position each of the respondents held within the firm and the following findings were made as presented in Table 4.5.

Table 4.5: Position held by respondent

Position	Frequency	Percent
Building Manager	43	39.4%
Building Owner	54	49.5%
Employee of Contracted Management Agency	12	11.0%
Total	109	100.0%

As presented in Table 4.5, it was observed that most of the respondents involved in the study were building owners (49.5%), followed by building managers (39.4%), and the employees of contracted management company (11.0%). All these respondents involved in the study were in a position to provide all the necessary information that the study required. The representation as per the position held was as expected in the study population with high proportion of the building owners while building managers were the next option before employees of contracted building management agency.

4.3.5 Duration in Construction Industry

The study also considered the duration these respondents had had in the construction industry which they represented and the following views were observed as presented in Table 4.6.

Table 4.6: Period operating in construction industry

Length of Operation in Industry	Frequency	Percent
Less than 5 years	29	26.6%
5-10 Years	27	24.8%
10-15 Years	38	34.9%
Above 15 Years	15	13.8%
Total	109	100.0%

The study found that most of the respondents (34.9%) had spent between 10 to 15 years operating within the construction industry while only 13.8% had been in the industry for more than 15 years. An additional 26.6% of the respondents had spent less than 5 years period in the industry while 24.8% of the respondents had spent 5-10 years in the industry. This is an indication that most of the respondents involved in the study were very experienced and able to offer the information required in the study, while not leaving out the views of the new entrants in the industry.

4.3.6 State of Ownership of the Commercial Buildings

The study looked at the various characteristics depicting the chosen commercial buildings within the study sample. Variances in their ownership, exposure to disaster, usage, and age of building were observed within the study sample. Forms of ownership of the commercial buildings represented in the study are as presented in Table 4.7.

Table 4.7: State of commercial building ownership

Forms of Project Ownership	Frequency	Percent
Privately Owned	73	67.0%
Partnership	8	7.3%
Corporate Owned	12	11.0%
Owned by a conglomerate of Companies	16	14.7%
Total	109	100.0%

It was observed that most of the buildings were privately owned (67.0%), with the rest being owned in form of partnerships (7.3%), corporate owned (11.0%), or owned by a conglomerate of companies (14.7). Note that the corporate owned projects also include buildings owned by government institutions. These are the dynamics of ownership that are a characteristic of the construction industry in the study area – Nairobi County.

4.3.7 Vulnerability of the Commercial Buildings

A look at the vulnerability for disaster management among the interviewed building owners through the study respondents found the following outcomes presented in Table 4.8.

Table 4.8: Vulnerability to disasters

Vulnerability to disasters	Frequency (N)			Percent		
	YES	NO	n	Yes	No	Total
Fire Disaster	83	26	109	76.4%	23.6%	100%
Terrorist Attack	28	75	103	26.7%	73.3%	100%
Building Collapse	14	91	105	13.6%	86.4%	100%
Chemical Spills	5	98	103	4.8%	95.2%	100%
Natural Disasters (Earthquake, Flooding, Lightning Strike)	40	68	108	36.7%	63.3%	100%
Food Poisoning	12	87	99	12.6%	87.4%	100%
Average	30	74	105	28.5%	71.5%	100.0%

As presented in Table 4.8, most of the building owners in the study perceive that their buildings are vulnerable to fire disaster (76.4%), natural disasters such as earthquake, flooding, lightning strikes (36.7%), terrorist attacks (26.7%), building collapse (13.6%), food

poisoning (12.6%) and chemical spills (4.8%). This is a clear indication that there is disaster risk within Nairobi in the construction industry.

4.3.8 Level of Disaster Risk the Facing the Premises

The further understand the disaster risk the commercial buildings were facing, the study sought to find out the extent to which buildings owners perceive they were exposed to disasters from which the following outcomes presented in Table 4.9 were realized.

Table 4.9: Extent of exposure to disaster

Extent of exposure	Frequency	Percent
No extent at all	25	23.1%
Low Extent	29	26.9%
Moderate Extent	34	31.5%
Great Extent	14	13.0%
Very Great Extent	6	5.6%
Total	108	100.0%

It was found that most of the respondents felt that they are exposed to disaster risk to a moderate extent (31.5%), while a further 26.9% felt they were exposed to a low extent. A very significant number (13.0%) felt they were exposed to a great extent and a further 5.6% who felt they were exposed to a very great extent. Only 23.1% of the building owners feel that they are exposed to disasters to no extent at all. This confirms that majority of the building owners in Nairobi county think that they exposed to varying disaster risks. The further understand the disaster risk the buildings were facing, the study sought to find out the extent to which buildings owners perceive they were exposed to disasters from which the following outcomes presented in Table 4.10 were realized.

Table 4.10: Age of building

Age of building	Frequency	Percent
Less than 5 Years	9	8.4%
5-10 Years	42	39.3%
11-15 Years	39	36.4%
Above 15 Years	19	17.8%
Total	107	100.0%

The study found majority of the buildings involved in the study have been in existent for more than 10 years (54.2%), with the rest being between 5-10 years (39.3%), and less than 5 years (8.4%). This confirms that most of the buildings in Nairobi County are ageing, hence are predisposed to increased risk of disasters.

4.4 Level of disaster preparedness in the construction industry

The key discourse in this study relates to disaster preparedness in the construction industry. The construction industry is faced with many disasters and hence both legal and social statutes demand a certain level of preparedness among the owners of the buildings towards reducing the risk of occurrence and destruction from these disasters. The study therefore considered to determine the level of disaster preparedness within the industry by assessing the laid down disaster management structures within the industry. The study sought to find out the presence of a disaster management plan and disaster management committee within the building management and the outcomes of the study are presented in Table 4.11.

Table 4.11: Presence of Disaster Management Committee/ Plan

Presence of Management committee/plan	Frequency (N)			Percent		
	YES	NO	n	Yes	No	Total
Presence of disaster management Committee	8	98	106	7.5%	92.5%	100%
Presence of a disaster Management committee	14	90	104	13.5%	86.5%	100%
Average	11	94	105	10.5%	89.5%	100.0%

The study found that very few buildings in Nairobi County (7.3%) have a disaster management committee in their premises to handle arising disasters. Presence of an active disaster management committee has an influence on the implementation of disaster risk management standards within the industry to ensure high level of disaster preparedness. On the other hand, it was observed that 13.8% of the buildings have a disaster management plan, an indication of a very low level of institutionalized measures to enhance disaster preparedness. This confirms that there is very low initiative towards formalizing their disaster preparedness efforts undertaken by the building owners in Nairobi County.

The study also looked at the extent to which the construction by-laws enforced for the protection of the construction employees (by preventing disasters during construction projects) were enforced, and the observed outcomes are as presented in Table 4.12.

Table 4.12: Extent of construction by-laws enforcement

Extent of enforcement	Frequency	Percent
No extent at all	9	8.3%
Low Extent	6	5.5%
Moderate Extent	12	11.0%
Great Extent	38	34.9%
Very Great Extent	44	40.4%
Total	109	100.0%

The study found that most of the respondents fully implemented the by-laws as a requisite for construction sites in Kenya. It was observed that 75% rated their implementation of the by-laws as being to a great extent, while 11% implemented it to a moderate extent. However, a significant number of respondents (14%) were able to undertake their construction with low - to no implementation of the by-laws. Given the implementation of these b-laws is mandatory, it confirms the lack of will power to avert disasters among the players in the construction industry.

