

**MEASURES OF REDUCING INDIVIDUALS CONTRIBUTION TO CLIMATE
CHANGE: THE CASE OF STAFF AT THE MINISTRY OF ENVIORNMENT AND
MINERAL RESOURCES HEADQUATERS NAIROBI.**

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DECLARATION

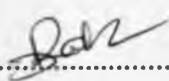
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DEDICATION

To my family for their love, support and encouragement.

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My greatest gratitude goes to the Almighty God for the strength and grace he has granted me throughout this project.

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ABBREVIATIONS AND ACRONYMS

- CBD- Convention on Biological Diversity**
- CFC'S- Chlorofluorocarbons**
- CFL-Compact fluorescent lights**
- Co²-Carbon dioxide**
- EIA- Energy Information Administration**
- GDP-Gross Domestic Product**
- GEF - Global Environment Facility**
- GHG-Greenhouse Gases**
- GoK- Government of Kenya**
- IPCC-Intergovernmental Panel on Climate Change**
- KPLC- Kenya Power and Lighting Company**
- LED- Light Emitting Diodes**
- MoE-Ministry of Education**
- NCCRS-National Climate Change Strategy**
- NGO-Non Governmental Organisation**
- OECD-Organisation for Economic Co-operation and Development**
- SPSS- Statistical Programme for Social Sciences**
- TAR- Third Assessment Report**
- TWh- Terawatt Hours**

UNEP-United Nations Environmental Programme

UNFCCC-United Nations Framework Convention For Climate Change

WHO-World Health Organisation

ABSTRACT

Although much has been said on the broad subject of climate change, more needs to be done to increase awareness and address measures which individuals can take to reduce their contribution to climate change. If large segments of society are willing to make changes, we can expect an early transition to energy-efficient, technologically innovative, and environmentally sustainable society. The beginning is recognizing as individuals the part we play in contributing to this global problem of climate change.

This project aimed at enquiring into the level of awareness by staff at the Ministry of Environment and Natural Resources (MENR) Headquarters, Nairobi about climate change. In addition, the researcher sought to find out the measures that individuals are taking to reduce their contribution to climate change.

The study was carried out at the Ministry of Environment headquarters Nairobi. Data was collected by using a questionnaire and the analysis done by SPSS software. The sample under study was drawn from the population by simple random sampling technique.

The main areas of focus for the study were an investigation into the level of awareness about climate change, energy -efficient lighting, pooling of transport to reduce vehicular emissions and the willingness by individuals to switch to renewable energy all aimed at reducing the effects of climate change.

CHAPTER ONE: INTRODUCTION

1.1 Background

Climate change is among the most important environmental issues of our time. Almost everything in the world around us; from our economy to our physical infrastructure; is based on having a consistent climate. When the climate begins to change, especially in ways we cannot fully predict, the consequences could be severe: drought, an increase in severe weather activity, flooding, soil erosion, increases in some diseases, and the extinction of certain species. Some of these consequences may be irreversible. The actions we take now and in the coming years will decide what kind of world our children and future generations live in. The greenhouse gases that we put into the atmosphere today will persist for more than 100 years, so the full ramifications of our actions will be felt for years to come (Rendell, 2009).

Every person, business and government can contribute to reducing greenhouse gas emissions, protecting our environment and preserving our climate.

The relevance of climate change for society seems indisputable: scientific evidence points to a significant human contribution in causing climate change, and impacts which will increasingly affect human welfare. There is therefore, an urgent need to understand and enable societal engagement in mitigation. Yet recent research indicates that this involvement is currently limited. (Lorraine Whitmarsh et al, 2010).

Scientists throughout the world underline the need for urgent action on climate change. The Intergovernmental Panel on Climate Change (IPCC) projects that without more immediate action to limit the activities that result in climate change; human activity could cause irreversible and possibly catastrophic consequences (European Community, 2009). Climate change and its impact on our environment, our economies and our security, is the defining issue of our era. But every day of inaction makes its consequences more irreversible, so we need to act now (OECD, 2008).

The evidence of climate change in Kenya is unmistakable. Temperatures have risen throughout the country. Rainfalls have become irregular and unpredictable. More specifically, since the early 1960s, both minimum and maximum temperatures have been on an increasing trend. The

minimum temperature has risen generally by 0.7 – 2.0° C and the maximum by 0.2 – 1.3° C, depending on the season and the region (GoK, 2010).

In Kenya, the National Climate Change Response Strategy (NCCRS) is mandated with the primary objective of putting in place robust measures needed to address most of the challenges posed by climate variability and change (GoK, 2010). The strategy is in line with the commitments in the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). The protocol aims at getting countries to commit to drastically cut their levels of emission in a bid to reduce climate change.

If individuals are convinced that their actions can make a difference, they will start taking the myriad small decisions that, when added together, can have a dramatic impact on emissions. This study seeks to investigate the level of awareness of climate change and the measures staff at the Ministry of Environment and Mineral Resources (MEMR) headquarters in Nairobi are taking to reduce their contribution to the problem of climate change.

1.2 Statement of the Problem

Despite the research both at the local and global arena in the area of climate change, there seems to be a gap in the level of awareness of the measures that can be taken by people in their daily lives that would reduce the effects of climate change.

This study aims to investigate the measures that staffs at the Ministry of Environment and Mineral Resources headquarters Nairobi are taking to reduce their contribution to the problem of climate change. A lot of people are ignorant of the fact that they contribute in a small way through activities which cause climate change. The cumulative effect of lifestyles has a big role to play in adding to the problem of climate change. Unless people become conscious of the impact of their actions and be committed to make changes to the way they live, then the problem of climate change will forever jeopardize current and future generations.

1.3 Purpose of the Study

This study seeks to establish the measures being taken by staff at MEMR to reduce their contribution to the problem of climate change.

1.4 Research Objectives

The general objective of this study is to establish the level of awareness by staff at MEMR about climate change and the measures they are taking to reduce their contribution to climate change.

The specific objectives of the study are:

- i. To establish whether staff at MEMR are aware of the extent of their contribution to climate change.
- ii. To investigate the utilization of energy efficient lighting as a measure towards the reduction of the contribution to the problem of climate change.
- iii. To assess the willingness by staff at MEMR to pool transportation as a measure to minimize the effects of vehicular emissions which contribute to climate change.
- iv. To establish the willingness to switch to renewable energy as a means of reducing their contribution to the problem of climate change.

1.5 Research Questions

- i. Are staffs at MEMR aware of their contribution to climate change?
- ii. Are staffs at MEMR adopting efficient energy lighting to reduce their contribution to climate change?
- iii. Are MEMR staffs willing to pool transportation as a measure to reduce vehicle emissions which contributes to climate change?
- iv. Are staffs at MEMR willing to utilize renewable energy in a bid to reduce their contribution to the effects of climate change?

1.6 Significance of the Study

This study will establish the level of awareness by staff at the MEMR about their contribution to climate change. It will help appreciate the fact that the cumulative actions of every person in combating climate change can create a significant impact in safeguarding the planet.

The world as it were is does not belong to the present generation. Rather it belongs to the future generations. It is therefore imperative that this current generation ensures that the way they live today assures their successors a certain future. There thus exists a challenge of guaranteeing that future. The study findings will help determine the level of awareness and the measures being taken by staff at MEMR to reduce their contribution to the problem of climate change.

1.7 Delimitation of the Study

The target population is easily accessible and this will make collecting of data convenient and faster. This is so because the staffs being targeted for the study are under one roof thus making it easy to carry out the research.

The MEMR hosts employees from all walks of life and social classes. Cleaners, messengers, clerks, middle class managers and top level officials will all be found under this Ministry. Thus, the study will cut across the entire social stretch making generalization of the findings more representative of the greater population with minimum bias.

1.8 Limitations of the Study

The study population is small and findings may not necessarily be a representation of the general population.

Time for data collection analysis and presentation of findings will also be a major constraint in the study. However, with proper planning, this challenge will be minimized.

1.9 Assumptions of the Study

The study assumes that the measures under investigation are applied by the individuals with the impact of their actions in mind. This may not be so as most people tend to do things out of the economic situation or as a lifestyle issue without giving much thought to the contribution they may be making towards either increasing or reducing their contribution to the effects of climate change.

The study also assumes that the respondents will be honest and truthful with their answers to the questions raised.

1.10 Definition of significant terms

Carbon footprint: A 'carbon footprint' is a measure of the greenhouse gas emissions associated with an activity, group of activities or a product. Nearly everything that we do produces greenhouse gas (GHG) emissions either directly or indirectly; whether it be getting to work, watching TV or buying our lunch. The most important greenhouse gas produced by human activities is carbon dioxide.

Climate change- climate change refers to any distinct change in measures of climate lasting for a long period of time. In other words, "climate change" means major changes in temperature, rainfall, snow, or wind patterns lasting for decades or longer.

Energy efficiency: includes all possible methods, techniques and principles that could lead to more efficient energy use and help decrease global demand for energy.

Global warming- is an average increase in temperatures near the Earth's surface and in the lowest layer of the atmosphere. Increases in temperatures in our Earth's atmosphere can contribute to changes in global climate patterns. Global warming can be considered part of climate change.

Greenhouse Gases (GHG): The three most powerful long lived greenhouse gases in the atmosphere are carbon dioxide, methane, and nitrous oxide. Water vapor is the single most powerful greenhouse gas in the atmosphere.

Kyoto protocol: Is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the protocol is that it sets binding targets

for the 37 industrialized countries and the European community for reducing greenhouse gases emissions.

Motorized transportation: motorized transportation refers to the movement of people and goods by means of fossil fuel propelled vehicles. The most common form of motorized transportation is road transport.

Pooling transportation: This refers to the practice of sharing vehicles by maximizing on the capacity and reducing on the number of vehicles being used on a particular route.

Renewable energy: refers to energy derived from resources that are naturally regenerative and practically non-exhaustible such as biomass, solar, wind and geothermal.

1.11 Summary

It is apparent that the problem of climate change is one that can no longer be ignored. The level of awareness of climate change and the measures that ought to be taken by individuals to reduce their contribution to this problem is a starting point in mitigating the effects of climate change. The starting point is by raising awareness of the problem and identifying measures that will help people to cut on their contribution to the effects of climate change.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Climate change is one of the most challenging global environmental problems hence the great interest in the topic lately. Climate change is a change of climate that is attributed directly or indirectly to human activities that alter the composition of the global atmosphere, which is in addition to natural climate variability, observed over comparable time periods (UNFCCC, 1992). To support the validity of this position, the same document asserts that the anthropogenic activities, which have contributed to the release of greenhouse gases into the atmosphere, are the main cause.

