

CHALLENGES OF DEALING WITH FIRE OUTBREAKS IN INFORMAL  
SETTLEMENTS: THE CASE OF THE 12<sup>TH</sup> SEPTEMBER 2011 SINAI FIRE  
IN NAIROBI COUNTY

BY

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with fire outbreaks*



**DECLARATION**

This project is my original work and has not been presented for a Masters Degree in any other University

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## ABSTRACT

The purpose of this study was to investigate the challenges faced in dealing with outbreak of fires in the informal settlements of Nairobi County. More specifically the study examined the level of awareness of risks posed by fire hazards and response in the event of a fire among the residents of the Sinai informal settlement in Nairobi. It also examined whether the Nairobi County Government has issued Standard Operating Procedures that detail sequence of events when responding to fire in informal settlements, how the tragedy at Sinai was responded to by the residents and the authorities and the challenges that hampered the effective response to the Sinai fire disaster were interrogated with the view to identifying strategies of coping with future fires like the Sinai one. The study adopted a conceptual framework for dealing with challenges of fire outbreaks in informal settlements. It also employed practical actions reducing vulnerability conceptual framework to explain the challenges that exist in dealing with the fire outbreaks in the informal settlements. The study adopted a case study design with the intention of finding out the issues that surrounded the Sinai fire. The targets population was all the households at the Sinai slum. Both stratified random sampling and simple random were used to samples 341 households. Data collection was done by use of questionnaires, Interview schedules and observation check list. The data collected was analysed by use of qualitative and quantitative methods. Data presentation was done using frequency tables, percentages, pie charts and bar graphs. The study established that the level of awareness of fire hazards among the residents were limited. The study also established that Nairobi County Government did not issue any Standardized Operating Procedures as majority of the respondents were not aware of these documents and were therefore not used in the Sinai fire disaster management. Majority of the respondents were not aware of the fire fighting policy. Little was done to create awareness among the publics on what to do in case of fire outbreak. The study established that response to the Sinai tragedy took long as the authorities arrived two hours late after the fire outbreak instead of the recommended five minutes. The rescue operation was made difficult due to the fact that there was no central command for the fire fighters which resulted into more losses. Finally, the study established that the challenges to fire fighting in Sinai included inaccessibility of the area due to lack of access roads, lack of enough water hydrants within the city, lack of enough skilled fire fighters and lack of a fire fighting policy in the country. The study therefore recommended that the government to develop a National Disaster Policy which makes it mandatory for public institution to display fire emergency numbers and provide standard operating procedures in case of fire outbreak, government to form a National Disaster Management Authority to coordinate disaster management and awareness creation through intensified fire drills in the country, government to relocate the residents of the Sinai slums since this area is a way leaf for Kenya Power, railway reserve and also has drainage for storm waters from the Kenya Pipeline which in most cases carry inflammable materials and therefore a danger to the residents of the slum and government to provide emergency lanes for vehicles dealing with emergencies on major roads in Kenya.

## **ABBREVIATIONS AND ACRONYMS**

CRC	Crisis Response Centre
FSMPOK:	Fire Safety Management Policy of Kenya
NDOC:	National Disaster Operation Centre
KPC:	Kenya Pipeline Company
NDRMP:	National Disaster Risk Management Policy
UNESCO:	United Nations Education Scientific and Cultural Organization
UNHSP:	United Nations Human Settlement Programme
DRR:	Disaster Risk Reduction
KIIs:	Key Informant Interviews
FGDs:	Focus Group Discussions
CBO:	Community Based Organisation

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## DEFINITIONS OF OPERATIONAL TERMS

**Disaster** - an emergency event that occurs with little or no warning and that causes more destruction or disruption of operations than the museum can correct by application of its own resources (Finely, 1983). Includes events like destruction, death or injuries from the trigger mechanisms/cause such as high winds, earthquake, shocks or lack of rain among others

The UN defines an international disaster, as “a serious disruption of the functioning of society, causing widespread human, material, or environmental losses which exceed the ability of the affected society to cope using only its own resources” Coppola, (2007:25)

The Natural Hazard Research Group at the University of Colorado defines disaster in terms of losses caused for instance “More than 1 million US dollars in damage or more than 100 people dead.” Although it is difficult to quantify the total monetary loss or damage caused by the Sinai fire, the 126 deaths that resulted from the fire, qualify the fire incident to be called a disaster in line with the definition of the Natural Hazard Research Group at the University of Colorado.

**Disaster Management** –This includes the entire process and activities rolled out in the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.

**Disaster preparedness** – Disaster Preparedness refers to the Specific measures taken before disasters strike; for example by removing people and property from a threatened location. The measures usually forecast or warn against disasters, take precautions when they threaten and arrange for the appropriate response (such as organizing evacuation and stockpiling food supplies). Preparedness falls within the broader field of mitigation and facilitates timely and effective rescue, relief and rehabilitation. Preparedness is the main way of reducing the impact of disasters.

**Informal settlement** - While a clear definition for informal settlement is still unavailable, characteristics of these settlements include: spontaneous, irregular, unplanned, marginal, and squatter settlements Lamba, (2005). It is in this light that the study uses the term informal settlements.

**Vulnerability-** Although there is still much uncertainty about what the term vulnerability covers, Cardona (2004b) underlines the fact that the concept of vulnerability helped to clarify the concepts of risk and disaster. He views vulnerability as an intrinsic predisposition to be affected by or to be susceptible to damage; that means vulnerability represents the system or the community's physical, economic, social or political susceptibility to damage as the result of a hazardous event of natural or anthropogenic origin (Cardona, 2004: 37–51). One of the best-known definitions was formulated

by the International Strategy for Disaster Reduction (UN/ISDR), which defines vulnerability as:

The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. (UN/ISDR, 2004). In this study, vulnerability is viewed as the whole province of physical, environmental, social, political and economic factors and processes that predispose and make the community more susceptible to hazards especially fire.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Background to the Study

Fire disasters have become prevalent in Kenya in the recent past leading to a trail of destruction, destitution and death. These disasters usually arise from natural causes, negligence and civil disorder, accidental or arson attacks (National Disaster Risk Management Policy, 2012.). Fire disasters are among the most destructive man experiences in terms of human life and property. Most of these fires are predictable and as such precautionary measures can be put in place to prevent them. For instance illegal power connections in the informal settlement and building on power lines, petroleum pipeline reserve areas, road and railway reserves, expose them to hazards. In the fires that are unpredictable, measures can be put in place to prevent spreading that could otherwise culminate in a disaster. To attain this, a National Policy on Fire safety and appropriate legislation is required (Fire Safety Management Policy of Kenya (FSMPOK), 2011).

#### 1.1.1 Fires that have left a Mark in History

In order to contextualize problems associated with fire outbreaks globally, this study explored generally the history of fires that have left a mark in history beginning with the A.D. 64 fire during Nero's reign when ten out of the fourteen districts of Rome, burnt in eight days. The 1666 great fire of London destroyed 13,200 homes, 87 parish churches and countless public buildings. The cost of this

fire and rebuilding London was 10 Million pounds ([www.london-fire.gov.uk](http://www.london-fire.gov.uk)). In addition, the Chicago fire of 1871 killed 766 and destroyed 17,500 buildings is among the earlier cases of destructive fires. Chelsea Massachusetts where 3500 buildings were lost is also included. On December 31<sup>st</sup> 1999, the Oakland California hills fire leaped freeways and destroyed nearly 6000 building (Nelson, 1994: 1). By 1994, it was estimated that fire caused some\$10 billion loss annually in the United States. Almost every region of the United States experiences fires at some point in the month of June. The fourth-hottest June on record in the US, June 2012 also rapped up the hottest 12-month period since record-keeping began in the US in the 1890 (Ibid). Whereas these fire disasters generally raise concern, it is important to note that these jurisdictions studied have since formulated fire policies that cut across institutions such as schools, hospitals, and care homes among others. These policies aim at minimizing the risk to life and to reduce injury by responding appropriately in the event of fire outbreak.

Informal settlements often referred to as squatter settlements, slum areas, or shanty towns are dense settlements comprising communities housed in self-constructed shelters under conditions of informal or traditional land tenure (Ambaye, 2011).. They are common features in developing countries and are typically the product of an urgent need for shelter by the urban poor. As such they are characterized by a dense proliferation of small, makeshift shelters built from diverse materials, they are also characterised by degradation of the local ecosystem and by severe social problems. These settlements are built and

occupied illegally in other people or state lands. They are temporary but good alternatives of shelter for the urban poor who are denied access to formal housing by their social and economic status. Informal settlements occur when the current land administration and planning fails to address the needs of the whole community. These areas are further characterized by rapid, unstructured and unplanned development. On a global scale, informal settlements are a significant problem especially in Third World countries housing the world's disadvantaged (Ambaye, 2011).

Although there are no records of fires in Kenya that date as far back as AD 64, the 16<sup>th</sup> century or even the beginning of the 20<sup>th</sup> century as was the case in the global environment, there is no doubt that the country has experienced a number of serious fire disasters. The NDOC has records dating back to the 1990s. Unfortunately, they are incomplete and therefore unreliable as a historical record of fires in the country. However, for the purpose of contextualizing the Kenyan situation, the study examined fires that have left a mark in the Kenyan history since 2011 when record keeping seems to have become consistent.

A number of fire outbreaks have been experienced in informal settlements in Nairobi e.g around 80-90 per cent of the Deep Sea informal settlement in Westlands was destroyed on 8 March 2011. Many families living in Deep Sea lost all of their belongings in the fire, including personal documents. "Now the children have to register for the National Primary School Examinations that are

on-going, whose deadline is 31 March, but for this they need birth certificates, which along with other key documents have been burnt in the fire....” *Amnesty International* (April 11 2011). President Kibaki expressed concern over fire outbreaks in informal settlements in Nairobi and called for measures to mitigate the effects *Standard* (13 -04-2011). The mayor of Nairobi said over 23 fire incidents had been reported within the city especially in the slums in April 2011 (Ibid).

In May 2011, eight people were burnt to death when a fire gutted down a paints making factory that also doubled as a residential area in Kariobangi. On 12<sup>th</sup> September 2011, 89 people were burnt to death while many others were injured and rushed to hospital where 40 more died on different dates while undergoing treatment, as a result of a fire that razed down part of the Mukuru Sinai slums. Against this background, civil society institutions such as *Amnesty International* have been petitioning the Government of Kenya through letters written to the Prime Minister, to mitigate and guarantee the safety of the poor; the majority of whom live in the informal settlements (CRC Briefs, September 2012).

Kenya promulgated the new constitution on August 27<sup>th</sup>2010 with the review process having taken place at a time of serious social, economic and political stress at the level of the polity (Constitution of Kenya Review Commission, 2005). The new constitution hence provided an advanced Bill of Rights that among other things recognises economic rights of the Kenyan citizens (Chapter

Six). The courts and government institutions are bound to the Bill of Rights as per the constitution Article 2(1), Article 10 (1). These articles in addition to many others not outlined here mark a milestone of the pillars that the public required in order to guarantee human rights protection in a new dispensation of justice in Kenya.

The High Court of Kenya also recently affirmed that Kenyans have the constitutional right to adequate housing and reasonable standards of sanitation (Petition Cases No. 65 and 66 of 2010). The Court also recommended the formulation of a reasonable state housing policy, which should pay special attention to the needs of the poorest and most vulnerable; have sufficient regard for the social economic and historical context of widespread deprivation and respond with care and concern to the needs of the most desperate especially those living in informal settlements (ibid).

Life in informal settlements is characterized by abject poverty and social exclusion (Global Report on Human Settlements, 2003). The physical and social characteristics of the environment in which informal settlements are located provide the context in which disasters are likely to occur. It is therefore imperative to try and determine challenges of dealing with fire out breaks in the informal settlements as these fires do not only make the situation of the slum dwellers worse, but also exacerbates their vulnerability to poverty and hence increases the desperate population in the Country.

## **1.2 Statement of the Problem**

The Nairobi City Fire Department receives about 300 distress calls per month, which translate to 10 reported fire incidents a day (NDRMP, 2012). In the Sinai fire of 12th September 2011, 89 people were burnt to death. Many others were injured and rushed to hospital where 40 more died on different dates while undergoing treatment (Ibid). This is the worst reported fire incidence in Nairobi so far. It is worrying that these fires destroy property of enormous value, damage infrastructure and cause deaths.

The sudden up-surge of fire outbreaks, the increasing numbers of victims and the enormous value of property lost clearly suggest that there is a problem when it comes to dealing with these fires and has been the main inspiration behind this research. The study sought to examine the challenges that hampered effective handling of such outbreaks by focusing on the Sinai informal settlement in Nairobi and hence preventing such outbreaks becoming disastrous in informal settlements.

## **1.3 Research Questions**

The study sought to answer the following research questions.

1. What is the community's awareness level on fire hazards and how to respond in the event of a fire?
2. What Standard Operating Procedures exists for use during the outbreak by residents of informal settlements and by local authorities?

3. How was the fire tragedy at Sinai responded to by the authorities and the locals?
4. What challenges hampered the effective response to the Sinai fire disaster?

