UNIVERSITY OF NAIROBI

ICT in Disaster Management

'A Case Study of Kenya Red Cross Society'

Research Project submitted at the School of Journalism in fulfillment of the
requirements of the degree of Masters of Communication Studies of the
University of Nairobi.

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DECLARATION

I hereby declare that this project is my original work and has not been presented for a degree in any other university.

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The project has been submitted for examination with my approval as the University supervisor.

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DEDICATION

In memory of my beloved late mother Drusila Cheruto Mung'ou. You were a star in my entire life, and inspiration in my academic life.

To all who value humanity in the world.

ACKNOWLEDGEMENT

ABBREVIATIONS

CCTV	Closed Circuit Television
COTM	Terminals Used For Communication on the Move
DRSRS	Department of Resource Surveys and Remote Sensing
EOC	Emergency Operations Centre
EOP	Emergency Operations programme
FSS	Fixed Satellite Services
Gok	Government of Kenya
G4S	Group 4 Securities
GSU	General Service Unit
HF	High Frequency
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
HQ	Headquarters
ICRC	International Committee of the Red Cross
ICT	Information and Communications Technology
IDPs	Internally displaced persons
IFRC	International Federation of Red Cross Crescent Societies
ISDR	International Strategy for Disaster Reduction
IT	Information Technology
KRCATs	Kenya Red Cross Action Teams
KRCS	Kenya Red Cross Society
MHZ	Megahertz
MoSSP	Ministry of State for Special Programmes
MSS	Mobile Satellite Services
NDOC	National Disaster Operations Centre
PEV	Post election violence
SMS	Short Message Service
SOJ	School of Journalism
UHF	Ultra High Frequency

UN	United Nations
UNDP	United Nations Development Programme
US	United States
USA	United States of America
VCA	Vulnerability Capacity Association
VHF	Very High Frequency
VOIP	Voice over the Internet Protocol
VSAT	Very Small Aperture Terminal
WFP	World Food Programme

CHAPTER ONE

1. INTRODUCTION

1.1. BACKGROUND INFORMATION

Natural disasters have profoundly affected humanity in many ways. The United Nations International Strategy for Disaster Reduction (UN/ISDR) has calculated that there have been more than 5,210 disasters recorded in the world between 1991 and 2005 (UN/ISDR.2004). This has mainly been in the form of natural and human made including the earthquakes, fires famine and floods. Africa especially has suffered from human made disasters mainly in the form of genocides, wars and other natural disasters ranging from floods to earthquakes (UN/ISDR.2004 ibid).

Kenya especially has recently been characterized by frequent floods, famine, human displacement, ethnic clashes and other catastrophes which have caused both loss of property and life. For example the post election violence, collapse of buildings in Nairobi and other areas, frequent occurrence of famine and starvation of people have rekindled the public debate on the country's disaster management capacity, preparedness and responses systems.

Information and communications technology (ICT) can potentially play a pivotal role in disaster prevention, mitigation and management. For instance, remote sensing for early warning is made possible by various available technologies, including telecommunication satellites, radar, telemetry and meteorology (Wattegama C. 2005). Enhanced early warning systems especially at national and community can save many lives and property if managed and implemented well. Wattegama C. ibid)•comments that "in all disaster recovery situations, both in developed and developing nations, the deployment of some form of constantly functional wireless

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communications is essential, and among the very first priorities in any emergency response, rescue, or relief situation."

Yet the government has not been fully prepared in handling frequent disasters experienced in the country. Disasters such as collapse of buildings, mass killings, famine have been mismanaged due to poor communication technology that slackens the disaster management process leading to high loss of lives and property which would not occur if communication had been smooth.

The Kenya Red Cross Society (KRCS) has been at the forefront in disaster management in Kenya. In the recent past, the society has diversified and invested in the use of modern information communication technologies in addressing myriad disasters. The KRCS investment in ICT for disaster management has been achieved through the networking at the headquarters, regional and branch offices countrywide. The networking process has ensured, capacity building and cost reduction by enhancing radio network, improving efficiency, reporting and staff output through shared and distributed services over the Wide Area Network. The Unit also ensures reliable and secure infrastructure is in place, proper utilization and performance of ICT equipment as well as branch capacity building through deployment of ICT equipment. These are some major disasters *(KRCS website)*:

This research therefore endeavors to explore the use of ICT in disaster management, with focus on KRCS as a case study. KRCS is a key humanitarian agency in Kenya, with a network of 62 branches and eight regions spread in the country.

1.2 PROBLEM STATEMENT

Disasters, whether natural or man-made, wreck havoc in the lives of millions of people around the globe[1]

Their aftermath is nothing but a grim picture of death, destruction and suffering. It is not always possible to avoid disaster, but the suffering can be minimized by proper disaster management through appropriate disaster management tools. The recent disasters such as the Indian Ocean Tsunami in December 2004 have drawn popular attention to the life saving role of how modern technology. For instance, technologies such as mobile telephony can help reduce the impact of a disaster on lives.

In Kenya drought, famine, landslides, fires and other disasters have cost the government more than US $1billion in rescue and recovery, including adverse losses of human and animal lives and destruction of infrastructure

Disaster response initiatives have been ad hoc, uncoordinated and short-term measures mainly in the form of emergency relief services in the most affected areas. Major challenges have been lack of disaster preparedness which has remained one of Kenya's perennial development challenges for many decades. This has mainly been as a result of, apart from other factors, non-utilization of ICT in disaster preparedness, mitigation and reduction. Yet the dynamic nature of an emergency situation calls for timely updating of a variety of required data needed for managing the disaster situations. ICT is gradually emerging as a cornerstone of early warning systems and proving to be the backbone of emergency responses to disasters using various telecommunication facilities. It is therefore necessary to investigate the relevance of ICT in disaster management activities including disaster preparedness and response by KRCS.

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[1] (*http://wiki.objectivismonline.net/wiki/Environmentalism*).

In Kenya, monitoring and forecasting of urban fires, especially in Nairobi is very weak. Stakeholders have noted that monitoring by KRCS butterfly surveillance cameras exist (GoK 2009).

This project therefore aims to explore the capacity of KRCS to use ICT in disaster management. The focus was an assessment of the society's capacity in ICT infrastructure, use of ICT in disaster management and the impact of ICT in the recent disasters in Kenya.

The study also highlights some actual benefits of ICT facilities in the full spectrum of disaster management.

1.3.1 OBJECTIVES OF THE STUDY

1.3.2 General Objective

The objective of the study is to explore the use of ICT in and its impact on disaster management.

1.3.3 Specific Objectives

The study pursued the following specific objectives that guided the collection and analysis of data:

1) Explore ICT facilities used by the Kenya Red Cross Society and their effectiveness in disaster management;

2) Establish application of ICT during the recent disasters in Kenya;

3) Analyze the opportunities and capacity building in ICT by Kenya Red Cross Society for disaster management; and

4) Explore the challenges facing the use of ICT in disaster management in Kenya and make suitable recommendations.

1.4 RESEARCH QUESTIONS

a) Which ICT tools does Kenya Red Cross Society use in disaster management? How effective are the ICT tools?

b) Which ICT tools were applied by KRCS during the recent disasters in Kenya?

c) How has KRCS developed its ICT capacity to manage disasters?

d) What challenges does Kenya face in the use of ICT tools in disaster management?

1.5 THEORETICAL FRAMEWORK

Diffusion of Innovation Process

We are constantly confronted with innovation, new technologies, new ideas, new fads and fashions and new standards of behavior. Mass communication studies have evolved theories of diffusion of innovations. Rogers (1995) points out that a 1945 study by Ryan and Gross at Iowa State University provided the genesis of modern diffusion research. Diffusion of innovations according to McQuial (2005) is the process of domesticating technological innovations within a given population, often on the basis of advertising or general publicity. It can be an unintended or intended effect. Here the messages being communicated are concerned with new ideas. Communication is defined by Wilbur Schramm (MaQuail,D. 2005) as sharing of information. An idea or an attitude where there are elements describes Harold Lasswell (Tan Alexis (1986) of who says what, to whom, and with what effect.

An innovation can be something borrowed from another society or it can be an invention. Invention is the process by which an individual or group makes use of elements that already exist in the culture, putting them together into some new pattern. When many individuals decide to adopt the invention and it comes into common use in a society, we say that diffusion of the innovation has occurred. Rogers (1995) defines an innovation as an idea, practice or object that is perceived as new by an individual. It refers to a new technology or idea.

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Innovation spreads through various channels to the population. In order to spread through a society, an innovation must be taken up or adopted by individuals. Rogers (1995) explains that the process of adoption occurs in five stages:

1) **Awareness stage**: the individual learns of the existence of the new item, but lacks detailed information about it.
2) **Interest stage**: the individual develops an interest in the innovation and seeks additional information about it.
3) **Evaluation stage**: the individual mentally applies the new item to his or her present and expected future situation and decides whether to try it.
4) **Trial stage**: the individual applies the new idea on a small scale to determine its utility.
5) **Adoption stage**: the individual uses the new item or idea continuously on a full scale.

Innovations are adopted by individuals through a communication channel which is the means by which messages get from one individual to another.

There is always a lapse of time between first learning and decision to adopt a new innovation. News of a vital event spreads quickly to reach a high percentage of the population. The diffusion of information is determined by the level of people's interest where reports of obscure events of little inherent interest diffuse slowly and reach only a few people; the amount of attention that the media give to the event, for example, repetitions of messages. DeFleur and Larsen (1987) predicted that stimulus intensity-defined as the repetition of a message increases the percentage of a population that receives the information hence they concluded that repetition can help diffuse the message; rate of adoption of the innovation by the population, that is, members of a social system (set of interrelated units engaged in a joined problem-solving to accomplish a common goal); that is the person to person communication.

