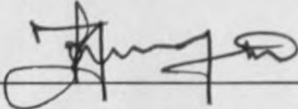


## DECLARATION

The work contained in this document is my original work, and has never been submitted to any other university for examination or any other purpose.

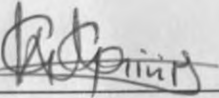
Name: **MUTUNGA JOHN KANYUITHIA.**

Signature:  \_\_\_\_\_

Date: 24/10/03

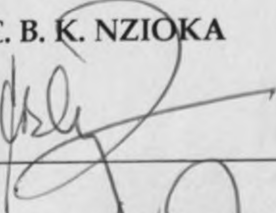
This project paper has been submitted for examination with our approval as university supervisors.

1. Name: **DR. G. G. WAIRIRE**

Signature:  \_\_\_\_\_

Date: 24/10/03

2. Name: **PROF. C. B. K. NZIOKA**

Signature:  \_\_\_\_\_

Date: 24/10/03

**MA SOCIOLOGY**

**PROJECT PAPER**

**SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS  
DEGREE IN SOCIOLOGY OF THE UNIVERSITY OF  
NAIROBI**

**TOPIC**

**"INFLUENCE OF FREQUENT FIRE DISASTERS ON  
MITIGATION AND PREPAREDNESS AMONG  
ENTREPRENEURS IN THE NAIROBI CENTRAL  
BUSINESS DISTRICT"**

University of NAIROBI Library



0404598 5

**BY:**

**MUTUNGA JOHN KANYUITHIA.**

**ADM. NO. C/50/P/8497/2000.**

## ACKNOWLEDGEMENT

My sincere gratitude goes to Dr. Wairire and Prof. Nzioka for accepting to supervise this work. Their experience, guidance, comments and suggestions contributed significantly toward successful completion of this project paper.

I also wish to thank the entire University of Nairobi administration and teaching staff for their cooperation and support throughout the course of my studies.

I would also like to thank friends and colleagues like S. K. Kanyuithia, M. W. Karanja, J. M. Ngunzi, C. M. Kibaya, and M. B. Kimiri for their moral support and cooperation during the process of compiling this document.

-----00-----

-----oo-----

This work is dedicated  
to my dear parents (Naomi and Jacob), who toiled for many years to ensure that I get educated  
in spite of the many hardships then, and to my beloved wife Sheila for her unwavering support  
and prayers.

-----oo-----

## LIST OF ABBREVIATIONS AND ACRONYMS USED

BC	Building Code
CO <sub>2</sub>	Carbon Dioxide
FEMA	Federal Emergency Management Agency
FEMA-DMM	Federal Emergency Management Agency-Disaster Management Manual
FEMA-SM	Federal Emergency Management Agency-Students' Manual
FGDs	Focussed Group Discussions
FWS	Fire Warning Systems
HAZMATs	Hazardous Materials
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IEMS	Integrated Emergency Management Systems
KRCS	Kenya Red Cross Society
NCBD	Nairobi Central Business District
NCBDA	Nairobi Central Business District Association
NCC-FB	Nairobi City Council – Fire Brigade
NDOC	National Disaster Operations Centre
NFPA	National Fire Protection Agency
NHIF	National Hospital Insurance Fund
SPSS	Statistical Package for Social Scientists
UK	United Kingdom
UNDP	United Nations Development Fund
UNHCR	United Nations High Commission for Refugees

## TABLE OF CONTENTS

<u>TOPIC</u>	<u>PAGE</u>
<b>CHAPTER ONE</b>	
	1
1.1	3
1.2	7
1.3	9
1.4	10
1.5	13
<b>CHAPTER TWO</b>	
	15
2.0	15
2.1	15
2.1.1	15
2.1.2	17
2.1.2.1	18
2.1.2.2	20
2.1.2.3	21
2.1.2.4	22
2.1.2.5	22
2.1.2.6	23
2.1.2.7	23
2.1.3	24
2.1.3.1	26
2.1.3.2	26

2.1.3.3	<b>Information Systems</b>	26
2.1.3.4	<b>Resource Base</b>	27
2.1.3.5	<b>Preparedness Planning</b>	27
2.1.3.6	<b>Public Education and Training</b>	27
2.1.3.7	<b>Warning Systems</b>	28
2.1.3.8	<b>Response Mechanisms</b>	28
2.1.3.9	<b>Evacuation Plans</b>	28
2.1.3.10	<b>Rehearsals (Drills)</b>	29
2.1.3.11	<b>Mutual Aids Agreements</b>	29
2.2	<b>CONCEPTUALIZATION</b>	29
2.2.1	<b>The conceptual framework</b>	29
2.2.2.	<b>The conceptual definitions</b>	32
2.2.3	<b>Specification of variables</b>	33
2.3	<b>OPERATIONAL DEFINITION OF TERMS</b>	34
2.4	<b>THE ANALYTICAL FRAMEWORK</b>	36
2.5	<b>THEORETICAL FRAMEWORK</b>	38
2.5.1	<b>SYSTEMS THEORY</b>	38
2.5.2	<b>THOMAS COCHRAN THEORY OF ENTREPRENEURIAL SUPPLY</b>	41
2.5.3	<b>CHAOS THEORY</b>	42
2.6	<b>RESEARCH HYPOTHESES</b>	45
	<b>CHAPTER THREE</b>	46
	<b>RESEARCH METHODOLOGY</b>	46
3.0	<b>INTRODUCTION</b>	46
3.1	<b>DESK RESEARCH</b>	46
3.2	<b>FIELD RESEARCH</b>	46
3.3	<b>SITE DESCRIPTION</b>	46
3.4	<b>SAMPLING PROCEDURES</b>	47
3.5	<b>METHODS OF DATA COLLECTION</b>	49
3.5.1	<b>Interview through the use of questionnaires</b>	49
3.5.2	<b>Focused Group Discussions</b>	49
3.5.3	<b>Observations</b>	50

3.6	<b>THE DATA COLLECTION PROCESS</b>	<b>51</b>
3.6.1	<b>Planning</b>	<b>51</b>
3.6.2	<b>Pre-testing the Questionnaires</b>	<b>51</b>
3.6.3	<b>Quality Control</b>	<b>52</b>
3.7	<b>PROBLEMS EXPERIENCED DURING THE DATA COLLECTION</b>	<b>52</b>
3.8	<b>DATA PROCESSING ANALYSIS AND INTERPRETATION</b>	<b>53</b>
3.8.1	<b>Data Processing and entry</b>	<b>53</b>
3.8.2	<b>Data analysis</b>	<b>54</b>
3.8.3	<b>Univariate analysis</b>	<b>54</b>
3.8.4	<b>Bivariate Analysis</b>	<b>54</b>
	<b>CHAPTER FOUR</b>	<b>55</b>
	<b>DATA PRESENTATION AND DISCUSSIONS</b>	<b>55</b>
4.0	<b>INTRODUCTION</b>	<b>55</b>
4.1	<b>Socio-economic and demographic characteristics</b>	<b>55</b>
4.2	<b>Entrepreneurs' understanding of the mitigation and preparedness measures required taken</b>	<b>57</b>
4.3	<b>Types and characteristics of mitigation measures taken</b>	<b>59</b>
4.3.1	<b>Measures aimed at ensuring that fire disasters do not occur</b>	<b>60</b>
4.3.2	<b>Measures aimed at ensuring minimum damage to property in the event of a fire disaster</b>	<b>63</b>
4.3.3	<b>Measures aimed at protecting people from injury</b>	<b>66</b>
4.3.4	<b>Fire safety regulations and levels of adherence</b>	<b>69</b>
4.4	<b>Types and characteristics of preparedness measures taken</b>	<b>72</b>
4.4.1	<b>Measures aimed at ensuring capacity to fight fire</b>	<b>73</b>
4.4.2	<b>Types and characteristics of warning systems</b>	<b>76</b>
4.4.3	<b>Fire escape/evacuation concerns</b>	<b>80</b>
4.4.4	<b>Channels of communicating fire safety information</b>	<b>82</b>
4.4.5	<b>Fire safety drills</b>	<b>84</b>
4.4.6	<b>Ensuring operational readiness of fire fighting equipments</b>	<b>85</b>
4.4.7	<b>Training on fire fighting techniques</b>	<b>86</b>
4.4.8	<b>Fire response plans</b>	<b>89</b>
4.4.8.1	<b>Future plans for the NCBDA fire response</b>	<b>91</b>



4.4.9	Ensuring the operational capacity of the fire response plans	91
4.4.10	Fire disaster recovery resources	93
	<b>CHAPTER FIVE</b>	<b>95</b>
	<b>BIVARIATE ANALYSIS</b>	<b>95</b>
5.0	<b>INTRODUCTION</b>	<b>95</b>
5.1	<b>Bivariate analysis</b>	<b>95</b>
5.1.1	Confirming the relationships between variables in analysing hypothesis H1.	95
5.1.2	Correlation between variables in analysing hypothesis H2.	98
5.1.3	Confirming the relationships concerning the mitigation measures taken in relation to hypothesis H3.	100
5.1.4	Confirming the relationships concerning the preparedness measures taken in relation to the hypothesis H3.	103
5.1.5	Correlation between variables in mitigation measures for hypothesis H4.	104
5.1.6	Hypothesis test using preparedness measures for H4	106
	<b>CHAPTER SIX</b>	<b>109</b>
	<b>RECOMMENDATIONS AND CONCLUSIONS</b>	<b>109</b>
6.0	<b>INTRODUCTION</b>	<b>109</b>
6.1	<b>RECOMMENDATIONS</b>	<b>109</b>
6.1.1	Recommendations to the Kenya Government	109
6.1.2	Recommendations to the NCBD entrepreneurs	111
6.1.3	Recommendations for research	113
6.2.	<b>KEY FINDINGS CONCLUSIONS</b>	<b>114</b>
6.2.1	Fire recording and reporting mechanisms	114
6.2.2	Fire prevention and control regulations	114
6.2.3	Establishment of synergies	114
6.2.4	Information Systems	114
6.2.5	Preparedness Planning	115
6.2.6	Evacuation planning	115
6.2.7	Rehearsals (drills)	115
6.2.8	Fire disaster recovery planning	116
6.2.9	General conclusions	116

<b>BIBLIOGRAPHY</b>	<b>118</b>
<b>ANNEXE I The Questionnaire</b>	<b>120</b>
<b>ANNEX II Description of the clusters</b>	<b>135</b>

**TABLES AND ILLUSTRATIONS:**

Table 1.	Variables and indicators	33
Table 2.	Distribution of respondents on the basis of having/not been victims of Fire Disasters	57
Table 3.	Distribution of respondents according to fire disaster information flow channels	58
Table 4.	Distribution of responses according to the methods of controlling fire outbreak	61
Table 5.	Distribution of respondents according to the levels of confidence with the property damage control measures used	64
Table 6.	Distribution of responses according to the improvements in injury prevention efforts	68
Table 7.	Distribution of respondents according to the measures taken to fight fire	74
Table 8.	Distribution of respondents according to the improvements towards containing a fire outbreak	75
Table 9.	Distribution of respondents according to efficiency of the fire warning systems	78
Table 10.	Distribution of respondents according to usefulness of fire escape routes	81
Table 11.	Distribution of respondents according to the relationship between improvements in fire fighting installations and increased frequency of fires within NCBD	86
Table 12.	Distribution of respondents according to the proportion of staff members trained in fire fighting	87
Table 13.	Distribution of those respondents who associated Improvements to fire disaster threats against those who took the relevant measures	96

Table 14.	Distribution of respondents according to the indicators of awareness of fire disaster mitigation and preparedness against measures taken	99
Table 15.	An illustration of the percentages of those who had confidence in the measures taken against the improvements made.	101
Table 16.	Distribution of responses according to the preparedness measures against improvements in the same	103
Table 17.	Distribution of responses according to the mitigation measures under analysis	105
Table 18.	Distribution of responses regarding the preparedness measures under analysis	107
Figure 1.	Schematic representation of relations between variables:	34
Figure 2.	An illustration of an integrated emergency management System	37
Figure3.	Diagrammatic representation of the variables:	38
Figure 4.	A map of the NCBD showing the various boundaries	47
Figure 5.	A map of NCBD showing the 24 clusters.	48

## ABSTRACT

Disasters of varying magnitude have occurred in many parts of the world, often caused by different types of hazardous substances. Fire hazards whether naturally occurring or technological in origin cause disasters that in most cases are devastating. However, fire is so central to human life that man cannot do without it. As a result, man has to take precautions to reduce the fire related risks to tolerable levels. Bearing in mind that disaster conditions subject people to stress due to harsh living conditions suddenly brought about by the unfolding effects of hazards; mechanisms have to be designed to enable people cope with or help themselves out of such circumstances

Over the past few years, many fire disasters have occurred in Kenya more so around Nairobi. Property worth billions of shillings has gone to waste, infrastructure destroyed, lives lost and injuries inflicted. Many people have been impoverished as a result. Whether occurring at night or during the day, fires in Nairobi have been characteristic of consuming all the structures and their contents, thus posing great threats to livelihood property and environment.

The study covered the Nairobi Central Business District, which was subdivided into 24 clusters whereby six of them were randomly selected and studied. The study interviewed 120 entrepreneurs from six randomly selected clusters within the NCBD, and 25 other selected key informants in groups of 5 through FGDs. Several aspects of fire disaster mitigation and preparedness were investigated in this study, in line with four principal areas of concern which included the actual measures taken, levels of confidence with those measures, improvements made in those measures in the recent past and how those improvements relate to the frequent fire disasters. Results from the investigations, were analyzed both qualitatively and quantitatively, recommendations given and conclusions drawn.

# CHAPTER ONE

## 1.1 INTRODUCTION:

With the tide of globalization sweeping across nations, all spheres of life are taking an international dimension. An issue is made global either through commerce, production, politics and media of mass communication or information technology, enhancing the spread of or universalization of artifacts, issues, ideas, occurrences, lifestyles and movements. Alleviation of suffering through disaster management is one issue that has been given a global perspective, and therefore included in the international laws. As culture, technology, social structures and economic parameters change on a day-to-day basis, it would only serve today's entrepreneurs right, to keep in tune with changes occurring around them, or elsewhere but somehow influencing their strategic choices. Whatever occurs today in one part of the world to some extent affects operations in all other parts of the world. With globalization, borrowing and counter-borrowing goes on daily as the world turns into a global village. To borrow or not to is not a matter of choice, but a condition that has to be met if drifting to obsolescence is not a desired destiny. Haralambos (1980:20) reckons that to functionalists, the behaviour of members of a community can be seen as response to the functional pre-requisites of the social system. The pace of change very much depends on the perceptions of the people, the unfolding events and the wind of change blowing across the modernized world. The demand for change remains a dictate of the functional prerequisite of any given community, and the pace of change is considerably influenced by *events occurring across time and space*, Giddens (1990). Disasters are known to disrupt the would be desired functional prerequisites of a given community by their chaotic nature and levels of demand, thus posing need to develop coping mechanisms.

According to FEMA-DMM (1990:I-13) disasters of varying magnitude have occurred the world over, often caused by different types of hazardous substances. These may include manmade events such as accidents involving hazardous materials, either localized at production, utilization or storage sites, or along transportation routes.

Fire hazards whether naturally occurring or technological in origin cause disasters that in most cases are devastating. Thomas (1972:2) points out that "it is a true but unfortunate cynicism, that fires are caused by men, women and children, and the higher our standards of living become, the greater appears to be the ever-present risk of an outbreak". This is easy to conceptualize upon consideration of the enormous presence of highly flammable modern materials, rising levels of pre-packed goods and the multiplicity of fire related labour-saving devices and machines in use within the modern world set up. Fire is so central to human life; that man cannot simply do without it. As a result, man takes precautions to reduce the fire related risks to tolerable levels. However, losses from fire in buildings in most countries such as Kenya are believed to be far greater than they should.

Williamson and Buckle (1958:4-6) have classified fire into three classes depending on the combustible materials involved, and the method used to combat them. Class A fires include those resulting from ordinary combustible material such as wood, paper, and textiles. They are best combated by the cooling effect of water. Class B. fires include those involving oils and other inflammable liquids such as grease, and similar substances for which blanketing is the most suitable method of extinguishment. Class C fires include those that involve electrical apparatus and equipment; in which case the extinguishing agent should not be a conductor of electricity. Carbon dioxide, which has the advantage of leaving no residue, or the gas expelled dry powder, are suitable for small fires of this nature. Accordingly, the Building Research Series (1972:14) adds that Class D fires are those involving flammable metals. These may be radioactive or non-radioactive metals. The former are usually regarded as the preserve of the atomic energy. Any of the fire types classified above could occur in the area targeted by this study.

According to UNHCR handbook for Emergencies (2000: 29), the distinguishing features of emergencies/disasters include loss of life, putting the well being of people at stake, and the requirement for a short reaction time. This is in due consideration of the high associated risk factors and the consequences of mistakes and/or delays to response. Urgency is the key word in view of the foregoing circumstances.

Contingency planning and other preparedness activities are crucial if accomplished way before a fire outbreak. Bearing in mind that disaster conditions subject people to very high stress due to harsh living conditions suddenly brought about by the unfolding effects of hazards; mechanisms have to be designed to enable people cope with or help themselves out of such circumstances. The appropriate measures required invoke those outlined in the disaster management cycle. These are considered as the essential components of the disaster management process so defined by the FEMA-DMM (1990:I-6), as an organized analysis, planning, decision-making and assignment of available resources to mitigate to (lessen the effects or prevent), prepare for, respond to, and recover from the effects of all hazards. The goal of disaster management is to save lives, prevent injuries and protect property and the environment if a disaster occurs. The level of efficiency in alleviating disaster situations is dependent on the mitigation and preparedness levels of the target population prior to the occurrence of a disaster.

Disaster mitigation and preparedness are triggered either by experiences of disastrous events within a given jurisdiction, or learning from others who have suffered such experiences. Under the globalized world, disaster information is passed over relatively fast through various means. The impact of disasters to non-sufferers is however influenced by the proximity of such events. There is need for mitigation measures and high levels of preparedness towards known disasters in terms of creating a state of operational readiness; as measured in terms of capability for action and availability of the means to act. FEMA-DMM (1990:II-3) defines capability for readiness as an assessment of operational readiness; coupled with capacity to address disaster and all functions of emergency management. Clear knowledge of what needs to be done is necessary in terms of mitigation and preparedness measures. In general, mitigation should be considered long before emergencies/disasters occur; and it includes any activities undertaken with an aim of eliminating or reducing the possibility of occurrence of a disaster. These according to FEMA-DMM (1990: II-2) mitigation measures are the activities designed to postpone, dissipate or lessen effects of a disaster.

On the other hand, preparedness could be looked at as the insurance policy against disasters since we cannot mitigate against all of them

According to FEMA-DMM (1990: II-2), it encompasses measures undertaken because mitigational activities cannot keep disasters from occurring/happening. Activities in reference include planning to ensure that the most effective and efficient response is achieved, while incorporating efforts to minimize damages such as forecasting, warning systems, and laying groundwork to response operations.

Nairobi has experienced many fire disasters ever since it came into being. Over the last three years alone, reports from the Daily Nation Newspaper on fires for the 2000-2002 period show that Nairobi has had over 63 major fire disasters out of the total 280 reported countrywide; (*Own compiled report*). Enormous losses have as a result been incurred in terms of property destruction and environmental degradation. Losses incurred have not been quantified in this country, a situation that requires urgent attention. There is no coordinated disaster reporting and loss quantification mechanism in place in this country, as compared to the developed world.

In its 2001 report for instance, the National Fire Protection Agency (NFPA) of the United States of America estimates property losses due to fire disasters at about 44 billion US dollars, seen as a 1.6% increase from the previous year. The increase is attributed to the September 11, 2001 World Trade Centre disaster. Response to such fires has been associated with efficient detection systems and well coordinated fast actions.

To build up appropriate mitigation and preparedness skills, a community is expected to have conducted a comprehensive hazard analysis. Under the Nairobi Central Business District (NCBD) conditions, fire disaster analyses should be with respect to the past/historical fire disasters, coupled with the risks posed by fires to the NCBD entrepreneurs, as well as their levels of vulnerability to this particular hazard. Scholars in this field have emphasized on recording of fire incidences as crucial. Injuries, fatal and non-fatal need be quantified so as to clearly indicate the impact of fire disasters in a given jurisdiction. NCBD entrepreneurs can only rely on newspaper reports since no proper disaster recording system is in place.



This study intends analyze the extent to which the NCBD entrepreneurs understand the fire disaster threats facing them, and the relative levels of readiness to combat the impending dangers.

On the other hand, Ramachandran (1993:33) argues that a fire controlled or responded to soon after the start will be in its early stages of growth, and will lead to much lower losses than otherwise. This could only be achieved through effective early warning preparedness measures as well as appropriate and thoroughly exercised response plans. Such a situation remains a pipe dream, until installation, updating, fine tuning, and exercising of appropriate mitigation and preparedness measures are taken seriously in this country. Discovery of fire cannot possibly be considered early if the warning systems are not efficient.

According to Ramachandran (1993:33), if a fire is fought when its size is small, it can be controlled and extinguished by the occupants, fire brigades or sprinklers before causing excessive damage. This highlights a situation of a high level of preparedness to fight fire in the absence of which, though detection system may give the required signals early, varying levels of preparedness to it may jeopardize the response operations.

Nairobi province houses the largest city in the country, which is also the capital of Kenya. According to the 1999 population and housing census report (2001), Nairobi is highly populated with a density of 3079 people per square kilometre, and an overall population of more than 2.1 million people. It is the smallest in size as compared to the other seven provinces, covering a total area of 696 square kilometres. Nairobi is divided into eight administrative divisions whereby Nairobi Central Business District (NCBD) is located in the central division comprising of the City Square and the City Centre. Although this study focuses on NCBD, fire as a phenomenon has the characteristic of affecting any part of the country, thus making the findings from this study useful under similar circumstances in any part of this country.

Fire has been recognized as a serious hazard causing danger or potential dangers to NCBD entrepreneurs. Haralambos (1980:16) argues that interactionism theorists assume that action is meaningful only to those involved. If this was to be applied

under the NCBD conditions, then a control or prevention mechanism so adopted should be aimed at alleviating suffering, and reducing or completely eliminating all forms of fire dangers and losses.

To effectively counter the effects of fire, a community such as the NCBD entrepreneurs has to understand the need to develop emergency response plans prior to the actual occurrence of the disaster. These plans should include identifying and developing some relationship with emergency support services in a given jurisdiction. They also should incorporate an assessment of all resources (community resources) a community can call upon in the event of a disaster.

In her unpublished report, Ndung'u (1991:3) argues that many fire disasters would be greatly reduced if building users were educated on safe house keeping habits, in view of fire safety as well as basic fire prevention techniques. This reduces the misguided notion that ties up protection and control of fires as the concern of architects and fire officers. This study will endeavour to identify how far the NCBD entrepreneurs have undertaken the process of mapping out the resources that could come in handy, and resource release and mobilization modalities. It will also aim at identifying the established corporate or individual measures entrepreneurs have taken to reduce fire occurrences, as well as eliminate the chances of suffering loss should it occur.

Entrepreneurs have a moral responsibility and duty to completely eliminate the chances of fire outbreaks or improve the efficiency and effectiveness of response to fires within NCBD. Relying on the financially able entrepreneurs, it is expected that there is a high level of compliance with the rules and regulations pertaining to fire prevention and control among them, and that they have taken serious measures to continuously improve on mitigation and preparedness to fire disasters. The extent to which these obligations have been met over time, and the level of influence the frequency of fire disasters have had on the process will form the key focus of this study.

## 1.2 PROBLEM STATEMENT:

Over the past few years, many fire disasters have occurred in Kenya more so around Nairobi. Property worth billions of shillings has gone to waste, infrastructure destroyed, lives lost and injuries inflicted. Many people have been impoverished as a result. Whether occurring at night or during the day, fires in Nairobi have been characteristic of consuming all the structures and their contents, thus posing great threats to livelihood property and environment.

Not so much is known as regards the causes of these fires, but what is very clear is that their frequency has been rising over time. This could be derived from the frequency of reporting through the mass media for there is no systematic recording of fire disaster occurrence, and their impact. As pointed out earlier in this proposal, scholars in this field have singled out recording of fire disasters as a crucial prerequisite to logical fire control and prevention planning. Injuries, fatal and non-fatal need be accurately quantified so as to clearly indicate the losses in these respects.

Similarly, lack of proper analytical fire disaster recording systems negatively influences the levels of actual and planned fire disaster control and prevention strategies, because it is not possible to size up the expected response requirements in the event of such outbreaks. Only after adoption and use of appropriate recording and damage quantification methods, could the NCBD entrepreneurial community and the Kenya government at large, understand the true definition and meaning of fire disasters and their impacts. It will be interesting to find out how much of such reports the NCBD entrepreneurs are able to come by.

Whenever these fires occur, the subsequent response operations have always been slow, inefficient and almost always leading to high costs in terms of losses. The response system does not satisfy the response requirements as to ensure adequate fire control. As a result, fire outbreaks almost certainly lead to major losses. Rarely are these fires put off to assure the NCBD entrepreneurs of safety of the self or their merchandise. As Giddens (1990) puts it, they live under conditions of decreased ontological security, a state of perpetual fear of unstable surroundings. With a poor fire response system therefore, the best option is to ensure that; either there is no

ignition at all, and if it does occur, then minimal damage results. This directly commits the NCBD entrepreneurs to think about and act as to satisfy their fire related security needs.

With a rising level of fire disasters, it is expected that the measures taken require commensurate improvements for the NCBD entrepreneurs to eventually qualify for adequate insurance covers for their properties. It will be the interest of this study to evaluate whether there are any measures taken at all, and whether they are individual or collective/corporate now that there is formation of an umbrella body (the NCBD Association) uniting all entrepreneurs in the Nairobi.

Under this body, it is the expectation of this study that the unified entrepreneurial community has negotiated and given some direction to this common problem. Accordingly, Haralambos (1980:17) argues that social interactionism provides that since interactions are concerned with definitions of situations and self, they are also concerned with the process by which those definitions are constructed. As a result, definitions and meanings are therefore constructed in interaction situations by a process of negotiation. It will be interesting to find out how much the frequencies of fire disasters in Nairobi have called for a collective approach to the problem.

Fire disasters around Nairobi have in the recent past been seen as much the same as the diseases in the early part of the 19<sup>th</sup> century; unpredictable, unlucky and part of every day risk of living, more so running business. The pattern is fairly unpredictable, magnitude varying, and damages devastating. Many other factors have in effect contributed to the increased potential for fire occurrences. These may include intensive urbanization, high population concentration within Nairobi, increased crime rate in relation to arsonists' activities, rising poverty levels and inadequate legislation and enforcement procedures/processes. These could be looked at as indirectly contributing to the increased fire disasters within Nairobi. NCBD entrepreneurs therefore have to contend with a rising demand for mitigation and preparedness, against fire disasters in the midst of much more than cited in this proposal. This is however upon knowledge and the consolation that fire disasters are largely preventable.

This study therefore aims at establishing what measures the NCBD entrepreneurs have put up, to mitigate and prepare towards fire disasters, and the extent to which they have ensured that these measures have been improved over time as to effectively achieve an appreciable level of performance in containing the ever increasing fire out breaks. In achieving the demands highlighted above, this study will be guided by the following questions.

1. How is NCBD entrepreneurs' understanding of the mitigation and preparedness measures required for fire disasters?
2. What mitigation and preparedness measures have the NCBD entrepreneurs taken against fire disasters?
3. How adequate do the NCBD entrepreneurs consider the mitigation and preparedness measures taken in relation to fire prevention and control?
4. To what extents have the mitigation and preparedness measures taken by NCBD entrepreneurs changed over time?
5. To what extent could the change in the measures taken be attributed to the increasing frequency of fires disasters?

### **1.3. GOAL AND OBJECTIVES OF THE STUDY.**

The study has the broad objective of investigating the relationship between increased fire disasters and investment in mitigation and preparedness towards control and prevention of these disasters by the NCBD entrepreneurs. To achieve this goal, the study will aim at achieving certain specific objectives that include:

1. To examine the NCBD entrepreneurs' understanding of the mitigation and preparedness measures required for fire disasters.
2. To determine the mitigation and preparedness measures taken by NCBD entrepreneurs against fire disasters.
3. To determine how adequate the NCBD entrepreneurs consider the mitigation and preparedness measures they have taken towards fire disasters.