#### **1.4 Objectives of the Study**

The study was guided by the following objectives:

1. To determine the level of awareness on fire hazards and how to respond in the event of a fire among the residents of the Sinai informal settlement.
2. To determine whether the Nairobi County Government has issued Standard Operating Procedures that detail sequence of events when responding to fire in informal settlements.
3. To find out how the tragedy at Sinai was responded to by the residents and the authorities
4. To examine the challenges that hampered an effective response to the Sinai fire disaster.

#### **1.5 Research Assumptions**

The study was based on these assumptions:

1. Nairobi residents especially those residing in informal settlements lacked enough awareness about fire tragedies.
2. There were haphazard operations procedures to deal with fire outbreaks.
3. The residents and the local authorities lacked capacity to tackle fire outbreaks.

4. Poor transport infrastructure in informal settlements undermined effective response to fire disasters in Nairobi county.

## **1.6 Significance and Justification of the study**

This study was motivated by the rising cases of fire outbreaks in the urban areas, especially in the informal settlements of Nairobi. The number of deaths, social, political and economic losses attributed to these fires to a section of the society that is vulnerable to other hazards such as; floods, earthquakes and disease outbreaks also motivated the study. Existing data from the National Disaster Operation Centre (NDOC) indicated that the country experienced 2957 fires between 2010 and 2011. Nairobi suffered the most; with 18% of the fires experienced in Kenya.

A close study of the available data on the Nairobi fires shows that most of these fires occur in the informal settlements scattered across most parts of the city and its surroundings (NDOC, 2010). It is puzzling that the causes of less than half of these fires remain unknown. The researcher hoped to establish the challenges faced in dealing with fire outbreaks in informal settlements and in particular to find out what challenges hampered the effective tackling of the Sinai fire with a view to giving recommendations with regard to policy interventions in order to address informal settlement fires. Hopefully, this information will be used to inform policy on dealing with disasters in informal settlement and more specifically, how to deal with informal settlement fires.

The significance of this study therefore lies in what can be gained through the research process. Perceptive actors such as: the slum dwellers, the local administrators, members of the civil society, business people, fire fighters and other responders during a fire outbreak may be able to assist in determining the challenges that were faced in dealing with the Sinai fire in order to enable them take the appropriate future preventive action where possible. Hopefully, the research will also positively affect the slum dwellers by confirming to them that they are important enough for a research to be undertaken to examine the challenges they faced while dealing with the fire tragedy that killed their folks and greatly affected them socially, environmentally and economically. There were many incidences of fire outbreaks but very few local studies of fire disasters in Kenya. In this regard, the result of this study may also provide data to future researchers in this area.

### **1.7 Limitation and Delimitations of the Study**

Although there are investigations focusing on Sinai fire disaster by the police or insurance companies for either criminal attribution or compensatory purposes. However, this study is purely academic and the findings were limited to the contribution to the wealth of knowledge. Since one of the characteristics of informal settlement dwellers is the frequent movement from one informal settlement to another, this study involved the Sinai slum dwellers who resided in the informal settlement in the month of September 2011. It was likely that some of them no longer resided at Sinai during the study. However, the study sought to

use snowballing in some cases to ensure that it obtained the residents of Sinai at that the time of the accident. The limited time and resources available to access community-level information was also a great challenge for the study, but the researcher used a budget as well as an action programme so as to reach the target within the available time and resources. Lack of accessibility due to poor infrastructure and blocked access roads also posed a challenge. However the research sought to get research assistants who used footpaths and moved from house to house by foot so as to access and reach the respondents. The other challenge was the insecurity within the area which the researcher sought to address by using the local administration for example the chief so as to provide the security. All in all the 126 deaths that resulted from the fire and the value of property lost qualify the fire incident to be called a disaster in line with the definition of the Natural Hazard Research Group at the University of Colorado; as the research has not found records showing such a magnitude of deaths in a single fire incident in Kenya; and therefore called for a thorough investigation of the Sinai fire disaster, in order to try and avoid such loses in the future.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

The study reviewed literature from the United States of America, and selected African countries which include South Africa and Kenya in order to appreciate efforts by these countries to deal with fire disasters. The study also reviewed the Fifteenth Edition of *Fire in the United States, 2003-2007*, a larger statistical report of the overall fire problem in the United States as well as parts of the problem, such as residential and non-residential structure fires. The report was available at ([www.usfa.dhs.gov](http://www.usfa.dhs.gov)) it presented trends of fires, deaths, injuries, and dollar loss over the 5-year period of 2003 to 2007, with emphasis on 2007 National Fire Incident Reporting System (NFIRS) data relating to causes of fires, property types, and civilian fire injuries.

This report based Civilian fire death data analyses on the National Center for Health Statistics mortality data with the 2006 data being the most current available at the time of its publication. It indicates that the U.S. fire departments responded to nearly 1.6 million fire calls in 2007 that resulted in thousands of deaths, tens of thousands of injuries, and billions of dollars in property loss, and ranks the United States as having the fifth highest fire death rate out of 25 industrialized Nations examined by the World Fire Statistics Centre. This general status has remained unchanged for the past 27 years. However, the fire and fire loss rate trends for the 5-year period of 2003 to 2007 show that, while dollar loss

per capita increased by 4 percent, the fire rate per million population declined by 3 percent. The death rate declined by 20 percent, and the injury rate declined by 9 percent. Ultimately, The Fifteenth Edition of Fire in the United States shows that, overall, the fire problem in the United States continues to improve. Five-year fire loss rates are down and the report attributes these trends to: Smoke alarms, whose usage has become nearly universal; Sprinklers, which quickly combat fires in their initial stage, especially in non-residential and multifamily buildings; Fire codes, which have been strengthened; Construction techniques and materials, which have been targeted specifically to fire prevention; Public education at the community, county, State, and Federal levels; and Improved fire-fighter equipment and training. programmes.

This report was significant to the current study as it provided a statistical overview of fires in the United States and is designed to equip the fire services and others with information that motivates corrective action, set priorities, targets specific fire programs, served as a model for state and local analyses of fire data, and provided a baseline for evaluation. It also provided a contrast in that while we saw the number of deaths associated to fires going down in the USA, the opposite was happening in Kenya as was shown by the Sinai fire disaster. Moreover, it was interesting to compare the policy and regulatory environments in relation to the building codes and materials of these three countries.

Nerina (2009) carried out a study on informal settlement fires. The study examined the issue of informal settlement fires in Kayamandi a township of Stellenbosch in the Western Cape Province of South Africa and sought to identify the relevant role-players involved in addressing the issue so as to understand the unique dynamics involved in this type of fires at the local level context. The study focused on the main contextual factors that contribute to the perpetuation of informal settlement sprawl in South Africa in relation to the risk and vulnerability experienced by informal settlement dwellers. The contextual focus included macro-economic factors that contribute to the environment in which informal settlement fires occur, and furthermore, developmental, economic, political and social aspects and the related experience of poverty, urbanization and unemployment. The researcher identified the role-players as the government, non-governmental organizations and the informal settlement dwellers affected by informal settlement fires. She reported that all the affected informal settlement dwellers and respondents in Kayamandi saw the task of addressing risk and vulnerability related to informal settlement fires as the responsibility of the local government. Nerina's study is important for illuminating the different role players that concern themselves with the problems of informal settlement fires in South Africa. However, her study does not dwell on the challenges in dealing with the outbreak of informal settlement fires and that was the scope of this research. Nerina's findings compared with those of the current research as far as challenges faced while suppressing the outbreak of fire in slums is concerned.

Nerina study is important because it shows that the mere existence of a policy does not solve the problems associated with the management of fires. Often, government management at the federal level ignores local variation. In addition, decision makers located in the administrative capitals, are remote and thus less able to comprehend the nuances of that variation, and less able to react to environmental changes as they occur. The challenge for policy makers in Kenya is therefore to create a national fire management policy that incorporates a greater degree of local control. There is no simple solution to remedy the problems of fire policy. Informal settlements are diverse and constantly changing. As a public good, fire suppression in informal settlements is not guaranteed to be provided at optimal levels. It may not be possible to reach an ideal solution under current institutional arrangements. But a comprehensive approach to the problem could at least produce a fire policy that will not increase risks to informal settlements.

Wangari and Makau (1998) carried out an inventory of the Nairobi slums in order to provide an appreciation of the scale and depth of the slum problem entitled: *Inventory of Nairobi slums* Matrix Consultants (1998). The study also hoped to provide a starting point for positive action and demonstrate that evicting slums is in the long run futile. While the study tried to ensure that data accuracy was enhanced, the exercise was however limited by the fact that settlements are subject to frequent upheavals given their vulnerability to evictions and fires, informal status, and the recent post-election violence. In some settlements, residents were hesitant to divulge details of land ownership or their efforts to

regularize their tenure status out of suspicion or fear of attracting outside interest. It was also limited given that land ownership in the informal settlements is often contested and current information is unavailable from Government. Moreover, the population figures given in some settlements were mere estimates.

Wangari and Makau (1998) study was significant to our study because it provides the history behind the establishment of Sinai slums. It also raised important policy questions since policies, as opposed to plans; assume that slums are part of the human condition. The study further recognized that slums are vulnerable to fires. Given that their research is not a study on slum fires, it does not dwell on challenges of dealing with fire outbreaks in informal settlements which was the core of our study.

Wachira and Smith (2012) reviewed major disaster incidents in Kenya for the period running from 2000-2012. Their review shows that Kenya's major disaster incidents profile is dominated by droughts, floods, fires, terrorism, poisoning, collapsed buildings, accidents in the transport sector and disease/epidemics. They argue that the lack of an integrated emergency services and a lack of resources, escalate many incidents in Kenya to such an extent that they become major incidents. Moreover, lack of specific training of emergency services personnel to respond to major incidents, poor coordination of major incident management activities, and a lack of standard operational procedures and emergency operation plans have all been shown to expose victims to increased morbidity and mortality.

Wachira and Smith. (2013; 28(2):1-4.) Given that the purpose for the review was to highlight the importance of developing an integrated and well trained ambulance and fire and rescue service appropriate for the local health care system, they did not focus deeply on fire disasters. Our study sought to examine factors that undermined efforts to deal with fires in informal settlements. The argument that the lack of an integrated emergency services and a lack of resources, escalate many incidents in Kenya to such an extent that they become major incidents also informed our study.

A number of scholars including; McGinn, Kutchma and Hammer (2012) of the Harvard university Kennedy school of Government, and a number of other scholars from George Mason (2012) university and Massachusetts Institute of Technology over time have published case studies and essays on Kibera slums; However as , Erica Hagen (2012) opines, ‘Despite Kibera’s “fame” on the international stage—including countless documentaries and NGO-funded media—these reports rarely reach a Kenyan audience *Innovations / volume 6, number 1 99*. They also tend to focus on the shock value of open sewers and garbage pits or present a glowing account of a given NGO’s contribution to Kibera. International audiences are led to believe that Kibera is a kind of hell on earth and are moved to send cash, while Nairobi’s middle and upper classes tend to avoid it altogether, out of fear or disdain’. Thus the studies by these individuals and organizations have one aim in common: Fund raising. The value of these studies to the affected population therefore remains in question yet according to

Anne Nelson (2012), *innovations* / volume 6, number 1 99; When the Haiti earthquake hit in January 2010, the consortium took measures to engage Haitians as active partners in the relief effort, especially in the media and communications spheres. It is no coincidence that many new digital tools—especially the *Ushahidi* mapping platform—were prominent in this effort. The overall philosophy was based on the principle that the most effective individuals in rescue and relief efforts are often the locals who possess knowledge of the affected environment. This study was important in our study because its findings corroborate the findings of our study as far as the importance of local knowledge in dealing with disasters is concerned. Thus an informed local population can prevent small fire from becoming a disaster such as the Sinai fire disaster.

The Kenya Ministry of Environment and Mineral Resources (MEMR) through the United Nations Resident Coordinator (UNRC) requested for environmental emergency response services On 23 September 2011, a few days after the Sinai fire. This led to the deployment of a Joint UNEP/OCHA Environment Unit; to undertake a rapid environmental emergency assessment. The scope of the mission was to provide scientific information on the extent and nature of pollution and to assist the decision-making and priority-setting by the authorities and other actors for follow-up activities on the affected site. The mission took place from 9 to 16 October 2011 and published the study immediately. Although this study was conducted in the area targeted by this research, the scope was different in that it focused on identifying the presence and concentrations of hydrocarbons in soil

and surface water and provided recommendations for the mitigation measures; thus it estimated the nature and the extent of the pollution recorded. The sudden up-surge of fire occurrences is evident and calls for an investigation into the rapid change of events and causes of these fires.