The study considered various indicators of disaster preparedness among respondents in the construction industry. Various construction disaster preparedness statements were presented to them measured on a five point Likert scale: (5) presents Strongly Agree; (4) Agree; (3) Neutral; (2) Disagree; (1) Strongly Disagree. The outcomes are as presented in Table 4.13.

Table 4.13: Disaster Preparedness

Level of agreement with construction disaster preparedness statements	1	2	3	4	5	Mean	Std. Dev.
There is a disaster management plan in the building that enhances disaster management	41.8%	27.9%	16.5%	10.3%	3.5%	2.058	0.521
There exists a disaster management committee that enhances disaster preparedness	54.9%	26.8%	10.3%	5.8%	2.2%	1.736	0.658
Familiarity of the contents of the disaster management plan by all staff members	61.5%	33.4%	2.3%	2.8%	0.0%	1.464	0.740
There is existence of adequate evacuation plan and exits	42.9%	52.7%	1.1%	1.1%	2.2%	1.670	0.317
We holds regular emergency drills	53.3%	35.6%	8.9%	2.2%	0.0%	1.600	0.417
Existence of adequate equipment in disaster preparedness	46.2%	44.0%	6.6%	3.3%	0.0%	1.672	0.396
Enhanced knowledge development of disaster preparedness through regular training and participation among building staff	23.9%	42.0%	28.4%	4.6%	1.1%	2.170	0.186
We have developed a policy on building use and facility to limit usage to least risky usage including a resource use procedure	68.2%	22.5%	6.1%	3.2%	0.0%	1.443	0.273
The users of the building are fully aware of the course of action in case of a disaster in the building	36.8%	57.4%	2.5%	3.3%	0.0%	1.723	0.357
We ensure regular maintenance of disaster management infrastructure and equipment	14.3%	28.6%	21.4%	15.5%	20.2%	2.987	0.816

The study found that most of the respondents (Mean 2.058) disagreed with the notion that ‘there is a disaster management plan in the building that enhances disaster management’, confirming the earlier observation that there lacks formalized disaster management plans in the construction industry. Similarly, majority of the respondents disagreed that ‘there exists a disaster management committee that enhances disaster preparedness (Mean 1.736)’, ‘there is existence of adequate evacuation plan and exits (mean 1.670)’; ‘they holds regular emergency drills (Mean 1.600)’; ‘existence of adequate equipment in disaster preparedness (Mean 1.672)’; ‘enhanced knowledge development of disaster preparedness through regular training and participation among building staff (Mean 2.170)’; and ‘users of the building are

fully aware of the course of action in case of a disaster in the building (Mean 1.723). The respondents also strongly disagreed to the statement that ‘there is familiarity of the contents of the disaster management plan by all staff members (Mean 1.4264),’ and that there is ‘developed policy on building use and facility to limit usage to least risky usage including a resource use procedure (Mean 1.443),’ an indication that they fully disagreed to the statements. However, the respondents were neutral to the statement that ‘they ensure regular maintenance of disaster management infrastructure and equipment (mean 2.987)’ with a significant number of the respondents (39; 35.7%) agreeing to this statement and 47 (42.9%) disagreeing to the notion, while the rest were neutral to this. From this outcome, it is clear that very little is being done in the construction industry to enhance disaster preparedness, with most of the undertaking being done to enforce various by-laws in the industry and not to initiate disaster risk management in the building. Therefore, the level of disaster preparedness within the construction industry is very low despite occurrences of various disasters in the recent past in the Country and more so in Nairobi County.

4.5 Knowledge level and disaster preparedness in the construction industry

The study sought to find out the influence of knowledge level concerning disaster preparedness on disaster risk management in the construction industry in Nairobi County. To find out this issue, the study looked at the experience of disaster among the respondents, their knowledge regarding disaster preparedness and their access to training in relation to disaster management. Figure 4.14 the proportion of respondents who have experienced occurrence of disasters in the building industry.

Table 4.14: Proportion of respondents with experience on disaster occurrence

Do you have experience on disaster occurrence?	Frequency	Percent
Yes	17	15.6%
No	92	84.4%
Total	109	100.0%

The study found that most of the respondents (92; 84.4%) have no experience of disaster occurrence with only 17(15.6%) of the respondents having had experienced disaster occurrence. This confirms that very few of the respondents have experienced disaster occurrence in the construction industry and hence there lacks the ‘out of experience’ drive towards disaster preparedness. This led to the need to determine the extent to which experience and awareness of construction disasters influence disaster preparedness among the respondents as presented in Table 4.15.

Table 4.15: Extent of Experience and Awareness influence on Disaster Preparedness

Extent of experience & awareness influence on disaster preparedness	Frequency	Percent
No extent at all	7	6.3%
Low Extent	15	13.9%
Moderate Extent	21	19.7%
Great Extent	41	37.6%
Very Great Extent	25	22.5%
Total	109	100.0%

The study found that most of the respondents (41; 37.6%) feel that disaster preparedness is influenced by experience and awareness of disaster to a great extent, while 25 (22.5%) feel it is influenced to a very great extent; 21(19.7%) feels it is influenced to a moderate extent and the rest feels that it is influenced to a low extent to no-extent at all. The study therefore observed that the respondent views that experience and awareness influence disaster preparedness. The study also considered the participation of the respondents in training related to construction disaster management. The outcomes presented in Table 4.16 were observed.

Table 4.16: Participation in Training on Construction Disaster Management

Have you participated in training on construction disaster management?	Frequency	Percent
Yes	19	18.2%
No	87	81.8%
Total	106	100.0%

The study found that a significant number of respondents (19; 18.2%) have participated in training related to disaster management, though a very large percentage of the respondents (87; 81.8%) have never participated in such training. This proportion of the population though significant is very minimal to achieve the desired awareness levels of disaster preparedness in the construction industry, hence more ought to be done to realize higher awareness levels.

The study further sought to understand the level of awareness of construction disaster risk management among the respondents in Nairobi County. It was found that most of the respondents (39; 36.6%) had fair awareness level while those who had good awareness were 13 (12.4%) while those with excellent awareness were 6 (5.3%). However, a significant number-actually a quarter of the respondents (27; 25.3%) claimed they had ‘no’ knowledge

whatsoever while a further 22 (20.4%) had ‘poor’ knowledge of disaster preparedness. From these outcomes, one would expect that the level of disaster preparedness is very low within the study area, which is the observed case. These outcomes are as presented in Table 4.17.

Table 4.17: Level of awareness of construction disaster preparedness

Level of awareness of disaster preparedness	Frequency	Percent
None	27	25.3%
Poor	22	20.4%
Fair	39	36.6%
Good	13	12.4%
Excellent	6	5.3%
Total	106	100.00%

The study considered various indicators of knowledge that are linked to disaster preparedness among respondents in the construction industry. Various knowledge indicators thought to influence disaster preparedness were presented to them measured on a five-point Likert scale where: (5) presents very great extent; (4) great extent; (3) Moderate extent; (2) Low extent; and (1) no extent at all. The ratings were as presented in Table 4.18.