4. To determine the extent to which the measures taken by the NCBD entrepreneurs in mitigating against and preparing towards fire disasters have changed over time.
5. To explore the extent to which mitigation and preparedness measures taken could be attributed to the increase in the frequency of fire disasters.

#### 1.4 JUSTIFICATION OF THE STUDY

Escalation of disastrous events world over has attracted an increased focus on the issues of disaster management. Today, many economies in the world are spending a significant percentage of their budgetary allocation to mitigate and prepare for disasters affecting their countries, in order to minimize losses arising from such events. This is in due recognition of the fact that there can be no sustainable development, in the absence of appropriate disaster management. Disasters act as external interferences/disruptions to man's preferred environment. According to Haralambos (1980:19), positivists believe that human behaviour is determined by external stimuli such that reactions to such external stimuli can explain the behaviour of men.

In the world of fire disasters, countries especially in the developed world have shown a marked increase in fiscal allocation to target control and prevention of disasters. The frequency of fire disasters worldwide is also rising. Jain (1986:6) premises that the materialistic society as per the western concept has brought about huge industrialization, which is totally based on fuel consumption and energy utilization. Most of the energy utilization processes are hazardous, especially those that are fire based, using electrical and fuel burning processes.

A great contrast exists in view of the developing world's planning and attitudinal commitment to disaster preparedness, a situation that is characterized by official and public apathy according to Drabek (1986:176). This leaves individuals and organizations to develop and execute their own disaster preparedness and mitigation strategies in the midst of escalating disaster events such as fires in Nairobi.

According to Drabek (1986:386), resources necessary to accomplish adopted disaster preparedness goals though in some cases allocated have not been forthcoming. The arising situation is such that the sole responsibility is left to the private entrepreneurs, as is the case in NCBD and fire disasters. This however remains a mere allegation until otherwise proved by such a study. The behaviour of the NCBD entrepreneurs in the face of increased fire disasters is of great concern to this study in due consideration of the escalating fire disasters against poor public response strategies and the need for continued operation.

The government has put some efforts towards disaster management in this country, though a lot more is still required done. Some of the notable efforts include establishment of the arid lands management unit in the office of the president, whose main function is famine relief targeting and food aid distribution. In the same office the National Disaster Operations Centre charged with the responsibility of responding to disasters occurring in the country is housed. This centre has come up with a draft Kenya Disaster Policy, aimed at its transformation into an authority, to enhance its operational capacity. Through the draft Disaster Management Policy 2001:8 (to be tabled before parliament), fire precaution and fire service bills have been proposed for enactment. This is upon recognition of the fact that fire is an economically important disaster of relatively high frequency in Kenya, requiring to be managed properly.

Before such bills reach enactment stage, people will need to be safe, operations to run unabated as well as the NCBD entrepreneurs to improve on their business ventures. There is therefore need for an evaluation of what control and fire prevention mechanisms exist, and how sustainable they are in the short run for the entrepreneurial community. This is a situation that needs to be investigated through this study, in order to assess the efforts in the desired direction and the arising levels of safety for those concerned, with an aim of advising on preferable cost effective measures that would ensure the desired position.

As the world gets more modernized, we cannot help experiencing what Giddens (1990), calls "consequences of modernity". Increased fire disasters are some of the consequences that we have to contend with.

The causes of these fires are also as complex and mysterious, as are the effects they tag along. Information about the frequent fire disasters has been reaching the NCBD entrepreneurs through various means. Toan A. B. (1968) asserts that information is inseparable from the management process, and that the significant elements of running business (planning, organizing, operating or controlling), cannot exist in a practical sense without information. Fire disaster information therefore has the aspect of influencing the target group to take up appropriate mitigation and preparedness measures. This study is thus important in that it will collect the relevant information on fire disaster mitigation and preparedness and make recommendations for the appropriate strategies to combat the ever-increasing fire disasters, especially in the urban set-ups.

According to Raphael (1997), multiple losses lead to a state of helplessness to the survivors. This is a state of affairs into which the NCBD entrepreneurs many not wish to find themselves, not forgetting that they are in business. As a result, they are expected to continuously update their levels of mitigation and preparedness to achieve comfortable degrees of readiness. An assessment of the available disaster information channels and their appropriateness will guide the process towards advising the NCBD entrepreneurs on the appropriate actions to take in updating; correcting or improving mechanism established to guarantee a fire prepared NCBD entrepreneurial community.

No study has been conducted in the country to evaluate how increased fire disasters influence the measures taken to reduce associated risks and vulnerabilities. This study will therefore base its focus on the NCBD entrepreneurs' actions to contain the ever-increasing threats of fire. Further on this study will generate information that will contribute positively to policy development in terms of mitigation and preparedness to fire disasters in urban areas. Disaster policies in use currently have had a heavy inclination or reliance on foreign sourced information, which may to some extent, not be fully compatible with the local demands. Such information will not only find use in the business world but in the government strategic long term planning, as well as corporate fire prevention planning, and protection efforts.



## 1.5 SCOPE AND LIMITATIONS OF THE STUDY

The homogeneity of fire protection efforts and the need to enhance fire protection and ensure continuity of business by entrepreneurs are the principle guiding criteria to the choice of NCBD as the area of study. The study will be conducted within the Nairobi Central Business District (NCBD), which covers the business centre of the city, targeting only those entrepreneurs with permanent businesses. Included in this category, are those who have various types of businesses, offices or any other related engagement within the NCBD. Only those respondents who qualify to the criteria will be involved in the study. The statements above therefore imply that the unit of analysis will be the NCBD entrepreneurs.

This study will assess the awareness levels and their creation processes, fire prevention safety precautions as well as fire consciousness with an aim of recommending and emphasizing enhancement of these aspects. Other aspects of maintenance of fire equipment and their use will be given some focus in terms of analyzing their presence and operational readiness. The study will be limited to those mitigation and preparedness measures that have been taken up by the NCPB entrepreneurs towards fire disasters in the last few years.

In an attempt to evaluate the actual reasons influencing the choice and intensity of measures taken, the study will concentrate on the relationship between the measures taken and the increased fire incidences within Nairobi. Levels of mitigation and preparedness will be evaluated in order to establish how they have come about over time. Improvements made in the fire disaster mitigation and preparedness will also be evaluated to determine the correlation between increased disasters and investment in measures taken.

Due to time and financial constraints, the study will focus on only those entrepreneurs within NCBD, who have permanent business ventures as opposed to the hawkers and Kiosk owners/operators. The study has chosen NCBD as opposed to the greater Nairobi for feasibility of conducting the it in view of the diversity of Nairobi as a large city. Mitigation and preparedness measures have been chosen as opposed to the entire fire disaster management process owing to the unavailability of information on the response and recovery processes arising from absence of data and as mentioned

earlier, the time and financial constraints. The two are also considered as key steps in averting losses to fire disasters, since response to fire has overtime proved unreliable especially response to urban fires. They are also the actions that can be taken prior to disaster occurrence, implying that intensified efforts in this direction considerably reduce fire-related losses.

## CHAPTER TWO

### 2. LITERATURE REVIEW, CONCEPTUAL AND THEORETICAL FRAMEWORK.

#### 2.1 LITERATURE REVIEW.

##### 2.1.1 The concept of disaster management

Disaster management in Kenya has not developed to the extent where systems are fine-tuned to effectively and efficiently prevent, control and manage disasters. This subject has also not been given so much attention locally, thus forcing this study to almost entirely rely on studies done elsewhere. The Federal Emergency Management Agency (FEMA), which is charged with disaster management in the USA, will be one key source of such information. According to FEMA-DMM (II: 2), disaster management activities are divided into four phases that require different types of organization and preparation.

These phases include mitigation, preparedness, response and recovery. **Mitigation** is the initial phase. It should be considered long before a disaster occurs and includes any activities aimed at eliminating or reducing the probability of occurrence of a disaster. These are the activities designed to postpone, dissipate, or lessen the effects of a disaster. An example is the regulation of transportation of hazardous cargo through congested urban areas.

The second phase **preparedness** is an “insurance policy” against disasters since we cannot mitigate against every disaster. It is undertaken because mitigation activities cannot keep disasters from happening. Preparedness activities include planning in order to ensure the most effective and efficient response efforts to minimize damages, such as forecasting and warning systems, and laying the groundwork for response operations, such as stockpiling supplies and surveillance facilities for fallout protection. This according to FEMA, logically leads to the **response** phase.

Response is the first phase that occurs after the onset of a disaster. It is intended to provide emergency assistance for casualties including search and rescue, shelter and medical care, to reduce the probability or extent of secondary damage through such measures as anti-looting security patrols. It also aims at reducing damage by efforts

such as sandbagging against impending floodwaters or remedial movement of shelters in heavily contaminated fallout areas, or other measures that will enhance future recovery operations, such damage assessment.

**Recovery** activities continue beyond the disaster period immediately following the onset of a disaster. This phase could be divided into relief, restoration/rehabilitation, and reconstruction. The purpose is to return all systems, both formal and informal, to normal. Recovery efforts could be broken down into short-term and long-term activities. Short-term activities attempt to return vital human systems to minimum operating standards and usually encompass approximately a two-week period. For example, crisis counselling may help victims of a catastrophic loss. Long-term activities stabilize all systems. These include such functions as redevelopment loans, legal assistance, community planning and radiation exposure control, which can last as long as years after a disaster.

The phased disaster management activities cannot be achieved without conducting a thorough **hazard analysis**. According to FEMA-SM (1990:11) hazard analysis is a necessary step in risk analysis, which is a prerequisite towards formulating disaster management plans. A systematic and thorough hazard analysis greatly enriches the process of development of emergency management plans. The analysis identifies all possible threats and vulnerabilities; presents historical data about past disaster assessments, future probability and frequency of disasters, and validates gathered data. Considerations include the predictability, frequency, controllability, duration, scope and intensity of Hazardous Materials (HAZMATs).

According to FEMA- SM (1990:11), hazard analysis involves three basic steps; hazard identification, which provides information on the identities and quantities of HAZMATs in the community; the location of facilities that use, produce, process, or store the HAZMATs; their physical and chemical properties; storage conditions; transportation routes; and the nature of associated hazards. According to FEMA- SM (1990:11), vulnerability analysis involves identification of the geographical zone within a given community that may be affected by the release of a hazardous substance; the population within each zone that is subject to harm; critical facilities

(for instance, hospitals) that are at risk together with the property and environmental systems that may be damaged.

According to FEMA- SM (1990:11), the next step is risk analysis, which builds on the results of the previous two (hazard identification and vulnerability analysis). Risk analysis is designed to provide a means for emergency planners to evaluate and compare different risks by assigning a measure to hazards and ranking them. For a community to gain knowledge of what risks it faces from various hazards, it must conduct a hazard analysis with an aim of mapping out the hazards within their areas of likely occurrence thus developing a hazard map.

Risk analysis provides a means to judge the relative likelihood of a release and the magnitude of harm to humans should it occur. The analysis includes; a judgment of the probability of the release; a judgment on the severity of consequences; and a basis for comparing sites to establish priorities for emergency planning, (FEMA- SM (1990:13). Risk to fire as a hazard need be examined in any community, and relevant response plans developed to counter its effects. It will be interesting to realize how much of this risk analysis has been conducted in the NCBD and what plans have been put in place.

### **2.1.2 Mitigation measures**

As earlier explained, the principal focus of this study will be to evaluate the mitigation and fire disaster preparedness measures taken by the NCBD entrepreneurs in line with how the two are influenced by the increased frequency of fire disasters. According to Coburn et al (1991), mitigation has the functional attributes of saving life, reducing economic disruption and reducing vulnerability. The more vulnerable a community is the higher the extent of suffering in the event of a disaster.

Fire disasters in Nairobi have had devastating effects especially in the slum areas where mitigation and preparedness measures are either few or completely non-existent. The only reason that may explain occurrence of fewer fire disasters within the core of the NCBD as compared to the greater Nairobi is that, entrepreneurs operating within this area, have considerably improved on their abilities to prevent

fire from occurring, and the actual early extinction of fire should it occur. This implies that they have put up efforts towards control, prevention and actual readiness to respond to such incidences. This could either be through their own efforts out of fear of suffering the effects of such incidences, or in keeping with the requirements of the law or the insurance firms, some of the factors this study aims at identifying.

Coburn et al (1991) argue that, the range of techniques that an authority might consider in order to assemble an appropriate package for disaster mitigation can be classified into engineering, spatial planning, economic, management and institutionalisation, societal and conflict reduction. These are however not relevant to all disasters, more so for fire disasters. Considered here below are some of the mitigation measures that would be appropriate to the study area

#### **2.1.2.1 Building code (Regulations)**

The sixth schedule of bylaw 27 of the Kenya building code deals with fire safety in public places, hereby referred to as assembly places and divided into 6 different groups or categories for the purpose of covering the appropriate consideration of each. All construction design considerations and the installations for fire controls include the passive measures of fire control.

The Kenya building code as contained in Kenya law Cap 214 requires provision of fire fighting equipment considered necessary by the respective local authority for different types of buildings. Such equipments are used for the first strike in fire fighting. They could be automated or manual, and the choice of the type to be installed greatly depends on the risk being catered for, size of building, available capital as well as fire service requirements. A fairly wide range of equipment including fire detectors, sprinklers, hand extinguishers, and standpipes with wet and dry risers among others, qualify for the purpose.

According to Jain (1996:134) a wide variety of rules and regulations regarding fire safety of buildings both nationally and internationally do exist. Although all codes and local bylaws in respect of fire safety are based on the same theme, they differ vastly in their methods of application.

Fire regulations can be broadly divided into three categories.

- Mandatory/obligatory
- Recommendatory
- Empirical

According to Jain (1996:134), mandatory or obligatory regulations are those introduced by local administrations like municipal corporations or by state governments in case local administration has not made any rules regarding fire security. Recommendatory regulations are available in the shapes of codes and drills formulated by Bureau of Standards. The most important out of these standards is the National Building code. Fire Protection provides sufficient guidance regarding all active (first aid or fire brigade portable or fixed) measures and passive (architectural and construction) measures to be adopted during design and construction of buildings. The code of practice/regulations provides sufficient guidelines on national basis, in line with the provisions of the given county's legislation. This study will aim at establishing what passive or active fire protection efforts have been employed by the NCBD entrepreneurs, and whether they are voluntarily installed or as adherence to a set of standards.

The building code by-law No. 69 according to the legal notice No. 15 of (1987:30) fire resistance generally requires that various parts of a building shall resist fire for specified period. Building code (BC) No. 71 a, and b, refers to compliance to requirements for non-combustibility and fire resistance up to achieving the specifications. Code No. 134 indicates that the walls separating buildings should be put up with fire resistance materials. According to Legal notice No. 15 (1987:32) Building Code No. 75 specifies that the upper floor of storied building should be put up in such a way that it adheres to specification of the British standard 476.

The BC No. 77 specifies that external wall of any building other than small houses should be resistant to fires for not less than 2 minutes. Building code No. 83 specifies that buildings which are used as warehouses should be divided internally with fire division walls so that the floor area exceeds 15 000 Sq ft. The fire division should meet the specifications of paragraph 2,4,5,6 & 7. BC No. 87 specifies the fire resistance of floors columns beams and certain walls.

BC 94 specifies the roof protectionism against fires. According to Culton (1991:13) the regulatory body should be responsible for maintaining a database with regard to hydrocarbon leaks, spills and ignition. This data should be made available for the purpose of carrying out quantified risk assessment. It is therefore clear that fire containment has to start with being given proper considerations at the time of planning and construction of buildings.

#### **2.1.2.2 Engineering / Design Measures**

Engineering measures are those that result in stronger individual structures that are more resistant to various hazards. Adherence to building codes is a critical consideration towards achieving stronger engineered structures, which are also fire resistant. According to Jain (1996), engineering materials resistant to fire should be used to reduce the chances of ignition.

Coburn et al (1991) argue that training techniques to teach builders the practicalities of disaster resistance in construction are the well-understood mitigation actions available to disaster planners. Jain (1996:132), argues that fire safety in buildings is deemed to cover the aspects of fire prevention, fire fighting and extinguishing methods, and fire salvage operations. Fire safety aspects include passive fire prevention/protection means and active fire prevention/protection means.

It is generally understood that passive fire prevention means are a must i.e. mandatory and obligatory and active fire prevention means may be adopted as a bonus. The higher the adoption rate of the latter measures, the better for the owner or user of the concerned building. Passive fire prevention/protection means are those which are taken care of during the design stage of a building and do not need any energy consumption there after, which this study does not intend to evaluate.

Jain (1996:133) accordingly describes the active fire prevention means as the fire security and fighting methods, which could be either fixed or portable. They may include portable fire extinguishers, fixed first-aid fire fighting equipment like hose-reels, fire hydrant installations like wet risers and yard hydrants, manual/automatic fire detection and alarm systems, fixed automatic fire fighting systems,



water sprinklers and emulsifier systems, CO<sub>2</sub> fire fighting systems, halon fire fighting systems, mobile fire fighting systems and brigades, and fire salvage corps.

They could be broadly categorized into fire detection, fire alarm, fire extinguishing/ fighting and fire salvage operations.

Bird and Docking (1949:63/4) classify the means of fire protection into: those geared towards providing safe means of escape from buildings; those used to identify the possible source of accidental fire; those for detecting outbreak and timing the rate of spread within a building both to facilitate escape and restrict damage to contents; those providing means of extinction in the early stages of fire, which are either automatic or hand-operated or both. Also included are those providing means of efficient professional fire fighting services; and finally those limiting the risk of spread of the fire from building to another and from one group of building to another.

### 2.1.2.3 Classification of Buildings

Many hazards are localized, with their likely effects confined to specific known areas. Some disasters such as famine are even predictable to some reasonable extent. Restricting human habitation in identified hazard areas could reduce effects of such hazards by reducing their vulnerability to the hazards. Fire on the other hand could be localized with high chances of spreading to other areas thus making it a special hazard requiring serious consideration. According to Jain (1996: 136/7) buildings could be classified based on occupancy in respect of making active or passive fire fighting provisions to fight and/or control fire. Of concern in this study, are the group E and F categories, which are the most common within the NCBD.

Group E or business buildings are any building or part of a building which is used for transaction of business (other than that covered by Group F); for keeping of accounts and records and similar purposes, professional establishment, service facilities, etc. City halls, town halls, courthouses and libraries shall be classified in this group so far as their principal function is transaction of public business and keeping of books and records. Business buildings are further sub-classified into many sub categories, which this study does not wish to concern itself with.

Further on, Jain (1996:137) clarifies that Group F buildings include, the mercantile category which are any building or part of a building, which is used as shops, stores, and market for display and sale of merchandise either wholesale or retail. Mercantile buildings are further sub-classified into F-1, which includes shops, stores, and markets with an area of up to 500 square metres, and F-2 to include underground shopping centres and departmental stores with area of more than 500 square metres.

#### 2.1.2.4 Economic Considerations

Coburn et al (1991) argue that economic development is a key disaster mitigation strategy, in that a strong economy translates into best protection against disasters.

A strong economy means more money to be invested in control and prevention mechanisms, and reserves to cope with future strategies or mitigate recovery. It reduces vulnerability to fire disasters by ensuring that all standards, recommendations and decrees are adhered to.

A sound economy also sponsors research into new strategies to lower the rate of fire occurrences in any one given community. The NCBD entrepreneurs are regarded as economically able people, and therefore capable of installing all the recommended anti-fire devices. According to Ndun'gu (1991:4) -unpublished dissertation work on fire safety in the Main Campus of the University of Nairobi- *One cannot possibly ignore the role played by proper design for fire safety in buildings. It is vital that architects and builders follow to the letter; provisions made for fire safety in the codes and even improve on them. This together with advanced research findings about fire protection has enabled us to prevent and handle competently fires that would otherwise have been catastrophic. People involved have saved many lives and property through prompt action, instituting suitable evacuation systems, fire containment and suppression depending on the premises or user and the situation.*

#### 2.1.2.5 Social Considerations

Mitigation to disasters will only be employed where there is a consensus that it is desirable. According to Haralambos (1980:16), social interactionists theorists assume that action is meaningful to those involved; following that an understanding of the action requires an interpretation of the meaning, which occurs resulting from their activities.

Mitigation planning should therefore aim at a disaster safety culture where the general public is aware of the potential hazards, chooses to protect itself as fully as possible and can readily support efforts made on its behalf. This study assumes that through the various fora, NCBD entrepreneurs have had sessions where fire safety, under the increasing fire disasters has been discussed and a way forward devised; a situation which this study intends to confirm

#### **2.1.2.6 Management and Institutionalization of disaster mitigation.**

According to Coburn et al (1991), disaster mitigation also requires certain organizational and procedural measures. The process of installing significant risk reduction measures such as location planning; upgrading structures and buildings takes quite a long time.

Policies and objectives should guide the mitigation processes if it has to be sustained over a long time, thus calling for establishment of a regulatory organization or a standards setting and enforcement entity. Accordingly, education training and the development of professional expertise are necessary components of institutionalising disaster mitigation. Within the NCBD, lies the National Disaster Operations Centre (NDOC) whose primary objective of existence and operation remains to control, prevent and respond to disasters within the country. This study aims at establishing the synergies developed between the NCBD entrepreneurs and the NDOC out of the realization of the benefits accruable, in both short and long term to the entrepreneurs.

#### **2.1. 2.7 Timing for mitigation**

Risk reduction measures of mitigation are often placed in the pre-disaster time frame. In fact, the most opportune time to implement mitigation is the period after a disaster. Public awareness of the problems posed by hazards is high and political will to act may also be at its peak. This period probably will not last for more than two to three years, before other development priorities take precedence. According to the proposed Kenya Disaster Management Policy (2001), public response to disasters has always been reactive. The same document recognizes the need for proactive disaster response strategies, and intensified public awareness campaigns on various disasters as a key strategy.

Under the NCBD conditions, fires have always been occurring, thus providing a constant reminder on the need to update the emergency protection efforts. As a result, it is the expectation of this analysis that risk reduction measures have been updated over time, which will therefore be evaluated.

### 2.1.3 Disaster preparedness

The concept of disaster preparedness has the objective of ensuring that in times of disaster there are appropriate systems, procedures and resources in place to assist those afflicted by the disaster and enable them to help themselves.

According to Kent (1991), "The aims of disaster preparedness are to minimize the adverse effects of a hazard through effective precautionary actions and to ensure timely appropriate and efficient organization and delivery of emergency response following the impact of a disaster."

Disaster risk reduction is intended to minimize the adverse effects of a hazard by eliminating the vulnerabilities, which hazards otherwise would expose and by directly reducing the potential impact of a hazard before it strikes. Disaster preparedness in its starkest form assumes that certain groups of people will nevertheless remain vulnerable, and that preparedness will have to address the consequences of a hazard's impact. It is important to note that the term used in "precautionary actions," makes end product of disaster preparedness be seen as a static plan to be devised and then filed until it is needed. Disaster preparedness on the contrary, must be seen as an active and continuing process. Of course, both plans and strategies are required, but they both must be dynamic ventures, which are frequently reviewed, modified, updated and tested.

Perhaps one of the most difficult aspects of disaster management is that of timing. Timing also impinges upon the concept of disaster preparedness. Speed and timeliness have often been treated synonymously, which is a major conceptual flaw. Decisions related to timing must consider the relationship between relief input and their effects.

In some types of disasters, flood, for example, there are certain basics such as shelter and clothing that may be required immediately. In terms of alleviating immediate distress, speed is critical. However, there are other forms of relief assistance that, under certain circumstances, may be disruptive unless delayed. Food assistance is one obvious example. Rushing in massive amounts of food aid before a clear assessment of local market conditions and agricultural prospects are known to create unwarranted dependency and undermine local economies. Timeliness – not speed – should be the criterion for preparedness.

According to Kent (1991), appropriate assistance demands careful scrutiny.

The issue goes to the important and natural link between disaster preparedness, recovery and rehabilitation. Ultimately we need to ask if one of the key objectives of disaster preparedness – the provision of appropriate assistance – is designed merely to ensure the immediate survival of affected communities or, in ensuring immediate survival, to simultaneously pave the way for recovery?

Efficient organization and effective disaster response delivery suggests obvious criteria for effective disaster preparedness. Systematic planning, well executed, distribution, clear-cut roles and responsibilities are all vital. However, too often disaster situations create conditions of chaos. The best-laid plans can mitigate but not eliminate the chaos. To the extent possible, preparedness plans should try to anticipate what to do when plans do not appear to work. The key here is to ensure that efficiency is measured in terms of the ability to deliver needed assistance to those most vulnerable. In the final analysis, the most important test of efficiency is that those in need are adequately provided for.

There are several major components involved in disaster preparedness, which provide a framework upon which a national disaster preparedness strategy can be developed. To narrow down this approach, NCBD entrepreneurs could benefit from the recommendations by way of an assessment as to whether their preparedness measures follow the proposed guidelines to any reasonable extent. All those guidelines considered below will not necessarily be evaluated in this study.

### **2.1.3.1 Assessing vulnerability.**

According to FEMA SM (1990:11), vulnerability assessment involves the identification of the geographical locations in any given community, which may be affected by a disaster. Information on the populations at risk, critical facilities that could be affected as well as the property and likely environmental systems that could be damaged, is important in planning measures that could be taken either to avoid or contain the disaster. Fundamental to all aspects of disaster management more so preparedness is information. It is a point that may appear obvious, but it is frequently overlooked. The disaster manager or community officials may know that a particular geographical region or community is susceptible to the impacts of sudden or slow-onset disasters out of the information available.

However, in reality, until a decision is made on systematic ways to compile and assess information about disaster vulnerabilities, the manager or community officials will be working in a void. Developing and compiling vulnerability assessments is one way of systematically approaching disaster preparedness as a means of establishing an essential disaster management tool.

### **2.1.3.2 Institutional framework**

According to Kent (1991), a coordinated disaster preparedness and response system is a prerequisite to any disaster preparedness plan. Each system design will depend upon the traditions and governmental structure of the country under review. However, without ensuring that there is "horizontal" and/or "vertical coordination", a plan will rapidly disintegrate. This requires a structure for decision-making, interpersonal committees to coordinate the plan, focal points within each committee to be responsible for the plan's implementation and communication, as well as community structures to implement the plan at the local level. This study aims at evaluating whether such organized institutional framework exists within the auspices of the NCBD, and how it has been used to enhance disaster protection efforts.

### **2.1.3.3 Information systems**

A preparedness plan must have an information system. For slow onset disasters this should consist of a formalized data collection process, and early warning system (especially for regions prone to specific disasters) and a monitoring system to update

the early warning information. For sudden onset disasters such as fire, a similar system must be in place for prediction, warning, and evacuation communication. Information about fire outbreaks should be dispatched rapidly. According to Murray (2000:20) "rapid means within 30 seconds". This study aims at evaluating how fire disaster protection information is transmitted among the NCBD entrepreneurs and other stakeholders, as well as how the disaster information itself is communicated.

#### **2.1.3.4 Resource base**

The argument posed by Kent (1991) is that in order to optimize disaster preparedness, certain requirements to meet an emergency situation will clearly be necessary and should be made explicit as to cover all aspects of disaster relief and recovery.

The range of relief requirements is too extensive, but some of the major requirements include; shelter, medicines, supplementary food, communication systems, logistics systems, relief workers, and clearance equipment. It will be interesting for this study to reveal how the NCBD entrepreneurs meet such commitments, whether as individual or collectivities.

#### **2.1.3.5 Preparedness planning**

According to Murray (2000:13), achieving and maintaining a high performance in fire control requires an integrated programme. Throughout all the activities designed to promote disaster preparedness, the ultimate objective is to have plans in place that are agreed upon, that are *implementable* and for which commitment of resources are relatively assured. The plan itself will have to address other points in this framework.

#### **2.1.3.6 Public education and training**

According to Kent (1991), the focus of a disaster preparedness plan should be to anticipate, to the extent possible, the types of requirements needed for action or responses to warnings and a disaster relief operations. The plan should also specify the most effective ways of ensuring that such requirements are met. Yet, the process will only be effective if those who are the ultimate beneficiaries know what to do in times of disasters and know what to expect. For this reason, an essential part of a disaster preparedness plan is the education of those who may be threatened by disaster such as the fire disasters in Nairobi.