A Review of past experiences of fire risk management and analysis of existing Acts, Codes, Regulations and Policies related to fire by the drafters of the unpublished, The draft Fires Safety Management Policy of Kenya (FSMPOK, 2011), showed that: outdated and inadequate codes, regulations and legislation; laxity in the enforcement of laws; lack of Public awareness; insufficient fire early warning systems; shortage of trained and qualified personnel; lack of national standardization of fire appliances and equipment; and lack of professionally designed fire detection and protection systems in domestic, commercial and industrial environments, have been the major impediment towards achievement of fire safety in the country

The draft Fire Safety Management Policy of Kenya (2011) was therefore designed to address the identified shortfalls in the management of fires risks in the country. The Policy lays down the goals, objectives, guidelines, coordinating structures, legal and institutional framework that will enhance the process of fire management in Kenya. The Policy also aims at providing institutional structures and building capacity to manage and cope with the menace of fires risks. It has identified the major policy elements and strategies necessary to overcome the

shortcomings of fire safety management. This Policy also advocates for the strengthening of fire and rescue services institutions and improving of coordination with other partners. It has recommended the review and harmonization of existing relevant policies and legislations in order to establish an institution with legal mandate to coordinate fire safety management in the Country. FSMPOK, (2011) The pace, at which the stakeholders are taking to draft, approve and eventual legislation of the policy and many others in the country, is an indictment of the country's commitment to reform, as it purports to make great strides towards significantly reducing poverty and hence achieving the goal of Vision 2030 when disasters have in the recent past increased and thereby distracting the tempo of economic development in the country NDP, (2011).

## **2.2 Summary of Reviewed Literature**

The comparison between different global areas: World view, Africa and Kenya has had a contribution in this project because it points out some of the areas that are critical. Firstly, it shows that significant efforts have been put in place in the Americas, Europe and Asia in the areas of Disaster Risk Reduction with both governments and the civil society allocating numerous resources to research and disaster management. This demonstrates the level of understanding and seriousness associated with disaster management in these areas. There is also a lot of literature available in those areas on policies and disaster management.

South Africa, Ethiopia and Ghana were good examples of African countries that are embracing good disaster management policies. Although they are at different

levels of development with South Africa leading in terms of technological advancement in the continent, the determination of both the Ethiopian and Ghanaian governments with the collaboration of the civil society has helped these countries advance in disaster risk reduction as compared to Kenya. These three countries have disaster policies and institutions with elaborate resources and procedures for disaster Management.

On the other hand, Kenya has prevaricated for more than a decade on a draft disaster policy that has denied it the opportunity and resources to develop in the area of disaster management. Although a number of studies have been carried out in disasters like drought, HIV & Aids, and hence there is some literature available in these areas, limited studies have been carried out on fire disasters and hence there is an opportunity for studies in this field including fires in informal settlements. Media articles reviewed are opinionated and therefore cannot be relied on as a sole source of data. Other data to support or deny their findings need to be collected.

The plethora of fires chronologies by Nelson and the NDOC reviewed by this study, do not deal with challenges of dealing with the outbreak of these fires. They simply act as accounts or historical records that leave unanswered questions. Secondly, the writer's approach is general while this research will focus on challenges that hampered effective dealing with fires in informal settlement with a

main focus on the Sinai fire, which forms the bulk of the reviews above as a result of limited literature on fires in Kenya and its surroundings.

### **2.3 Conceptual Framework**

This research considers several theoretical and conceptual frameworks that can be used to analyse the challenges of dealing with the outbreak of fire in the informal settlements and effects of fires on slum dwellers. Conceptual frameworks, according to Smyth (2004), are structured from a set of broad ideas and theories that help a researcher to properly identify the problem they are looking at, frame their questions and find suitable literature. The researcher considered the vulnerability ladder as a conceptual framework for a specific assessment approach: Asset, Institutional, Attitudinal and Physical vulnerability etc. As proposed by the Centre for Environmental Research, whereas the framework was used to assess vulnerability in informal settlements, it focuses on knowledge of property exposed upon the occurrence of disasters in the areas surveyed; understanding of risk perception by the people and their effects on their daily lives. While this conceptual framework failed to offer this study a structure for its conceptual analysis, it is significant in that it offers it a procedure of theorization for building conceptual frameworks based on grounded theory methods. The advantages of conceptual framework analysis are its flexibility, its capacity for modification, and its emphasis on understanding instead of prediction.

Nick Brooks (2003) developed a conceptual framework of risk, vulnerability and adaptive capacity that synthesises a variety of approaches in adaptation to climate variability and change, generally applicable to a wide range of contexts, systems and hazards. While this framework could also be used to assess the capacity of the of the Sinai informal settlement to adapt to fire hazards, our study focuses on challenges of dealing with fire outbreaks which sequentially would mean that the current study deals with pre and during disaster periods, Nick Brooks (2003) framework deals with the post disaster period alone.

The Practical Action's Reducing Vulnerability programme which aims at reducing vulnerability by strengthening the ability of poor people to use community systems to cope with threats from natural disasters, environmental degradation and civil conflict has also been considered and contributes to the formulation of this conceptual framework to deal with challenges of fire outbreaks only to the extent to which it looks at the assets of vulnerable people and their linkages with institutions, policies and processes. The framework aims at strengthening the ways that people who live in fragile environments cope with environmental degradation that threatens their livelihoods, improving vulnerable communities' ability to prepare for, survive and rebuild homes and livelihoods after natural disasters, preventing and managing conflicts over scarce natural resources and competition for common property resources and rebuilding the livelihoods of people affected by civil war or conflict.

The heart of the framework is slum dwellers and their livelihoods. It is the exposure of these people to fire hazards that results in increased risks of loss of life and property. However, to determine the underlying challenges of dealing with fire in informal settlements, the study looks beyond the immediate threat or hazard. It looks at the physical, social and political environment in which people live. Fire disasters do not occur in isolation, but are affected by long term trends in physical, social and economic factors. The impact on people ultimately depends on the types of institutions, policies and processes that affect their access and control of resources which form the variables that this study examined below:

### **Policy, Institutions and Processes**

Policies are framework through which governments attain their planned objectives. If poverty eradication is the goal: rural development, urban development and industrial development policies are shaped to attain the broad goals (Naidu, 2011:59). The lack of a national disaster policy in Kenya limits the Government's framework for the provision of goods and services to the public. The situation is exacerbated during disasters. This study therefore will sensitize the various institutions such as Government ministries, parliament and other sections of society involved in rescue activities during fire outbreaks; by suggesting further ideas for consideration in the process of formulating the National Disaster Policy.

## **Build Capacity of Slum Dwellers to improve the level of their assets**

The land issue in Kenya has continued to be a political, social and economic problem. A common characteristic of Nairobi slums is that, most of them are constructed in either private land occupied illegally by the dwellers, or government land earmarked for future development. Scenes of roaring bulldozers bringing down such structures are common. Because of insecurity or lack of legal claim to the lands occupied, the settlements are made of low quality materials that make them vulnerable to fires and have inadequate or lack any form of access roads and social services. There is therefore need to formulate strategies for dealing with hazard risk as a prerequisite for the creation of a secure living environment. This may include: exploring a legal framework that upgrades these structures: provide adequate infrastructure; and security of assets and social services leading to improved human settlement to mitigate fire disasters.

## **Long Term Trends**

Policy implementation would enable all stakeholders' including: Government and civil society organizations take up their responsibilities during disasters; there will be an improved environment as a result of formal structures and policies for the upgraded housing units will create order and lead to population change by eliminating spontaneous building of low quality structures; Improved health as a result of clean environment; ease of movement as a result of improved access to the informal settlement and availability of proper sanitation facilities and other infrastructure. These put together will lead to Urbanization.

## **Fire Hazards**

Strengthening the stake holder's knowledge on prevention, risk management, warning systems, response ability and mitigation would reduce vulnerability and losses associated to slum fires.

## **Outcome**

The improved legal and operational framework will lead to improved living conditions; and improved building material will lead to reduced fire incidences resulting in a cleaner and secure environment to live and invest in. Slum dwellers currently marginalized due to lack of basic constitutional entitlements thus have a unique opportunity to enjoy constitutional rights accorded to other citizens and also reduced burden on other tax payers who meet the cost of relief extended to them whenever there is a fire breakout.

The diagram below seeks to illustrate the framework discussed above.

The Framework for dealing with challenges of fire outbreaks in informal settlements

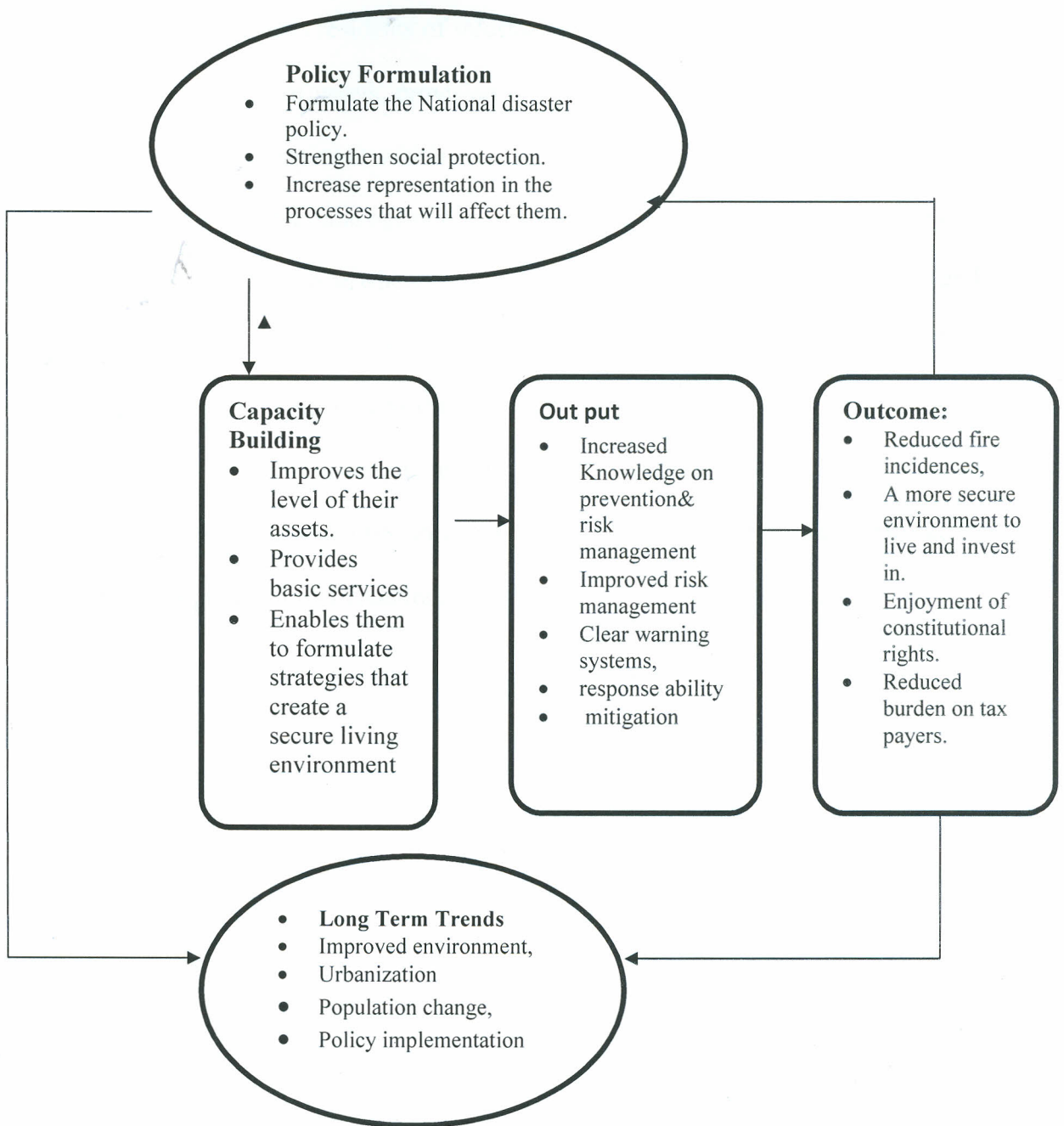


Figure 2.9: Conceptual Framework

Source: Researcher (2013)

This conceptual framework specifically indicate that the presence of a National Disaster Policy that strengthens social protection and increases representation of processes that affects residents of informal settlements such as Sinai would result in improved level of assets, provision of basic services, enable the creation of a secure living environment which would translate to an increased knowledge on prevention and risk management, clear warning system, able to respond if necessary and when overwhelmed there would be mitigation. Such capacity and output would result in reduced fire incidences, a more secure environment to live in, greater enjoyment of constitutional rights and reduced burden on tax payers. Ultimately, the environment in the informal settlement would have been improved, the area would be more urbanized, and the population would change as a result of policy implementation.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Research Design

The research was based on a case study research design. This allowed focus on the specific challenges experienced in addressing the outbreak of the Sinai fire since in a case study, one deliberately try's to isolate a small study group, one individual case or one particular population (Worth, 2008). A case study is most appropriate when the relationships among variables are to be studied in detail and the interaction of factors and events that undoubtedly lead to the fire described in detail. In a case study a few features are identified and how they affect the implementation of the system fully described. A case study integrates decision making and how programmes have been implemented or the lack of implementation thereof. In as far as a generalization is concerned; no two informal settlements can be described in a similar manner due to the fluidity of their occurrence and re-occurrence. The informal settlements can be structurally similar in their lack of basic infrastructure and high density, but dissimilar in their cultural environs and accessibility. Some informal settlements are accessible due to their proximity to middle income estates while others on the fringes of the city are no-go zone even in times of disaster. For this reason, each informal settlement requires a unique independent study. The research was descriptive in that it described the characteristics of the Sinai slum and how they pose a challenge to addressing the issue of fire out break (Kothari, 2002).