Table 4.18: Awareness and Disaster Preparedness

Extent of agreement with knowledge statements on the extent they affect construction disaster preparedness	1	2	3	4	5	Mean	Std. Dev.
Being directly affected by a disaster	3%	63%	23%	11%	0%	2.425	0.725
I witnessed a disaster in a similar establishment	3%	67%	27%	3%	0%	2.301	0.570
I was involved in managing a disaster that had occurred	10%	52%	16%	3%	19%	2.699	1.277
I was directly affected by disaster occurrence	8%	66%	15%	8%	3%	2.315	0.848
Someone close to me had been directly affected by a disaster occurrence	36%	29%	30%	5%	0%	2.055	0.941
I have access to any needed information on construction disaster management which has assisted me in instituting disaster preparedness	37%	58%	5%	0%	0%	1.685	0.574
I have access to training on construction disaster management which has assisted me in instituting disaster preparedness	11%	64%	22%	3%	0%	2.164	0.646
Every building user is offered requisite information on construction disaster management as a disaster preparedness measure	3%	81%	11%	5%	0%	2.192	0.569
Every user of our building is equipped with all emergency response information such as emergency exits, assembly points, and emergency response unit call numbers	10%	59%	23%	3%	5%	2.356	0.903
We involve our staff on periodical emergency drills that prepares them for disaster preparedness	8%	63%	21%	3%	5%	2.343	0.885
Ease of access to knowledge and training on construction disaster management has enhanced disaster preparedness in our building	27%	53%	16%	3%	0%	1.945	0.7433
The technological development has enhanced construction disaster preparedness due to eased access to information	22%	62%	5%	5%	5%	2.109	0.9939

As presented in Table 4.18, the study found that: being directly affected by a disaster (Mean 2.425); witnessing a disaster in a similar establishment (Mean 2.301); being directly affected by disaster occurrence (Mean 2.315); someone close to them being directly affected by a disaster occurrence (Mean 2.055); having access to any needed information on construction disaster management which assist in instituting disaster preparedness (Mean 1.685); having access to training on construction disaster management which assist in instituting disaster preparedness (Mean 2.164); every building user being offered requisite information on construction disaster management as a disaster preparedness measure (Mean 2.192); the technological development having enhanced construction disaster preparedness due to eased access to information (Mean 2.356); staff involved on periodical emergency drills that prepares them for disaster preparedness (Mean 2.343); ease of access to knowledge and training on construction disaster management has enhanced disaster preparedness in our building (Mean 1.945); and every user of the building being equipped with all emergency response information such as emergency exits, assembly points, and emergency response unit call numbers (Mean 2.109), to a low extent influences the level of respondents disaster preparedness. Being involved in managing a disaster that has occurred to influences disaster preparedness to a moderate extent (Mean 2.699). This indicates a very low impact of disaster awareness, information access and knowledge among the building owners on their propensity to institute disaster preparedness mechanisms in their premises. It confirms that a disaster might occur and majority of the respondents wouldn't institute future measures to curb that disaster. This confirms a carefree approach to disaster management in the construction industry in Nairobi County. One respondent pointed out that after a fire incident in their premises, "their perception of fire disasters didn't change since there were no damages to the property and hence found no need to institute any measures", while another respondent who had no previous experience of disaster occurrence observed that "it is the role of the government to protect citizens from disasters using fire fighters in case of fire, security, and to ensure buildings are made up to standard and hence it is not his role to undertake disaster preparedness". However, one respondent after being faced with flooding claims that he "have to check the drainage system for all construction sites and the experience gave him 'some reluctance' in starting a construction without surveying the area". This confirms that a small percentage of the respondents were influenced by disaster occurrence in adopting disaster preparedness measures but majority was not influenced to adopt preparedness measures.

4.6 Vulnerability of the building and preparedness for disaster risk management

The study considered vulnerability of the building as a motivating factor to the adoption of disaster preparedness measures. The study considered the functional (location, accessibility to amenities and form of usage) and structural (load bearing walls, columns, beams, floor and roof) vulnerabilities. On the structural realm, a few who claimed to have considered disaster preparedness claims that they ensured their building is ‘built according to the standards of the building code’, while some claims to have involved ‘a construction engineer’. The study found that a significantly large number (50; 47.2%) of the respondents’ choice of location for their building was determined by the need to ensure disaster preparedness for their premises, with only 56(52.8%) of the respondents seemingly unfazed by disaster considerations in deciding the location for their building. This confirms that the location of the building is considered a vulnerability factor by some section of the study population. One building owner who was interviewed claims that he was assured of disaster preparedness by making sure his house was in a good location where fire fighters can access and also where he is assured of security. Table 4.19 provides the opinion of the respondents in regards to the value of building location to the issue of disaster preparedness.

Table 4.19: Consideration of building location as disaster deterrent

Is Location a Determinant of Disaster Preparedness?	Frequency	Percent
Yes	50	47.2%
No	56	52.8%
Total	106	100.0%

The study requested opinion of respondents on the effects of vulnerability of the building on disaster preparedness within the construction industry. The study rated the opinion of the study respondents on a five point Likert scale where: (5) presents very great extent; (4) great extent; (3) Moderate extent; (2) Low extent; and (1) no extent at all. The following were the observations from the study as presented in Table 4.20.

Table 4.20: Building Vulnerability and Disaster Preparedness

Building Vulnerability Indicators	1	2	3	4	5	Mean	Std. Dev.
Construction planning considered disaster preparedness provisions	41%	51%	5%	3%	0%	2.109	0.994
Our building plan provided disaster management structures and infrastructures	38%	53%	5%	3%	0%	1.698	0.701
The building location provides for ease in disaster management	23%	66%	3%	5%	3%	1.726	0.692
The value of investment in the building has been the driving force in implementation of disaster preparedness measures	37%	45%	10%	5%	3%	1.986	0.858
The type of business within the building have been a great determinant of the disaster preparedness measures in the building	32%	62%	7%	0%	0%	1.918	0.968
The building structures predisposes us to disasters which has forced us to take disaster preparedness measures	33%	60%	4%	3%	0%	1.753	0.572
Forced by the various disaster management authorities to enforce disaster preparedness measures due to our level of vulnerability	29%	45%	18%	3%	5%	1.794	0.763
The types of investment in the building increases the level of disaster risk hence forcing us the owners to enhance disaster preparedness	51%	47%	3%	0%	0%	2.109	1.035
The disasters that have low preparedness in our building are those with low chances of occurrence	40%	56%	4%	0%	0%	1.644	0.562

The study sought to find out how vulnerability of the building relates to construction disaster management. The study posed questions related to vulnerability of the building from which it was found that to a low extent: construction planning considered disaster preparedness provisions (Mean 2.109); our building plan provided disaster management structures and infrastructures (Mean 1.698); the building location provides for ease in disaster management (Mean 1.726); the value of investment in the building has been the driving force in implementation of disaster preparedness measures (Mean 1.986); the type of business within the building have been a great determinant of the disaster preparedness measures in the

building (Mean 1.918); the building structures predisposes us to disasters which has forced us to take disaster preparedness measures (Mean 1.753); we have been forced by the various disaster management authorities to enforce disaster preparedness measures due to our level of vulnerability (Mean 1.794); the types of investment in the building increases the level of disaster risk hence forcing us the owners to enhance disaster preparedness (Mean 2.109); and, the disasters that have low preparedness in our building are those with low chances of occurrence (Mean 1.644). This confirms that the building owners have not been influenced by the level of vulnerability in their building. The respondents disagreed that their decision to input disaster preparedness is not influenced by: their location (whether their location predisposes them to disasters risk such as flooding or increases the risk in case of inaccessibility or not); the investments done in the building (whether the investments put the building to disasters such as fire or security or not); and the type of building. The vulnerability of the building to disaster is therefore not an indication of the disaster preparedness undertaken within constructions, a confirmation that disaster preparedness is not a key consideration among most of the building owners in Nairobi County.