This study intends to reveal how information on response to fire is passed within the NCBD entrepreneurial fraternity and how this has been influenced by the increased frequency of fire disasters within Nairobi.

#### **2.1.3.7 Warning systems**

According to Jain (1986:358), any fire protection system will have major functions to be performed, which include; fire prevention and isolation, fire detection, fire alarm (visual and audio), fire fighting and extinguishing, salvage and insurance functions. For most types of rapid onset disasters like fire, a warning system can save many lives. By giving a vulnerable population adequate notice of an impending disaster, they can either escape the event or take precautions to reduce the dangers.

Coburn et al (1991) accordingly argue that it must be assumed that functioning communications systems, such as telephones and telexes, may not be available in times of a major disasters; as such planning a warning system should begin around that assumption. Preparedness plans should include provisions for access to alternative communication systems among police, military and government networks. This study intends to evaluate how the communication system or systems established by the NCBD entrepreneurs have been affected by the increased fire disasters within Nairobi.

#### **2.1.3.8 Response mechanisms**

According to Kent (1991), the plans' ultimate test is the effectiveness of response to warnings and disaster impacts. At a certain stages in the warning process, various responses will have to be mobilized. The staging of responses becomes an essential factor in designing a preparedness plan.

#### **2.1.3.9 Evacuation planning:**

According to Kenya Red Cross (KRCS/DRPD/FSERP/2002:2), fire safety emergency action plan; there is no use having a properly working alarm or fire-extinguishing system if there is no evacuation plan especially for homes and schools. In the panic of a fire, it is usually impossible to locate keys in order to release dead locked doors. It will be the interest of this study to evaluate whether the NCBD entrepreneurs have



evacuation plans, and how they have improved them over time in the advent of increased fire disasters.

#### **2.1.3.10 Rehearsals (drills)**

Kent (1991) indicates that military maneuvers cannot fully portray the reality of battle, neither can disaster preparedness rehearsal portray the full dynamics – and potential chaos – of a disaster relief operation. However, that fact should provide no excuse for avoiding the need to rehearse the disaster preparedness plan. Not only will rehearsal re-emphasize points made in separate training programmes, but they will also test the system as a whole and, invariably, reveal gaps that otherwise might be overlooked.

#### **2.1.3.11 Mutual Aid Agreements:**

According to Meyers (1994:49) agencies and jurisdictions could benefit from mutual agreements, which include assistance such as fire, rescue, law enforcement, medical services, public works and engineering works. Mutual aid are preparedness measures designed to ensure that additional resources are provided to a given jurisdiction by the neighbouring one(s) whenever disaster has consumed their own resources; or when such resources are in short supply. Through the proposed study, it will be worthy finding out whether there are any mutual aid agreements entered into as preparedness measures during fire incidences, with any organization, jurisdiction or agency operating within or around Nairobi.

## **2.2. CONCEPTUALIZATION**

### **2.2.1. The conceptual framework**

Fire has been very useful to man over a long time. When used in its proper confines, fire does not call for precaution or alarm. However fire poses danger whenever it gets out of control. When, and if this happens, irreparable damage occurs to both life and property within the affected premises. Uncontrolled fire may not be an everyday phenomena and at least on the largely destructive scale. This may lead to not only negligence of fire safety but to often deliberate overlooking of the same in order to attend to other seemingly more demanding problems.

It is not until when something disastrous happens that people begin to appreciate the destructive potential of fire. No wonder it took the 1966 great fire of London, to shake the U.K. into formulating and enforcing comprehensive regulations to prevent and control spread of fire. This was the turning point in the history of fire fighting or prevention, despite the industrial revolution of the early 19<sup>th</sup> century when a new and greater magnitude of fire risk became apparent.

Mitigation measures aim at either completely eliminating chances of an ignition, or ensuring that least damage is incurred. In this particular study, mitigation measures are considered as part of dependent variables. Investment in mitigation under conditions of increased fire disasters will therefore aim at ensuring that entrepreneurs in the NCBD suffer least effects of fire disasters.

Mitigation will therefore aim at reducing vulnerability to fire, which has the direct impact on reduction of the severity of consequences. The more vulnerable situations are to fire disasters the greater the damage caused. Employment of the "correct" mitigation strategies and mechanisms enhances fire disaster vulnerability reduction. These measures always change with time and prevailing predisposing factors. The more frequent and severe the fire disasters, the greater the need for more combative mitigation measures. In this study therefore, increased fire disasters is the independent variable.

This study aims at evaluating how the recent increase in fire disasters, has influenced the levels of mitigation measures undertaken or generally investment in mitigation by the NCBD Entrepreneurs. In this study we shall rely on more than one indicator to try and closely capture the total imagery of the concept. This is in view of Singleton et al (1988:99) argument that indicators provide imperfect representations of the concept, since no one indicator will measure a variable in the same way.

The indicators of mitigation measures in this study will be in terms of the actual efforts towards fire disaster control and prevention. This could be in terms of types and numbers of fire extinguishers installed and how they are serviced over time to remain responsive, knowledge and preference of fire resistance walled buildings for occupation, types of insurance covers taken, number of trained personnel on fire

safety, fire early warning equipments installed and other relevant considerations in the choice and maintenance of the premises.

Mitigation alone is not good enough. Some fire incidences will still occur however much we mitigate. There is therefore need to develop capacity to contain the situation prior to its occurrence, so as to reduce on the losses. The need for preparedness measures therefore to face or counter the fires disasters should they occur, cannot be over overlooked. This is yet another dependent variable to the increased frequency of fire disasters. It is the expectation of this study that improvements in this aspect will be apparent, with increased fire disasters. As to what extent, will be one of the key findings of this study.

Some of the measurable indicators this study will evaluate will be in terms of investment in planning for response to fire disasters, drills and exercises of fire response plans, establishment of elaborate fire warning systems, established contacts for support in case of need, Improvements in communication of fire outbreaks, presence of elaborate fire escape routes, as well as servicing and upgrading of the fire fighting equipments to maintain some level of operational readiness.

NCBD entrepreneurs have had their ontological security considerably reduced by the recurrent fire disasters in the city. According to A. Giddens (1990) ontological security is the confidence in the continuity of self-identity through consistency of the surrounding social and material environment. It is the consistency on belief that one is unlikely to face danger. Disasters reduce the amount of ontological security. With the consistency of ontological security being offered by environment being inversely proportional to the risk factors, the most likely reaction by man is to reverse such situations.

It is expected that the NCBD entrepreneurs will act as to institute measures to increase assurance of safety from fires. This implies that they will mitigate to and prepare for fires. This study will try to evaluate the extent to which increased fire disasters therefore a reduction in ontological security have influenced investment in mitigation and preparedness measures taken by the NCBD entrepreneurs

The idea the study intends to measure is the extent to which, frequent fire disasters have influenced the measures taken by NCBBD entrepreneurs to mitigate and prepare for fire disasters. Therefore, the idea is the influence of frequent fire disasters on mitigation and preparedness measures taken. Influence on mitigation and preparedness are not directly measurable. As such we have to specify what variables could possibly interpret mitigation, preparedness and the influence on the two.

## **2.2.2 The conceptual definitions**

### **Mitigation and Preparedness measures.**

For the purposes of this study, these measures are simply summarized as prevention and control measures.

In some cases, it is not possible to distinguish the two as responses aimed at one may qualify for the other. Some conceptual understanding of these measures has been given here below.

#### **Mitigation is considered to mean;**

- Completely eliminating the likelihood of fire occurring
- Reducing chances of a fire outbreak
- Containment of fires as to cause no harm
- Preventing ignition
- Effectively controlling fires
- Lowering levels of vulnerability etc

#### **Preparedness in this study means;**

- Readiness to act
- Operational readiness
- State of high alert
- Having appropriate capability to respond
- Having fine tuned and well understood response plans
- Having resources in readiness for deployment etc

### 2.2.3 Specification of variables

The study assumes that increased frequency of fire disasters raises/increases the intensity of the application of the independent variables. The variables to be measured have therefore been further broken down into indicators, which are the measurable attributes of the variables. This information has been summarized in table 1 below.

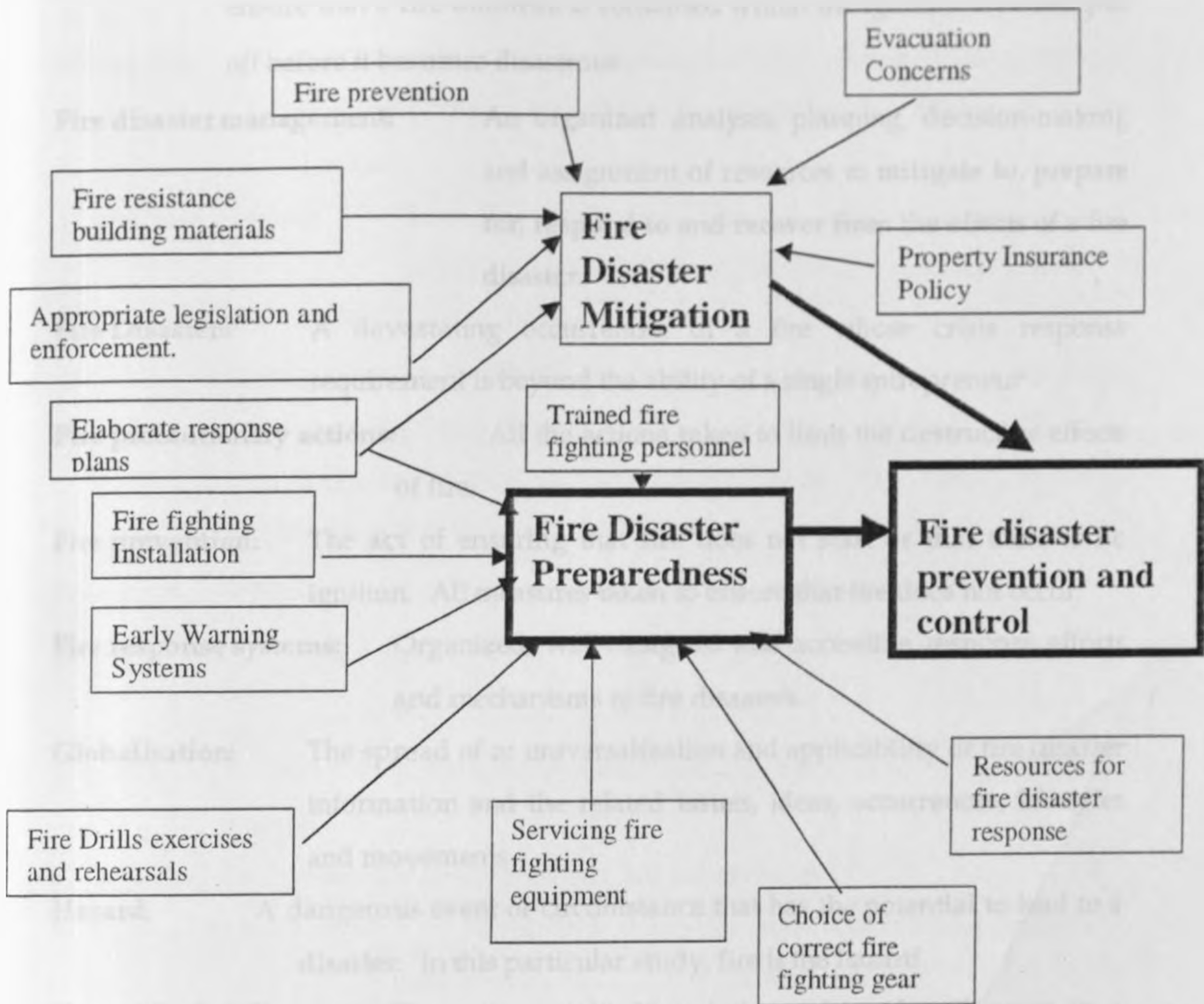
**Table 1. Variables and indicators**

DEPENDENT VARIABLE	INDEPENDENT VARIABLE	INDICATORS
Mitigation as defined in terms of: 1. Measures to control ignition 2. Measures to reduce human injury 3. Measures to reduce damage to property 4. Adherence to regulations	Fire prevention installations	Types, number and relevance of the installations
	Fire resistant building materials	Number of buildings put up with such materials
	Appropriate legislation /regulations and enforcement	Levels of understanding and application of the regulations
	Evacuation concerns	Presence of evacuation routes and knowledge by the people.
	Property insurance covers	Number and types of covers.
Preparedness as measured in: 1. Measures aimed at fighting an ignition 2. Fire warning systems 3. Fire escape/evacuation concerns 4. Methods of passing information on fire escape 5. Fire drills 6. Training on fire fighting 7. Fire response planning 8. Ensuring operational capacity of FRPs 9. Disaster recovery resources	Elaborate response plan	Actual plans and their relevance
	Fire fighting installation	Types and number and relevance of fire fighting equipment.
	Early Warning systems	Types of FEWS and workability.
	Fire drills, exercises and rehearsals	Existence of fire drills, exercises and rehearsals - Frequencies of rehearsals
	Maintenance and service of fire fighting equipment's	How regularly maintained are the equipment.
	Choice of the correct fire fighting equipment	The equipment themselves and their relevance
	Resources for response action	Availability and type of resources
	Trained fire fighting personnel	Number and type of training.

There is no matching between dependent variables and the independent variables because one independent variable could contribute to more than one dependent variable. The matching will be done during the bivariate analysis.

Mitigation and preparedness may in this case be considered as the dependent variables against sets of independent variables. The two positively contribute to fire safety concerns in the NCBD.

**Figure 1. Schematic representation of relations between variables:**



NB. The arrow  $\longrightarrow$  means contributes towards.

### 2.3. OPERATIONAL DEFINITIONS OF TERM

**Entrepreneurs:** A shopkeeper, hotelier, private or public office holder or a banker operating within the Nairobi Central Business District.

**Essential facilities:** All facilities, which are useful in responding to fire disaster and their effects, such as fire brigades, ambulatory services, the police etc.

**Fire consciousness:** The state of increased general awareness of the fire as a hazard and its effects.

**Fire control:** The act of ensuring that fire does not spread. All measures taken to ensure that a fire outbreak is contained within the ignition area and put off before it becomes disastrous.

**Fire disaster management:** An organized analysis, planning, decision-making and assignment of resources to **mitigate to, prepare for, respond to and recover from** the effects of a fire disaster.

**Fire Disasters:** A devastating occurrence of a fire whose crisis response requirement is beyond the ability of a single entrepreneur.

**Fire precautionary actions:** All the actions taken to limit the destructive effects of fire.

**Fire prevention:** The act of ensuring that fire does not start or that there is no ignition. All measures taken to ensure that fire does not occur.

**Fire response systems:** Organized, well-designed and accessible response efforts and mechanisms to fire disasters.

**Globalisation:** The spread of or universalization and applicability of fire disaster information and the related issues, ideas, occurrences, lifestyles and movements.

**Hazard:** A dangerous event or circumstance that has the potential to lead to a disaster. In this particular study, fire is the hazard.

**Hazard Probability:** The estimated likelihood that a hazard will occur in a particular area.

**Hazardous substance**

**Individualization of the fire problem:** Failure of the public fire control and prevention systems hence leaving the entrepreneurs to do whatever possible to enhance safety to fire related incidences.

**Influence:** To cause to act in a certain direction, or to be given a strategic orientation and be made to act accordingly.

**Information:** Fire disaster related news, propositions and facts passed through whatever means.

- Measures:** All installations and actions taken, in relation to fire prevention and control.
- Mitigation:** All measures or efforts designed and executed to postpone, dissipate, lessen or completely eradicate the effects of a fire disaster.
- Natural fire hazards:** Those fires that are naturally occurring, either as a result of rubbing surfaces, lightening or any other natural means.
- NCBD:** The Nairobi Central Business District, which is the area bound by the Nairobi river to the North; Racecourse road to the east, Haele Sellasie Avenue on the South Eastern and Southern side, Cathedral road, Ngong road, Kenyatta Avenue, and Nyerere road to the West, Uhuru highway and Museum Hill Road in the North West.
- Ontological insecurity:** A state of perpetual fear of unstable surroundings.
- Preparedness:** All measures taken to ensure operational readiness and capacity to effectively respond to fire disasters
- Resources:** All that which the entrepreneurs can call upon in the event of a fire disaster
- Risk to fire:** The probability of suffering fire related damages.
- Technological fire hazards:** Those fires caused by tools machines and substances used in everyday life or accidental ignitions.
- Vulnerability:** The susceptibility of life, property, or the environment to damage if a fire (hazard) occurs.

## 2.4 THE ANALYTICAL FRAMEWORK

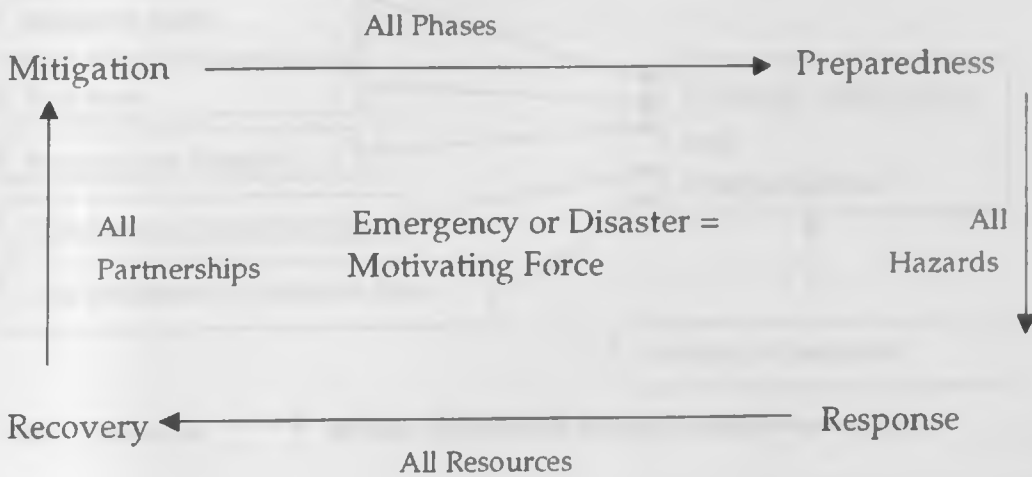
Integrated Emergency Management System is the process into which disaster mitigation and preparedness feeds into. This is the process that aims at ensuring that in all phases, there is coordination to ensure effectiveness and efficiency of emergency management efforts. Disaster mitigation naturally lowers the resource requirements of the preparedness response and recovery phases. This is in view of the fact that with proper mitigation either disaster doesn't occur and if it does, very little impact will be felt. This implies that the preparedness requirement is at a low level while



response costs will either be non-existent where mitigation completely stops fire disaster from occurring or the impact is very low in the event of their occurrence. Recovery from a well mitigated to fire disaster will be faster, less costly and least time consuming in that very little damage will have ensued.

Disaster preparedness mainly enhances operational readiness and capability to respond to disasters before they occur. Preparedness ensures that disasters are adequately responded to and costs reduced in terms of losses, as well as the response requirements. The IEMS cycle appears as follows: -

**Figure 2. An illustration of an integrated emergency management system**



*Source: FEMA-Disaster Management Manual, September 1990.*

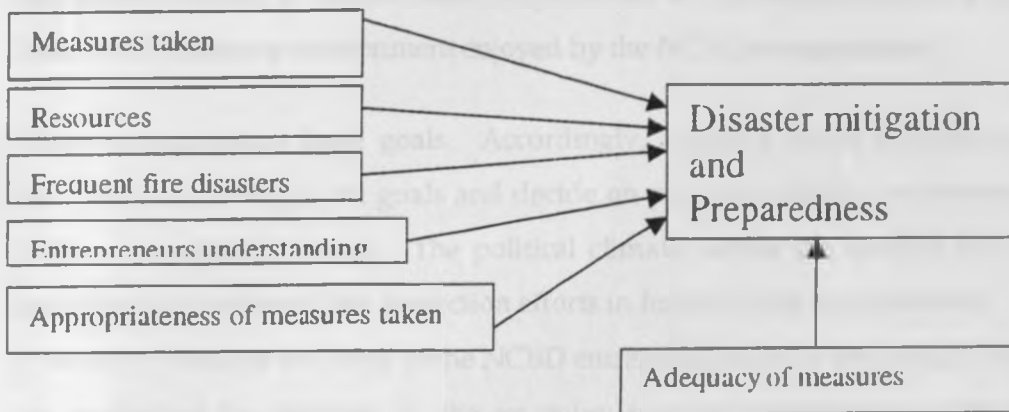
According to the cycle above, mitigation and preparedness phases of a disaster management process occur before the disaster. Where disaster response is poor such as response to fires in Nairobi, communities are advised to put more efforts in these two phases to eliminate or reduce the impact of a disaster before occurrence.

Experience shows that these phases, in fact, are cyclical rather than linear in their interrelationships. All activities and experiences lead individually and cumulatively back to the mitigation phase. Put another way, we learn to prevent and diminish future emergencies by what we learn from past events, whether through actual emergencies or simulations of response activities. Disasters, actual or potential, can be seen as the motivating force for the motion of the cycle. The four phases form the

major components of an integrated emergency management system, which involves mitigating at all the phases of disaster management, ensuring preparedness against all hazards available in a given community, responding by use of all the resources available and engaging recovery strategies that call for involvement of all partnerships.

This study particularly intends to evaluate the mitigation and preparedness measures undertaken by the NCBD entrepreneurs against fire disasters and how an increase in such disasters has influenced the extent to which these measures have been taken.

**Figure3. Diagrammatic representation of the variables:**



**NB. The arrow → means contributes towards improvement of.**

## 2.5 THEORETICAL FRAMEWORK

### 2.5.1 SYSTEMS THEORY

Parson (1973) observes that social life is characterized by mutual advantage and peaceful cooperation rather than mutual hostility and destruction. This theory recognizes the main functions of a system as; pattern maintenance which encompasses preservation and reproduction of systems' essential characteristics; goal attainment which emphasizes on the need for societies to set goals towards which social activities are directed;

integration which involves coordination and mutual adjustment of the parts of the social system to achieve adjustment of conflict' and adaptation which involves mechanisms aimed at restoration of a distorted social equilibrium.

Haralambos, (1985:528). Disasters are known to distort almost all equilibriums, implying that human beings have to devise means of controlling excessive distortions or surviving the disaster effects.

The theory clearly recognizes interdependence of parts and individual's contribution into the proper functioning of a system as a whole. In order to survive, social systems must have some control over their environment. The NCBD entrepreneurs faced by the fire disaster threats have to devise means of containing such threats so as to survive and form viable parts of the community. The mitigation and preparedness measures to fire disasters have to be constantly reviewed overtime to ascertain their functional capacity to ensure that disruption due to fire outbreaks do not completely destroy the business environment enjoyed by the NCBD entrepreneurs.

These entrepreneurs have goals. Accordingly, Parson's theory emphasizes on the need for all societies to set goals and decide on priorities, which are institutionalised in form of political system. The political climate within the country has specified guidelines on preferred fire protection efforts in form of code of regulations.

It therefore remains the duty of the NCBD entrepreneurs to be and remain relevant to the guidelines by adhering to the set rules; in due consideration of the fact that common goals provide incentives for cooperation. The degree to which NCBD entrepreneurs have translated their goals into roles in the advent of increased fire disasters, exemplify the levels to which values and goals have been translated into actions. Only those actions relating to controlling, preventing or containing fire disasters does this study aim at evaluating.

Pattern maintenance according to Parsons; refer to the maintenance of the basic patterns of values, institutionalized in the society. Accordingly institutions achieving maintenance of pattern range from family through education to religion. Disaster disrupts any of these institutions whichever it targets by destabilizing the economic base of the whole. To avoid such disruptions the NCBD entrepreneurs, who may have business entities, which are significant sources of support for families' education or even religion, there is need to be cautious in maintaining them under a stable state; in order to indirectly ensure the whole is maintained.

The principle in operation is that of individuals being dependent on the system in the immediate social environment. According to Parsons, once disturbance has been introduced into an equilibrated system, there will tend to be a reaction to this disturbance which tends to restore the system to equilibrium" Haralambos (1985:529) The many fire disasters within Nairobi over time are therefore assumed to have caused some levels of adjustment towards containing such future disturbances; the extent to which this study aims at establishing.

According to Buckley (1976), consciousness and action are interrelated. Action begins with a signal from the environment, which is transmitted to the actor. The signal provides the actor with information. Accordingly, Buckley argues that on the basis of this information the actor is allowed to select responses, through mediating mechanisms possessed by the actor in form of self-consciousness. Self-consciousness in systems theory terms are mechanisms of internal feedback of a systems' own state, which may be mapped or compared with information from the situation and from the memory. This triggers selection from a reparation of actions in a goal-oriented manner that takes one's own self and behaviour implicitly into account. This may explain the choices made by NCBD entrepreneurs, as a result of fire disasters simulated in terms of preventive and control actions. Ritzer (1988:520) points out that choice of actions is made to suit situations. Whatever installations, training and related precautionary actions to contain fire outbreaks by NCBD entrepreneurs depend on the nature of fires that have been occurring in Nairobi, the threats they pose and more so their frequency.

Systems theory explains the relations between various parts of a system. For instance in mechanical systems, interrelationship of the parts are based on energy transfer. While in social cultural systems, interrelationships are based on information exchange. There is a degree of dependence between interrelated parts of a system; which this study intends to evaluate as concerns fire prevention and control by NCPB entrepreneurs. It will be interesting to know whether there are joint efforts in this direction.

Ritzer (1988:519) argues that, "a more open system is better able to respond selectively to a greater range and details of the endless variety of the environment". Social cultural systems are the most open. The degree of openness as explained by Bailey (1990) is related to two crucial concepts in systems theory; entropy and negentropy. Entropy is the tendency of a system to run down, while negentropy describes a system with tendency to have elaborate features to contain it.

According to Bailey (1990), social-cultural systems can be purposive and goal-seeking because they receive feedback from the environment which allows them to keep moving towards their goal. NCBD entrepreneurs could be assumed to have a goal of completely eradicating the chances of fire disasters occurring in their premises. The feedback from the frequency of fires is therefore assumed to enable them develop even more preventive and control mechanisms; the extent to which this study aims at confirming.

### **2.5.2. THOMAS COCHRAN THEORY OF ENTREPRENEURIAL SUPPLY.**

This theory is presented in the Weberian-Parsonian traditional model, which according to Buchman and Ellis (1955), the real fundamental problems of economic development are non-economical. The key elements of this theory include cultural values, roles expectations and social sanctions. Disasters contribute to the sanctions that the entrepreneurs have to contend.

In this respect, entrepreneurs are not seen as being deviant or supernormal individuals, but as representatives of the society's model personality. The choice of entrepreneurs within the NCBD for this study was based on their capacity to represent the greater majority in a city set-up.

In this model, prevailing child-rearing practices and schooling common to the culture shape personality. Frequency of fire disasters is one other learning process that the entrepreneurs have had to go through.

This theory proposes that an individual's performance as a businessman will be influenced by three main factors:

1. His / her own attitude towards his/her occupation.
2. The expectations held by the sanctioning groups
3. The operational requirements of the job

The values held by the society are the most important determinants of the attitude towards one's occupation and the expectations of the sanctioning group; in this case the society. Important to note is the fact that changes over time in such exogenous variables as population, technology and institutional drift impinges on the role and structures in determining whether the entrepreneurs' response will be determined by cultural values. However, contrary to the popular belief that economic environment influences have effects on business, Cochran accordingly believes that the most fundamental influences are non-economical. Some of these non-economical factors are believed to be disaster related. As such, the orientation of the entrepreneurs within the NCBD in establishing various mitigation and preparedness measures is governed by the exogenous influences of fire disasters.

### 2.5.3. CHAOS THEORY

The dictionary definition of chaos is turmoil, turbulence, primordial abyss, and undesired randomness, but scientists will tell you that chaos is something extremely sensitive to initial conditions. Chaos also refers to the question of whether or not it is possible to make good long-term predictions about how a system will act. A chaotic system can actually develop in a way that appears very smooth and ordered. Mendelson and Blumenthal (<http://www.mathjendl.org/chaos/index.html>)

Determinism is the belief that every action is the result of preceding actions. It functions on the premise that cause and effect rules govern science. Sir Isaac Newton was closely associated with the establishment of determinism in modern science. His laws in natural science were able to predict systems very accurately.