### 3.2 Location of the Study



**Figure 3.1: Site Map**

*Source: Extracted from City of Nairobi scale 1:2500, Survey of Kenya March 2005.*

The study was conducted at Sinai informal settlement of Viwandani sub location in Makadara district, Nairobi County. Sinai slum is situated along the valley of Nairobi's Ngong River that traverses Nairobi from Dagoretti through Nairobi Dam, Nairobi South C and through industrial area (CRC 2011). The slum is a

home to a huge population of Nairobi inhabitants who also form a huge labour market for the neighbouring industries. The area is located near the Kenya Pipeline depot where petrol fuel which found its way to the slum through the nearby Ngong River is reported to have originated. Sinai was chosen since it is still prone to fire hazards and other disasters after the one under focus by this study, there also exists background information focused on identified gaps and priority needs and that the area has documented information highlighting effect of the disaster to the residents

### **3.3 Target Population**

The study targeted the entire population of the Sinai Slums in Viwandani sub location of Makadara District. The slum had a population of 44,881 and comprised of 2,880 households according to the National Population census of 2009. Although Viwandani Sub location is part of Nairobi and not all structures are informal, the study mainly focused on the informal areas of Sinai and the dynamics specific to addressing the problem of informal settlement fires. To achieve this, the research sought to access the households affected by the 12<sup>th</sup> September 2011 fire. It also targeted the administrators of the area and the community leaders. These include the chiefs, district officers, and Deputy County Commissioners.

### **3.4 Sample Selection**

Since the census is untenable, sampling was done to identify the representative group of respondents. The area in which the fire occurred was purposefully

sampled from which the households within that area noted. Stratified random sampling was used to sub divide the households according to how the houses are structured. From each stratum, simple random sampling was used to identify the households for study. Most writers Gay, (1992), Mugenda and Mugenda, (1999), recommend a minimum sample size of 10% for descriptive studies. However the sample size used for the study was 341 households. According to the Krejcie and Morgan (1970) table for determining sample from a given population. Mulusa (1998) recommends the use of the Krejcie and Morgan table for determining sample size for Research activities when the sample selection is purposive. The household sample was drawn randomly using the basket method for each subset. Three members of local CBO, local administration, fire marshals, local police officers and officials of Kenya Pipeline Company were also sampled.

### **3.5 Data Collection Instruments**

The study employed the use of questionnaires and observation schedules to collect data from the respondents about the tragedy. Questionnaires, with mainly closed ended questions, were used to collect data from members of affected household. Interview schedules were used to interview local administration officers and fire marshals as well as the local police officers and officials of Kenya Pipeline Company. Observation was done as the questionnaires and interview schedules were being administered to check on the accessibility of the areas, the dangers and hazards that residents faces and more so, the observation helped the researcher check on the poverty levels and other parameters that would affect the response to fire tragedies and incidents.

### **3.6 Data Collection Procedures**

The researcher sought for authority to collect data from the University after which the authority was used to also obtain authority from the provincial administration of the area. The researcher personally distributed the questionnaires to the respondents and collected them as soon as they were completed. Observation was done as the researcher and his assistants were moving from households to households. Observation aided in eliminating bias on the part of administrative responses since the operational behaviour of the administrators' was not under direct analysis. This method is independent on the respondents' willingness to respond and especially such questions that may be deemed sensitive to the job.

### **3.7 Data Analysis and Presentation**

Collected data was checked for completeness, coded, tabulated and analysed for purposes of answering the questions of the research. Descriptive statistics was used to analyse the collected data. Measures of central tendency and those of dispersion was calculated in order to obtain mean responses as well as draw comparisons between various variables and parameters of the study. The study also used the Statistical Package for Social Studies (SPSS) to aid in getting a better perspective. The analysed data was then presented for ease of understanding by all, in form of pie charts and bar graphs as well as frequency tables and percentages.

### **3.8 Ethical Considerations**

To enhance higher response rate and honest responses, the researcher assured the respondents about the confidentiality of the data they were giving. All data obtained from the study was discreetly handled. The questionnaires as well as observation schedules did not require the name of the respondents or any form of identification ensuring anonymity. The respondents were briefed on the purpose of the study and consent before any questions were posed to them. In the event that a respondent was unwilling to be interviewed that interview schedule was marked as 'non-respond' and no attempt was made to coerce the respondent. Corroboration and triangulation was used to harmonize data from oral/observation and secondary sources. The research finding was disseminated through the internet in order to be available to any interested person.

## CHAPTER FOUR

### DATA ANALYSIS, PRESENTATION AND DISCUSSION

#### 4.1 Introduction

In this chapter data pertaining to: the level of awareness on fire hazards and how to respond in the event of a fire among the residents, Nairobi County Government issuing Standard Operating Procedures that detail sequence of events when responding to fire in informal settlements, how the tragedy at Sinai was responded to by the residents and the authorities and the challenges that hampered an effective response to the Sinai fire disaster, is analyzed, interpreted, presented and discussed.

A total of 359 respondents comprising of 341 households, three local CBOs, three local administration officers, three fire marshals, three local police officers and three officials of the Kenya Pipeline Company were targeted out of which 224 households completed the questionnaires and returned. The study also established that three local CBOs, 4 local administration officers, one fire marshal, one local police officers and one official of the Kenya Pipeline Company participated in the interview. This gave a response rate of 65.5 percent.

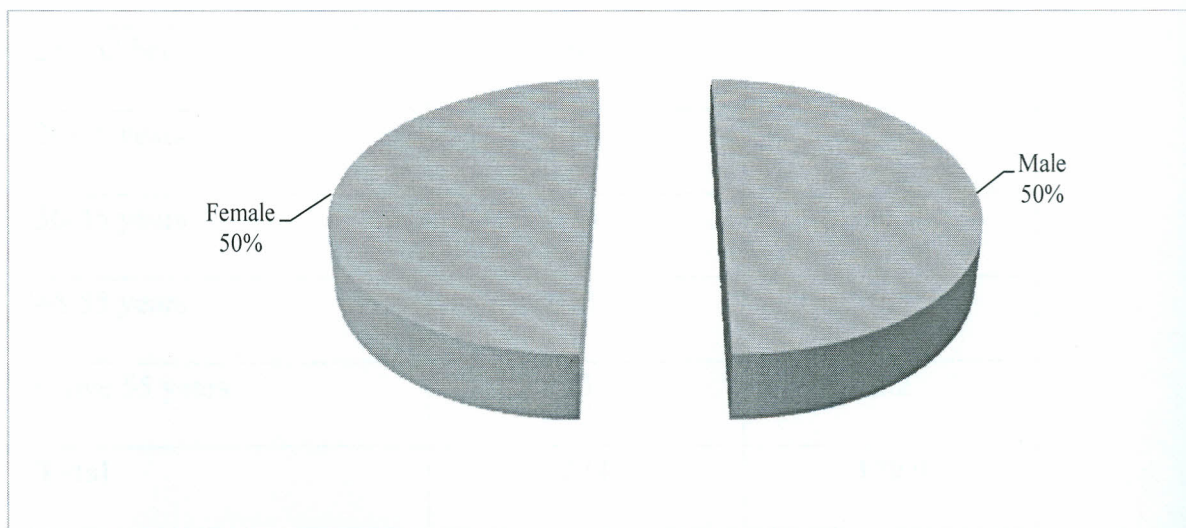
## 4.2 General Information

In this section, the study sought to establish the respondents' gender, age bracket, marital status, length of stay in Sinai and the level of education. The findings are presented in the subsequent sections.

### 4.2.1 Distribution by Gender

The respondents were asked to indicate their gender. According to the Figure 4.1, the distribution of the respondents is even as the number of both the male and the female were equal (50% each). This indicates the response would not be biased based on gender. This findings are however dissimilar from those by Tlou (2011) who in his study on informal settlement fires in India, found that more women (72.1%) respondents which he interpreted to mean that the distribution in the informal settlement in India was tilted in favour of women.

**Figure 4.1: Gender of Respondents**



Source: Research Data (2013)

#### 4.2.2 Distribution by Age

The study sought to determine the distribution of respondents by age. According to the study findings in Table 4.1, the majority of the respondents (87, 38.8%) were aged between 26 and 35 years while another 66 (29.5%) of the respondents were aged 25 years. The study findings show that 45 (20.1%) of the respondents were aged between 36 and 45 years. This meant that the majority of those who were affected by the fire were in their middle age. A number of them residents were also indulging in drinking illicit brews due to lack of employment or any form of productive activities. For instance when the researcher asked them why they were drunk during the day, they stated that they drink for lack of a better thing to do. The distribution of respondents by age contradicts the findings of Tlou (2011) who in his study found that most of his respondents were aged between 35 years and 60 years.

**Table 4.1: Distribution by Age**

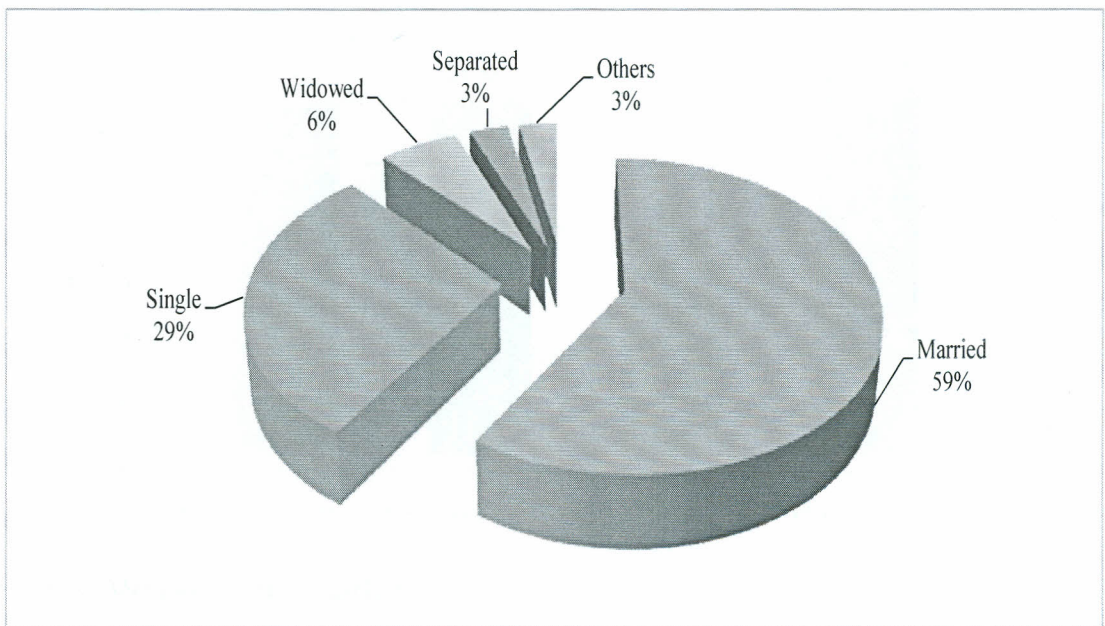
	<b>Frequency</b>	<b>Percent</b>
25 and below	66	29.5
26-35 years	87	38.8
36-45 years	45	20.1
46-55 years	21	9.4
above 55 years	5	2.2
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

### 4.2.3 Marital Status

Respondents were asked to indicate their marital status. The study results in Figure 4.2 show that majority of the respondents (59%) were married while another 29% were single. The findings mean that the most affected by the Sinai fire were family people who probably were out fending for their families. These findings contradicts those of Tlou (2011) who found that in his study, there were more singles 46% than any other category.

**Figure 4.2: Marital Status**



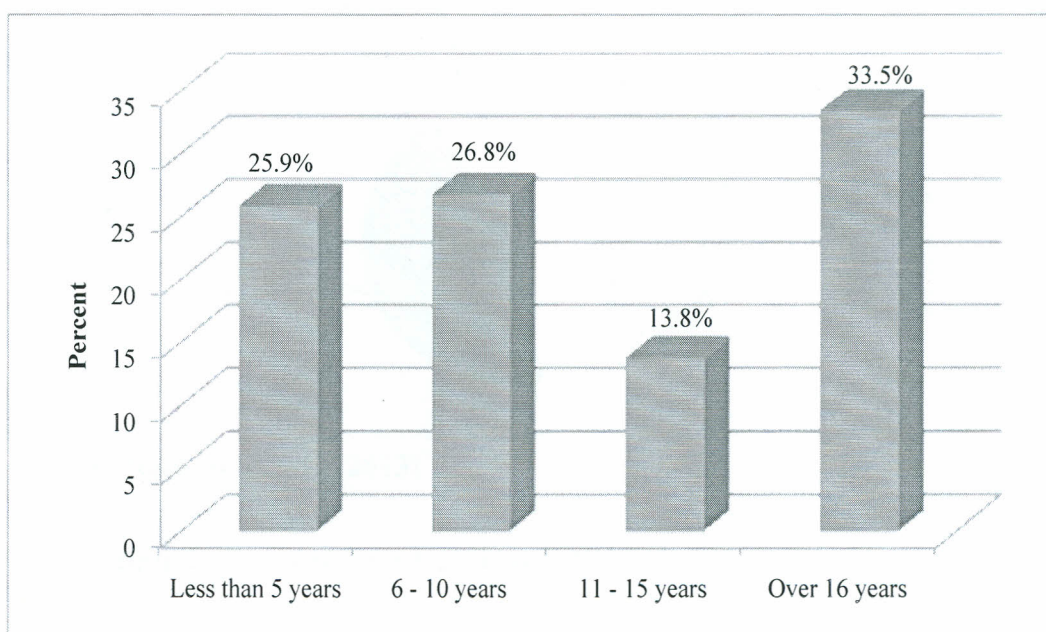
**Source: Research Data (2013)**

### 4.2.4 Length of Stay at Sinai

The study sought to determine how long the household respondents had stayed in Sinai. The study findings as presented in Figure 4.3 show that majority of the respondents (33.5%) had lived in Sinai for over 16 years while 26.8% of the

respondents had lived at Sinai for between 6 and 10 years. The findings further revealed that 25.9% of the respondents had lived in Sinai for a period of less than 5 years. The findings mean that most of the respondents have lived in Sinai long enough. The findings agree with Tlou (2011) who found that in the majority of the residents of Mafora informal settlement in South Africa (67%) had lived in the slum for a long period.