It is widely accepted that by engaging in activities that cause the emission of large amounts of carbon dioxide and methane, human beings are increasing the concentration of these and other so-called greenhouse gases in the atmosphere. This, in turn, has brought about climatic change or 'global warming' as it is popularly known (Houghton et al, 1992).

This chapter contains discussion of findings from previous studies in the area of climate change. The main area of this review is based on primary sources specifically journals and reports of various authors and conventions on climate change. This review is concentrated along the areas of awareness, efficient energy lighting technology, motorized transport and renewable energy utilization.

2.2 Awareness on climate change

Climate change is one of the most challenging global environmental problems and for that reason there has been a great interest in the topic. Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UNFCCC, 1992). To support the validity of this position, the obvious variability in climatic patterns raises the question of the main cause and this has pointed to anthropogenic activities which have contributed to the release of greenhouse gases mainly carbon dioxide into the atmosphere.

Although carbon dioxide is touted as the most significant greenhouse gas, some authors dispute this position. Water vapor, not carbon dioxide (CO²), is the most important greenhouse gas.

Computing the exact contribution of each type of greenhouse gas to the overall greenhouse effect is complicated, because the gases “overlap” in some of the spectra in which they absorb infrared radiation. Taking the overlaps into account, RealClimate.Org concludes that “water vapor is the single most important absorber (between 36% and 66% of the greenhouse effect), and together with clouds makes up between 66% and 85%. CO² alone makes up between 9 and 26%, while the O₃ and the other minor GHG absorbers consist of up to 7 and 8% of the effect, respectively (Lewis, 2006)

It is widely accepted that by engaging in activities that cause the emission of large amounts of carbon dioxide and methane, human beings are increasing the concentration of these and other so-called greenhouse gases in the atmosphere. This, in turn, has brought about climatic change or 'global warming' as it is popularly known (John T. Houghton, 1992).

The 1995 IPCC Science report concludes that evidence now available "points toward a discernible human influence on global climate". Reductions in emissions will require changes in human behavior. According to the report, gains in global climate change knowledge would lead to changes in human behaviors that could be deemed environmentally responsible (Houghton et al, 1996).

Environmental knowledge is very low globally (Maloney and Ward, 1973; Arcury, 1990; Miller, 1991) and particularly lacking and confused related to global climate change issues (Kempton, 1991; Bostrom et al 1994; Read et al, 1994). This is especially so in terms of understanding the anthropogenic activities that enhance natural cycles and the environmental consequences of those activities for both humans and the natural world over both the short and long term. The above quoted observations is more true in developing world where a majority of the population are more concerned with making ends meet rather than concern themselves with getting information concerning global climate change.

Recognition of climate change as a significant global environmental challenge has its origin in the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. Global negotiations have paid greater attention to the minimizing of the cost of mitigating greenhouse gas (GHG) emissions, which has obscured the importance of the vulnerability of natural and human systems in weaker economies and their adaptation to such changes.

The UNFCCC and its Kyoto Protocol can only succeed if the general public and key stakeholders are aware of, and support effective action in combating climate change. Since governments are directly responsible for only a small proportion of greenhouse gas emissions, they must persuade businesses, communities and individuals to adjust their behavior in ways that limit emissions and promote adaptation (UNEP 2006). In view of this, it is important that the public be sensitized on the role they play in contributing to the bigger problem of climate change and also be made aware of the measures they can take either individually or collectively to reduce the emissions that contribute to climate change.

Fortunately, governments have several tools at their disposal for raising awareness and encourage people to make these changes. Policies and legislation can be used to raise the cost of activities that emit greenhouse gases or create vulnerabilities to climate change impacts. They can also be designed to reduce the costs of activities that lower emissions and promote adaptation (Miller, 1991).

Such policies and measures, however, can encounter inertia, passive resistance or active opposition, particularly from those concerned about the imposition of a new cost. Increasing awareness through provision of information and explanations is therefore vital for generating public and stakeholder support for government policies and regulations. Public outreach can also encourage voluntary changes in habits, address the arguments of those who oppose specific actions and help to prepare the younger generation for living in the climate-change world that they will soon inherit (Guggenheim, 2006).

Many governments and non-governmental organizations (NGOs) are already working actively to raise awareness. The scale of the change required, however, and the vast number of people and interests that must be influenced, calls for outreach activities of a much greater magnitude. National governments will want to encourage local authorities, nongovernmental organizations (NGOs), educators, the media, the entertainment industry and individuals to play a role. They may also consider building partnerships with many of these diverse actors (UNEP, 2006).

The intergovernmental Panel on Climate Change (IPCC) for the first time in 1995 acknowledged that human influence is a key factor to climate change because of its impact in increasing the concentration of greenhouse gases in the atmosphere. Over the past 100 years, the global mean

temperatures of earth has increased from 0.3 to 0.6⁰ C, and current climate models predict that over the next 100 years global temperatures could increase from 1.4 to 5.8⁰C, depending on the amount of greenhouse gases emitted (Mahlman, 1997). The main greenhouse gases are carbon dioxide, water vapor, methane, CFC's and nitrous oxides. Of these, carbon dioxide seems to be the most important as, according to calculations; it is responsible for about two thirds of the expected global warming now and in the future (IPCC, 1996).

According to UNFCCC, the issue of public awareness is the top priority, ahead of education and training in combating climate change. There should be a commitment to developing sustainable, long-term public awareness strategies for engaging all stakeholders. Such strategies could draw on the experiences gained during outreach efforts for other issues and across the globe.

Article 6 of the Convention is the main vehicle by means of which Parties foster action to develop and implement educational, training and public-awareness programmes on climate change (UNFCCC, 2010). In support of this position, the researcher acknowledges that unless individuals become aware of the consequences of their actions, the problem of climate change will continue to haunt the planet and the effects are bound to become more severe with time. Thus, it is important that the public be empowered with the knowledge and information relevant to reduce emissions responsible for climate change.

The convention identifies policy makers, the general public and youth as key target audiences for awareness messages on emissions and climate change. In my view, Policy makers are a priority because officials responsible for national climate change programmes often find that their colleagues in other ministries and departments are not fully engaged or interested. Because climate change is a cross-cutting issue, climate change policy makers need the active engagement of their other colleagues in order to develop effective policies.

To be effective, messages must be crafted for the particular target audience and avoid jargon and highly technical terms. Most messages should emphasize vulnerability and adaptation, as these are the most important climate change issues for the African region. Where possible, links should be made to related concerns, such as those dealt with under the United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD), to boost the relevance and impact of the message.

The most effective public awareness campaigns will establish a “human face” for the issue. This involves linking climate change directly to citizens’ day-to-day concerns. In particular, climate change should be tied to issues that affect how people earn their living. This can help to motivate people to take action themselves and to pressure their government to respond to climate change. Awareness messages can also focus on encouraging support for certain projects or public expenditures (Cook, 1990).

The media is a particularly vital channel for reaching out to the public and to key stakeholders. In many parts of Africa, however, journalists can face serious constraints. Many would like to receive more professional training, including in specialized topics such as climate change. Journalists sometimes observe that government regulations and practices can inhibit fruitful exchanges between civil servants and the press; they argue that government officials could communicate on climate change more effectively by proactively seeking positive relationships with journalists (Michaels,2004).

Outreach strategies should exploit the advantages of each type of media. For example, newspapers and magazines tend to be considered more authoritative, are read by decision makers and allow a more detailed explanation. On the other hand, they reach only the literate and are often concentrated in capital cities, so distribution outside urban areas can be poor. Radio stations that transmit in local languages can be particularly effective for outreach. Radio’s strengths are that it is relatively inexpensive, reaches many people and does not require a literate audience (UNEP, 2006).

In addition to media, other channels for reaching the public can include channeling messages via sports and music celebrities, theatre performances, brochures in local languages, agricultural extension systems and other professional networks, religious groups, and United Nations special days such as World Environment Day and eventually perhaps a United Nations Climate Change Day. Messages can be conveyed through text, drama, song, comedy, contests (such as posters, essays or paintings), publicity events (book launches and debates), on-line chat groups and public meetings. Cultural activities, workshops and seminars, site visits and partnerships with advertisers and NGOs all offer innovative possibilities.

Promoting public participation in climate change decision-making and public access to information can also play a critical role. Efforts could focus on ensuring that libraries and educational institutions offer a full range of relevant materials, from national communications and the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (TAR) to videos and popularized brochures. Also essential is a proactive effort to ensure that people are informed about how this climate change information can be accessed.

Barriers to implementing the above ideas include lack of funding, technical skills and political support. High illiteracy rates and competing national priorities can also undermine outreach efforts. Possible solutions include building partnerships between ministries, the media and civil society organizations; raising funds and other support from international partners in order to build capacity and leverage national resources and linking climate change concerns to other priority issues, such as poverty, desertification, agriculture and health (UNFCCC, 2004).

Developing countries in particular need better information on how the climate is likely to change in the future. There is an urgent need for regional and national scientific assessments of climate change, its impacts, the costs of mitigation and adaptation (and the costs of inaction), as well as national vulnerability assessments. UNEP is strongly positioned to pass information on the understanding about the causes and consequences of climate change, and the responses available to decision-makers, businesses and individuals. The organisation is promoting activities that will help increase awareness of climate change and promote integration of climate change into policy-making in developing countries and countries with economies in transition. As part of this process, UNEP works in partnership with the UNFCCC Secretariat in organizing preparatory workshops for negotiators as well as other outreach programmes in support of the UNFCCC.

The United Nations is expected to and must play a key role in providing some of the answers and information that wider society expects, and UNEP has been given the UN system lead in climate change outreach.

Audiences throughout the world are increasingly exposed to climate related stories — predominantly negative and inadequately solution oriented. Helping governments, industry and the public to make sense of it all and take informed actions is a communications and advocacy challenge and opportunity that UNEP must embrace. UNEP's activities must be undertaken in

collaboration with partners to ensure coordination and the highest impact possible, and will both guide and be informed by the UN Communications Group Task Force on Climate Change.

The focus of UNEP's strategies include the development of strategic communications, including through mutually reinforcing messages with the UNFCCC Secretariat, to convey a sense of urgency in dealing with climate change; of Use media and outreach activities to help deliver key messages on climate change, especially those derived from UNEP Climate Change publications, to the media and other target groups. This helps communicate successful climate change programmes to key stakeholders to promote replication of best practices and success stories using the Internet and audiovisual tools (UNEP 2009).