They were deterministic at their core because they implied that everything that would occur would be based entirely on what happened right before.

In normal day life, it calls for mechanisms to be put in place to avoid situations turning to chaotic ones especially as precipitated by disastrous fire incidences.

The Newtonian model of the universe is often depicted as a billiard game in which the outcome unfolds mathematically from the initial conditions in a pre-determined

This theory proposes that an individual's performance as a businessman will be influenced by three main factors:

1. His / her own attitude towards his/her occupation.
2. The expectations held by the sanctioning groups
3. The operational requirements of the job

The values held by the society are the most important determinants of the attitude towards one's occupation and the expectations of the sanctioning group; in this case the society. Important to note is the fact that changes over time in such exogenous variables as population, technology and institutional drift impinges on the role and structures in determining whether the entrepreneurs' response will be determined by cultural values. However, contrary to the popular belief that economic environment influences have effects on business, Cochran accordingly believes that the most fundamental influences are non-economical. Some of these non-economical factors are believed to be disaster related. As such, the orientation of the entrepreneurs within the NCBD in establishing various mitigation and preparedness measures is governed by the exogenous influences of fire disasters.

### 2.5.3. CHAOS THEORY

The dictionary definition of chaos is turmoil, turbulence, primordial abyss, and undesired randomness, but scientists will tell you that chaos is something extremely sensitive to initial conditions. Chaos also refers to the question of whether or not it is possible to make good long-term predictions about how a system will act. A chaotic system can actually develop in a way that appears very smooth and ordered. Mendelson and Blumenthal (<http://www.mathjmendl.org/chaos/index.html>)

Determinism is the belief that every action is the result of preceding actions. It functions on the premise that cause and effect rules govern science. Sir Isaac Newton was closely associated with the establishment of determinism in modern science. His laws in natural science were able to predict systems very accurately.



They were deterministic at their core because they implied that everything that would occur would be based entirely on what happened right before.

In normal day life, it calls for mechanisms to be put in place to avoid situations turning to chaotic ones especially as precipitated by disastrous fire incidences.

The Newtonian model of the universe is often depicted as a billiard game in which the outcome unfolds mathematically from the initial conditions in a pre-determined fashion, like a movie that can be run forwards or backwards in time. Determinism remains as one of the more important concepts of physical science today. Sir Isaac Newton. <http://www.mathjmindl.org/chaos/index.html> . Chaos is the opposite of Cosmos (universe), which was seen as the ideal order of things or orderliness. For instance, " Constellation will still be the same" (Cosmos). Chaos Theory explains movement from order to disorder. It is what organized systems degenerate into if they do. Chaos is therefore the synonym of entropy. Chaos theory is relevant in the study of disasters since they are seen as disruptions of orderly systems or normal flow of systems.

Entropy is as found in the 2<sup>nd</sup> law of Thermodynamics which says that the Universe is continually running down like clockwork, with it's energy progressively transformed into waste or heat and exhausted by function; finally it will end up as a single formless burble of inert motionless gas with a temperature just above absolute zero. That means, "All systems will eventually grind down to a halt." It is argued that all closed systems will eventually grind to a halt. Certain interjection that can destroy the normal functional status of systems such as fires cause disorders. All disasters are representations of disorders, implying that all disasters lead to disorders or chaos, which will call for systems to be brought back to normal.

In chaos theory, there is always a movement from inert (cosmos) to a chaotic system. Constant monitoring or vigilance maintains the systems checked, therefore reducing the likelihood of exposure to dangers. Surveillance reduces (lengthens the period) of movement from Cosmos to Chaos. Under the NCBD conditions, it is expected that entrepreneurs constantly update their vigilance and protective mechanisms in order to ensure that fire disasters do not occur in their environment.

Such mechanisms involve investment in mitigation and preparedness to fire in such a way as to ensure infinite delay of fire occurrences in their premises, or to ensure that should it occur, then mechanisms are in place to combat the fire and bring the situation back to normal the soonest possible while incurring least losses. Entropy itself has been defined in various ways. For instance, entropy could mean transformed or decreased energy, which has been dissipated by functions into random motion of molecules and which cannot be retrieved. "The Entropy of an isolated system always increases", and when two systems are joined together the entropy of the combined system is greater than the sum of the entropies of the individual systems.

For instance fire disaster occurrences in a petrol station or a fuel storage depot, or fire occurrence where prevention and control mechanisms are lacking.

This could be compared to a situation of HIV/AIDs infection under poverty, or when one is infected with two strains of HIV. Under such circumstances the rate of disintegration is much higher than otherwise.

A chaotic system is one in which a tiny change can have huge effects on an individual or the original system. For instance, an ignition either causing an entrepreneur's death, or complete damage of all the property acquired over a long period of time. A good example is the World War II, which was caused by a single assassination in Austria. Chaotic systems describe the complex and unpredictable motion or dynamics of systems that are sensitive to their initial conditions. Chaotic systems are mathematically deterministic. They follow precise laws by their irregular behaviour and can appear to be random to the casual observer. It is suspected that even economic systems such as stock exchange may be "chaotic." It has been pointed out that chaotic systems are unpredictable because of their initial conditions, which may include velocity. It is human nature especially for those with the ability, not to wait for systems to disintegrate to an extent of becoming chaotic. In view of this factor, it is expected that the NCBD entrepreneurs have to do all that is possible to ensure that either fires do not occur, or if they do, then minimal damage is caused. The intensity or levels of investment in the preventive and/or control mechanisms is expected to be directly related to increased fire disasters, which is the main focus of this study.

## 2.6 RESEARCH HYPOTHESES:

According to Kerlinger (1964) a research hypothesis is a conjectural statement between two or more variables. This principle is assumed in this study in order to draw out its logical consequences of relations between variables. Hypotheses will be tested, to ascertain their validity or invalidity of what they stand for. The relationship or attempted relationship between two or more variables acting, as determinants of the study will be assessed.

To provide sufficient direction for research, the statement of research problem should always suggest observations that offer some solution to the problem. Singleton et al (1988:85). Kerlinger (1973:17) accordingly argues that a problem statement should first of all express or ask a question about a relation between two or more variables. Defined by Singleton (1988) as an unconfirmed relationship between two or more variables, hypothesis well stated should therefore show how changes in one variable are related to changes in another. In this study, an attempt has been made to show which variable predicts causes or explains the other. The four hypotheses for this study therefore are as follows:

(H1) Fire disasters threats promote adherence to fire disaster control and prevention regulations.

(H2) Increased frequency of fire disasters raises the awareness levels of what disaster mitigation and preparedness measures ought to be taken by the NCBD entrepreneurs.

(H3) Ineffective and inefficient response systems to fire disasters increase the level of insecurity therefore leading to an improvement in the levels of mitigation and preparedness by the NCBD entrepreneurs.

(H4) There is a positive correlation between the increased frequency of fire disasters and investment in mitigation and preparedness.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.0 INTRODUCTION

This chapter covers the research design and the methodology used in the study. Problems encountered during the various stages of the research have also been highlighted.

#### 3.1 DESK RESEARCH

The researcher took some time to study and understand the problem at hand before embarking on the field research. This involved reviewing various reports, journals, newspapers and other related publications and records concerning the study area. Information generated from that effort was extremely useful in guiding the researcher to focus on the key factors of the study.

#### 3.2 FIELD RESEARCH

The importance of the desk research cannot be overemphasised. However the reality desired by the study could not have been understood without the field research component.

#### 3.3 SITE DESCRIPTION

The study was conducted within the Nairobi Central Business District (NCBD). NCBD covers the area bound by the Nairobi river to the North, Racecourse road to the East, and Haele Sellasie Avenue to the South Eastern and Southern part. Cathedral road, Ngong road, Kenyatta Avenue, and Nyerere road form the Western boundary while Uhuru highway and the Museum Hill Road form the North Western boundary.

It is the main business centre of the capital city of Kenya where most of Nairobi's inhabitants work. The sampling frame included all the entrepreneurs within the specified area. Temporary businesses like kiosks and hawking points were not included in this study owing to their low levels of investment, and their semi permanent nature.

**Figure 4. A map of the NCBD showing the various boundaries**



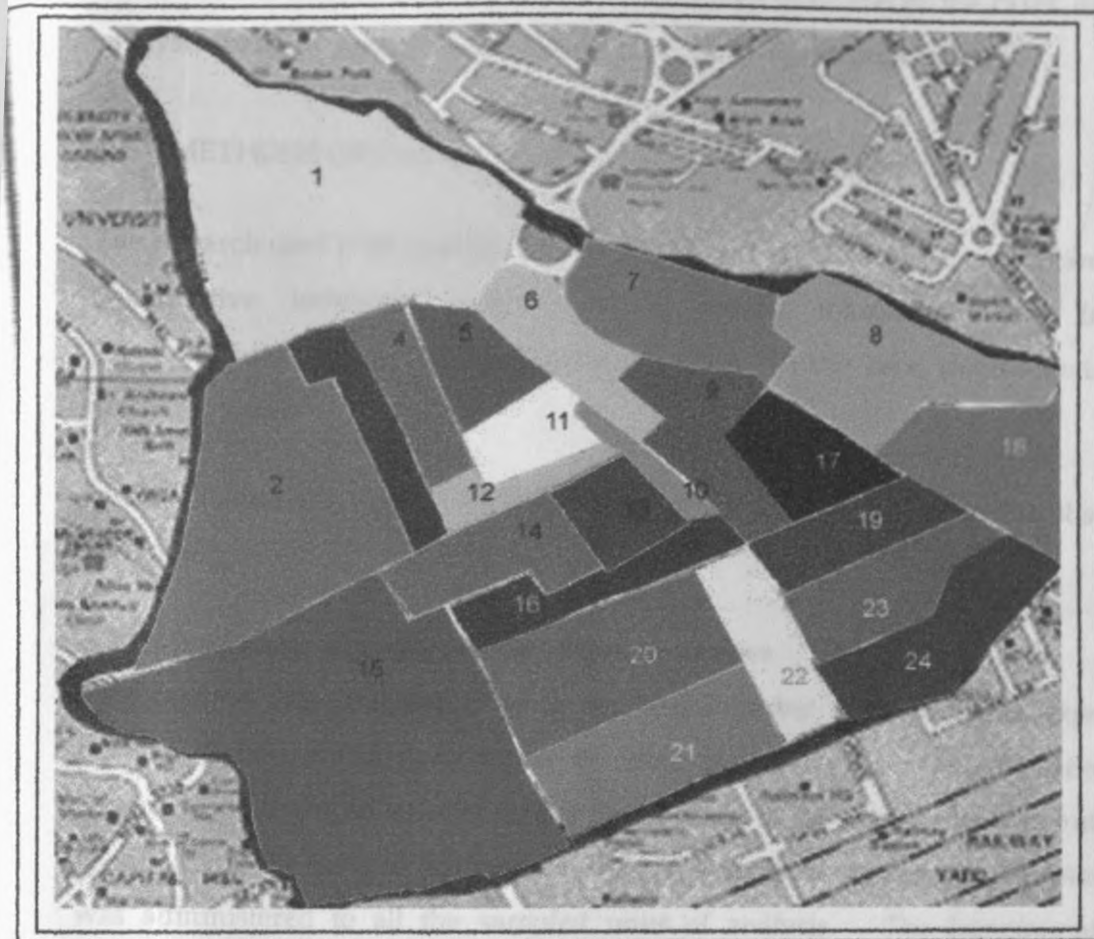
### **3.4 SAMPLING PROCEDURE**

#### **Single Stage Cluster Sampling followed by Purposive sampling.**

Simple random sampling was used to scale down the study area from the entire Nairobi Central Business District (NCBD) consisting of 24 clusters as the study was so designed, to 6 representative ones. The units of analysis were however selected purposively. The researcher was guided by the available information on the socio-economic development, demographic profiles, the 1999 enumeration area maps as well as his own knowledge and expert judgement, to categorize clusters which were representative or typical of the population under study.

The six representative clusters were randomly selected by use of mechanical methods out of the total numbers of clusters. This was achieved through labelling all the clusters, writing their labels/numbers on round balls and randomly selecting six out of the total of 24 balls representing the 24 clusters. From the six randomly selected clusters, a sample of 120 cases was identified.

**Figure 5.** A map of NCBD showing the 24 clusters.



NB. See the description of the clusters in annex II.

Purposive sampling procedure was then used to select at least 20 units of analysis from the total available entrepreneurs within each of the six selected clusters. This method was preferred because it gave room for re-selection of a case, if a prospective respondent was unavailable or if he/she refused to participate in the interview.

A sample size of 120 entrepreneurs was chosen, in order to achieve a greater level of reliability, owing to the expected levels of heterogeneity in fire disaster mitigation and preparedness measures taken. The study was exploratory in that not so many of the kind have been conducted in Nairobi, more so in Kenya. The idea behind this study was to discover patterns of mitigation and preparedness occasioned by increased frequency of fire disasters. Cluster sampling technique/procedure led to an effective reduction in both human and financial resources demanded in undertaking the study. Cluster sampling was chosen in view of the fact that variability within the cluster was as little as that between the clusters thus considerably reducing the standard error.

Only one stage cluster sampling was chosen to further reduce the sampling error. Convenience sampling was then used to enhance selection of the cases or units of analysis from the readily available NCBD entrepreneurial population.

### 3.5 METHODS OF DATA COLLECTION

The research used both qualitative and quantitative methods of data collection.

Quantitative techniques were used to gather information that facilitated generalisations through well-calculated statistics. In this case, questionnaires were extensively used.

In the quantitative approach, focused group discussions and physical observation were used.

#### 3.5.1 Interviews through the use of questionnaires

This method was preferred due to the large number of respondents expected to participate in the study, in terms of being interviewed. The interviews were thoroughly introduced so as to clarify the purpose of the study as well as outline the usefulness of the same to the respondents. A systematic standardized questionnaire was administered to all the sampled units of analysis. The questionnaire was designed as to capture all the required information as guided by the research objectives and the research questions.

Through use of appropriate interview techniques in the choice of what questions to ask, when to ask them and how to frame questions in order to capture all the responses the researcher, administered the questionnaires throughout.

#### 3.5.2 Focused Group Discussions.

Focused Group Discussions (FGDs) were viewed as important in this study, to complement/supplement the information acquired through the interviews. Groups of 5 respondents were engaged in discussions concerning the following issues.

1. The NCBD association leaders/officials to find out what concerns the association had identified and put forward in terms of strategies aimed at curbing the problem of fire disasters within the study area.
2. Nairobi City Council Fire Brigade to establish the mitigation and preparedness measures that they believe should be put in place, to enhance faster extinction of fires.
3. Manufacturers of fire control and prevention equipment represented by Nimrod Africa Limited to establish the various recommendations towards suitability as well as maintenances levels to be achieved in order to ensure operational readiness of the equipments.
4. St Johns ambulance Service providers to establish what measures should be employed to lessen severity of fire injuries during rescue missions.
5. The National Disaster Operations Centre officials to determine their efforts in enhancing adequate sensitisation towards fire prevention and control as well as regulatory mechanisms.

The FGDs took place in well planned, focused and appropriate venues to facilitate discussions. The chosen venues were in close likeness to familiar surrounding of the group members, to avoid biases arising from the change of the environment. Where possible, the groups were made as homogeneous as possible and gender balanced to improve on the quality of the information generated. The researcher was assisted during the FGDs so as to be able to effectively lead the process by focusing the discussion on the subject matter, guiding the direction of the discussions and focusing on the research issues. He ensured that democracy prevailed in the groups by taming the domineering characters and ensuring that the right to be heard was enhanced.

### **3.5.3 Observations**

The interviews were face to face with the questionnaires administered to the respondents at their places of work. The researcher occasionally requested to be shown the fire disaster mitigation and preparedness measures put in place by the entrepreneurs. Some measures did not require much effort to be visually verified, even without the assistance of the respondents.



As such, and where possible, the researcher did not believe the narratives of the respondents without physically verifying some of the observable fire disaster mitigation and preparedness measures. This gave him the advantage of ascertaining the conditions these installations were in.

### **3.6 THE DATA COLLECTION PROCESS**

#### **3.6.1 Planning**

Having selected the research topic and formulated the research questions, the planning for this study was at an advanced stage. Relevant literature in the field of disaster mitigation and preparedness was reviewed and gaps identified which this study intended to fill. Units of analysis were identified as per the objectives of the study and independent variables to the study identified, based on the characteristics to be evaluated in order to meet the objectives of the study.

The study adopted same questions with the same wording and same order, which were as much as possible presented in the same manner even for the FGDs, to further minimize the error.

#### **3.6.2 Pre Testing the Questionnaires**

This was done by administering the questionnaires to twelve entrepreneurs within the study area but outside the sampled clusters. However, the researcher ensured that they had similar characteristics as those of the target group or the respondents within the six sampled clusters. According to Singleton et al (1988:253), a pre-testing exercise is necessary prior to the actual administration of the questionnaires to evaluate whether they do serve the purpose for which they were designed or whether there is need for further revision. Revision indeed became necessary when the researcher discovered that the respondents could not clearly differentiate between disaster mitigation and preparedness measures. As such, the Pre-testing outcome was used to inform the interviewer in pointing out the concerns, weakness and omissions in the questionnaires as well as comparing the outcome with the expectations of the actual interview.

### 3.6.3 Quality Control

The researcher ensured that:

1. The respondents were sampled as per the criteria stipulated in the research proposal.
2. The sampled respondents were interviewed according to the schedule.
3. All necessary records were kept, and information available from the interviews recorded immediately.
4. He was available to ask questions personally and seek clarifications where necessary.
5. He provided feedback and reinforcement throughout the interviewing period.

### 3.7 PROBLEMS EXPERIENCED DURING DATA COLLECTION

1. Non-commitment of the respondents to the interview. Some of them gave appointments but ended up not respecting them; while others finally turned the researcher down after as many as four failed appointments. The main reasons given for unavailability was that they were too busy to spare time for the interviews. In most cases, the nature of business would dictate the availability of the respondents.
2. Convincing most of the prospective respondents to accept to be interviewed was an up-hill task. Some respondents treated the researcher suspiciously as though they were out to investigate something that they (respondents) could not quite understand. As such they simply refused to participate on account of not wanting to. This was however common in the more congested areas of clusters 17 and 19.
3. The researcher perceived that one of the reasons for the respondent's apprehension was that in these clusters, most of the fire exits were either sublet to smaller scale business ventures, or heavily barricaded and therefore completely unavailable for the purpose. The commonest response for those who so did was that the main doors are sufficient for the workforce in the premises. For instance, majority of the respondents could hardly visualize the use of fire exits for the purpose they were designed.

4. Some respondents required clearance from higher authorities before responding to the questionnaires. On several occasions, the researcher was required to make a formal application to the top management of certain enterprises, to obtain approval to have representatives of the over all management respond to the questionnaire. On several occasions, the top management not knowing that the study had a specific area of focus approved for branches outside the enumeration areas or clusters. The researcher therefore had to look for adequate replacements, which were quite rare.
5. Some prospective respondents refused to be interviewed on anything to do with fire because according to their religion, talking about fire may bring a bad omen. These were basically respondents of Asian origin. Some of them associate fire with bad omen and therefore would not like to dwell on the topic to the detail required by the researcher in line with the questionnaire.
6. Most of the respondents complained that the questionnaire was too long and therefore time consuming. Several prospective respondents refused to respond to the questionnaire on that basis. Several of them still said that the questionnaire was rather repetitive. This is because without the researcher taking a lot of time to explain every question, the respondents could not give the correct answers. Some termed the questionnaire rather technical and requiring a lot of time, which they did not seem to have. All this was in an effort to turn down the researcher.

### 3.8 DATA PROCESSING, ANALYSIS AND INTERPRETATION

#### 3.8.1 Data processing and entry.

Data could not be meaningfully interpreted before putting it through an analytical process. All the responses from the questionnaires were initially coded before entry into the computer for analysis. The coding process consisted of a total of 75 responses, which were then put through the analytical process.

### **3.8.2 Data analysis**

Data analysis was conducted in line with the statements of hypothesis guiding this study and in regard to the anticipated relationships among the identified sets of variables. The Statistical Package for Social Scientists (SPSS) was used to analyse the data from the questionnaires. Both univariate and bivariate analytical techniques were employed to establish the restrictive and inferential statistical characteristics of the data respectively.

According to Frank & Althoen (1994:275), using the inferential statistics the researcher possibly makes appropriate generalizations from limited observations. A close scrutiny was made of how differences in one variable related to differences in another variable. In this context, inferential statistics and computer-based data processing were used to make inferences and generalizations of the sample.

### **3.8.3 Univariate Analysis**

The univariate analytical process used was to summarise the data into frequency distribution tables based on the relative frequencies of the various observations. This was based on the numbers of responses from the set of 120 respondents.

### **3.8.4 Bivariate Analysis**

Bivariate analysis was used to detect possible relationships between variables and aspects of the variables, which, could therefore be statistically explained. Bivariate analysis involved comparing two sets of variables or their aspects and therefore determine whether there was any correlation or regression between them. Through calculation of correlation coefficients some relationships were confirmed between different sets of variables and supporting explanation given.

## CHAPTER FOUR

### DATA PRESENTATION AND DISCUSSION

#### 4.1 INTRODUCTION

This chapter covers as much of the observations and responses from the informants as possible. However, it does not necessarily include all the summary tables for every aspect of the study. As quoted in Ngunnzi (2002), the report is a further summary of the total observations in line with Powell's (1993:41) advice that, *the compulsion to include everything, leaving nothing out, does not prove that one has unlimited information; it proves that one lacks discrimination. The fool collects facts; the wise man selects them.* As a result, information included in this analysis was carefully selected and presented as guided by Powell's advice. Therefore, only a few of the tables have been included in this report with information from the bulk of others appearing in narrative form.

The chapter, through the use of frequencies and percentages, describes the characteristics of the research sample. Special attention has been paid to the study hypotheses, objectives and research questions. The three areas have been linked to arrive at the final findings. The recommendations and conclusions for the various categories of the likely users of the knowledge generated through this study are presented in the next chapter.

#### 4.1. Socio-economic and demographic characteristics of the entrepreneurs

The study attempted to capture Socio-economic and demographic information on the informants regarding their gender, number of people working in the respective business establishments, category of business, type of business and the fire prevention and control strategy adopted in any of the visited premises. This was useful in analyzing the decision making process on whether or not to have fire prevention and control strategies within the business premises. This is with due consideration of the losses that could possibly be incurred should there be a fire outbreak within the NCBD business community. According to Auf der Heide (1989), *disasters create new tasks, and engage participants who are not ordinarily disaster responders,* thus all the more emphasizing the importance of adopting a fire prevention and control strategy.

The study focused on business owners or managers who were believed to be the decision makers on whether or not to put mitigation and preparedness measures in place.

Majority of those interviewed were male, comprising of 84.2% against 15.8% female respondents who together informed the study through answering the questions in the questionnaire. The FGDs were also male dominated whereby we had 84% males against 16% females. This may reflect the level of women involvement in challenging entrepreneurship nationally, which is consistent with the national average of 83.7% against 16.35% male/female involvement in the manufacturing industry (Economic Survey 2002:56). The 120 business premises covered by the study engaged a total labour force of 16,160 people including the entrepreneurs themselves.

Most of the businesses within the NCBD according to the study results were small-scale company owned representing 38.3% of the total; followed by small-scale sole proprietorship, covering 23.6% of the total. In total small scale businesses thrive in the NCBD representing 60.6% of the total studied, while large-scale business represent 22.8%. A total of 5.5% public investments were covered in the study.

About 36% of the businesses covered in the study were shops, while hotels/restaurants and private offices accounted for 16% and 14.3% respectively. 21.8% of businesses fell out of the classification decided upon earlier, and were therefore grouped among the other categories.

Majority of the entrepreneurs, either by the location of their business premises or by design, have adopted a certain fire prevention and control strategy. Research findings indicate that 50.8% of the respondents rely on corporate fire prevention and control strategy. Under this strategy, fire prevention and control falls in the hands of the landlord or the property management agency. About 40% of the respondents have adopted individualised fire prevention and control strategy where fire prevention and control is the responsibility of the business owner. In most cases, dependence of corporate fire prevention and control is unreliable.

In actual sense, majority of the entrepreneurs only shift blame to the landlords or management agencies, as they themselves do not take any responsibility in fire prevention and control. From the data collected 9.2% of the respondents declined to indicate their fire prevention and control strategy.

#### 4.2. NCBD entrepreneurs' understanding of mitigation and preparedness measures required

Every strategy adopted carries with it some responsibilities in fire prevention and control, generally referred to as mitigation and preparedness in this study. It was thus necessary for this study to evaluate the relative levels of understanding of fire disasters by the respondents and what resultant actions they have taken. Such knowledge could be acquired through actual experiencing of a fire disaster, as well as other formal and/or informal means. Data on the proportion of the respondents who had been fire disaster victims was collected and results presented in table 2 below.

**Table 2. Distribution of respondents on the basis of having/not been victims of Fire Disasters:**

Experience of fire disaster	Frequency	Percentage
Yes	13	10.8
No	104	86.7
N/A	3	2.5
<b>Total</b>	<b>120</b>	<b>100</b>

At least 11% of the respondents had experienced fire disasters in their premises. About 3% did not indicate their experiences while 86% had no fire disaster experience whatsoever. Those who did not indicate their experiences consider discussing fire a bad omen arising from their religious believes as was confirmed during the FGD with representatives of Nimrod Africa Ltd.

One way of fighting fire is to call for help as the study was further informed. About 46% of the victims of fire disasters sought for help.

The remaining 54% either did not know what to do at the peak of the moment, or chose to struggle with the fire owing to unavailability of reputedly efficient fire brigades. Asked whose help they did go for, half of the victims went for the Nairobi City Council Fire Brigade (NCC-FB), one sought assistance from St John's Ambulance and the other called the fire appliances supplier.

A key informant from Nimrod Africa Ltd confirmed that when any one of their clients encounters a fire disaster, the company fire marshals rush to the scene with fire extinguishers to help. From the data collected, the remaining victim managed to put off fire with the help from neighbours and members of the public while using fire extinguishers he had earlier installed in the premises.

An examination of whether the rest of the respondents were aware of fire incidences was a logical one in this sequence of analysis. Findings indicated that 78% of the respondents had learnt of a specific fire incident within the NCBD through some means. The remaining 22% knew that several fires had occurred in the NCBD but could not pinpoint or exactly tell where they occurred, when and who was involved.

55% of the respondents had received information about fire disasters from the mass media (print and electronic) making it the most popular means through which such information is channelled. About 28% of the respondents had actually witnessed a fire disaster, implying that at least 95% of the entrepreneurs had acquired such information through various formal and informal channels including (neighbours/friends) and actual encounter.

**Table 3. Distribution of respondents according to fire disaster information flow channels**

Channel through which information is received	Frequency	Percentage
Witnessed	34	28.4
Neighbour/friend	1	.8
Media	66	55
Victim	13	10.8
N/A	6	5
<b>Total</b>	<b>120</b>	<b>100</b>



Information about a fire disaster occurrence triggers the need to build some capacity to act responsively in the event of such an occurrence in one's premises. As such and upon evaluation in this study, 86.5% of the respondents know what to do in order to prevent fire disasters from occurring. About 33% of the respondents believe that fire occurrence could be curtailed by ensuring that there is proper electrification and preventing careless ignition. Of the total, 31.2% believed that with proper electrification alone, most of the fires in business premises could be prevented. This means that 64.2% of the respondents believed that most of the fires within the NCBD are caused by electrical short circuits. This sends a clear message to the electrical wiring service providers as concerns installation of proper electrical wiring in accordance with the specifications.

To ascertain that the respondents knew how to mitigate and prepare for fire disasters, they were asked to indicate what measures they would take to minimize damage arising from fires. These include the strategic measures aimed at total elimination of the chances of a fire occurrence, damage control in case of fire or establishing a state of high readiness to act in the event of a fire. Installation of fire fighting equipments and having an unfailing source of water supply are some of the key fire occurrence minimization strategies cited.

