



**UNIVERSITY OF NAIROBI  
SCHOOL OF THE BUILT ENVIRONMENT**

**FIRE DISASTER MITIGATION AND PREPAREDNESS IN NAIROBI: A  
CAPACITY ASSESSMENT OF THE CITY'S FIRE BRIGADE**

**BY**

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Architecture and Building Science in the University of Nairobi.**

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## DECLARATION

This Project Report is my original work and has not been presented for award of a degree in any other University.

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## **DEDICATION**

To my family, for walking with me throughout this journey

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## **ABBREVIATION**

ATV	All Terrain Vehicle
CBD	Central Business District
CBDPs	Community Based Disaster Preparedness Programs
CFAI	Commission on Fire Accreditation International
DMISA	Disaster Management Institute of Southern Africa
DRR	Disaster Risk Reduction
EABL	East Africa Breweries Limited
EMT	Emergency Medical Technician
EU	European Union
FAO	Food and Agriculture Organization
FEMA	Federal Emergency Management Agency
FY	Financial Year
GIS	Geographical Information Systems
GoI	Government of India
GoK	Government of Kenya
GoN	Government of Nepal
HFA	Hyogo Framework for Action
HoD	Head of Department
HRVA	Hazard Risk and Vulnerability Analysis
IFRC	International Federation of Red Cross & Red Crescent
IFSTA	International Fire Service Training Association
IRIN	Integrated Regional Information Networks
KARA	Kenya Alliance of Residents Associations
KPC	Kenya Pipeline Company
KRCS	Kenya Red Cross Society
NDMU	National Disaster Management Unit
NDOC	National Disaster Operations Centre
NIFC	National Interagency Fire Centre
NFPA	National Fire Protection Association

NGO	Non Governmental Organization
NRC	National Research Council
PPE	Personal Protective Equipment
RoK	Republic of Kenya
SIDA	Swedish International Cooperation Agency
SOPs	Standard Operating Procedures
UNOCHA	United Nations Office for Coordination of Humanitarian Affairs
UNDP	United Nations Development Programme
UN/ISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development
USFA	United States Fire Administration

## **ABSTRACT**

This study is an assessment of the capacity for fire disaster mitigation and preparedness of the county government. It aims at assessing the existing capacity, identifying the deficiencies and recommending areas of improvement to enhance fire disaster mitigation and preparedness. Based on parameters of assessment identified in fire disaster management literature, a conceptual framework for fire disaster preparedness was developed. The study adopted an evaluative approach to achieve its objectives. Several indicators of management technical and infrastructure, financial, and institutional and legislative capacities were assessed. The study used stratified random sampling to create a sample frame which comprised two hundred and forty three respondents (243), out of which 198 respondents were service users and 45 respondents were fire department personnel. Service users were derived from three different parts of the city where recent fire disasters had occurred- Gikomba market, Industrial area and Gatwikira village, Kibera. Data collection was done using questionnaires, interview schedules, observation and photography. Data analysis was done using Statistical Package for the Social Sciences and Ms Excel, and the results presented using tables, graphs and pie charts. The study revealed that the county government has inadequate capacity for fire disaster mitigation and preparedness by identifying inadequacies such as lack of fire disaster management plans and inadequate machinery and equipment among others. The study provides recommendations on improvements and policy measures on fire disaster mitigation and preparedness key among them being development of fire disaster management and contingency plans, adequate budgetary allocation, community awareness creation and capacity development.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background of the Study

The concern about disasters is becoming increasingly relevant globally, particularly in cities and urban areas. This is mainly because cities are generally the economic drivers within their countries and the centres of intellectual, political, business and financial activities. Rapid urbanization has resulted in population influx in cities; in fact, it is estimated that presently more than half the global population resides in urban areas (UNDP, 2010). Further, it is estimated that roughly two-thirds of the world's inhabitants and the vast majority of wealth will be concentrated in urban centres by 2025 (UN/ISDR, 2012).

Urbanization and its associated impacts often increase the exposure of people and economic assets to hazards and create new patterns of risks, making disaster management in urban areas particularly complex. Notably, growing populations, environmental degradation, unplanned settlements, expanding and ageing infrastructure, increasing concentration of economic assets, and more complex societies influence the number, scale and cost of disasters (UN/ISDR, 2009). In the face of the ever-increasing risk of disaster losses, there is good reason to be concerned about the ability of cities to deal with these catastrophes.

Disaster management is mainly concerned with the protection of human life and post-disaster recovery that allows individuals and communities to resume dignified lives. However, a review of past disasters paints a grim picture of a number of recurring difficulties with disaster management. According to UNDP (2010) - report on *Urban Risk Management* - most disaster-prone cities are unprepared for potential disasters and ill-equipped to reduce associated risks. In addition, policy makers face numerous challenges with respect to urban disaster management, including lack of adequate knowledge and administrative capacities; inadequate finances; weak institutional frameworks; weak law enforcement mechanisms; and corruption. This

has contributed to massive loss of lives and property and hindered post disaster recovery efforts. This therefore calls for an urgent need to promote a culture of disaster prevention and preparedness at all levels and to improve disaster management practices.

Kenya has experienced a variety of disasters such as droughts, fires, floods, industrial accidents and terrorist attacks among others (RoK, 2009). The increasing frequencies, complexity, scope and severity of destruction left in the wake of disasters have resulted in serious consequences including loss of lives, disruption of livelihoods, destruction of infrastructure, diversion of planned use of resources and interruption of economic activities thereby causing economic retardation.

Disaster management in the country however, appears to be more ad hoc and reactive rather than preventive and deliberate (ibid). Over the past two decades, various disaster management initiatives have been undertaken by various agencies, regardless of these efforts, an adequate level of preparedness required to address the country's significant risk profile has not been achieved. Most initiatives have also been undertaken in an inconsistent, inharmonious, reactive and uncoordinated manner due to the multiplicity of institutions handling disasters coupled with the lack of a unified policy framework (RoK, 2010). This situation therefore questions the quality of disaster governance in our institutions and raises the need to adopt an appropriate and effective approach to disaster management in Kenya.

Fire disasters in particular, are a common occurrence in cities across the world. Dynes and Russell (2002) attribute the increasing risk of fire occurrences to increased development interactions in cities. In Kenya, fires have contributed to the toll of manmade disasters with varying loss of property and life (Mutugi &Maingi, 2011). Nairobi city has experienced its share of fires over the years. Notable examples include Westgate mall terror related fire in 2013, Kimathi house fire in 2012, Nakumatt downtown supermarket fire in 2009, City Hall fire in 2004, fire at Free market, Uhuru Park in 2001 and numerous informal settlement fires notably the

Sinai fire in 2011. These have led to loss of hundreds of lives and damage to properties worth billions of Kenya shillings.

The County Government of Nairobi is expected to play a leading role in fire disaster management activities. However, the manner in which it has handled these events - through its Fire Department - has exhibited the existence of major institutional and policy gaps as well as capacity deficiencies. In most cases, response to these fire occurrences and indeed other high-risk events such as bombings, collapsed buildings, floods, and other major accidents tends to be slow, poorly co-ordinated and unnecessarily expensive (IRIN, 2007). This has been attributed to basic institutional and rescue capacity, lack of equipment and emergency services needed in the event of a disaster, inadequate financial resources and lack of a comprehensive disaster preparedness policy (ibid).

This study assessed the capacity of the county government with regard to fire preparedness and mitigation. It evaluated technical and infrastructure capacity, management capacity, financial capacity and institutional and legislative support; identified existing gaps and makes recommendations to enhance fire mitigation and preparedness capacity of the County government.

## **1.2 Problem Statement**

Literature review on fire disaster mitigation and management draws substantive conclusion that rapid growth of cities and urban areas leads to increased risks of fire disaster. Despite this, it has been established that local governments are rarely well prepared to handle such disasters. Good practice in disaster management entails effective disaster mitigation and preparedness, disaster response and disaster recovery systems.

The National Policy for Disaster Management in Kenya (2009) acknowledges that disasters in Kenya have been handled without a coordinated disaster management policy, legal and institutional frameworks. Additionally, disaster response activities



have been poorly coordinated, due to lack of Standard operational procedures and Disaster Emergency Operation Plans leading to duplication of efforts and wasteful use of resources. They also expose disaster victims to greater risks and slow recovery. Similarly, in the absence of planned and coordinated action, prevention, preparedness and mitigation have not always been attained.

IRIN (2010) noted that disaster preparedness and response in the Nairobi city appears to be ad hoc. This is manifested by delayed and uncoordinated disaster response, inadequate equipment and machinery, poor disaster scene management and insufficient human capacity. The City of Nairobi has experienced numerous fire disasters as earlier mentioned. However, it has been widely observed that response by the City's fire brigade has brought to the fore underlying disaster management inefficiencies. The concerns raised mainly relate to the County Government's disaster preparedness, the ability to effectively handle disaster incidents as well as post disaster recovery efforts.

This scenario therefore begs the question, "Does the county government have adequate capacity to handle fire disasters?" In a bid to answer this question, the study aims at assessing the County government's existing capacities for fire mitigation and preparedness. It identifies capacity deficiencies and makes recommendations to enhance the City government's capacity for fire preparedness and mitigation.

### **1.3 Research Questions**

The study seeks to answer the following questions;

1. What capacity does Nairobi County Government have for fire disaster mitigation and preparedness?
2. What capacity deficiencies exist in the County Government with regard to fire disaster mitigation and preparedness?

3. What measures can be recommended to the County Government to enhance fire disaster mitigation and preparedness in the City?

#### **1.4 Research Objectives**

The objectives of the study are as follows:

1. To assess the existing capacities for fire disaster mitigation and preparedness of the County Government of Nairobi.
2. To identify capacity gaps in fire mitigation and preparedness in the County Government of Nairobi.
3. To suggest areas of improvement and other management mechanisms that can enhance fire disaster mitigation and preparedness in the County Government of Nairobi.

#### **1.5 Significance of the Study**

Disaster management has become a major challenge the entire world is faced with owing to urbanization, the ever growing population, climate change, and the ever changing environment in general. Natural and man-made disasters result in economic as well as environmental losses. Disaster impacts are increasing in severity; these place a need for a systematic and integrated approach to disaster management practices with emphasis on disaster mitigation and preparedness.

The City of Nairobi serves as the political and administrative capital and economic hub of Kenya. This renders the city a significant pace setter in the country. Consequently any occurrence of fire disasters in the city is likely to have adverse effects on the people and the economy. Developing a comprehensive fire disaster preparedness framework can contribute towards more effective and efficient disaster management that will ensure the establishment of effective preventive measures as well as minimize the severity of disaster impacts.

The study addressed capacity deficiencies in the county government identified in the course of the study. The study findings helped to recommend areas of improvement as well as suggest ways of enhancing good practices in fire disaster management in the City of Nairobi. The research findings may also apply to other County governments in Kenya, therefore enhancing fire disaster management countrywide by promoting the practice of fire disaster mitigation and preparedness.

### **1.6 Scope of the study**

Disaster management generally comprises mitigation, preparedness, response and recovery, this study however concentrates on fire disaster preparedness and mitigation. The study shall however focus on evaluating the County Government of Nairobi's capacity for fire disaster mitigation and preparedness, focussing on management, financial, technical, and institutional and legal capacities for fire disaster mitigation and preparedness. Based on the findings, the study shall identify capacity gaps and finally formulate proposals and recommendations on ways of enhancing fire disaster mitigation and preparedness in the City.

The geographical scope of the study is Nairobi, Kenya's capital city. However, the researcher sampled three areas of the City where recent fire incidents had occurred and where the frequency of fire disasters is high. These areas included Gikomba market, Kibera informal settlement and specifically Gatwikira village, and Industrial area along Lunga Lunga road where a recent fire incident occurred at Alliance Garment factory.

### **1.7 Limitations of the Study**

The main challenge faced was the availability of Fire brigade officials; it was difficult to secure appointments with officers. Prior arrangements were however made to facilitate smooth commencement of data collection. Additionally, given that the study was assessing the capacities of the County Government, officers were to an extent very defensive and therefore some information was classified as confidential

thus insights on certain matters such as personnel qualifications were not extensively covered.

The major challenge faced during data collection from service users was frequent interruptions while administering questionnaires especially in Gikomba market where traders are busy selling their goods to customers. The researcher therefore made the questioning sessions brief and to the point to facilitate minimal disruptions where possible. The researcher was also faced with security challenges in Kibera; this was however well managed by making prior arrangements with the local chief to provide two local residents and an administration police officer to accompany the researcher during field data collection in Gatwikira.

### **1.8 Assumption of the Study**

The study assumption is that inadequate capacity for fire mitigation and preparedness in the County Government largely hinders fire disaster management in Nairobi city.

### **1.9 Operational Definition of Key Terms**

<b>Disaster:</b>	Any occurrence (happening with or without warning) causing or threatening death, injury or disease, damage to property, infrastructure or the environment
<b>Vulnerability:</b>	The degree to which an individual, community or region is at risk of experiencing a disaster.

<b>Hazards:</b>	Threats to life, well-being, material goods and the environment.
<b>Risk:</b>	The probability of harmful consequences or loss resulting from the interaction between natural hazards and vulnerable conditions of property and people
<b>Disaster Risk Reduction:</b>	The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters,
<b>Disaster Management:</b>	The sum of organised efforts to mitigate against, prepare for, respond to, and recover from a disaster.
<b>Disaster Preparedness:</b>	Activities geared towards planning how to respond in case an emergency or disaster occurs.
<b>Fire Disaster Preparedness:</b>	Pre-fire disaster activities designed to increase the level of readiness or improve operational capability for fire emergency response
<b>Disaster Response:</b>	Activities carried out by city authorities in reaction to a disaster during the occurrence and immediately after.
<b>Disaster Recovery:</b>	Post disaster efforts to restore all systems back to normal or near normal.
<b>Service Users:</b>	Citizens/communities who require fire services
<b>City Authorities:</b>	County Government of Nairobi
<b>Capacities:</b>	A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. It may include management, financial, technical and infrastructure and institutional/legislative means attributes

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Concern for Disasters

A disaster is an adverse situation that overwhelms the capacity of those in the vicinity to protect their lives and livelihoods, and in most instances requires external help in dealing with the losses. Disasters arise from hazards, and, crucially, it is the impact on human life that distinguishes the former from the latter (Practical Action, 2010). Disasters cause the loss of many lives, directly and indirectly (primarily or secondarily), affect large segments of the population, and cause significant damage to the environment and large-scale economic and social harm (Suda, 2000).

Globally, nearly all hazards carry a higher risk of culminating in a disaster, a fact that reveals the inseparable human influences in disaster creation. Between 1970 and 2007, the United Nations recorded that the highest death tolls and economic losses occurred in more concentrated geographic areas, evidence that the worst impacts are felt where exposure and vulnerability to hazards are intensified within smaller but more populated areas (UN/ISDR, 2009).

The increase in impacts from low-intensity events is primarily associated with ‘locally specific increases in exposure, vulnerability and hazard in the context of broader processes of urbanization, economic and territorial development, and ecosystem decline’ (ibid). With over half the world’s population now living in urban areas, making cities safer and resilient is a long-term challenge. Throughout history, disaster events have disrupted urban life. An extreme and changing climate, earthquakes, and emergencies triggered by man-made hazards are increasingly putting pressure on people and threatening the prosperity of cities (UN/ISDR, 2012).

In the case of developed countries, disasters causes huge damage to the large stock of accumulated capital, whereas losses of human life are limited, thanks to among other factors, the availability of effective early warning and evacuation systems as well as

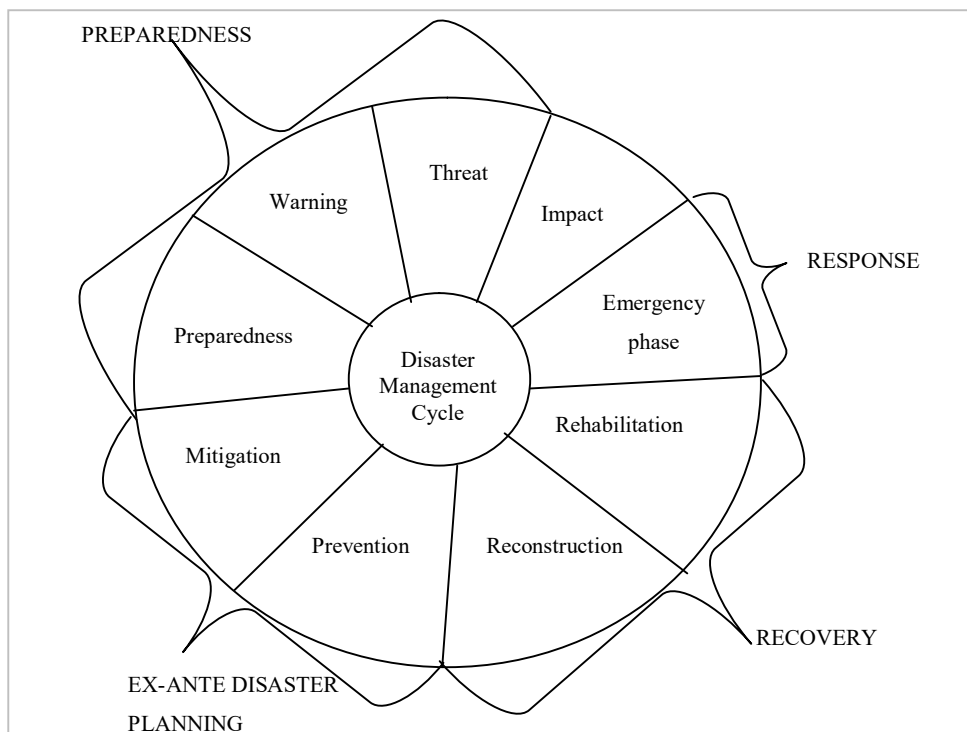
better urban planning and the application of more strict building codes and standards (Obwaya, 2010; Suda, 2000). In developing countries, however, the number of deaths is usually high because of greater vulnerability brought about by the lack or inadequacy of forecast and evacuation programmes; and although losses of capital might be smaller in absolute terms when compared to those in developed countries, their relative weight and overall impact tend to be very significant, even affecting sustainability (Suda, 2000).

Fortunately, disasters are not inevitable, even where there is a high rate of hazards; with better support, a disaster can be completely averted or its impacts reduced to limit loss and disruption. The increasing intensity and frequency with which disasters are being experienced worldwide demonstrate the critical need to enhance disaster management. Indeed, high-profile, large-scale disasters are increasing global consciousness of the need to strengthen national and regional capacities to mitigate, respond to and manage such events (Kirton, 2013).

## **2.2 Understanding Disaster Management**

Disaster Management is the coordination and integration of all activities necessary to build, sustain and improve the capability to prepare for, protect against, respond to and recover from threatening or actual natural or human-induced disasters (UN/ISDR, 2012).

The above definitions describe the phases of the disaster management cycle illustrated in Figure 2.1.



**Figure 2.1: Disaster Management Cycle** (adapted from FAO Corporate Document Repository, 2013)

Morales (2002), explains the different phases of the cycle as follows:

**Mitigation** relates to pre-activities that actually eliminate or reduce the chance or the effects of a disaster. Mitigation activities involve assessing the risk and reducing the potential effects of disasters, as well as post-disaster activities to reduce the potential damage of future disasters. Examples of mitigation mechanisms include land-use regulations, engineering works, building codes and insurance programmes.

**Preparedness** consists of planning how to respond in case an emergency or disaster occurs and working to increase the resources available to respond effectively. Preparedness covers contingency planning, resource management, mutual aid and cooperative agreements with other jurisdictions and response agencies, public information, and the training of response personnel.



**Response** refers to activities that occur during and immediately following a disaster. They are designed to provide emergency assistance to victims of the event and reduce the likelihood of secondary damage. Response activities include search and rescue, evacuation, emergency medical services and fire-fighting, as well as reducing the likelihood of secondary effects, for example to the contents of damaged buildings. Local government officials, as well as the community itself, constitute the "first responders" and therefore have to handle disasters for hours or even days before state and foreign resources arrive on the scene.

**Recovery** constitutes the final phase of the disaster management cycle. Recovery continues until all systems return to normal or near normal. Long-term recovery from a disaster may go on for years until the entire disaster area is either completely restored or redeveloped for entirely new purposes that are less disaster-prone. Recovery activities encompass temporary housing, restoration of basic services (e.g. water, electricity), food and clothing, debris clearance, psychological counselling, job assistance, and loans to restart small businesses among others.

On the other hand, Waugh (2000) considers that disaster management should attempt to develop disaster *resistant, resilient* and *sustainable communities*. Disaster resistance is achieved through land-use regulations, building codes, engineering works and other mitigation programmes. Disaster resilience is achieved by developing the necessary medical facilities, social services, public education and other capabilities useful in disasters and crises. Sustainable communities are achieved by incorporating disaster management into their economic, environmental and social programmes.

Twigg (1998) however notes that until very recently, disaster response has been the only form of disaster management carried out in many countries. This is very unfortunate since disaster response alone is not sufficient, as it yields only temporary results at a very high cost. It is worth noting that management of disasters cannot be an add-on, chaotic set of actions during a disaster which result to crisis management.

Ultimately, disaster management aims to reduce the impact of disasters. The ways of achieving this have varied and evolved over time. More recent approaches take a more holistic view and seek to reduce the risk of a disaster. Rather than waiting to respond, disaster management programs plan for the whole disaster process including a range of activities at different stages of disaster management (Practical Action, 2010). It is worth noting that the following stages also apply in the management of fire disasters.