4.7 Regulatory framework and preparedness for disaster risk management

The construction industry is highly regulated both by the National Construction Authority (NCA) and the County Government. Some of these regulations such as: building standards (for the evasion of building collapsing disasters), those indicating areas to avoid during construction (i.e. along riparian region which helps in reducing flooding disasters occurrence), and fire safety regulations (for preventing and managing fire disasters), are created with a view of enhancing disaster preparedness within the construction industry in the county. The study sought the level of awareness of the building owners of the various policies in the construction industry and most (78; 73.8%) confirmed knowledge of NCA and County by-laws regarding construction industry. These outcomes are presented in Table 4.21.

Table 4.21: Awareness of disaster preparedness policies

Are you aware of Disaster Preparedness Policies?	Frequency	Percent
Yes	78	73.8%
No	28	26.2%
Total	106	100.0%

One observed that they are supposed to ensure that ‘having a lot of ventilation; making sure the building is not susceptible to floods; making sure durable materials are used during construction; having an experienced contractor; fire policy-adequate water, fire extinguisher, fire assembly point, and fire alarms; NCA standard building regulations on the type of materials to use for construction, management of raw materials; NEMA- avoiding Noise pollution& dust pollution;’ as some of the requirements related to disaster preparedness. All these confirm a high level of awareness of regulations as provided by the various entities, though one pointed out that: ‘there are so many entities entitled to enforcing these regulations (i.e. Nairobi County, NCA, NEMA, and Local Authority, that it becomes easy to circumvent the enforcement process. This confirmed the views posited when the respondents were asked whether there is serious enforcement of the legal and regulatory framework, where only 42 (39.6%) of the respondents felt the enforcement was serious. These outcomes are as presented in Table 4.22.

Table 4.22: Enforcement of regulatory framework

Is there serious enforcement of regulatory framework?	Frequency	Percent
Yes	42	39.6%
No	64	60.4%
Total	106	100.0%

Various policies, rules and regulations guide the disaster risk management within Nairobi County and the study sought to find out the extent to which they influence disaster preparedness in the County using a five point Likert scale where: (5) presents very great extent; (4) great extent; (3) Moderate extent; (2) Low extent; and (1) no extent at all. The following were the observations made as presented in Table 4.23.

Table 4.23: Regulatory Framework and Disaster Preparedness

Impact of Policy, legal and regulatory provisions on disaster preparedness	1	2	3	4	5	Mean	Std. Dev.
Existing policies on disaster management	7.6%	7.6%	18.7%	31.6%	34.7%	3.78	1.215
The Kenyan legal framework	10.5%	16.4%	28.8%	37.0%	7.3%	3.15	1.113
The regulatory framework in the country	9.9%	15.7%	21.5%	31.8%	21.1%	3.38	1.252
Available enforcement of legal and regulatory framework in construction industry	7.4%	21.8%	10.6%	38.9%	21.3%	3.65	1.257
All buildings are able to comply to the legal and regulatory framework	2.3%	19.5%	21.4%	36.8%	20.0%	3.63	1.091
Need to comply with all policies and regulation have been vital in enhancing g disaster preparedness	4.1%	14.0%	13.1%	44.1%	24.8%	3.72	1.119

The study found that most of the respondents (Mean 3.78) that to a great extent the existing policies on disaster management influence their disaster preparedness, that influence disaster preparedness. The study found that: the regulatory framework in the country (Mean 3.38); and the Kenyan legal framework (Mean 3.15), affect disaster preparedness in the construction industry to a moderate extent. The study further found that: available enforcement of legal and regulatory framework in construction industry (Mean 3.65), all buildings being able to comply to the legal and regulatory framework (Mean 3.63); and, that the need to comply with all policies and regulation have been vital in enhancing disaster preparedness (Mean 3.72) influence disaster preparedness in the construction industry. This confirms that disaster preparedness in the construction industry is influenced among majority of the building owners by the legal and regulatory framework. Regulations aimed at disaster preparedness in Kenya are in most cases not created for that purpose but are aimed at strengthening the industry, while at the same time enforcing environmental considerations, therefore, they are very limited in their abilities to enhance disaster preparedness and are not able to control disaster occurrence and management. This is exacerbated by the low regulatory enforcement capabilities observed in the study area, hence though the respondents observe that the regulatory framework has made them adopt disaster preparedness measures, it is clear that the

level of preparedness within the study population is not extensively improved as should be expected.

4.8 Demographic characteristics and preparedness for disaster risk management

Demographic characteristics are widely touted to have a direct impact on peoples' perception of risk. Factors such as education, income, gender as well as age of individuals have been widely linked to disaster preparedness. The study sought to find out the influence of demographic characteristics on preparedness for disaster risk management. The study considered various factors thought to influence disaster preparedness by ranking the extent of their influence on a five-point Likert scale where: (5) presents very great extent; (4) great extent; (3) Moderate extent; (2) Low extent; and (1) no extent at all, and the following outcomes were observed as presented in Table 4.24.

Table 4.24: Demographic Characteristics and Disaster Preparedness

Demographic Characteristics	1	2	3	4	5	Mean	Std. dev.
Level of Education	3.4%	0.0%	14.8%	50.0%	31.8%	4.068	0.881
Age of the Business Owner	8.4%	26.7%	23.9%	24.6%	16.4%	3.139	0.896
Gender	17.0%	21.6%	27.3%	15.9%	18.2%	2.965	1.342
Level of Experience in the Construction Industry	0.0%	3.4%	26.1%	42.0%	28.4%	3.920	0.925
Size of the Building (Construction Project)	1.1%	2.3%	21.6%	43.2%	31.8%	4.022	0.857
Size of businesses held in the building	1.1%	4.5%	28.4%	42.0%	23.9%	3.829	0.886
Age of the building	1.1%	6.9%	33.3%	42.5%	16.1%	3.655	0.873

The study found that the respondents feels that: level of education (Mean 4.068); level of experience in the construction industry (Mean 3.920); size of the building (Mean 4.022); size of businesses held in the building (Mean 3.829), and age of the building (Mean 3.655), to a great extent influences disaster preparedness. Other factors such as age (Mean 3.139) and gender (Mean 2.965) of the business owner were found to influence disaster preparedness to a moderate extent. This indicates that demographic characteristics influences disaster preparedness in the construction industry.

4.9 Inferential Statistics

The study sought to undertake a quantitative analysis that involved a correlation and a regression analysis. The correlation analysis revealed the link between the study variables showing how the factors relate to each other. The correlation coefficient of the study is as presented in Table 4.25.

Table 4.25: Correlation Coefficients

Correlation between Disaster Preparedness against knowledge level, vulnerability of building, regulatory framework and demographic characteristics		
Knowledge level	Pearson Correlation	.431*
	Sig. (2-tailed)	.029
	N	31
Vulnerability of building	Pearson Correlation	.626*
	Sig. (2-tailed)	.010
	N	31
Regulatory framework	Pearson Correlation	.533*
	Sig. (2-tailed)	.045
	N	30
Demographic characteristics	Pearson Correlation	.692**
	Sig. (2-tailed)	.000
	N	31

****.** Correlation is significant at the 0.01 level (2-tailed).
***.** Correlation is significant at the 0.05 level (2-tailed).