**Figure 4.3: Length of Stay at Sinai**



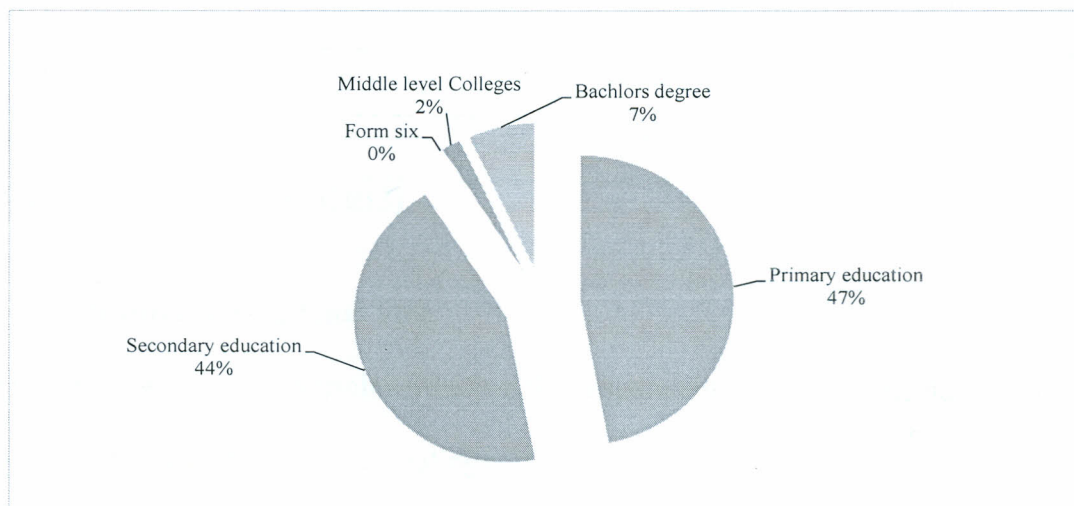
**Source: Research Data (2013)**

#### **4.2.5 Level of Education**

Respondents were asked to indicate their highest level of education. The study findings in Figure 4.4 revealed that most of the respondents (47%) had primary education while 44% of the respondents had secondary education. There were only a handful of university graduates living in the slums. The study findings

mean that the higher the level of education the less likely that one will live in Sinai slums. This further explains why most of them were unemployed since the current job market is demanding more skills and higher levels of education. The study findings contradict those of Tlou (2011) who found that most of the respondents in his study had completed secondary schools.

**Figure 4.4: Academic Qualifications**



**Source: Research Data (2013)**

### **4.3 Community's Awareness Level on Fire Hazards**

In this section the study sought to determine the community's level of awareness of the fire hazards and how to respond in the event of fire. The findings of the study are presented in the subsequent sections.

#### **4.3.1 Encountered Fire Tragedy in Lifetime**

Respondents were asked to state whether they had encountered any fire tragedy in their lifetime. According to the study results in table 4.2, majority of the

respondents (84.4%) have encountered fire tragedy in their lifetime. The findings mean that most of the respondents have encountered fire tragedy at least once in their lifetime and may therefore be aware of the fire hazards.

**Table 4.2: Encounter of Fire**

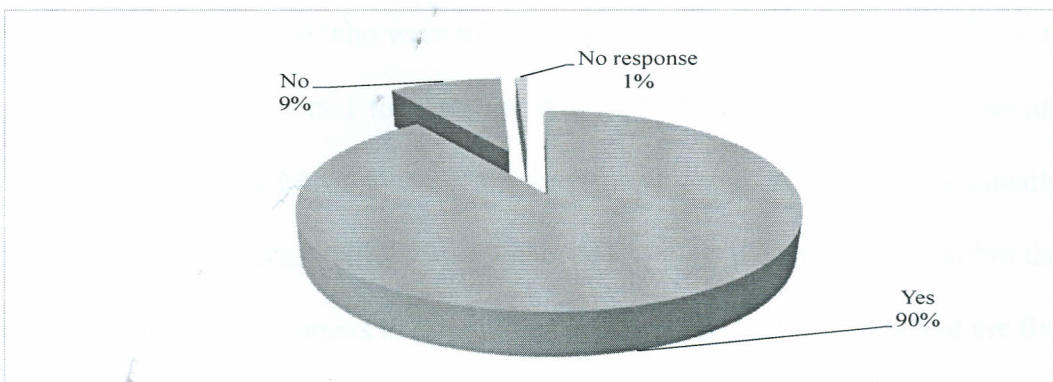
	<b>Frequency</b>	<b>Percent</b>
Yes	189	84.4
No	33	14.7
No response	2	.9
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

#### **4.3.2 Presence during Sinai Fire**

The study sought to determine whether the respondents were present during the Sinai fire. According to the findings of the study as presented in Figure 4.5, Majority of the respondents (90%) said that they were present when the Sinai fire tragedy occurred. Only a few respondents (9%) were not present where the fire occurred. This may be attributed to the high level of unemployment in the informal settlements which could be linked to their lack of skills and low education as earlier shown. This therefore explains why the residents saw the spill over of the petroleum as an opportunity to scoop the product in order to sell earn some money without considering the dangers they were exposing themselves to and the entire community.

**Table 4.5: Presence during Sinai Fire**



**Source: Research Data (2013)**

### 4.3.3 Response effectiveness

The respondents were also asked whether they thought the tragedy was responded to appropriately by the authorities. The study findings in Table 4.3 show that 49.1% of the respondents strongly agree that the response was appropriate while 44.6% agreed that the Sinai fire was responded to appropriately. The findings mean that the respondents were satisfied with the response that the Sinai fire received.

**Table 4.3: Response Effectiveness**

	Frequency	Percent
Strongly Agree	110	49.1
Agree	100	44.6
Don't Know	1	.4
Disagree	2	.9
Strongly Disagreed	3	1.3
No response	8	3.6
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

When asked to explain their answers on the appropriateness of the response to the Sinai fire, three of those who were of the opinion that the response to the fire was not appropriate mentioned the late arrivals of both authorities and the rescue teams that caused a lot of loss on property and lives. The respondents equally mentioned the in -accessibility to the scene due to poor road structures within the slum and lack of equipments to put out the fire by both local residents and the fire fighting team which caused a lot of wasting hence lose of lives and property. The study established that two respondents cited lack of knowledge in response to fighting the fire and lengthy operations of up to 2 hrs by the response team. The respondents further noted that most those who were victims continue facing trauma to date due to lack of counseling services to the affected. The respondents noted that impact of the fire would have been less fatal if their job was well done and that the aftermath of the fire was resolved including death expenses but the main cause was not resolved

However, five of the respondents who were of the opinion that the response to the fire was appropriate explained that there was a lot of harmony from the responding teams. The respondents also noted that there were enough ambulances to rush people to the hospitals which saved lots of lives. According to the respondents, there were proper equipment used to conquer the fire. Had the situation been different more damage to property and loss of lives would have occurred. They also noted that many victims were rescued from perishing in the fire. Respondents explained that the rescue teams arrived on time. Respondents

also indicated that the relevant rescue personnel were present to handle the situation and that the Government took charge of the victims by providing hospital fees, upkeep money and temporary shelter and clothing. They also mentioned that the fire would have been more disastrous but was managed and that despite late arrivals the extent of damage was contained and largely reduced as well as the fact that the ability to penetrate the otherwise compact housing system to contain the fire.

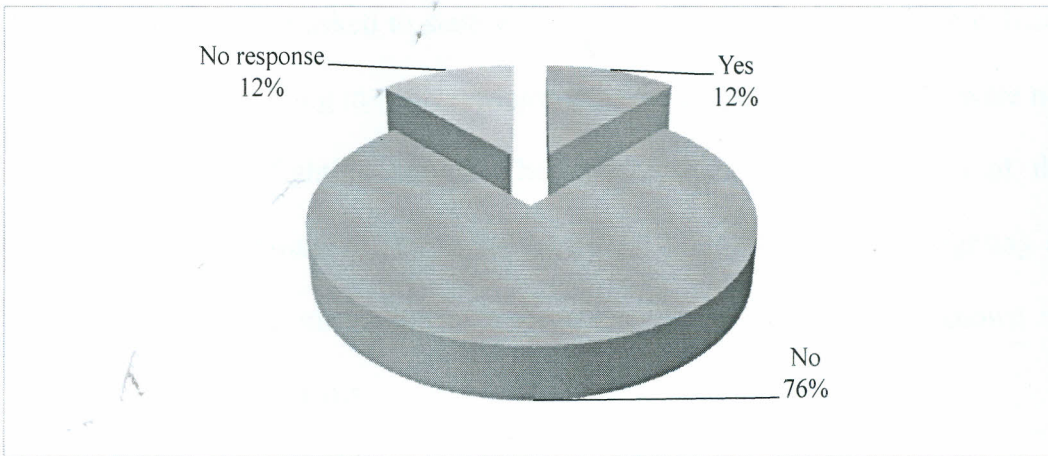
#### **4.4 Nairobi County Government Issued Standard Operating Procedures**

In this section the study sought to determine whether the Nairobi County Government had issued Standard Operating Procedures that detailed sequence of events when responding to fire in informal settlements. The findings are presented in the subsequent sections.

##### **4.4.1 Aware of Standard Operating Procedures in Fire Fighting**

The study sought to determine whether the respondents were aware of the Standard Operating Procedures in fire fighting. According to the study results in Figure 4.6, majority of the respondents (76%) were not aware of the Standard Operating Procedures of fire fighting. Only a few respondents (12%) were aware of its existence. This was a clear indication that the respondents had not been prepared for any fire fighting nor have been made aware of the issues to do with fire despite living next to the pipeline in a slum.

**Figure 4.6: Awareness of Standard Operating Procedures**



**Source: Research Data (2013)**

#### **4.4.2 Standard Operating Procedures were used**

The study further sought to know whether the Standard Operating Procedures were used during the Sinai tragedy. The study findings in Table 4.4 show that only 4% of the respondents indicated that the Standard Operating Procedures were used. The results show that according to 41.5% of the respondents, the Standard Operating Procedures was never used during the Sinai tragedy. This shows that no procedure was followed in the fire fighting in Sinai.

**Table 4.4: Use of Standard Operating Procedures**

	<b>Frequency</b>	<b>Percent</b>
Yes	9	4.0
No	93	41.5
No response	122	54.5
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

#### 4.4.3 Knowledge of Fire Fighting Policy in Kenya

The respondents were asked to state whether they had knowledge of the policies that guide in fire fighting in Kenya. Majority of the respondents (91.8%) were not aware of the fire fighting policy. The results show that only 8.2% of the respondents were aware of the existence of the policy guiding fire fighting in Kenya. The findings mean that to a large extent, the policy is not known by majority of the respondents.

**Table 4.5: Policies Known**

	<b>Frequency</b>	<b>Percent</b>
Yes	15	8.2
No	169	91.8
No response	40	17.9
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

#### 4.4.4 Accessibility of Sinai

Respondents were asked to indicate how they would rate the accessibility of the areas within the slum, including the site of the tragedy. The study results in Table 4.6 show that the majority of the respondents (42.4%) said that the area had limited access while according to 36.2% of the respondents; the area was difficult to access. The study findings show that only 11.2% of the respondents rate the accessibility of the area as quite accessible. These mean that the accessibility in the area is difficult. This result was corroborated by the researcher during data

collection. There were structure built on part of access roads hampering access by vehicles to the site of the tragedy and general movement within the Sinai slum.

**Table 4.6: Accessibility Rate of Sinai**

	<b>Frequency</b>	<b>Percent</b>
Quite accessible	25	11.2
Limited access	95	42.4
Difficult access	81	36.2
No Access	8	3.6
No response	15	6.7
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

When asked to explain their responses, the respondents indicated that poor planning with houses occupying spaces meant for roads, narrow paths between houses make the areas inaccessible, poor and unclear roads, congestion of houses and that the houses built within close proximity hamper ease of access. The researcher experienced same difficult that the residents of Sinai faced while navigating though the slum area. For instance, sewage water that passes through several places within the slum forced the researcher to jump in order to avoid the slimy waters. Dark alleys forced the researcher to leave the slum earlier than planned during the data collection exercise.