### **2.3 Disaster Mitigation and Preparedness**

Disaster mitigation is the ongoing effort to lessen the impact disasters have on people and property (McMillan, 1998). Presently, there is a paradigm shift in the approach to disaster management from a culture of relief and rehabilitation to that of preparedness and mitigation. In the face of increasing menace of various hazards, mitigation would remain the key and the most effective strategy to reduce the risks of disasters (GoI, 2009).

The Government of India – Dhanbad plan, 2012, outlines that mitigation actions may be taken to eliminate or reduce the impact of a disaster. Such measures include zoning and land-use measures, formulating and enforcing building codes that recognize the hazards faced by the community, public education about hazards and protective measures, hazard and vulnerability analysis and preventative health care.

Morales (2002) classifies disaster mitigation mechanisms into two categories; Structural mitigation and non-structural mitigation. Structural mitigation measures generally refer to capital investment on physical constructions or other development works, which include engineering measures and construction of hazard resistant and protective structures and other protective infrastructure. Non-structural measures on the other hand, involve urban development restrictions awareness and education, policies techno-legal systems and practices, training and capacity development.

The National Institute of Disaster Management, New Delhi (2013) concurs with the aforementioned as it considers mitigation mechanisms to include structural and non-structural measures undertaken adopting physical, environmental, engineering, social, economic and/or regulatory approaches to contain the hazards from causing adverse impact on people, environment, property or any kind of human well-being.

Mitigation can thus be summed up as a mechanism that encompasses a wider range of activities starting from knowing the hazards and reducing vulnerability to preparedness and post-disaster actions to reduce the impacts, with different approaches based on regulatory planning, engineering, ecological and community based interventions.

In order to be effective, disaster management must be based on serious preparedness (McMillan, 1998). Disaster preparedness can be defined as the aggregate of measures to be taken in view of disasters, consisting of plans and action programmes designed to minimize loss of life and damage, to organize and facilitate effective rescue and relief, and to rehabilitate after disaster (Masellis et al, 1999).

McMillan (1998) notes that disaster preparedness includes all of the activities that are carried out prior to the advance notice of a catastrophe in order to facilitate the use of available resources, relief, and rehabilitation in the best possible fashion. UN/ISDR, (2012) emphasizes that for this to be effective; disaster preparedness should start at the local community level. The Government of India-Dhanbad Plan, (2012) appreciates that local communities should be involved in disaster preparedness and as such actions may be taken in advance of a disaster to develop operational capabilities and help communities respond to and recover from a disaster. Such measures include undertaking Community Based Disaster Preparedness Programmes (CBDPs).

Disaster preparedness mechanisms include forecasting, construction and equipping of Emergency Operating Centres with warning and communications systems,

recruitment and training of emergency management personnel and the general public, development of plans, procedures, arrangements, and agreements, and exercises of personnel and systems, the stock piling of supplies, and ensuring the needed funds and other resources (Masellis et al, 1999).

Buchanan (1999) sums up disaster preparedness as comprising of the following:

1. Developing a written preparedness, response and recovery plan, which involves updating and testing the plan; providing and maintaining supplies and equipment required in a disaster; establishing and training an in-house disaster response team; identification and marking on floor-plans and enclosures of irreplaceable and important material for priority salvage.
2. Preparing and keeping an up-to-date set of documentation including building floor-plans, with locations of cut-off switches and valves; inventory of holdings, with priorities for salvage marked on floor-plans; list of names, addresses, and home telephone numbers of personnel with emergency responsibilities; list of disaster control services, in-house supplies and equipment; list of suppliers of services and sources of additional equipment and supplies, including names of contacts and home telephone numbers; arrangements for funding emergency needs; Copies of insurance policies and salvage procedures.
3. Distribution of the plan and documentation to appropriate locations on- and off-site.
4. Instituting procedures to notify appropriate people of the disaster and assemble them rapidly.

Despite all these prescriptions, Obwaya (2010) notes that throughout all the activities that are meant to promote disaster preparedness, the ultimate objective should be to have plans in place that are not only agreed upon by stakeholders, but also implementable given the available resources both material and manpower. Over-ambitious plans, especially with inadequate resources, are bound to fail and lower the credibility of the organization in the eyes of the public. Indeed, any disaster

preparedness plan must have adequate resources that have been committed and readily available.

## **2.4 The Role of Local Government in Disaster Management**

Disaster management should include administrative decisions and operational activities that involve prevention, preparedness, response, recovery and rehabilitation at all levels of government. It does not only involve official bodies, because non-governmental organizations and community-based organizations also play a vital role. Even though all levels of government are generally involved in disaster management, the role and actions of local government is particularly critical (Col, 2007). This can be attributed to the fact that local authorities frequently deal with the impacts of small- and medium scale disasters and less frequently with large-scale events that arise from natural or man-made hazards. In most instances, local governments are the first line of response during disasters (UN/ISDR, 2012). Their disaster management abilities therefore affect the course of the initial response to a disaster (Fukasawa, 2002).

Local governments are responsible for long-term development and viability of their areas of jurisdiction as such, they are required to consider and institutionalize disaster management in their day-to-day operations, including development planning, land use control and the provision of public facilities and services. Drabek and Hoetner (1991) describe the role of local government with regard to disasters, to entail comprehensive disaster management and integrated disaster management. Comprehensive disaster management involves coordinating the four phases of disaster management, that is, mitigation, preparedness, response and recovery. Integrated disaster management on the other hand, entails coordinating planning and strategy of hazard assessment, resource mobilization and operations with other entities both laterally and vertically.

The active commitment and leadership of a local government is important for the implementation of any disaster management measures. This is because city

authorities play a central role in coordinating and sustaining a multi-level, multi-stakeholder platform to promote disaster management programs. In many cases, a comprehensive disaster management plan or program takes long time to fully implement, and the leadership of the local government is particularly crucial to ensure the political momentum and support among external stakeholders throughout the process (UN/ISDR, 2010).

Additionally, as the most immediate public service provider and interface with citizens, local governments are naturally situated in the best position to raise citizens' awareness of disaster risks and to listen to their concerns. They need to effectively engage local communities and citizens with disaster management activities and link their concerns with government priorities (ibid). According to UN/ISDR (2012), even the most sophisticated national disaster management mechanisms- such as early warning systems- may fail, if communities are not properly informed and engaged. Local governments should therefore play a central role in community education and training.

A local government is better positioned than a national government to develop and experiment with various new tools and techniques, applying them to unique settings and policy priorities. This can be attributed to the fact that local authorities' jurisdictions are smaller in scale and flexibility. They are thus required to devise and implement innovative tools and techniques for disaster management, which can be replicated elsewhere or scaled up nationwide. Given the aforementioned, local governments should thus be constantly proactive in disaster management.

## **2.5 Disaster Mitigation and Preparedness: Kenyan Perspective**

Disaster management in Kenya has not developed to the extent where systems are fine-tuned to effectively and efficiently prevent, control and manage disasters (Obwaya, 2010). Mawanda (2003) notes that locally; resources are geared towards recovery and reconstruction, rather than prevention or appropriate response. While there have been impressive humanitarian relief efforts in times of crisis, particularly

related to natural disasters in Africa, Holloway (2003) says that disaster vulnerability and risk have not been as an important area of sustainable development planning. The International Federation of Red Cross and Red Crescent Societies (IFRC) faults the Government of Kenya in disaster management and preparedness. In its 2010 *World Disasters Report (WDR)*, Kenya is among the low-income nations, which are most vulnerable to disasters. Rapid urbanisation, poor local governance, population growth, poor health services, rising levels of urban violence and climate change fuel the disasters.

In Kenya, more resources have actually been allocated to relief and rehabilitation efforts than prevention. This is a major shortcoming on the part of the government and other stakeholders in the disaster mitigation sector. For example, according to the Kenya Red Cross Society- KRCS (2009), a fire outbreak in Nakumatt downtown supermarket (Nairobi) in January 2009, saw many relief efforts. In actual fact, city planners should have foreseen the possibility of such a disaster and advised on house plans. Lack of disaster preparedness has remained one of Kenya's enduring development challenges for decades. Most of the disaster response initiatives in Kenya tend to be ad hoc, uncoordinated and short term measures, mainly in the form of emergency relief services to the worst affected areas. There is lack of recognition of the interrelationship between disaster preparedness, unsustainable production and consumption patterns (GoK, 2009).

## **2.6 Fire Disasters**

For longer than recorded history, fire has been a source of comfort and catastrophe for the human race. Sometimes they occur in circumstances that are unexpected or unpredictable. According to Brown and Smith (2000), fire incidents can be divided in many ways depending on the cause of fire outbreak, but broadly there are two types of fires - natural and manmade. Natural fires are basically earthquake, volcanic eruption and lightning - generated fires. Man-made fires are caused by human/machine errors, for example, industrial or chemical fire disasters, fires caused by electrical short circuit fires, accidental fires and kitchen fires.

Fire disasters include the unplanned and massive burning which may cause destruction of equipment, settlements, property and life (RoU, 2010). Among the many factors that cause fire hazards are haphazard electric wiring, poor construction standards, accidents, arson and uncontrolled burning of bush or waste materials bush burning. Fires are common in industries, refineries, petroleum pipelines, and congested human settlements, institutions of learning, work places, food establishments and markets places among other areas.

Masellis et al (1999) notes, although a fire disaster need not necessarily reach catastrophic proportions, it will present some of the characteristic aspects of a disaster because of the highly destructive action of fire and of the considerable number of victims. A fire of vast proportions can moreover cause damage to the surrounding environment by the massive production of heat and the emanation of burn gases and fumes. Smoke and gas, because of their suffocating action and their direct action on airways, represent other specific danger elements. This therefore calls for the need for mitigation of fire hazards in order to minimize fire disaster impacts to communities.

### **2.6.1 Overview of Fire Disasters in Nairobi City**

It is the responsibility of Nairobi County Government to assure fire safety in the city. However, Nabutola (2004) notes that the city authority has a poorly equipped fire station. Additionally, its management and staff are not motivated and are ignored except when there is a fire incidence. Over the years, the inadequacies of the city authority in fire disaster management have been manifested in the handling of various incidences in the city.

For instance, in 2004 there was a fire incident in City Hall, Mayor's Parlour, it however turned out that fire equipment was grossly inadequate and fire hydrants had no water. It took the intervention of Kenya Armed Forces and Airport Fire Brigade to bring the fire under control, four or five hours later (Nabutola, 2004). This is



evidence that the city authority was grossly unprepared to even manage a fire within their premises.

In January 2009, a fire broke out at Woolworths Building which housed Nakumatt Downtown, Nairobi; the fire claimed 30 lives. The Kenyan media reported that fire fighters arrived late (despite the fire station being about 200 meters from the fire incident site), in insufficient numbers and without enough water, hence prolonging the time and effort to reach those affected (IRIN Africa News, 2009). The City Council Fire Brigade had to be helped by two private companies with fire engines. The *Daily Nation* news paper, in an article dated 30<sup>th</sup> January 2009, reported that Nairobi's three million inhabitants were served only by one fire station situated close to a traffic-choked business district. It remarked on the way the fire was handled and responded to by saying, "It is fair to say that ours is a modern city with an 18th century fire-fighting infrastructure."



**Plate 2.1: Nakumatt Downtown Supermarket fire** (Source:www.irinnews.org)

In April, 2012, a fire broke out at Kimathi House located right opposite the Nakumatt downtown site. According to KARA, (2012), the city fire brigade arrived late and ill equipped to handle the fire. At first, none of the fire trucks, including those from private firms, had hydro-cranes to lift fire fighters to the fifth floor where the fire had

started, and none could pump water beyond the third floor. Later, the city brigade's fire truck with cranes arrived but fire brigade personnel had to refer to its manual to operate it. It was also established that fire hydrants around the building were also dysfunctional. The fire thus consumed the entire fifth floor and spread to the sixth and seventh floors. This incident clearly shows the glaring inadequacies of the city authority in fire disaster preparedness.



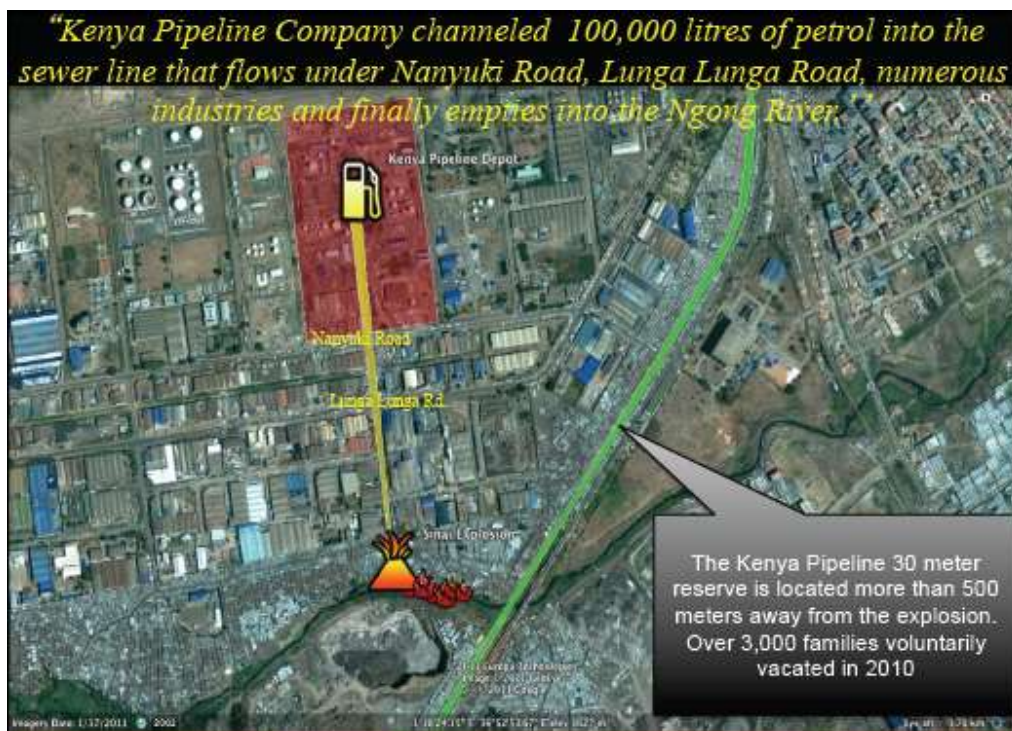
**Plate 2.2: Kimathi House fire** (Source: Daily Nation, online archives)



**Plate 2.3: Aftermath of Kimathi House fire** (Source: Daily Nation, online archives)

Informal settlements in the city also experience fire breakouts frequently. IFRC (2011) notes that response to fires, especially in informal settlements, continues to be a daunting task due to the lack of publicly provided fire fighting systems including the lack of water sources to douse fires, extreme proximity and high density of shelters coupled with combustibility of construction material and poor infrastructural development in these areas including lack of access roads into the settlements.

A case in point is the Sinai slum fire which occurred in 2011, killing more than one hundred people. This was caused by fuel leakage from Kenya Pipeline Company (KPC) pipeline system. SIDA (2011) notes, the land on which the slum is located is owned by the Kenya Pipeline Company and shanty homes are built along or on top of the pipeline. Past attempts to remove the settlers have failed because the government did not provide them with alternative settlements.



**Plate 2.4: Lungalunga map showing source of fire disaster** (Source: [www.sdinet.org](http://www.sdinet.org))

This fire incident raises issues to do with land use planning in terms of location of the informal settlement on the pipeline way leave. The incident would have been mitigated if city authorities enforced planning and zoning regulations thus not allowing any kind of settlement on the pipeline due to the palpable danger posed.

## **2.7 Local Government Fire Disaster Mitigation and Preparedness Challenges**

Many local authorities are being challenged by budget crises, rising call volume, personnel and equipment shortages, security issues and the overall expectation to do more with less. Effectively managing these challenges requires a basic understanding of how changes in levels of fire department resources deployed affect outcomes from emergencies that occur daily. Failing to manage these challenges can leave individuals, a fire department and a community vulnerable to undesirable events (NFPA, 2008)

Fire department response capability and capacity is a function of resource allocation and is a significant determinant in the degree of vulnerability of a community to unwanted fires and other emergencies. Recognizing this, decision makers must minimize the consequences of unwanted fires and other emergencies in a community by matching the allocation of fire department resources to the fire risk profile of a community (CFAI, 2006)

A survey conducted in Nepal municipalities by UNDP (2011) paints a grim picture of fire mitigation and preparedness in several municipalities. According to the report generated, the management capacities of municipalities in terms of fire prevention and fire extinguishing are inadequate. Fire-fighters have limited skills and knowledge and other municipals have never had the opportunity to participate in trainings and orientations on fire-fighting. Compared to other hazards, fires are overlooked in educational curriculum and over-staffing and poor management has burdened municipalities unnecessarily. Additionally, none of the municipalities have made fire response, contingency, fire safety or emergency plans. This situation therefore calls

for urgent need to identify capacity deficiencies in local governments and propose the way forward.

## **2.8 Local Government Capacity Requirements for Fire Disaster Mitigation and Preparedness**

The Hyogo Framework for Action 2005-2015 considers that both communities and local authorities should be empowered to manage and reduce disaster risk by having access to the necessary information, resources and authority to implement actions. In this regard, achieving the goal of a holistic approach to disaster management needs a framework of a capable institutional setup with competent professionals, educators, trainers and field practitioners in different aspects of the disaster management, starting from addressing hazards and vulnerability, prevention and mitigation, preparedness, early warning, relief and recovery (GoI, 2013).

It is important to have the capacities to ensure the disaster mitigation and management actions do not create future risks or jeopardize the sustainability of the natural resource of the livelihood systems. It is worth noting that, Municipal administrations cannot effectively manage disasters if they lack an institutional understanding of the potential impact of hazards that threaten the local population, infrastructure and economy (UNDP, 2010).

It is necessary to identify the existing deficiencies in the system, based on experience with respect to previous disasters as well as the emerging needs of changing disaster risk scenarios, for example, the growing challenges due to climate-change impacts, urban agglomeration, migration, environmental degradation, and industrial development. Assessing institutionalized capacities to effectively use resources and execute critical actions requires several different kinds of measures, corresponding to different kinds of resources and actions (ibid).

### 2.8.1 Financial Capacity

According to UNDP (2009), one of the key priorities in disaster management is the allocation of a budget. It is also noted that a strategy for mobilization of resources should also be integrated in the budget to facilitate funding for disaster management. Phaup and Kirschner (2010) note that disasters are difficult to predict; putting a speculative number in the budget may reduce the budget's credibility and usefulness. Projecting the government's expected cost need not be an exercise in illusion. Over the past decade, most countries have spent significant sums on recovery from various "unexpected" loss events. This experience provides a convenient database for extrapolating expected costs from such events.

*Ex ante* budgetary policies can increase net benefits by providing fiscal incentives and legislative opportunities to increase national savings, reduce exposure to risk, and promote mitigation, before a disaster. Effective *ex ante* budgeting for disasters requires trade-offs of current consumption for saving and mitigation, and procedural safeguards against opportunistic efforts to divert disaster savings to other uses. This also implies that *ex post* budgetary policies can have the perverse effect of increasing welfare losses from disasters (ibid).

In the case of fire disasters, the operation of a fire department is normally a function of local government. It is therefore critical for fire department managers to thoroughly understand their jurisdiction's budgeting systems (Cote, 2003). This is because inadequately prepared budgets can lead to serious monetary shortfalls and thus hinder smooth operations. Cote (2003) further emphasises that all costs must be estimated realistically and expenditures monitored on regular basis. Additionally, efforts should be made to develop a long range plan that projects capital replacement costs for items like fire department staff, vehicles, fire apparatus, fire stations and other equipment.

A report on Nepal's capacity for disaster preparedness recommends that local governments carry out functional coordination for resource sharing. They should

coordinate with national government offices, which allocate resources for fire disaster management, as well as with other relevant offices to help generate funds (UNDP & GoN, 2011). The report further emphasises the need to design and run quality plans for resource mobilization in order to secure funding from the central government.

## **2.8.2 Technical and Infrastructure Capacity**

### **a. Competency**

The development of technical capacities associated with professional disciplines or functions related to fire disaster management needs to be combined with other types of capacity development that include the promotion of leadership and other managerial capacities and performance-enhancing measures (UNDP, 2010). It is imperative that all fire service personnel be fully qualified and capable of efficiently performing the wide range of services necessary to protect life and property (Cote, 2003).

Daniels, 2009 notes that it is incumbent upon municipal administrators, fire chiefs, safety officers and training officers to ensure that fire department's training system prepares personnel to perform safely and effectively in the variety of fire disaster scenarios they will face. Coley (2010) notes that the training and education of fire brigades requires that brigade members be provided with training in all duties which they are expected to perform and this training must be provided by instructors with a comprehensive knowledge of the subject.

Training should be frequent enough for personnel to safely and satisfactorily (a minimum of quarterly for structural fire fighters) perform their duties. Coley recommends the use of core competency based training as a positive way to instil the fundamentals in new fire service employees and a needed process to reinforce the details of the basic skills for the more seasoned veterans. The ability to utilize basic skills is imperative to enable personnel to perform at the apex of the profession. As

such, it is important for fire departments to develop their comprehensive training plan based on an explicit list of organizational functions, input from personnel, government regulations, and professional standards (ibid). The bottom line is: it cannot be assumed that fire brigade personnel are trained to perform operations for which they have not been provided with high-quality and ongoing training

NFPA 1001 is a standard for Fire Fighter Professional Qualifications published by the National Fire Protection Association (NFPA). It states “the authority having jurisdiction shall establish instructional priority and the training content to prepare individuals to meet the job performance requirements.” NFPA 472, NFPA 1002 and NFPA 1006 standards on professional qualifications made the same statement and went on to identify the minimum job performance requirements (JPR) for that standards job title. It is clear, from these standards, that every agency has to be responsible to define and prioritize its own core competency training and testing based on the needs of the agency. Professional qualification standards guide an agency, but core competencies are needed to base an individual agency’s priorities and functions.