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In this study, ICT is the new invention. It is the source of information. Individuals who have knowledge about the innovation act as the media of connectivity to new individuals who have no idea about the innovation.

The study therefore explores the use of ICT as a new technology in disaster management in Kenya. The ICT tools used for disaster management serve as the communication channels.

1.5.2 Two-step Flow Theory

This model emerged originally from the first study of the effect of mass communication in presidential election campaign of 1940 in the USA by Lazersfeld, Berelson and Hazel Gaudet. It was based on the conclusion that media had a limited effect in changing people's election choices as compared to personal contact. These findings prompted Elihu Katz and Paul Lazersfeld to conduct a more focused research to understand the second level of the communication process that is communication between opinion leaders and the less active audience (Tan Alexis, 1986).

The research was based on the following assumptions:
- Interaction between individuals and groups influence the interpretation of media messages and therefore the decision-making process.
- The mass media were not so powerful and so direct as once thought.
- One may be exposed to new ideas either through the mass media or through interpersonal channels.
- Individuals are not social isolates but members of social groups which interact.
- The response and reaction to media influence will not be direct but mediated through and influenced by social relationship.

In diffusion of innovation, information flows through a diffusion network, which is mainly in **a two-step flow of communication.** It was discovered that the major

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source of information and influence was other people that is individuals turn to other individuals to obtain information about issues. Those who provided the information also provided the interpretation. Thus the flow of information between people also included a flow of influence. Those who served most often as sources of information and influence were called opinion leaders. They had the following characteristics. Firstly, they have grater attention to the media. Secondly, their social economic status was similar to those of whom they influenced (Tan Alexis, 1986).

Tan Alexis (1986) concludes that content moves from the mass media to opinion leaders, who then pass it on to others whom they inevitably influence. Personal influence has been found to play a major role in spreading innovations and bringing about technological and cultural change.

Relevance of Theory

This theory is relevant in ICT since those competent in the use of ICT tools can influence the rest of the society by explaining and interpreting to them what they have learned from the mass media. In most African societies, few people have access to ICT facilities like the mobile phones, radio, television, Internet and so on. Therefore, the rest of the society turns to these individuals to obtain more information. This could be in form of the latest news from the radio, television or disaster warnings given on mobile phones about current issues like impending floods, or disasters like fire tragedies, accidents and so on.

The two-step flow theory also reveals another important element in the society of social classes. This is whereby the high class people who happen to have more ICT tools and the ability to interpret messages from, for example, sirens and surveillance cameras tend to influence the low class people who rely on other personal contacts as guides.

The use of new technologies and flow of information as advanced in the diffusion and two-step theories are clearly reflected in the use of ICT in disaster management by the Kenya Red Cross Society.

1.6 SCOPE AND DELIMITATIONS OF THE STUDY

The study mainly focused on ICTs in relationship to disaster management in Kenya and - how KRCS uses ICT during disaster preparedness and response activities. The study was limited to analysis of the disaster cases in the year 2007-2009 since it will not be possible to study all the past disasters.

1.7 LIMITATIONS OF STUDY

The major limitation of the study was the small sample size since the responses from the KRCS headquarters may not be as representative of all the branches countrywide. This is because the regional branches may not have the ICT facilities that the KRCS headquarters has. This may affect the generalizability of the research findings.

Another challenge was that there was little literature published on the use of ICT in disaster management which is another great limitation.

1.8 ETHICAL ISSUES

The researcher observed the following ethical issues stipulated by Mugenda and Mugenda(1999):

Plagiarism and fraud

The researcher has not referred to another researcher's work as her own without acknowledging the author. The researcher has not used fake data which has not been collected or give false presentation of research methodology and findings.

Voluntary participation

The researcher sought for voluntary participation of the KRCS officials in releasing information, answering interview questions and filling in the questionnaires.

No harm to the participation

The researcher will never use the information revealed by the KRCS officials to embarrass them and ruin the image of the KRCS. The information given to the researcher by the KRCS will be confidential and only be used for academic purposes.

Analysis and reporting

The researcher has given a report of both the positive and negative findings. The researcher has also made the technical shortcomings and failures of the study known to the reader.

Anonymity and privacy

The researcher has accorded the respondents the anonymity and privacy they deserve. Hence, names of individual respondents have not been given.

1.8 DEFINITION OF CONCEPTS

a) **Disasters** are any event natural or manmade which threatens human lives, damage private and public property and infrastructure and disrupts social and economic life.

b) **Disaster Management** is a cycle of activities that include mitigating the vulnerability and negative impacts of disasters, preparedness in responding to operations, responding and providing relief in emergency situations that threaten lives and infrastructure.

c) **Information and Communication Technology** covers a range of technologies-computers, communications, audio and video-which developed separately but which are now converged towards the point where the technologies that support, telephones and televisions are highly interconnected (Powell, 2003).

d) **Information and Communication Disaster Management tools** include satellites, Geographic information systems, remote sensing, Internet, radio, television and mobile phones.

e) **A warning** can be defined as the communication of information about a hazard or threat to a population at risk, in order for them to take appropriate actions to mitigate any potentially negative impacts on themselves, those in their care and their property (Samarajiva *et al.*, 2005)

f) **Mitigation:** any activity that reduces either the chance of a hazard taking place or a hazard turning into a disaster.

g) **Risk reduction**: anticipatory measures and actions that seek to avoid future risks as a result of a disaster.

h) **Prevention:** avoiding a disaster even at the eleventh hour.

i) **Preparedness:** plans or preparations made to save lives or property and help the response and rescue service operations.

j) **Response:** includes actions taken to save lives, prevent property damage and to preserve the environment during emergencies or disasters.

k) **Recovery:** includes actions that assist a community to return to a sense of normalcy after a disaster.

l) **Remote sensing:** measurement or acquisition of information about an object or phenomenon by a recording device that is not in physical or intimate contact with the object. It is the remote utilization (as from aircraft, spacecraft, satellite or ship) of any device for gathering information about the environment.

m) **Communication:** the process by which messages are transferred from a source to a receiver. It also refers to a process in which participants create and share information with one another in order to reach a mutual understanding which leads to social change (in knowledge and attitudes).

n) **Diffusion:** it is the process by which an innovation (a given new practice) is communicated through certain communication channels over time among members of a social system.

o) **Innovation:** these are the ideas, practices or objects to be diffused.

p)   **Social system:** interrelated units that are engaged in joint problem solving in order to accomplish a common goal.

1.9 DISSEMINATION PLAN

The research findings will be availed in the School of Journalism library and Jomo Kenyatta Memorial Library at the University of Nairobi. The findings will also be given to the KRCS for the purposes of future reference in view of their application of ICT in disaster management.

The researcher will also make presentations of the same findings in various ICT and disaster management conferences. This will include presenting papers, participating in discussions, leading workshops and making formal addresses. Further, the research findings will also be published as articles in peer reviewed journals.

1.10 THESIS STRUCTURE

This study is organized into five chapters, references and annexes. Chapter One covers introduction to disaster management and ICT. Chapter Two is a review of related literature on disasters, ICT tools, the role of ICTs in disaster management and the theoretical framework. Chapter Three delineates the research design and the methodology of the study, a description of the instruments used to gather the data, sample size and method of data analysis are also described. An analysis of the data and presentation of the findings is presented in Chapter Four. Chapter Five contains conclusions and recommendations of the study. The study concludes with a bibliography and references.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 DISASTER MANAGEMENT

The term "disaster", which evolved from the Latin word 'bad star", refers to the impact of natural or man-made hazard that causes human suffering or creates human needs that the victims cannot alleviate without assistance (Wattagama, 2007). United Nations Development Programme and UNDP/ISDR (2006; p 27-29) has further conceptualized disaster(s) as a social situation occurring when a physical phenomenon of natural, socio-natural or anthropogenic origin negatively impacts vulnerable populations and their livelihoods, production, systems, infrastructure and historical heritage causing intense, serious and widespread disruption of the normal functioning of the affected unit. Impacts of disasters are evident among the affected society. The impacts are also expressed in different forms such as loss of life; health problems; the destruction, loss or rendering useless of the totality or part of private or collective goods; and severe impacts on the environment.

The United Nations International Strategy for Disaster Reduction (UN/ISDR) has calculated that the 5,210 disasters recorded in the world between 1991 and 2005 (approximately 40 per cent) have occurred in the Asia-Pacific region Consequently, the region has been more prone to natural disasters than other regions in the last few decades. Earthquakes across Indonesia and other countries in the region have now become annual occurrences for the last three years, particularly in areas along Sumatra fault, the origin of the earthquake that spawned the 2004 Tsunami. In 2006, the Pacific typhoon caused considerable physical damage and loss of life in many Asian countries including China, the Democratic People's Republic of Korea, the Philippines the Republic of Korea and Viet Nam.

In Africa, however, most disasters are man-made as they are consequences of human error either in politics or management. (http://www.afro.who.int/press/2003).

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Man-made disasters and natural hazards such as armed conflicts, floods, drought, famine, earthquakes and volcanic eruptions cost Africa $15 billion in 2002.

Recent and ongoing emergencies in Africa have caused millions of deaths and incalculable human suffering in the Region. Among them: the 1994 conflict in Rwanda which caused one million deaths; the civil strife in Burundi which has claimed more than 300,000 lives; the emergency in Liberia which has resulted in more than 500,000 deaths, and millions of people displaced; the conflicts in Guinea and Cote d'Ivoire which have displaced two million; the emergencies in the Democratic Republic of Congo which have claimed three million deaths and displaced four million people.