From the above, it is apparent that a lot needs to be done to raise awareness about the problem of climate change. It is clear that although much has been said at higher levels, little is known about individual's level of awareness about their contribution to climate change. This study therefore seeks to investigate whether individuals are aware of the problem of climate change and their contribution towards reduction of emissions.

2.3 Motorized Transport

Like many things in life, there are advantages to motorized transportation such as access to jobs, wealth, and mobility of goods and people. But there are also serious negatives such as emissions that are known to contribute to climate change (Joseph A. Carpenter et al, 2008). Lifestyle depends greatly on access to a reliable transport system, and most people see mobility as a prerequisite for a good life. Yet, at the same time there are concerns about its impact on the environment.

In the context of the requisite shift to a secure, low-carbon energy economy, motor vehicles present a major challenge. Road transport is now one of the largest contributors to emissions of greenhouse gases (GHGs), and transport is the sector with the highest growth rate of emissions (Kohler J, 2006).

Car design, ownership and usage are clearly major determinants of the degree of carbon emissions produced as a result of personal transport. However, both innovation on the supply side, and change on the consumer side, to reduce GHG emissions associated with transport have been disappointing (De Coninck, 2008). Vehicle technologies to enable a major reduction in

emissions are already known in principle and are being actively developed. However, the auto industry has not yet changed its business model to switch to low-emission technologies as the basis of its products. Environmental innovation is still small scale (Nieuwenhuis and Wells, 1997).

Similarly, the public is aware of, and expresses concern about, climate change, but are taking few steps to alter their lifestyles. While most people express concern about climate change and are worried about traffic fumes and smog, a minority have cut down on car use for short journeys (DEFRA, 2002). Indeed, research consistently shows there is considerable resistance to changing travel behaviour (Lethbridge, 2001), which poses challenges for introducing transport demand policies .

Transport accounts for almost one quarter of global energy-related CO² emissions. To achieve the necessary deep cuts in greenhouse gas emissions by 2050, transport must play a significant role. However, without strong global action, car ownership worldwide is set to triple to over 2 billion by 2050. Trucking activity will double and air travel could increase four-fold. These trends will lead to a doubling of transport energy use, with an even higher growth rate in CO² emissions as the planet shifts towards high CO² synthetic fuels (IEA, 2009).

According to the Asian Development Bank, Transport is currently responsible for 13% of all world greenhouse gas (GHG) emissions and 23% of global carbon dioxide (CO²) emissions from fuel combustion are transport related, of which road transport (both passengers and freight) account for 75%, aviation - 11.5%, and maritime transport - 10.3%. Private vehicles currently account for 10% of global CO². Transport-related CO² emissions are expected to increase 57% worldwide in the period 2005 – 2030. It is estimated that the People's Republic of China (PRC) and India will account for 56% of the global increase. The majority of these increased emissions will come from private vehicles, both for passenger and freight transport. Transport infrastructure investments in the next 5-10 years, to support the increase in motorization will lock in transport related CO² emission patterns for the coming 20–30 years in Asia (ADB, 2009).

According to United States (US) Energy Information Administration (EIA), motorized transportation fuel use is expected to grow substantially in the developing world over the next two decades, by 4.8% per year, compared with average annual increases of 1.6% in the

industrialized countries. The EIA analysis projects transportation energy use in developing Asia to increase by 5.1% per year between 1999 and 2020. Much of the growth is expected to be in the on-road sector, a combination of freight movement and personal motor vehicle ownership. Personal vehicle ownership is seen as a symbol of prosperity with annual car sales growing by double-digit percentages in many Asian and African countries (IEA, 2009).

This statistics point to the problem of increased emissions. Unless some thought is given into managing the level of emissions from motor vehicles, the impact on climate change will be tremendous. If the above projections by the EIA are anything to go by, the levels of vehicular emissions is bound to increase in the same proportion from current levels which are already detrimental and alarming (Gerard 2005).

It is important to recognize that travel is an essential activity for most organizations and individuals. Reducing the climate footprint of travel can be achieved not only through reducing travel, but also by improving the way we travel, the way we plan our travel, the systems we use to organize travel etc. Travel is also a significant economic cost in most organizations and certainly also affects the way work is conducted, as well as the work-life balance of staff members (UNEP, 2010).

From a global perspective the airline industry transports some 1.6 billion passengers annually, contributing to roughly 2 % of global anthropogenic greenhouse gas emissions (IPCC, 2007). While the share of global emissions from air travel can be seen as being modest, the emission resulting from each journey is high counted per person. The emission for example a business class roundtrip from New York to Beijing is 3.0 tonnes CO² equivalent, which can be compared with the average emission per person, which is 5.5 tonnes CO² equivalent per year. This is the explanation of why air travel, in spite of having a smaller part of the global climate footprint, has a very high footprint in organizations where travel is a common activity (Whitmarsh, 2008).

Transport is mostly a means to an end, but transport users are locked into production and consumption patterns that are not easily changed in the short term, i.e. companies are located in certain places and need supplies, people need to go to work, children need to go to school etc. The transport supply and demand patterns that the world economy experiences today are the results of decades of planned and unplanned developments. Changing these patterns in a more

sustainable direction is a long term issue. The many different policy fields which affect transport demand, such as spatial planning, industrial development and agriculture, must all integrate the aim of reduced transport demand as a policy driver (Nobis, 1997)

Due to technical requirements implemented in several countries legislation, the amount of emissions from motor vehicles is being curtailed by a requirement of the maximum age of vehicles entering their markets. For instance, in Kenya, the maximum age of vehicle entering the country is strictly 6 years. This helps ensure that that old vehicles manufactured with little regard to their impact on the environment do not come into our roads. More progress is in the pipeline. Even stricter standards will come into force and old vehicles will be replaced by new, cleaner ones. The development in technical characteristics of vehicles as well as the introduction of cleaner fuels has mostly affected road transport. This is because emission standards for other transport modes are in some aspects less restrictive and were introduced later. Road transport dominates the land transport market. It is generally the form of transport, and is used closest to people. Thus, more people are exposed to its pollutants. Therefore, it has been appropriate to pay particular attention to it (Whitmarsh, 2008).

The main reason for the growth in greenhouse gas emissions from the transport sector has been that the growth in transport volumes has not been offset by effective measures. Growth of transport volumes has also been shown to be closely linked to growth of GDP. Although there is a desire for economic growth, the negative impacts of transport are extremely undesirable (GoK, 2010). Most activities that contribute towards increases in GDP include an element of transport. Therefore, decoupling of transport growth from economic growth requires close examination of the internal efficiency of the use of transport in different sectors of the economy. In the short term, measures like improvements of logistics and better use of more efficient modes of transport can in some cases reduce transport volumes significantly. However, in the long run, consumption patterns and levels will have to be addressed as well (Lundahi 2008).

Better vehicle technology also holds a promise of progress. The car makers' voluntary commitment to reducing average CO² emissions to 140 grams/km is a step in the right direction. But the mid-term evaluation of this commitment shows that industry needs to make greater efforts if targets are to be met. In view of this and the overall Community objective of 120 grams/km, the effort to align vehicle taxation with environmental performance should be seen as

a push in an environmentally more sound direction. The emissions of other vehicle classes such as light-duty vehicles should also be addressed, as they make up a significant share of the vehicle fleet (Rendell 2008).

Transport volume growth is undermining improvements. However, long-term policies in many sectors of the economy can reduce transport emissions of greenhouse gases.

In spite of the initiatives mentioned above, transport emissions of greenhouse gases are presently growing. The main offender is the growth in transport demand, which is not being offset by the energy efficiency of vehicles. Policy development therefore needs to address transport growth if absolute reductions in greenhouse gas emissions are to be achieved.

In the EU, road transport now accounts for 21 % of total greenhouse gas (GHG) emissions. While GHG emissions of many other sectors are decreasing, the contribution from transport keeps growing. Since 1990, the emissions have grown by around 23 %. Projections made under UNFCCC reporting show a continuation of the trend. Even with all planned reduction measures included, the emissions will grow a further few percentage points by 2010 (EEA, 2005).

In addition to the transport modes covered by the Kyoto Protocol, international aviation and maritime shipping also have significant GHG emissions. Aviation is growing faster than any other transport mode and CO₂ emissions grew by 62 % in the EU-15 between 1990 and 2003. Therefore, aviation now accounts for 13.6 % of transport CO₂ emissions. In addition to this, the non-CO₂ climate effects of aviation from NO_x emissions and contrail formation should be taken into account as soon as scientific knowledge improves. The total impact of aviation is estimated at two to four times the direct impact of CO₂ emissions alone (IPCC, 1999)

New technologies that improve fuel efficiency are being applied in road transport. Such technological advances, such as the use of lightweight materials, advanced transmissions, and low-resistance tires and lubricants are some of the measures aimed at reducing vehicular emissions globally (Peters, 2006).

Total CO₂ emissions of transport are still increasing. The emission reductions achieved cannot compensate for the continuing growth of transport volume. (Peters, 2006) asserts that the use of hydrogen, possibly in combination with fuel cells, may in the future reduce CO₂ emissions of

transport, provided that the required hydrogen is produced using low-CO² energy sources. He however points out that large scale introduction of these technologies is still a long way off and sustainable hydrogen production needs to be addressed.

From the above review on motorized transport, it is clear that the problem of emissions from motorized transport is real and growing. Though transport is essential for development, it is important that measures be put in place to reduce the level of emissions from this end. The impact that vehicular emissions have on the environment are a major contributor to climate change and thus strategies need to be put in place to reduce this problem. The strategies range from walking short distances, cycling, carpooling, and use of public transport.

Though much has been accomplished in adopting these strategies in the developed world, little is known locally about reducing emissions from motorized transport. Car pooling as a strategy would be very effective in addressing the problem of emissions. However, even from the above literature, little has been said about pooling of transportation and its effectiveness in addressing the problem of emissions (Kohler et al., 2008).

This study therefore seeks to fill this gap by finding out how willing individuals would be to pool transportation as a measure aimed at the reduction of emissions responsible for climate change.

2.4 Efficient Energy Technology

Accelerating the development of new low-carbon technologies and promoting their global application are key challenges for stabilizing atmospheric greenhouse gas (GHG) emissions. Consequently, technology is at the core of current discussions surrounding the post-Kyoto climate regime (Dechezlepretre et al, 2011).