**b. Infrastructure (Fire stations, machinery and equipment)**

NFPA standards recommend that there should be 1 fire station requiring at least 5 fire engines for a catchment population of 200 000 persons. Additionally, according to international standards, there should be one fire-fighter in every 2,000 people and one engine for a population of 28,000 (GoN & UNDP, 2011). Wilson (2009) further notes that a fire department in a large city may operate one engine company per 15,000 to 20,000 population. The physical location of fire brigade is crucial to the efficiency of fire response work. As such fire brigades should be located in strategically appropriate areas. Due to the rapid pace of urbanization it is recommended that fire brigades be decentralized and thus be established at the outer periphery of municipalities to avoid heavy traffic and facilitate quick response. They should not all be kept in the same place; for instance, if there is more than one fire



engine in a municipality, they can be kept at different ward offices in coordination with the local police station.

In term of response time, NFPA 1710 recommends 80 seconds for turnout time for fire and special operations response. For the initial arriving company, the fire department's fire suppression resources should be deployed to provide for the arrival of an engine company within a 240-second travel time to 90% of the incidents. NFPA 1720 on the other hand makes recommendations for meeting objectives based on the population per square mile of the community. This means fire station location is key in the achievement of an average 5 minutes response time.

For fire brigaded to contain and extinguish fire disasters reliably, they need well maintained vehicles, machinery and equipment. In this regard, the parameters to be considered include their status, the physical condition of fire engines, the availability of spare parts, the servicing of fire engines and fuel management as well as the availability of search and rescue tools (UNDP, 2011).

Fire stations require fire engines with extension ladders and elevators especially for suppression of fires in high rise buildings (IFSTA, 2008). Since the use of fire engines is seasonal and unpredictable, it is important to make provision for their periodic servicing (Ibid). Additionally, to be properly prepared for fire hazards, each fire brigade should keep engines at international standards operations by establishing repair and maintenance workshops within the municipalities themselves (GoN &UNDP, 2011). Fire stations are also required to safely store fuel to run engines for use in emergencies. It is recommended that after every fire response, engines should be refuelled fully (ibid). It is also important to stock other forms of fire suppression materials such as hydrogen gas, liquid fuel, and platinum chemical foams.

Fire departments are also required to have search and rescue tools as well as first aid equipment; they should be stocked in sufficient quantity and stored properly. Ideally, a set of search and rescue tools includes optimal numbers of chain saws, concrete cutters, crow bars, wire and abaca ropes, shouldering sticks, clippers, jacks, hammer

pincers, and handsaws and abaca rope; these should ideally match the model of fire engines used by the fire brigade (ibid). First aid equipment and services include a first aid kit, stretchers and spin boards, as well as health and ambulance services specially designated for fire-fighting and suitably equipped with instruments and monitors (ibid). Additionally, first aid kits should be constantly replenished and updated.

Water plays a crucial role in fire response; it is therefore important for fire stations to have adequate water storage facilities on their premises. Harvesting rainwater and pumping underground water are examples of supplementing main water sources for fire stations. A water-lifting system using portable generators should also be arranged. City authorities and other stakeholders should also ensure that fire hydrants are strategically placed and well supplied with water.

Fire service personnel require sufficient Personal Protective Equipment (PPE). This refers to protective helmets, masks, boots or other garment designed to protect fire fighters or rescue workers from injury. Fire fighters PPE is technically advanced to protect against the demands of fire fighting and rescue. Personal Protective Equipment (PPE) addresses hazards from physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Protective Personal Equipment is also used by rescue and emergency teams for search and rescue (<http://www.fireproductsearch.com>, accessed 25<sup>th</sup> October 2015).

PPE should essentially consist of specialized protective clothing as outlined below (ibid):

**Fire fighter Boots or Fire Boots** designed to meet the tough demands of a fire fighter providing comfort and high levels of protection. They are generally waterproof and provide breathable qualities while ensuring fire fighter safety in the harshest of environments;

**Fire fighter Gloves** need to offer fire-fighters a high level of heat resistance and protection against other risks including falling debris and potentially harmful chemical risks. They also need to offer flexibility, dexterity and overall comfort to the fire services;

**Fire fighters helmets** made from tough fibre glass are heatproof and worn when fire fighting or carrying out rescue work. A fire helmet protects the fire fighter's head from falling objects or banging their head on low beams. At the front of the fire fighter helmet there is a visor which moves down to protect the fire fighter's face from the heat and sparks of the fire;

**Fire Resistant Fabric** also known as Fire Retardant Fabric is used in protective clothing for fire fighters and primarily designed to protect fire fighters from flames, heat and heat stress when fighting fires. Fire Fabric has to meet tough international safety standards.

Personal Protective Equipment should be well stored when not in use. PPE storage includes boxes, cabinets and racks that all help protect the PPE equipment. Employers are legally required to provide suitable storage to protect personal protective equipment from damage, contamination or loss (ibid).

### **c. Communication systems**

Communications is a crucial and rapidly evolving element of fire service operations. Increased sophistication of equipment, incident command systems, and radio frequency congestion are among the forces stimulating change, and making it more essential than ever for fire officers to have a good understanding of communications systems and policies. Communications and communications systems also are critical to safe and effective fire ground performance (USFA, 1995). The basic elements of a communications system include transmitters, antennas, receivers, and their power supplies and other ancillary equipment.

Computer-aided dispatch systems are becoming increasingly popular. Once found only in the largest departments, fire departments serving communities of 100,000 population and below are now adopting these systems. Planning for and working with these systems requires fire service communications managers to be familiar with the concepts and technologies behind them. Other communications technology is changing rapidly too, with portable facsimile machines, automatic vehicle location, computer-aided dispatch, push-button vehicle status using more compact and powerful computer hardware, and more sophisticated software available (ibid).

It is important for local governments to establish a communications centre, often also called the dispatch centre. This is the nerve centre of fire department operations and usually the first point of contact the public has with its fire/rescue agency. It is also the hub of fire department communications. The communications centre must manage and allocate the fire and rescue resources of the fire department or jurisdiction in a way that ensures that the proper resources are dispatched in a quick, efficient, and professional manner to emergency incidents. It also provides support to field operations personnel and units in carrying out many routine tasks and responses to non-emergency incidents. Given its important role, it is critical that the communications centre be managed in a way that gains the confidence of the public and the department served. In the future, it is anticipated that new digital radio technology and satellite communication systems will provide many applications that could change how fire departments receive and send information. As such fire departments should aim at embracing new technology to enhance their efficiency and effectiveness (USFA, 1995).

### **2.8.3 Management Capacity**

#### **a. Fire Disaster Management Planning**

Leonard (1995) notes that without management plans derived from an orderly planning process, fire disaster management would be no more than a series of uncoordinated reactions to immediate problems. Through planning managers can

reconcile differences in management philosophy and ideas before taking actions that have long range resource effects. Good plans have a stabilizing influence on management despite changes in personnel or multiple administrative influences. Plans that establish clear, attainable, measurable and acceptable objectives for an area, and policies and actions by which such objectives are pursued, are essential for guiding fire disaster management toward consistent outcomes.

In an era of heightened concern about cost effectiveness and competition for scarce funds, the potential for obtaining the personnel and money essential for fire disaster management will be increased by plans that identify clear objectives, effective management actions and adequate monitoring processes (ibid).

#### **a. Contingency Planning**

Contingency planning aims to prepare an organization to respond well to an emergency and its potential humanitarian impact. Developing a contingency plan involves making decisions in advance about the management of human and financial resources, coordination and communications procedures, and being aware of a range of technical and logistical responses. Such planning is a management tool, involving all sectors, which can help ensure timely and effective provision of humanitarian aid to those most in need when a disaster occurs (IFRC, 2012). This therefore means that effective contingency planning should lead to timely and effective disaster-relief operations.

Simply put, the International Federation of Red Cross and Red Crescent notes that contingency planning ensures that we know what to do when disaster strikes, and have the systems and tools to respond fast. It means anticipating the types of disasters we might face and knowing practically how to manage disasters when they do strike. It also means rehearsing our procedures and working out where the gaps are, so that we can be ready when we are needed most. In order to be relevant and useful, contingency plans must be a collaborative effort. They must also be linked to

the plans, systems or processes of other government, partner or Movement bodies at all levels – national, regional and global (IFRC.org, *accessed 3<sup>rd</sup> March, 2014*).

The disastrous consequences in the absence of a pre-disaster contingency plan have been demonstrated repeatedly in many countries on a number of occasions. Therefore, one of the most critical elements of disaster management is to have a contingency plan in readiness, which would clearly delineate the roles and responsibilities of various agencies within and outside the government, define the exact functions to be performed by them, the process to be followed in the performance of these functions, the tools and equipments to be kept in readiness, procurements to be made, evacuation drills to be followed, the emergency medical plan to be put in place among other procedures necessary for disaster handling (UN/ISDR, 2009).

Standard Operating Procedures (SOPs) should also be laid down for each activity in the contingency plan to avoid any confusion and to ensure coordination among the various agencies involved in the response, relief, rehabilitation and reconstruction programmes after the disasters. A Standard Operating Procedure is “a set of instructions constituting a directive that establishes a standard course of action.” SOPs, clearly spell out what is expected and required of personnel during disaster incidences (GoI; UNDP, 2009). Such a contingency plan should be prepared vertically at the national, provincial, district and sub-district and community level and horizontally for the different sectors such as police, civil defense, health and fire services among others.

Of importance is the fact that contingency plans need to be regularly updated and tested through simulations (IFRC, 2012). A contingency plan should be reviewed periodically to update them according to changing situations and also to create awareness among all the stakeholders. The best way to keep a contingency plan in readiness is to conduct mock drills at least once in a year so that the operational difficulties in implementation of the plan are sorted out at the ground level and the

various agencies within and outside the government can work together in a coordinated and efficient manner when the disaster would actually strike. Such mock drills again should be conducted at various levels to ensure operational readiness of the system (UNDP, 2009).

#### **b. Fire Hazard, Risk and Vulnerability Assessment**

Disaster risk assessment is the first step towards designing and implementing prevention and mitigation measures (UNDP, 2010). The first and probably the most complex task of mitigation however, is to map the hazard, risks and vulnerabilities, analyze and assess the levels of risks and monitor it continuously (GOI, 2009). It is only on the basis of such a knowledge base that a proper and effective strategy for disaster mitigation and preparedness can be developed.

The purpose of Hazard, risk and vulnerability analysis (HRVA) is to help communities make risk-based choices to address vulnerabilities, mitigate hazards and prepare for response to and recovery from disasters. The effectiveness of disaster management rests on an understanding of hazard risks and the capacity to deal with them before they become a threat to a community (DMISA, 2009). Hazard mapping is therefore a crucial aspect of disaster management. It is the process of mapping hazard information within a study area of varying scale, coverage, and detail.

It is therefore argued that mapping, as a visualization of spatial data, is a prerequisite for successful efforts in disaster mitigation (NRC, 2007). The function of spatial data in disaster risk reduction is, among others, for the creation of thematic maps on population and infrastructures as well as underlying hazards in a certain areas. These thematic maps are necessary input in developing elements at risk map. Examples of element at risk are people, buildings, agriculture field, economic activities, industrial complexes, road, railway, and bridges. The objective is to identify which elements of the society are at risk if confronted with certain of types of natural and man-made hazards of certain time and magnitude. The process of mapping elements at risk

usually involving large scale map of infrastructure and utilities combined with small-to-medium scale hazard maps (Sutanta, Rajabifard and Bishop, 2009).

In the case of fire disasters, the aim of risk assessment is to identify fire hazards and to reduce the risk of those hazards causing harm to as low as is reasonably practicable; and to determine what fire safety measures and management policies are necessary to ensure the safety of people should fire occur. A community based approach to fire risk assessment and mapping fosters solidarity, coordination and cooperation among relevant stakeholders (GoN & UNDP, 2011). According to UN/ISDR (2012), citizen groups in risk-prone areas, including informal settlements, local business and other groups should participate in risk assessments and the findings must be shared with them.

The use of computer software programs to automate steps of risk management process such as the use of GIS and remote sensing has allowed hazard mapping to become more comprehensive. GIS technology integrates database operations with the geographic analysis benefits offered by maps. This technology can give higher quality results which can facilitate decision-making and improve coordination among agencies when disasters strike ([www.disasterassessment.org](http://www.disasterassessment.org), 2014).

Batty (2007) notes, elements of risk maps are useful media to communicate disaster risks to planners, politicians, and communities. For land use planners, this information serves as input for putting the right uses for a particular location or to implement specific restriction for certain uses or even prohibited any modification to the existing conditions. Politicians need this information in developing planning policy in order to make a better-informed decision. Communities on the other hand need specific information relating to whether their activity places are safe in the present and future to prevent potential loss in the event of disaster.

Cities should thus work with national and local research institutes and hazard monitoring centres, encouraging them to contribute to documenting and assessing past and potential hazards and risk scenarios. These institutions should be part of the



coordination mechanism created to deal with disaster mitigation. Additionally there is need to maintain up to date data on fire hazards and vulnerabilities. City authorities also need to use the fire risk assessments as the basis for urban development plans and decisions (ibid).

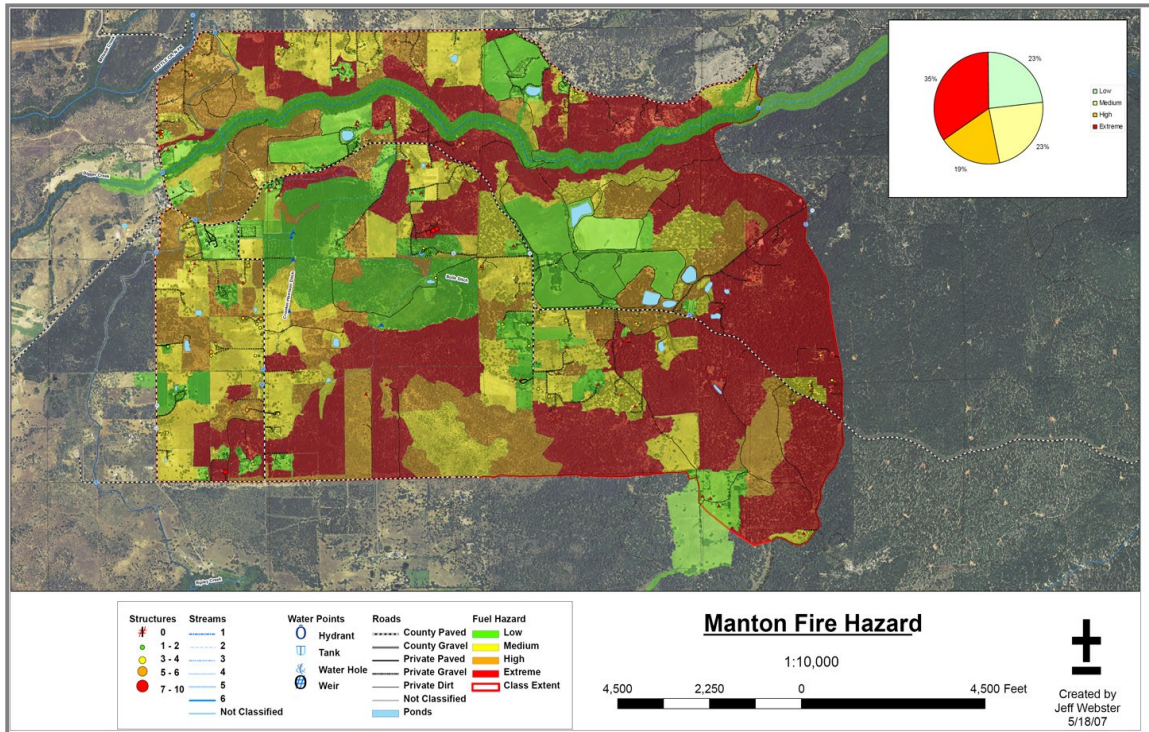


Plate 2.5: Example of a fire hazard map (Source: <http://www.battle-creek.net>.)

### c. Staffing Requirements

Appropriate staffing levels are not a new concern; whether or not fire departments should adhere to a “per company” staffing minimum has been debated and studied for over forty years. Despite the multitude of studies undertaken to determine the optimal per company staffing number and the effect increased staffing has on performance, there remains little information about how fire departments are actually staffing companies and the extent to which these staffing assignments affect performance. Prior research has been almost exclusively based on time-to-task-

completion experiments. Done in a controlled environment, these experiments mimic what happens to single-family residential structures during a fire and time how long it takes different-sized companies to complete a specific set of tasks. In general these studies were oriented to specific communities and while their results have been generalized, it is not clear that this is appropriate (Stingley, 2011).

According to Monday (2000), the National Fire Protection Association (NFPA) index was examined for standards of recommending numbers of fire fighters when performing ground operations. As per NFPA 1500 standard on Fire Department Occupational safety and Health Program (1997), fire departments have the responsibility to set policies with the minimum number of fire fighters. Since fire departments are required to develop procedures for defining the number of personnel to perform each function, the standard adds that the department shall provide an adequate number of personnel to safely conduct emergency scene operations.

The National Fire Protection Association's Standard 1710 provides career fire departments with technical guidelines and recommendations for response times, staffing, operational procedures and department organization. Regarding staffing levels, the standard recommends that each fire company be staffed with four fire fighters, including a company officer who must remain as part of the fire company. The standard further outlines that one fire fighter will staff the pump, another will secure water and two fire fighters will advance the hose line (NFPA, 2010).

Stingley (2011) notes that in North Carolina, for instance, complying with the minimum staffing per company standard in 1710 is something many, if not all, managers and governing body members would like to consider; but the reality is that increased staffing costs a lot of money and few career fire departments are in compliance. She further notes that it is important for decision-makers to look at all of the available information when determining where to allocate resources and why, because local governments have to do less with less. Time-to-task completion studies show that for a number of crucial tasks, 4-person companies can operate faster than

those with fewer. Presumably this should lead to improved performance results. However, given the cost of adding fire fighters and the absence of data linking 1710 compliance to improved outcomes, it will be difficult for cash-strapped municipalities to make 1710 compliance a priority (ibid).

Fire service personnel require proper staff facilities to enhance their productivity. Staff facilities differ from municipality to municipality. Apart from a monthly salary, fire brigade team members need to get food, clothing, and other allowances keeping in mind that they are on duty for 12-hour shifts. Staff insurance can also be considered in the package (GoN &UNDP, 2011). These provide incentives to motivate them. In regard to accommodation it is important for staff to be accommodated either very close to or in the same premises as fire stations. This enables teams to depart 3-5 minutes after receiving a fire disaster message/alarm (ibid).

#### **d. Training and Capacity Development**

Fukasawa (2002) notes that Local governments play a central part in disaster management; their personnel therefore have a very important role. This makes upgrading their skills and knowledge a top priority in the efforts to mitigate the effects of a disaster. UNDP (2010) however notes that the involvement of communities also prompts the need to upgrade their skills too. Whereas vulnerable communities have a certain degree of capacities built into their social systems and practices acquired through inherited experiences of generations, such indigenous capacities are often overwhelmed by the vagaries of nature due to various anthropogenic factors like the degradation of environment, changing land uses, pressures of population on settlements and climate change (GoI, 2013).

Local capacities therefore have to be continuously upgraded and further developed according to the changing needs and the developments of science and technology and other improved practices in various sectors. Indeed, UN/ISDR (2012) agrees that

people need to be empowered to participate, decide and plan their city together with local authorities and value local and indigenous knowledge, capacities and resources.

The challenge of capacity development is to transfer the new horizons of knowledge into actionable modules at the local levels for the local people by the local community. Such capacities can be developed through meetings, interactions, discussions, exposure visits and trainings. Training is particularly necessary for cutting edge functionaries within and outside the government at various levels in different sectors to impart them with necessary skill for disaster risk reduction and management (Burby and Beatley, et al., 1999).

Training programmes have to be practical, scenario based, exercise and problem solving oriented so that the functionaries are aware of their specific responsibilities and are able to discharge those responsibilities efficiently before, during and after the disasters (GoI-Kannur Plan, 2009). It is recommended that local governments design training as per training needs assessment. Training, drills, and simulations in areas such as emergency fire management, risk assessment, search and rescue, first aid, fire-fighting, evacuation, and crowd control should be conducted for municipal staff, municipal police, and disaster focal persons. There should be refresher trainings as well.

While designing the training curricula, more emphasis should be given to metropolitan officials, more focus on search and rescue capacity-building than fire control, and more time and energy for fire preparedness than fire response (GoN & UNDP, 2011). Mirkhah (2008) notes that fire prevention education standards should be a part of career paths for fire service personnel. Fifty percent of training time should be devoted to fire prevention. The requirement for a fifty percent training time assigned to fire prevention is in line with the requirements of the more progressive countries such as Britain, which require junior officers to attend nine weeks of training, four of which are devoted to the prevention issues.

Training is also required for those community members who would be part of the community response teams for the initial critical hours and days till specialized assistance from the government and non-governmental agencies from the outside are organized. Such trainings may include maroon search and rescue, first aid, evacuation, temporary shelter management, arrangements of drinking water and sanitation, provision of cooked food among others (GoI, 2009).

#### **e. Awareness Creation**

Urban disaster mitigation and preparedness in the realm of disaster risk reduction is a relatively new concept that requires further promotion given that knowledge about it in cities remains low among many national and local governments and with donors and multilateral financial institutions (UNDP, 2010).