About 65% of the respondents believe that the above two strategies will suffice, while an additional 18% cited certain other strategies including staff training, improving the performance of the fire brigades among others. This was confirmed during the FGDs with the St. John's Ambulance and the NCC-FB whose informants cited lack of capacity as the one most serious hindrance to their effective service delivery.

Occupying fire safe premises is a mitigation strategy. It was therefore necessary for this study to evaluate whether entrepreneurs considered fire safety during the choice of the business premises. It was interesting to find out that 72% of the respondents considered fire safety when deciding on a business premises. This means that they chose where to invest in business in relation to the risk of having a fire outbreak. This shows a considerably high level of awareness that fire disasters are quite common and entrepreneurs are reasonably aware of prevention strategies.

The study sought to find out exactly what entrepreneurs looked for to ascertain that a given premises is fire safe. Data collected concerning this aspect reveal that about half the respondents could not specifically say what exactly they looked for to ascertain that a given prospective premises is fire safe. They claimed to know exactly what to look for. The remaining 46% were quite specific on what to ensure is available to guarantee safety for investment in business. This ranged from proper wiring, fire fighting and warning installations; through to elaborate fire exits and fireproof construction materials.

### **4.3 Types and characteristics of mitigation measures taken**

Fire disaster prevention measures are regarded as mitigational. Coburn et al, (1991) posits that mitigation involves risk reduction. This means that in respect to fire disasters, mitigation measures aim at ensuring that fires do not occur at all, and if they do; they still ensure that, least damage occurs from such fire outbreaks. The impact of a fire outbreak is measured in terms of casualties, which could either be fatal or in form of injuries, some permanent. Fire burns cause serious scars, which have a sense of permanence; while burns beyond a certain degree/percentage lead to death. The extent of Property and environmental destruction could also be used to describe the severity of a fire disaster.

Several aspects of fire disaster mitigation were considered in this investigation in line with the four principal areas of concern in this study. These include naming and where possible observing the measures themselves; getting to understand the extent to which NCBD entrepreneurs consider the measures to be adequate; evaluating the extent to which the measures cited have been improved over time and seeking the respondents' opinion on the extent to which they considered the improvements to be as a result of increased frequency of fire disasters.

#### **4.3.1 Measures aimed at ensuring that fire disasters do not occur**

An analysis of whether the NCBD entrepreneurs have taken fire disaster mitigation measures, and the actual observation of the measures themselves where possible was considered a logical step in the study. According to Kent (1991) systematic planning, well-executed distribution, clear-cut roles and responsibilities are vital if best laid.

It was established that the entrepreneurs have actually taken up certain fire preventive and damage control measures. These include prevention/control of careless ignition through frequent checks on the electrical installations, use of fireproof walling, use of fire depressants and staff training on fire prevention and control. About 23% of the respondents confirmed having tried to control fire outbreaks through ensuring that there is no careless ignition. Through the FGD with the NCC fire brigade, this study was informed that careless ignition through smouldering cigarette butts or careless use of matchboxes especially by children is a main cause of fire.

In regard to the methods used to control fire outbreaks, responses were collected and presented on table 4 below.

**Table 4. Distribution of responses according to the methods of controlling fire outbreak.**

Fire outbreak control method	Frequency	Percentage
No careless ignition	28	23.4
Frequent checks on the electrical systems	18	15
Fire proof building materials	1	.8
Use of fire depressants	5	4.2
Staff training	6	5
No careless ignition and frequent electrical system checks	39	32.5
Others	10	8.3
None	13	10.8
<b>Total</b>	<b>120</b>	<b>100</b>

Electrical short circuit sparks ranks highest in all the known causes of ignition according to the key informants from the NCC fire brigade. As such, it was not surprising to find that 15% of the respondents confirmed that they have always ensured naked wires are immediately covered upon identification. According to the literature review, it was established that use of fireproof building materials enhances a reasonable degree of resistance to ignition, which can give response operations some time to act.

Only one respondent (.8%), confirmed having occupied a premises whose walling is made up of fire proof building material. This does not necessarily unearth the level of ignorance of the entrepreneurs and by extension Kenyans, in relation to the use of fire proof walling since the degree of fireproofing varies. However, only about 4% of the respondents use fire depressants. Materials whose chemical composition has some in-built fire depressing capacity, which therefore increases the chances of salvaging property in the event of fire. Some 32.5% of the respondents have used a combination of measures, in that they have incorporated measures to prevent careless ignition as well as having frequent checks on the electrical wiring. A combination of measures gives better protection to the premises in that they complement each other. About 11% of the respondents having done nothing to prevent ignition or smother out fire should an ignition occur, meaning that they are at high risk of incurring great losses in the event of a fire outbreak.

Asked to relate the measures established and the risk to fire, about 44% of the respondents indicated that they were confident with the measures taken, while 17.5% were very confident and 7.5% extremely confident with the measures taken. This shows that a total of 69.2% of the respondents were at least confident with whatever measures they took to avert an ignition with an aim of preventing fire related damages. Only 3.3% of the respondents were not confident, implying that majority of the respondents believed that the measures they have taken are sufficient to prevent an ignition.

According to Kent (1991) preparedness plans, are mitigational but they do not eliminate chaos with which disasters are associated. One assumption made at the beginning of this study was that the entrepreneurs had improved the measures taken to mitigate fire disasters in terms of preventing an ignition. The study therefore went ahead to pursue this assumption. Findings indicate that improvements had been made in terms of increased surveillance against ignition, intensified declaration of premises as no smoking zones as well as increased frequency of electrical wiring checks. Other responses included improvements in renovations to install fireproof walling as well as use of fire-depressants. Several entrepreneurs cited a combination of the improvements just covered.

Of particular importance is the overwhelming majority 72.3%, who made no improvements at all or rather showed the need for maintaining the status quo. This may explain the situation in most city enterprises where fire disasters are not given any serious consideration leading to major losses in the event of a fire outbreak.

It was considered logical to ask the respondents to relate the improvements in measures to mitigate ignition and damage from fire to the increased frequency of fire disasters in Nairobi. As if to confirm the majority who had no improvement, a significant 37.5% remained non-committal while 10.8% said that the two are unrelated. As such about half of the respondents did not believe there was a relationship between the improvements in ignition prevention efforts and increased frequency of fire disasters in Nairobi. However, over half of the respondents 51.7% believed that the two are related though to varying degrees.

#### **4.3.2 Measures aimed at ensuring minimum damage to property in the event of a fire disaster**

One of the aims of disaster management is property protection. It has never been possible to eliminate chances of a disaster occurring. Damage minimization is therefore considered an important mitigation measure to any form of disaster. Considering fire disasters within the NCBD, informants in this study were requested to enlist the measures they had taken to ensure that should there be a fire outbreak in their premises, least damage would occur to the property. The study found out that majority, 30.8% had ensured that fire-fighting gadgets had been fitted in their premises.

Only 19.3% respondent out of the total interviewed had installed a combination of automatic smoke detectors and fire extinguishers, which are considered leading in fire control efficiency. This group of respondents is considered as having made considerable efforts in preventing damage because smoke detectors will automatically start the process of fire fighting while the extinguishers would complement the already on going process. About 10% of the respondents had combined the fire extinguishers and pressurized water supply by use of hosepipes, while 4.2% had engaged fire depressant for fire damage control.

Out of those covered by this study, 15% had done nothing to ensure that a fire outbreak in their business premises causes least damage

Asked to state the extent to which they were confident that the measures they had taken were adequate, 43.3% of the respondents were just confident that the measures would ensure least damage in the event of fire.

**Table 5. Distribution of respondents according to the levels of confidence with the property damage control measures used**

Levels of confidence with the measures to minimize damage to property	Frequency	Percentage
Extremely confident	7	5.8
Very confident	26	21.7
Confident	52	43.3
A bit confident	13	10.8
Not confident	14	11.7
Not applicable	8	6.7
<b>Total</b>	<b>120</b>	<b>100</b>

The data reveals that 21.7% of the respondents were very confident in the measures while 5.8% were extremely confident that the measures taken were sufficient. This testifies that a total of 70.8% of the informants were at least confident that the measures were sufficient (see table 4). A close relationship was observed as regards the number of respondents who were not confident, 11.7% and those who remained tight lipped on this issue 6.7% totalling to 18.4% against those who did nothing in terms of ensuring that least damage occurs represented by 15% as observed earlier. The testimony of the Key informants from Nimrod Africa Ltd, a fire appliances dealer in Nairobi confirmed that installations of the correct fire extinguishers would control fire at an early stage. According to the sales manager of Nimrod Africa,

*The problem with majority of the users of fire fighting equipments is lack of knowledge on matching the equipment with fire categories. We take time to explain and advise our clients on what fire fighting equipment they need according to our assessment of the situation.*

*We always advise on use of a combination of smoke detectors and fire extinguishers to both serve as an early warning as well as initiate the war against destruction. This will however depend on how vigorously the fire will be burning at any point in time.*

The study further evaluated the improvements the entrepreneurs had made towards ensuring that the measures taken remain reliable. Findings in this particular aspect showed that 63.3% had done nothing. A further on 30% of the respondent cited regular servicing of the fire fighting equipments. However according to the testimony of one of the key informant s from Nimrod Africa, fire equipments' servicing has been more of seller than user oriented initiative. He confirmed this by saying that;

*We have made deliberate attempts to inspect and service all fire fighting equipment on quarterly basis from all our clients. This came up upon realization that our clients are least bothered with the state of those equipments. Technically, they should be serviced on quarterly basis else effective and efficient performance cannot be guaranteed. We therefore added a service charge to the sale price of these equipments to offset the cost of regular servicing. Since we want our product to be useful at the moment of need, it is therefore our duty to ensure that they are serviced and that they remain at the highest degree of readiness.*

It was considered necessary that the study establish whether there was a relationship between the improvements made on the fire damage control efforts and the increased incidences of fire. To this respect, 32.5% of the respondents said that it was not applicable while 19.2% said the two are unrelated. That is to say that 51.7% did not believe that increased fire disasters had led to improvements in the fire damage control mechanisms, hereby referred to as mitigation measures. On the other hand 20.8% said that the two are related. Only 5.8% of the respondents believed that the two are totally related. This, accordingly was an almost balance of opinions. A key informant confirmed this position during the FGD with representatives of Nimrod Africa Limited, who said that their sales had not reflected any shift (increase) even as the intensity and frequency of fire disasters bit.

#### 4.3.3 Measures aimed at protecting people from fire injuries

Fire disasters are associated with various levels and types of human injuries. This could be in terms of physical burns to individuals, suffocation or other forms of injury during the fight for self-preservation and that of property and environment. Some of the injuries could be fatal. As such, this study sought to establish what measures the entrepreneurs within the NCBD have taken to ensure that should there be a fire outbreak, least damage occurs to them and their employees/workers. Data collected through this study revealed that about 42% of the respondents have done nothing.

The use of insurance cover as a damage prevention strategy was reported by 18.3% of the respondents, a response that the study finds quite misplaced. However, 12.5% have trained their staff on the fire response strategies to avoid injuries in the event of fire outbreak. Some 14.2% cited a combination of strategies including installing fire warning mechanisms, establishing evacuation/ exit routes and training on fire safety and first Aid to victims of fire. A key informant from St. John's Ambulance confirmed this position during the FGD by clarifying that organizations and individuals have the opportunity to train with them on general First Aid. According to him, several individuals and organizations have made reasonable advancements in this direction. The informants however clarified that those individuals who approach St. John's Ambulance as volunteers form the majority of adult trainees save for the school children training programmes.

A key informant from Nimrod Africa Ltd also informed this study that his organization by saying that his organization occasionally conducts a two-day training workshops on fire safety in which clients to the company and other interested parties participate. He said that the charges are Ksh. 6,000 per person per day. He was quoted saying that:

*The most important thing is not to have fire fighting equipments such as fire extinguishers in the premises, but rather knowing how to use them. Knowing the right fire extinguishers for the right class of fire, and being able to position yourself strategically to attack fire from the base. There is the danger of armatures getting injured in the process of attacking a fire because they do understand the basic preparations to effectively the attack a fire*



He went on to explain that to effectively attack a fire, one needs to stand with legs slightly astride and in a walking position, aim the nozzle of the fire extinguisher at the base of the fire as if one is shooting it with a gun. He was quick to add that *One should not try to be a hero in fighting fire. If the situation gets out of hand, one should run for one's dear life.*

Ensuring adequate evacuation routes that are well known to the occupants of any given premises is another injury prevention strategy that could be employed. The study was however informed that, only 6.7% of the respondents have ensured usability of fire exits as a damage/injury control strategy. The reason for the very few respondents recorded in this matter was advanced during a FGD with the NCBDA, who said that most of the fire escape routes have either been sub-let for small scale business ventures or are heavily barricaded thus making them unavailable for fire escape.

In any situation, entrepreneurs would size up the control mechanisms and decide on whether to modify or improve for the better. This however depends on the level of satisfaction of the entrepreneurs themselves and the likelihood of the impending danger. Accordingly, this study was informed that only 30% of the respondents believe that the efforts are just adequate. A total of 21.7% did strongly believe that the efforts were sufficient while 8.3% were sure. In total, 60% of the respondents do believe that the efforts are at least sufficient.

The study gathered through the FGD that efforts to prevent injury in the event of fire include training on fire safety, which includes fire fighting and First Aid. Other related activities include installation of fire warning systems, enhancement of escape through establishment and designation of fire escape routes and training on casualty handling within the workforce of any given enterprise.

With the changing times, population growth and entrepreneurship becoming a complicated puzzle day by day, there is need for improvement in whatever measures taken to keep in tune with the times.

This study sought to establish how the entrepreneurs' efforts have changed towards ensuring safety for the personnel from fire disasters. From the data collected, an overwhelming majority, 82% of the respondents had done nothing. This position was confirmed during a FGD with the NCB and Nimrod Africa Limited in which occasions, key informants informed the study that entrepreneurs are least bothered in matters pertaining to investing in fire prevention and control.

The key informant from Nimrod Africa Limited said that their organization makes deliberate efforts to visit clients, recommend strategies towards fire related injury control and follow up to ensure implementation. The form of improvement cited by the respondents and confirmed by Nimrod Africa Limited was in terms of training on fire safety. Accordingly, Coburn et al (1991) confers that long-term mitigation measures may include public attitude change through education. Nimrod Africa Limited holds training sessions to introduce new products in the market, as well as emphasize on the need for remaining relevant in pursuits for fire safety.

**Table 6. Distribution of responses according to the improvements in injury prevention efforts**

Type of improvement	Frequency	Percentage
Modernization of fire warning systems	3	2.4
Regular training on fire safety	14	11.6
Advanced training on First Aid and casualty handling	4	3.2
Nothing	93	78
Missing data	6	4.8
<b>Total</b>	<b>120</b>	<b>100</b>

From the table above, about 12% of the respondents have acquired regular training on fire safety while only 3.2% have undergone advanced training on First Aid and Casualty Handling. Only 2.4% had incorporated an aspect of modernizing the fire warning systems in their premises to ensure security for personnel against a fire outbreak. *Data for six respondents was not available.* An appreciation of how the respondents related an improvement in injury prevention mechanisms and increased fire disasters was found logical in understanding whether the measures taken were strategic or routine.

Respondents to this question were asked to indicate whether the efforts were solely due to increasing fire disasters, or that fire disaster frequencies were a major consideration or that they partly or somehow contributed, or that they did not contribute at all.

About 55% of the respondents saw no relationship and therefore indicated that the relationship is not applicable. As such, more than half of the respondents do not believe that the improvements were as a result of increased fire disasters. A key informant from Nimrod Africa Limited confirmed this claim during the FGD by saying that their products' sales do not reflect the increases in line with increased fire outbreaks. One of the informants from the NDOC said that;

*These people, although they have the money, and you cannot accuse them of not knowing exactly what is expected to be done, they do nothing or invest nothing towards ensuring personal protection and protection of those others they work with. We need some regulation and a tough enforcement process to be able to contain and upgrade the situation regularly.*

About 19% of the respondents said that the frequency of fire disasters was not a consideration in instituting the improvements thus adding to that majority who are already indifferent. This kind of attitude could be attributed to lack of adequate sensitisation among the NCBD entrepreneurial fraternity, while it could also point out lack of commitment on their part. This could also be attributed to lack of information on disaster management. As Turner (1978:162) advises, "if we are looking back at a decision which has been taken as are most decisions in the absence of information, it is important that we should not assess the action of decision makers too harshly".

#### **4.3.4 Fire safety regulations and levels of adherence**

A wide variety of rules and regulations regarding fire safety in buildings both nationally and internationally do exist. Although all codes and local bylaws in respect of fire safety are based on the same theme, they differ vastly in their methods of application. Fire regulations can be broadly divided into three categories.

- Mandatory/obligatory
- Recommendatory

- Empirical

According to Jain (1996:134), *mandatory or obligatory regulations are those introduced by local administrations like municipal corporations or by state governments in case local administration has not made any rules regarding fire security.* Recommendatory regulations are available in the shapes of codes and drills formulated by Bureau of Standards.

The most important out of these standards is the National Building code because it guides the design and architecture of structures within a give nation. Fire Protection provides sufficient guidance regarding all active (first aid or fire brigade whether portable or fixed) measures and passive (architectural and construction) measures to be adopted during design and construction of buildings. The code of practice/regulations provides sufficient guidelines on national basis, in line with the provisions of the given county's legislation. For instance, after the collapse of sunbeam supermarket in Nairobi, the planning and building regulations were reviewed.

The need to establish if the NCBD entrepreneurs are aware and conversant with the fire safety regulations was found logical in the process of study. Responses to this question were quite interesting in that 43.2% of the NCBD entrepreneurs indicated that regulation are either not there or inapplicable while 35.6% were not aware of any regulations. This implies that a total of 78.8% of the NCBD entrepreneurs either do not know of the regulations or do not care about the issue. This problem could be attributed to lack of knowledge on the various types of regulations and poor enforcement processes. One key informant from the N(D)OC during the FGD confirmed that people (entrepreneurs) are not bothered about such regulations because they know that no-one will bother following them up.

As the researcher probed the issue of non-adherence to regulations, one entrepreneur is in record to have wondered whether these regulations are written or verbal - colloquial laws. He also wondered which was the enforcing agency and through what means did the enforcing agency advocate those regulations.

Another respondent in the cluster 17 along River Road wondered whether the regulations fall under the central government or the local authorities. He is in record to have advised that: *It were better if such regulations were put under the local authorities act, and then enforced through strict judicial systems.* He intoned that, *“with the changed government, it may be possible to do something.*

With very few respondents unaware of the regulations, it was found useful to assess the extent to which the respondents felt regulations were useful to them in mitigating fire disasters. 80% of the respondents could not link regulations with fire disaster mitigation as they considered the relationship non-existent.

This proportion closely compares with the situation above in which case is large majority also confirmed that regulation are either non-existent or inapplicable. This scenario was confirmed during the FGD with the members of the NCBDA who believe that majority of the entrepreneurs have not been introduced to and therefore cannot be expected to adhere to the set regulations.

About 89% of the respondents confirmed having had no knowledge of any regulations reviews or changes, a position that was disqualified by the fact that planning and building regulation focusing on fire safely installation was reviewed in 1998 soon after the sunbeam collapse. This therefore shows a clear case of ignorance, which is brought about by lack of knowledge and adequate sensitisation, as confirmed by one informant from NDOC during the FGD.

The study further tried to establish whether the little improvements to the regulations in terms of reviews had any relationship with increased frequency of fire disasters. As expected and in view of the foregoing, 82 of the respondents said that such a relationship is inapplicable while 6% said that the disaster frequencies did not contribute to the improvements in regulation. As such a total of 88% believed that there is no relationship, meaning that only 12% thought that the frequency of fire disasters has contributed to some extent.

#### 4.4. Types and characteristics of preparedness measures taken by the NCBD entrepreneurs

Fire disaster prevention and control basically involves disaster mitigation and preparedness. This implies that irrespective of the level of efficiency of mitigation measures taken, one cannot talk of effective fire disaster prevention and control without having sound and elaborate disaster preparedness strategies. One of the key areas of investigation in this study was to identify the levels of preparedness towards fire disasters by the NCBD entrepreneurs. This was considered important because entrepreneurs have a stake in ensuring efficiency in fire protection within their environment. They are bound by their physical presence in the NCBD and by the capital investment they have put in place. As such they are not only duty bound to invest in fire disaster preparedness, but also do have a stake in preventing direct losses in terms of real capital input going into ashes in the event of fire. Preparedness to fire disasters is also seen as an individual decision thus falling squarely on the docket of the entrepreneurs themselves.

The study investigated various aspects of preparedness to fire disasters as guided by the research objectives and the research questions. In order to clearly unearth the preparedness efforts and analyse the relative levels of safety, the study focused on four principal areas, as guided by the objectives of the study. To begin with, it was necessary to establish what preparedness measures have been taken by the NCBD entrepreneurs towards fire disasters. Then the study also sought to establish the extent to which the NCBD entrepreneurs considered the preparedness measures taken as adequate for the purpose.

It was assumed that these measures were not taken at once, to full satisfaction of the entrepreneurs. In other words, there was need to focus on the third objective of finding out what improvements have been achieved, to ensure that the preparedness measures remained sound and highly responsive to the need. Finally, with increased frequency of fires or occurrence of fires, it was only necessary to establish whether the improvements in the preparedness measures taken have any bearing on the increased frequency of fires.

As such they were requested to indicate whether efforts in improving their levels of responsiveness to fire disasters were in any way as a result of increased frequency of fire disasters.

Ten mitigation measures were considered relevant in the NCBD and similar set-ups and therefore evaluated accordingly. These include; the measures aimed at ensuring capacity to fight fire; the types and characteristics of fire warning systems in place; fire escape/evacuation concerns; methods of passing knowledge on safe fire escape/evacuation; fire safety drills; measures ensuring operational readiness of fire fighting equipments; presence of fire response plans; measures aimed at ensuring operational ability of fire response plans and finally, the available fire disaster recovery resources. It was on the basis of those measures that an evaluation of the sampled NCBD entrepreneurs was made by having them interviewed by use a guided questionnaire.

#### **4.4.1 Measures aimed at ensuring capacity to fight fires**

Being able to combat a fire outbreak means one is prepared for it. The reverse is true for an unprepared individual or entity. Levels of preparedness vary depending on various factors as this study established. The study sought to know what measures the entrepreneurs have taken to ensure that they could fight or extinguish fire should it occur.

According to Kent (1991), one of the key objectives of disaster preparedness is provision of appropriate assistance at the time of need. The issue under investigation was to establish the operational readiness of the entrepreneurial community to fight fire. According to Diane Meyers (1994:18), *It is crucial for organizations to educate themselves about the roles and responsibilities of other functionaries within reach for support in time of disaster.* Respondents to the questionnaire were asked to indicate exactly what they have done to ensure that they can put off fire.

**Table 7. Distribution of respondents according to the measures taken to fight fire**

Levels of preparedness to fight fire.	Frequency	Percentage
Installed Fire fighting equipment	72	60
Fire fighting equipment and trained personnel	2	1.7
Fire fighting equipment and alerting mechanisms	4	3.3
Trained personnel on fire fighting	5	4.2
Fire fighting equipment and linked to NCC-FB	4	3.3
Inborn ability to fight fire	15	12.5
No measures/ None	18	15

The study established that 60% had installed fire-fighting equipment. Further findings were that 15% of the respondents did absolutely nothing in this respect. 12.5% said that they had some inborn knowledge to enable them fight fire and that they could handle the situation should the need arise. This is an indicator of a high degree of ignorance of the seriousness of fire disasters and their effects. It is important to realize that the presence of fire fighting equipments does not necessarily mean an equal ability to use them. As such only 1.7% of the respondents had both the equipments and trained personnel to handle them, while 4.2% of the respondents had trained their personnel but did not have the fire fighting installations. This makes the situation much more frustrating in that they know what to do but cannot do it.

Only 3.3% of the respondents had fire-fighting equipments and were linked with the fire brigade; while 3.3% of the respondents had the equipments and had developed some alerting mechanisms to use in the event of fire. The ideal situation would be one where an entrepreneur has made provision for the various fire fighting installations which include fire warning and alerting mechanisms as well as having established contacts with the essential service providers linked with fire disaster control and prevention.

The question of whether the respondents considered the measures taken as adequate or not was addressed. Data collected on this issue revealed that 55% of the respondents were fairly convinced that the measures were adequate while out of the total number of respondents, 20.8% were quite convinced that the measures were sufficient and only 6.7% were totally convinced that they had done all they could to



ensure that they could adequately fight fire. About 13% of the respondents did not respond to this issue.

Asked what they believed should have been ideal, some of the key informants from the N(D)OC confirmed that there are those entrepreneurs, who believed in free riding. They did not see the use of investing in fire prevention and control. They shifted the blame to the landlords and claimed that it should have been be their (landlords' /ladies') responsibility. Continuous improvements are expected in making fire containment an easy option. The study therefore sought to establish what improvement/efforts have been put in place towards ensuring that the measures taken towards fire prevention and control are adequate and results summarised in table 8 below.

**Table 8. Distribution of respondents according to the improvements towards containing a fire outbreak**

Response	Frequency	Percentage
New Installations	2	1.7
Frequency and regularity of servicing	27	22.7
Diversified approaches to fire safety	1	.8
Nothing	89	73.6
Missing data	1	.8
Total	120	100

From table 8 above, the findings on this particular issue were that majority, 73.6% have done nothing. To them, there was no need for any form of improvements, to either maintain or increase the efficiency to respond to fire. A further 22.7% had increased the frequency and the regularity of servicing the fire fighting equipments, while about 1.7% had installed new equipment.

The reason why all those who have installed fire-fighting equipments did not claim to have improved on their service was given by a key informant from Nimrod Africa Limited. According to him, the regularity of servicing the equipment depends on its initial source. He claimed to have been involved in servicing only those equipments from his organization.

He pointed out that the regularity and efficiency of servicing fire fighting equipment might not be owner driven but seller driven in that the seller/dealer adds an extra service charge to the price, for initial maintenance of the equipment at least for some time after purchase.

The study further sought to establish whether the improvement made in ensuring the ultimate responsiveness of the fire fighting equipments had any relationship with the increased frequency of fires. In this case, the respondents were asked to state whether the improvements were purely due to frequency of fire disasters. If the relationship was not that strong, they were free to indicate whether improvements and fire disaster frequencies were somehow related or simply unrelated.

13.3% of the respondents said there was no relationship, while majority 65% of the respondent did not pick on any of the alternatives.

As such over 78% of the respondents did not visualize a relationship. A total of 12.5% said that improvements were reasonably due to the increased fire disasters while 4.2% believed they were considerably so. Only 3.3% were sure that improvements were purely due to increased for disasters. The key informant from NDOC explained this factor by painting the scenario of different levels of ignorance. According to the key informant, those who read, record or follow the fire disaster reports to an extent of seeing such a relationship were very few. As such, people need to be made more aware of what they ought to know in order to make informed decisions.

#### **4.4.2 Types and characteristics of fire warning systems**

For most types of rapid onset disasters like fire, a warning system can save many lives. Giving a vulnerable population an adequate notice of an impending disaster enables it to either escape the event or take precautions to reduce the dangers. According to Coburn et al (1991), it must be assumed that functioning communications systems such as telephones and telexes may not be available in times of major disasters; upon which premise planning a warning system should begin. The study therefore intended to establish what the NCBD entrepreneurs have done to ensure that all the occupants of the various sections of their premises are adequately and effectively warned in case of a fire outbreak.

This is in due consideration of the fact that preparedness to respond to fire and the extent of injury are related to early warning systems in place. That is why the respondents were asked to state how they have ensured that all the occupants of the premises can be quickly informed of a fire outbreak in case it occurs. This is in due recognition of Kent's (1991), advice that "by giving a vulnerable population adequate notice of an impending disaster they can either escape the event or take precautions to reduce the dangers".

Responses to this concern indicate that majority 58.3% had installed some early warning systems. In response to a further exploration on how they have ensured that workers and colleagues understand the importance of fire early warning system, 33.1% indicated that fire early warning has been made part of the induction training to new comers joining their establishments at various levels. However 48.3% have done nothing to ensure that colleagues and workers are alerted on the presence, implications and use of fire early warn systems. This may explain why we often have confusion and excessive injuries during stampede after a fire outbreak. According to Kent (1991), fire early warning systems should be understood by all the occupants of a given premises.