In his observation checklist, the researcher sought to determine whether the policy framework for response to fire hazards such as policy document, standard operating procedures, and the levels of information on disaster policy, were

available at various public institutions such a local administration, fire stations, the local primary schools and the police station. The researcher observed that policy document was available only at the fire and the police stations. The researcher observed that the Standard Operating Procedure was only available on the notice board of the fire station. The level of information of disaster policy was however not available in any of the institutions.

The study sought to establish whether there existed early warning systems such as the charts and flyers on the key public areas on what to do in the event of fire, emergency number to call and emphasis during public meetings, national days and barazas. The observations were made in the health centers, bus stops, chiefs' offices, local primary schools, fire stations and police stations. The researcher observed that at the health centres, the chief's office the fire station and the police stations, there were charts on what to do in the event of fire and an emergency number to call. This was placed either on the fire fighting equipment or on the emergency exit of the buildings.

On the institutions engagement in countering or mitigating the fire disaster by displaying fire emergency number boldly, and Standard Operating Procedure in case of fire the researcher observed that it was only at the fire station that the fire emergency number was displayed boldly. In all the other institutions and public places such as the police station, bus stop, chief's office and the local primary school, there were no countering strategies that were engaged in.

The study sought to establish whether there were modalities for knowledge transfers to the communities such as the existence of community trainers, knowledge transfer in schools and the knowledge transfer from parent to child. The study established that there were no community trainers in the community. However, there was knowledge transfer in schools as the pupils were taught how to act in case of fire outbreak. The transfer of knowledge from the parent to children was to a large extent non-existent as in most cases the parent and their children are hardly together for such a forum to take place. The study established that the researcher did not observe any graffiti on the walls of the organization depicting the emerging issues and lessons learned. There were equally no community recommendations on the walls according to the observation made by the researcher.

#### **4.5 Response to Sinai Tragedy by Respondents**

In this section the study sought to find out how the tragedy at Sinai was responded to by the residents and the authorities. The findings are presented in the subsequent sections.

##### **4.5.1 Participated in Fire Fighting**

The study sought to know if the respondents personally or as a family participated in putting off the fire. The results of the study in Table 4.7 show that 53.6% affirmed that they participated while the other 42.4% said that they did not participate in putting out the fire. The findings are interpreted to mean that while

most respondents participated in the fire fighting; quite a number did not participate.

**Table 4.7: Participation in Fire Fighting**

	<b>Frequency</b>	<b>Percent</b>
Yes	120	53.6
No	95	42.4
No response	9	4.0
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

The respondents when asked to explain their answers indicated they participated in the identifying bodies. Respondents also indicated that they took part in the rescuing of the victims. The study established that respondents participated in the tracing the missing persons and taking casualties to hospital. Four respondents who participated indicated that they assisted in putting out the fire using water buckets and tore down some structure in order to create fire breaks and hinder the rapid spread of the fire while other assist the fire brigade personnel in holding the horse. Five respondents said, they offered first aid. Respondents also indicated that they participated in evacuating people and goods. Those who indicated that they did not participate explained that they were either in shock, or were mothers taking care of children or did not just know what to do. The findings mean that to a large extent the respondents participated in the putting out the fire. However, their knowledge of putting off fire from different causes was limited. For instance,

some used water to put off fire caused by petroleum products which instead of putting off the fire further ignited the fire and worsened the situation. Those who were busy salvaging property from the burning houses inadvertently exacerbated the situation when containers of the scooped petroleum products they were carrying exploded.

#### 4.5.2 Exposure to Different Ways of Handling Fire

The respondents were asked to indicate whether they had been exposed to the different ways of handling fires from different causes. The study results show that majority of respondents (61.6%) have not been trained in skills of handling fire from different causes. The findings show that only 29.9% of the respondents were exposed to the different ways of handling fire. Those who claim to have knowledge were trained by civil society such as the Kenya Red Cross through fire drills while others had gained experience through putting out fire that are frequent in the area. This mean that most of the respondents are not exposed to different ways of handling fire from different causes and therefore require training in order to avert such tragedies in the future.

**Table 4.8: Exposure to Fire fighting**

	<b>Frequency</b>	<b>Percent</b>
Yes	67	29.9
No	138	61.6
No response	19	8.5
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

### 4.5.3 Correct Handling of Sinai Fire

On whether the fire was handled using the correct means, the results in Table 4.9 show that 43.8% of the respondents indicated that they did not handle the fire in the correct way. Only 16.1% of the respondents handled the Sinai fire in the correct manner. The findings mean that the respondents did not handle the fire in the correct way which could be attributed to the lack of exposure of fire handling skills as earlier found. Most of those who tried to put off the fire before the fire brigade arrived were using water buckets. This worsened the situation and helped the fire to spread further. Others tried to throw away the containers containing the products they had scooped, but this also helped in the spread of the fire. The few who felt that they handled the fire in a correct manner were those who brought down some structures in order to create fire breaks.

**Table 4.9: Correct Handling of Sinai Fire**

	<b>Frequency</b>	<b>Percent</b>
Yes	36	16.1
No	98	43.8
No response	90	40.2
<b>Total</b>	<b>224</b>	<b>100.0</b>

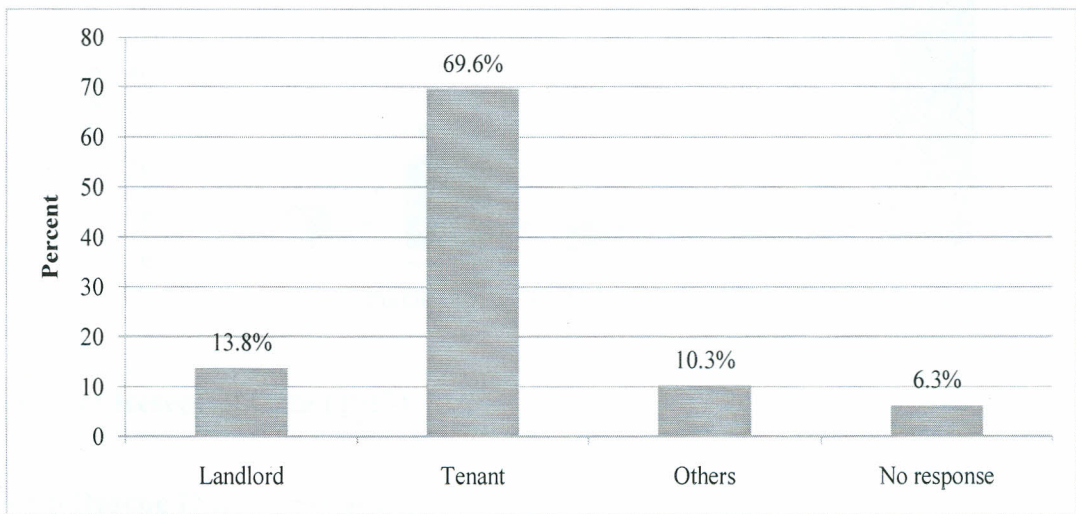
**Source: Research Data (2013)**

### 4.5.4 Structure Ownership

The study sought to establish the ownership status of the houses within Sinai. The findings presented in Figure 4.7 show that majority of the respondents (69.6%)

were tenants while only 13.8% were landlords. This implies that those who were affected by the fire were mainly the tenants. Most of these houses were constructed by use of corrugated iron sheets and timber both which are highly inflammable and characterizes most informal settlement structures. The findings also imply that in case of fire, most of the residents will relocate to others areas but for some, due to lack of a place they helped the owners to put up new structures. These finds contradict the study findings by Tlou (2011) who found that most of the residents in the informal settlements (71.38%) owned the structures.

**Figure 4.7: Structure Ownership**



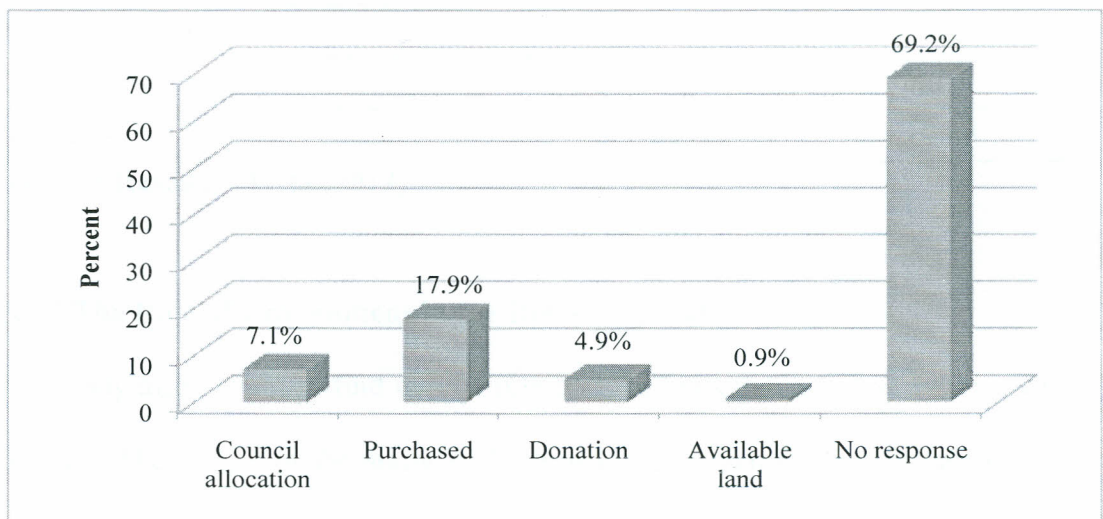
**Source: Research Data (2013)**

#### **4.5.5 Acquisition of Land or House**

The respondents were asked to indicate how they acquired the land of the house they lived in. According to the findings of the study presented in Figure 4.8, show that 17.9% of the respondents purchased their properties while 7.1% were

allocated by the City Council of Nairobi. Those who claimed to have purchased the land indicated that they purchased it from the Chiefs and Assistant Chiefs who purported to have the authority to issue land which was a clear way of defrauding them because the Chief have no such authority hence such actions were irregular and fraudulent. Majority of the respondents (69.2%) did not respond to the question. There were mainly the tenants who may have found the question not applicable to them.

**Figure 4.8: Plot Acquisition**



**Source: Research Data (2013)**

#### **4.5.6 Rescue Operations at the Scene**

The respondents were asked to describe the rescue operations at the scene of tragedy. The study findings show that majority of the respondents (47.8%) described the rescue operation as good while 15.2% described the rescue operation as excellent. The study findings therefore mean that according to most respondents the rescue operation went on well. Although the members of the

public were satisfied with the resources that were put in place to put out the fire, the fact is that the exercise was not well coordinated, huge crowds that showed up hampered the smooth operations of the fire respondents e.g the fire brigade and the police.

**Table 4.10: Rescue Operations**

	<b>Frequency</b>	<b>Percent</b>
Excellent	34	15.2
Good	107	47.8
Fair	37	16.5
Inhibited	4	1.8
No Rescue Operations	2	.9
No response	40	17.9
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

#### **4.5.7 The Role of Government in the Rescue Operation**

The study also sought to find out the role that the Government played during the tragedy. The results of the study in Table 4.11 show that more than half of the respondents (52.2%) indicated that the Government also participated in the rescue operation. The findings show that 12.5% of the respondents indicated that the Government played the supervisory role while according to 12.1%, the Government provided facilitation. Government officials present ensured that the fire was put off, all the injured and the dead were taken to various hospitals within the city and that the members of the public were kept away from the disaster scene. The government also provided temporary shelter, food and other basic

necessities to the victims. The findings therefore mean that the government coordinated the rescue operations.

**Table 11: Role of Government**

	<b>Frequency</b>	<b>Percent</b>
Supervisory	28	12.5
Rescuers	117	52.2
Coordinator	22	9.8
Facilitator	27	12.1
Not Present	9	4.0
No response	21	9.4
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

#### **4.5.8 Forms of Humanitarian Assistance Received during and after the Fire**

The study sought to determine the different forms of humanitarian assistance offered to the victims of the Sinai fire tragedy during and after the fire. The question was answered by all the respondents where they acknowledged that there was overwhelming support from the government, civil society and members of the public. These included support such as food stuffs and non food items including blankets, mattresses, mosquito nets, soaps etc from the government and civil society organization such as the Kenya Red Cross and San Frontieres. The victims also received startup tokens of Ksh. 10,000 per household from the government of Kenya. The government also met funeral expenses for the dead and paid medical fee to the hospitals where those injured were admitted. This was in addition to cash clothes etc. Some of the victims of the fire were taken in by their neighbours and relatives.

The respondents were asked to indicate the role they played in the disaster management in Sinai. One of the key informants indicated that he was involved in the monitoring the operations at the disaster site. Another key informant stated that he was charged with co-ordination and mobilization of responses in disaster incident in Sinai and in the country. The study established that according to one of the key informants, his work entailed conducting inspections in all buildings to find out compliance, building plan scrutinization, fire fighting, rescue, creating awareness and provision of humanitarian services as well as to enforce the fire fighting bylaws and other laws. A key informant stated that his role was to provide the fire fighting equipments within their region.