In all cases, women and children account for a disproportionate 80% of the populations affected by disasters, which result in considerably high maternal and infant morbidity and mortality.

2.2 WORLD DISASTERS

According to the United Nations Office in Charge of Humanitarian Affairs (UNOCHA), a disaster is any "serious disruption of the functioning of a society, causing widespread human, material or environmental losses which exceed the ability of a society to cope using only its own resources" (OCHA,1996).

According to the Centre for Research on the Epidemiology of Disasters (CRED), disaster "is a situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance, an unforeseen and often sudden event that causes great damage, destruction and human suffering."

2.2.1 HIV/AIDS

HIV is either the primary or one of the leading factors behind 'a serious disruption of the functioning" of a society or community.

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A group of researchers writing in the British Medical Journal concluded, "HIV/AIDS, which has a long (approximately ten years) latency period from infection to death, is comparable to other so-called "slow onset disasters (e.g. famine) that often have an insidious onset, but can have death rates and secondary consequences no less devastating than classic acute onset disasters (e.g. floods)" (Stabinski et al., 2003).

UNAIDS estimated that some 2.1 million people around the world died of AIDS in 2007,bringing the total number of deaths from HIV infection since 1981 to more than 25 million(UNAIDS,2007 a). The end of 2007, an estimated 33 million people around the world were living with HIV (UNAIDS, 2007a).

HIV is a disaster in national contexts-that is from an overall, society-wide perspective rather than purely personal-only where it has become generalized and widely pervasive...this has occurred in Sub-Saharan Africa(UNAIDS,2007 a).

(The *Reach Out* newsletter, 2008) states that HIV is a disaster in many levels; in most affected countries in sub-Saharan Africa, where prevalence rates reach 20%,development gains are reversed and life expectancy halved. People living with HIV (PLHIV) are among the groups most vulnerable in disaster and crisis situations.

"For sub-Saharan African communities that are torn apart by HIV and numerous marginalized groups worldwide who are left to cope with death, disease and destruction, HIV is undoubtedly a disaster," said Dr Asha Mohammed, Head of the Eastern Africa Zone of the International Federation.

'The HIV and AIDS epidemic is a disaster whose scale and extent could have been prevented. Ignorance, stigma, political inaction, indifference and denial all contribute to millions of deaths.

Addressing HIV requires a longer-term reaction than the usual response to emergencies, but it also provides an opportunity to build resilience and empower communities," explains Abbas Gullet, Secretary General of the KRCS.

2.2.2 Natural Disasters

Natural disasters comprise some of the most devastating events in human history. Natural disasters are divided into two categories of 'climatic" and "geological" events. Climatic disasters are weather-related and include floods, cyclones, storms, drought and wildfires. Geological disasters include earthquakes; tsunamis and volcanic eruptions. Somewhere in the middle are avalanches, landslides and mudslides, (World disasters, 2008).

The Global Resource Information Database maintained by the UNEP estimates that 118 million people are exposed each year to major earthquakes; 343.6 million to tropical cyclones, 521 million are exposed to floods and 130 million to meteorological drop. Another 2 million people are exposed annually to landslides.

Fast moving epidemics of highly infectious diseases are also included in the list of natural disasters. The so-called Black Plague, caused by the *Yersinia pestisis bacterium* is thought to have killed around 75 million people in Asia and Europe during a decade in the mid-1300s.an epidemic of influenza killed almost 50 million people in the single year of 1918.

There is increasing concern that climate change, particularly global warming may result in an increasingly harsh environment for some already vulnerable populations. The UNDP Human Development Report for 2007 speculated about the possible effects over the century if an overall warming of 2 degrees centigrade occurs (UNDP, 2007).

Hurricanes

The 2005 hurricane season buffeted the Caribbean and Central America with no less than 27 named storms (UNDP, 2007).the impacts of some of these storms were significant. For example, Hurricane Stan in October killed 1,600 people in Guatemala's Central Highlands, most of them Mayan people from the country's aboriginal majority (Simms et al., 2006).

The Wikipedia encyclopedia records **Hurricane Katrina** of the 2005 Atlantic hurricane season as the costliest the hurricanes as well as one of the five deadliest, in the history of the US. Among recorded Atlantic hurricanes, it was the sixth strongest overall.

Hurricane Katrina formed over the Bahamas on August 23, 2005, and crossed southern Florida as a moderate Category 1 hurricane, causing some deaths and flooding there before strengthening rapidly in the Gulf of Mexico. The storm weakened before making its second landfall as a Category three storm on the morning of Monday, August 29 in southeast Louisiana. It caused severe destruction along the Gulf coast from central Florida to Texas, much of it due to the storm surge. The most severe loss of life and property damage occurred in New Orleans, Lousiana, which flooded as the levee system catastrophically failed; in many cases hours after the storm had moved inland. Eventually 80% of the city became flooded and also large tracts of neighboring parishes and the floodwaters lingered for weeks.

At least 1,836 people lost their lives in the actual hurricane and in the subsequent floods. Economist and crisis consultant Randal Bell wrote: "Hurricane Katrina in 2005 was the largest natural disaster in the history of the United States. Preliminary damage estimates were well in excess of $100 billion, eclipsing many times the damage wrought by Hurricane Andrew in 1992.

2.2 RECENT DISASTERS IN KENYA

Kenya experiences diverse disasters, both natural and man-made. Recent disasters have rekindled public debate on Kenya's disaster management capacity, preparedness and responses systems (KRCS departmental report 2009).

Currently various departments and ministries in the Kenyan Government are responsible for disaster management, early warning and coordination. The Ministry of state for Special Programmes (MoSSP) has the lead role in disaster related issues.

The Office of the President, Provincial Administration, administratively houses the National Disaster Operations Centre (NDOC). However, NDOC is operationally run by the MoSSP! Other key ministries include the Ministry of Development of Northern Kenya and other Arid Lands, the Ministry of Agriculture and the Ministry of Environment.

Below are some disasters reported in Kenya during the recent years, first man-made followed by natural disasters.

Bombing of United States of America Embassy in Nairobi

On 7th August 1998, the USA Embassy located in downtown Nairobi City, was bombed by terrorists. The impact of the bomb was felt throughout the Central Business District. The impact damaged surrounding buildings with the Ufundi Co-operative Building completely destroyed. More than 200 people were killed and over 3,000 others injured.

In a swift response to the disaster, Kenya Red Cross Action Teams (RCATs), together with other KRCS staff members were mobilized and sent to the ground to assist in the search and rescue efforts. The teams carried out First Aid services and evacuation of the injured and the dead. They also provided counseling services to

those who witnessed the attack, those injured and others who lost their relatives and friends.

The KRCATs, together with various other personnel worked round the clock to ensure that the evacuation from the bomb site was complete. The spirit of volunteerism, that identifies the Red Cross Movement, was evident as volunteers and staff worked tirelessly to bring relief to those affected.

Kikambala Bombing

On 28th November 2002, Kenya was hit again by terrorists. A car detonated a bomb at the Paradise Hotel in Kikambala, Coast Province, and destroyed property worth millions of shillings. Some 13 people were killed, seven of them being members of a traditional dancing troupe. More than 80 people were injured, most of them seriously. The powerful explosion extensively damaged the hotel building, and sparked off a huge explosion.

Intelligence reports later revealed that the Israel-owned Paradise Hotel was expecting tourists at the time of the attack.

Following the attack, KRCS volunteers and personnel rushed to the scene to assist in the rescue and recovery efforts. Equipped with First Aid kits, stretchers, blankets, body bags and water, the team was at the scene providing First Aid to those injured, ferrying them to hospitals, and retrieving bodies of the dead. At least 25 counselors were mobilized to give psychological counseling and support to the survivors.

Ethnic Clashes

Ethnic clashes in Kenya during the 1990s were frequent in most parts of the country, including Rift Valley and Coast provinces. Some worst ethnic clashes claimed lives prior to the 2002 General Elections and subsequent elections in the country.

The KRCS was responsible for provision of humanitarian aid to hundreds of people displaced as a result of ethnic clashes. The Society distributed relief food and attended to injured persons.

El-Nino Floods

In May 2002, heavy rains, known as *El-Nino*, hit parts of Kenya causing massive destruction, displacement of people, and loss of property and lives. The rains of such magnitude had never been witnessed before in the country and fell in parts of Central, Western and Coastal provinces. In Murang'a and Meru, in Central Province, landslides destroyed homes and farms, and led to death of 10 people and loss of livestock. In response to this disaster, the KRCS launched an appeal for aid to those affected by the floods.

More than 150,000 people were also displaced in Budalangi in Western Province and Tana River District in Coast Province. KRCS was the lead agency in coordinating the distribution of non-food items to the affected people.

Kyanguli School Fire Tragedy

On 26th March 2002, a fire swept through a dormitory at Kyanguli Secondary School in Machakos District, killing at least 59 male students aged between 15 and 19 years. Some 28 students were admitted to hospital, most of them in critical condition (60 percent burns). Most of the deaths during the incident were caused either by carbon monoxide inhalation or collapse of the roof of the single storey building.

In response to the Kyanguli tragedy, a team of Kenya Red Cross Society volunteers rushed to the scene to help evacuate the injured students and retrieve bodies of those who died. The volunteers worked round the clock at the scene, and helped in retrieving, packing and transporting the dead to City Mortuary in Nairobi. The volunteers also helped in counseling the bereaved families.