Training and capacity development involves sensitization of common masses about the risks, vulnerabilities of fire disasters and the preventive, mitigation and preparedness measures that can be taken at the government, community, household and individual level (GoI, 2009). Media can play important roles in awareness generation on a large scale. Mass and print media mobilisation for instance are very important for fire preparedness activities, which include spreading messages through television, radio, street drama, video, folk songs, drills, posters, pamphlets, and hoarding boards (UNDP, 2011). Awareness and sensitization programmes can also be organized for more specific and limited audience such as parliamentarians, policy makers, media and other selected audience such as construction experts among others.

The UNDP encourages support for activities to create awareness and prescribes designing campaigns in cities; establishment of community information centres; conducting specialized training programmes for city managers and local government officials, teaching structural and non-structural urban risk management measures; and training of engineers and architects in disaster-resistant construction technology among other activities.

#### **f. Fire Control Mechanisms - Planning Regulations**

According to UN/ISDR (2009) sound development practice with good planning regulations coupled with effective enforcement help in disaster mitigation. These coupled with well-maintained infrastructure, capable emergency management and solid institutions, which develop participatory urban plans, provide building permits, and manage water resources and solid waste, help to build up cities' resilience over time.

In regards to fire disasters, proper construction and arrangement of buildings is essential to sound fire protection program. City Planning departments are key components in ensuring quality control in building construction and compliance with fire protection features of local building codes Cote(2003). Close cooperation is also needed between fire departments and Planning departments to control serious fire hazards (ibid).

Given the foregoing, it is important for municipal authorities to prepare and implement comprehensive land use plans and zoning ordinances to ensure that new and existing facilities are compliant before granting locational clearances. This is an innovative feature of the City's permit application process (UN/ISDR, 2010). A zoning ordinance should also incorporate health and safety considerations and risk parameters into land use regulations. Compliance with safe building codes is often overseen by city planning departments; it is however very important to enforce building codes in cooperation with the private sector and professional 'watchdog' organisations that conduct annual inspections, provide training and support in risk-sensitive planning and construction, and manage a certification mechanism (ibid).

#### **g. Inter-agency Coordination**

Successful implementation of any fire management program is dependent on good coordination and cooperation with and between other agencies. This requires an understanding of agencies' organizational structures and their roles in fire

management. This understanding, coordination, and cooperation will enhance efficiency across jurisdictional boundaries (NIFC, 2005).

According to Leonard (1995), interagency cooperation is vital to the full realization of fire management program objectives. The ability of a single agency to implement a fire disaster management program of any complexity is limited without coordination and assistance from other organizations. Interagency and cooperation and coordination of shared resources and common activities are imperative at all organizational levels. A clear understanding of the roles each agency has, at each organizational level, is necessary to maximize the benefits of interagency coordination and assure the fulfilment of agency responsibilities.

#### **2.8.4 Institutional and Legislative Support**

Adequate governance is fundamental for the sustainability of urban disaster management (Nishtar, 2010). This therefore means that the institutional and legislative systems at the municipal level must ‘own’ the disaster reduction process. Bang (2013) notes that DRR which involves mitigation and preparedness measures requires that disaster risk reduction at the local levels are mainstreamed into general government policy process.

This calls for flexibility in the decision-making process that involves the citizens and all key stakeholders at the local level, and the empowerment of communities, which in turn pushes political will, transparency and good governance. The need for improved political commitment and improved governance of institutions is thus crucial to realizing this. This requires decentralisation of disaster management coupled with the empowerment of local governments to enhance their abilities and capabilities and give them authority and autonomy to manage fire disasters effectively (ibid).

In general, a national disaster preparedness plan should clearly define the institutional “architecture” necessary to implement it. It should also define a

coordination structure, articulating both horizontal (between different sectors) and vertical (between national, sub-national and local entities and authorities) linkages. Although the exact nature of the architecture will vary based on the national context, some common elements that should be clearly specified in the institutional arrangements include (UN/ISDR and UN/OCHA, 2008):

- **Composition:** Which entities (including non-governmental bodies) are responsible for disaster preparedness at the local, sub-regional and national levels? Is this clearly reflected in their mandates, work-plans and staff job descriptions?
- **Roles and responsibilities:** Which entities are responsible for the various tasks and outcomes considered essential to building preparedness capability? How are different elements expected to relate to each other so that they operate in a cohesive and coordinated manner?
- **Processes, agreements or interagency protocols:** Are arrangements in place to facilitate consistent coordination and communication between different entities with responsibilities for preparedness? Have these been written down and are they agreed upon both by all organisations concerned, and by both senior managers and field staff?
- **Protocols regarding external assistance:** Have rules and procedures for requesting and receiving nongovernmental (NGO) assistance, private donations, international or regional assistance, if required, been agreed and approved in advance?

It is important that the institutional arrangements necessary for preparedness are also reflected in local/state and national legislation. These laws will guide which activities can be implemented under what conditions and establish who has overall responsibility in a disaster. Such legislation should specify the role of key ministries,



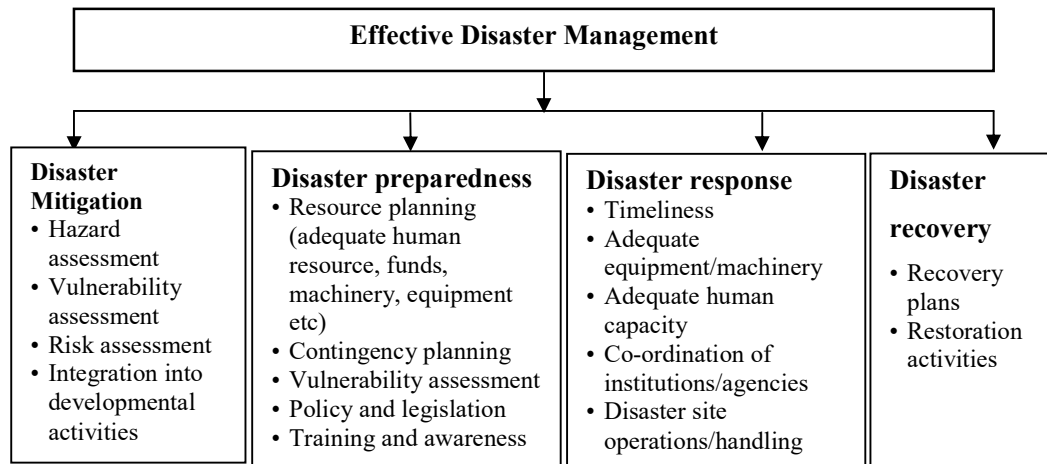
national and international organisations and civil society actors in preparedness and response to avoid confusion in the early days of a response.

Legislation should also clearly establish decentralised mechanisms and encourage community participation. It should identify the source of funding and other resources required for preparedness. Ideally, it should establish a specific line item, or funding source, in the overall national budget for building preparedness capabilities prior to disasters. It should also outline how additional emergency disaster funds might be allocated in the face of a major disaster (ibid).

National legislation should also outline a monitoring and enforcement regime that requires entities responsible for building a preparedness capability to report back on their work, and should set targets for accountability within the system. Local authorities thus need to ensure that there is adequate capacity to monitor compliance with comprehensive rules and regulations. Disaster management institutions should also participate in reviewing and amending municipal institutional and legislative frameworks; proposing institutional strengthening programmes to enhance local capacity; reviewing and amending existing zoning regulations, building codes and by-laws, and sensitizing building experts to these; and disseminating guidelines for appropriate institutional arrangements to the most vulnerable cities and towns (UN/ISDR, 2007).

## **2.9 Conceptual Framework**

According to Luthra (2009) effective Disaster management, entails four phases which include Disaster mitigation, disaster preparedness, and disaster response and disaster recovery. Luthra (2009) identifies what each stage of the disaster management cycle entails; this forms the basis of the conceptual framework for this study.



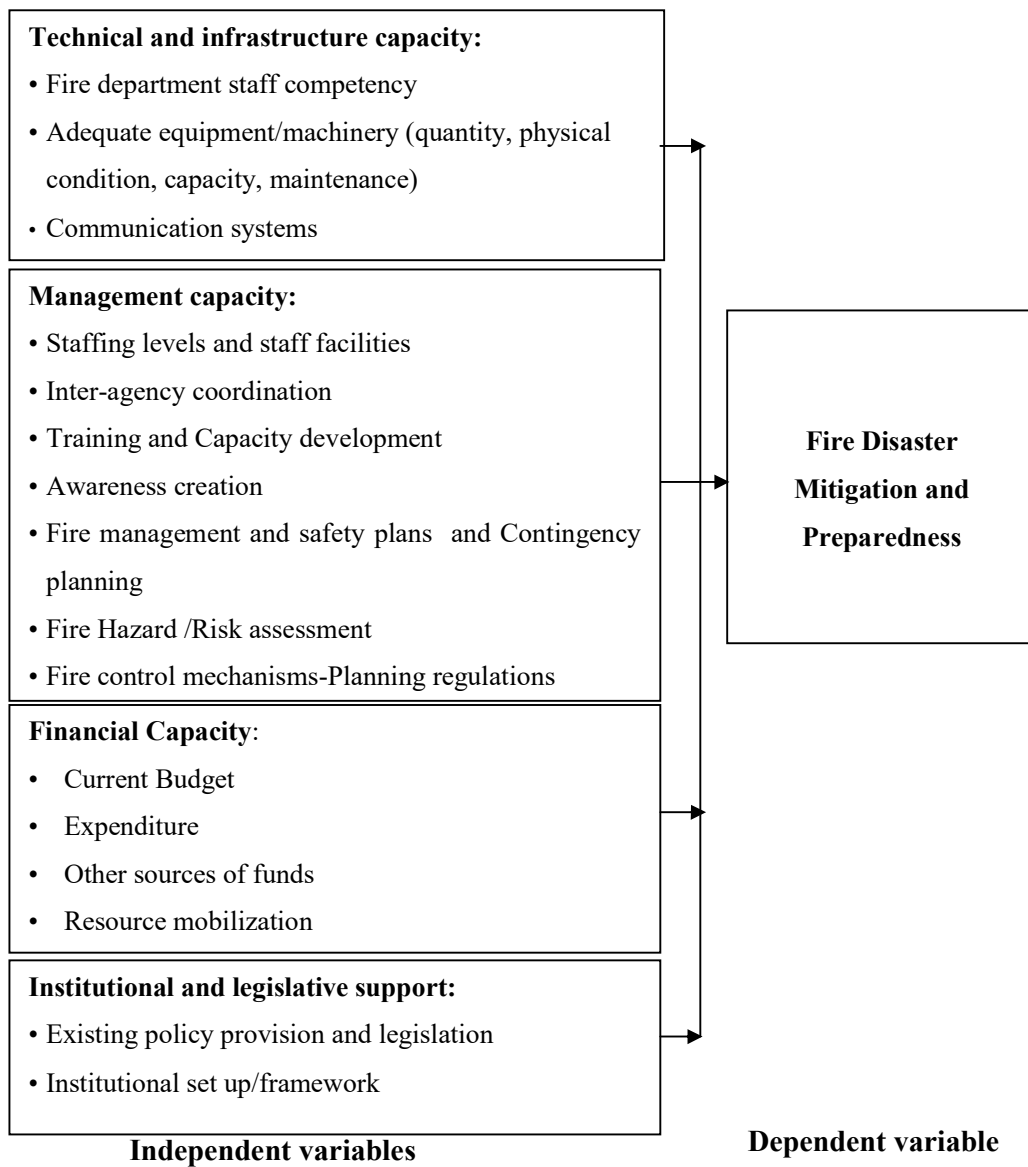
**Figure 2.2: Basis of conceptual framework** (Luthra, 2009)

The scope of the study limits the study to assessing capacity for fire disaster mitigation and preparedness in Nairobi City County. Fire disaster mitigation and preparedness in this study is therefore the dependent variable while the parameters that shall be assessed such as technical and infrastructure capacity, management capacity, financial capacity and institutional capacity as outlined in the conceptual framework shall be viewed as the independent variables.

In order to achieve study objective 1 (to assess the existing capacities for fire disaster mitigation and preparedness in Nairobi County Government) and objective 2 (to identify capacity deficiencies in fire mitigation and preparedness in the County government); the parameters of disaster mitigation and preparedness as well as disaster response and recovery outlined by Luthra (2009) and those outlined in the conceptual framework form the basis for assessment of the existing capacity for fire disaster mitigation and preparedness in the city fire department.

These parameters also form the basis for objective 3 (to suggest areas of improvement and other management mechanisms that can enhance fire disaster mitigation and preparedness in the city). Based on the evaluation of the existing capacity, against those that have been identified in the conceptual framework, the study identifies aspects of disaster mitigation and preparedness that the city authority

has not explored. The evaluation also brings to the fore limitations of the city authority which form the basis for identifying gaps between real practice and the ideal practice in fire disaster mitigation and preparedness. These, therefore prompt the need for the study to bridge the gap by suggesting areas of improvement and other mechanisms the city government can explore to enhance fire disaster mitigation and preparedness.



**Figure 2.3: Conceptual Framework**

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This section explains the procedures used in conducting the study. The issues discussed include the study strategy, types of data collected, the data collection techniques and the instruments used in carrying out the study. It further outlines the data processing and analysis techniques employed in the study.

#### 3.2 Research Design

This study adopts an evaluative approach. Quinlan et al (2008) define evaluation research as the systematic acquisition and assessment of information to provide useful feedback about some object or subject. They further narrate that there are many different types of evaluation but this can be distinctly categorized into formative and summative evaluation. Formative evaluations strengthen or improve the object being evaluated; they help form it by examining the delivery of the program or technology, the quality of its implementation, and the assessment of the organizational context, personnel, procedures, inputs, and so on.

Summative evaluations, in contrast, examine the effects or outcomes of some object; they summarize it by describing what happens subsequent to delivery of the program or technology; assessing whether the object can be said to have caused the outcome; determining the overall impact of the causal factor beyond only the immediate target outcomes; and estimating the relative costs associated with the object. Despite these two distinctions, there is broad consensus that the major goal of evaluation should be to influence decision-making or policy formulation through the provision of empirically driven feedback (ibid).

In this case, the study is a formative evaluation of the capacity for disaster mitigation and preparedness by Nairobi County government. The study assesses the existing capacity against parameters identified in the conceptual framework, and suggests

areas of improvement and other useful disaster mitigation and preparedness mechanisms that can be employed by the city government to further enhance overall disaster management in the city.

In carrying out the study, both qualitative and quantitative strategies are used. Hughes (2006) describes qualitative research as research concerned with collecting and analysing information in as many forms, chiefly non-numeric, as possible. It is more open and responsive to its subject. Quantitative research on the other hand is concerned with the collection and analysis of data in numeric form. It is based more directly on its original plans and its results are more readily analysed and interpreted (ibid).

Bryman (2006) states that in the field of evaluation research, and indeed in several other applied fields, the case for a multi-strategy research approach seems to have acquired especially strong support. Hughes (2006) further supports this by quoting Bryman (1988) who argued for a 'best of both worlds' approach and suggested that qualitative and quantitative approaches should be combined. True to this, questionnaires (normally deemed as quantitative) were administered to gather statistical data about responses. On the other hand, interviews (normally deemed as qualitative) were scheduled for selected heads of department in the County government, to provide more insights on the parameters being assessed during the study. Observation and documentation by photography was also employed as a means of data collection.

### **3.3 Target Population**

The target population consisted of County fire brigade personnel and affected service users derived from three separate fire incidents which occurred in the year 2015 in various parts of the city. These include Gikomba market, Kibera Gatwikira Village and industrial area, Lunga Lunga road where a fire occurred at Alliance Garments Factory. The choice of these three incidents is based on the need to sample different parts of the city in relation to the type of land use activities that occur in these areas;

these include residential, commercial and industrial land uses which largely represents three main land use activities in Nairobi.

According to the Chief Fire Officer, the county fire brigade staff consists of one hundred and fifty two (152 No.) persons. With regard to service users, a total of two hundred and ninety two (292) affected service users constituted the target population. The total number of target population was therefore 444. Table 3.1 indicates the target population distribution.

**Table 3. 1: Target population by strata**

<b>Strata</b>	<b>Target Population</b>	<b>Sample size</b>
<b>1. Service Providers</b>		
(Fire brigade personnel)	152 Persons	45
<b>2. Service Recipients</b>		
BCR area (Gikomba-Gorofani area)	240 business owners	150
Informal settlement (Kibera-Gatwikira)	22 Households	20
Industrial area (Lunga Lunga road)	30 business owners	28
<b>Total</b>	<b>444</b>	<b>243</b>

### **3.4 Sampling Design**

The study adopted stratified random sampling to create the sample frame. According to Singh and Masuku (2014), stratified random sampling is a useful method when the population is heterogeneous. The entire heterogeneous population is divided into a number of homogenous groups, known as strata and then units are sampled at random from each stratum. The technique of drawing this stratified sample is known as stratified sampling (ibid). This study divided the target population into two major categories, that is, service provider being the County fire brigade personnel, and service recipients. The service recipient category is further stratified into three categories of those affected by the three fire incidents in the city. These are as follows:

- a. Business-Cum- Residential (BCR) area fire incident in Gikomba (Gorofani area)
- b. Informal settlement fire incident in Kibera (Gatwekera village)
- c. Industrial area Lunga Lunga road business premises near Alliance Garment factory

Cochran (1963) notes that stratified random sampling technique is very common and preferred because stratification produces an increase in precision in the estimates of characteristics of the whole population.

To get an appropriate sample size from service recipients, the following formula provided by Yamane (1967) was used. The confidence level being 95% and precision (e) being 0.05.

$$n = N / [1 + N(e)^2]$$

Where            n = sample size  
                       N = Target Population  
                       e = level of precision

The sample size from each stratum was therefore as outlined in table 3.2.

**Table 3. 2: Sample size by strata**

<b>Service Recipients</b>		
<b>Strata</b>	<b>Target population</b>	<b>Sample size</b>
1.     BCR area (Gikomba-Gorofani area)	240 People	150
2.     Informal settlement (Kibera-Gatwikira)	22 Households	20
3.     Industrial area (Lunga Lunga Road)	30 business owners	28
<b>Total</b>	<b>292</b>	<b>198</b>

To get a sample size from the fire brigade personnel, 30 per cent (30%) of the brigade personnel was selected, which is, 45 persons. Cochran (1967) and Blanche et

al (2003) note that, a sample of 30 percent of the population is sufficient for a study. Given the aforementioned the total sample size constitutes a total of **243 respondents**.

### **3.5 Research Instruments**

Quantitative data was collected from fire brigade personnel, Gikomba, Kibera and industrial area through administering questionnaires to various respondents. The questionnaires had both closed and open ended questions which were used to seek in depth information from the respondents. The questionnaires had adequate instructions and comprehensible language; this aided in reaching a large number of the sample population within a short time and offered a sense of confidentiality to the respondents. On the other hand, qualitative data was collected through interviews using interview schedules and the use of an observation checklist. Photography was also employed to document the observations made during data collection.

### **3.6 Ethical Consideration**

To ensure ethical handling of all emerging issues during the data collection process, clearance from the County Government Fire Brigade was obtained from the Chief Fire Officer. Fire brigade personnel were given adequate explanation on the purpose of the research. Given that data collection was also carried out in some of the informal settlements in the city, clearances from provincial administration offices (mainly Chiefs' office) were also obtained and necessary arrangement made for security during data collection. Regarding the city markets, goodwill was sought from market chairmen and attendants in order to facilitate the process. Participation was fully voluntary and confidentiality maintained at all levels during the study.

### **3.7 Data Collection Process**

The researcher obtained a letter of introduction from the University department indicating the kind of research to be undertaken. This was used to introduce the researcher and the purpose of the study to the respondents, that is, the County



Government officials and respondents in Gikomba, Kibera and Industrial area business premises. At the County government, The Chief Fire officer gave authority for the study to be conducted and handed his deputy the mandate to introduce the brigade personnel. One fire station assistant commander was assigned to take the researcher around the fire station as well as access fire engines and ambulances.

The researcher recruited six research assistants to assist in data collection in Gikomba, Kibera and industrial area. The research assistants were trained on how to administer the questionnaires and clarifications were made in areas where they did not have clear understanding. They were further introduced to the Chief in Kibera and a market representative in Gikomba who assisted in ensuring smooth data collection.

### **3.8 Data Processing and Analysis**

Processing and analysis of quantitative data obtained from questionnaires involved the following steps:

- i. **Sorting data:** this entailed ordering of questionnaires and other field records for the purpose of subsequent processing and analysis. The questionnaires were numbered and arranged in order.
- ii. **Quality control checks:** this involved editing the questionnaires for the purpose of checking on completeness, clarity and consistency in answering the research questions.
- iii. **Coding of data:** data coding was done to convert the data gathered into appropriate form for analysis.
- iv. **Data processing and analysis:** this was done by computer compilation involving several stages: data entry, verification, validation and output. SPSS and MS-Excel software were used in analysis and presentation of statistics.
- v. **Data Presentation:** the output of data analysis has been presented using frequency tables, pie charts and graphs.

Qualitative data generated from interviews and observation checklist has been categorized in accordance with the research objectives and reported in narrative form and additionally used to reinforce quantitative data.

## CHAPTER FOUR

### DATA ANALYSIS, PRESENTATION AND INTERPRETATION

#### 4.1 Introduction

This chapter presents the data analyzed. The results are presented based on the objectives of the study which aimed at assessing capacity for fire disaster mitigation and preparedness of Nairobi County government with a view of coming up with recommendations on how to improve fire disaster mitigation and preparedness. The analysis was done through descriptive statistics and findings presented in form of frequency tables and percentages, photographs, pie charts and graphs.