The study found that Knowledge level has a statistically significant positive correlation with construction industry's disaster preparedness ($r=0.431$ $p=0.029$). This is to imply that the knowledge level and building's Disaster Preparedness are correlated 43.1% of the time when other factors are held constant. Similarly, the other factors such as vulnerability of building ($r=0.626$ $p=0.010$), regulatory framework ($r=0.533$ $p=0.045$), and demographic characteristics ($r=0.692$ $p=0.000$) were found to have statistically significant positive correlation coefficients. The significant positive correlations have the implication that the more emphasis building sector stakeholders apportion to knowledge level (regarding disaster preparedness), vulnerability of building, regulatory framework and demographic characteristics, the greater the chances that the firm will acquire higher levels of Disaster Preparedness.

The inferential analysis also involved a regression analysis summary consisting of a correlation and a coefficient of determination, ANOVA and model specification statistics. The study's main objective was to determine the factors affecting disaster preparedness. This relationship was determined by carrying out a regression analysis on knowledge level,

vulnerability of building, regulatory framework and demographic characteristics as the independent variables and the level of disaster preparedness as the dependent variable. The outcomes of this analysis produced the outcomes presented in Tables 4.26, 4.27, and 4.28.

Table 4.26: Regression Analysis Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.753(a)	0.506	.010	.6317

a Predictors: (Constant), knowledge level, vulnerability of building, regulatory framework, demographic characteristics

Table 4.6 discusses the regression model summary. It was observed that the study model showed a low correlation coefficient of 0.753. This is an indication that there is a defined relationship between disaster preparedness in construction industry and factors such as knowledge level, vulnerability of building, regulatory framework, and demographic characteristics. This view was further enhanced when a very high coefficient of determination (R^2) of 0.506 was realized which indicates that the study independent variables (knowledge level, vulnerability of building, regulatory framework, and demographic characteristics) can be able to explain 50.6% of the variability in the dependent variable (disaster preparedness), which gives the indication that though the level of disaster preparedness is low, the influence of knowledge level, vulnerability of building, regulatory framework, and demographic characteristics is present, and the factors have significant impact on disaster preparedness.

An ANOVA of the study model was carried out to further investigate this link and the following outcomes of the study are presented in Table 4.27.

Table 4.27: ANOVA Test

Model	Analysis	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.327	3	.442	1.108	.028(a)
	Residual	11.173	28	.399		
Total		12.500	31			

a) Predictors: (Constant), knowledge level, vulnerability of building, regulatory framework, demographic characteristics

b) Dependent Variable: Disaster Preparedness

The study carried out an analysis of variance (ANOVA) to test the variability between knowledge level, vulnerability of building, regulatory framework, demographic characteristics and disaster preparedness presented in Table 4.27. According to outcomes

presented, the p-value (sig.) was 0.028 (P<0.05) indicating that knowledge level, vulnerability of building, regulatory framework, and demographic characteristics have statistically significant influence on the disaster preparedness of constructions in Nairobi County at 95% confidence level. This confirms that the ability of knowledge level, vulnerability of building, regulatory framework, and demographic characteristics to influence disaster preparedness as observed in goodness of fit model (model summary) is statistically significant. A further analysis on the relationship gave off the outcomes presented in Table 4.28 showing the regression model coefficients.

Table 4.28: Regression Coefficients

Model	Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.695	1.148		3.477	.040
	Knowledge level	.054	.394	.031	2.382	.024
	Building Vulnerability	.334	.406	.206	2.824	.006
	Regulatory framework	.171	.313	.131	2.985	.032
	Demographic Characteristics	.822	.116	.548	4.339	.000

a) Dependent Variable: Preparedness for disaster risk management

The information contained in table 4.28 reveals the results of the regression analysis model. According to the findings, knowledge level of building on disaster risk (0.054, p=0.024); vulnerability of building (0.334, p=0.006), regulatory framework (0.171, p=0.032), and demographic characteristics (0.822, p=0.000), influence disaster preparedness in Nairobi County since its relationship was observed to be statistically significant. The regression model indicates that the relationship between the independent variables (knowledge level, vulnerability of building, regulatory framework, demographic characteristics) and dependent variable (disaster preparedness) have positive regression coefficients and a constant of 1.695. The regression model of this relationship is presented as:

$$DP = 1.695 + 0.054 KL + 0.334 VB + 0.171 RF + 0.822 DC + \epsilon$$

Where **DP**= Disaster Preparedness

KL= Knowledge Level

VB= Vulnerability of the Building

RF= Regulatory Framework

DC= Demographic Characteristics

ε = error term

Therefore, we can confirm that knowledge level, vulnerability of building, regulatory framework, and demographic characteristics have a positive impact on disaster preparedness in the construction industry in Nairobi County. It was observed that a positive change in knowledge level, vulnerability of building, regulatory framework, and demographic characteristics would cause a positive change in disaster preparedness of the construction industry. There is therefore a direct linkage between disaster preparedness and knowledge level, vulnerability of building, regulatory framework, and demographic characteristics.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Chapter five have three main sections namely summary of study findings, discussion of findings, conclusions and recommendations. A summary of study findings is presented in the first section followed by the discussion of findings, and then the conclusions based on the research findings on each objective. The last sub-section provides the study recommendations, and the chapter culminates with the suggestions for further studies.

5.2 Summary of Findings

The study found that majority of the buildings studied were privately owned commercial buildings - just like most of the buildings in the county, and above 5 years old. Within these buildings, the perception of disasters vulnerability is low, especially for chemical spills, food poisoning and building collapse. Given the high number of building collapse disasters that have happened in the recent past in Nairobi County, the study would have expected higher perception, though there is a conviction among building owners that their buildings after being made to the required standards can withstand such a disaster. The respondents however perceive that they are very vulnerable to fire disasters, and moderately vulnerable to terrorist attack, and natural disasters such as floods and earth quake. An enquiry into the extent to which respondents were exposed to disasters danger indicates that majority were moderately exposed to disaster risk management.

A look at the level of disaster preparedness revealed that very few buildings in Nairobi County (7.3%) have either a disaster management committee or a disaster management plan (13.8%), confirming that the building owners in Nairobi County have very low level of initiatives undertaken towards formalizing their disaster preparedness. Given the implementation of these by-laws is mandatory, it confirms the will power to avert disasters among the players in the construction industry. There was disagreement with all the statements related to disaster management within the construction industry confirming that very little is being done in the construction industry to enhance disaster preparedness. Therefore the level of disaster preparedness within the construction industry is very low despite occurrences of various disasters in the recent past in Nairobi County.

A look at the influence of knowledge level on disaster preparedness within the industry found that only 16% of the industry have experienced disaster occurrence. Additionally, it was observed that only 18.2% have participated in training related to disaster management with most rating their level of awareness of disaster management as either none (25.3%), poor (20.4%), or fair (36.6%). The study further found very low impact of disaster awareness, information access, and knowledge among the building owners on their propensity to institute disaster preparedness mechanisms in their premises, especially given their low levels of disaster management awareness. Inferential analysis realized a positive and statistically significant correlation and regression. A regression analysis found that knowledge level of building owners has an influence on disaster preparedness (0.054, $p=0.024$); confirming both a link and an impact of knowledge level on disaster preparedness.