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During the funeral service, KRCS volunteers provided counseling and offered First Aid services to friends and relatives who lost their loved ones in the tragedy.

Road Accidents

Like many other countries, Kenya suffers from many road accidents that often lead to injuries and deaths. The loss of lives and complication of injuries has been attributed to the poor coordination in reporting and response to and from the emergency response organizations.

Oil Tanker Fire Response

Early February 2009, an oil tanker transporting more than 30,000 litres to a country in the Great Lakes region overturned along the Nakuru-Eldoret road, at Sachang'wan, near Molo town, in Rift Valley Province. At least 300 people, most of them residents from the area, rushed to scooped oil from the over-turned tanker. An hour later, there was a huge explosion at the scene, that left more than 90 people dead and tens of others escaping with burns of various degrees.

The Kenya Red Cross Society personnel responded to the oil tanker tragedy minutes after the explosion, mainly providing search and rescue services.

Through the use of the HF radios and ICT equipment in the South Rift Regional office and Nairobi offices, KRCS coordinated various relief efforts in partnership with some agencies and Government ministries.

Drought

The Kenya Red Cross Society has been responding to perennial droughts that have affected the Kenyan population. In response to droughts, the Society initiated the Emergency Operation Programme (EMOP) in 2008, with an extensive mandate encompassing IDPs in agricultural areas that were not considered during the post election humanitarian assistance. In 2008, EMOP targeted over 230,000 persons in Nyanza, North and South Rift regions.

Post Election Violence

Following the disputed Presidential elections in December 2007, large parts of Kenya were affected by violence, in which many people were seriously injured; over 1,000 people killed and more than 300,000 others internally displaced due to the degenerating security situation. The KRCS, designated by the Government of Kenya as the lead coordinating agency for response to the emergency, was immediately active on the ground, initially supporting IDPs as they moved away from violence-prone areas and administered First Aid and transported seriously injured people to hospitals. KRCS also coordinated the set-up and management of over 300 temporary camps that were established to provide shelter to the IDPs and at the height of the operation was providing a range of emergency relief services to approximately 500,000 people. These emergency services included distribution of food and non-food items, family reunification and tracing, providing basic emergency health care, access to safe water and sanitation facilities.

You seem to focus more on what KRCS did rather than what the disaster was. Please, begin by explaining what the disaster was and how it occurred them sum-up by showing what the KRCS did. Do this for all the disaster examples you discuss here.

Other Disasters

The Kenya Red Cross Society has responded to other disasters that hit Kenya such as fires and plane crashes. Fires have been rampant in informal settlements, often resulting in loss of assets, injuries and even deaths. In order to improve its disaster management, KRCS has developed an Emergency Operations Centre (EOC), which doubles up as the Disaster Management and Training Centre at the HQ, and constructed early warning systems in regions.

2.4 INFORMATION AND COMMUNICATION TECHNOLOGY

Powell (2003) conceptualizes information and communication technology (ICT) as a range of technologies - computers, audio and video - which developed separately but which have now converged towards the point where the technologies that support computers, telephones and televisions are highly interconnected. According to UN/ISDR (2006), ICT includes any communication device encompassing radio, television, mobile phones, computer and network hardware and software, satellite system and so on, as well as the various services and applications associated with them like video conferencing and distance learning.

In the light of recent natural and man-made disasters that have occurred, great attention and efforts have been directed towards the application of ICT in disaster management, especially early warning, prediction, and mitigation. Emphasis is steadily being placed by both international agencies and governments on the use of various communication facilities to manage disasters. The application of ICT in disaster management is in a realization, through experience, that has shown that communication in disaster management helps speed up responses, including deployment of rescue, recovery and evacuation teams, and information sharing among diverse audiences and saves lives (Reference).

2.5 ICT AND DISASTER MANAGEMENT

Suda (2007; 91-103) states that disaster of any kind is a development issue. The devastation from the floods and landslides in many parts of the world in terms of displaced populations, loss of lives, destruction of property and the collapse of vital infrastructure clearly reflect lack of disaster preparedness nationwide. The consequences of natural and man-made disasters and the vulnerabilities to which populations are exposed can be mitigated if they are targeted proactively. In this context, ICT can play a pivotal role in disaster prevention, mitigation and management. Suda (2007) states that the ability to anticipate disasters before they occur and to respond to them expeditiously and effectively in a well-coordinated manner requires, among other things, an efficient early warning system with state-

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of-the-art equipment for early warning system preventive action. She further explains that the issue of preparedness is rooted in the question of what capacity exists in the country as a whole to effectively deal with natural and man-made calamities.

2.6 ICT TOOLS FOR DISASTER MANAGEMENT

Wattegama (2007) identifies channels used for disaster warning. He states that all are means of passing along disaster warnings as quickly and as accurately as possible. Any one or combination of the following media can be used for that purpose.

a)   Radio and Television

Considered the most traditional electronic media used for disaster warning, radio and television have varied use. They can be used to spread a warning quickly to a broad population. For instance, after the Indian Ocean Tsunami of 2004, many radio manufacturers considered introducing new digital radio alert systems that react even if the set is switched off. In order to trigger this alarm, a special flag integrated into the received signal from a terrestrial transmitter or a satellite would be used and the set would automatically tune to the emergency broadcast channel (Dunnet, 2006).

b)   Telephone (Fixed and Mobile)

Telephones can play an important role in warning communities about the impending danger of a disaster. For example, a timely telephone call-warning about the impending tsunami saved a village's entire population of 3,600 inhabitants of Nallavadu in Pondicherry, India (Subramanian, 2005).

c)   Short Message Service

Short message service (SMS) is a service available in most digital mobile phones that facilitates the sending of short messages or text messages between mobile

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phones, other handheld devices and even landline telephones. During the 2005 Hurricane Katrina disaster in the US, many residents of affected coastal areas were unable to make contacts with relatives using traditional landline phones. However, they could communicate with each other via SMS more easily when the network was functional.

d) Cell Broadcasting

Most of today's wireless systems support a feature called cell broadcasting through which a public warning message in text can be sent to the screens of all mobile devices with such capability in any group of cells of any size, ranging from one single cell (about 8km across) to the whole country if necessary. Cell broadcasting when used for emergency has no additional cost to implement, is not affected by traffic load, is geo-scalable and so a message can reach hundreds of people and it is geo-specific so that government disaster managers can avoid panic and road jamming (Clothier, 2005).

e) Satellite Radio

A satellite radio or subscription radio is a digital radio that receives signals broadcast by communication satellites, which covers a much wider geographical range than terrestrial radio signals. Satellite radio functions anywhere there is "line of sight", given there are no major obstructions such as tunnels or buildings. Satellite radio audiences can follow a single channel regardless of location within a given range. Satellite radio can play a key role during both disaster warning and disaster recovery phases since it is the only wireless communications infrastructure that is not vulnerable to damage in most types of disaster situations. This is because the main repeating equipment which sends and receives communications signals are located outside the earth's atmosphere, either in geosynchronous orbit (GEO satellites) or in low earth orbit (LEO satellites).Wattegama(2007).

f)   Handheld Mobile Solutions

This is a type of satellite disaster communication which can be used in the immediate aftermath of a disaster which destroys or renders a local ground-based communications infrastructure inoperable. There is one reliable form of communications that is immediately deployable – handheld satellite telephone systems provided by mobile satellite service (MSS) providers. Such systems provide satellite communications access through small, mobile phone-sized devices, as well as pagers and in-vehicle (Wattegama , 2007).

g)   Fixed Satellite Service (FSS)

This is also a form of satellite radio which has terminals that are typically installed in situations where the equipment is required for periods of longer than a week, including pre-disaster applications (e.g. environmental monitoring, communications redundancy, etc) as well as post-disaster recovery operations. Such systems are configurable to provide everything from low-speed data transmissions up to very broad bandwidth data and full broadcast-quality video to replace local and national infrastructure and services. FSS is mainly used by humanitarian aid agencies in disaster risk reduction and response since they are significant in sensing distress through high frequency (HF) and Very High Frequency (VHF) radio communication.

The HF band is the range of frequencies between 3 and 30 MHz. HF allows for long distance communication as it can cover up to 3000Km (Reference). This is possible because of the way the HF wave propagates. HF radio waves propagate in 3 ways simultaneously:

a)   Ground Wave: This wave travels near the ground for short distances of about 100 Km over land and 300 Km over sea.

b)   Direct Wave: This wave travels in a direct line of sight from the transmitter to the receiver.

c)   Sky Wave is the most important wave for effective long distance communication. The wave is propagated from transmitter towards the sky

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and is reflected by the ionosphere to a distant receiver on earth. The reflective properties of the ionosphere change throughout the day, from season to season, and yearly.