The expression 'global climate change' no longer designates merely a discourse on possible future risks; today it is used as shorthand for specific ongoing events that are having a serious impact on the lives of people around the world. In the light of this change and consequent efforts to limit carbon dioxide emissions, contributions from social scientists are increasingly in demand within the study of energy use (Appenzeller, 2005). The argument in this discussion is skewed towards the fact that energy use determines the amount of emissions released to the atmosphere which contributes to climate change. In support of this argument, it is key to seek an

understanding into the ways we can reduce this emissions by embracing efficient technology that is friendly to the environment.

The adoption of efficient technology ranges from what we use in our homes and offices for lighting, heating, refrigeration and entertainment and for powering our electronic devices.

Between now and 2050, the global economy is expected to grow by a factor of four and as much as a factor of 10 in developing countries like China and India (OECD 2008). Such growth will inevitably require increased energy use. The International Energy Agency forecasts a 70 percent increase in oil demand and a 130 percent increase in CO² emissions by 2050 (IEA, 2008)

Approximately 65 percent of global anthropogenic GHG comes from energy-related activities and the remaining 35 percent comes primarily from agricultural and land-use practices. For most industrial countries, the most significant anthropogenic GHG is CO². Most CO² is emitted as a result of using fossil fuels. Globally, 89 percent of primary energy consumed comes from fossil fuels. Electric power production accounts for the most CO² emissions, followed by the transportation sector, industrial sector, and natural gas in buildings. However, buildings are responsible for more than 70 percent of electricity use; therefore, reducing electricity use in buildings directly affects carbon emissions in electricity production (UNEP,2011).

Current trends in energy consumption are neither secure nor sustainable - economically, environmentally or socially. Inexorably rising consumption of fossil fuels and related greenhouse-gas emissions threaten our energy security and risk changing the global climate irreversibly (Ahman, 2006).

The demand for electricity is set to rise dramatically. For lighting alone, electricity consumption is expected to increase by 60 per cent in the next 20 years. Today, lighting is responsible for 19 per cent of global electricity consumption and for six to eight per cent of global greenhouse gas emissions (GHG). The good news is that the technology is here to enable a global transition to lighting efficient enough to slash emissions by half (Rodgers 2010).

Lighting worldwide is responsible for 1,900 million tonnes of CO² a year meaning that the potential for reductions in GHG emissions is enormous. Around 40 per cent of future global energy demand for lighting could be avoided by switching to efficient light bulbs (UNEP 2009).

The shift from inefficient incandescent bulbs to energy efficient compact fluorescent (CFLs) or light-emitting diodes (LEDs) would cut world lighting energy demand significantly, saving countries, businesses and households considerable sums in reduced electricity bills. Few actions could reduce carbon emissions as cheaply and easily as the phase-out of inefficient lighting (Geels, 2005).

Market forces are not sufficient to achieve the rapid transformation needed in the lighting market to respond to the climate change challenge. Instead, a multi-stakeholder global partnership is required to support countries as they embark upon efficient lighting transformation programmes. Two of the biggest lighting manufacturers in the world, Philips and Osram have chosen to focus their efforts on transforming the lighting market in partnership with UNEP through its en.lighten initiative. The initiative addresses the challenge of accelerating global market transformation to environmentally sustainable lighting technologies by developing a global strategy in support of the gradual phase-out of inefficient lighting. This will reduce global GHGs from the lighting sector drastically (UNEP 2009).

With its unparalleled global network, UNEP can provide leadership by inspiring and enabling nations to prioritise efficient lighting and reap the benefits of lowered energy costs. Whereas activities aimed at phasing out inefficient technologies have been introduced in recent years in a number of countries, experience indicates that global coordination is required to assist countries as they embark upon efficient lighting transformation programmes. Support is necessary to provide countries with the required know-how to make the transition successful, both in terms of the economic gains and the associated reduction of GHG emissions. A number of countries and regions in the world have initiated successful steps in order to move to efficient lighting.

In 2009, the EU banned traditional incandescent bulbs of 100 watts or more, a decision that will save about 32 million tonnes of CO² a year. Together with energy efficiency regulations, the ban will save about €11 billion a year (US\$15.3 billion). In Australia, where the legislation of efficiency standards resulted in a ban on incandescent bulbs in 2008, more than 30 terawatt hours (TWh) of electricity and 28 million tonnes of GHG emissions were expected to be saved between 2008 and 2020 (Whitmarsh, 2008).

With the above activities as examples of what is possible, the UNEP en.lighten initiative has seized the opportunity to lead the engagement required with developing and emerging countries, governments and the private sector to achieve a global market transformation to efficient lighting (Bibbings, 2004).

In Kenya, initiatives by the Kenya Power and Lighting Company (KPLC) in partnership with Phillips Lighting distributed bulbs to replace the old energy inefficient ones with CFL's in 2009. This was an effort aimed at creating energy efficiency in homes which also contributes towards reducing greenhouse gas emissions.

Each and every one of us can do something to improve energy efficiency, not only by using compact fluorescent lights (CFL's) instead of traditional incandescent light bulbs but also by buying modern energy-efficient appliances and replacing the old ones. This will not only ensure energy efficiency but it will be a most effective measure to reduce emissions of greenhouse gases that contribute to climate change (World Watch Institute 2008).

Despite the above initiatives, there still exists a knowledge gap as to the benefit of efficient lighting technology. To most of the users, economic motives drive the switch to energy efficient bulbs. Very few people associate this with the impact it has on emissions responsible for climate change. This study therefore aims at establishing whether staff at MEMR use energy efficient lighting with the intention of reducing the effects of climate change or otherwise.

2.5 Renewable Energy

In Africa and the developing world in general, the rate of adoption of renewable energy sources is peeking although at a rather slow rate. Reliance on fossil fuels for energy and traditional energy generating methods continue to affect the rate at which clean energy can be used to curb the effects of climate change (Lanjouw and Mody 1996).

“Renewable energy is especially attractive as an emissions reduction strategy, as the majority of renewable energy options are zero emitting technologies. Wind energy, small-scale hydro, and waste-to-energy (biomass) facilities can be cost competitive with conventional electricity generation. Improvements in design, in-creases in efficiency and decreases in cost have caused an explosion in annual growth of many renewable technologies. There is large potential for developing countries to bypass the energy infrastructure needs of large centralized fossil-fuel-

fired electric generating plants by undergoing a technology leap to distributed renewable technologies” (Jones, 2002).

Renewable energy systems can contribute to protection of the environment and security of the energy supply, as they provide a diversified portfolio of energy supply using local resources. These and other benefits were defined in a political declaration by 154 nations at the Renewables 2004 conference held in Bonn, Germany. As a result, there has been increasing support for renewable energy deployment in developing countries, not only from international development and aid agencies, but also from large and small local financiers, with additional backing from donor governments and market facilitators to reduce their risks. As an example, total donor funding pledges in the Bonn Renewables 2004 Action Programme amounted to about \$50 billion (Sims, 2008, World Watch institute, 2004).

The Earth's radiation balance is being disturbed by increasing emissions of greenhouse gases into the atmosphere. The renewable sources of energy-directly or indirectly driven by solar radiation-will inevitably be affected. The energy sector is the largest single source of greenhouse gases, accounting for more than half of anthropogenic climate forcing through the enhanced greenhouse effect (Ahman 2006). Limiting atmospheric concentrations of carbon dioxide (CO²), the most important anthropogenic green-house gas, to present-day levels, will require at least 60% reduction in emissions (EIA, 2007). Preventing the anticipated changes in climate will likely require a transition in energy supply from CO₂-emitting fossil fuels to renewable energy sources. Considering the climate-sensitivity of renewable energy, and its vital role in reducing the risk of global warming, the question arises to what extent these resources can be utilized under present and future rates of climate change (Lundahi, 1995).

The Energy revolution scenario developed by Greenpeace in conjunction with more than 30 scientists and engineers worldwide envisions a transition from dirty, deadly energy, such as coal and nuclear, towards renewable energy. It will empower local communities to produce, monitor and profit from their own energy use and help supply energy to the 2 billion people around the world who have little or no access to reliable energy services. In the process it will radically reduce greenhouse gas emissions helping to avert climate chaos. (Ramdas, 2010)

Wind power provides a green, never-ending power supply (Wilkes, 2011). Wind is one of the world's most abundant energy resources, it does not emit harmful greenhouse gases, or other air pollutants, and it uses no water during operation. It can be scaled up relatively rapidly and start reducing carbon emissions with immediate effect. In Europe, wind power has made the shift into the mainstream. It is a proven technology and must be harnessed further if the region is to meet its carbon reduction targets (Waldau 2008).

Slowly and, in many cases, the world is waking up to climate change, but world leaders are yet to go the extra mile in GHG emissions reductions that could keep global warming in check. The failure by the USA and Australia to accede to the Kyoto Protocol so far serves as evidence of this. Recently in 2009, some developing nations namely China and India also exhibited resistance to commit to reduction of emissions in Copenhagen (Hascic et al. 2010).

Burning fossil fuels, the main source of GHG emissions, increases as a country's economy grows. However, imposing mandatory emissions limits on developing countries will be difficult because these countries face pressures to develop and modernize their economies and provide a higher standard of living for their citizens. Tension over this issue was evident during the December 2009 Copenhagen negotiations on a successor to the Kyoto Protocol, as China and many other developing countries remained unwilling to commit to binding emissions targets (Wilkes 2011).

From the above review on renewable energy, it is clear that more research needs to be carried out to address the problem of emissions from fossil fuels. Though there has been a current interest in the subject of renewable energy, little has been translated into actual and more so at the domestic level. Therefore, this study seeks to help fill this gap by exploring the willingness by individuals to switch from fossil fuel energy to renewable energy sources where it is available.