#### 4.2 Response Rate

Out of the two hundred and forty three (243 No.) questionnaires administered, two hundred and thirty (230 No.) were returned for analysis. This constitutes 94.7 per cent (94.7%) response rate. This was an acceptable response rate and is attributed to the fact that questionnaires (except at the fire station and industrial area) were physically administered to the respondents as opposed to leaving them with the respondents for collection at a later date.

The response from the various strata is given on table 4.1 below:

**Table 4.1: Strata Response Rate**

<b>Strata</b>	<b>Sample size</b>	<b>Response</b>
1. Fire brigade personnel	45	41
2. BCR area (Gikomba-Gorofani area)	150	150
3. Informal settlement (Kibera-Gatwikira)	20	20
4. Industrial area (Lunga Lunga Road)	28	19
<b>Total</b>	<b>243</b>	<b>230</b>

### 4.3 General Information of Fire brigade respondents

This section gives an analysis and interpretation of the respondents' gender, age and level of education. Table 4.2 below shows the distribution of respondents in the fire brigade by age gender and level of education.

**Table 4.2: Distribution by age, gender and level of education of Fire brigade respondents**

Category	Frequency	Percentage %
<b>Age bracket of respondent</b>		
21-30 years	0	0
31-40 years	11	26.8
41-50 years	22	53.7
51 years and above	5	12.2
Not indicated	3	7.3
<b>Total</b>	<b>41</b>	<b>100.0</b>
<b>Gender of respondents</b>		
Male	38	92.7
Female	3	7.3
<b>Total</b>	<b>41</b>	<b>100.0</b>
<b>Education level of respondents</b>		
Primary	0	0
Secondary	34	82.9
Tertiary (Diploma level)	5	12.2
No response	2	4.9
<b>Total</b>	<b>41</b>	<b>100</b>

According to Table 4.2 above, majority of the fire brigade personnel (53.7%) were between the age of 41 to 50 years, 26.8% of the respondents were aged between 31 to 40 years whereas those aged above 51 years accounted for 12.2%. No respondent was aged between 21 to 30 years. This is maybe an indication that those engaged in

fire service delivery are much older people who have served in the fire brigade for a very long time. It may also imply that many young people are not engaged in fire fighting thus posing a challenge when it comes to succession in the brigade once those who are advanced in age seek retirement.

Table 4.2 also reveals that 92.7% of the respondents were male and 7.3% female; indicating an unbalanced gender distribution in the fire brigade. This may be attributed to the heavy duty work of fire fighting. Upon further inquiry, it was revealed that as a matter of fact, there are no female fire fighters in the brigade; those in the fire brigade are either Emergency Medical Technicians (EMTs) or serve administrative functions in the fire station.

Finally, Table 4.2 shows that majority (82.9%) of the fire brigade personnel have attained at least secondary level of education whereas 12.2% had attained middle level tertiary education. The researcher opted to establish the education level of the respondents as this may highly influence the competency of the brigade personnel and this influence the County's capacity for fire disaster mitigation and preparedness.

#### **4.4 Management Capacity**

The management capacity of the County government was assessed in terms of availability of fire disaster management plan, contingency planning, fire hazard/risk assessment, staffing levels and facilities, capacity development, awareness creation, planning regulations and interagency coordination.

##### **a. Fire Disaster Management and Contingency Planning**

Fire disaster management plans are an essential management tool in local government disaster preparedness. Their main purpose is to enhance the capacity of the municipalities to prevent and to deal with fire disasters; they form a basis to establish procedures which will assure maximum and efficient utilization of resources to minimize loss of life and/or injury and property damage. The study

established that the County government has no documented fire disaster management plan in place; handling fire disasters by the fire brigade was ad hoc.

In addition to the lack of a documented fire disaster management plan, the study established that there was no contingency plan in place to guide the operations of the fire brigade. Whereas the procedures were well known to the fire brigade personnel, most of it was dependent on their training and instructions given by the station commanders. Standard Operating Procedures (SOPs), delineation of roles and responsibilities of various agencies within and outside the government are not well documented since this is defined informally. This may therefore imply that decisions about management of human and financial resources, coordination and communications procedures, and the awareness of a range of technical and logistical responses are not made in advance and this therefore impacts timely and effective disaster-relief operations.

As part of the assessment on contingency planning, the study sought to find out whether the county conducts fire drills within the fire department as well as outside the department. According to the head of department, fire drills otherwise known as squad drills are conducted at the department level; this was confirmed by 92.7% of respondents in the department personnel who affirmed that this is done annually. Table 4.3 presents the respondents confirmation of fire drills conducted at the department level.

**Table 4.3: Response on fire drills conducted at department level**

<b>Does the brigade conduct Fire Drills?</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Yes	38	92.7
No	0	0
No response	3	7.3
<b>Total</b>	<b>41</b>	<b>100</b>

<b>Frequency of fire drills</b>	<b>Frequency</b>	<b>Percentage</b>
Annually	<b>38</b>	<b>92.7</b>
Bi-annually	<b>0</b>	<b>0</b>
Quarterly	<b>0</b>	<b>0</b>
No response	<b>3</b>	<b>7.3</b>
<b>Total</b>	<b>41</b>	<b>100</b>

The situation was however not the same when service users were asked about fire drills conducted by the County government.

**Table 4.4: Response on fire drills conducted by County government at community/business premises**

<b>Does the county government conduct Fire Drills in the area?</b>	<b>Gikomba</b>	<b>Kibera</b>	<b>Industrial area</b>	<b>Frequency</b>	<b>Percent (%)</b>
Yes	0	0	0	0	0
No	142	20	19	181	95.8
No response	8	0	0	8	4.2
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

Table 4.4 above shows that 95.8% of respondents indicated that the County Government does not conduct fire drills in their premises or community. An inquiry about the situation from the fire brigade confirmed that this was true, given that the fire brigade only conducts fire drills on demand basis after payment of requisite fees.

This implies that it is upon business owners or communities/neighbourhoods to request for fire drills to be conducted, failure to which fire drills are not conducted.

#### **b. Fire hazard/risk assessment**

The study established that in the year 2013, the county government carried out a fire hazard assessment whose output was a fire hazard report. This was however not availed to the researcher at the time of study as it could not be easily retrieved. This gave an indication that record keeping and retrieval was a major problem in the institution.

#### **c. Staffing Levels**

The study established that the fire brigade has a workforce of one hundred and fifty two (152 No.) staff members working in three shifts, against an approved establishment of four hundred and fifty (450 No.) personnel. Out of this, one hundred and nineteen (119 No.) are fire fighters and thirty three (33 No.) were support staff undertaking emergency medical and administrative duties. The head of department decried the need for at least an additional 1500 fire fighters to make fire disaster handling more manageable; this implied that the fire brigade was grossly understaffed. According to international standards (NFPA standards) it is required that there is 1 fire fighter for every 1000 residents. In a city of 3.2 million people, Nairobi therefore requires about 3,200 fire fighters. The NFPA standards further require that each fire engine should be run by at least four fire fighters. The study established despite the understaffing, the fire brigade assigns a team of six fire fighters to run each fire engine dispatched to a fire disaster scene. Fire brigade personnel however expressed the need to have more engines and additional staff for effectiveness.



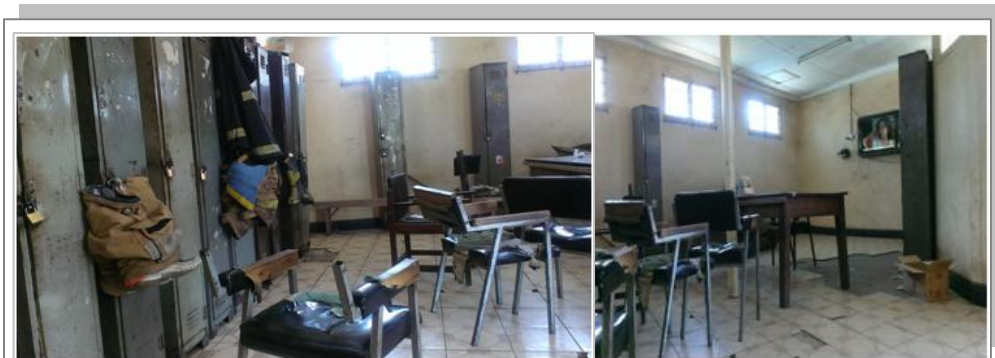
#### d. Staff Facilities

With regard to staff facilities it was established that office space, sanitation facilities recreation room, changing rooms/accommodation were provided. The status of these facilities was however wanting as observed during the study. It was established that there are three rooms assigned as dormitories at the fire station headquarters in the CBD and four rooms acting as dormitories in the Industrial area fire station.



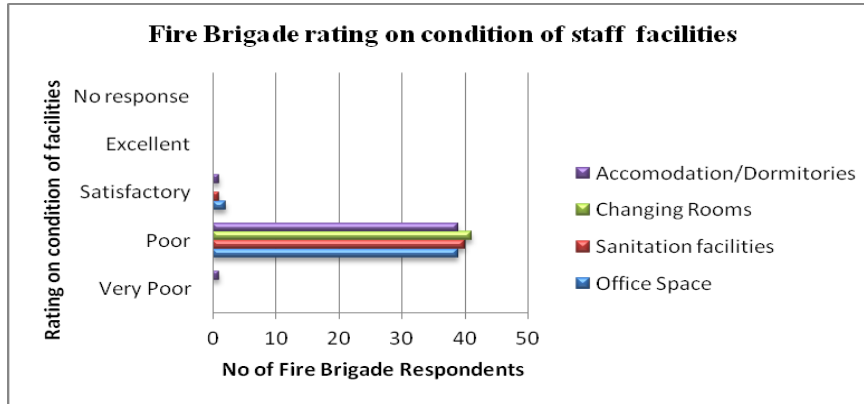
**Plate 4. 1: Fire brigade dormitories at CBD and Industrial area Fire stations**  
(Source: Author, field study, 2015)

It was established that the dormitories had a bed capacity of 30 beds in total with each fire fighter providing their own beddings. The dormitories also double up as the changing rooms as each fire fighter is assigned two cabinets for storage of food stuff and PPE. A recreation room is provided but this only has a television. The room also has cabinets where some fire personnel store their PPE too. The condition of the room is not very good.



**Plate 4.2: Recreation room at CBD fire station** (Source: Author, Field study, 2015)

An average of 97% of fire brigade personnel generally rated the condition of the facilities provided as poor with about 2.4% of respondent stating that the condition of the facilities was satisfactory. Figure 4.1 below shows the rating of the facilities provided as per the respondents opinion.



**Figure 4. 1: Fire brigade personnel rating of condition of staff facilities**

The fire brigade personnel were also asked whether there were any incentives provided to them by the county government. According to the respondents 61% indicated that they were given risk allowance, 9.6% stated that insurance was provided while 24.5% stated that no incentives were provided. The majority who were given risk allowance were mainly fire fighters. They however expressed dissatisfaction with the incentives provided as these were termed as inadequate and more often not assured.

**Table 4. 5: Response on incentives provided to fire brigade personnel**

Incentives	Frequency	Percentage (%)
Insurance	4	9.6
Clothing	2	4.9
Food	0	0
Risk allowances	25	61.0
None	10	24.5
<b>Total</b>	<b>41</b>	<b>100</b>

### e. Training and Capacity Development

The study established that the county government had no training plan for fire brigade personnel and no Training Needs Assessment had been carried out to establish the training needs of the brigade personnel. However it was stated by top officials that fire brigade personnel were regularly trained in areas such as leadership; control room operations; search and rescue; fire prevention; fire fighting; disaster management; fire marshal training and anti-terrorism.

According to fire personnel respondents, 53.7% stated that the County government facilitates training and capacity building, whereas 36.6% of respondents stated that this was not the case. Table 4.6 shows the responses given when respondents were asked about facilitation of training and capacity development.

**Table 4.6: Fire brigade personnel response on training and capacity development**

<b>Training and capacity development facilitation</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Yes	22	53.7
No	15	36.6
No response	4	9.7
<b>Total</b>	<b>41</b>	<b>100</b>

Out of the 22 respondents who indicated that they had been through some form of training in the past five years, 16 No. had attended basic fire fighting training, 14 No. fire prevention program; 4 No. control room operations; 10 No. first aid and 3 No. fire disaster management. Majority of respondents (81.8%) had attended these training programmes between years 2010 to 2014, 9.1% had attended training in year 2015 and 9.1% had been through training before year 2010. Table 4.7 below shows the responses about the last training year.

**Table 4. 7: Response on year of last training in the past five years**

<b>Year of last training</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Before 2010	2	9.1
2010	2	9.1
2011	5	22.7
2012	4	18.2
2013	4	18.2
2014	3	13.6
2015	2	9.1

This implies that training and capacity development is carried out annually, however the number of people attending these training programmes is low with an average of about three people trained annually. It was also established that training happens in their Enterprise road fire station which also serves as the training school for other fire fighters in the country.

**f. Awareness creation**

As part of the assessment of fire disaster mitigation and preparedness, the researcher sought to find out whether the county carried out community/stakeholders awareness creation activities in the city. It was established that the fire brigade conducts awareness campaigns and sensitization during *barazas* mainly held in informal settlements. This happens annually during what is termed as fire safety week. Awareness creation also happens when fire inspections are done throughout the year.

According to stakeholders in the sampled areas, 89.5% stated that the county government has not carried out any form of awareness creation, whereas 7.9% stated that the county has carried out some form of awareness creation. The mode of awareness creation was established to be in form of education during chiefs' *barazas* in the slum and education during fire audits in Gikomba and Industrial area. Table 4.8 shows stakeholders' response on awareness creation by the county government.

**Table 4. 8: Response on stakeholder awareness creation by County government**

<b>Response</b>	<b>Gikomba</b>	<b>Kibera</b>	<b>Industrial area</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Yes</b>	7	5	3	<b>15</b>	7.9
<b>No</b>	139	14	16	<b>169</b>	89.5
<b>No response</b>	4	1	0	<b>5</b>	2.6
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

**g. Fire Control Mechanisms-Planning Regulations**

Cote (2003) notes that City Planning departments are key components in ensuring quality control in building construction and compliance with fire protection features of local building codes therefore close cooperation is required between fire departments and planning departments to control serious fire hazards. An interview conducted in the City planning department (development control) section, revealed that their main role was to ensure that all building applications presented for approval had fire breaks and fire escape routes and that materials used for building were fire safe as per the building code and fire safety regulations. It was also established that during plan preparation the planning department through zoning ordinances sets aside land for fire stations and gives provisions for fire utility facilities like hydrants. The development control unit works together with the fire brigade by ensuring that plans submitted for construction permits are forwarded to the fire brigade to check on fire safety standards. The fire department checks on these issues during fire audits/inspections which are carried out throughout the year and a fire certificate issued to various premises before occupancy and during occupancy.

The study sought to establish whether fire audits were carried out in the sampled areas; table 4.9 shows the responses from the different areas.

**Table 4. 9: Response on fire audits carried out by County government**

<b>Fire audits</b>	<b>Gikomba</b>	<b>Kibera</b>	<b>Industrial area</b>	<b>Total</b>	<b>Percentage</b>
Yes	13	0	19	32	16.9
No	137	18	0	155	82
No response	0	2	0	2	1.1
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

From table 4.9 above, 82% of respondents indicated that no fire audits were carried out in their localities while 16.9%. However it is worth noting that all business premises in industrial area, along Lunga Lunga Road stated that fire audits were conducted in their premises while no audits were done in Kibera. This may be attributed to that fact that Kibera is an informal settlement and many structures are basically illegal. On the other hand, the response rate in industrial area may be attributed to the fact that fire certificates are required for all the premises in industrial area and that fire inspections are done regularly by officers at the Enterprise Road fire station.

Regarding land use planning information obtained from the planning department indicated that, the 1948 Nairobi master plan had set aside sites for fire stations in various parts of the city; these included Ruaraka, Lungalunga, Karen, Westlands, Gigiri, Mombasa road, Dandora, Waithaka, Buruburu, Jogoo road near Aquinas High school and Zimmerman. These sites however were never used and it is alleged that this is due to land grabbing over the years. Given the aforementioned it is clear that the county is still using an outdated master plan to influence planning decisions. However it was established that the department had prepared a more updated plan (NIUPLAN) which takes into consideration the provision of fire stations in the city by proposing sites for fire station construction.

#### **h. Interagency coordination**

Regarding interagency coordination, it was established that the county government collaborates with various public agencies including private companies in handling fire disasters depending on the magnitude of the incident. The main agencies include National Disaster Operations Centre (NDOC), Kenya Red Cross, Kenya Police, St. John ambulance and occasionally the military during terror related disasters. The roles of these agencies are as indicated in table 4.9 below:

**Table 4. 10: Roles of other agencies in fire disaster management**

	<b>Agency</b>	<b>Roles</b>
1.	NDOC	<ul style="list-style-type: none"><li>→ Co-ordination of disaster response at a national level</li><li>→ Act as the command centre for all communications and information relating to response operations</li><li>→ Liaise with responsible ministries on national response efforts.</li></ul>
2.	Kenya Red Cross	<ul style="list-style-type: none"><li>→ Community awareness creation</li><li>→ Search and rescue</li><li>→ First aid</li><li>→ Ambulance services</li><li>→ Post disaster recovery efforts</li></ul>
3.	St. John Ambulance	<ul style="list-style-type: none"><li>→ Ambulance services</li><li>→ First aid</li><li>→ Community awareness</li></ul>
4.	Kenya Police	<ul style="list-style-type: none"><li>→ Maintenance of law and order in the disaster scene</li></ul>
5.	Kenya Military	<ul style="list-style-type: none"><li>→ Terror related disaster management</li></ul>

It was established that during interagency fire disaster response, NDOC coordinates the disaster response efforts except where military expertise is required. According to the fire chief, the roles of the agencies are well known to each agency thus once on disaster scene each agency executes its mandate accordingly. It was however revealed that the lack of clearly stipulated agency roles occasionally hindered disaster response at the disaster scene. This was mainly in relation to the existence of NDOC and National Disaster Management Unit (NDMU) which are two national level agencies both charged with coordination of national disaster response. The chain of command is not clear and at times supremacy battles hinder disaster response efforts.

#### **4.5 Technical and Infrastructure Capacity**

The indicators of technical and infrastructure capacity of Nairobi county fire brigade included: competency, Fire fighting machinery and equipment, and communication systems.

##### **a. Competency**

Cote, (2003) notes that it is imperative that all fire service personnel are fully qualified and capable of efficiently performing the wide range of services necessary to protect life and property. It was established that there was no clear core competency standard established by the county government on fire brigade personnel. Despite this, the study found out that the brigade adheres to American Federal Emergency Management Agency (FEMA) and National fire Protection Association (NFPA) professional standards. The study sought to find out the competency level of the fire brigade respondents by assessing the level of education and experience in the fire service. It was established that in terms of highest level of education, 82.9% of the respondents had attained at least secondary level education, whereas 12.2% had attained diploma level education. Table 4.11 shows the level of education of respondents.



**Table 4. 11: Level of education of fire brigade personnel**

<b>Education level of respondent</b>	<b>Frequency</b>	<b>Percentage</b>
Primary	0	0
Secondary	34	82.9
Tertiary (Diploma level)	5	12.2
No response	2	4.9
<b>Total</b>	<b>41</b>	<b>100</b>

The researcher also inquired about the level of experience in fire service in order to determine their capability to handle fire disasters. According to the response, majority (63.4%) of the respondents had over 10 years experience working in the service; 34.2% had between 5 to 10 years experience and 2.4% had between 1-5 years experience. Table 4.12 shows the distribution according to level of experience.

**Table 4.12: Distribution by level of experience of respondents**

<b>Level of experience</b>	<b>Frequency</b>	<b>Percentage</b>
Less than 1 year	0	0
1-5 years	1	2.4
5-10 years	14	34.2
More than 10 years	26	63.4
<b>Total</b>	<b>41</b>	<b>100</b>

From the above data, it can be noted that the fire brigade have adequate experience in fire fighting despite their level of education. This coupled with the training on various aspects of fire disaster handling can attest to their capability to handle fire disasters.

## **b. Infrastructure Capacity**

### **Fire Stations**

The study established that there are three (3 No.) fire stations in the city; these included the Fire station in the CBD along Tom Mboya street (fire brigade head quarters); Enterprise Road fire station in Industrial area (also acts as training school) and Ruaraka fire station. The study found out that the head quarter was built in 1907; the industrial area station was built in 1956 and the Ruaraka station was established in 2006. It is worth noting that the Ruaraka station was leased from East Africa Breweries Limited (EABL) in an agreement that EABL will provide the premise and the County government will provide the equipment. This is however not the case as it was observed that the county has no sufficient staff and equipment to adequately equip the station.

From the information obtained it can be noted that the city does not have enough fire stations. According to NFPA standard, there should be 1 fire station for a catchment population of 200 000 persons. As such, Nairobi, with a population of 3.2 million people should ideally have about 16 stations. This sentiment was echoed by the fire chief who recommended that given that the city is divided into 17 sub-counties, each sub-county should have 1 fire station, making it a total of 17 fire stations.

When asked about their opinion on adequacy of fire stations in the city, 97.9% of users stated that the fire stations were inadequate to serve the entire city whereas 2.1% stated that they were enough. Table 4.13 shows the opinion of user respondents on adequacy of fire stations.