When asked what really transpired during the Sinai tragedy, one Key informant narrated that a highly flammable fuel leaked and flew all the way in to Sinai slum from the depot. Another key informant explained that siphoning of the fuel by residents who were unexposed to the dangers and risks involved and further storing them in the poorly constructed houses and finally some unknown source of ignition occurred causing the fire breakout

When asked what things they thought were done right in the fight against the fire, the key informants stated that some of the things which were done right included the timely arrival by the response team, the creation of fire breaks by residents, help from good Samaritans in transportation of victims to hospitals, the collaboration by all the stakeholders such as the G4S, City Council of Nairobi and

KK in fighting the fire as well as proper crowd control by the police. However when asked what might not have been done right, the key informants mentioned lack of water hydrants within or nearby which led to ineffectiveness of the process.

#### **4.6 Challenges Hampering Effective Response to Sinai Fire Disaster**

In this section the study sought to determine the challenges which hampered effective response to the Sinai fire disaster. The findings of the study are presented in the subsequent sections.

##### **4.6.1 Factors Which Contributed to the Disaster**

Respondents were asked to state the extent to which they agreed with the statements as the reasons which contributed to the fire becoming a disaster. This was on a scale of strongly disagree, disagree, don't know agree and strongly agree. The scale 0.1 – 0.9 was taken to mean strongly disagree, the scale 1.0 – 1.9 was taken to mean disagree, scale 2.0 – 2.9 represent don't know, scale 3.0 – 3.9 represents agree while the scale 4.0 – 4.9 represents strongly agree. The study findings show that in most cases, the respondents chose to remain neutral as they stated that they did not know (mean score 2.0 – 2.9) whether the listed factors were the reasons why the fire turned out to be disastrous. The study findings however show that the respondents agreed that the equipments and facilities used by the residents to put out fire were ineffective and therefore allowed the fire to spread further (mean score 3.848). The respondents also agreed that the faulty

equipments used to fight the fire were ineffective in putting off the fire caused by petroleum products and hence allowed the fire to continue burning and turning into a disaster (mean score 3.0680). The respondents also agreed with the statement that the fire became disastrous due to the fact that the fire fighters lacked training on how to deal with the fire (mean score 3.46). The study findings however show that most respondents disagreed to the statement that the effort to put out fire was hampered by inaccessibility to the scene by the fire engines (mean score 1.7961). Respondents also disagreed with the statement that the fire became disastrous because the poverty levels of the locals pushed them to scoop the fuel (mean score 1.5076).

**Table 4.12: Challenges of Fire Fighting**

	N	Mean	Std. Deviation	Skewness	
				Statistic	Std. Error
Community not aware	217	2.4240	1.54110	.612	.165
Local administration failed	214	2.4766	1.53730	.502	.166
Late arrivals	210	2.8619	1.57583	.201	.168
Equipment available	204	3.8480	1.39367	-.872	.170
Faulty equipment	206	3.0680	1.58507	-.105	.169
Access hampered	206	1.7961	1.30932	1.542	.169
Police overwhelmed	204	2.4020	1.54575	.566	.170
Wrong construction	205	2.3220	1.58849	.697	.170
Poverty levels	197	1.5076	.95094	2.208	.173
Untrained fire fighters	200	3.4600	1.61911	-.516	.172

**Source: Research Data (2013)**

#### 4.6.2 Challenges in Putting out Fire

Respondents were asked to indicate the challenges they faced as persons or groups in putting out the fire. According to the findings of the study, 49.6% of the respondents indicated that they were faced with various challenges apart from the listed ones. The results show that 19.2% of the respondents cited accessibility of the area as a challenge. The findings of the study mean that there were other challenges which were encountered during the putting out of fire by the respondents.

**Table 4.13: Challenges faced**

	<b>Frequency</b>	<b>Percent</b>
Lack of Water	14	6.3
Looters	11	4.9
Accessibility	43	19.2
Other(s)	111	49.6
No response	45	20.1
<b>Total</b>	<b>224</b>	<b>100.0</b>

**Source: Research Data (2013)**

Asked to list the challenges which hindered the fire being put off and the rescue operation, the respondents listed lack of knowledge of putting out the fire, trauma by residents due to loss of beloved ones and properties, lack of fire fighting equipments and even the ones that existed were faulty, bad weather condition as it was raining at the time of the disaster, overcrowding by onlookers, the victims out

numbered the rescue team as well as lack of knowledge of fire fighting policies and standard operating procedures. Some respondents complained that some fire engines arrived without adequate water. Respondents also indicated that due lack of access to the site of the fire, the fire engines were parked far away which made it difficult to put out the fire. The fact that it was raining hampered the movement of the rescue ambulances to and from the site. People were also not prepared to respond to such a magnitude of fire.

The respondents were also asked to make suggestions on what should be done in future tragedies where they suggested that there was need to conceal all sewers from companies and improve the drainage systems, create awareness regarding the dangers of fires, educate the public on different ways of putting out fire, relocation of the slum, increase the number of fire stations within the city, readily avail the fire fighting equipment at police posts, chief's camps and sub chiefs, proper planning of the housing structures in slums, building of security lanes to deal with such emergencies, improving accessibility within the slum as well as improving methods of fighting fires including fire fighting jets.

The key informants were asked to state whether they had undergone any course in disaster management or have been exposed to fire fighting techniques. According to the Kenya Red Cross key informant, he has an undergraduate degree in disaster management and has undergone short courses in fire fighting. Another key informant stated that he had attended a few seminars on disaster management but

have never attended a course on fire fighting. The Assistant Chief, key informant has never undergone any course on disaster management. This therefore means that most of the key informants have only been to seminars where they went through disaster management process but only those from the fire brigade and the Kenya Red Cross have had courses on fire fighting. The key informants cited lack of unified communication system among the fire fighting team. The respondents also cited the hostility towards the fire brigade by the residents who thought that not enough was being done to contain the situation.

When asked if they had the necessary tools within their areas, most of the key informants stated that they did not have the necessary tools within their disposal to address such challenges and therefore depended entirely on the Kenya Fire Brigade, Kenya Defense Forces, National Youth Service and other private fire fighting Institutions such as the G4S and KK. One of the key informant stated that there was need to have a fire station next to the slum for better management of such disasters in future because the area is very prone to fires. The respondents also cited need to have a person to head disaster management around the area. However, one key informant indicated that there were a few tools such as crash tender, decontamination unit, gas detectors and reference books to address such challenges.

When asked about the challenges that they faced in the fight against the fire at Sinai, the key informants stated that one of the challenges was the accessibility of

the scene of tragedy due to lack of access roads. Other challenges listed by the respondents included the faulty equipment used to fight the fire, crowd control problem, and lack of a substation within the vicinity which meant that the fire fighters had to travel from far off areas. The respondents cited inadequate supply of water and more so lack of co-ordination by the appropriate personnel. According to respondents, lack of enough fire fighting personnel in the city and limited accessibility within the slum were some of the challenges faced in fighting the Sinai fire. The study revealed that the key informants cited lack of emergency lanes within the country and lack of adequate fire fighting equipment as well as the failed emergency protocols.

Asked whether lessons have been learnt, most of the respondents indicated that people seemed not to have learnt lessons as no measures have been taken to prevent such disaster from happening again. One key respondent indicated that the people seemed not to have learnt any lesson as the Kenya Pipeline has not constructed the interceptor pit to ensure that what caused the fire does not happen again. The respondents indicated that people still reside by the drainage yet oil still spills from the area. However, according to the key informant from the Kenya Pipeline, systems have been put in place to ensure the spillage does not occur again within. The respondents also indicated that the fire team is trained and alert should a fire occur.

#### **4.7 Key Informants Suggestions for Improvement**

The respondents were asked to suggest the improvements that should be done in the future to avoid such tragedies from happening. The study findings show that one of the key informant indicated that there was need to map out the risks to avoid persons from settling in industrial area and their drainage system. He also proposed that there was need to share the information with all. The study established that the key informants indicated that there was need to form a forum that will bring all the fire agencies together where they can share ideas and work as a team. There was a need to all the agencies to work under one command. The respondents indicated that there was need to upgrade the slum area. Through public Barazas, the need for continued education to create awareness of such disasters. The children in schools should be taught about disaster management and be encouraged to form disaster management clubs. The key informants stated that there was need for the development of a fire management policy in the country. The government should form a National Disaster Management Authority and distribute educational materials for instance fliers, posters and carryout general disaster management campaigns. The key informants suggested that there is need to provide emergency lanes for vehicles dealing with emergencies on our roads. The key informants stated that the government should train more community volunteers to fight the fire while at the same time train and employ more fire fighters.

The key informants were asked to state the options they have as regards to the fire fighting in Kenya. According to some key informants, there was need for increased investment in fire safety for the general public by the government. The key informants also suggested that the capacity of the Nairobi fire brigade needs to be improved. They also suggested that there was need for increased fire fighting drills to gauge the capability of the fire disaster management in the country. The key informants suggested that the national disaster management policy which should put in place institutions to manage disaster and the institutions be fully resourced to ensure better services.

## CHAPTER FIVE

### SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

#### 5.1 Introduction

This chapter summarizes the findings of the study on data pertaining to the level of awareness of fire hazards and how to respond in the event of fire among residents of Sinai, the Nairobi County Government issuing of Standard Operating Procedures that detail sequence of event when responding to fire, how the fire was responded to by residents and authorities and the challenges that hamper effective response to Sinai fire disaster. Conclusions based on the findings are then made and thereafter recommendations for management and suggestion for future study are presented.

#### 5.2 Summary

The study established that majority of the respondents (90%) were present when the Sinai fire tragedy occurred. The study findings revealed that according to 93.7% of the respondents, the response to the Sinai fire was appropriate. However, those not satisfied with the response explained that late arrivals (after two hours) of both authorities and the rescue teams led to loss of property and lives. Some respondents explained that the response was appropriate as there was a lot of harmony from the responding teams. The respondents also noted that there were enough ambulances to rush people to the hospitals which saved lots of lives. According to the respondents, there were proper equipment used to conquer the

fire which if not so would have destroyed lots of properties. Respondents explained that the rescue teams arrived on time which was two hours after the fire broke out. Respondents also indicated that the relevant rescue personnel were present to handle the situation and that the Government took charge of the victims by providing hospital fees, upkeep money and temporary shelter and clothing.

The study findings revealed that majority of the respondents (76%) were not aware of the Standard Operating Procedures of fire fighting. The study further revealed that according to 41.5% of the respondents, the Standard Operating Procedures was never used during the Sinai tragedy. Majority of the respondents (91.8%) were not aware of the fire fighting policy in Kenya. The results showed that 42.4% of the respondents said that the area had limited access while according to 36.2% of the respondents; the area was difficult to access. Respondents explained that poor planning with houses occupying spaces meant for roads, narrowed paths between houses make the areas inaccessible. The researcher observed that policy document was available only at the fire and the police stations. The researcher observed that the Standard Operating Procedure was only available on the notice board of the fire station. The level of information of disaster policy was however not available in any of the institutions. The researcher further observed that at the health centres, the chief's office the fire station and the police stations, there were charts on what to do in the event of fire and an emergency number to call. This was placed either on the fire fighting equipment or on the emergency exit of the buildings. The study established that

there were no community trainers in the community. The study however, established that there was knowledge transfer in schools as the pupils were taught how to act in case of fire outbreak. The transfer of knowledge from the parent to children was to a large extent non-existent as in most cases the parent and their children are hardly together for such a forum to take place.

The study established that 53.6% of the respondents participated in the fire fighting while the other 42.4% said that they did not participate in putting out the fire. These were in areas such as identifying of bodies, rescuing of the victims, tracing the missing persons and taking casualties to hospital. Others participated in putting out the fire offering of first aid to the affected and evacuating people and goods. The study results show that majority of respondents (61.6%) have not been exposed to the different ways of handling fire from different causes and only 29.9% of the respondents were exposed to handling fire. The results of the study revealed that 43.8% of the respondents did not handle the fire in the correct way. The study findings showed that majority of the respondents (47.8%) described the rescue operation as good while 15.2% described the rescue operation as excellent. This is despite the fact that so many lives were lost and properties destroyed. More than half of the respondents (52.2%) indicated that the Government participated in the rescue operation while according to 12.5%, the Government played the supervisory role. The study established that One of the key informants indicated that he was involved in the monitoring the operations at the disaster site. Another key informant stated that he was charged with co-ordination and

mobilization of responses in disaster incident in Sinai and in the country. The study revealed that key informants were involved in works such as conducting inspections in all buildings to find out compliance, building plan scrutiny, fire fighting, rescue, creating awareness and provision of humanitarian services as well as to enforce the fire fighting bylaws and other laws. Other provided the fire fighting equipments within their region.