A further 27.8% said that they warn their colleagues about fire by shouting 'FIRE!!' This has to be understood as a clear warning of impending danger and as a call to action specifically for those who have been trained. It was also confirmed through the FGD by a key informant from the NDOC who referred the study to fire signage, which indicates that in case of fire, shout 'FIRE' and run for safety mainly through the fire exit. Incidentally not many business premises had such signage and elaborate fire exits, as this study was later to confirm. About 10.8% of the respondents indicated having no knowledge of the need to ensure that the co-occupants of the business premises need to have an elaborate fire warning system and understand it well.

Further on, data collected on this issue indicate that 11.9% of the respondents underscored the need for everyone to understand fire warning since it is general knowledge. In other words, there should be no need to put in any efforts in establishing elaborate, well-designed and better-understood fire warning systems.

From the FGD with Nimrod Africa Limited, this level of ignorance was regarded as very dangerous. One informant recited a case in point during a training session, where the fire alarm was sounded without prior warning to the occupants of the training institution. He said that;

*Everyone was caught unawares; in their normal routine. Everyone did whatever he or she thought was best and safest at the nick of the moment. Most of the people forgot that they are not supposed to use elevators. Majority tried to jump out through the windows. If we had not stationed people around the building to wave the occupants back, several people could have had their limbs broken or even suffered worse injuries.*

According to him, the whole institution was thrown into panic. Within a short time, everyone was somehow out of the two-storey building. Some including the gatekeepers ran out of the compound. What was peculiar about this incident is that the occupants of this building knew the importance of the fire alarm. However they needed to know more in terms of how to conduct themselves in the event of the alarm going off, implying a fire outbreak.

Efficiency of fire warning systems is measured in terms of the coverage within the target structure; the audibility of the alarm whereby in most cases it is audio; and the levels of understanding of the target group about the warning system. The study further sought to establish how efficient NCBD entrepreneurs considered the established fire warning systems to be. Responders were requested to choose among *extremely, very, fairly, a bit efficient and not efficient*. Data collected and presented in the table 9 below, shows that majority of the respondents considered the warning systems efficient. Only 15.8% did not regard the fire warning systems as efficient.

**Table 9. Distribution of respondents according to efficiency of the fire warning systems**

Response	Frequency	Percentage
Extremely efficient	6	5
Very efficient	26	21.7
Fairly efficient	53	44.2
A bit efficient	16	13.3
Not efficient	19	15.8
<b>Total</b>	<b>120</b>	<b>100</b>

To maintain the efficiency levels of the warning system, certain improvements need to be done such as redesigning the whole systems or installing better or modernised ones. To ascertain this, the study went to further evaluate what the NCBD entrepreneurs have done to improve on the efficiency of the fire warning systems. A large majority, 83.2% reported to have done nothing. This confirms that the entrepreneurs attach little importance to fire warning. Only 10.1% reported some improvements on the fire signage, while 3.4% have modernized the warning systems by installing fire alarms.

In terms of ensuring that the users of the premises understand the use of fire warning systems a whole 95.8% reported having done nothing about it. This implies that either there is no training to complement the modernization/improvements or the fact that sensitization on the importance and used of the fire warning is not conducted appropriately. Such findings were confirmed by a key informant from Nimrod Africa Limited during a FGD, who informed the study that rarely will any client (entrepreneur) request for training of the personnel on use of new installations.

He said that convincing the entrepreneurs to have the warning systems installed is in itself an uphill task. In most cases, the equipment suppliers do not push clients into training but continuously remind them of upcoming schedules to give them an opportunity to decide whether and when to have their workers trained. The other methods of fire warning information exchange recorded include regularized fire drills by 1.7% of the respondents and review of fire instructions by only .8% of the respondents.

Though there were little improvements in making the fire warning systems more efficient, the study sought to establish whether efforts in those improvements were as a result of increased fire disasters in Nairobi. From the data collected, 58.3% did not see any relevance in the relationship. Another 15.8% said that the frequency of fire was not a consideration.

As such, 74.1% do not think that improvements are as a result of increased fire disasters. Only 10.8% related the efforts, though to a little extent, to the increased frequency of fire disasters.

To some extent the efforts are as a result of increased fire disasters as reported by 6.7% of the respondents, while 4.2% of the respondents believed that the efforts to a great extent depended on the increased frequency of fire disasters. This once more boils back to the levels of ignorance within the NCBD entrepreneurial fraternity. It is illogical for one to relate no efforts to increased fire disasters.

In view of the fact that only 3.4% have improved/modernized the FWS, then it is not surprising that only 3.3% of the respondents related such improvements/modernization to increased fire disasters. Likewise, just as majority (95.8%) of the entrepreneurs have done nothing to ensure that FWS are understood so then can they relate improvement to threat to fire (82.5%). Therefore, a lot needs to be done to enable the NCBD entrepreneurs and the total entrepreneurial fraternity at large, regard fire safety in the light of efficient early warning of an ignition.

#### **4.4.3 Fire escape/evacuation concerns**

Preparedness against fire disasters within buildings calls for designated and well marked fire escape/evacuation routes. In the event of fire, use of elevators should be avoided since they are supposed to use electricity. This is because one of the primary response strategies to fire in buildings is cutting of electricity supply to decelerate the rate of spread. The study therefore, went further to find out how the respondents had designed their escape routes to ensure safe evacuation in the event of fire. Findings revealed that that 21.7% of the respondents have ensured that fire signage have been strategically installed showing the direction of exit in the event of fire. The signs were always illuminated and coloured green, with a sign showing someone running. They bore the sign FIRE EXIT.

A total of 30.8% of the respondents confirmed having fire escape routes, which were not the normal entry and exit points to the premises. Efforts to physically see these fire escape routes were curtailed in most cases by the respondents claiming that they were located at the rear of the building and that they did not have enough time to take the researcher round. The truth of the matter was that, most of them had been sublet to smaller entrepreneurs who were operating business therein. As such they are not available for the purpose. This implies that the design and construction regulations were adhered to, but user specifications grossly violated.

The other problem was where the building were leased through agent, who were either uncooperative in ensuring that the escape routes were released for the purpose or claimed that the owners of the premises were forever doing something about it. Apparently most of the respondents claimed to have complained to the landlords/ladies through the agents who always promised to have the matters sorted out. Through the FGD with the NDOC, the study gathered that in agent run/managed premises, it was very difficult to enforce user rights.

The study was further informed that 40% of the respondents had done nothing to ensure that escape routes are available and user friendly. This only adds to the problems of having no escape routes in that blocked escape routes are as good as unavailable. However the study did not determine the extent of unusable escape routes because the issue is outside the study objectives.

The study sought to establish how useful the respondents considered the fire escape routes to be. Data collected on this issue indicated that 74.2% (see table 10) of the respondents considered escape routes as extremely useful. This explains the fact that entrepreneurs, though majority of those interviewed had done nothing about having elaborate escape routes, were not ignorant of their importance.

**Table 10. Distribution of respondents according to usefulness of fire escape routes.**

Response	Frequency	Percentage
Extremely useful	89	74.2
Quite useful	10	8.3
Fairly useful	7	5.8
Not useful at all	6	5
None	4	3.3
Missing data	4	3.3
<b>Total</b>	<b>120</b>	<b>100</b>

According to the information on table 10, 8.3% of respondents find escape routes quite useful, while 5.8% said that they are fairly useful. As such, 88.3% of respondents find escape routes at least fairly useful.

It is a preparedness strategy to ensure that fire escape or evacuation concerns are improved and maintained at optimal operating standards. This could be achieved through maintenance and servicing of the escape routes, and regular checks on the usability of the same. The study therefore needed to be informed on whether NCBD entrepreneurs had put in any efforts towards improving the escape/evacuation routes in the recent past. Findings revealed that a large majority, 84.2% had done nothing to improve the evacuation routes.

The implications of such findings are that entrepreneurs had not concerned themselves a lot with their safety and that of their subjects should there be a fire outbreak. It also reveals that they did not attach a lot of importance to the issue in putting such little personal efforts towards taking up strategic fire safety measures. Very few respondents, 1.7% had modernized the signage, while only 2.5% have modernized the evacuation routes themselves. Extra efforts were also reported in that 7.5% of the respondents had cleared out the escape routes meaning that they were initially put into some alternative use. More of rehabilitation of fire escape routes needs to happen in order to release them for their initially intended purpose.

Reasons for modernization or improvements cited above were also explored in view of establishing whether they were in any way linked to increased frequency of fire disasters in Nairobi. A large proportion of respondents, 77.1% saw no relationship between the improvements and the increased frequency of fire disasters. An additional 6.8% said that improvements were not at all due to fire threats. This indicates that 83.9% of the respondents, which very well compares to the 84.2% of those who had done nothing to improve on the fire escape, do not find investment in modernization /improvements in fire escape to relate with the increased fire disasters. Therefore, the findings are consistent with the little efforts entrepreneurs have put in the direction of ensuring efficient fire escape. Only 16.1% of the respondents saw the improvements being fairly due to threats to fire.

#### **4.4.4 Channel of communicating fire safety information**

Existence of fire exit/evacuation routes and warning systems is not sufficient without their importance being fully understood by users.



Diane Myers (1994:18) advises that, owing to the complexities and the challenges of a disaster environment, key factors in an organization's effectiveness are flexibility and the ability to improvise. Preparedness to fire prevention and control should include inbuilt mechanisms of passing information to occupants of any given premises, as it should have an information generation process.

This study went on to find out the communication channels used to educate occupants of various premises within the NCBD on the presence and effective use of fire escape routes as a fire safety initiative. It was evident that within the NCBD, staff meetings are used to pass on information concerning preparedness to fire, whereby 25.7% of the respondents indicated having used such channels for the said purpose. Of those, 21.4% said that they specifically call for staff meeting to discuss fire prevention and control matters.

Various other methods of communicating fire prevention and control information were reported. At least 7.7% of the respondents use formal training (in house or otherwise) to impart knowledge on fire prevention and control. On the other hand, 3.4% produce and distribute materials in form of fliers and pamphlets, while 34% have displayed location maps at strategic places showing their relative locations in relation to the nearest fire escape. This was quite common in the data collected from hotels, which are mostly patronized by strangers.

Majority of the NCBD entrepreneurs however did not have any specific method of communicating fire prevention and control information, including the presence and location of safe evacuation facilities, in which category 57.3% of the total was found. Three respondents did not attempt this question.

The study, also set out to assess the extent to which the entrepreneurs found fire safety information channels efficient. Findings in this respect revealed that 55.4% of the respondents were convinced that the channels were not efficient. However, 24.4% of the total found the channels fairly efficient while 13.4 confirmed that they were very efficient. Only 3.4% of the respondents said that the channels are extremely efficient.

It is clear from the findings that entrepreneurs could easily assess the level of efficiency of their fire safety information channels, depending on the efforts they had put in fire control and prevention information management.

This study evaluated the improvements that have been put into the communication channels over time, to make them more efficient. Quite interesting findings were that an overwhelming majority of the NCBD entrepreneurs have done nothing to improve the communication channels. Only 17% reported increased discussions on the importance of the fire escape routes while one respondent each talked of intensified training and intensified publication materials production.

Further on, the research focused on whether the improvements in the information channel were in any way related to the increased frequency of fire disasters. Finding here revealed that less than 10% of the respondents, actually 8.9%, said that the improvements were to some extent related to the increased frequency of fire disasters. 88.5% of the respondents either said that the improvement and fire disasters frequencies were not at all related or did not see any links between the two. 1.7% of the respondents did not comment on this issue.

#### **4.4.5 Fire safety drills**

From the earlier findings in this study, fire drills are not conducted. Data collected showed that 85.7% of the respondents have never conducted any fire drills in their premises, while only 3.4% do so after a year, which is considered to be too long an interval.

According to Kent (1991) "not only will rehearsal re-emphasize points made in separate training programmes but they will also test the system as a whole and invariably reveal gaps that otherwise might be overlooked". It is recommended that fire drills be conducted as often as possible at least half yearly, in order to have occupants of a building familiarize with the exercise and basically perfect on the reaction time. Only 5.9% had fire drills conducted bi-annually, which was confirmed during the FGD as the recommended time.

Failure to conduct fire drills does not mean that the NCBD entrepreneurs do not value them. This is supported by separate findings that 51.3% of the respondents believed that fire drills were absolutely essential. From this research, only an insignificant proportion, 0.8% of the respondents said that fire drills are not necessary.

As concerns improvements in the fire drills, several aspects were recorded as having been improved though by a very small, 4.2% of the respondents. 0.8% had sought collaboration with the fire brigades, while two others have linked fire drills with introduction of new equipment. The other 1.7% stated that they had been involving their personnel in servicing the fire fighting equipments. A large majority 92.5% claimed to have made no improvements at all; while 2.5% of the respondents did not give their comments.

The study further sought to find out the relationship between the improvements in fire drills and increased fire disasters. 84.2% of the respondents did not see any relationship between the two. However 5.8% clearly stated that improvements were not at all due to increased fire disasters while 8.3% said that at least, the two were somehow related. Out of the latter group, 2.5% said the two were essentially due to increased fire disasters while another 2.5% said that they are to a great extent due to increased fire disasters. These findings were confirmed during the FGD with the NCBDAs who said that only those entrepreneurs who have invested in fire prevention and control did conduct fire drills.

#### **4.4.6 Ensuring operational readiness of fire fighting equipment**

Preparedness has the connotation of improved efficiency and effectiveness to fighting an ignition. Mere presence of fire fighting equipments does not guarantee this efficiency and effectiveness. This study therefore sought to determine what measures the NCBD entrepreneurs have put in place, to ensure that the fire fighting installations were kept at high levels of responsiveness. Only 10% cited regular servicing of the equipments as a measure aimed at improved responsiveness. Regular servicing was therefore confirmed as the most essential measure by one of the key informant from Nimrod Africa Ltd, during the FGD.

Only 0.8% of the respondents said that they have modernized and increased the number of equipments respectively. All the rest, 86.7% have done nothing to improve on the responsiveness of the fire fighting equipments.

The study further sought to know whether the improvements are related to increased fire disaster and the responses recorded in table 11 below.

**Table 11. Distribution of respondents according to the relationship between improvements in fire fighting installations and increased frequency of fires within NCBD**

<i>Response</i>	<b>Frequency</b>	<b>percentage</b>
<b>The two are extremely related</b>	5	4.2
<b>The two are quite related</b>	15	12.5
<b>The two are fairly related</b>	20	16.7
<b>The two are completely unrelated</b>	21	17.5
<b>Not applicable</b>	59	49.2
<b>Total</b>	120	100

From the data on table 11 above, about half of the respondents did not visualize any relationship between improvements in fire fighting installations with increased frequency of fire disasters. 17.5% said that there is no relationship. However a total of 40 respondents representing 33.4% of the total said that at least the two are related.

#### **4.4.7 Training on fire fighting techniques**

Fire disaster response training, commonly referred to as fire-fighting techniques is a crucial preparedness initiative. According to Auf der Heide (1989), organizations inexperienced in disaster often respond by continuing their independent roles, failing to see how their functions fit into the complex total response effort. This is described as the "*Robinson Crusoe Syndrome*" (we are the only ones in the Island). Having personnel who can combat an ignition with the available equipment means buying some time before back up or real response capability is availed.

This study went further to evaluate the extent to which entrepreneurs have invested in fire fighting training to enhance a commendable level of preparedness of their staff members. Training in fire fighting enhances personal and by extension, organizational capacity to combat/control fire in the event of an outbreak. According to Kent (1991), an essential part of a disaster preparedness plan is the education of those who may be threatened by disaster. Information gathered in terms of the number of persons trained against the total number of the occupants of each premises captured earlier, was computed to arrive at the proportion of those trained, and the results recorded table 12 below.

**Table 12. Distribution of respondents according to the proportion of staff members trained in fire fighting**

Response	Frequency	Percentage
0-5%	88	73.3
6-10%	5	4.2
11-20%	7	5.8
21-50%	7	5.8
51-100%	13	10.8
<b>TOTAL</b>	<b>120</b>	<b>100</b>

From the findings of this study, it was apparent that majority of the entrepreneurs had achieved up to 5% performance in staff training on fire fighting techniques. This is extremely low as compared to the apparent risk of and in due consideration of the findings that about  $\frac{3}{4}$  lie in this category. Further evaluation indicate that only 10.8% of the NCBDA entrepreneurs had trained at least 50% of their staff on fire fighting techniques. This is true for certain strategic organizations in fire control and prevention such as the Fire Marshals owed by GIMCO Commercial Agencies.

There is need for intensified training in fire fighting techniques. According to a key informant from Nimrod Africa Ltd, training on fire fighting should actually be considered mandatory. During the FGD, he is reported to have said that;

*If entrepreneurs are left to decide whether to go for or have their subjects trained on fire fighting techniques, they will almost certainly decide otherwise.*

*Very few indeed understand the importance of being able to combat fire, until they encounter one. From then on, and it is unfortunate that the large majority lie in this category, they become serious about fire fighting. The major problem we have is that of people believing that some one else will do it. Until such attitudes are completely eradicated, we shall almost always incur major losses.*

The study further probed on whether the entrepreneurs (respondents) intend to train/cover everyone else in the organization. About 52% of the respondent did not commit themselves on this issue. They simply shunned the idea. Further probe through in-depth interviews and the FGD proved that plans to train staff on fire fighting, or any other field are agreed upon way before they have been hired into the various enterprises. In this respect, most of the employees or workers for the business owners within the NCBD were hired on temporary terms of service as not to qualify for any such expositions. This form of employment (casual basis) denied the employee any benefits apart from the wage. As such the employers felt justified not to invest in them through training on any skills including fire-fighting techniques, which would ironically benefit the employers more. Plans to conduct such training were reported by 20.8% of the respondents, which would be seen as an effort in the right direction.

This study was an eye opener to most of the respondents as it exposed them to how much they did not know. Some showed immediate interest for further information and possibly training. The findings further revealed that 14.2% of the respondents were prepared to push through training the very few remaining staff members, while 8.3% saw no need for training any more of the staff members.

A further evaluation of the improvements/advancements incorporated in the training programmes to make them more relevant and better focused on the real needs of the entrepreneurial community revealed that majority had made no improvement in this direction. Over 94% of the respondents have made no improvement in either the content or intensity of training on fire fighting. This shows the level of ignorance in this field and how less important the subject has been regarded by the entrepreneurs. Only one person did not respond to this question.

From the FGDs with the NDOC, and the NCC-FB, professional training on fire fighting could only be acquired from overseas. Most of the qualified fire marshals had been trained in United Kingdom, which was not within reach of the common man. This was further confirmed from the literature review where such training was realized to take place in several fire training schools in UK.

Relationship between the improvements/intensification of training and the increased frequency of fire disasters was also evaluated. Findings revealed that there is no relationship as was clearly pointed out by 92.2% among whom 6.9% said that the improvements were not at all linked to fire disaster frequency increase while, 85.3 did not visualize any relationship at all. Only a small percentage, 5% indicated any form of improvement in such trainings showing that training on fire fighting is not taken seriously by the NCBD entrepreneurs.

#### **4.4.8 Fire response plans**

Response planning for any form of disaster is a preparedness strategy/measure towards that particular disaster. Fire response planning would involve either having an individual, organizational or even institutional fire response plan, which only needs activation in the event of a fire disaster. According to Kent (1991) - the preparedness plan must have an information system, consisting of formalized data collection process, an early warning system, and a system for monitoring warning information.

The study therefore sought to establish whether the NCBD entrepreneurs had fire response plans, and what these plans covered. According to Diane Meyers (1994:18), *a disaster response plan must identify the respective individuals (by position), responsible for carrying out the functions.* Further on, Diane Meyers (1994:18) argues that a disaster plan must specify the roles, responsibilities and relationship of a given organization to those others with responsibility for disaster planning response and recovery.

The study results revealed that only 2.5% of the respondents had any form of response planning. Another 2.5% depended on the regional response plan while a large majority; 94.1% neither had any response plan nor did they know what these plans were all about.

According to a key informant from the NDOC key, fire response planning for business personnel should encompass an in-house capacity development to fight fire, coupled with identification and development of proper linkage with the relevant organizations to avoid the Robinson Crusoe Syndrome; *we are the only ones in the Island* (Auf der Heide: 1989). There should be prior knowledge of who could help and to what extent in containing a fire out break. The linkage should include contact details of the organizations; persons to contact in the event of fire and an unfailing means through which they could be contacted having been established before a fire incident. The alerting and/or notification systems should have been developed, tested, exercised and approved as effective.

A log of important aspects of notification for the specific members of the organization/enterprise should have been established and regularly updated prior to a disaster. On the contrary most of the NCBD entrepreneurs shifted blame to the NCC-FB for its inefficiency and ineffectiveness. Some however suggested that it should be privatised and then entrepreneurs allowed to buy shares so as to monitor its performance. Most of the entrepreneurs as shown by the data collected did not even consider calling the fire brigade as a solution to their problem in the event of fire.

The study further sought to establish the extent to which NCBD entrepreneurs felt that the response plans were adequate. Results of this exploration revealed that just as many did not have response plans so are they unable to comment on the sufficiency of the plans. About 83% of the respondents could not perceive any relationship between the two. Only a few, 3.4% were satisfied that the response plans are completely adequate, while 6% were quite satisfied with the response plans themselves.



Further on, the study sought to find out what improvement the entrepreneurs had been made on the response plans. To this respect, 97% of the respondents reported to have had no improvement against only 3% who had. This implies that the entrepreneurial community is ill prepared. This could be explained by the fact that one does not improve on what he/she does not know. According to some key informants, there is need to instil the thinking of collaborative response to fire into the NCBD members/entrepreneurs.

The study went on to explore whether in the understanding of the entrepreneurs, response planning would have had any relationship with the increased frequency of fire disasters. About 88% of the respondents did not think the two were related. However from what was earlier realized, most of the respondents do not have fire response plans to begin with, and 97% of them have not had any improvements.

#### **4.4.8.1 Future plans for NCBDA fire response**

The issue of having no organized response planning was further followed and taken up with the NCBDA Disaster Preparedness Committee, which had held only two meetings by the time of the interview. This committee discussed the future plans of the NCBDA disaster preparedness. According to the Chairman of NCBDA, the organization intends to adopt a clustering strategy whereby NCBD will be subdivided into clusters, which will therefore be advised to form some joint disasters planning sub committee to further develop mitigation and preparedness strategies for the respective clusters. The strategies will be incorporated into the NCBDA disaster preparedness master plan. This Process will however take some time and resources, but it is a worthy course. The final product will be a disaster response plan covering all the likely disasters in the clusters, hence the whole of the NCBD.

#### **4.4.9 Ensuring the operational capacity of the Fire Response Plans (FRPs)**

The mere presence of fire response plans is not the ultimate goal in fire disaster preparedness. The desired condition is that they should be relevant and utilizable/usable at the time of need. According to Meyer (1989:18) response plans should be based on solid knowledge of the organization and the environment. Response plans should also be comprehensive to adequately address fire response.

To ascertain this, they must be exercised regularly. It is in view of the foregoing that the study sought to establish how often the NCBD entrepreneurs, fire response plans were exercised. The respondents were requested to state how often they exercised the fire response plans.

Data collected indicated that a very large majority of the respondents did not actually exercise their fire response plans. About 91% of the respondents indicated that exercising of fire response plans was not applicable to them. What this tells us is that they either did not have response plans or did not know about them or both. Only a very limited number of entrepreneurs reported having some form of exercising of their response plans. This includes 2.5% of the respondents who said they to exercise their response plans bi-annually, and 1.7% who do so beyond one year.

Fire response plans exercising after one year is too long to be considered effective especially when the precise period is not known. This response was deliberately included to capture those who could not certainly remember how often their response plans were exercised. 4.2% of the respondents said that they exercised their response plans after every one month. Again this sounded rather unconvincing owing to the preparations and resources that go with exercising such plans.

Further on, the respondents were asked to state their degree of satisfaction with the effectiveness of the response plans. Data collected from this question revealed that a large majority again did nothing or simply did not bother about the response plans' adequacy. About 15% of the respondents were able to realize some levels of satisfaction with the ability of the fire response plans to sufficiently serve the purpose. The study followed up to find out what improvements the respondents had made in the recent past towards exercising the fire response plans. Finding from the interviews indicate that about 98% of the total number of respondents covered by the study did nothing concerning improvement of the plans.

The study went on to find out if there was any relationship between the improvements to the fire response plans with increased fire disaster within the study area.

Findings indicated that 83.2% of the respondents did not see any relationship between the two. This could be associated to there being no improvements in the very first place. The remaining 12.8% indicated some kind of relationship between the two.

#### **4.4.10 Fire disaster recovery resources**

Preparedness also has to do with the ability to get the recovery process started. According to Kent (1991) the objective of disaster preparedness is to ensure that in times of disaster, there are appropriate systems, procedures and resources in place to assist those afflicted by the disaster and enable them help themselves. For the process to begin one will need resources besides time and physical presence, to begin and sustain a relief, rehabilitation, restoration and the reconstruction processes which encompass the recovery phase. According to Auf der Heide (1989), disasters also disable the routine equipments and facilities needed for emergency response thus amplifying the need for resources. The resources would be utilized in alleviation of suffering during the recovery phase of a comprehensive emergency management system.

The study therefore sought to establish what resources had been set-aside in preparation for recovery from fire disasters. Data collected indicated that 53.3% of the respondents have an insurance cover. Probed further, these respondents indicated that the cover is normally sufficient for both the property and the personnel working in their premises. Further outcome of the study indicated that about 31.7% have done nothing about setting aside some resources as disaster preparedness measures. An insignificant number cited other resources such as NHIF (5%) etc. What those results are loudly saying is that the NCBD entrepreneurs are to a great extent ill prepared.

Asked whether they consider those resources adequate, about 59.2% of the respondents indicated that the resources were adequate though to varying degrees. A large proportion, 36.7% just like those who said nothing about the resources could not relate the two. This issue need be revisited to ascertain whether the insurance cover so cited is for all and evaluate it against the requirements of the facility to ascertain its sufficiency.

Further on, the study was informed that 71.7% did nothing to improve on the resource base. When probed further on to establish whether the improvements have any notable relationship with the increased fire disasters, 66.7% did not visualize any relationship. However 8.3% said that the two are to quite related, while only 7.5% were very sure that the two were related. 13.3% of the respondents however did not think the two were related in any way, bringing up the total to 80% of those who did not believe the two are related. This could be closely associated with absence of he plans themselves.



## CHAPTER FIVE

### BIVARRIATE ANALYSIS AND FINDINGS

#### 4. INTRODUCTION

This chapter covers the quantitative analysis of the relationships between variables covered in the study. Findings from the analysis are used to test the hypotheses of the study.

##### 5.1 Bivariate analysis

The research finding reported in Chapter four were put through bivariate statistical analysis to evaluate the relationships and possibly test some of the proposed hypotheses of the study. Cross tabulations were done to evaluate capture the relationships and calculate correlation coefficients of the various finding, from which some conclusions were drawn.

Correlation coefficient was used because it is a better measure in determining the cause effects relationships as well as the fact that it does not depend on the units of the data. In this particular study, the computational formula derived from the Pearson's correlation coefficient formula was used to calculate the correlation coefficient since the data is not ordinal.

The computational formula

$$R_{xy} = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{(N \sum x^2 - (\sum x)^2)} \sqrt{(N \sum y^2 - (\sum y)^2)}}$$

##### 5.1.1 Confirming relationship between variables, in analysing the hypothesis H1.

From literature review, regulations on fire safety are centred on the passive and active fire prevention/protection measures that need to be taken. While passive measures are design and construction related, active fire prevention/protection measures are adopted through the efforts of the users of buildings. It is generally understood that passive fire prevention measures are a must i.e. mandatory and obligatory and active fire prevention measures are adopted as a bonus. The active measures could therefore be summarised as fire detection measures, fire alarm or alerting measures, fire

extinguishing and fighting measures, fire salvage operations and fire evacuation concerns. This is in accordance with Jain (1996:132) argument that fire safety in buildings is deemed to cover the aspects of fire prevention, fire fighting and extinguishing methods, and fire salvage operations.