**Table 4.13: Service users' opinion on adequacy of fire stations**

<b>Opinion on adequacy of fire stations</b>	<b>Gikom ba</b>	<b>Kibe ra</b>	<b>Industrial area</b>	<b>Freque ncy</b>	<b>Percentage (%)</b>
<b>Yes</b>	4	0	0	4	2.1
<b>No</b>	146	20	19	185	97.9
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

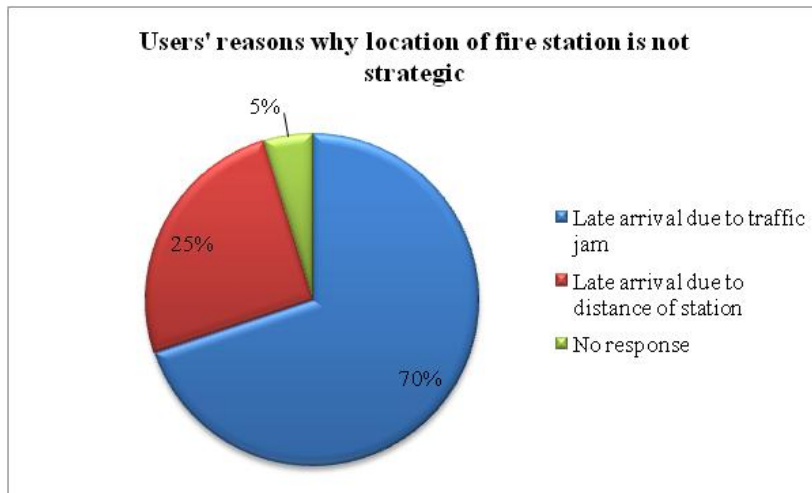
According to literature review, the physical location of fire brigade is crucial to the efficiency of fire response work. As such fire brigades should be located in strategically appropriate areas. It was established that the location of the main fire station was a hindrance to disaster response leading to delayed response. The station is located in one of the busiest streets in downtown Nairobi characterised by heavy pedestrian and vehicular traffic. In fact, throughout the day, the street experiences traffic jams thus restricting movement.

According to respondents from the sampled areas of the city, 83.1% stated that the location of the fire stations was not strategic for fire disaster response, while 16.4% stated otherwise.

**Table 4.14: Service users’ opinion on strategic location of fire station**

Is location of fire stations strategic?	Industrial			Frequency	%
	Gikomba	Kibera	area		
<b>Yes</b>	125	20	12	157	83.1
<b>No</b>	24	0	7	31	16.4
<b>No Response</b>	1	0	0	1	0.5
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

The reasons cited by the stakeholders were mainly late arrival at disaster scene due to traffic congestion (70%) and distance (25%). Figure 4.2 shows the reason given by respondents on poor location of the fire stations. When asked about the average time taken for the fire brigade to respond to the fire incidents that occurred in their areas, majority 65.6% stated that it took more than one hour for the fire brigade to arrive at the disaster scene whereas 14.3% of respondents stated that response time was 1 hour. It is however worth noting that in the industrial area fire incident the fire brigade arrived within 30-45 minutes; this may be attributed to the presence of Enterprise Road fire station within the vicinity. Table 4.15 shows the response given by service users on the response time by the fire brigade.

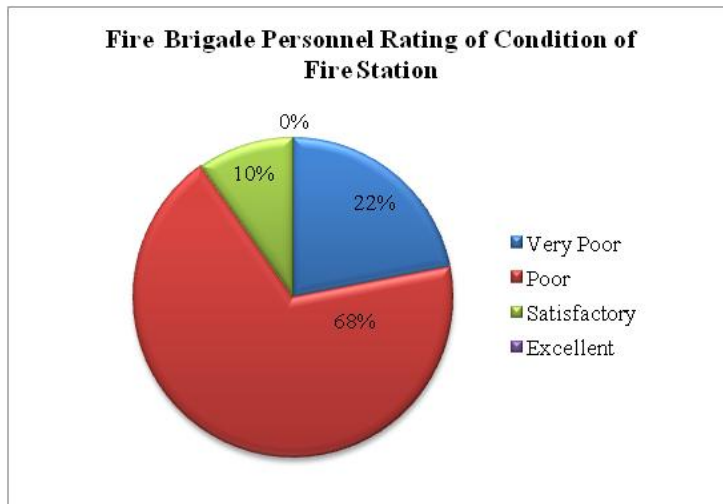


**Figure 4. 2: User’s reasons for non-strategic location of fire stations**

**Table 4.15: Users’ response on response time by fire brigade**

<b>Response time during last incident</b>	<b>Gikomba</b>	<b>Kibera</b>	<b>Industrial area</b>	<b>Frequency</b>	<b>%</b>
15 minutes	1	0	0	1	0.5
30 minutes	8	0	12	20	10.6
45 minutes	8	2	7	17	9
1 hour	18	9	0	27	14.3
More than 1 hour	115	9	0	124	65.6
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

The physical condition of the fire stations was generally rated as poor according to fire brigade personnel. From the data obtained, 68% of respondents rated the condition as poor, 22% rated the physical condition as very poor; only 10% of the respondents stated their satisfaction at the condition of the fire stations. Figure 4.3 shows the response given by the brigade personnel on the physical condition of the fire station.



**Figure 4.3: Fire brigade rating of physical condition of fire stations**

Observation made during the field visit confirmed the poor state of the stations and the need for repair works and paint works as well as upgrading them to state of the art facilities.

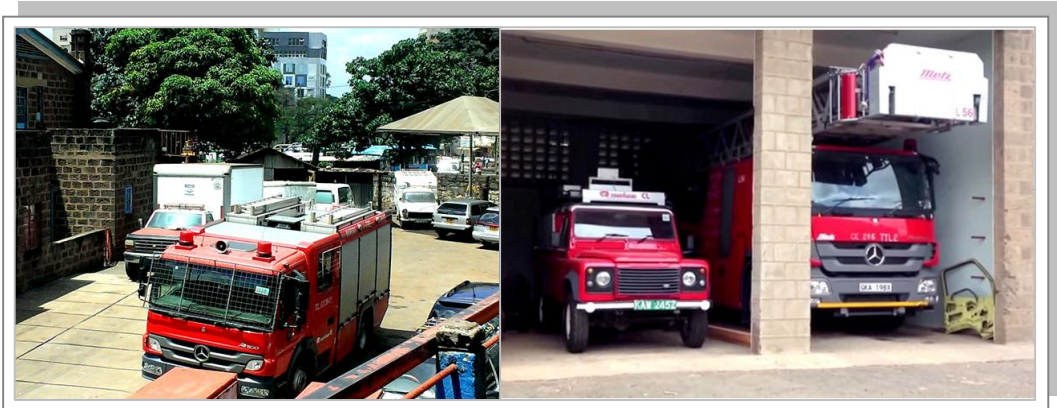
#### **Fire Engines and other Emergency Vehicles**

The study established that the county has only five (5No.) functional fire engines; this constituted one (1 No.) emergency tender for search and rescue and extrication and evacuation; three (3 No.) 10,000 litres capacity foam tenders for fire fighting and suppression, and one (1 No.) turntable ladder engine for fire fighting in tall buildings. Ideally, it is recommended that there should be 1 fire station requiring at least 5 fire engines for a catchment population of 200 000 persons.

This means that the county should have at least 80 fire engines; this implies that the fire brigade has inadequate fire engines. The county also has three (3 no.) utility vehicles for purposes of ferrying additional fire fighting equipment when need arises. Generally, it was observed that the functional engines were in good condition and well equipped except one of the form tenders which did not have all the necessary search and rescue tools. However due to the inadequacy of the fire engines, search

and rescue tools were also rated as inadequate as they are contained in the fire engines when purchased and should ideally match the engine model.

The study also established that about 18 fire engines were broken down and parked at the county's garage with one donated by USAID during the 1998 bomb attack packed at the headquarters. The reason given for lack of operation of the engines was that there spare parts were not locally available and funds had not been allocated for repair works. It was also established that the engines were rarely serviced due to financial constraints thus maintenance was generally poor. This poses a great challenge given that ideally a new fire engine can work effectively for four years with proper servicing and thereafter repair and good maintenance is crucial.



**Plate 4.3: Nairobi fire brigade engines and utility van** (Source: Author, Field study, 2015)

With regard to fuel management, it was established that fuelling of the engines and other emergency vehicles was done immediately after every fire disaster incident which is highly recommendable. The stations however did not have any fuel storage facility. Fire brigade personnel confirmed this given that all the respondents stated that fuelling of the vehicles was adequate.

It was observed that the main fire station also had twelve (12 No.) fire fighting All Terrain Vehicle (ATV) which were supposed to be used in areas with accessibility challenges. These, according to information obtained, were however not in use and it

was established that their efficacy in handling fire disasters was challenged by the Kenya Fire brigade Association. Fire fighters also felt that they were not very safe to use. Plate 4.4 shows a fire fighting ATV at the main fire station.



**Plate 4.4: Fire fighting ATV at CBD fire station** (Source: Author, Field study, 2015)

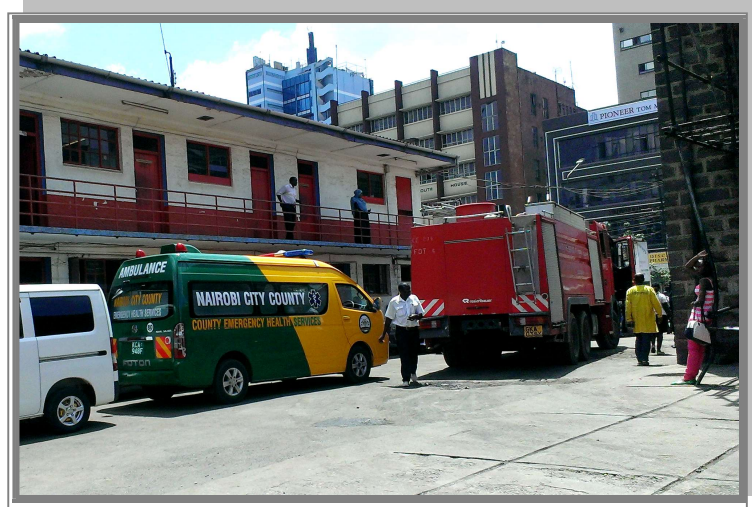
### **Ambulances**

It was established that there are two ambulances dedicated to the fire service. However it was revealed that the county has several other ambulances serving county medical facilities and this can be dispatched to fire disaster scenes depending on the magnitude of the disaster. According to fire brigade personnel, 68.3% stated that the ambulances were inadequate, whereas 26.8% stated that they were adequate. Table 4.16 shows the response on adequacy of ambulances

**Table 4.16: Fire brigade response of adequacy of ambulances**

<b>Adequacy of Ambulance</b>	<b>Frequency</b>	<b>Percentage</b>
Adequate	11	26.8
Inadequate	28	68.3
No response	2	4.9
<b>Total</b>	<b>41</b>	<b>100</b>

It was observed that the two ambulances designated for fire fighting were in good condition and well equipped for emergency services. They both had an up to date first aid kit, stretchers and all the necessary medical equipment required.



**Plate 4.5: A Nairobi County ambulance** (Source: Author, Field study, 2015)

### **Water Supply**

It was noted that water and form supply to the form tenders which contain both water and form for fire suppression was generally adequate the main source of water was piped water and this was supplemented by water bowsers from the Nairobi Water and Sewerage Company. According to fire brigade personnel, 80.5% of the respondents indicated that the water was sufficient whereas 14.6% stated the contrary.

**Table 4. 17: Fire department personnel response on adequacy of water supply**

<b>Water Supply</b>	<b>Frequency</b>	<b>Percentage</b>
Adequate	33	<b>80.5</b>
Inadequate	6	<b>14.6</b>
No response	2	<b>4.9</b>
<b>Total</b>	<b>41</b>	<b>100</b>



It was established that all the form tenders had generators to aid in water pumping during fire fighting. In addition to these, the fire brigade has 4 portable generators for this purpose; it was however established that only 2 generators are functional. The stations however do not have a water storage facility and thus heavily rely on piped water from the water company.

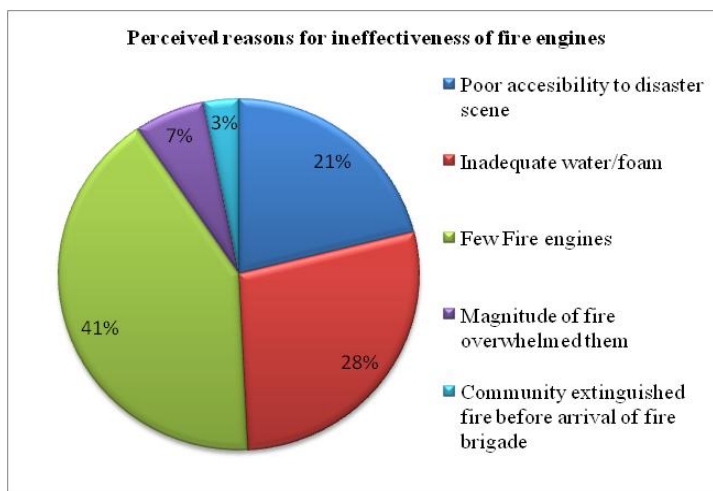
The study sought the opinion of stakeholders on the effectiveness of the fire engines during the fire disasters that had occurred in the areas. According to the respondents 70.4% stated that the fire engines were not effective in handling the fire disaster while 25.4% stated that they were effective. Table 4.18 indicates the users' response on effectiveness of the fire engines.

**Table 4.18: User's response on effectiveness of fire engines**

<b>Effectiveness of engines</b>	<b>Gikomba</b>	<b>Kibera</b>	<b>Industrial area</b>	<b>Frequency</b>	<b>%</b>
Yes	35	3	10	<b>48</b>	<b>25.4</b>
No	114	14	5	<b>133</b>	<b>70.4</b>
No response	1	3	4	<b>8</b>	<b>4.2</b>
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

It is worth noting that majority of respondents (10 out of 19 respondents-52%) in industrial area stated that the fire engines were effective.

The reasons stated for the lack of effectiveness to handle the fire disasters were as follows: 41% cited inadequacy of fire engines; 28% cited inadequate water/foam; 21% cited poor accessibility to disaster scene whereas 7% stated that the magnitude of the fire overwhelmed fire fighter and private company engines had to be used while 3% stated that the community extinguished the fire before the engines arrived. Figure 4.4 shows the reasons stated for ineffective county fire engines.



**Figure 4.4: Users’ perceived reasons for ineffectiveness of fire engines**

The study also sought to assess the availability and physical condition of fire hydrants in the city. According to county officials, there are about 4044 fire hydrants in various parts of the city, the location map of was however not availed. The officials decried vandalism of the hydrants by citizens. It was established that most developers were compelled to install fire hydrants within their properties to facilitate fire fighting. The study also established that water supply to the fire hydrants was inadequate thus hindering fire response.

When stakeholders were asked about whether there were fire hydrants within their vicinity majority(74.1%) stated that fire hydrants were not provided; 21.2% indicated that fire hydrants were provided whereas 4.7% had did not know whether these were provided. Table 4.19 shows the distribution according to responses given in the different areas.

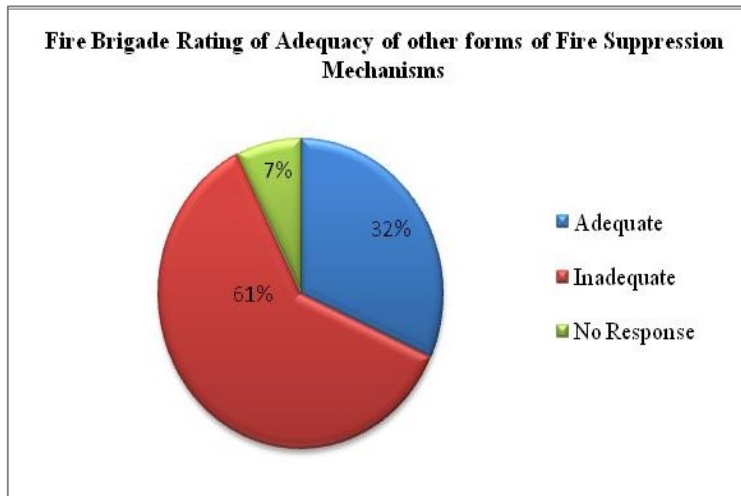
**Table 4.19: Users’ response on presence of fire hydrants**

Fire hydrants provision	Gikomba	Kibera	Industrial area	Frequency	Percentage
Yes	21	0	19	40	21.2
No	120	20	0	140	74.1
Don't know	9	0	0	9	4.7
<b>Total</b>	<b>150</b>	<b>20</b>	<b>19</b>	<b>189</b>	<b>100</b>

From Table 4.19 it is worth noting that all respondents in industrial area stated that there were fire hydrants within their vicinity. On the other hand all respondents in Kibera stated that there were no hydrants in the neighbourhood. The situation in Kibera can be attributed to the fact that it is an informal settlement where infrastructure and utility services are inadequately provided. In the other hand, the situation in industrial area may be attributed to the fact that many business premises install hydrants as part of the requirements for fire certificate from the county government. The average distance to the nearest hydrants was about 200 metres the supply of water to the hydrants was generally inadequate given that 70% of the respondents who had knowledge of the existence of fire hydrants indicated that there was no water supply to the hydrants.

### **Other forms of fire suppression**

The fire brigade also uses foam for fire suppression. It was established that the supply of foam for the foam tenders was however inadequate thus forcing the brigade to rely on assistance from private companies.

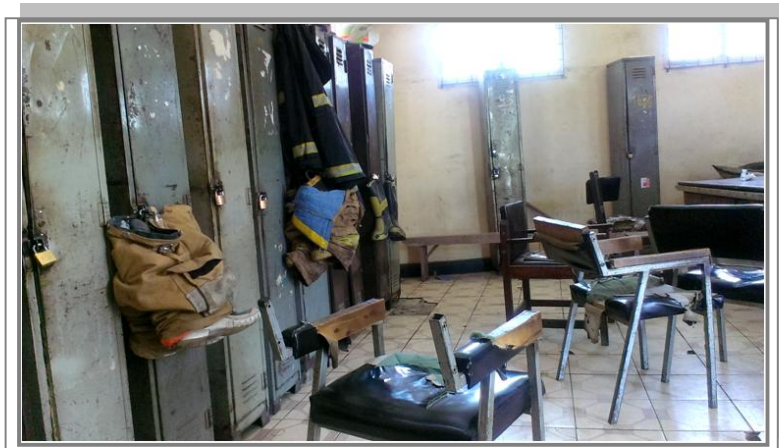


**Figure 4.5: Fire brigade response on adequacy of other forms of fire suppress**

From Figure 4.5, it can be noted that 61% of the fire brigade personnel stated that the other forms of fire suppression were inadequate while 32% stated that it was adequate.

### **Personal Protective Equipment (PPE)**

All respondents in the fire brigade stated that they were provided with PPE; 40 respondents out of the 41 stated that they were provided with only one set of PPE and that it would be ideal to have at least two sets. They also stated that the condition of the PPE was poor. It was observed that the storage situation of the PPE was not proper. Whilst cabinets were provided, the PPE do not fit in the cabinets and some firemen end up storing them in the fire engines.

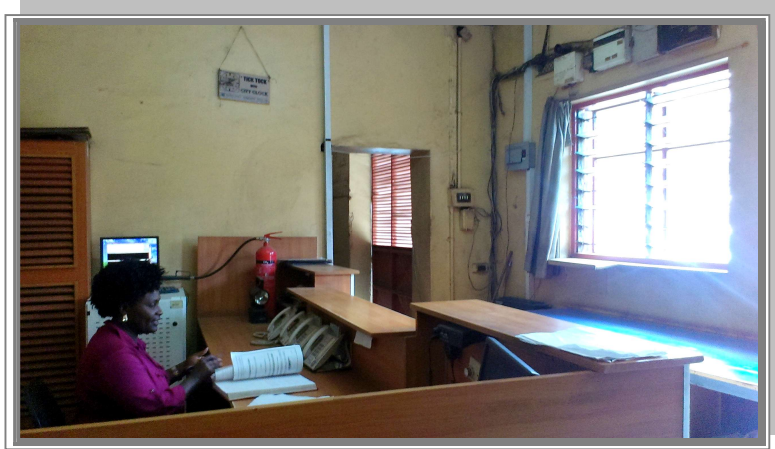


**Plate 4.6: Poor storage of PPE at the main fire station** (Source: Author, Field study, 2015)

### **Communication Systems**

The fire brigade relies on phone and radio communication systems. The main station has a control room which acts as the communication centre for all disaster related alerts. During the study it was observed that there was only one radio transmitter in the control room, one functional computer and four landline phones. The fire brigade has a hotline number (0202344599) and a mobile phone number (0771637161) in

case of emergencies which are operational. The brigade also has a third emergency number (112); the officials however agree that this number is not well known to citizens. It was established that the control room was the communication centre for the fire brigade and that all emergency calls were directed to the centre before the other stations are alerted.



**Plate 4.7: Control room at the Nairobi fire station** (Author, field study, 2015)

The brigade's mode of communication within the station is via bells which convey different messages; all members of staff are trained on the bell communication codes. It was established that on average, the fire brigade receives about 30 calls in a week, though on very busy days, the calls can be as many as 10 calls. Officials stated that the control room and mode of communication required upgrading to a fully automated control room to handle emergency communication given that the current situation makes it difficult to deal with multiple fire incidents. It was also observed that all emergency calls are recorded in an Occurrence Book (OB) in the control room which forms the basis of weekly reporting.

#### **4.6 Financial Capacity**

One of the key priorities in disaster management is the allocation of a budget to facilitate operations when disasters occur. The study established that the fire brigade operates using allocations from the governor's office budget. On further inquiry it

was established that the fire brigade is not an autonomous department, it operates under the office of the governor thus it does not get direct budgetary allocation. The current situation is that it operates through requisitions made to the governor's office; this has hindered operations in the brigade as decried by officials given that the process of goods/services requisition is lengthy and bureaucratic thus causing unwarranted delays.