The VHF band, on the other hand, is the range of frequencies between 3 and 30 MHz. VHF is capable of covering a distance of up to 60 Km or more depending on the terrain. VHF propagates with only 2 waves: ground wave and direct wave. VHF is effective in densely populated areas such as towns. Portability allows responders to carry VHF radios with them while responding to disasters, hence relaying information back to base effectively. VHF coverage area can be improved by introducing a repeater. Portable handsets can be used without a repeater for distances up to 1 Km, to increase this distance a repeater station must be set up.

h) Internet/Email

The role the Internet, email and instant messages can play in disaster warning entirely depends on their penetration within a community and usage by professionals such as first respondents, coordinating bodies, etc. The Internet has proved quite an invaluable technology and an early warning system during disasters. It proved to be the most effective media during the various tsunami disasters in which the Internet was used in dissemination of tsunami-related news and as a fund-raising tool.

i) Amateur and Community Radio

Amateur radio operators have assisted their communities and countries during disasters by providing reliable communications to disaster relief organizations at a moment's notice. In such a situation, amateur radio operators transmit emergency messages on voice mode about the well-being of survivors and information on casualties to friends and relatives. Besides transmitting voice-based messages, some amateur radio operators can also transmit digital modes that include technologies such as teletype, tele-printing, packet radio transmission and the recent phase Shift Keying, 31 Baud - a type of modulation. Amateur radio broadcasters are authorized to communicate on HF, VHF and UHF or all three

bands of the radio spectrum.

j)   Sirens

Though not necessarily an ICT tool, sirens can be used in tandem with other ICT media for final, localized delivery.

k)   COTM: Portable and Transportable Equipment

Terminals used for communications on the move (COTM) include equipment that can be transported and operated from inside a road vehicle, maritime vessel, or fixed wing and rotary aircraft, including commercial aircraft. This kind of terminal is required on an expedited basis for damage assessment, medical evaluation, or other applications where voice, video and data are required in combination. The agencies that depend on this mode of communication are the Army, Police, Navy, Firefighters, etc.

2.7 ICT AND DISASTER MANAGEMENT IN KENYA

According to the Government of Kenya's (GoK) draft proposal on national disaster management programme, disaster preparedness is viewed as one of the disaster management strategies which involves the preparation of an early warning system and consists of timely activities to minimize the effect of a catastrophe (GoK, 1996a:1997).

Enhanced capacity at the Kenya Meteorological Department and the Department of Resource Surveys and Remote Sensing (DRSRS), together with the involvement of private sector institutions in monitoring and forecasting changes in weather patterns and setting up floods early warning systems could, for example, tend to some useful preventive measures. Similarly, the Department of Mines and Geology should be able to carry out studies and establish an early warning information system which should, for example, show all the areas in Kenya prone to landslides so that they are not used as sites for heavy settlements, roads and railway (UNDP, 1997).

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2.8 RELATED LITERATURE ON ICT AND DISASTER MANAGEMENT

Some research projects by the post graduate students of School of Journalism and Sociology on ICT and disaster management provided an important background for this study.

Joyce Thaara Ndiangui (2006) in a research project entitled: *Vulnerability of Kenyan schools to disaster: a case study of Nairobi Public Schools in Kenya,* established that alarm facilities available in schools are alarm and electric bells in fire prone spots. The study noted that schools are vulnerable to disasters not due to unforeseen consequences of the expert system, but due to rigid administrative frameworks in these schools. However, the study never focused on how schools can incorporate ICT in disaster management.

A study on the *Factors influencing Information Channel Preferences in Accessing Educational Materials by High School Teachers: A Case Study of Keiyo District* by Wilson Ugangu (2006) indicated that high school teachers in Keiyo District access educational materials and other information related to their careers and professional work using a host of information channels. The range of channels identified included radio, newspapers, television, magazines, workshops and seminars. The study also noted that teachers prefer certain media channels over others for very specific personal reasons. Newspapers and the radio were for instance the most preferred channels. However, this study never focused on the communication channel preferences by teachers incase of disasters.

Wanyonyi Francis (2007) in a study entitled *ICT and Society, An Exploratory Survey on The Role of The Internet on Knowledge Acquisition Among Nairobi Youth* found that youth use the Internet for increasing their social network, getting in touch with loved ones and getting the latest information on youth issues such as fashion, and sports among others. The study nevertheless focused on how the Internet can be used in disaster management.

Okinda Thomas Ibrahim (2007) studied *Uses and Gratifications of The Internet Among College Students in Kenya: A Case Study Of Kenya School Of Professional Studies.* This study noted that students use the Internet for communication, information seeking and developing and maintaining online and social interactions. However, the study never focused on how the internet can be used in disaster management.

A study by Mwangi Kamonde (2003) entitled *The Diffusion, Adoption and Development of ICTs for Research, Teaching and Communication in Public Universities in Kenya* established that though basic skills are high, more training is required to enable the community to explore the deeper recesses of the Internet. Furthermore, inadequate facilities militate against the full utilization of the Internet resources. The key areas surveyed included general Internet use, use of electronic journals and the role of electronic mail amongst the academic community. The study also found a vigorous use of email but finds it not sufficiently used for exchange of research information and for student-lecturers communication. The study found that more needs to be done especially in the area of training, provision of functioning facilities and publicity for existing services to enhance the use of the Internet.

Mungania Martin Kaithia (2004) in a research entitled *Diffusion, Utilization and Implications of the Mobile Phone for Rural Development: A Case Study of Igembe South West Division in Meru North District*, concluded that some immediate advantages brought by this technology to the population entail easing communications needs and problems among the adopters since it is more efficient and fast compared to traditional methods of communication. The study also noted that the mobile phone is imbued with a variety of other equally important communications related possibilities such as the Internet and news media among other applications. These enable one to communicate across international borders from any networked locations.

Samuel Kairianja Maina (1998) in his research entitled *A Social Audit of Disaster Preparedness, Plans and Structures in Kenya* concluded that most organizations had some degree of preparedness in terms of preparedness plans, early warning system and equipment and machinery that can be deployed for disaster preparedness and response. The study explored historical disasters recorded in Kenyan history up to the year 2005.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter details the research approaches and methods of data collection that enabled this research to meet the objectives of the study. It explains the research setting, population, sample and sampling design, data collection instruments and data analysis techniques used.

The study employed the use of questionnaires, key informant interviews, structured interviews and secondary data analysis (content analysis) in its data collection.

The researcher interviewed key informants mainly from the Kenya Red Cross Society, which is the case study. Reponses from the interviews were noted by the help of a note taker so as all the information was captured. The key informant interviews enabled the researcher to avoid any confusion from the self-administered questionnaires to the managers or officers.

Data was collected through secondary data in libraries, content analysis, web browsing, and interviews with key informants.

3.1 RESEARCH DESIGN

The overall research design was mainly qualitative in nature; adopting a case study approach. This is an exploratory research looking into an area of great importance to the country in terms of assessing the capacity of KRCS - a leading humanitarian organization in the country - to handle disasters. It is probably one of the first to explore the use of ICT in disaster management in Kenya and especially by the KRCS.

3.2 DATA COLLECTION METHODS

Data used for this study comprised the primary data collected using documentary analysis and key informant interviews.

3.3 SAMPLING METHOD

Sampling is the fundamental method of inferring information about an entire population without going to the trouble or expense of measuring every member of the population. Developing the proper sampling technique can greatly affect the accuracy of the results.

Purposive sampling was used to select Kenya Red Cross society for this study due to its participation in ICT based disaster management. Various people working in the organization were interviewed.

3.4 DOCUMENTARY ANALYSIS

Relevant literature was explored. The theoretical models explaining the diffusion of innovation were examined to provide a background for the study. The researcher also read the KRCS newsletters and reports to provide more information about the society on disasters and ICT. Web browsing too was used for additional information on ICT and disasters. Most of the websites referred to in this study are those of institutions dealing with disaster management.

The rate of responses from the respondents took too long hence affecting the compilation of data. Some of the respondents were too busy to answer the questionnaires within the required duration.

3.5 INTERVIEWS

Face-face interviews and telephone interviews were used to gather information from the key informants in the KRCS.

Interviews both (telephone and face-face) are susceptible to biases. The respondents are likely to anticipate what the interviewer expects of them and act accordingly. The interviewer may also not obtain accurate information on highly sensitive matters. Telephone interviews assume a faster pace and a shorter length which affects the number of questions that can be asked and the subsequent responses.

The interviews are expensive in both time and money.

3.6 DATA COLLECTION TOOLS

3.6.1 Questionnaires

The interviewer prepared three sets of questionnaires; one with questions for the Kenya Red Cross Society ICT, Disaster Management and Communications staff. The questionnaires contained both open ended and closed ended questions. The closed ended questions were captured through a Likert scale and contingency questions. **Likert scale** is a psychometric scale commonly used in questionnaires, and is the most widely used scale in survey research. When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement or question[2]

The sample resulting from self-administered questionnaires is usually less representative than in personal interviews since the respondents may not get time to answer all portions of the questionnaire

A letter of introduction was provided to inform the respondents the purpose of the study. The interviewer delivered the questionnaires to the KRCS ICT manager, the disaster manager and the communications manager. Every respondent was approached and requested to fill the questionnaires at their convenience, within three weeks.

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[2] (http://en.wikipedia.org/wiki/Likert_scale).

3.7 CASE AND SITE SELECTION

The International Federation of Red Cross and Red Crescent Societies (IFRC) is the world's largest humanitarian organization, providing assistance without discrimination as to nationality, race, religious beliefs, tribe, clan, gender, class or political opinion. Founded in 1919, IFRC comprises 185 member countries, a Secretariat in Geneva and more than 60 delegations strategically located to support activities around the world, including Nairobi. The Red Crescent is used in place of the Red Cross in many countries, but this does not have a religious connotation.

National Red Cross and Red Crescent Societies have been in the forefront in disaster management in different countries since 1880s when the American Pioneer Clara Barton published her pamphlet advocating assistance to victims of "plagues, cholera, yellow fever and the like, devastating fires or floods, railway disasters, mining catastrophes, etc[3]

In Kenya, ICRC presence fulfils a double role; it acts as a regional base for its exclusive humanitarian activities in the countries covered from Kenya and as a base for logistics providing ICRC delegates throughout Africa with relief supplies, know-how and training.