2.6 Conceptual Framework

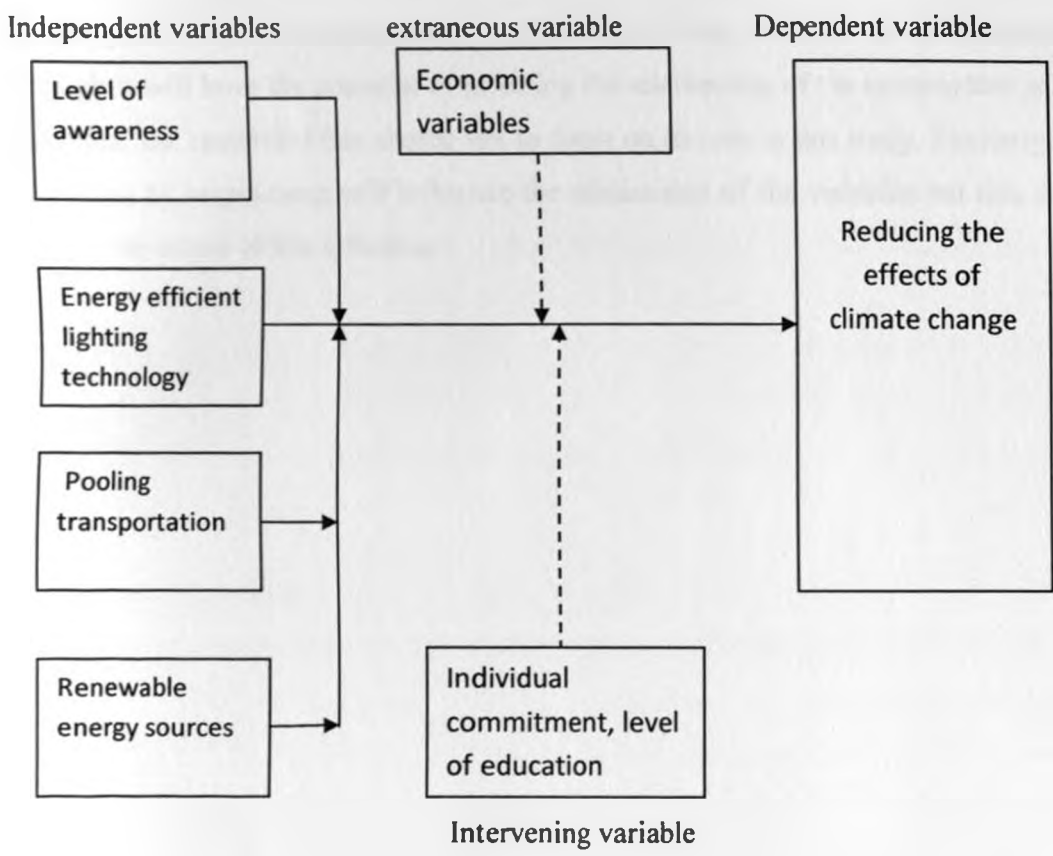


Figure 1: Conceptual framework

The diagram above depicts the relationship between the independent and dependent variables. The level of awareness about the extent of contribution by the respondent on climate change influences the measures taken for reduction of climate change effects. Similarly, the adoption of energy efficient lighting technology, the willingness to pool transport and to switch to renewable energy sources also contributes to the reduction of the effects of climate change.

In addition to the above variables, there will be an extraneous variable that may affect the relationship between the above variables and the reduction of emissions responsible for climate change. An intervening variable is a variable that might affect the relationship of the dependent and independent variables but it is difficult to measure or to see the nature of their influence

Economic variables such as level of income, inflation etc will most certainly influence the relationship. However, the study will not focus on its effect.

Similarly, the level of commitment by individuals has been identified as an intervening variable. Though it will have the potential of affecting the relationship of the independent and dependent variables, the researcher has chosen not to focus on its role in this study. Similarly, the level of education by respondents will influence the relationship of the variables but this study will not go into the extent of this influence.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, the target population, population size, data collecting instruments, reliability, validity and data analysis and operationalization of variables.

3.2 Research Design.

A survey design was applied in this study. Both qualitative and quantitative approaches were employed in the study. The survey sought to collect data for the purpose of establishing the measures being taken by staff at the ministry to reduce their contribution to climate change; it was also descriptive in nature. The tool of investigation used in the study was a questionnaire for collection of data. The questionnaire contained both open ended and closed questions which were analysed separately.

3.3 Target Population

The target population for this study was staff at the Ministry of Environment and Mineral Resources' headquarters at NHIF building Nairobi. The headquarters is housed on the 11th and 12th floors of NHIF building at Community Nairobi. The population was targeted for the study due to the major reason that it spans across the social and economic divide. The population was assumed to be as nearly as possible a representative of the general population hence the choice.

Other considerations that also informed the choice of this audience was access to information on climate change. In order to reduce bias on the research findings, it was important for the researcher to identify a population where the likelihood of the subjects having advanced knowledge above what is common generally on matters of climate change was minimal. This informed the choice of this population. The population is well versed with issues of the environment thus the researcher felt that the information collected would be reliable for purposes of this study.

The Ministry headquarters has a total population of 301 staff. There are departments all dealing with different distinct areas of the environment and mineral resources.

3.4 Sample and Sampling Procedure.

A simple random sampling technique was applied in this study. Initially, the population was divided in departments from which a sampling unit was drawn. A sampling unit was then drawn randomly and entirely by chance from each department, such that each subject stood the same probability (or chance) of being chosen at any stage during the sampling process.

Stratified sampling technique involves dividing your population into homogeneous subgroups and then taking a simple random sample in each subgroup. It falls under the random or probability sampling category. When surveys are being conducted, due to the population not being homogeneous, different problems are experienced in different parts of the population. To increase efficiency, it becomes important to treat homogenous parts of the population as populations in their own rights. Each homogenous part of the population is referred to as a stratum and simple random samples are taken from each stratum independently of each other. An unbiased random selection of subjects is important so that in the long run, the sample represents the population.

The research targeted a sample size of 30% from the population as per the recommendations of Mugenda and Mugenda (Mugenda 2003). The MEMR headquarters has a population of 301 staff. Thus a total of 90 staff was selected as the sample. This sample was derived from the different departments which are as shown below.

Table 3.1: Population and sample size

DEPARTMENT	TOTAL POPULATION	SAMPLE
Directorate of environment	90	27
Climate change secretariat	91	27
Minerals and geology	42	13
Human resource and administration	48	14
Finance	30	9
TOTAL	301	90

3.5 Research Instrument

The study employed the use of a questionnaire to collect data.

The questionnaire had both open ended and closed questions. The structure of the questionnaire was such that there was to be an organized flow of information relevant to the study.

The questionnaire was self administered where the respondents were left to complete the questionnaire themselves with minimum intervention of the researcher.

3.6. Reliability of the Research Instrument

Reliability can be defined as the extent to which a research instrument yields consistent results of data after repeated trials (Mugenda 2003). Where the results of a study can be reproduced under a similar methodology, the research instrument is considered reliable. The instrument was tested for reliability by being subjected to a test-retest technique to measure the consistency of the results obtained.

A reliability test was carried out at the department of the director of environment which is one of the departments in the ministry of Environment and Mineral Resources. A 10% sample was taken from the department for purposes of the test. Thus a sample of 9 staff members was used.

After the first test was administered, a one week period was allowed before the retesting was done.

A correlation of the results from both tests was then done to determine the extent of consistency resulting from the tests. A correlation coefficient of 0.9 was found indicating strong correlation of the results from the 2 sets of data and this was interpreted to mean the instrument was reliable.

3.7 Validity of the Research Instrument

(Mugenda, 2003) defines validity as the accuracy and meaningfulness of inferences which are based on the research results. It is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. Validity is a measure of the degree to which the results of the study can be generalized to the larger population. Both internal and external validity were considered in this study. Internal validity depends to a large extent on the degree to which extraneous variables have been controlled. In this study, the identified extraneous

variables were impossible to control and it was known that it would apply even in the entire population.

External validity refers to the extent to which research findings can be accurately generalized to the target population. If the sample and the target population are similar on salient features, then, generalization of the study findings can be made with confidence. This was targeted to be achieved by selecting the sample population by use of the random sampling technique (Mugenda 2003).

Before the actual data collecting exercise, a pilot study was conducted to test the instrument for validity and reliability. The pilot was conducted with a sample of 10% in the department of the directorate of environment. The aim of the pilot study was to detect any weaknesses in the instruments.

3.8 Data Collection Procedures

Since the questionnaire was being administered in the respondents' place of work, interference with official duty was taken into consideration. The researcher distributed the questionnaire during non-critical hours of business mainly during tea and lunch breaks. This ensured that the researcher did not interfere with the respondent's official work.

In addition, a drop and pick approach was applied. Respondents were given time to fill out the questionnaire and the researcher collected the completed form 2 days after distributing them. This helped minimize chances of the respondents rushing through the questionnaire and give them time to go through at their own pace. At the same time, having a longer period was likely to result to the questionnaires being misplaced or forgotten.

3.9 Data Analysis

Computerized statistical analysis was employed to tabulate the data gathered on each variable. The analysis and interpretation of the data was directly related to the objectives and research questions. The data was then analysed by use of computer packages specifically Statistical Programme for Social Sciences (SPSS) and the results interpreted.

The variables in this study all had a cause and effect relationship. Therefore, the researcher used correlation analysis to measure this cause-effect relationship between the variables. For instance,

an individual's level of awareness on climate change was likely to influence the measures he/she takes to reduce the effects of climate change. Similarly, the use of energy efficient lighting technology was likely to cause a reduction of emissions responsible for climate change. In the same way, the willingness to pool transportation is aimed at causing a reduction in vehicular emissions. This also applies to the willingness to adopt renewable energy sources to reduce the effects of climate change.

3.10 Operationalization of Variables

Table 3.2: Operationalization of Variables

OBJECTIVES	VARIABLES	INDICATORS	MEASUREMENT	DATA COLLECTION	DATA ANALYSIS
1.To establish whether individuals at the MEMR are aware of the extent of their contribution to climate change	The level of awareness of individual contribution to climate change.	The extent to which individuals understand and comprehend their contribution to climate change	Likert scale	Interview/ questionnaire	statistical analysis

<p>To establish weather staff at MEMR are utilizing Energy efficient lighting technology and its contribution to the reduction of the effects of climate change.</p>	<p>Energy efficient lighting technology</p>	<p>The level of conscious utilization of energy efficient lighting as a way of reducing the effects of climate change.</p>	<p>Ordinal scale</p>	<p>questionnaire</p>	<p>statistical analysis</p>
<p>To assess the extent to which individuals using motorized transportation at MEMR are willing to pool transportation</p>	<p>Pooling of transportation.</p>	<p>The number of people willing to pool transport as a way of reducing their contribution to climate change.</p>	<p>Ordinal scale</p>	<p>Questionnaire</p>	<p>Descriptive analysis</p>
<p>To determine the willingness by</p>	<p>Renewable energy sources.</p>	<p>Utilization of renewable energy from</p>	<p>ratio scale</p>	<p>Questionnaire</p>	<p>Statistical analysis</p>

individuals to switch to renewable energy sources		energy from fossil fuels.			
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3.11 Summary

After data collection and analysis, interpretations and conclusions were drawn from the findings. Suggestions towards addressing the problem were made for application. Also the shortcomings of the study were identified from the objectives set at the beginning of the study. This study is to be made available for academic purposes and for further research in the area. Since the research of this study is not entirely broad on the area of climate change, more research needs to be carried out to address the areas that the study has not explored.