The hypothesis H1 under analysis stated that, *fire disasters threats promote adherence to fire disaster control and prevention regulations*. The dependent variable here was the fire disaster threats, while the independent one was adherence to fire disaster control and prevention regulations. From the responses collected in the study, those measures that are regulations' oriented were identified and responses relating to them recorded. The fire disaster threats or increased frequency of fire disasters could not be directly measured in this study, implying that they were indicated by those respondents who related improvements in the measures taken with the rising frequency of fires. The choice of these indicators was based on the fact that there could hardly be any improvements in fire disaster mitigation and preparedness measures, in the absence of fire disaster threats.

Corresponding responses to those measures in terms of levels of adherence, in this study captured as percentage of the respondents who took positive/relevant actions concerning those measures were also identified and the results tabulated in table 13 below. The relationship between the two sets of data is therefore representative of the relationship presupposed in the hypothesis H1.

Correlation coefficient was calculated to determine the presence/absence and therefore extent of the assumed relationship between the two variables thus confirming or negating the hypothesis. Results of the correlation coefficient calculations were used to draw conclusions as shown below.

**Table 13. Distribution of those respondents who associated improvements to fire disaster threats against those who took the relevant measures.**

Mitigation/preparedness measure under analysis	Percentage of those who associated improvements to frequency of fire disasters	Percentage of those who took relevant action on the measures
Measures to detect/ ignition	52	89
Measures aimed at fighting/extinguishing fire	22	73
Measures enhancing fire alarm or warning	26	58
Fire disaster recovery/salvage measures	20	58
Fire response / evacuation concerns	16	53

**Calculation of correlation coefficient**

x	y	xy	x <sup>2</sup>	Y <sup>2</sup>
52	89	4628	2704	7921
22	73	1606	484	5329
26	58	1508	676	3364
20	58	1160	400	3364
16	53	848	256	2809
$\Sigma x = 136$	$\Sigma y = 331$	$\Sigma xy = , 9750$	$\Sigma x^2 = 4, 520$	$\Sigma y^2 = 22, 787$

The computational formula

$$R_{xy} = \frac{N \Sigma xy - (\Sigma x) (\Sigma y)}{\sqrt{(N \Sigma x^2 - (\Sigma x)^2)} \sqrt{(N \Sigma y^2 - (\Sigma y)^2)}}$$

From the formula above,

$$R_{xy} = \frac{5 \times 9750 - 136 \times 331}{\sqrt{(5 \times 4520 - 136^2)} \sqrt{(5 \times 22787 - 331^2)}}$$

$$\begin{aligned}
 &= \frac{48,750 - 45,016}{\sqrt{(22,600 - 18,496)(113,935 - 109,561)}} \\
 &= \frac{3734}{\sqrt{(4104 \times 4374)}} \\
 &= \frac{3734}{4236} = \boxed{0.88}
 \end{aligned}$$

From the calculated value of the correlation coefficient, there is a strong positive correlation between the sets of variables compared, meaning that the hypothesis is correct. This also implies that an increase in threats from fire/ increased fire disasters causes an increase in the adoption of regulations in terms of taking up some measures to enhance further protection..

### 1.1.2 Correlation between variables in analysing hypothesis H2.

The hypothesis H2 stated, *increased frequency of fire disasters raises the awareness levels of what disaster mitigation and preparedness measures ought to be taken by the NCBD entrepreneurs*. The dependent variable here was the levels of awareness of fire disaster mitigation and preparedness, while the independent one was the increase in fire disasters. What the hypothesis implied was that due to the cause, which was the increased frequency of fire disasters, the effects were such that an increased number of entrepreneurs got to know more about the mitigation and preparedness measures to take. In other words, there was a relationship between the levels of awareness and the measures taken. This implies that the awareness levels were directly related to the measures taken.

To assess the strength or weakness of this proposition, 5 indicators of awareness could be plotted against 5 mitigation measures that had been reported taken, irrespective of whether they are mitigational or preparedness, and correlation coefficient calculated to prove that there is a positive linear correlation. The reverse would otherwise disapprove the hypothesis.



**Table 14. Distribution of respondents according to the indicators of awareness of fire disaster mitigation and preparedness against measures taken**

Indicator of awareness	Percentage of respondents	Measures taken	Percentage of respondents
Proportion of respondents who have been exposed to fire disasters through various means	78	Measures aimed at damage reduction	64
Proportion of respondents who knew what to do in the event of a disaster	87	Measures aimed at effective communication of information	64
Proportion of those who understood fire fighting strategies	65	Measures aimed at fighting fire	76
Proportion of those who considered fire safety in the choice of a prospective business premises	72	Measures aimed at addressing evacuation concerns	53
Proportion of those who know the main causes of fire	64	Strategies aimed at fighting fire	76.

## Calculation of correlation coefficient

x	y	xy	x <sup>2</sup>	y <sup>2</sup>
78	64	4992	6084	4096
87	58	5046	7569	3364
65	76	4940	4225	5776
72	53	3616	5184	2809
64	76	4864	4096	5776
$\Sigma x = 366$	$\Sigma y = 327$	$\Sigma xy = 23,453$	$\Sigma x^2 = 27,158$	$\Sigma y^2 = 21,821$

The computational formula

$$R_{xy} = \frac{N \Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{(N \Sigma x^2 - (\Sigma x)^2)(N \Sigma y^2 - (\Sigma y)^2)}}$$

$$\begin{aligned}
 R_{xy} &= \frac{5 \times 23,453 - 366 \times 327}{\sqrt{(5 \times 27,158 - 366^2)(5 \times 21,821 - 327^2)}} \\
 &= \frac{117,265 - 119,682}{\sqrt{(135,790 - 133,956)(10,910.5 - 106,929)}} \\
 &= \frac{-2,417}{\sqrt{(1,834 \times 2,176)}} \\
 &= \frac{-2,417}{1,998} \\
 &= -1.2 \quad \boxed{\approx -1}
 \end{aligned}$$

The calculated value of correlation coefficient shows that there is a perfect linear negative correlation, which therefore negates presupposition of the hypothesis H2. The perfect linear negative relationship implies that an increase in the frequency of fire disasters lowers the rate of fire disaster mitigation and preparedness awareness.

### 5.1.3 Confirming the relationships concerning the mitigation measures taken in relation to hypothesis H3

This hypothesis was tested for mitigation and preparedness measures separately.

Computations of correlation coefficient were done to determine the relationship between the percentage of the respondents who had no confidence in the measures taken and that of those who showed improvements in the levels of mitigation to fire disasters.

This in due evaluation of the hypothesis that *ineffective and inefficient response systems to fire disasters increase the levels of insecurity therefore leading to an improvement in the levels of mitigation and preparedness by the NCBD entrepreneurs*. The dependent variable in this hypothesis was the improvements in the level of mitigation and preparedness indicated by the percentage of the respondents while the independent one was the level of insecurity. This hypothesis presupposed a relationship between insecurity as a result of poor response to fire disasters measured in the percentage of those who found the mitigation measures inadequate as compared to improvements on the measures themselves.

The hypothesis implied that the higher the number of those who found the measures inadequate, the higher the insecurity therefore the higher the higher the percentage of those who show improvements in mitigation measures. The relative responses were illustrated in table 15 below. The outcome of this computation enabled the researcher to draw conclusions. In this particular analysis, all the four assessed mitigation measures in the study were evaluated.

**Table 15. An illustration of the percentages of those who had confidence in the measures taken against the improvements made.**

Mitigation measure under analysis	Percentage of all those who have no confidence in the measures taken	Percentage of those who showed some improvements
Measures to control fire outbreak	31	28
Measures to reduce damage to property	18	93
Measures to minimize human injury	40	22
Adherence to regulations	81	11

### Calculation of correlation coefficient

x	y	xv	x <sup>2</sup>	y <sup>2</sup>
31	28	868	961	784
18	93	1674	324	8649
40	22	880	1600	484
81	11	891	6561	121
$\Sigma x = 171$	$\Sigma y = 154$	$\Sigma xv = 4313$	$\Sigma x^2 = 9446$	$\Sigma y^2 = 10038$

The computational formula

$$R_{xy} = \frac{N \Sigma xv - (\Sigma x)(\Sigma y)}{\sqrt{(N \Sigma x^2 - (\Sigma x)^2)} \sqrt{(N \Sigma y^2 - (\Sigma y)^2)}}$$

$$R_{xy} = \frac{4 \times 4313 - 170 \times 154}{\sqrt{(4 \times 9446 - 170^2)} \sqrt{(4 \times 10038 - 154^2)}}$$

$$R_{xy} = \frac{17,252 - 26,180}{\sqrt{(8,884 \times 16,4346)}} = \frac{-8,928}{12,083.76} = -0.73$$

The computed value of the correlation coefficient shows that the two sets of observations are highly negatively correlated. In this relationship, the levels of insecurity are measured in the percentage of those who had no confidence in the measures. Increase in that percentage meant an increase in insecurity. On the other hand, high levels of insecurity according to the hypothesis should imply an increase in the percentage of those who have improved in mitigation measures. As such the hypothesis presupposes a positive linear correlation.

From the findings, we had a negative linear correlation meaning that an increase in insecurity measured in the increase in the number of those who had no confidence in the measures leads to a decrease in the improvements in mitigation measures measured in the percentage of those who showed improvements in mitigation measures. The findings therefore negate the hypothesis (H3) of the study as concerns the disaster mitigation measures.

**5.1.4 Confirming the relationships concerning the preparedness measures taken in relation to hypothesis H3.**

Responses on similar parameters concerning the preparedness were put through the same calculations and the correlation coefficient evaluated in an attempt to confirm or reject the hypothesis that; *ineffective and inefficient response systems to fire disasters increase the levels of insecurity therefore leading to an improvement in the levels of mitigation and preparedness by the NCBD entrepreneurs.* The hypothesis presupposed that an increase in insecurity due to poor response and in the study measured in terms of the percentage of those who had no confidence in the preparedness measures take; leads to an improvement in the preparedness measures taken.

The improvements in the preparedness measures taken were measured in percentage of those who showed improvement in preparedness measures. Responses from 9 different measures were captured and presented in table 16 below. The variables in the hypothesis were similar to those of the mitigation measures captured in 5.1.3 above, only that they in this case, referred to preparedness measures instead of mitigation as the case is in 5.1.3.

**Table 16. Distribution of responses according to the preparedness measures against improvements in the same**

Preparedness measure under analysis	Percentage of those who showed no confidence in the measure	Percentage of those who showed improvements.
Measures aimed at fighting an ignition	13	25
Fire warning systems	16	17
Fire escape/evacuation concerns	26	16
Methods of passing information on fir escape	55	20
Fire drills	49	8
Training on fir fighting	79	6
Fire response planning	83	3
Ensuring operational capacity of FRPs	85	2
Disaster recovery resources	41	28

**Calculation of correlation coefficient.**

X	v	xv	x <sup>2</sup>	v <sup>2</sup>
13	25	325	169	625
14	16	224	196	256
26	16	416	676	256
55	20	1100	3025	400
49	8	392	2401	64
79	6	474	6241	36
83	3	249	6889	9
85	2	425	7225	4
41	28	1148	1681	784
<b>Σx = 404</b>	<b>Σv = 124</b>	<b>Σxv = 4753</b>	<b>Σx<sup>2</sup> = 28503</b>	<b>Σv<sup>2</sup> = 2434</b>

The computational formula

$$R_{xy} = \frac{N \sum xv - (\sum x)(\sum y)}{\sqrt{(N\sum x^2 - (\sum x)^2)} \sqrt{(N\sum y^2 - (\sum y)^2)}}$$

$$\begin{aligned}
 R_{xy} &= \frac{9 \times 4753 - 404 \times 124}{\sqrt{(9 \times 28503 - 404^2)} \sqrt{(9 \times 2434 - 124^2)}} \\
 &= \frac{42,777 - 50,096}{\sqrt{(93311 \times 6530)}} \\
 &= \frac{-7319}{24684} = \boxed{-0.3}
 \end{aligned}$$

The results show that variables are negatively correlated though not as highly as in the case of mitigation measures. This proves the hypothesis wrong because the expectations of the hypothesis would have been a positive linear correlation.

**5.1.5 Correlation between variables in analysing hypothesis H4.**

One key issues of concern in this study was an understanding of what improvements were made in the direction of fire disaster mitigation and preparedness, and how the respondents viewed these improvements in line with increased fire disasters.

This is in response to the presupposition that “ there is a positive correlation between the increased frequency of fire disasters and improvements in mitigation and preparedness”, which was hypothesized at the beginning of this study. In this study, increased frequency of fire disasters was measured in terms of the proportions of the respondents who claimed to have acted due to the fire disaster threats. The improvements had been captured directly from the responses on the question of what improvements were made. The level of significance of the correlation coefficient will definitely explain the strength or weakness of the relationship.

Table 15. Distribution of responses according to the mitigation measures under analysis

Mitigation measure under analysis	Percentage of those who showed some improvements	Percentage of those who linked improvements with increased fire disasters
Measures to control fire outbreak	28	52
Measures to ensure that least damage to property	93	48
Measures to minimize human injury	22	26
Adherence to regulations	11	12

Calculation of correlation coefficient

X	Y	xy	X <sup>2</sup>	Y <sup>2</sup>
28	52	1456	784	2704
93	48	4464	8649	2404
22	26	572	484	676
11	12	132	121	144
$\Sigma x = 154$	$\Sigma y = 138$	$\Sigma xy = 6624$	$\Sigma X^2 = 10038$	$\Sigma Y^2 = 5928$

The computational formula

$$R_{xy} = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{(N \sum x^2 - (\sum x)^2) \sqrt{(N \sum y^2 - (\sum y)^2)}}$$

$$\begin{aligned} R_{xy} &= \frac{4 \times 6624 - 154 \times 138}{\sqrt{(4 \times 10038 - 154^2) (4 \times 5928 - 138^2)}} \\ &= \frac{26496 - 21252}{\sqrt{(40152 - 23716) (23712 - 19044)}} \\ &= \frac{5244}{\sqrt{(16436 \times 4468)}} \\ &= \frac{5244}{8759} \\ &= \underline{0.5986} \quad \boxed{= 0.6} \end{aligned}$$

The computed value of the correlation coefficient shows that there was a strong positive correlation between the two variables thus proving the hypothesis right. In other words, an increase in fire disaster frequency causes an increase in disaster mitigation measures taken to curb those disasters.

#### 5.1.6 Hypothesis test using the preparedness measures.

The same hypothesis tested by use of mitigation measures in 5.1.5. was once more evaluated in regard to the preparedness measures taken. Responses were gathered and presented in table 16, and the correlation coefficient calculated to assess the presence/absence and the characteristics of the hypothesis in regard to the preparedness measures.



**Table 16. Distribution of responses regarding the preparedness measures under analysis**

Preparedness measure under analysis	Percentage of those who showed improvements.	Percentage of those who related improvements with increased fire disasters
Measures aimed at fighting an ignition	25	22
Fire warning systems	17	26
Fire escape/evacuation concerns	16	16
Methods of passing information on fire escape	20	10
Fire drills	8	5
Training on fire fighting	6	12
Fire response planning	3	13
Ensuring operational capacity of FRPs	2	20
Disaster recovery resources	28	20

**Calculation of correlation coefficient**

x	y	xy	X <sup>2</sup>	Y <sup>2</sup>
25	22	550	625	484
17	26	442	289	676
16	16	256	256	256
20	10	200	400	100
8	5	40	64	25
6	12	72	36	144
3	13	39	9	169
2	20	40	4	400
28	20	560	784	400
125	144	2199	2467	2654

The computational formula

$$R_{xy} = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{(N \sum x^2 - (\sum x)^2) \sqrt{(N \sum y^2 - (\sum y)^2)}}$$

$$\begin{aligned} R_{xy} &= \frac{9 \times 2199 - 125 \times 144}{\sqrt{(9 \times 2467 - 125^2) (9 \times 2654 - 144^2)}} \\ &= \frac{19791 - 18000}{\sqrt{(22203 - 15625) (23886 - 20736)}} \\ &= \frac{1791}{\sqrt{(6578 \times 3150)}} \\ &= \frac{1791}{4551} = \boxed{0.39} \end{aligned}$$

From the computed value of correlation coefficient, there is an apparent positive correlation between the increased frequency of fire disasters and the preparedness measures. This implies that the higher the number of fire disasters occurring in the NCBD, the more the entrepreneurs take up fire disaster preparedness measures, thus proving the hypothesis H4 correct.

## CHAPTER SIX

### RECOMMENDATIONS AND CONCLUSIONS

#### 6. INTRODUCTION

The recommendations and conclusions outlined in this chapter are based on the expected situation as understood from the reviewed literature and the actual research findings. Some of the recommendations and conclusions were general and others specific.

#### 6.1 RECOMMENDATIONS

The recommendations have been broken down into three categories, which include those specific to the Kenya government, those targeting the entrepreneurs themselves and those to the researchers.

##### 6.1.1 Recommendations to the Kenya government

1. There is need for an establishment of a database containing all the fire disasters occurring in the country, to enhance quantification of the losses incurred through such disasters. Information captured should include the fire disasters themselves, where and when they occurred, the losses associated with specific disasters, the understood causes and the actions taken to prevent future occurrence of such disasters. Lack of proper analytical fire disaster recording systems negatively influences the levels of actual and planned fire disaster control and prevention strategies, because it is not possible to size up the expected response requirements in the event of such outbreaks. Only after adoption and use of appropriate recording and damage quantification methods, could the affected community and the Kenya government at large, understand the true definition and meaning of fire disasters and their impacts. Such information would help a great deal in the forecasting and forward planning of future disaster mitigation, preparedness and response strategies because they would be based on realistic estimates while conducting risk assessment programmes.

2. The government should set up a national secretariat on fire disasters to ensure implementation of fire disaster policies.

This secretariat should be charged with the responsibility of pointing to the government the outdated laws and bylaws that need to be reviewed, as well as recommend policies on fire prevention and control, which are currently not well catered for. This secretariat should also evaluate and recommend the best ways of advocating and enforcing fire control and prevention regulations, which are currently grossly violated according to the findings of this study. Important to note is the fact that a lot of support has been given to the other crucial concepts such as gender, focus on the girl child, HIV/AIDS and advocacy on fire disasters prevention and control forgotten in the process. There is need for a renewed thinking in the direction of solving fire related problems because, information available shows that they are highly preventable.

3. This study has given reasons as to understand or reflect what has been happening in other parts of Kenya where a fire outbreak almost certainly leads to complete consumption of the entire building and its content. Many investors have lost their property through fires as has been apparent in the Kenyan coastal city of Mombasa. This has all been due to poorly planned and poorly coordinated fire response operations. In most cases, capacity to respond is questionable, coupled with the impaired mobility especially around the major cities' central business districts during the rush hours.

In the spirit of restoring the investor confidence, the government should take fire prevention and control very seriously. Mobility within the city centers could be enhanced through traffic regulations that restrict everyone to drive into the city centre. This could be achieved through levying some taxes onto those who must access the city centre, a strategy that would lower the influx of vehicles into the city, thus jeopardizing fire response operations. Faster mobility could also be achieved through designation of emergency rescue/operations routes or roads. Faster response to fire should be understood as to reduce losses, thus encourage investors the much yearned for economic growth.

4. It should be made mandatory that all employees within the NCBD and by extension all similar areas of the country, be fire response trained. The government or

local authorities concerned should devise a way of establishing who the employees of any premises in are and what level of exposure they have on response to fire. Labour laws should be observed so that laborers/workers are not engaged on casual basis for too long, as the case is currently within the NCBD deliberately so as not qualify for any form of training. The commonest reason given exposing employees to the basic fire response strategies is that they were only casual workers who therefore not qualify for any form of training.

5. It is recommended that the Nairobi City council makes the fire brigade operational or privatise it. Some respondents during the study recommended that the fire brigade be privatised and entrepreneurs be allowed to buy shares so as to monitor its performance. Most of the entrepreneurs presently do not even consider calling the fire brigade as solution to their problem in the event of fire owing to its long lasting history of inefficiency and ineffectiveness. Investigations should be launched to establish why the NNC-FB does not perform as per the expectations.

6. This study recommends that the regulations concerning fire safety in buildings be reviewed with an aim of ascertaining their relevance and recommending a process of enhancing adherence. This study confirmed that majority of the NCBD entrepreneurs were not aware of such regulations. They therefore could not be expected to adhere to what they do not know. Serious advocacy campaigns are also recommended, backed up by strict enforcement procedures.

#### **6.1.2 Recommendations for the NCBD entrepreneurs**

1. There is need for the NCBD entrepreneurs to understand the need to develop emergency response plans prior to the actual occurrence of the disaster. These plans should include identifying and developing some relationship with emergency support services in a given jurisdiction. They also should incorporate an assessment of all resources that could come in handy, to effectively counter the effects of fire. Individual entrepreneur's fire response plans should not considerably negate that of a neighbour, unless where corporate fire disaster control and prevention are employed.

There should be creation of some synergy between the entrepreneurs and the essential service providers so as to access help in the time of need.

2. Where premises management has been left into the hands of the agents it should be clearly stipulated who takes what responsibility and subsequently enforced. Majority of landlords have delegated the rent collection and premises occupation authorization to management agents. This reduces the chances of the tenants meeting the landlords and by extension the chances of launching their complaints directly. This forces them to stay mum and accept the progressively deteriorating decay without question because they would otherwise be addressing the wrong personalities or organizations. As such, it is recommended that the management agencies be held responsible for the non-performing of the fire preparedness and mitigation strategies required for any building within NCBD and similar areas in Kenya.

3. The fire exits should be freed for the purpose, whether the concerned person/organization has had a fire disaster experience or not. They should neither be sub-let nor as heavily barricaded as is the case currently. It is recommended that these exits be fitted with fire doors, which can only be opened from the inside. Where they must be locked one person should keep the keys and be deployed near enough to easily open the door in case of need. The occupants/users of the building should also know who keeps the key to that door, and where to contact him/her in the event of a fire outbreak. It is therefore recommended that it should be a policy of any given premises that if a fire occurs, then the exit door key keeper should head for that exit point. Everyone in the building where possible should be informed that the fire exit would be free and useful for the purpose.

4. According to the NDOC key informant, fire response planning for business personnel should encompass an in-house capacity development to fight fire, coupled with identification and development of proper linkages with the relevant organizations to avoid the "Robinson Crusoe Syndrome" of being alone in the island. The entrepreneurs should maintain a database for organizations and/or individuals who can be contacted in case of a fire outbreak.

5. All the entrepreneurs should buy insurance covers against fire for all their employees. The authorities should carry out regular inspections to ensure that this is done.

6. It was discovered that the presently used/installed fire early warning systems are not good enough and therefore need modernization. Reliance on "shouting fire" has the disadvantage of the failure to notice the fire early. It is therefore recommended that efforts be made to establish elaborate, well-designed and better-understood fire warning systems within the NCBD entrepreneurial fraternity.

### 6.1.3 Recommendations for research.

1. There is need for research on the possibilities of institutionalization of disaster mitigation and preparedness. Such a study would unearth the organizational and procedural measures required taken, to establish and operationalise such and institution. Such a study would lead to development of policies and objectives, which would guide the process of disaster mitigation and preparedness in terms of regulation standard setting and enforcement.

2. Research is recommended to find out exactly why the NCC\_FB does not appear to deliver in terms of fire response operations, and recommend what ought to be done in order to improve its performance.

3. Coordination and emergency communication appears to have a problem that could only be addressed through research. It is not possible to clearly tell the nature of the problem hindering efficiency in fire response within Nairobi. Is it capacity based or poor coordination? Only research in this field could clearly identify what the problem really is and advise on how best such a problem could be addressed.

4. According to the findings of this study, increased frequency of fire disasters have not really made an impact in mitigation and preparedness by the NCBD entrepreneurs and by generally Kenyans. There is need for a study to find out why this is so.

5. A study is recommended to find out why fire safety regulations are not followed.

## 6.2 CONCLUSIONS

### 6.2.1 Fire recording/reporting mechanisms

There is no proper analytical fire disaster recording systems in place to capture and synthesize fire disaster information for use in planning fire disaster prevention and control. Majority of the entrepreneurs within the NCBD basically rely on mass media reports on fire disasters. The actual and /or planned fire disaster control and prevention strategies where available, are therefore not based on past accidental records, making it impossible to size up the extent to which these plans should cover. It is therefore not clear whether fire containment has been given proper considerations at the time of planning and construction of buildings.

### 6.2.2 Fire prevention and control regulations

Majority of the respondents do not know of the existence of any fire prevention and control regulations, let alone their contents. This represents a high level of ignorance assumed to have been caused by the failure of the enforcement agency to clearly and explicitly inform the public about the existence and the content of those regulations. It was quite surprising to find out that majority of the entrepreneurs had adhered to the fire disaster control and prevention regulations without knowing, all as proved by this study in an attempt to secure security from fire disaster threats.

### 6.2.3 Establishment of synergies

The study revealed that collaborative approach to fire disaster control and prevention has not been adopted. Linkages with the available fire protection agencies in the country have yet to be established. The National Disaster Operations Centre (NDOC), whose primary objective of existence and operation remains to control, prevent and respond to disasters within the country, has yet to be understood by the entrepreneurs. No mention of any linkages with NDOC was made by any of the respondents, meaning the existence and role of the centre as a disaster information-clearing house has yet to be advocated

### 6.2.4 Information system

A preparedness plan must have an information system. The study found out that there was no system of communicating fire disaster incidences, either among the



entrepreneurs or with the outside world. Most of the entrepreneurs do not even have the NCC-FB hot line, and also do not believe in calling the number due the past performance of the fire brigade. The alerting mechanisms so established within the entrepreneurial set ups were also found to be highly wanting. Majority of the NCBD entrepreneurs however do not have any specific method of communicating fire prevention and control techniques, including the presence and location of safe evacuation facilities

#### **6.2.5 Preparedness planning**

The study revealed that preparedness planning has not been done by a large majority of the respondents; contrary to the fact that to achieve and maintain a high performance in fire control requires an integrated programme. All the activities should be designed to promote disaster preparedness, whereby the ultimate objective is to have plans in place that are agreed upon, that could be implemented, for which commitment of resources are relatively assured. These plans should be regularly exercised and reviewed for comprehensiveness.

#### **6.2.6 Evacuation planning:**

There is no use having a properly working alarm or fire-extinguishing system if there is no evacuation plan especially that is fully understood by all the occupants of a given premises. Fire early warning is not taken very seriously within the NCBD according to the data collected. As found out through the study, most of the fire escape routes are either not available for the purpose or are put into alternative use.

#### **6.2.7 Rehearsals (drills)**

Although disaster preparedness rehearsal cannot portray the full dynamics – and potential chaos – of a disaster relief operation, there is need to have rehearsals to enhance assimilation of the sequence of events involved in a fire disaster rescue operation. Findings indicated that most of the respondents do not have fire drills meaning that in the event of a fire outbreak, people would scatter helter skelter in pursuit for survival. Rehearsals are important in that they would re-emphasize points made in separate training programmes, as well also test the system as a whole and, invariably, reveal gaps that otherwise might be overlooked.

### 6.2.8 Fire disaster recovery strategies

The study found out that about half of the NCBD entrepreneurs rely on insurance as a fire disaster recovery measure, which is viewed as a response mechanism. What was not quite clear is whether these insurance covers are sufficient and that they cover all the people involved.

### 6.2.9 General conclusions

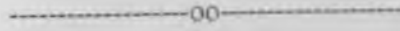
It was apparent from the study that majority of the entrepreneurs do understand what they ought to do in order to mitigate and prepare against fire disasters. What was not quite clear are the regulations governing fire disaster prevention and control which is an issue requiring further study especially to establish why the regulations are not quite known to and followed by the public.

Upon a comprehensive evaluation of the mitigation and preparedness measures taken against fire disasters, the study confirmed wide disparities in choice and application of various measures. However a considerable proportion of the entrepreneurs have taken isolated measures to ensure some form of safety against fire disasters. Surprisingly, majority appeared quite satisfied with the measures taken and therefore convinced that should there be a fire disaster, they could take care of themselves, their colleagues and property. This shows a high level of ignorance, which is dangerous to perpetuate. Such realization could also explain why a fire disaster leads to total consummation of the affected structures and their contents.