This situation was confirmed by examining the budgets for the past two financial years, that is, FY 2013/2014 and FY 2014/2015 which were availed during the field study. The two budgets do not mention the fire brigade as a department and thus no distinct allocation of funds have been made; it may be assumed that the office of the governor's budget includes allocations to the fire brigade. Officials also revealed that the fire brigade is inadequately funded due to its lack of autonomy hence impeding effective service delivery.

In the FY 2014/2015, for instance, allocation to the fire brigade was estimated at about Kshs. 173 Million. The FY 2014/2015 budget however singles out allocation of Ksh.156 million to the fire brigade and this was for the following development expenditures: Ksh. 36 Million for purchase of 3 No. water bowsers; Kshs. 100 Million for purchase of 3 No. fire engines, and Kshs. 20 million for construction of fire stations. This means that about Kshs. 17 million was set aside for operations of the fire brigade. It was clear that the criteria used to establish the brigade's budget was based on capital expenditure. Whereas, recurrent expenditures were factored in the office of governor's budget, the allocation is not definite According to officials, the fire brigade requires about Kshs.1.2 Billion for it to operate effectively.

The study also found out that an emergency fund is in place to cater for disaster management in the county. According to County budgeting regulations, the emergency fund should constitute 2% of county revenue. In the FY 2014/2015, the emergency fund allocation was Ksh.24 Million. This is far from the estimated Ksh.460 Million that should be allocated as emergency fund, given that the actual

county revenue was Kshs. 22.9 Billion in the previous financial year. Officers revealed that the fund is limited and provisions for providing relief to fire victims are not regulated. The fund is also prone to diversion to other functions as may be determined by policy makers in the county; the fire brigade thus has no say on how it should be utilized.

In terms of revenue mobilization, the fire brigade collects revenue in form of fire inspection certificates; on average the brigade collects an average of Kshs. 140 Million from inspections conducted throughout the year. The brigade also collects revenue from on demand fire drills by various institutions. Officials stated that there was need to introduce service charges to citizens in order to increase revenues. It was however noted that this can only work if citizens express satisfaction in the level of service delivery.

#### **4.7 Institutional and Legislative Support**

The institutional capacity of the County was assessed with respect to existing policy and legislative provisions as well as the institutional set up.

With regards to institutional set up, the study established that the fire brigade falls under the office of the governor; as such the chief fire officer reports directly to the governor in matters concerning fire disasters. Fire brigade officials opined that the fire brigade should be an independent department like other county departments in order for it to effectively work without undue political interference as is the current situation. Given the aforementioned, it was clear that the fire brigade needed to be empowered to enhance its abilities and capabilities; as well as given authority and autonomy to manage fire disasters effectively.

In terms of policy, the study established that the county government has no policy on fire disaster management. Officials also revealed that Kenya has no comprehensive fire disaster management policy. It was established that the draft national disaster management policy does not comprehensively cover fire disasters, as a matter of

fact, natural disasters such as floods, landslides and epidemics are considered more significant than fires. The county however has fire safety bylaws (formerly City council bylaws) which mainly guide enforcement of fire safety regulations. It was established that the county government is in the process of enacting two legislations on disaster management; these include; Nairobi City County Disaster and Emergency Management Bill, 2015 and Nairobi City County Fire and Rescue Services Bill, 2015. When enacted into law, these legislation will likely guide implementation of activities and establish the roles and responsibilities for fire disasters if implemented.

#### **4.8 Conclusion**

The findings presented in this chapter show that Nairobi county government has inadequate capacity for fire disaster mitigation and preparedness. The assessment of parameters such as management, technical and infrastructure, financial, and institutional and legislative support capacities revealed capacity gaps that clearly affect fire disaster preparedness by the County government.



## **CHAPTER FIVE**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter gives a summary of findings, brief discussions, conclusions reached and recommendations of the study. The study set to assess the capacity for fire disaster mitigation and preparedness of the county government of Nairobi focussing on management, technical and infrastructure, financial and institutional and legal support capacities. Finally, suggestions are made on areas for further research as a pointer to areas of concern in fire disaster preparedness.

#### **5.2 Summary of Findings**

The study aimed at assessing the existing capacities for fire disaster mitigation and preparedness with the view of identifying capacity gaps and recommending ways of improving fire disaster preparedness to facilitate effective fire disaster management by the County government. The capacities assessed were categorized into management capacity, technical and infrastructure capacity, financial capacity and institutional and legal support.

##### **5.2.1 Management Capacity**

The study established that the County government does not have a fire disaster management plans including contingency plans, to guide the operations of the fire brigade. Even though, these plans are not in place fire brigade procedures and operations are well known to the fire brigade personnel, given that it is dependent on their training and instructions given by station commanders. With regard to contingency planning, the study established that fire brigade drills are conducted annually in order to acquaint the brigade personnel on standard operating procedures. Service users on the other hand painted a different picture with 95.8% of respondents revealing that fire drills are not conducted by the county government. This situation

was attributed to the fact that the fire brigade only conducts fire drills on demand basis after payment of requisite fees

With regard to fire hazard assessment, the study established that in the year 2013, the county government carried out a fire hazard assessment whose output was a fire hazard report. This was however not availed at the time of study as it could not be easily retrieved.

The study established that the fire brigade has a workforce of one hundred and fifty two (152 No.) staff members working in three shifts, against an approved establishment of four hundred and fifty (450 No.) personnel. Out of this, one hundred and nineteen (119 No.) are fire fighters and thirty three (33 No.) were support staff undertaking emergency medical and administrative duties. This gave an indication of understaffing given that ideally a city like Nairobi should have about 3,200 fire fighters to handle fire disasters across the city based on recommendation of NFPA standards.

In terms of staff facilities, it was observed that the condition of staff facilities (offices, dormitories, sanitation facilities and recreation areas) provided was wanting. This was further confirmed by majority of the fire brigade personnel, with an average of 97% of the personnel generally rating the condition of facilities provided as poor. Only 2.4% of respondents stated that the condition of the facilities was satisfactory. The study also established that fire brigade personnel are provided with some incentives given that 61% of respondents stated that they were given risk allowance, 9.6% stated that insurance was provided while 24.5% of respondents stated that no incentives was provided. Fire fighters however expressed dissatisfaction with the incentives provided given the risky nature of their work.

On training and capacity development, the study established that the county government has no training plan for fire brigade personnel and no Training Needs Assessment has been carried out to establish the training needs of the brigade personnel. The study established that the county government to some extent

undertakes training and capacity development though not regularly; in fact 53.7% of fire personnel respondents stated that the County government facilitates training and capacity building, whereas 36.6% of respondents stated that this was not the case. Training programmes included leadership; control room operations; search and rescue; fire prevention; fire fighting; disaster management; fire marshal training and anti-terrorism.

Majority of respondents who stated they had gone through some form of training (81.8%) stated that they had attended these training programmes between years 2010 to 2014, 9.1% had attended training in year 2015 and 9.1% had been through training before year 2010. This implies that training and capacity development is carried out annually, however the number of people trained is low with an average of about three people trained annually.

Regarding awareness creation, it was established that this is undertaken during *barazas* mainly held in informal settlements. Awareness creation also happens when fire inspections are done throughout the year. Majority of service users (89.5%) stated that the county government does not carry out any form of awareness creation, whereas 7.9% stated the contrary, indicating that sensitization on fire prevention and safety took place during chiefs' *barazas* in Kibera slums and briefings during fire audits in Gikomba and Industrial area.

With regard to fire control mechanisms the researcher got an overview of functions of the City Development Control (DC) section - City Planning department, in relation to fire disaster preparedness. It was established that the City Planning department is key in ensuring quality control in building construction and compliance with fire protection features of the building code. The DC section's main role was to ensure that all building applications presented for approval had fire breaks and fire escape routes and materials used for building were fire safe as per the building code and fire safety regulations.

The fire brigade on the other hand checks on these issues during fire audits/inspections which are carried out throughout the year and a fire inspection certificate issued to various premises before occupancy and during occupancy. According to service users however, majority (82% of respondents) indicated that no fire audits were carried out in their localities. This was mainly stated in Kibera and Gikomba, whereas 16.9% of respondents comprising business owners in industrial area and a few in Gikomba stated otherwise. It is worth noting that all business premises sampled in industrial area stated that fire audits were conducted in their premises while no audits were done in Kibera. This may be attributed to the fact that Kibera is an informal settlement and many structures are basically illegal. The response rate in industrial area may be attributed to the high level of compliance to avoid unnecessary penalties from the County government.

The study also established that the 1948 Nairobi master plan had set aside sites for fire stations in various parts of the city; these included Ruaraka, Lungalunga, Karen, Westlands, Gigiri, Mombasa road, Dandora, Waithaka, Buruburu, Jogoo road near Aquinas High school and Zimmerman. These sites were however grabbed and developed privately.

The study established that the county government collaborates with various public agencies including private companies in handling fire disasters depending on the magnitude of the incident. The main agencies include National Disaster Operations Centre (NDOC), Kenya Red Cross, Kenya Police, St. John ambulance and occasionally the military during terror related disasters. During interagency fire disaster response, the NDOC takes command in coordinating disaster response efforts except where military expertise is required. Whereas the county government does not have clearly stipulated operating procedures for interagency fire disaster response, it was established that NDOC determines various agency roles that are well known to each agency. The existence of NDMU whose role is disaster response coordination too presents conflict on chain of command and this has occasionally led to poor coordination thus hindering response efforts.

### **5.2.2 Technical and Infrastructure Capacity**

The study established that there was no clear core competency standard established by the county government on competency levels of fire brigade personnel. Despite this, the fire brigade adheres to American Federal Emergency Management Agency (FEMA) and National fire Protection Association (NFPA) professional standards.

The study sought to find out the competency level of the fire brigade respondents by assessing the level of education and experience in the fire service. It was established that in terms of highest level of education, 82.9% of fire personnel respondents had attained at least secondary level education, whereas 12.2% had attained diploma level education. In terms of experience, the study established majority (63.4%) of the respondents had over 10 years experience working in the fire service; 34.2% had between 5 to 10 years experience and 2.4% had between 1-5 years experience. It was thus noted that the fire brigade personnel have relatively adequate experience in fire fighting. This coupled with training on various aspects of fire disaster handling can attest to their capability to handle fire disasters..

Infrastructure capacity was evaluated based on the availability, physical condition and the number of fire stations, fire engines, search and rescue tools, ambulance, water supply and fire hydrants, maintenance of machinery and equipment and communication systems. In relation to fire stations, it was established that the city has three fire stations with one not fully operational. These include the fire station head quarters in the CBD along Tom Mboya Street, Enterprise Road fire station in Industrial area (also acts as training school) and Ruaraka fire station, which is not fully functional. According to NFPA standard, there should be 1 fire station for a catchment population of 200 000 persons. This therefore means that Nairobi does not have adequate fire stations to serve its population, in fact, 97.9% of service users sampled agreed that the city does not have adequate fire stations. Ideally the city should have about sixteen fire stations given its population of 3.2 million people.

The physical location of fire station was also assessed as this is crucial to the efficiency of fire response work. It was noted that the main fire station is located in one of the busiest streets in downtown Nairobi characterised by heavy pedestrian and vehicular traffic. In fact, throughout the day, the street experiences traffic jams thus restricting movement. According to respondents from the sampled areas of the city, 83.1% stated that the location of the fire stations was not strategic for fire disaster response, while 16.4% stated otherwise. Two main reasons were cited for poor location of the station; 70% of respondents stated that the location was not strategic due to late arrival at disaster scene as a result of traffic congestion and 25% cited late arrival due to the long distance covered mainly from the CBD to the city outskirts.

Regarding response time, majority of service users' (65.6%) stated that it took more than one hour for the fire brigade to arrive at the disaster scene; whereas 14.3% of respondents stated that response time was 1 hour. It is however worth noting that in the industrial area fire incident the fire brigade arrived within 30-45 minutes; this may be attributed to the presence of Enterprise Road fire station within the vicinity. The recommended response time according to NFPA standards is 320 seconds (5-6 minutes) this therefore means that the location of Nairobi fire stations does not favour timely disaster response.

The physical condition of the fire stations was generally rated as poor according to fire brigade personnel. 68% of fire brigade personnel rated the condition as poor, 22% rated the physical condition as very poor; only 10% of the respondents stated their satisfaction at the condition of the fire stations. Observation made during the field visit confirmed the poor state of the stations and the need for repair works and paint works as well as upgrading them to state of the art facilities.

The study also established that the county fire brigade does not have adequate fire engines and emergency vehicles. The county has only five (5No.) functional fire engines; and 18 non functional engines. Ideally, it is recommended that there should be 1 fire station requiring at least 5 fire engines for a catchment population of 200

000 persons. This means that the county should have at least 80 fire engines. The county also has three (3 no.) utility vehicles for purposes of ferrying additional fire fighting equipment and twelve fire fighting ATVs but these are not in use since their efficacy and safety in handling fire disasters was challenged by fire fighters.

Generally, it was observed that the functional engines were in good condition and well equipped. Lack of locally available spare parts was the main reason given for the non functional fire engines. It was also established that the engines were rarely serviced due to financial constraints thus maintenance was generally poor. With regard to fuel management, it was established that fuelling of the engines and other emergency vehicles was done immediately after every fire disaster incident; this is highly commendable.

In relation to emergency medical service vehicles, it was established that the fire brigade has two well equipped ambulances dedicated to the fire service. The county has several other ambulances serving county medical facilities and this can be dispatched to fire disaster scenes depending on the magnitude of the disaster. According to fire brigade personnel, 68.3% stated that the ambulances were inadequate, whereas 26.8% stated that they were adequate.

In relation to water supply, it was established that supply was generally adequate. The main source of water was piped water and this was supplemented by water bowsers from the Nairobi Water and Sewerage Company. According to fire brigade personnel, 80.5% of the respondents stated that water was sufficient whereas 14.6% stated the contrary. The study established that the stations however do not have a water storage facility and thus heavily rely on piped water from the water company. The fire brigade also uses foam for fire suppression. It was established that the supply of foam for the foam tenders was inadequate and that generally, other form of fire suppression were inadequate. Indeed, 61% of the fire brigade personnel stated that the other forms of fire suppression were inadequate while 32% stated that it was

adequate. This situation therefore forces the brigade to rely on assistance from private companies.

According to county officials, there are about 4044 fire hydrants in various parts of the city. Despite this number of hydrants, 74.1% of service users stated the lack of fire hydrants within their vicinity, whereas 21.2% indicated availability. It is worth noting that industrial area is well provided with hydrants given that most industries install their own fire hydrants. The average distance to the nearest hydrants was about 200 metres the supply of water to the hydrants was generally inadequate. County officials decried vandalism of the hydrants as a major challenge.

With regard to PPE, all fire brigade personnel respondents in the fire brigade stated that they were provided with PPE; most respondents stated that they were provided with only one set of PPE and that this was inadequate. They stated that it would be ideal to have at least two sets. They also stated that the condition of the PPE was poor and it was observed that the storage situation of the PPE was not proper.

It was observed that the main fire station was the centre of communications for fire disasters. The state of the control room was however wanting; the room has one radio transmitter, one functional computer and four landline phones. It was clear that the control room and mode of communication makes it difficult to deal with multiple fire incidences.

### **5.2.3 Financial Capacity**

Officials stated that the fire brigade is generally inadequately funded due to its lack of autonomy hence impeding effective service delivery. The study established that the fire brigade has no direct budgetary allocation. It operates through requisitions made to the Governor's office; this has hindered operations as decried by officials given that the process of goods/services requisition is lengthy and bureaucratic thus causing unwarranted delays.



A look into budgets availed during the study indicated no distinct allocation of funds have been made to the fire brigade except for the FY 2014/2015 budget which singled out allocation of Ksh.156 million to the fire brigade for capital expenditure like purchase of fire engines, water bowsers and construction of fire stations. It was established that there is an emergency fund for disaster relief, however, fire brigade officials revealed that the fund is limited and requirements for providing relief to fire victims are not well regulated.

In terms of revenue mobilization, the fire brigade collects revenue in form of fire inspection certificates. The brigade also collects revenue from on demand fire drills by various institutions. Officials stated that there was need to introduce service charges to citizens in order to increase revenues. It was however noted that this requires sensitization of stakeholders and better service delivery to convince the citizenry to pay service charges.

#### **5.2.4 Institutional and Legal Support**

The study established that the fire brigade falls under the Office of the Governor; as such the Chief Fire Officer reports directly to the Governor in matters concerning fire disasters. Fire brigade officials opined that the fire brigade should be an independent department like other county departments in order for it to effectively work without undue political interference as is the current situation. The fire brigade therefore needs to be empowered to enhance its abilities and capabilities; as well as given authority and autonomy to manage fire disasters effectively.

In terms of policy, the study established that the county government has no policy on fire disaster management. In fact, Kenya has no comprehensive fire disaster management policy. The draft national disaster management policy does not comprehensively cover fire disasters, as a matter of fact, natural disasters such as floods, landslides and epidemics are considered more significant than fires. The county has fire safety bylaws (formerly City council bylaws) which mainly guide enforcement of fire safety regulations. The county government is however in the

process of enacting two legislations on disaster management; these include; Nairobi City County Disaster and Emergency Management Bill, 2015 and Nairobi City County Fire and Rescue Services Bill, 2015 to guide fire disaster management in the County.

### **5.3 Conclusion**

Based on the findings of the study, it is clear that the county government has inadequate capacity for fire disaster mitigation and preparedness. With regards to management capacity, the county government has no fire disaster management and contingency plans thus hindering seamless operations. The fire brigade is grossly understaffed and staff lack motivation due to inadequate incentives. Additionally, staff facilities are generally in poor condition. Whereas training for capacity development is undertaken in the institution, some fire-fighters have limited skills and knowledge as they have not had the opportunity to participate in trainings programmes to enhance their knowledge and skills for fire prevention and fire fighting. Awareness creation by the county government is largely limited to informal settlements and thus coverage of neighbourhoods/communities in Nairobi is lopsided. Interagency coordination is largely the preserve of NDOC; as such the county government has no documentation on the roles of various agencies or SOPs to guide interagency fire disaster response.

The technical and infrastructure capacity is also inadequate, whereas fire brigade personnel have on-the-job experience it emerged that the skills gained were still limited and intensive and regular capacity development could improve their capabilities. The city does not have enough fire stations to serve its population. In addition to this, the location of fire stations is not strategic thus leading to delayed fire disaster response. Fire engines and other emergency vehicles are inadequate, this extends to search and rescue tools. Fire engines are rarely serviced and their spare parts are not readily available; most fire engines are therefore non functional. Provisions for emergency water and fuel storage have also not been considered.

Fire brigade personnel also expressed their dissatisfaction with the PPE provided and termed it as inadequate; poor storage of PPE was also evident. In terms of communication systems, the fire station control room, which acts as the communication centre is not automated and record keeping is manually done. The fire brigade relies mainly on four landline phones and a radio transmitter for communications. The facility largely requires upgrading to a state of the art facility to facilitate better fire emergency communication.

Financial capacity of the county fire brigade is largely limited due to the fact that it is not an independent department. Fire brigade officials revealed that the fire service is largely underfunded and this has hampered effective fire service delivery. The emergency fund established is also not in the fire brigade's control and as such is prone to diversion to other uses.

The institutional setup affects fire brigade operations since the brigade operates under the Office of the Governor. This has affected budgetary allocation and decision making. The fire brigade therefore needs to be empowered to become a fully fledged autonomous department for effective operations. Legislative support was also lacking given that the county government has no fire disaster management policy or legislation; the existing bylaws are largely to facilitate enforcement of fire safety. This basically means that there is no proper legislative framework for fire disaster management.

## **5.4 Recommendations**

Based on the research findings, the study makes recommendations based on the four categories of capacities that were assessed as outlined in the subsequent paragraphs.

### **5.4.1 Management Capacity**

Traditionally, planning is the first step of five main functions of management of an organization. The study thus recommends that as a first step towards enhancing capacity for fire disaster mitigation and preparedness, the county government needs

to formulate and implement fire disaster management plans and contingency plans. These shall form a basis for systematic, comprehensive and holistic approach to fire disaster management by enabling establishment of structures and systems, development of strategies and management mechanisms for fire disaster management.

The county government needs to undertake fire hazard, risk and vulnerability assessment of the city to identify fire hazards and devise mitigation strategies as well as determine fire safety measures and management policies. To achieve this, the study recommends fire hazard mapping using GIS based tools. This will highlight vulnerable areas as well as facilitate classification of areas according to the level of risk. Further to this, the county government should link this with land use zoning ordinances in order to ensure fire related building codes are enforced accordingly depending on the level of risk/vulnerability.

The study recommends the recruitment and training of more fire fighters to enhance fire service delivery. Due to budgetary constraints, the County government should explore the alternative of recruiting community volunteer fire fighters to enhance human resource capacity in the fire brigade. These volunteers can only be called upon when fire disasters occur at neighbourhood level. The study also recommends that the county government should identify minimum staffing requirements to ensure that a sufficient number of fire brigade personnel are available to operate safely and effectively.

The county government should ensure that staff facilities such as dormitories, offices, changing rooms and sanitation facilities are adequately provided, and in good condition. A recreation room where fire fighters can undertake daily exercises is recommended given that fire fighting involves physical strength and therefore requires physical fitness. Incentives such as risk allowances, adequate PPE and insurance should be guaranteed by the county government to enhance staff motivation.