The Kenya Red Cross society was chosen in this study due to the immense work it has done in disaster management through use of ICT in Kenya. The Kenya Red Cross society headquarters is located in Nairobi.

3.8 DATA ANALYSIS

Content analysis was used in data analysis. After collecting data from the questionnaires, interviews and documentary analysis, the researcher classified it

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[3] *(http://www.kenyaredcross.org/).*

into various categories. The data then was analyzed in view of the objectives of the study.

The data collected under the study will be analyzed using the SPSS (Statistical Package for the Social Sciences) software. Data analysis will mainly be descriptive in nature.

Please, clearly indicate the data analysis method you will use. Content analysis is an example of data analysis technique.

3.8.1 Reliability

Reliability concerns the extent to which the instrument yields the same results on repeated trials. The tendency towards consistency found in repeated measurements is referred to as reliability (Carmines and Zeller, 1979). The results from the interviews and questionnaires in the communication department in KRCS the disaster management, ICT and public relations departments yielded the same results.

3.8.2 Validity

Mason and Bramble (1989) define validity as the degree to which a test measures what it is supposed to measure. The disaster management personnel, communication personnel, ICT personnel and the public relations personnel were the right subjects given the questionnaires and to be interviewed. They are representative of the content to be measured. They represent the KRCS view on the use of ICT in disaster management.

The questionnaires were presented to 10 people in each department in the KRCS representing the whole hence ensuring validity.

The documentary analysis from the KRCS is also expected to yield accurate results on data collection about ICT and disaster management in the KRCS.

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CHAPTER FOUR

4.0 DATA PRESENTATION AND ANALYSIS

4.1 RED CROSS MOVEMENT

National Red Cross and Red Crescent Societies including the *Kenya Red Cross* embody the work and principles of the International Red Cross and Red Crescent Movement worldwide. National Societies act as auxiliaries to the public authorities of their own countries in the humanitarian fields and provide a range of services including disaster relief, health and social programmes. During wartime, National Societies assist the affected civilian population and support the army medical services where appropriate. National Societies cover almost every country in the world. Together they have 105 million volunteers and 300,000 employees, who provide assistance to some 233 million beneficiaries each year.

The International Committee of the Red Cross (ICRC) is an impartial, neutral and independent organisation whose exclusive humanitarian mission is to protect the lives and dignity of people affected by war and internal violence and to provide them with assistance. Established in 1863, it directs and co-ordinates international relief activities conducted by the Movement in situations of armed conflict. It also endeavours to prevent suffering by promoting and strengthening International Humanitarian Law and universal humanitarian principles.

In Kenya, ICRC presence fulfils a double role; it acts as a regional base for its exclusive humanitarian activities in the countries covered from Kenya and as a base for logistics providing ICRC delegates throughout Africa with relief supplies, know-how and training.

ICRC, in co-operation with the International Federation of Red Cross and Red Crescent Societies (IFRC), contributes to the development of National Societies, such as Kenya Red Cross, in the region, through institutional support and

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emergency preparedness assistance, exchange of families' news and making the public aware of National Society's programmes.

The International Federation of Red Cross and Red Crescent Societies (IFRC) is the world's largest humanitarian organisation, providing assistance without discrimination as to nationality, race, religious beliefs, tribe, clan, gender, class or political opinion. Founded in 1919, IFRC now comprises 185 member countries, a Secretariat in Geneva and more than 60 delegations strategically located to support activities around the world, including Nairobi. The Red Crescent is used in place of the Red Cross in many countries, but this does not have a religious connotation.

IFRC's mission is to improve the situation of the most vulnerable people, those who are at great risk from situations that threaten their survival, or their capacity to live with an acceptable level of social and economic security and human dignity. IFRC co-ordinates and directs international assistance of the Red Cross and Red Crescent Movement to people affected by natural and technological disasters, to refugees and in health emergencies. It combines its relief activities with development work and works closely with ICRC to strengthen the capacity of National Societies and through them individual people.

The Kenya Red Cross Society is a humanitarian relief organisation created through an Act of Parliament, Cap 256 of the Laws of Kenya of 21st December 1965. Previously, the Kenya Red Cross existed as a Branch of the British Red Cross between 1939 and 1965. As a voluntary organisation, the Kenya Red Cross operates through a network of 62 Branches and eight Regional offices throughout Kenya.

The Kenya Red Cross, which gained recognition by the International Committee of the Red Cross (ICRC) in 1966, is also a member of the International Red Cross and Red Crescent Movement since 1967, the largest humanitarian movement represented in 185 countries worldwide.

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The Disaster Preparedness and Response (DPR) department of KRCS aims at increasing the capacity of the Kenya Red Cross to forecast, prevent, mitigate and respond to disasters whenever they occur. The Kenya Red Cross usually responds to disasters with food such as maize, beans, vegetable oil, unimix, seeds and water, and non-food aid such as blankets, jerricans, kitchen sets, clothes, tents, tarpaulins and mosquito nets.

The challenge of reducing vulnerability and enhancing capacity requires an intimate knowledge and understanding of local realities. The Kenya Red Cross therefore, utilises its grassroot structures as channels through which to tackle this challenge to be able to minimize vulnerabilities and disaster risks and limit the adverse impact of hazards on vulnerable communities in the country.

The Kenya Red Cross Society's Information and Communication Technology (ICT) Unit is mandated to enhance communication through the networking of Regional Offices and Branches, capacity building and cost reduction by enhancing radio network, improving efficiency, reporting and staff output through shared and distributed services over the Wide Area Network. The Unit also ensures reliable and secure infrastructure is in place, proper utilization and performance of ICT equipment as well as Branch capacity building through deployment of ICT equipment.

The Society has been involved in various disaster management activities s, aimed at alleviating human suffering in the country.

KRCS 2007 *Annual Report* highlights some disaster-related cases addressed by the Society. Since 2006, 18,000 people have benefited from physical installations of water points (North Eastern); health centres, maternity wings (Eastern); fish market and refrigeration facilities (Nyanza) from KRCS that have improved the livelihoods of the target communities in food, income generation, hygiene and sanitation.

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Emergency operations in Kuvasali in Kakamega to assist over 25,000 people displaced by a mudslide, fire disasters mostly in the informal settlements countrywide, and road traffic accident victims in major highways.

In emergency operations especially in drought prone areas KRCS is the largest partner with the World Food Programme (WFP).

KRCS continues to work with VCA tools and disaster management committees to identify and prioritize the needs of the beneficiaries, mapping of risk prone areas, and development of disaster management plans for Kwale, Kilifi, Lamu, Mombasa, Nairobi, Nyando and Machakos.

Exchange mail service: The Society's mail system migrated from MDaemon to Exchange to extend the service to Regional offices and allow office mobility operation areas. Staff in the field with portable modem can now access their mail through web mail.

KRCS is a member of various local disaster management committees. This is especially important in flood-prone areas of Western Kenya and Coast, and the drought-prone areas. KRCS also operates the disaster management training which is crucial in training people in disaster preparedness, management and mitigation. Special training on Basic Health Care is provided in Emergencies and Public Health in Emergencies, among others. Teams and personnel trained in Field assessment and coordination (FACT) are part of the Regional Disaster Response Teams (RDRT) and National Disaster Response Teams (NDRT).

4.2 RESULTS FROM QUESTIONNAIRES

Responses

- Eight (8) staff out of ten (10) responded to the Disaster Management questionnaire.
- Five (5) staff out of seven (7) responded to the ICT questionnaire.

Main Issues

- KRCS responds to man-made disasters more than natural
- Disaster tools frequently used are HF radios and ambulances
- Most ICT tools used by KRCS during disaster management are located in Nairobi, namely website, HF radios, mass media and butterfly cameras.
- KRCS is rated as effective in the use of the ICT tools
- Disaster Management Department is in charge of the Emergency Operation Centre (EOC), based at the headquarters, Nairobi.

Table1. Location of ICT Tools

ICT Tool	Location
Website	Nairobi
Intranet	Nairobi
HF Radios	Countrywide
Butterfly cameras	Nairobi
Mass Media	Countrywide

Table 2: Effectiveness of ICT Tools in Disaster Management

	Not Effective	Effective	Very Effective
Website		8	
Intranet	2	6	
HF Radios		6	2
Butterfly cameras		4	2
Mass Media	2	4	2
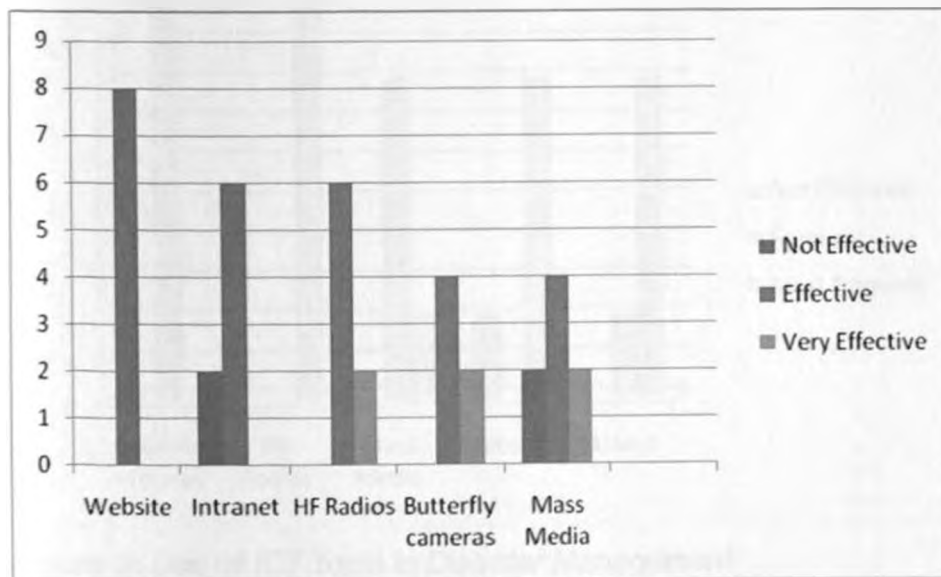
Figure 1: Effectiveness of ICT Tools in Disaster Management