3.12 Ethical Considerations

The respondents were assured of confidentiality of the information prior to the collection of data.

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.0 Introduction

The study was descriptive in nature. It was carried out on a randomly selected sample of 90 employees from the Ministry of Environment and Mineral Resources headquarters located at the NHIF Building, 11th and 12th floor in Nairobi. The data collection instrument employed in the study was a designed questionnaire comprising of five parts: Demographic information encompassing three items, gender, education level and the age while section two comprised of six questions seeking “To establish whether staff at MEMR were aware of the extent of their contribution to climate change.” Part three contained four questions destined to explore the third research objective “To assess the willingness by staff at MEMR to pool transportation as a measure to minimize the effects of vehicular emissions which contribute to climate change.” The fourth part also had four questions meant to address the fourth research objective “To investigate the utilization of efficient lighting energy as a measure towards the reduction of the contribution to the problem of climate change” while part five contained five items in regard to the fourth objective “To establish the extent to which MEMR staff are willing to switch to renewable energy as a means of reducing their contribution to the problem of climate change.”

The questionnaire contained structured questions and one open ended question. Validation of the instrument was carried out through expert feedback of the supervisor. It was in light of the experts’ opinion that the instrument was administered at a large scale through personal visits. In addition, a pilot study was conducted at the ministry in a bid to test the adequacy of the instrument for purposes of the study.

The data was analyzed using Statistical Package for Social Sciences (SPSS) Version 12.0. The data was presented using simple frequency distribution tables and percentages on item wise responses. Correlation analysis was also used on selected variables in the study.

The data presentation layout is in APA format.

4.1 Response rate

Out of the 90 questionnaires administered, the analysis revealed that the overall response rate was 87 % representing 78 members of staff who responded to questionnaire.

4.2 Gender response rate

The first part of the instrument contained the demographic information, and the study revealed that of the overall 87% response rate the gender parity was sufficiently represented with 59% males and 41% females respectively as illustrated by the table 4.1 below.

Table 4.1: Gender response rate

	Frequency	Percent	Cumulative Percent
Male	46	59.0	
Female	32	41.0	59.0
Total	78	100	100.0

4.2.1 Gender and the Education level cross tabulation

Table 4.2 below shows that of the five levels of education options, majority of the respondents were Bachelors degree holders at 37% followed by Diploma holders at 31% while Secondary school and master's level represented 20% and 12% respectively.

Further, in regard to education level against gender, the analysis revealed that 39% of the male respondents were holders of Bachelors Degree and 35% constituted Diploma holders while secondary and Master's level represented 17% and 9% respectively.

Table 4.2: Gender and the Education level cross tabulation

			Level of education				Total
			Secondary school	Diploma	Bachelors	Masters	
Gender	Male	Count	8	16	18	4	46
		% within Gender	17	35	39	9	100
	Female	Count	8	8	11	5	32
		% within Gender	25	25	34	16	100
Total	Count		16	24	29	9	78
	% within Gender		21	31	37	12	100

Within the female respondents it was observed that the holders of the Bachelors Degree level were the majority at 34% with diploma holders and the secondary school level indicating 25% each while master's level represented 16%.

Between the groups it was established that males slightly dominated in the Bachelors level at 39% against 34% females while in the Diploma level also the males emerged the majority at 35% as compared to 25% females. In the category of Masters and Secondary levels females tended to do better than males at 16% and 25% against 5% and 17% respectively.

4.2.2 Age of the respondents

The analysis revealed that the majority of the respondents were aged between 27-34 years representing 38% with 35% being in the age bracket of 18-26 years. The age group of 35-42 years represented 19% while the age bracket of 43-50 and 50 and above accounted for 5% and 3% respectively as illustrated by the table 4.3 below.

Table 4.3: Age of respondents

	Frequency	Percent	Cumulative Percent
18-26	27	35	
27-34	30	38	35
35-42	15	19	73
43-50	4	5	92
50+	2	3	97
Total	78	100	100

4.3 Awareness about the problem of climate change

The second objective of the survey contained questions designed to find out whether the respondents were aware of the problem of climate change. This section also sought to establish the level of awareness of the problem. Further the study sought to establish the channels through which the awareness was created. In this section, the researcher went further to establish the extent to which respondents agreed with the statement that climate change is being aggravated by human activity. In the same line, the respondents were requested to

indicate the extent to which they agreed to the importance of having the knowledge about their contribution to the problem of climate change. Further, respondents were asked whether they knew how they contribute to the problem of climate change and if so, the measures they could take to reduce their contribution to the problem.

One of the key concerns of the study was to investigate the general awareness of the problem of climate change. The study revealed that a significant proportion of the respondents were aware accounting for 91% of the total participants with only 9% indicating that they were not aware as illustrated in table 4.4 below.

Table 4.4: Awareness on the problem of climate change

	Frequency	Percent	Cumulative Percent
Yes	71	91	
No	7	9	91
Total	78	100	100

The results could be generalized to construe that the majority of the people living in Nairobi city where the representative sample for the survey was selected are aware of the problem of climate change.

4.3.1: The relationship between level of awareness about the climate change and level of education.

The researcher sought to find out the relationship between the level of awareness and education level. A cross tabulation of these 2 variables was done and the results were as presented in table 4.5 below.

Table 4.5: The relationship between level of awareness about the climate change and level of education.

Cross tabulation of level of awareness and level of education						
		Level of education				Total
		Secondary school	Diploma	Bachelors	Masters	
Very High	Count	0	3	6	2	11
		0%	27%	55%	18%	100%
High	Count	1	1	7	6	15
		7%	7%	46%	40%	100%
Moderate	Count	3	13	14	0	30
		10%	43%	47%	0%	100%
Low	Count	6	5	1	1	13
		46%	38%	8%	8%	100%
Very low	Count	6	2	1	0	9
		67%	22%	11%	0%	100%
Total	Count	16	24	29	9	78
		20%	31%	37%	12%	100%

From table 4.5 above, the study findings indicate that the higher the level of education, the higher the level of awareness. A combined proportion of 73% of the respondents who indicated that their level of awareness was very high were from the Bachelors and Masters level of education at 55% and 18% respectively while Diploma level accounted for 27%. Secondary level did not register any responses.

The same trend was observed with respondents who were of the Bachelors and Masters Level representing 46% and 40% respectively indicating that their level of awareness was high while 14% were from the Diploma and Secondary levels combined.

Respondents who indicated that their level of awareness was low emerged from the secondary level at 46% and Diploma level at 38%, with a combined 16% from both Bachelors and Masters indicating that their level of awareness was low.

The respondents who indicated that their level of awareness was very low were 67% from Secondary level followed by Diploma level at 22% while Bachelors were at 11%.

4.3.2: The relationship between level of education, awareness and gender.

The study sought to find out whether any relationship existed between the level of education, level of awareness and gender.

Table 4.6 below depicts the relationship between the three variables; level of education, level of awareness in climate change and gender. The analysis revealed that there was a statistically significant relationship between the level of education and climate change awareness, $r=0.6$, $p<0.005$ which was also revealed in table 4.5. Further the study showed that there was no relationship between the level of education and the gender, $r=0.008$, $p>0.005$ and also the level of awareness and the gender, $r=0.01$, $p>0.005$.

Table 4.6: Intercorrelation between the level of education, awareness and gender

		Level of education	level of awareness	of Gender
Level of education	Pearson Correlation	1	0.6**	0.008
	Sig. (2-tailed)	.	0.000	0.946
	N	78	78	78
level of awareness	Pearson Correlation	0.6**	1	0.010
	Sig. (2-tailed)	0.00	.	0.929
	N	78	78	78
Gender	Pearson Correlation	0.008	0.010	1
	Sig. (2-tailed)	0.946	0.929	.
	N	78	78	78

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

4.3.3 Mode of first learning about the climate change.

The study sought to find out how respondents first learnt about climate change. Among the different modes given, some prominently dominated as indicated in table 4.7 below.

Table 4.7: Mode of learning about climate change

Mode	Frequency	Percent	Cumulative Percent
Print media	16	21	
Electronic media	28	36	21
Internet	5	6	56
School	13	17	63
Print/Electronic media	7	9	79
Print media/Internet	3	4	88
Print/Electronic media/Government papers	1	1	92
Print/Electronic media/Internet	3	4	94
All the mentioned modes	1	1	97
Never heard	1	1	99
Total	78	100	100

Electronic media was the most cited mode in learning about climate change by 36% of the respondents followed by the print media at 21% while school accounted for 17% and internet having 6%. On combination of the modes print and electronic media were rated by 9%, while print media and internet accounted for 4%. The combination of print, electronic media and internet accounted for 4% also. Other modes contributed to only 3% with only 1% citing never having heard of the problem of climate change from any of the modes.

It would be argued that the high frequency observed with the respondents towards print and electronic media was as a result of the ease of accessibility as would be compared with the Government policy papers. The contribution made by school would be due to the fact that more importance is being laid on educating people on the global problem of climate change. The internet performed rather poorly and this could be associated with its inadequate

provision in the Government offices and also coupled with exorbitant cost in accessing privately.

4.3.4: whether climate change is aggravated by human activity

The study sought to establish how the respondents agreed with the statement that climate change is aggravated by human activities. Table 4.8 below displays the results.

A majority of respondents strongly agreed with the statement at 50% and those that agreed were 44% of the respondents while there were only 6% disagreeing with the statement. There were no respondents who said that they don't agree or strongly disagreed. The results compare favorably with those of the awareness about the problem of the climate change.

Table 4.8: Climate change is aggravated by human activity

	Frequency	Percent	Cumulative Percent
Strongly agree	39	50	
Agree	34	44	50
Disagree	5	6	94
Total	78	100	100

4.3.5: Relationship between the value attached to knowing personal contribution to climate change and knowledge on how they contribute

The study sought to find out the value of knowing personal contribution to climate change and the knowledge of how they contribute. A cross tabulation was carried out and results depicted in table 4.9 below.

Table 4.9: Relationship between knowledge and how one contributes to climate change

		Importance of knowledge on contribution to climate change			Total	
		Strongly agree	Agree	Moderately agree		
Knowledge of contribution to climate change	Yes	Count	41	8	1	50 (64%)
			82%	16%	2%	100%
	No	Count	10	9	9	28 (36%)
			36%	32%	32%	100%
Total		Count	51	17	10	78
			65%	22%	13%	100%

The findings show that 65% of the respondents strongly agreed that it was important to be informed on individual's contribution to climate change while 22% and 13% indicating that they agreed and moderately agreed respectively. There were no respondents who cited they didn't know or strongly disagreed. This high level of agreement observed is associated with the significant level of awareness that was found with the respondents associated with advanced level of education.