Respondents indicated that the equipments and facilities used by the residents to put out fire was the reason for the disaster (mean score 3.848). The respondents also indicated that the faulty equipments used to fight the fire was another cause of disaster (mean score 3.0680). They also noted that the fire fighters lacked training on how to deal with the fire (mean score 3.46). The results showed that 49.6% of the respondents indicated that they were faced with various challenges as lack of knowledge of putting out the fire, trauma by residents due to loss of beloved ones and properties, lack of fire fighting equipments and even the ones that existed were faulty, bad weather condition as it was raining at the time of the disaster, overcrowding by onlookers, the victims outnumbered the rescue team as well as lack of knowledge of fire fighting policies and standard operating procedures. The results further showed that 19.2% of the respondents cited accessibility of the area as a challenge. The study established that most of the key informants have only been to seminars where they went through disaster management process but only those from the fire fighting and the Kenya Red Cross have had courses on fire fighting. The key informants cited lack of unified

communication system among the fire fighting team. The respondents also cited the hostility towards the fire brigade by the residents who thought that not enough was being done to contain the situation. Most of the key informants stated that they did not have the necessary tools within their disposal to address the challenges of fire and that they depended entirely on the Kenya Fire Brigade, Kenya Defense Forces, National Youth Service and other private fire fighting Institutions such as the G4S and KK. The key informants cited challenges as accessibility of the scene of tragedy due to lack of access roads, faulty equipment used to fight the fire, crowd control problem, and lack of a substation within the vicinity which meant that the fire fighters had to travel from far off areas, inadequate supply of water and more so lack of co-ordination by the appropriate personnel and lack of enough fire fighting personnel in the city. The study revealed that lack of emergency lanes within the country and lack of adequate fire fighting equipment as well as the failed emergency protocols.

### **5.3 Conclusion**

From the findings of the study, the researcher concludes that the level of awareness of fire hazards among the residents was limited. This was demonstrated by the fact that the residents had siphoned the highly flammable fuel and stored it in their houses. The subsequent explosion of this fuel led to damage to property, injury death of many residents.

Secondly, the study concludes that the Nairobi County Government did not issue any Standardized Operating Procedures as majority of the respondents were never

aware of these documents and was therefore not used in the Sinai fire disaster management. The study concludes that the fire management in the country was never taken seriously as majority of the respondents were never even aware of the fire fighting policy. Most of the public instructions and places such as the schools, health centres Chiefs offices and even bus stops do not have these important documents as what to do in case of an emergency fire outbreak. The study also concludes that little has been done to create awareness among the publics on what to do incase of fire outbreak.

The study concludes that the response to the Sinai tragedy took long as the authorities who have the skills and the tools arrived two hours late after the fire outbreak instead of the recommended five minutes. Even though the residents arrived immediately, they lacked the skills and the tools. The residents some of whom were offering no help formed crowds which made the rescue operation difficult as they blocked the way. This made the rescue operation more difficult. The study also concludes that the rescue operation was made difficult due to the fact that there was no central command for the fire fighters which resulted into more losses.

Finally, the study concludes that the major challenges which hampered the rescue operation in Sinai were the inaccessibility of the area due to lack of access roads and the lack of enough water hydrants within the city which made the fire fighting difficult. Further, lack of enough skilled fire fighters was yet another challenge

mentioned by respondents. Above all fire fighting process was hampered by lack of a disaster management policy in the country which stipulates how fire and other disasters should be managed.

#### **5.4 Recommendations**

The researcher makes the following recommendations

- i. The study recommends that the government should develop a National Disaster Policy which makes it mandatory for public institution to display fire emergency numbers and provide standard operating procedures in case of fire outbreak.
- ii. The government should form a National Disaster Management Authority to coordinate disaster management and awareness creation through intensified fire drills in the country.
- iii. The study further recommends that the government should relocate the residents of the Sinai slums since this area is a way leaf for Kenya Power, railway reserve and also has drainage for storm waters from the Kenya Pipeline which in most cases carry inflammable materials and therefore a danger to the residents of the slum.
- iv. It is also recommends that the government should provide emergency lanes for vehicles dealing with emergencies on major roads in Kenya.

#### **5.5 Suggestions for Further Research**

The study was done in the challenges dealing with fire outbreaks in informal settlements with main focus on Sinai fire tragedy. The study recommends that

future studies should be done in other slums in Kenya such as Kibera and Mathare. Further studies should also be done in other areas such as the rural areas like Sachangwan fire and commercial buildings such as a company in industrial in which employees perished and recently the Jomo Kenyatta International Airport fire.

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## APPENDICES

### Appendix 1: Letter to Respondent

Koitamet Ole Kina

P.O. BOX 43844 – 00100

NAIROBI

Dear Sir/Madam,

#### RE: RESEARCH PROJECT

I am a Postgraduate student in Kenyatta University pursuing a Executive Master of Public Policy and Administration (EMPPA). I am currently carrying out a study on *Challenges of dealing with fire outbreaks in Informal Settlements: The case of the Sinai fire in Nairobi County*. The success of the research substantially depends on your cooperation. I hereby request you to respond to the questionnaire attached as honestly and duly as possible and to the best of your knowledge. There are no correct or wrong answers.

The questionnaire is designed for the purpose of this study only, therefore the responses will absolutely be confidential and anonymously given.

Thanking you in advance.

Yours faithfully,

**Koitamet Ole Kina**



5. What is your highest educational standard?

Academic Level	Primary	Secondary	Form Six	Bachelors	Others (Specify)
Response					

**SECTION B: CHALLENGES**

6. Have you encountered a fire outbreak in your life time?

Yes  No

7. Which year was that?.....

8. Were you living within Sinai when the September 12<sup>th</sup> 2011 fire occurred?

Yes  No

9. To what extent do you agree that the fire tragedy was responded and dealt with appropriately?

**Where 5 – Strongly Agree, 4 – Agree, 3 – Don’t Know, 2 – Disagree and 1 – Strongly Disagree**

Extent	5	4	3	2	1
Response					

10. Explain your answer in 9

above.....  
 .....  
 .....  
 .....

.....  
 .....  
 11. Did you personally or any of your household members participate in the exercise? Yes  No

12. If yes, what role did you have?.....

13. What challenges did you personally or as a group face as you tried to put out the fire?

Lack of water

Looters

Accessibility

Other(s) ..... (Specify)

14. To what would you agree that the following reasons contributed to the fire being disastrous the way it became?

**Where 5 – Strongly Agree, 4 – Agree, 3 – Don’t Know, 2 – Disagree and 1 – Strongly Disagree**

Reason	Response				
	5	4	3	2	1
The community were not aware of the dangers of the fire					
The local administration did not do enough to restrain the locals from scooping the oil spills					
The fire fighters arrived late					
There were equipment and facilities used by residents to put out the fire					





Council Allocation  Purchased  Donated to

Don't Know  Available Land

23. How were the rescue operations at the scene of the tragedy?

Excellent  Good  Fair

Inhibited  No Rescue Operations

24. What form of assistance was available during and after the fire tragedy?

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

25. List the challenges that you think hindered the fire being put off and rescue operations

- i. ....
- ii. ....
- iii. ....
- iv. ....
- v. ....

26. What role did the Government do during the rescue operation?

Supervisory  Rescuers  Coordinator

Facilitator  Not present

27. In future, what needs to be done to contain such scenarios?.....

.....  
.....

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

**END**

**THANK YOU FOR YOUR TIME AND RESPONSES**

### Appendix 3: Observation Guide

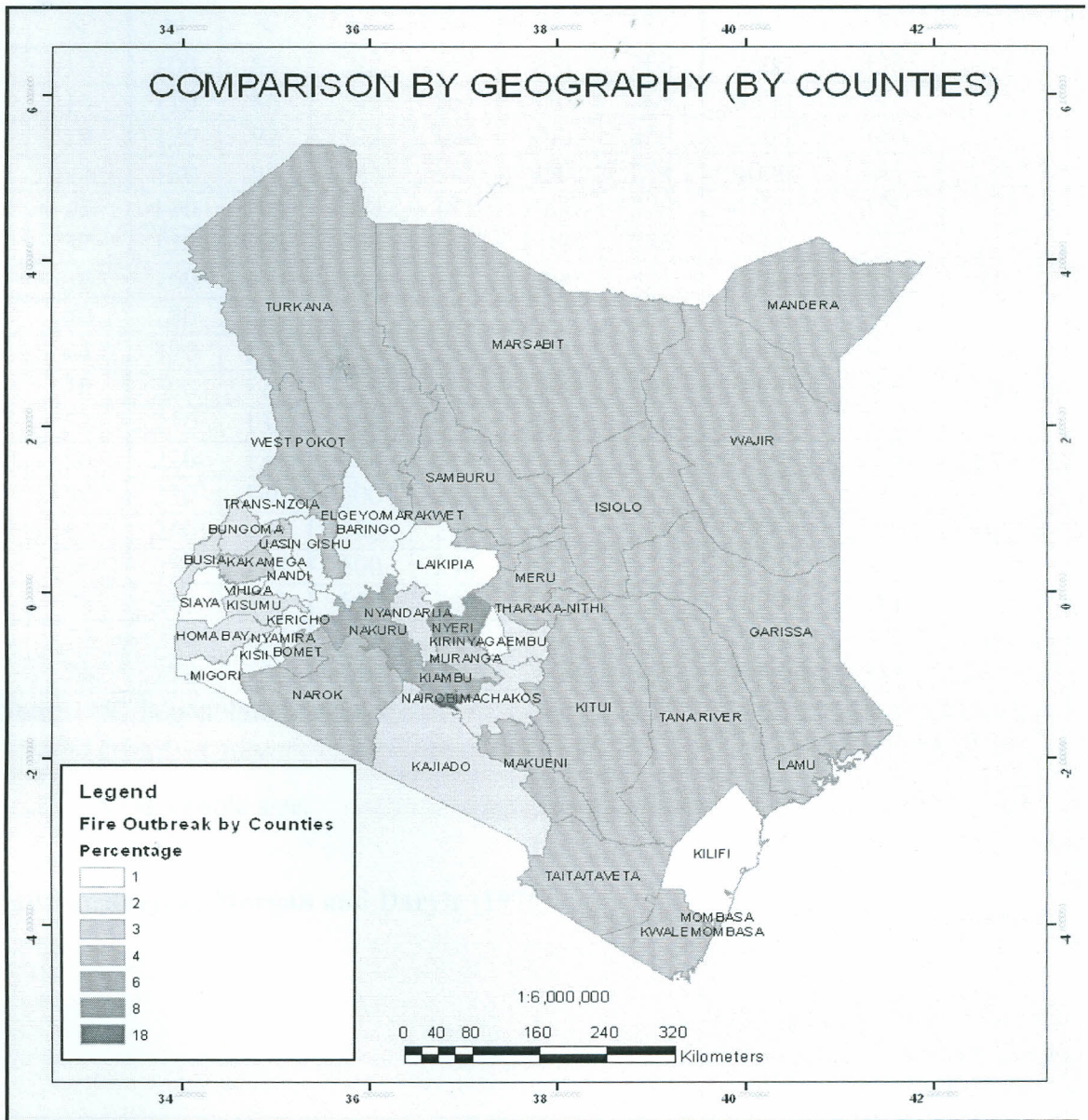
Theme	Location	Availability	Non-availability
Policy framework for the response to fire hazard <ul style="list-style-type: none"> <li>• Policy document</li> <li>• Standard Operating Procedures on notice board of key offices</li> <li>• levels of information on disaster policy</li> </ul>	Local administration		
	Fire station		
	Local primary school		
	Police station		
Early warning systems <ul style="list-style-type: none"> <li>• Charts and flyers on key public areas on what to do in the event of a fire, emergency numbers to call</li> <li>• Emphasis during public meetings, national day baraza etc</li> </ul>	Health centre		
	Bus stop		
	Chief's office		
	Local primary school		
	Fire station		
Institutions engaged in countering /mitigating the fire disaster <ul style="list-style-type: none"> <li>• Presence of fire emergency numbers displayed boldly</li> <li>• SOP displayed in case of fire</li> </ul>	Fire station		
	Police station		
	Bus stop		
	Chief's office		
	Local primary school		
The modality for knowledge transfer in the community			

<ul style="list-style-type: none"> <li>• Existence of community trainers</li> <li>• Knowledge transfer in schools</li> <li>• Knowledge transfer from parent to children</li> </ul>			
<p>Emerging issues and lessons learned</p> <ul style="list-style-type: none"> <li>• Graffiti on walls</li> </ul>			
<p>Community's recommendations</p> <ul style="list-style-type: none"> <li>• Graffiti on walls</li> </ul>			

#### Appendix 4: Interview Schedule

1. What role do you play in disaster management within your area?
2. In your own opinion, what really transpired during the Sinai Fire tragedy?
3. What do you think was:
  - a. Done right in managing the fire?
  - b. Not done (right)?
4. Have you undergone a course in disaster management or have you been exposed to fire fighting techniques?
5. Do you have the necessary tools within your exposure to address such challenges?
6. What challenges did you face in the fight against the fire at Sinai?
7. Were the relevant authorities (police, fire marshals, ambulances, emergency response units, Kenya Pipeline among others) responsible in the management of the fire?
8. Do you think people learnt a lesson in the tragedy?
9. What improvements should be done in the future so as to avoid such a tragedy?
10. What opinions do you have as regards fire fighting in Kenya?

## Appendix 5: Fire Outbreaks per County



Source: NDOC, 2005

## Appendix 6: Determining Sample Size table

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size

"S" is sample size.

**Source: Krejcie, Morgan and Daryle (1970)**

## Appendix 7: Research Budget

<b>NO</b>	<b>ACTIVITY</b>	<b>NO. OF PERSONS INVOLVED</b>	<b>COST PER PERSON</b>	<b>TOTAL COST</b>
1	Training	8	500	4,000
2	Piloting	8	500	4,000
3	Data collection	8	5,000	40,000
4	Data analysis	8	500	4,000
5	Report writing	1	-	30,000
<b>Grand Total</b>			-	Kshs. 82,000