Table 3: Use of ICT Tools in Disaster Management

	Not Frequent	Frequent	Most Frequent
Butterfly cameras		5	
HF Radios			5
Mass Media		4	1
Website	1		4
Intranet		1	4
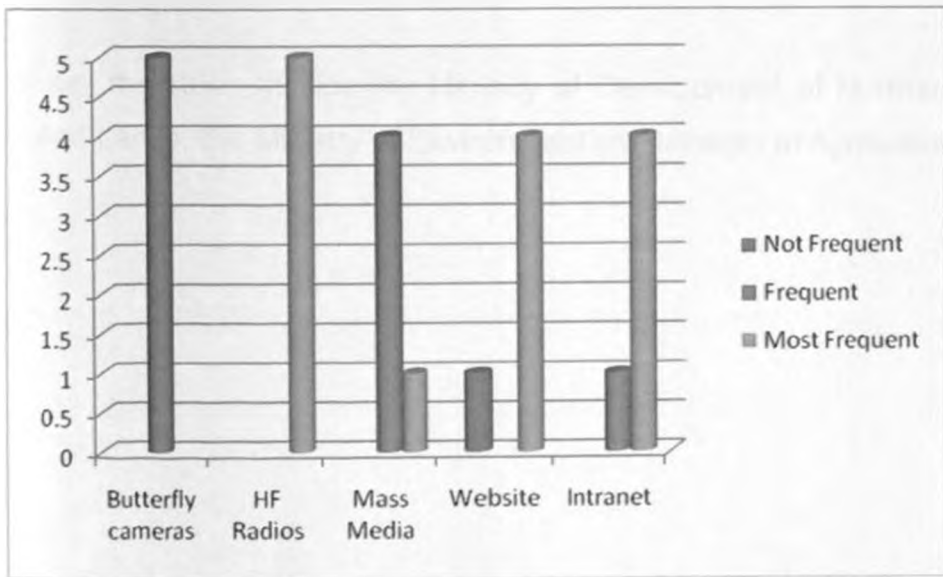
Figure 2: Use of ICT Tools in Disaster Management

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4.3 GOVERNMENT MINISTRIES IN DISASTER PREPAREDNESS

Frequent disasters in Kenya, in the recent years, rekindled public debate on the country's disaster management capacity, preparedness and responses systems. Various departments and ministries are responsible for disaster management, early warning and coordination.

The Ministry of state for Special Programmes (MoSSP) has the lead role in disaster related issues. The Office of the President, Provincial Administration, administratively houses the National Disaster Operations Centre (NDOC). However, NDOC is operationally run by the MoSSP.

Other key ministries include the Ministry of Development of Northern Kenya and other Arid Lands, the Ministry of Environment and Ministry of Agriculture.

Figure 3: *GoK Ministries in Disaster Preparedness. (Source: KRCS, 2000)*

4.4 STATUS OF ICT AT KENYA RED CROSS

In 2008, KRCS website was redesigned to reflect the new face and other developments relevant to disaster management. Intranet has been developed and will soon be launched to enable the sharing of common internal documents.

With support from the Kenya Data Network, three regional offices were networked (West Kenya, North Rift and South Rift) and are now part of KRCS wide area network in addition to Coast and North Eastern regional offices. This enabled deployment of mail services, antivirus solution and Navision system to the regional offices. Plans are underway to network other regional offices.

In 2008, Kenya Red Cross invested in Emergency Operations Centre (EOC), which doubles up as the Disaster Management and Training Centre. The EOC incorporates the integration of real-time streaming media and web portals to detect and alert on earthquakes, traffic, and weather in disaster-prone sites. This information is then relayed to the Red Cross Action Team leaders on the ground using the Short Messaging Service (SMS) and email that is made possible using the GSM Wireless Data Technology.

Communities in disaster-prone areas such as Kwale, Kilifi, Mombasa, Lamu, Tana River, Machakos, Nairobi and Nyando initiated small-scale disaster mitigation projects. This was made possible through the use of vulnerability and capacities assessment (VCA) tools, developed by IFRC, to design and implement relevant, community-owned and sustainable risk reduction micro-projects.

The National Society engaged partners at different levels of disaster preparedness, including the Government, UN agencies, national and local organisations to help raise the profile of disaster preparedness in Kenya.

Mombasa, Kwale, Kilifi, Lamu, and Nyando branches installed VHF (Very High Frequency) and HF (High Frequency) radio base stations as part of the early warning system. The radio network is linked with the Society's Headquarters in Nairobi, which receives and transmits information directly from the Emergency Operations Centre and other national and regional disaster monitoring agencies.

By 2007, Kenya Red Cross Society has installed structured network at the headquarters and Regional Office to support voice and data. The two offices are interlinked with improved information sharing.

Installed a new PABX system with VOIP capabilities enabled additional extension connection with improved voice transfer. Also, upgraded the bandwindth to Access Kenya from 128kbps up-down to current 1mbps up and 152 down. This has eased information exchange and faster internet access.

Set up Navision System at the Coast Regional office and expanded Navision to include human resource module. This is meant to improve financial and HR reports.

KRCS Installed FVHF repeater stations in Nyanza-Kisumu, Coast-Mombasa, Tana River, Garissa and Marsabit and Headquarters. This has improved communication, as well as drastically reduced the cost of communication. The IT unit also installed new HF radio system in Nyanza-Kisumu, Marsabit and Tana River for improved radio communication between Region-Region and Region-Headquarters. An HF and VHF in the mobile units were also set up to improve tracking communication.

The IT unit also supported the maintenance of all computers and workstations at the Headquarters, Regions and Branches.

4.4.1 Disaster Preparedness

Kenya Red Cross Society has established various tools and structures to ensure disaster management in the country, among them:

- Formation and training of disaster management committees
- Early warning installations and rapid response units to disasters
- Training of staff and volunteers in disaster management skills
- Stockpiling emergency relief stocks
- Development of all-inclusive disaster management tools
- The Emergency Operations Centre (EOC)
- Support to small-scale disaster mitigation projects
- Operational research through VCAs
- Advocacy in raising the profile of disaster preparedness
- Communication installations through VHF/HF radios, VSAT

4.5 CASE STUDIES

4.5.1 Nakumatt Fire Tragedy

On 28th January 2008 at 2pm Kenya Red Cross received information from various sources of a blast at Nakumatt Downtown Supermarket in Nairobi. The information was relayed to various KRCS offices.

The EOC (Emergency Operations Centre) immediately deployed the Use of Butterfly cameras to confirm the information with a visual of site upon which KRCS alerted RCAT teams from branches as well as HQ to respond to the fire.

Upon arrival at the scene, the first response team did a quick assessment of the level of disaster. Given that the fire was rapidly spreading to larger scales additional back up teams were deployed. A team of about 20 volunteers that was in the process of conducting a fire prevention (risk reduction) activity in a slum in Nairobi was immediately deployed to support the first team. Another response team of 45 staff members was also rapidly deployed to bolster the teams on the ground. Five vehicles, including two Ambulances and three land cruisers were deployed to the site and other points in the response. First aiders and first aid kits were also deployed for the response.

In this incident, some 26 people have been confirmed dead and efforts are continuing to determine the fate of 30 others reported missing.

Figure 4: Images from KRCS butterfly cameras after a fire incident at Nakumatt Supermarket Nairobi (Source: KRCS, 2009)

4.5.2 Molo Oil Tanker Tragedy

A Road Traffic Accident (RTA) occurred on Sunday, 1st February 2009 along Nakuru-Eldoret highway at 5.35 PM. The accidents involved a long distance, long haul trailer ferrying petroleum products towards Eldoret (Actual destination not confirmed). The trailer overturned approximately 5 Km past Salgaa Trading Centre, at Borop Sub-Location of Sachangwan Location in Molo division of Molo District. The driver and his turn boy are reported to have escaped with minor injuries and were treated at Molo District Hospital.

Following the accident, the community members from the surrounding villages including Molo town moved to the accident scene for fuel siphoning from the overturned trailer, their number is estimated to have been in excess of 200 heads(including men, women and children). Traffic policemen also arrived to assess the accident scene and control the local population. It is reported that at between 6.30 and 7.00 PM, an explosion occurred while people were still scrambling for spilling fuel. The fire, consumed the fuel in pools, the tanker, fuel stored in jerrycans, 1 motor cycle and 2 motor vehicles parked along the road. The fire also killed 89 people almost instantly while over 100 escaped with burns that ranged from very severe(over 99%) to minor burns. Additional deaths continue to be reported and last death toll from this accident is reported at 94 deaths.

Some fire outbreaks were also reported in several residential and business premises in Nairobi and other urban centres during January 2009 and continue to be reported across the country with last reported cases of such fires being on 3rd February 2009 night in Mombasa and Busia where more than 40 houses were gutted. There were no casualties in both incidents.

During the Oil tanker explosion in Sachangwan, a few kilometre from Molo town, the Kenya Red Cross jointly carried rescue evacuation, First Aid and other services with the security officers, Fire brigade and medical officers from Rift valley hospitals.