A look at the vulnerability of building influence on the preparedness for disaster risk management revealed that the buildings are vulnerable to disasters to a low extent. A regression analysis found that vulnerability of building has an influence on disaster preparedness (0.334, $p=0.006$) confirming both a link and an impact of vulnerability of building on disaster preparedness. This confirms that the building owners have not been influenced by the level of vulnerability in their building to institute disaster preparedness.

The study looked at the influence of regulatory framework and preparedness for disaster risk management. It was found that most respondents (73.8%) are aware of the NCA and County by-laws regarding construction industry but only 39.6% of the respondents felt the enforcement was serious. The study confirmed that the regulatory framework has been vital in enhancing disaster preparedness in the construction industry. The construction industry is highly regulated both by the National Construction Authority (NCA) and the County Government. Some of these regulations such as: building standards (for the evasion of building collapsing disasters), those indicating areas to avoid during construction (i.e. along riparian region which helps in reducing flooding disasters occurrence), and fire safety regulations (for preventing and managing fire disasters), are created with a view of enhancing disaster preparedness within the construction industry. Inferential analysis realized a positive and statistically significant correlation and regression coefficients confirming that regulatory framework has a positive and significant influence on disaster preparedness within the construction industry.

A look at the demographic characteristics revealed that to a great extent it influences disaster preparedness, thus confirming the value of demographic factors in influencing disaster preparedness. This indicates that demographic characteristics influences disaster preparedness in the construction industry. A correlation and regression analysis found that vulnerability of building have a positive and significant influence on disaster preparedness (0.822, $p=0.000$) confirming both a link and an impact of demographic characteristics on disaster preparedness. This confirms that knowledge level, vulnerability of building, regulatory framework, and demographic characteristics have a positive impact on disaster preparedness in the construction industry in Nairobi County.

5.3 Discussions of the Study Findings

The study considered the level of disaster preparedness in the Nairobi County construction industry where it was found that the level of disaster preparedness is at a very low level, with a great majority of respondents lacking s disaster management plan and disaster management committee. It was also found that the construction by-laws are enforced to a great extent by most of the respondents. The industry is faced with many disasters hence the by-laws demand a certain level of preparedness among the owners of the buildings towards reducing the risk of occurrence and destruction from these disasters, hence their enforcement is a great step towards realizing improved disaster preparedness. However, the level of disaster preparedness does not seem to improve in line with the by-laws implementation, an indication that they might have a very small scope. Disaster preparedness seems not to matter in the construction industry. These outcomes confirmed earlier findings by Nabutola (2013) who claimed that the greatest push towards creation of ‘integrated disasters and risk management policy, legislation and regulations’ was the ill state of preparedness in foretelling and combating disasters. Kiongo (2015), found that there was few preparedness precautions among staff members at the highest hospital in Kenya – Kenyatta national Hospital. This therefore confirms minimal disaster preparedness measures in place.

5.3.1 Level of Knowledge and Disaster Preparedness

The study sought to assess the influence of knowledge level on disaster preparedness in the construction industry. The study found that most of the respondents have no experience of disaster occurrence, with very few ever participating in construction disaster management training. Low awareness levels were observed regarding construction disaster management. The study further found that knowledge levels influences disaster preparedness to a low

extent, which was further confirmed in the correlation and regression analysis where the influence was observed to be positive and significant. Comolotti, (2004) observed that people with knowledge about the disaster will acquire requisite equipment to support response activities, and ensure preventive measures are instituted, while those without the knowledge would discourage the preparedness measures hence having a negative implication, hence confirming Wood (1990) views that safety awareness has direct influence on disaster preparedness. Additionally, the views posited by Kaluarachchi (2013) advocating for increased training in a bid to foster stakeholders' awareness on the vulnerability of their built assets to extreme weather events, as he had observed the awareness (knowledge) to be far from ensuring full awareness. The level of disaster preparedness is observed to increase with higher education levels since highly educated individuals have access to more and better economic resources to partake in the preparedness actions (Horney et al., 2008). Sime, (2001) observed that building owners with high knowledge level ensures easy access to vital information, skills development and appropriate escape plans and behaviors hence can be able to respond to disasters. Disaster preparedness is clearly influenced by knowledge level but the impact was found to be low.

5.3.2 Vulnerability of Building and Disaster Preparedness

The study found that both the structural (load bearing walls, columns, beams, floor, and roof) and functional (location, accessibility to amenities and form of usage) vulnerabilities of the buildings influence disaster preparedness of buildings. The study found that to a low extent, the vulnerability of the building influences disaster preparedness, an indication that the observed or perceived vulnerabilities have minimal influence on disaster preparedness. The regression analysis confirmed the low influence but indicated a significant and positive influence on disaster preparedness. This confirms findings by Eakin and Semchuk, (1998) which found that presence of a wide gap in relation to companies' awareness of the possible vulnerabilities for disasters occurrence and the amount of preparedness to disasters they have. Gregory *et al.*, (2012) associated this gap to the observation that disasters wouldn't be that severe to deserve resources investment in preparedness undertakings. Similar findings were posited by Donnel (1980) who found that a high percentage of SME businesses in urban areas are inadequately prepared for disaster due to lack of requisite resources. Therefore, disaster incidences are worse in small businesses as compared to large business considering the higher disaster preparedness level of the latter. Studies done on disaster management in urban centre's in India found a difference in disaster preparedness within the small business and

large businesses (Leon and Villagran, 2006) confirming that small businesses possess low values for safety regulations among the most burdensome and most difficult problems, hence confirming the view that small scale businesses are more vulnerable than large scale businesses.

5.3.3 Regulatory Framework and Disaster Preparedness

The regulatory framework in the construction industry for disaster preparedness is very complex with many different institutions having a role. Most respondents are aware of the regulations they need to comply with the regulations related to disasters. However, the enforcement of the regulations is considered 'not serious' by majority of respondents, mainly based on the fact that very many institutions give these regulations and each enforces its own. It was observed that disaster preparedness in the industry is influenced among majority of the building owners by the legal and regulatory framework, a relationship that was confirmed to be significant and positive by the regression analysis. These outcomes are enforced by the findings by Boshier (2013) that despite awareness, a lot of activities need doing to raise higher the hazard and vulnerability awareness for the stakeholders, undertake a financial and economic appraisal of disaster resilience interventions and, generally, prompt creation and maintenance of a culture of resilience. Accordingly, assumption of the matter is that disaster preparedness upsurge with education sector since highly educated persons have improved economic resources access to participate in preparedness actions (Horney, *et al.*, 2008). Chmutina and Boshier, (2014) found that 'built-in' resilience, i.e. the preventative /mitigation-oriented, pre-disaster interventions mapped to a 'normal' (as opposed to a more expansive) construction life cycle so that disaster response and recovery / reconstruction have some influence disaster preparedness. Haigh and Amaratunga (2010), have noted the importance of appropriate building regulations and land-use zoning in disaster mitigation and that their aspect discussed absence or non-enforcement has been a contributory factor in many disasters, particularly in developing countries.