The study recommends that the county government should undertake a Training Needs Assessment and prepare a training plan for the fire brigade. This shall help to identify fire brigade personnel training needs and facilitate regular training as well as participation of all personnel; refresher training is also recommended. The county government should additionally consider identifying and training first responders within neighbourhoods on basic tips on fire response using *barazas*, drills and simulation exercises.

The study further recommends that the county government should intensify awareness creation by developing strategies for community awareness creation. Besides the conventional electronic and print media campaigns, the county government should embrace social media (Twitter, Facebook, Whatsapp e.t.c) platform to educate the masses on fire disaster mitigation and preparedness. The county government should also partner with NGOs and CBOs at community level to assist in fire prevention awareness creation.

To curb poor coordination of disaster relief operations, the study recommends that the county government in liaison with other public and private agencies should develop an interagency fire management program as part of fire disaster management plan, to clearly outline areas, levels and roles of coordination and cooperation for the agencies involved.

#### **5.4.2 Financial Capacity**

The county government should prioritise disaster management when allocating budgetary resources. To enhance fire disaster preparedness, the county government should adapt an *ex ante* budgeting approach to facilitate inclusion of mitigation measures onto the policy agenda thus forcing policy makers to consider the cost of disaster relief against other alternatives.

The study recommends that the established emergency fund should be allocated as per budget guidelines that require allocation of 2% of county revenue for emergency

fund. Regulation mechanisms for the fund should be established to avoid misuse or diversion of funds. Prompt disbursement of funds is also recommended to facilitate effective and efficient fire service delivery.

The study also recommends that the county government should coordinate with other public agencies such as NDOC to help generate funds for fire disaster operations. It should also coordinate with private fire brigade companies to obtain resources as part of corporate social responsibility. Additionally, the county government needs to formulate quality plans for resource mobilization in order to secure funding from the national government as well as the private sector.

The county government should organize periodic review and interaction meetings between the fire brigade and other stakeholders to share ongoing efforts in fire preparedness and mitigation, emerging challenges, and the anticipated contribution of each stakeholder in whatever initiatives are adopted. Such meetings have the potential to bridge the gaps in fire-fighting coverage by sharing resources for synergy.

#### **5.4.3 Technical and Infrastructure Capacity**

The study recommends that the county government should design an operational competence framework to ensure that operational personnel have the necessary skills, knowledge and understanding in order to fulfil the vast array of operational demands placed upon them. Additionally, they should establish an instructional priority and training content to facilitate recruitment and preparation of individuals to meet the job performance requirements.

With regard to infrastructure capacity, the county government should allocate adequate resources to facilitate construction of additional fire stations. The study recommends the establishment of fire stations at sub-county/ward levels and thus closer to service users, to facilitate timely response to fire disasters. The county government should prioritise purchase of fire engines, ambulances and other

machinery and equipment for fire disaster management. Further, routine maintenance and repair works of machinery and equipment is recommended and this should be properly scheduled and done promptly.

Further, the study recommends that funds should be adequately allocated for fire engines' spare parts and these procured promptly according to the model of engine. PPE as well as search and rescue equipment should be stocked in sufficient quantity and stored properly. Other forms of fire suppression such as foam should also be adequately supplied. The county government should also explore alternative water sources like rain water harvesting and storage as well as ensure adequate provision of fire hydrants and water supply to fire hydrants across the city.

Emergency communication should be enhanced by upgrading the control room into an automated communication centre well equipped with state of the art equipment for emergency communication systems. Control room personnel should also be trained in new technologies to facilitate smooth operations.

#### **5.4.4 Institutional and Legislative Support**

The study recommends the empowerment of the fire brigade by giving it autonomy as a fully fledged department. Its existence under the Office of the Governor strains financial independence and hence largely impedes effective operations.

The study also recommends the establishment of Disaster Management Units at ward level to regulate fire disaster preparedness and mitigation programmes at community level as well as encourage community participation in fire disaster management.

It is also recommended that the county government should ensure the enactment and implementation of fire disaster management statutes to facilitate regulation of fire disaster management. A fire disaster preparedness policy should also be formulated to guide mitigation and preparedness activities.

The county government administration should also explore Public-Private Partnerships (PPP) in fire service delivery to facilitate resource mobilization for effective fire disaster mitigation, preparedness, response and post disaster recovery efforts.

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

The study proposes the following areas for further research:

1. A research on challenges facing municipal financing for fire disaster management.
2. A study on public-private partnership in fire service delivery.
3. An examination of factors influencing fire disaster post recovery efforts.



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## APPENDIX 2: FIRE DEPARTMENT PERSONNEL QUESTIONNAIRE

The purpose of this questionnaire is to collect data which will be used to assess the capacity of the Nairobi City County Government for fire disaster mitigation and preparedness. The information provided through this questionnaire will be used purely and exclusively for academic purpose and will be treated confidentially. Your cooperation and assistance is highly appreciated.

### Section A: Personal details

1. Name(optional).....
2. Designation:.....
3. Age  21-30 years  31-40 years  41-50 years  51years and above
4. Gender  Male  Female
5. Highest level of education attained  Primary  Secondary  Tertiary (Specify).....
6. Years of experience.....

### Section B: Management Capacity

#### Staff facilities

7. What staff facilities are available for fire department personnel
  - a. Office space  Yes  No  
If yes, Condition  Very poor  Poor  satisfactory  Excellent
  - b. Sanitation facilities  Yes  No  
If yes, condition  Very poor  Poor  satisfactory  Excellent
  - c. Changing rooms  Yes  No  
If yes, condition  Very poor  Poor  satisfactory  Excellent
  - d. Accommodation  Yes  No  
If yes, condition  Very poor  Poor  satisfactory  Excellent
  - e. Other (Specify).....
8. What incentives does the county government give to motivate fire personnel?  
 Insurance  Clothing  Food  Allowances (Specify)  
Other (specify).....

**Training and Capacity Building**

9. a. Does the city government facilitate capacity building and training of fire department staff?  Yes  No
- b. If yes, what training programmes have you attended so far?

	<b>Training Programme</b>	<b>Year attended</b>
1.		
2.		

10. What other training programmes would you like to attend with regard to fire disaster management?.....

**Section C: Infrastructure Capacity**

*Please rate the following (tick in the spaces provided)*

11. Condition of fire station?  Very Poor  Poor  Satisfactory  Excellent
12. Fire engines  Adequate  Inadequate
13. Physical condition of fire engines  Very Poor  Poor  Satisfactory  Excellent
14. Fire equipment  Adequate  Inadequate
15. Ambulances  Adequate  Inadequate
16. Physical condition of ambulances  Very Poor  Poor  Satisfactory  Excellent
17. Fuel supply for fire engines  Adequate  Inadequate
18. Water supply  Adequate  Inadequate
19. Other forms of fire suppression  Adequate  Inadequate

**Personal Protective Equipment (PPE)**

20. a. Do you have appropriate Personal Protective equipment?  Yes  No
- b. If yes,  fire resistant garments  fire fighter boots  fire fighter gloves  fire fighter helmets
- c. How many sets of PPE does each fire fighter have?  1  2  3
- d. Condition of the PPE  Very Poor  Poor  Satisfactory  Excellent

### APPENDIX 3: CHIEF FIRE OFFICER HOD QUESTIONNAIRE

The purpose of this questionnaire is to collect data which will be used to assess the capacity of the Nairobi City County Government for fire disaster mitigation and preparedness. The information provided through this questionnaire will be used purely and exclusively for academic purpose and will be treated confidentially. Your cooperation and assistance is highly appreciated.

#### Section A: Personal details

1. Name (optional).....
2. Designation:.....
3. Age  21-30 years  31-40 years  41-50 years  51years and above
4. Gender  Male  Female
5. Highest level of education attained  Primary  Secondary  Tertiary (Specify).....
6. Years of experience.....

#### Section B: Management Capacity

##### Fire disaster management planning

7. a. Does the County Government have a fire disaster management plan?  Yes  No  
b. If yes, what does it entail?.....
8. a. Does the County Government have a fire disaster contingency plan?  Yes  No  
b. If yes, what does it entail?.....
9. a. Does the county government conduct fire audits on buildings?  Yes  No  
b. If yes, how often do you do fire audits?  Annually  semi-annually  Quarterly  Other (specify).....
10. a. Does the county government conduct fire drills?  Yes  No  
b. If yes, how often?  Annually  semi-annually  Quarterly  Other (specify).....

- c. At what levels are fire drills conducted?  Fire department level  County government  Inter-agency  Community/neighbourhood level  Other (specify).....

**Fire hazard mapping**

11. a. Has the county government ever carried out fire disaster risk/hazard assessment?  Yes  No  
 b. If yes when was this carried out?.....  
 c. What was the output of the assessment?  Fire hazard/risk report  Fire hazard map  Other (Specify).....

**Staffing levels**

12. a. What is the current staffing level of fire department?.....  
 b. Distribution in terms of functions/job description

Job description	No. of personnel

13. a. Is this sufficient for optimum operation of the fire department?  Yes  No  
 b. If no, how many additional staff is required for better operation?

Job description	No. of personnel

14. How many shifts do you have for fire personnel?.....  
 15. With regard to fire engines, how many fire fighters are assigned to one fire engine?  4 fire fighters  < 4(Specify).....  > 4 (Specify).....

**Training and Capacity Development:**

16. a. Do you have a training plan for fire department personnel?  Yes  No  
 b. If yes, what does it entail? .....
17. . a. Have you ever carried out a Training Needs Assessment?  Yes  No  
 b. If yes, what are the training needs?.....
18. a. What training programmes have been carried out?

b. How many people have been trained in the various programmes?

Training programme	No. of trainees

19. What training programmes are recommended for fire personnel?  
 .....

How often do you conduct training?.....

20. a. Do you conduct training for community members and other stakeholders?

Yes                       No

b. If yes, what training programmes are conducted?.....

**Awareness creation**

21. a. Do you conduct community awareness on disaster mitigation and preparedness?  Yes                       No

b. If yes, how do you conduct awareness on disaster mitigation and preparedness?  Awareness campaigns  Electronic media  Print media  Information centre  Specialized training programmes  Other (specify).....

c. How often do you conduct awareness campaigns or forums?.....

d. What thematic areas do you focus on during fire disaster awareness creation?  
 .....

**Inter-agency Coordination**

22. Does the county government have an interagency collaboration framework for fire disaster mitigation and preparedness?  Yes                       No

23. a. What other agencies does the county government collaborate with and what are their roles in fire disaster mitigation and preparedness?

	Agency	Roles
1.		
2.		
3.		

- b. Are their roles in fire disaster mitigation and preparedness clearly documented?  Yes  No
24. What management challenges are experienced in the county government in regards to fire disaster mitigation and preparedness? .....

**Section C: Technical Capacity**

25. What is the total no. of fire department personnel in the county? .....
26. Designation and minimum and highest qualification of current personnel

Designation	No. of personnel	Minimum qualification	Highest qualification

27. a. Do you have a professional qualification standard against which you measure competency for fire department personnel?  Yes  No
- b. If No, what is the criterion of selection of fire department personnel?.....

**Section D: Infrastructure Capacity**

28. How many County Government fire stations are in the city?.....
29. Where are they located?.....
30. How many fire engines does the county government have?.....
31. How many are functional?..... Non functional?.....
32. a. Are the fire engines well equipped?  Yes  No
- b. If yes, what equipment is in the fire engines?
- Search and rescue tools** -  Chain saws  Concrete cutters  Crow bars  
 Wire and abaca ropes  shouldering sticks  Clippers  Jacks  
 hammer pincers  handsaws  extension ladders & elevators  
 Shovel  fire extinguishers  others (specify).....
- First aid equipment-**  First aid kit  Stretchers  Spin boards  
 Other (Specify).....
- c. Does this equipment match the fire engine models?  Yes  No
- d. Are first aid kits replenished and updated regularly?  Yes  No
33. a. Do you have ambulance services specifically designated for fire-fighting?

Yes  No

b. If yes, how many ambulances?.....

c. Are they well equipped?  Yes  No

34. What other forms of fire suppression materials do you have?

Hydrogen gas  Liquid fuel  Platinum chemical foams  Other (specify)

35. Do you have a storage facility for the fire equipment?  Yes  No

### **Maintenance and Repairs**

36. How often are the fire engines and other vehicles serviced?.....

37. Do you have a maintenance schedule for the engines and other vehicles?  Yes

No

38. a. With regard to repairs, are fire engine spare parts readily and locally available?

Yes  No

b. If No, where do you source them from?.....

39. a. Do you have a repair and maintenance workshop?  Yes  No

b. If No, where are maintenance and repairs done?.....

### **Fuel management**

40. How often are the fire engines fuelled?.....

41. a. Do you have a vehicle fuelling schedule?  Yes  No

b. If No, how do you account for fuel consumption by engines?.....

42. a. Do you have a fuel storage facility in the station?  Yes  No

b. If No, where do you obtain fuel from during fire emergencies?.....

### **Water**

43. What is the main source of water in the station(s)?.....

44. a. Do you have supplementary water sources?  Yes  No

b. If yes mention.....

45. Do you have a water storage facility in the fire station?  Yes  No

46. How many fire hydrants are in the City?.....

47. Do you have a location map for the hydrants?  Yes  No

48. a. Are the hydrants well supplied with water?  Yes  No

b. If No, state reason.....



**Personal Protective Equipment (PPE)**

- 49. a. Do fire fighters have appropriate Personal Protective equipment?  Yes  
 No
- b. If yes,  fire resistant garments  fire fighter boots  fire fighter gloves  fire fighter helmets
- c. How many sets of PPE does each fire fighter have?  1  2  3
- 50. Do you have a storage facility for the PPE?  Yes  No

**Communication systems**

- 51. What communication infrastructure is available for fire disaster preparedness?  
 Radio  phones  Computer aided systems  satellite transmitters  
 fire alarm systems  Other (specify).....
- 52. a. Does the county government have a fire disaster communication centre?  
 Yes  No
- b. If No, how do you handle fire emergency communication?.....
- 53. What challenges does the county government face with regards to technical and infrastructure capacity?.....

## APPENDIX 4: SERVICE USERS QUESTIONNAIRE

The purpose of this questionnaire is to collect data which will be used to assess the capacity of Nairobi County Fire department for fire disaster mitigation and preparedness. The information provided through this questionnaire will be used purely and exclusively for academic purpose and will be treated confidentially. Your cooperation and assistance is highly appreciated.

### Section A: Personal details

1. Name (optional).....
2. Age  20 years and below  21-30 years  31-40 years  41-50 years  
 51years and above
3. Gender  Male  Female
4. Highest level of education attained  Primary  Secondary  Tertiary  
(Specify).....

### Section B: Management Capacity

5. a. Do you think that the County Government is adequately prepared for fire disasters in the city?  Yes  No  
b. Why? (give reason for answer).....
6. a. Does the county government conduct fire audits on buildings within the area?  
 Yes  No  
b. If yes, how often does the County government conduct the fire audits?  
 Annually  semi-annually  Quarterly  Other (specify).....
7. a. Has the county government ever conducted fire drills in the area?  
 Yes  No  
b. If yes, when was this conducted?.....
8. Do you think the County government has adequate personnel to handle fire disasters?  Yes  No
9. a. Do you think County government personnel are well trained to handle fire disasters?  Yes  No  
b. If No, give reasons.....

10. a. Has the County government conducted fire disaster preparedness training for community members and other stakeholders in the area?  Yes  No  
 b. If yes, what training programmes have been conducted in the area?  
 .....

11. a. Has the County government engaged the Community in creating awareness on fire disaster mitigation and preparedness?  Yes  No  
 b. If yes, how has this been done?  Awareness campaigns  Electronic media  Print media  Information centre  Specialized training programmes  Other (specify).....

**Section C: Technical and Infrastructure Capacity**

12. In your opinion, does the County government have adequate fire stations in the city?  Yes  No
13. a. Do you think that that the current location of fire stations affects timely response to fire disasters?  Yes  No  
 b. If yes, give reasons.....
14. What means of communication was used to alert the County government about the fire disaster?  Radio  phones  Computer aided systems  satellite transmitters  fire alarm systems  Other (specify).....
15. During the last fire disaster incident what was the response time of the County government fire department?  
 15 minutes  30 minutes  45 minutes  1 hour  more than 1 hour
16. How many fire fighters were dispatched to the disaster scene?  
 <4 fire fighters  4 fire fighters  >4 fire fighters
17. Did the fire fighters have Protective clothing?  Yes  No
18. a. Were the fire engines dispatched to the disaster scene effective in handling the fire?  Yes  No  
 b. If no, give reasons.....
19. a. Do you have fire hydrants in this area?  Yes  No  
 b. If yes, what is the distance to the nearest fire hydrant?

<100 metres  101-200 metres  201-300 metres  301-400 metres  
 401-500 metres  >500metres

c. Are the fire hydrants well supplied with water?  Yes  No

20. a. Did the County government dispatch ambulances to the fire disaster scene?

Yes  No

b. (i) if yes, were the ambulances adequate to handle the victims?

Yes  No

(ii) If No, give reasons.....

21. How long did it take the disaster response team to suppress the fire?

< 1 hour  2-3 hours  4-5 hours  >5 hours

22. How would you rate the County government's response to the fire disaster

incident?[  Very poor  Poor  satisfactory  Excellent

**Section D: Institutional and legal support**

23. a. Are you aware of any County government bylaws and/or regulations on fire disaster preparedness?  Yes  No

b. If yes, outline.....

24. Do you think that these bylaws/regulations influence the County Government's level of disaster preparedness?  Yes  No

25. In your opinion, is the County government doing enough to enforce these bylaws?[  Yes  No

**Section E: Financial Capacity**

26. a. In your opinion, does the County government make adequate budgetary allocation for fire disaster mitigation and preparedness?[  Yes  No

b. Give reasons for answer.....

27. In your opinion, what challenges does the county government face with regards to fire disaster mitigation and preparedness?.....

28. What can be done to enhance fire disaster mitigation and preparedness by the County government?

## APPENDIX 5: INTERVIEW SCHEDULE FOR CHIEF FIRE OFFICER

### Financial Capacity

1. What is the current county budgetary allocation for fire disaster preparedness?
2. What was the budgetary allocation and expenditure in the last five financial years?

<b>Financial Year</b>	<b>Budgetary allocation in Ksh.</b>	<b>Expenditure in Ksh.</b>
2014/2015		
2013/2014		
2012/2013		
2011/2012		
2010/2012		

3. What should be the ideal budgetary allocation for fire disaster mitigation and preparedness?
4. In your opinion is the current budgetary allocation adequate or inadequate? State reasons
5. How is the County budgeting process in regard to fire disaster mitigation and preparedness?
6. What criterion is used in determining fire department budget?
7. Does the County government promptly disburse the necessary funds for fire disaster mitigation and preparedness?
8. What is the process of disbursement of funds fire disaster mitigation and preparedness?
9. Does the county government have other sources of funds for fire disaster mitigation and preparedness?
10. Does the county government have resource mobilization strategies for fire disaster mitigation and preparedness? Outline
11. What financial Challenges does the county government face with regard to fire disaster mitigation and preparedness?

## **Institutional and Legislative Support**

### **Institutional framework**

1. Outline the institutional framework with regard to fire disaster management in the county government
2. How has the institutional setup affected fire disaster mitigation and preparedness?
3. What challenges does the existing institutional framework have in regard to fire disaster mitigation and preparedness?

### **Legislation**

1. Is there a national policy/legislation on fire disaster management? Outline
2. Does the county government have any legislation/bylaws on fire disaster mitigation and preparedness? Outline
3. In your opinion, are there any legislative gaps with regard to fire disaster preparedness? Outline

**APPENDIX 6: INTERVIEW SCHEDULE FOR CITY PLANNING  
(DEVELOPMENT CONTROL) HOD**

**Fire disaster control mechanisms - planning regulations**

1. What is the role of city planning department in fire disaster mitigation and preparedness?
2. What regulations/standards does the planning department have regarding fire safety in buildings?
3. How does land use zoning influence fire disaster mitigation and preparedness in the city?
4. How is the fire department involved in the process of building plan approval?
5. What challenges does the Planning department face with regard to ensuring compliance to fire safety standards in buildings

## APPENDIX 7: OBSERVATION CHECKLIST

### 1. Checklist on condition of infrastructure

	Infrastructure	Condition		Capacity		Remarks
		Functional	Non functional	Adequate	Inadequate	
1.	Fire station					
2.	Fire engines					
3.	Ambulances					
4.	First aid equipment					
5.	<b>Fire equipment</b>					
	Chain saws					
	Concrete cutters,					
	Crow bars					
	Wire and abaca ropes					
	Shouldering sticks					
	Clippers					
	Jacks					
	Hammer pincers, and					
	Handsaws					
	Others					
6.	<b>Fire Personal Protection Equipment</b> (boots, garments, gloves, helmets)					
7.	Fire Equipment Storage facilities					
8.	Fire PPE storage facilities					
9.	Water storage facilities					
10	Repair and maintenance workshop					
11	Fuel storage facility					



12	Accommodation facilities					
13	Offices					
14	Sanitation facilities					
15	Changing rooms					
16	Communication systems					
17	Communication centre					

## 2. Checklist on documentation

	Document	Availability		Remarks
		Yes	No	
1.	Disaster management plan			
2.	Contingency plan			
3.	Training plan			
4.	Training Needs Assessment report			
5.	Vehicle Maintenance and repair schedule			
6.	Fire equipment maintenance and repair schedule			
7.	Fuel management schedule			
8.	Fire hazard map/ report			
9.	Fire hydrant location map			
10.	County Legislation or bylaws on fire disaster management			
11.	Fire audit reports			