Other responders were the Kenya Police, GSU and other security units that assisted in disaster response. The number of responders was estimated to be over 600, of which Kenya Red Cross staff and volunteers were 391. At least 14 fire trucks used during the response.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Kenya Red Cross Society has been a consistent and effective partner to the Government in responding to and preparing for disasters. The Society has been present at most natural and man-made disasters, providing relief supplies and counselling services (*KRCS 2009, Cooperation Agreement Strategy 2010*).

Kenya Red Cross Society works closely with the Ministry of State for Special Programmes in responding and mitigating the effects of disasters. KRCS collaborates with the Government in national disaster management in areas afflicted by drought, floods and other emergencies.

The Society plays a critical role in national disaster management policies and strategies. It also plays an advisory role at policy-making and implementation of policies on disaster management. The policies and institutional measures are intended to enable the Government to predict and make advanced preparations for natural disasters and strengthen its ability to respond appropriately and effectively when disasters arise.

From the study, it has been noted that KRCS has received support from the Kenya Data Network, and networked its three regional offices out of eight regions. There are plans to complete the networking of other regional offices. The aim is to enhance the use ICT in disaster management and general administration.

The study further underscored KRCS the response in both natural and man-made disasters, with the latter being prominent in the recent years.

The ICT disaster tools frequently used by KRCS include HF radios, Most of the ICT tools used by the society as well as the Emergency Operation Centre (EOC), are located in Nairobi.

The challenge is to build the capacity of regions in ICT, since most disasters occur in all parts of the country.

The study concluded the following from the research objectives:

There is inadequate use of ICT tools in disaster management in the country. The use of ICT tools by the Kenya Red Cross Society is gradually emerging as a new phenomenon that is expected to improve disaster management in the country..

From the specific objectives, the study found out that:
- The ICT facilities used by the Kenya Red Cross Society in disaster management are mainly HF radios and butterfly cameras, located in Nairobi. HF radios are the most effective tools used in disaster management;
- Kenya Red Cross Society used some ICT tools such as HF radios and butterfly cameras during the Nakumatt Supermarket fire tragedy and Sachang'wan oil tanker explosion.
- The Kenya Red Cross Society has established the EOC in Nairobi, and build capacity in three regions to use ICT for disaster management.
- There is inadequate investment in ICT tools for disaster management in the Kenya Red Cross Society. There is also inadequate training in the use of ICT tools and low capacity of disaster management institutions like the Kenya Red Cross Society to use ICT tools.

5.2 RECOMMENDATIONS

The study recommends future research in the following areas:

- Capacity of local institutions in use of ICT in disaster management
- A survey of institutions using ICT in disaster management.
- Effectiveness of ICT tools in disaster management in Kenya.
- Policies in ICT and disaster management in Kenya.

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ANNEXES

1. QUESTIONNAIRES

1.1 Disaster Management Staff

Section A: Background Information

This section is quite crucial in ensuring that the sample selected is adequately represented and data gathered is relevant to the study. Please tick the appropriate answer or provide your brief remarks in the spaces provided.

1. Department...
....
2. Highest education
Level...
3. Years of experience in Disaster
Management..
4. Job
title...
5. Key duties
....
....
....

Disasters in Kenya

6. How often does Kenya Red Cross respond to the following disasters?

Disasters	Daily	Monthly	Annually	Seasonal	Unpredictable
Locust invasion					
Terrorism					
Fires					
Drought					
Road accidents					
Typhoons					
Floods					
Earthquakes		.			
Tsnunami					

7. Which of the following does Kenya Red Cross use when responding to these disasters?

Disasters	Personnel	Trucks	Light vehicles	Ambulances	ICT Equipment	Others
Locust invasion						
Terrorism						
Fires						
Drought						
Road accidents						
Typhoons						
Floods						
Earthquakes						
Tsnunami						
Disease outbreaks						
Epidemics						

8. How do you rate the use of ICT in disaster management in Kenya?

Poor, Fair, Good, Excellent

Section C: Disaster Management and ICT

This section is central to answering the objectives of the study and data collected will validate the research objectives.

Question	Strongly Agree	Agree	Disagree	Strongly Disagree	Not sure
...has a policy on disaster management					
...invests adequate resources in disaster management.					
...tes are central to KRCS' disaster management					
...CS staff use ICT facilities in their work					
...CS staff are trained in use of ICT tools during disasters					
...ents of KRCS use ICT in disaster management					
...personnel trained in use of ICT facilities.					
...ties have improved KRCS response during disasters					
...ICT during disasters is central in KRCS plans					

11. ICT has enabled KRCS to improve its response during disasters YES/NO

If your answer is YES, please state the results in view of recent disasters

....

....

....

....

Section D: Challenges in Use of ICT in Disaster Management

This section will enable the researcher in analysis of data provided in Section B and make recommendations.

2. State any challenges facing the use of ICT in disaster management

....

....

....

....

3. Any other comments

....

....

....

....

1.2 ICT Staff

Section A: Background Information

This section is important in ensuring that the sample selected is adequately represented and data gathered is relevant to the study. Please tick the appropriate answer and make brief remarks in the spaces provided.

1. Department..
2. Highest education
   Level..
3. Years of experience ....
4. Job title..
5. Key duties
   ....
   ....
   ....
   ....

Section B: ICT Status at KRCS

This section is important in answering the objectives of the study and data collected will validate the research objectives. Please tick the appropriate answer.

estion	Strongly Agree	Agree	Disagree	Strongly Disagree	Not sure
CS has a strong an ICT Department					
CS has a strong ICT Department/Unit					
CS has invested in ICT development					
CS personnel have adequate training in the use of ICT					
is integral in disaster management					

13. Kenya Red Cross offices and regions are connected to ICT facilities YES/NO

(a) If yes, describe the regions networked (s)

....
....

....
......

(b) Name 3 institutions that partner with KRCS in provision of ICT services during disasters?

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

14. List three achievements of KRCS in the use of ICT in disaster management

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

17. Have you attended ICT workshops or conferences? YES/NO

(a) If yes, please list the benefits of the workshop/conference to disaster management

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

18. How can you rate the use of ICT by the following institutions in disaster management?

Institution	Reliable	Fairly Reliable	Not Reliable
National Disaster Management Centre			
Nairobi City Brigade			
Ministry of Special Programmes			

1.3 PR& Communications Staff

Section A: Background Information

This section is quite crucial in ensuring that the sample selected is adequately represented and data gathered is relevant to the study. Please tick the appropriate answer or provide your brief remarks in the spaces provided.

1. Department...

2. Highest education Level...

3. Years of experience in the media..

4. Job title...

5. Key duties

....

....

....

Section C: ICT and Communication

This section is central to answering the objectives of the study and data collected will validate the research objectives.

Question	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
RCS has a policy on disaster management					
RCS invests adequate resources on disaster agement					
T facilities are central to KRCS's disaster management					
KRCS staff are trained in use of ICT tools during ters					
epartments of KRCS use ICT in disaster management					
RCS personnel trained in use of ICT facilities.					
T facilities have improved KRCS response during sters.					
se of ICT during disasters is central in KRCS plans.					

Section D: Challenges in Use of ICT

This section will enable the researcher in analysis of data provided in Section B and make recommendations.

1. Briefly describe three challenges of ICT use in KRCS?

....

....

....

....

2. How does KRCS respond to the above challenges?

3. Any other comments ....

....

....

....

....

KRCS– Update on Radio Communications

Radio Communications

	REGION
	TURKANA
	TURKANA
	NAIROBI
	NAIROBI
its raining	POKOT
	ELDORET WEST
	MARAKWET
	NAIVASHA
	KILINYAGA
	MURANGA NORTH
	NYERI
	THIKA
	LAIKIPIA EAST

Base Stations 27th-30th April

Location	Call Sign	Status	Remark
Nairobi	November Alpha	On	
Nakuru		Down	
Kisumu		on	
mandera		on	Reports their still going on with relief distribution things are ok
Mombasa			
lamu			Call ups
wajir			Call ups
Eldorets			
Pokot			
garsen			
marsabit			Call ups
Lodwar			Call ups
Moyale	Ꮞ		Call ups
Isiolo			Call ups
Kwale			Call ups
Kilifi			Call ups

Mobiles

Location	Call Sign	Status	Remark
Garissa	412	ok	Reporting in golf romeo
isiolo	500	ok	Reported in garbatulla
masalani	426	ok	Reported in masalani-ijara relief distribution
marsabit	388	ok	Relief distribution ireret
	511	ok	Relief distribution in pokot east
Mt elgon	134	ok	Cash for work operation
machakos	424	ok	Morning call up
NAIROBI	167		

Map of Kenya and surrounding regions: Sudan, Ethiopia, Uganda, Somalia, L. Turkana, L. Victoria, with locations including Lokichoggio, Kakuma, Lodwar, Moroto, Lokichar, Lokori, Mbale, Kitale, Kapsowar, Marakwet, Tororo, Mol's Bridge, Iten, Kabarnet, Busia, Bungoma, Eldoret, Marigat, Kakamega, Kapsabet, Eldama Ravine, Nyahururu, Kisumu, Nakuru, Kericho, Gilgil, Kisii, Narok, Isebania, Machakos, Maralal, Isiolo, Marsabit, Moyale, Wajir, Habaswein, Mado Gashi, El Wak, Eel Wak, Liboi, Dadaab, Hola, Ijara, Bura, Kolbio. Regions labelled: RIFT VALLEY, WESTERN, NYANZA, CENTRAL, EASTERN, NORTH EASTERN.