Further the study sought to establish whether the respondents were conversant with how they could be contributing to the problem of climate change. The analysis revealed that the majority of respondents at 64% were knowledgeable on how they could be contributing to climate change with 36% citing that they didn't know. This positive acknowledgement towards the knowledge of individual contribution to climate change is also due to the high level of awareness.

The study results indicated that of the 51 respondents who strongly agreed that it was important to know about individual contribution to the climate change 82% indicated that they already knew on how they could be contributing to the problem. Similarly, 36% although citing to strongly agree with the importance, said they did not know how they could be

contributing to the problem of climate change. Out of the 17 respondents who agreed with the question showed that there was no awareness towards their contribution to climate change.

4.3.6: Relationship between knowledge of individual contribution to climate change and measures they can take to reduce the effects of climate change.

The respondents who indicated that they knew how they contributed to climate change were requested to say whether they were aware of the measures they could adopt in order to reduce their contribution to the problem. Of the 50 respondents who indicated that they knew how they contributed, 82% said that they knew of the measures to take in mitigating their contribution to climate change while 16% were not aware to the measures to take in reduction of their contribution to the climate change. Table 4.10 below illustrates.

Table 4.10 cross tabulation between knowledge of contribution to climate change and measures for reducing the contribution to climate change.

Table 4.10: Knowledge of contribution to climate change

				Yes	No	N/A	Total
Knowledge of contribution to climate change							
Yes	Count	41	82	8	16	2	50 (64%)
				1	1	26	28 (36%)
No	Count	1	4	1	4	93	100%
				42	9	27	78
Total		Count	54	12	35	100%	

The notable knowledge with the majority of the respondents on the associated measures to reduce their contribution is as result of the high level of awareness.

4.4. Motorized transport

Public transport emerged the most preferred mode by 63% of the respondents while private mode came second in preference at 26%. Another mode of transport which has emerged very fast, motorcycling, commonly known as “*Boda Boda*” attracted only 5% of the respondents together with cycling respectively while walking was highly insignificantly rated. Table 4.11 below indicates.

Table 4.11: Preferred mode of transport

	Frequency	Percent	Cumulative Percent
Public	49	63	
Private	20	26	63
Motorcycle	4	5	89
Bicycle	4	5	94
Walk	1	1	99
Total	78	100	100

The reasons attributable to the majority preferring public transport though it is categorized as a notable contributor to greenhouse gas emissions, is that within the city it is the only readily available and affordable mode therefore leaving many with no alternative regardless of their awareness of the climate change. Private mode preference is associated with economic wellbeing and therefore a preserve for the few.

Motorcycling also contributes to the greenhouse gas emissions but it is available, quick and cheaper. However, its adverse effects mainly accidents and other related health issues demean its viability leading to the low level of preference.

In addition, infrastructure design especially roads has not been done with cycling in mind. This not only makes cycling dangerous but also inconvenient as the lack of designated lanes and parking contributes to its low preference. In addition, this mode is mostly associated with the low income group and very few people who drive would give up driving for riding as driving has been conceived to epitomize high social standing and is considered prestigious.

However, if embraced, cycling could lead to a massive reduction in emissions especially from motorized transport.

4.4.1: Relationship between the mode of transport and reasons for preference

The respondents were requested to articulate the reasons for preference of the mode of transport used. The results are illustrated in table 4.12 below.

Table 4.12: Mode of transport and reason for preference

What mode of transport do you use often	Why do you prefer the chosen mode of transport					Total
	Affordability	Convenience	To curb emissions	Affordability/Convenience		
Public	Count	41	1	1	6	49
		84%	2%	2%	12%	100%
Private	Count	1	13	1	5	20
		5%	65%	5%	25%	100%
Motorcycle	Count	4	0	0	0	4
		100%	0	0	0	100%
Bicycle	Count	4	0	0	0	4
		100%	0	0	0	100%
Walk	Count	1	0	0	0	1
		100%	0	0	0	100%
	Count	51	14	2	11	78
Total		65%	18%	3%	14%	100%

41 out of the 49 representing 84% of the respondents who chose public transport as their preferred mode gave the reason as affordability while 12% were due to affordability coupled with convenience. Convenience and curbing of emissions registered 2% each. Out of the 20 respondents who use private means, a majority at 65% cited convenience as their reason for utilizing the private means while 5% indicated both affordability and convenience. On this option also, the reasons affordability and curbing emissions accounted for 5% each. Those respondents who suggested motorcycling and cycling modes was as a result of the

affordability. The results imply that the respondents do not tie the issue of climate change to the means of transport being utilized.

4.4.2: Relationship between preferred mode of transport and the willingness to pool transport.

The study further sought to establish the relationship between the preferred mode of transport and the will to pool transport.

Table 4.13 below shows that of the 20 respondents who indicated that their mode of transport was private, 75% were willing to pool transport for the reasons of mitigating their contribution towards climate change while partly 20% were not willing to pool and 5% did not answer the comment.

Table 4.13: Preferred mode of transport and the willingness to pool transport

Mode		If your preferred mode is private would you be willing to pool transport			Total
		Yes	No	Not applicable	
Private	Count	15	4	1	20
		75%	20%	5%	100%

4.4.3: willingness to pool transport and the preferred method of pooling transportation

The researcher wanted to find out whether those using private means were willing to pool transport and if so, how they would achieve this. A cross tabulation between the willingness and the method of pooling was done and the results are as displayed in table 4.14 below.

Table 4.14: Preferred means of pooling transportation

		If your answer is yes how would you prefer to pool transportation			Total
willingness to pool transport		Ensuring full passenger capacity utilization the car	By using public/shared transport	Not applicable	
Yes	Count	9	9	2	20
		45%	45%	10%	100%

Out of the 20 respondents who indicated that their preferred mode of was personal/private, 45% preferred to pool transportation through full passenger capacity utilization and a further 45% indicated using public/shared transport while 10% were non committal. The suggested two measures would ensure minimal number of vehicles on the roads hence reduced volume of emissions responsible to causing climate change.

It was however noted that, though there was willingness to used pooled transport, the actualization of this practice was nonexistent. The major reason given for not pooling transport was mainly the unreliability of public transport. The absence of an organized and reliable public transport prevents people from opting for public transport in place of private means. Most respondents in this category cited the fact that the available public transport system is not dependable thus the continued use of private cars.

In addition, different schedules for people likely to pool transport are a hindrance to the practice. Since people would like to arrive at the destinations at different times, it becomes a challenge to share vehicles. This coupled with the fact that private motorists have other duties to fulfill like taking children to school and shopping creates a challenge for pooling transport.

Different destinations for people willing to pool transport are another challenge that prevents pooled transport from being adopted.

4.5 Efficient lighting technology.

The study also sought to investigate the kind of lighting technology respondents used in their residences. Lighting has been known to be a major contributor of emissions responsible for climate change. Table 4.15 below represents the kinds of lighting used by the respondents.

Table 4.15: Sources of lighting in the place of residence

	Frequency	Percent	Cumulative Percent
Ordinary bulbs	13	17	
Fluorescent tube	11	14	17
Energy saving bulb	40	51	31
Kerosene lamps	4	5	82
Ordinary bulb/Energy saving bulb	5	6	87
Fluorescent tube/Energy saving bulb	5	6	93
Total	78	100	100

The respondents were required to give the source of lighting in their places of residence. Analysis as shown in the table 4.15 above indicates that a majority of the respondents at 51%, utilized energy saving bulbs for lighting their residential premises while 17% accounted for those respondents who draw lighting energy from ordinary bulbs with 14% quoting fluorescent bulbs as their source of lighting energy.

Further it was revealed that some of the respondents use multiple sources of lighting energy with 6% citing a combination of ordinary and energy saving bulbs as their source and a similar proportion indication the combination of fluorescent tube and energy saving bulbs. A proportionate 5% cited using kerosene for lighting their residences.

Table 4.16: Reasons for using energy saving bulbs

If your answer is energy saving bulb why use it							Total
Energy source	Save cost/environment	Save cost/Free bulbs	Save environment/Free bulbs	Save cost	Save environment	Free bulbs	
Energy saving bulb	17	10	2	5	3	3	40
	43%	25%	5%	13%	8%	8%	100%

Table 4.16 above shows the reasons provided for using energy saving bulbs. A majority 43% of the respondents cited the combination of saving on cost of energy bills and saving the environment from emissions while 25% cited a combination of saving cost coupled with the fact that the bulbs were supplied freely by the Kenya Power Company. A further 5% indicated availability of free bulbs as well as saving the environment as their reason for utilizing energy savers. Responses accounting for 13% gave the reason of saving the cost as the sole reason for utilizing the energy saving bulbs. Those who use energy saving bulbs solely to save the environment and because free bulbs were provided accounted for 8% for each case. From the analysis it can be deduced that the three provided reasons were equally the major themes for using the energy saving bulbs since no other responses were provided despite the researcher giving the option to indicate any other reasons. Saving cost came out as the single most popular reason for using energy saving bulbs.

4.5.1: Number of the light bulbs in the residential premises

It is assumed that the higher the number of the bulbs in the premises, the higher the contribution of emissions responsible for climate change. In regard to this the respondents were asked to indicate the numbers bulbs installed in their premises. The study revealed that the number of bulbs were almost evenly distributed with the highest of the respondents at 36% saying to had four bulbs followed with those who said they possess five and above at 23% while those with three stood at 21% and 14% putting it on approximately average of two bulbs in the premises.

Table 4.17: Number of light bulbs

	Frequency	Percent	Cumulative Percent
One	1	1	
Two	11	14	1
Three	16	21	15
Four	28	36	36
Five& above	18	23	72
Don't have	4	5	95
Total	78	100	100

4.5.2: The number of hours in a day bulbs keep working.

Further the study sought to establish the number of hours the bulbs are kept working in the house per day. It is argued that the higher the number of hours bulbs are on, the higher the effect of emissions. In identifying whether the respondents were aware of this assertion, they were requested to indicate the number of hours they keep the bulbs burning.

The study revealed that 64% of the respondents kept bulbs working between 3 and 4 hours and 18% represented those who kept bulbs working in the range of 6 to 9 hours while those who maintain 1 and 2 hours accounted for 12%. A minimal 1% indicated keeping bulbs on the whole day while 5% did not respond to the question. These statistics indicate that majority of the respondents considerably scale down the number of hours bulbs are kept working. The contributing factor to this revelation would be associated with the effort to minimize the cost associated with long hours of usage. Conserving the environment comes in as a secondary reason for minimizing the number of hours of lighting.