5.3.4 Demographic Characteristics and Disaster Preparedness

The study looked at demographic factors that were thought to influence disaster preparedness. Frankenberg, *et al.*, (2011) observed that the high mortality rate realized disasters varies depending on factors such as type of disaster, location, and timing and further observed that risk of mortality may vary by age and sex in ways that differ across disasters. Sherman, *et al.*, (2011) claim that demographic characteristics are clear indicators of peoples' perception of risk. Disaster preparedness correlates with specific socio-demographic features

such as income, gender, education, and age of individuals (Reese, *et al.*, 2010). Perceived risk is defined risk taken or damages individuals experiences caused by occurrence of the hazard or disaster, and have a direct influence on their preparedness to disaster risk management. The study confirms views posited by Schmidlin, (2010) who observed that due to observed variations in socio-demographic characteristics within various populations, there should be disparities among individual disaster preparedness with respect to their age, race, education, gender, and income. The study found that disaster preparedness influences disaster preparedness to a great extent with factors such as level of education, level of experience in the construction industry, size of the building, businesses held in the building, and age of the building. The influence was further confirmed through regression analysis which revealed that the influence is positive and statistically significant. Demographic characteristics therefore influence disaster preparedness in the construction industry.

5.4 Conclusion of the Study

From the study findings, we can make the conclusion that the level of knowledge of building owners influences disaster preparedness in the construction industry in Kenya. It was found that despite the low levels of influence, a positive and significant influence is apparent. There is a direct positive correlation between knowledge level and disaster preparedness in the construction industry and a regression revealed a significant and positive impact on knowledge level on disaster preparedness. Knowledge level among the building owners therefore influences disaster preparedness.

The study also concludes that vulnerability of the building influences disaster preparedness in the construction industry. It was found that a statistically significant positive influence exists between the two factors, though at a low level. Vulnerability of the building offers disadvantageous situations such as location and accessibility, for example, where the location is in a congested area of a city with vulnerable buildings around, when roads leading to the area are narrow secondary roads, presence of a bridge separating the building from the other areas. All these factors predispose the building to disasters and therefore the business owners respond by instituting disaster preparedness measures.

The study concludes that the regulatory framework in the construction industry have a positive and statistically significant influence on disaster preparedness. Disaster preparedness practices involve growth of risk management plans and procedures and acquisition of facilities, equipment, and materials needed to provide active protection during emergency

response. In some countries, building owners are required by the NCA office to create an in-house disaster risk management team and also equip the buildings with appropriate means for disaster preparedness and warning mechanisms. However, in Kenya, the regulatory framework is offered to different institutions to enforce them such as NCA, Nairobi County among others, making it hard to enforce, though this does not deter the regulatory environment to influence disaster preparedness, nonetheless minimal.

The study further concludes that demographic characteristics influences disaster risk management in the construction industry in Nairobi County. It was observed that socio-demographic factors such as age, type of disaster, sex, location, education timing, income, and gender among other have some significant influence on disaster preparedness within the construction industry. Others related to the buildings themselves such as the level of experience, size of the building, businesses held in the building, and age of the building were found to influence disaster preparedness.

The study therefore concludes that knowledge level, vulnerability of building, regulatory framework, and demographic characteristics are some of the factors influencing the preparedness for disaster risk management in the construction industry in Nairobi County. It concludes that preparedness towards disaster risk management is directly influenced by the four factors and improvement in these factors among the building owners in Nairobi County would lead to an increase in disaster preparedness which was found to be at a very low level in the construction industry.

5.5 Recommendations of Study

The study found that the knowledge level and awareness of owners of building in relation to disaster risk management is very low hence the study recommends that the construction sector stakeholders should increase and widely advertise training on disaster risk management so as to enhance their awareness and hence improve disaster preparedness. Similarly, more should be done to enhance the awareness of the regulatory framework to building owners. The study also recommends that building owners, construction sector stakeholders and tenants should institute regulatory measures based on the level of vulnerability of the building or businesses to disaster so as to cushion others who may be affected by the disasters.

Research on factors influencing preparedness for disaster risk management offers new contributions in improving the resilience to disasters of the construction industry. It provides a road map of identifying key areas that could be targeted by the government and any other institution interested in enhancing disaster preparedness and hence saving lives and properties. This study therefore recommends that key stakeholders in disaster risk management introduce aspects of knowledge, vulnerability of building, regulatory frameworks, and demographic characteristics so as to ensure that they are able to maximize on enhancing disaster preparedness, with the support of policy makers like the government and NGOs being solicited for this undertaking. Building owners are also recommended to take the initiative of getting involved in various training programs on the same so as to enhance disaster preparedness for their building.

5.6 Recommendation for Further Studies

The study poses that other factors might be influential to disaster preparedness, hence more studies ought to be undertaken to bring forth all the available factors so as to optimize the understanding of factors influencing disaster risk management and hence enhance the risk management in the construction industry.

The study recommends an evaluation of this relationship to further bring out the model in varying environmental settings in order to integrate the model into disaster preparedness theories. Further studies on this relationship are thusly recommended.

The study suggests further studies be undertaken to assess these factors in a different sector such as the transport sector so as to broaden the application of the study findings.

The study findings were limited to the Nairobi region and therefore should be broadened in scope to other locations and in other countries to come up with widely applicable outcomes globally.

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APPENDICES

Appendix I: Letter of Transmittal

Caroline Ngondi
University of Nairobi
P.O Box 30197,
Nairobi, Kenya.

**RE: REQUEST TO CONDUCT RESEARCH ON FACTORS INFLUENCING
PREPAREDNESS FOR DISASTER RISK MANAGEMENT IN THE
CONSTRUCTION SECTOR IN NAIROBI COUNTY.**

TO WHOM IT MAY CONCERN

My Name is Caroline Ngondi, a student in University of Nairobi undertaking a M.A in Project Planning and management at the School of Education and Distance Learning. I am carrying out a study on factors influencing preparedness for disaster risk management in the construction industry in Nairobi County. This study is done for academic purposes but will be used to inform an independent and impartial analysis of the current state of disaster preparedness capabilities as well as recommended enhancements. It will provide actual facts of the situation and the available equipment to check incidences of disaster. Additionally, future studies will use the findings of the study as the basis for further research. Your feedback and views will help in compiling the research findings.

A questionnaire is attached which can take approximately 20 minutes of your time to complete. The data collected will be used for academic research purposes only and anonymity of the respondents will be fully maintained.

Thank You in Advance

Yours Sincerely,

Signature:
Caroline Ngondi.

6. For how long have you been operating in the Kenyan Construction industry?
- a. Less than 5 years
 - b. 5-10 Years
 - c. 10-15 Years
 - d. Above 15Years
7. What kind of disasters do you feel the building is most likely to face and vulnerable?
- a. Fire Disaster
 - b. Terrorist Attack
 - c. Building Collapse
 - d. Chemical Spills
 - e. Natural Disasters (Earthquake, Flooding, Lightning Strike)
 - f. Food Poisoning
8. What forms of business/es are held within this building?
-
-
9. To what extent do you perceive that this/these business/es expose your building to disasters?
- No extent at all
 - Low Extent
 - Moderate Extent
 - Great Extent
 - Very Great Extent
10. What is the age of this building since it was constructed?
- Less than 5 Years 5-10 Years
 - 11-15 Years Above 15 Years

Section B: Disaster Preparedness

11. Do you have a construction disaster management committee for the building?
- YES NO
12. Is there a disaster management plan that may be a guide for construction disaster management in this building?
- YES NO

13. To what extent did you follow the by-laws of the construction industry for safety of your employees?

- No extent at all : []
 Low Extent : []
 Moderate Extent : []
 Great Extent : []
 Very Great Extent : []

14. Please indicate your level of agreement with the following construction disaster preparedness statements on a five point likert scale where 1 means strongly disagree and 5 means strongly agree by placing a tick (✓) inside the appropriate box:

Disaster Preparedness Statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
There is a disaster management plan in the building that enhances disaster management					
There exists a disaster management committee that enhances disaster preparedness					
Familiarity of the contents of the disaster management plan by all staff members					
There is existence of adequate evacuation plan and exits					
We holds regular emergency drills					
Existence of adequate equipment in disaster preparedness					
Enhanced knowledge development of disaster preparedness through regular training and participation among building staff					
We have developed a policy on building use and facility to limit usage to least risky usage including a resource use procedure					
The users of the building are fully aware of the course of action in case of a disaster in the building					
We ensure regular maintenance of disaster management infrastructure and equipment					

Section C: Knowledge Level on Disaster Preparedness

15. Have you ever been involved in a construction disaster occurrence?

Yes [] No []

16. Kindly explain the types of construction disaster that have directly affected you.....

.....
.....