Improvements made in the various mitigation and preparedness measures taken were significant in some cases while in most cases they were negligible. Response to the question on improvements was highly dependent on the issue under investigation. Whatever appeared unfamiliar was not responded to while common issues were clearly elaborated.

The entrepreneurs do not believe that increased fire disasters have had any impact on the mitigation and preparedness measures taken within the NCBD and by extension all similar set ups. This is confirmed by lack of significant attitude change among the entrepreneurs in terms of being less fire disaster prepared, and the relative insignificant changes in the fire fighting equipments sales. Most of the measures

evaluated remain considerably underdeveloped. There was no clear conviction that the efforts made by entrepreneurs were related to the increased fire disasters. Thus the entrepreneurs have not put the increasing fire disasters into clear focus and considerations. This could be attributed to ignorance and the tendency to believe that some one else will take care.



## BIBLIOGRAPHY

1. A. W. Coburn, R. J. S Spencer, & A. Pomonis, *Disaster Mitigation*. A UNDP/UNDRO Training Module, June 1991. Cambridge
2. A. W. Coburn, R. J. S Spencer, & A. Pomonis, *Risk Assessment*. A UNDP/UNDRO Training Module, June 1991. Cambridge
3. Babbie E., *The Practice of Social Research*, 1995. Wordsworth Publishing Company, New York
4. Bird E.C.L and Docking S.J, *Fire in Buildings*, 1949.
5. BRE. Building Research Series Vol. 8, *Fire Control*, 1978. The Construction Press.
6. Daily Nation Newspaper, *Fire Disaster Reports*, 2000 to 2001. Self.
7. Diane Myers, R. N., M. S. N. *Disaster Response and Recovery; A Handbook for Mental Health Professionals*; August 1994. Monterey, California.
8. Drabek T. E., *Human System Response to Disasters, and Inventory of Sociological Findings*, 1986. Springer Verlag. New York.
9. Federal Emergency Management Agency (FEMA) *EOC Management and Operations Course, Students Manual*; July 1995. Emergency Management Institute.
10. Federal Emergency Management Agency (FEMA) *Introduction to Emergency Management*, Disaster Management Manual, July 1990.
11. Federal Emergency Management Agency (FEMA), *Introduction to Hazardous Materials Preparedness*, Student Manual June 1994.
12. Federal Emergency Management Agency (FEMA), *Risk Analysis*, Student Manual, September 1990.
13. Frank H. & Althoen S. C., *Statistics Concepts and Applications*, 1994. Cambridge University Press, United Kingdom.
14. Giddens A. *The Consequences of Modernity*, 1991. Polity Press, Cambridge U.K.
15. J. G.L. Thomas, *Fire Safety in Buildings, Principles and Practices*, 1972.
16. J. J. Williamson & P.A.I Buckle, *Fire Extinguishment and Fire Alarm Systems*, 1958. Sir Isaac Pitman & Sons Ltd.

17. J. K. Ndambiri & C. D. Kahuki; ([http:// www.fire.uni-erberg.de/iffn/country/ ke/ke\\_hm](http://www.fire.uni-erberg.de/iffn/country/ke/ke.htm))
18. Jain, *Fire Safety in Buildings*, 1996. New Age International Press, India.
19. Jonathan Mendelson and Elana Blumenthal, *Chaos Theory*, (<http://www.mathjendl.org/chaos/index.html>)
20. Manual of Firemanship, *Fire Protection of Buildings*, 1977. Her Majesty's Stationery Offices, London.
21. Michael Haralambos with Robin Heald, *Sociology Themes and Perspectives*, 1985. Bell & Hyman, London.
22. Ndung'u, *Fire Safety in Buildings*, 1991. Unpublished Dissertation report from the Department of Architectural design and Development.
23. Office of the President, *National Policy on Disaster Management*, June 2002. The Government Printers, Nairobi.
24. Parsons T. *The Social Systems* 1951. Glencoe Ill, The Free Press.
25. Parsons T. *The Social Systems* 1979. Rout Ledge & Kegan Paul, London.
26. R. S. Stephenson, *Disasters and Development*, A UNDO/UNDRO Training Module, January 1991.
27. Ramachandran, *Early Detection of Fire and Life Risk*, 1993. Fire Engineers Journal vol. 53 no 171
28. Randolph Kent, *Disaster Preparedness*, A UNDP/UNDRO Training Module 1991,
29. Rephael B., *When Disaster Strikes*, 1997. Basic Books Inc, New York.
30. Republic of Kenya, *1999 Population and Housing Census report, Volume I and II*. January 2001.
31. Ritzer G., *Sociological Theory (3rd Ed)* 1992. Mc Graw Hill, New York.
32. Royce Singleton, Jr; Bruce C. Straits and Margaret M. Straits; Ronald J. McAllister; *Approaches to Social Research*, 1988. Oxford University Press, New York.
33. T. Lucey, *Management Information Systems (8<sup>th</sup> Ed)*, 1997. Letts Educational, London.
  - a. UNHCR, *Handbook for Emergencies 2<sup>nd</sup> Edition*.
34. *US -Fire Losses Report*, 2001

**INFLUENCE OF FREQUENT FIRE DISASTERS ON  
MITIGATION AND PREPAREDNESS AMONG  
ENTREPRENEURS IN THE NAIROBI CENTRAL  
BUSINESS DISTRICT**

**QUESTIONNAIRE**

**I. General information:**

Cluster No.  10  11  17  19  21  22

Name of respondent \_\_\_\_\_ S  M   
F

Street \_\_\_\_\_

House/ building Name \_\_\_\_\_

Name \_\_\_\_\_ of  
Business/Engagement/Establishment \_\_\_\_\_

Number \_\_\_\_\_ of people working in the establishment

**Category of business:**

- a. Large scale sole proprietor
- b. Small scale sole proprietor
- c. Large scale company owned
- d. Small scale company owned
- e. Public establishment
- f. Government corporation
- g. Others-Specify:


\_\_\_\_\_

Type of business:

Nature of business:

a. Shop (Retail or Whole sale)

b. Hotel/Restaurant/Bar

c. Private office

d. Public office

e. Banker

f. Other, Specify:

\_\_\_\_\_

Type of fire prevention and control strategy /policy

a. Individual

b. Corporate

II. Understanding Mitigation and Preparedness measures

1. Have you encountered any fire disaster in your business?

NO

If yes, how many times? \_\_\_\_\_

2. Did you seek for help to contain the fire disaster?

YES

NO

If yes, whose help?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. If you have never personally encountered any fire disaster, have you ever learnt of one?

Yes

No

4. Through what means did you learn about it?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. What in your opinion should be the measures to take in order to prevent fires from occurring?

a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

6. What should be the measures to take in order to minimize the damage arising from such fires, in case they occur?

a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

7. Did you consider fire safety while choosing this particular premises for business?

Yes  No

8. If yes, what did you look for in terms of fire safety before occupation of this premises?

a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

III. Mitigation and Preparedness measures taken.

IV. Adequacy of measures taken.



V. Extent to which measures have changed.

VI. Relationship between Change in measures and increased fire disasters.

### Mitigation:

9. a) What measures have you taken, to ensure that fire disaster do not occur at all in your premises?

i) \_\_\_\_\_

ii) \_\_\_\_\_

iii) \_\_\_\_\_

iv) \_\_\_\_\_

v) \_\_\_\_\_

b) How confident are you that the measures you have taken will ensure that no fire disaster occurs in your premises

- |       |                     |                          |
|-------|---------------------|--------------------------|
| (i)   | Extremely confident | <input type="checkbox"/> |
| (ii)  | Very confident      | <input type="checkbox"/> |
| (iii) | Confident           | <input type="checkbox"/> |
| (iv)  | A bit confident     | <input type="checkbox"/> |
| (v)   | Not confident       | <input type="checkbox"/> |

c) What improvements have you made in the last recent past in the measures in a. above, to ensure that no fire outbreak occurs in your premises?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

d) To what extent could you relate your actions in c. above, to increased fire outbreaks?

- |       |                 |                          |
|-------|-----------------|--------------------------|
| (i)   | Totally related | <input type="checkbox"/> |
| (ii)  | Quite related   | <input type="checkbox"/> |
| (iii) | Related         | <input type="checkbox"/> |
| (iv)  | A bit related   | <input type="checkbox"/> |
| (v)   | Unrelated       | <input type="checkbox"/> |

10.a) What measures have you taken to ensure that if fire occurs, there is least damage to your property?

i) \_\_\_\_\_

\_\_\_\_\_

- ii) \_\_\_\_\_
- \_\_\_\_\_
- iii) \_\_\_\_\_
- \_\_\_\_\_
- iv) \_\_\_\_\_
- \_\_\_\_\_
- v) \_\_\_\_\_
- \_\_\_\_\_

**b)** How confident are you that those measures will ensure that least damage occurs to your property should there be a fire outbreak?

- |       |                     |                          |
|-------|---------------------|--------------------------|
| (i)   | Extremely confident | <input type="checkbox"/> |
| (ii)  | Very confident      | <input type="checkbox"/> |
| (iii) | Confident           | <input type="checkbox"/> |
| (iv)  | A bit confident     | <input type="checkbox"/> |
| (v)   | Not confident       | <input type="checkbox"/> |

**c)** What improvements have you introduced in the recent past, to ensure that those measures remain that reliable?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**d)** To what extent can you relate your actions in **b)** above to increased fire incidences?

- |       |                 |                          |
|-------|-----------------|--------------------------|
| (i)   | Totally related | <input type="checkbox"/> |
| (ii)  | Quite related   | <input type="checkbox"/> |
| (iii) | Related         | <input type="checkbox"/> |
| (iv)  | A bit related   | <input type="checkbox"/> |
| (v)   | Unrelated       | <input type="checkbox"/> |

**11. a)** How have you ensured that if there is a fire outbreak in your premises, it causes least damage to yourself, colleagues or employees/workers?

i) \_\_\_\_\_

\_\_\_\_\_

ii) \_\_\_\_\_

\_\_\_\_\_

iii) \_\_\_\_\_

\_\_\_\_\_

iv) \_\_\_\_\_

\_\_\_\_\_

v) \_\_\_\_\_

b) To what extent do you believe that your efforts in a) above could ensure that an outbreak will lead to least damage to your property?

- |       |                          |                          |
|-------|--------------------------|--------------------------|
| (i)   | I am sure                | <input type="checkbox"/> |
| (ii)  | I strongly believe       | <input type="checkbox"/> |
| (iii) | I believe                | <input type="checkbox"/> |
| (iv)  | To some extent, it is so | <input type="checkbox"/> |
| (v)   | I don't believe so       | <input type="checkbox"/> |

c) How have your efforts changed in ensuring that least damage results from a fire outbreak should it occur?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

d) To what extent could you relate your efforts in c) above to increased fire outbreaks?

- |       |  |                          |
|-------|--|--------------------------|
| (i)   | Efforts were solely due to increasing fire disasters | <input type="checkbox"/> |
| (ii)  | Fire disaster frequency was a major consideration    | <input type="checkbox"/> |
| (iii) | Fire disasters frequency partly contributed          | <input type="checkbox"/> |
| (iv)  | Fire disasters frequency was somehow considered      | <input type="checkbox"/> |
| (v)   | Fire disaster increase was not a consideration       | <input type="checkbox"/> |

12 a) Are you aware of any fire prevention and control regulations concerning safe occupation of such premises?

- i) \_\_\_\_\_
- \_\_\_\_\_
- ii) \_\_\_\_\_
- \_\_\_\_\_
- iii) \_\_\_\_\_
- \_\_\_\_\_
- iv) \_\_\_\_\_
- \_\_\_\_\_
- v) \_\_\_\_\_
- \_\_\_\_\_

b) To what extent do you believe that the regulations have served in ensuring fire safety over the recent past?

- |       |  |                          |
|-------|--|--------------------------|
| (i)   | Regulations served as the main consideration     | <input type="checkbox"/> |
| (ii)  | Regulation contributed to a great extent         | <input type="checkbox"/> |
| (iii) | Regulation contributed to some reasonable extent | <input type="checkbox"/> |
| (iv)  | Regulation contributed to a mall extent          | <input type="checkbox"/> |
| (v)   | Regulation did not contribute at all             | <input type="checkbox"/> |

c) What changes have been introduced into the regulations in the recent past, in line with making them more responsive?

---

---

---

---

---

---

---

---

- 12) To what extent could you attribute the changes in c. above to increased fire incidences?
- (i) Regulations change was purely due to increased fire disasters
  - (ii) Disaster frequency contributed a great deal
  - (iii) Disaster frequency contributed to some extent
  - (iv) Disaster frequency contributed to a little extent
  - (v) Disaster frequency did not contribute at all


### Preparedness:

13) a) How have you ensured that you can fight fire if there is an outbreak?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

b) To what extent do you consider your efforts in this direction sufficient?

- (i) I am totally convinced that they are sufficient
- (ii) I am quite convinced that they are sufficient
- (iii) I am fairly convinced that they are sufficient
- (iv) I am convinced that they are quite insufficient
- (v) The efforts are completely insufficient


c) How have you improved your efforts to fight fire in the recent past?

---

---

---

---

---

---

d) To what extent could you relate your improvements in c) above to the increased threat to fire?

--

- (i) The improvements were purely due to increased fire disasters \_\_\_\_\_
- (ii) Improvements were considerably due to increased fire disasters \_\_\_\_\_
- (iii) The improvements were, reasonably, due to increased fire disasters \_\_\_\_\_
- (iv) Improvements were somehow due to increased fire disasters \_\_\_\_\_
- (v) Improvements were not in due considerations of fire disasters \_\_\_\_\_

**14. a)** How have you ensured that all the occupants of your premises can be quickly informed of a fire outbreak in case it occurs?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

**b)** How efficient do you consider your fire occurrence alerting system?

- (i) Extremely efficient
- (ii) Very efficient
- (iii) Fairly efficient
- (iv) A bit efficient
- (v) Not efficient at all


**c)** What have you done to improve on the efficiency of the fire occurrence alerting system in the recent past? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**d)** To what extent could you relate your efforts in increasing the efficiency of fire occurrence alerting system to increased frequency of fire disasters?

- (i) Efforts are solely due to increased fire disasters
- (ii) Efforts to a great extent depended on increased fire disasters
- (iii) Efforts to some extent depended on increased fire disasters
- (iv) Efforts to a little extent depended on the increased fire disasters
- (v) Frequency of fire disasters was not a consideration


**15. a)** What have you done to ensure that your colleagues understand the importance of a fire warning system?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

**b)** How efficient could you regard your fire warning system?

- (i) Extremely efficient
- (ii) Quite efficient
- (iii) Fairly efficient
- (iv) Not so efficient
- (v) Completely inefficient


**c)** What improvements/modernization investments have you made to the fire warning system in the recent past?

---

---

---

---

**d)** To what extent could you relate your efforts in improving fire warning system, to the increasing threats of fire?

- (i) Efforts are solely dependent on the increased threats to fire
- (ii) Efforts are quite dependent on the increased threats to fire
- (iii) Efforts are fairly dependent on the increased threats to fire
- (iv) Efforts are not dependent on the increased threats to fire
- (v) Modernization is not at all dependent on the increased threats to fire


**16 a)** Have you designed escape routes to ensure safety evacuation in the event of fire?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

**b)** How helpful do you consider these escape routes to be?

- (i) Extremely helpful
- (ii) Quite helpful
- (iii) Fairly helpful
- (iv) Not so helpful
- (v) Not helpful at all


**c)** What improvements have been made to the evacuation routes in the recent past?

---

---

---

---

d) To what extent could you relate the improvements to the fire threats, owing to increased frequency of fire outbreaks?

- (i) Improvements are entirely due threats of fire
- (ii) Improvements are greatly due to threats of fire
- (iii) Improvements are fairly due to threats of fire
- (iv) Improvements are not so much due to threats of fire
- (v) Improvements are entirely due to threats to fire


17. a) What communication channels have you used to educate your colleagues and/or workers on the safe use of fire escape routes in the event of fire?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

b) How efficient and reliable do you consider these communication channels to be?

- (i) Extremely efficient and reliable
- (ii) Very efficient and reliable
- (iii) Fairly efficient and reliable
- (iv) Neither so efficient nor so reliable
- (v) Neither efficient nor reliable


c) How have these communication channels been improved over time?

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

d) To what extent could you say this improvement was as a result of fire increased fire outbreaks?

- (i) The improvement are entirely due to frequency of fire disasters
- (ii) The improvement are greatly due to frequency of fire disasters
- (iii) The improvement are to some extent due to frequency of fire disaster
- (iv) The improvement are not so much due to frequency of fire disasters
- (v) The improvement are not at all due to frequency of fire disasters


18. a) How often do you conduct fire drills?

- i) \_\_\_\_\_

- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

**b)** To what extent do you think the fire drills are useful?

- (i) Fire drills are essentially useful
- (ii) Fire drills are quite useful
- (iii) Fire drills are fairly useful
- (iv) Fire drills are not so useful
- (v) Fire drills are completely useless


**c)** What improvements have you made in the recent past, to make fire drills more regular and followed? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**d)** To what extent could you relate improvements in the fire drills to increased threat of fire?

- (i) Improvements are essentially due to increased fire disasters
- (ii) Improvements are to a great extent due to increased fire disasters
- (iii) Improvements are to some reasonable due to increased fire disasters
- (iv) Improvements are to some limited extent due to increased fire disaster.
- (v) Improvements are not at all due to increased fire disasters


**19 a)** What installations have you put in place to fight fire in case of an outbreak?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

**b)** To what extent do you think these installations are adequate?

- (i) The installations are all that is needed to fight fire
- (ii) The installation are quite adequate to fight fire
- (iii) The installation are fairly adequate to fight fire
- (iv) The installation are not so adequate to fight fire
- (v) The installation are not adequate at all to fight fire




19 What changes have you made to make these installations more responsive to fire fighting?

---

---

---

---

---

---

20 How does increased frequency of fire disasters relate to your efforts towards more efficient fire fighting installations?

- (i) The two are extremely related
- (ii) The two are quite related
- (iii) The two are fairly related
- (iv) The two are not so much related
- (v) The two are completely unrelated


21 a) How have you ensured that these equipments can effectively fight fire in case there is an outbreak?

i) \_\_\_\_\_

ii) \_\_\_\_\_

iii) \_\_\_\_\_

iv) \_\_\_\_\_

v) \_\_\_\_\_

b) To what extent are you satisfied with your actions in a) above?

- (i) I am completely satisfied
- (ii) I am quite satisfied
- (iii) I am fairly satisfied
- (iv) I am a bit satisfied
- (v) I am not satisfied at all


22 What improvements have you made in the recent past, to ensure that the equipments can effectively respond to fire?

---

---

---

---

---

---

23 To what extent could you say that the improvements in 22 above are as a result of increased threats to fire?

--

- (i) The improvements are entirely in response to increased threat to fire \_\_\_\_\_
- (ii) The improvements are to a large extent in response to increased threat to fire \_\_\_\_\_
- (iii) The improvements are to some extent in response to increased threat to fire \_\_\_\_\_
- (iv) The improvements are not so much in response to increased threat to fire \_\_\_\_\_
- (v) The improvements are not at all in response to increased threat to fire \_\_\_\_\_

21. a) How many staff members are trained on fire fighting techniques in your establishment?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_
- iv) \_\_\_\_\_
- v) \_\_\_\_\_

b) Are you planning to train the rest of your staff members on the same?

- (i) All the rest will be trained
- (ii) Quite a large number of the rest will be trained
- (iii) A reasonable number of the rest will be trained
- (iv) Just a few of the remaining ones will be trained
- (v) There is no need of training any more of them

c) What recent developments or advancements have you incorporated in this form of training?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

d) To what extent could you say that the improvement in training is due to increased threats to fire?

- (i) The improvement is entirely due to increased fire disasters
- (ii) The improvement is considerably due to increased fire disasters
- (iii) The improvement is fairly due to increased fire disasters
- (iv) The improvement is to a little extent due to increased fire disasters
- (v) The improvement is not at all due to increased fire disasters

22. a) In general, what fire response plans do you have?

- i) \_\_\_\_\_
- ii) \_\_\_\_\_
- iii) \_\_\_\_\_

iv) \_\_\_\_\_

v) \_\_\_\_\_

b) To what extent are you convinced that these plans are adequate?

- (i) The plans are completely effective
- (ii) The plans are quite effective
- (iii) The plans are fairly effective
- (iv) The plans are not so effective
- (v) The plans are not effective at all


c) What improvements have you made in the response plans lately?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

d) How has the increased fire disaster influenced improvement in the response plans?

- (i) The improvements are entirely due to increased frequency of fires
- (ii) The improvements are to a large extent due to increased frequency of fires
- (iii) The improvements are fairly due to increased frequency of fires
- (iv) The improvements are not so much due to increased frequency of fires
- (v) The improvements are not at all due to increased frequency of fires


23 a) How often do you exercise the fire response plans?

i) \_\_\_\_\_

ii) \_\_\_\_\_

iii) \_\_\_\_\_

iv) \_\_\_\_\_

v) \_\_\_\_\_

b) To what extent are you satisfied with the ability plans to adequately respond to fires?

- (i) Completely satisfied
- (ii) Quite satisfied
- (iii) Fairly satisfied
- (iv) Not that much satisfied
- (v) Completely dissatisfied


c) What recent improvements have you made towards exercising these plans?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4) To what extent could you relate the improvements in c) above to increased fire incidences?

- (i) Improvement are entirely due to increase frequency of fires
- (ii) Improvement are to a great extent due to increase frequency of fires
- (iii) Improvement are fairly due to increase frequency of fires
- (iv) Improvement are not so much due to increase frequency of fires
- (v) Improvement are not at all due to increase frequency of fires


24. a) What resources have you set aside to help yourself or colleagues in case of a catastrophic fire outbreak?

i) \_\_\_\_\_

ii) \_\_\_\_\_

iii) \_\_\_\_\_

iv) \_\_\_\_\_

v) \_\_\_\_\_

b) To what extent do you feel that these resources are adequate?

- (i) They are all the resources we need
- (ii) The resources were quite adequate
- (iii) The resources are fairly adequate
- (iv) The resources are to some extent
- (v) The resources are not adequate at all


What improvements have you made towards making these resources adequate in the recent past? \_\_\_\_\_


5) To what extent could you relate the improvements in 4) above to increased frequency of fire disasters?

- (i) The increase is purely due to increased frequency fire disasters
- (ii) To a great extent, the increase was due to increased frequency of fires
- (iii) To quite an extent, the increase was as a result of increase in the fires
- (iv) To a little extent, the increase is associated to increase in the number of fires
- (v) The increased is not due to increased frequency of fire disasters


## ANNEX II

### DESCRIPTION OF CLUSTERS

Clusters were identified and described according to the roads and/or rivers that border them.

Cluster description	Cluster description
<b>Cluster 1.</b> Roads/rivers defining its boundaries <ul style="list-style-type: none"> <li>• Uhuru Highway</li> <li>• Museum Hill Road</li> <li>• Nairobi River</li> <li>• Slip Road</li> <li>• Moi Avenue</li> </ul> University way	<b>Cluster 6.</b> Roads defining its boundaries <ul style="list-style-type: none"> <li>• Moi Avenue</li> <li>• Slip Road</li> <li>• Globe Roundabout</li> <li>• River Road</li> <li>• Tom Mboya Street</li> <li>• Kenyatta Avenue</li> </ul>
<b>Cluster 2.</b> Roads defining its boundaries <ul style="list-style-type: none"> <li>• Kenyatta Avenue</li> <li>• Loita Street/Monrovia street</li> <li>• University way</li> <li>• Nyerere Road</li> </ul>	<b>Cluster 7.</b> Roads/rivers defining its boundaries <ul style="list-style-type: none"> <li>• Link Road</li> <li>• Ngarama Road</li> <li>• Nairobi River</li> <li>• Globe Roundabout</li> <li>• River Road</li> </ul>
<b>Cluster 3.</b> Roads defining its boundaries <ul style="list-style-type: none"> <li>• University way</li> <li>• Monrovia street</li> <li>• Loita street</li> <li>• Kenyatta Avenue</li> <li>• Koinange Street</li> </ul>	<b>Cluster 8.</b> Roads/rivers defining its boundaries <ul style="list-style-type: none"> <li>• River Road</li> <li>• Kamusi Road</li> <li>• Race Course Road</li> <li>• Nairobi River</li> <li>• Ngarama Road</li> </ul> Link Road
<b>Cluster 4.</b> Roads defining its boundaries <ul style="list-style-type: none"> <li>• University way</li> <li>• Koinange Street</li> <li>• Market Street</li> </ul> Muindi Mbingu Street	<b>Cluster 9.</b> Roads defining its boundaries <ul style="list-style-type: none"> <li>• River Road</li> <li>• Latema Road</li> <li>• Tom Mboya Street</li> <li>• Luthuli Avenue</li> <li>• Moi Avenue</li> <li>• Kenyatta Avenue</li> </ul> Tom Mboya Street
<b>Cluster 5.</b> Roads defining its boundaries <ul style="list-style-type: none"> <li>• University way</li> <li>• Moi Avenue</li> <li>• Biashara Street</li> </ul> Muindi Mbingu Street	<b>Cluster 10.</b> Roads defining its boundaries <ul style="list-style-type: none"> <li>• Tubman Road</li> <li>• Kimathi Street</li> <li>• Mama Ngina Street</li> </ul> Moi Avenue

<p><b>Cluster 11.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Biashara Street</li> <li>• Moi Avenue</li> <li>• Tubman Road</li> <li>• Kimathi Street</li> <li>• Banda Street</li> <li>• Muindi Mbingu street</li> </ul>	<p><b>Cluster 16.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Mama Ngina Street</li> <li>• Moi Avenue</li> <li>• City Hall Way</li> <li>• Parliament Road</li> <li>• Kaunda Street</li> </ul>
<p><b>Cluster 12.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Market Street</li> <li>• Muindi Mbingu Street</li> <li>• Banda Street</li> <li>• Kimathi Street</li> <li>• Kenyatta Avenue</li> <li>• Koinange Street</li> </ul>	<p><b>Cluster 17.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• River Road</li> <li>• Luthuli Avenue</li> <li>• Tom Mboya Street</li> <li>• Latema Road</li> </ul>
<p><b>Cluster 13.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Kenyatta Avenue</li> <li>• Kimathi Street</li> <li>• Mama Ngina Street</li> <li>• Muindi Mbingu Street</li> </ul>	<p><b>Cluster 18.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• River Road</li> <li>• Pumwani Road</li> <li>• Race course Road</li> <li>• Kamusi Road</li> </ul>
<p><b>Cluster 14.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Kenyatta Avenue</li> <li>• Muindi Mbingu Street</li> <li>• Kaunda Street.</li> <li>• Koinnge Street</li> </ul>	<p><b>Cluster 19</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Moi avenue</li> <li>• Ronald Ngala Street</li> <li>• River Road</li> <li>• Luthuli avenue</li> </ul>
<p><b>Cluster 15.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Haile Selassie Avenue</li> <li>• Parliament Road</li> <li>• Kenyatta Avenue</li> <li>• Ngong Road</li> <li>• Cathedral Road</li> </ul>	<p><b>Cluster 20.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• City Hall Way</li> <li>• Aga Khan Walk</li> <li>• Harambee Avenue</li> <li>• Parliament road</li> </ul>

<p><b>Cluster 21.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Aga Khan walk</li> <li>• Haile Salesie Avenue</li> <li>• Parliament Road</li> <li>• Harambee Avenue</li> </ul>	<p><b>Cluster 23.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Moi Avenue</li> <li>• Ronald Ngala Street</li> <li>• River Road</li> <li>• Temple Road</li> <li>• Hakati Road</li> </ul>
<p><b>Cluster 22.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• City Hall Way</li> <li>• Moi Avenue</li> <li>• Haile Salesie Avenue</li> <li>• Aga Khan Walk</li> </ul>	<p><b>Cluster 24.</b> Roads defining its boundaries</p> <ul style="list-style-type: none"> <li>• Moi Avenue</li> <li>• Haile Salesie Avenue</li> <li>• Ring Road</li> <li>• River Road</li> <li>• Hakati Road - Temple Road</li> </ul>