17. How did the disasters you have witnessed affect you

.....
.....
.....

18. How did this experience affect your perception of construction disaster preparedness?

.....
.....
.....

19. To what extent did the experience of the construction disaster affect your awareness for the disaster preparedness?

- No extent at all []
- Low Extent []
- Moderate Extent []
- Great Extent []
- Very Great Extent []

20. Have you ever received any training on construction disaster management?

Yes [] No []

21. How has knowledge on construction disaster management affected your approach to disaster management?

.....
.....

22. How would you rate your knowledge regarding construction disaster management?

None [] Poor [] Fair [] Good [] Excellent []

23. Please indicate the extent to which you agree to the following knowledge statements on their effect to construction disaster preparedness on a five point likert scale where 1 means No Extent At All and 5 indicates Very Great Extent:

Knowledge Indicators	1	2	3	4	5
Being directly affected by a disaster					
I witnessed a disaster in a similar establishment					
I was involved in managing a disaster that had occurred					
I was directly affected by disaster occurrence					
Someone close to me had been directly affected by a disaster occurrence					
I have access to any needed information on construction disaster management which has assisted me in instituting disaster preparedness					
I have access to training on construction disaster management which has assisted me in instituting disaster preparedness					
Every building user is offered requisite information on construction disaster management as a disaster preparedness measure					
Every user of our building is equipped with all emergency response information such as emergency exits, assembly points, and emergency response unit call numbers					
We involve our staff on periodical emergency drills that prepares them for disaster preparedness					
Ease of access to knowledge and training on construction disaster management has enhanced disaster preparedness in our building					
The technological development has enhanced construction disaster preparedness due to eased access to information					

Section D: Vulnerability of the Building

24. During the construction process, how did you ensure that the building is safe from disasters in future?

.....

.....

25. What measures were taken in construction planning towards ensuring a disaster free zone in the building?

.....

.....

26. Was the choice of location for the building in any way determined by the need to ensure disaster preparedness?

Yes [] No []

27. Please indicate the extent to which you agree to the following building vulnerability statements on their effect to disaster preparedness on a five point likert scale where 1 means No Extent At All and 5 indicates Very Great Extent:

Building Vulnerability Indicators	1	2	3	4	5
Construction planning considered disaster preparedness provisions					
Our building plan provided disaster management structures and infrastructures					
The building location provides for ease in disaster management					
The value of investment in the building has been the driving force in implementation of disaster preparedness measures					
The type of business within the building have been a great determinant of the disaster preparedness measures in the building					
The building structures predisposes us to disasters which has forced us to take disaster preparedness measures					
We have been forced by the various disaster management authorities to enforce disaster preparedness measures due to our level of vulnerability					
The types of investment in the building increases the level of disaster risk hence forcing us the owners to enhance disaster preparedness					
The disasters that have low preparedness in our building are those with low chances of occurrence					

Section E: Regulatory Framework

28. Are you aware of the Nairobi County disaster preparedness policies?

Yes [] No []

29. If yes, which policies are you aware of?

.....

.....

30. In what ways have your building been able to meet NCA requirements?.....

.....

31. Do you think there is serious enforcement of disaster management policies, legal and regulatory provisions in the building industry in Nairobi County?

Yes [] No []

32. Please indicate the extent to which the following policy, legal and regulatory provisions affects construction disaster preparedness on a five point likert scale where 1 means No Extent At All and 5 means Very Great Extent:

Policy, legal and regulatory provisions	1	2	3	4	5
Existing policies on disaster management					
The Kenyan legal framework					
The regulatory framework in the country					
Available enforcement of legal and regulatory framework in construction industry					
All buildings are able to comply to the legal and regulatory framework					
Need to comply with all policies and regulation have been vital in enhancing disaster preparedness					

33. How have your interactions with the enforcement teams from relevant bodies been in terms of construction disaster preparedness? How do you feel enforcement has influenced disaster preparedness?

.....

Section F: Demographic Characteristics

34. What social factors influenced you to implement construction disaster preparedness measures in your building?

.....

35. Please indicate the extent to which the following social demographic characteristics affect construction disaster preparedness on a five point likert scale where 1 means No Extent At All and 5 indicates Very Great Extent:

Social and Demographic Characteristics	1	2	3	4	5
Level of Education					
Age of the Business Owner					
Gender					
Level of Experience in the Construction Industry					
Size of the Building (Construction Project)					
Size of businesses held in the building					
Age of the building					
Others					

36. Kindly explain how the following social and demographic characteristics affect your approaches to disaster preparedness within the construction industry.

.....

37. What challenges have you come across in implementation of your construction disaster preparedness projects and what do you suggest as some of the solutions to these challenges?

.....

THANK YOU FOR YOUR PARTICIPATION

Appendix III: University Recommendation



UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA-MURAL STUDIES
NAIROBI EXTRA-MURAL CENTRE

Your Ref:

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
NAIROBI

Our Ref:

Telephone: 318262 Ext. 120

24th October, 2016

REF: UON/CEES/NEMC/24/344

TO WHOM IT MAY CONCERN

RE: NGONDI GAKII S. CAROLINE - REG NO L50 /82738/2012

This is to confirm that the above named is a student at the University of Nairobi, College of Education and External Studies, School of Continuing and Distance Education, Department of Extra- Mural Studies pursuing Master of Arts in Project Planning and Management.

She is proceeding for research entitled "factors influencing preparedness for disaster risk management within the construction industry in Nairobi County, Kenya."

Any assistance given to her will be appreciated.

CAREN AWILLY
CENTRE ORGANIZER
NAIROBI EXTRA MURAL CENTRE



Appendix IV: Research Authorization



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/17/38867/17702**

Date: **19th June, 2017**

Caroline Gakii Ngondi
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Factors influencing preparedness for Disaster Risk Management within the construction industry in Nairobi County Kenya,”* I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **19th June, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

**GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO**


Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

Appendix V: Research Permit

THIS IS TO CERTIFY THAT: Permit No : **NACOSTI/P/17/38867/17702**
MISS. CAROLINE GAKII NGONDI Date Of Issue : **20th June,2017**
of UNIVERSITY OF NAIROBI, 46799-100 Fee Received : **Ksh 1000**
Nairobi, has been permitted to conduct
research in Nairobi County
on the topic: FACTORS INFLUENCING
PREPAREDNESS FOR DISASTER RISK
MANAGEMENT WITHIN THE
CONSTRUCTION INDUSTRY IN NAIROBI
COUNTY KENYA
for the period ending:
19th June,2018



.....
Applicant's Signature **Director General**
National Commission for Science, Technology & Innovation