Table 4.18: Number of hours lights are on per day

Hours	Frequency	Percent	Cumulative Percent
1-2	9	12	
3-5	50	64	12
6-9	14	18	76
Whole day	1	1	94
Not applicable	4	5	95
Total	78	100	100

4.6. Renewable energy.

Renewable energy refers to energy generated from sources that are non-exhaustible and are considered clean sources due to the minimal or nil production of emissions responsible for climate change. In line with this, the respondents were asked to show their level of understanding of the term “renewable energy”

Table 4.19: The level of understanding of the term ‘renewable energy’.

	Frequency	Percent	Cumulative Percent
Very high	8	10	
High	18	23	10
Moderate	28	36	33
Low	15	19	69
Very low	9	12	88
Total	78	100	100

The analysis on the table 4.19 above indicate that of the respondents, 36% posses moderate understanding of the term renewable energy. Those responding to as having a high level of understanding represented 23% of all responses. Similarly, 10% of respondents indicated a very high level of understanding with the term. Low and very low registered 19% and 12% respectively. The aggregate of the respondents at 69% falling within the moderate level of understanding to very high understanding reveals that the term renewable energy is quite well understood.

4.6.1 Usage of any other type of energy source apart from electricity.

To gauge whether the respondents use the renewable sources of energy they were first asked to indicate whether they used any other source of energy apart from electricity and the responses were as displayed in table 4.20 below.

Table 4.20: Utilization of alternative sources of energy

	Frequency	Percent	Cumulative Percent
Yes	36	46	
No	37	47	46
N/A	5	6	94
Total	78	100	100

From the table, it was revealed that almost a similar proportion of the respondents at 46% agreed to using other types of energy source apart from electricity while 47% said they do not use any other source. A further 7% of the respondents were not legible since there was no electricity in their premises.

4.6.2: Source of energy used apart from electricity.

Of the 78 respondents 54% indicated that did not make use of any other source of energy apart from electricity. 46% of the respondents indicated that they adopted other sources of energy split into eight different sources. Liquefied petroleum gas (LPG) was the main source of energy apart from electricity used by the majority at 17%. Solar energy was the second rated at 9% of the respondents while Bio-gas was the alternative source with 8%. Kerosene/charcoal attracted 4% of the respondents. Wind energy, Kerosene and a combination of LPG and charcoal accounted for 3% of the respondents each.

Table 4.21: Alternative sources of energy used

	Frequency	Percent	Cumulative Percent
Bio-gas	6	8	
Wind energy	2	3	8
Solar energy	7	9	10
Car battery	1	1	19
Kerosene	2	3	21
LPG	13	17	23
LPG/Charcoal	2	3	40
None	42	54	42
Kerosene/Charcoal	3	4	96
Total	78	100	100

4.6.3: Willingness to switch from hydro-electric to renewable energy sources

The respondents who were affirmative that they would be willing to switch from utilizing hydro-electricity that contributes to emissions responsible for climate change to using renewable energy sources stood at 85% while only 14% were negative which could be attributed to those who had indicated as having a low level of understanding of the term renewable energy. The proportion of respondents who indicated that they did not know stood at 1%.

Table 4.22: Willingness to switch from hydro electricity to renewable energy.

	Frequency	Percent	Cumulative Percent
Yes	66	85	
No	11	14	85
Don't know	1	1	99
Total	78	100	100

4.6.4: Renewable energy contributes to reduction of emissions responsible for climate change.

Table 4.23: Level of agreement to whether renewable energy reduces climate change

	Frequency	Percent	Cumulative Percent
Strongly agree	33	42	
Agree	34	44	42
Disagree	2	3	6
Don't know	9	12	88
Total	78	100	100

The respondents were asked to show their level of agreement on whether utilizing renewable energy contributes to reduction of emissions responsible for climate change. The study revealed that 86% of the respondents both agreed and strongly agreed with the statement. This can be attributed to the earlier results that indicated a high understanding of the term renewable energy while 12% and 3% said they did not know and disagreed respectively.

4.6.5: Other measures adopted to reduce contribution to climate change.

Table 4.24: Measures taken to curb climate change

	Frequency	Percent	Cumulative Percent
Plant trees	29	37	
Eco- friendly appliances	12	15	37
Recycle of pollutant items	11	14	53
No comment	26	33	67
Total	78	100	100

The respondents were required to indicate any other measures that they were adopting to reduce individual contribution to climate change. While 33% did not give any comment, 37%

said that they were planting more trees. On the same, 15% of the respondents said that they were maximizing their efforts by utilizing Eco-friendly and energy efficient appliances with 14% indicating that they were re-using and recycling bio-degradable materials. This was demonstrated by examples that they re-use polythene bags and plastic items more than once while making sure that they dispose them responsibly.

CHAPTER FIVE: SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

5.1 Introduction.

The study sets out to investigate the level of awareness into the problem of climate change and the measures being taken to reduce the effects of climate change by staff at the Ministry of Environment and Mineral Resources headquarters in Nairobi. To this end, the study sought to establish the level of awareness, utilization of efficient lighting technology, motorized transportation and the utilization of renewable energy.

The problem of climate change is globally receiving attention more than ever before. The impact of this problem is being felt at all levels of human activity and more so the agricultural sectors. The threat of food security due to the inability of both small and large scale farmers to plan their seasons is in itself a threat to human existence.

The problem has gone further to spell an extinction of both plants and animals and the planet at large.

The limitations in the study have been identified and they will be used to make recommendations for further research in the area.

5.2 Summary of Findings

5.2.1 Level of awareness

The magnitude of the problem seems to be well appreciated with the study revealing that the level of awareness is quite high. Out of the 78 respondents, 71 indicated that they were aware of the problem which represented 91% of the sample with 7 respondents representing 9% indicating that they were not aware of the problem. From the results of the study, it was established that the level of awareness was positively correlated with the level of education. Of the respondents who indicated that they had a low level of awareness, 46% came from the secondary level while 38% were from the diploma level and 16% from both bachelors and masters degree holders.

The study further established that there is no correlation between the level of awareness and gender.

The study further revealed that electronic and print media are the leading sources of first time information about the problem of climate change. Dissemination of climate change through education is also significant indicating the growing importance of the subject in academic circles. The internet is a distant fourth with only 6% of the respondents saying they learnt first about climate change from the web.

5.2.2 Motorized transport

The study's objective of establishing the mode of transportation preferred by the respondents was also investigated. Results of the study indicated that the most preferred mode was public transport followed by private means, motorcycle, bicycles and walking in that order.

The study findings revealed that affordability came in first among the reasons given for preference on the mode of transport used. This can be construed to tally with the fact that a majority of the respondents are in the low and middle class income bracket who cannot afford to own private cars. These results can be generalized to the greater population.

Convenience came in second followed by a combination of convenience and affordability. Curbing emissions emerged the least popular reason for choosing any mode. Though the emissions from motorized transport is a major contributor to climate change, very few people have taken the initiative to minimize this emissions by limiting or utilizing modes of transport that minimize emissions like cycling and walking.

However, most people who use private transport are willing to use pool transportation in order to curb the effects of climate change. If embraced and made practical, this measure could result in not only saving the environment but also economic saving as people will be sharing on fuel and maximum capacity utilization of vehicles.

5.2.3: Energy efficient lighting technology

On the utilization of energy efficient lighting technology, results of the study revealed that majority of the respondents cited using energy saving bulbs. The second most used were ordinary bulbs followed by fluorescent tubes. Those who used a combination of ordinary bulbs and fluorescent tube together with energy saving bulbs came in third while as kerosene lamps were cited as least used.

The study further revealed that, among those who used energy saving bulbs, a majority cited saving cost and the environment as the major reason for utilizing the bulbs. Provision of free bulbs by the Kenya Power Company coupled with saving cost came up as a popular reason for using the energy savers.

It is clear from these results that cost considerations are the most likely reason why respondents adopt energy saving bulbs. Though the end result is saving the environment, it is clear that a majority of those using these bulbs do so without any conscious or deliberate consideration for the environment.

5.2.4: Renewable energy

On the issue of renewable energy, the study revealed that a majority of the respondents are aware of the term renewable energy.

The study also indicated that respondents utilize other sources of energy apart from electricity. The use of liquefied petroleum gas (LPG) is evidently the mostly used alternative to electricity followed by solar and bio gas. A significantly huge proportion of the respondents however, used none of the options provided indicating that though there might be availability, a huge proportion of the population depends largely on electricity for their energy needs. This high dependence on electricity is in conflict with efforts to reduce individual contribution to climate change. A majority of the respondents however indicated their willingness to switch to the use of alternative energy sources to reduce their contribution to the effects of climate change.

The study also found out that tree planting was the most practiced method of combating climate change by respondents. This was followed by utilization of eco-friendly appliances and recycling of materials.

5.3 Discussion

It is clear that the problem of climate change is well understood. The high level of awareness is proof enough that an increasingly large number of people are becoming conscious of this problem. The first objective of the study was to establish the level of awareness about the problem of climate change and up to this end; the study established that the respondents are aware though at varying degrees.

The second objective of the study was to establish the utilization of motorized transport. The researcher found out that a majority of the respondents at over 89% used both public and private means. Those who used public means mainly cited affordability as the reason for preferring this means. However, those who used private means quoted reliability and convenience. The public transport system is not properly organized within the study area and more so in Kenya in general. This explains why people using private transport would desist from switching to public means.

Secondly, public transport is considered a preserve for the poor and the common man. Therefore, those who can afford to use private means would not easily want to be associated with this other lower class of people.

Moreover, the public transport system though economical is not organized in terms of planning of drop off and picking up points. Most people who work in the areas surrounding the study area are often forced to use more than one vehicle to get to their places of work. Alternatively, some are forced to walk long distances to make it to the offices, making public transport unattractive to those using private means.

In this area also, the continued improvement of the technology in motor vehicles to ensure low levels of emissions is yet another reason why people using private means of transport would not want to pool transportation.

The study findings also revealed that the willingness to pool transportation is more informed by convenience rather by the need to cut emissions. The fact that most private motorists are aware of the effect of continued use of this mode, most are not willing to pool since it may be construed to mean loss of status and social standing as public transport is associated with the lower class of the population, as earlier mentioned.

The issue of climate change has become so crucial and awareness should be integrated into the education systems from the lowest level upwards. To enhance the knowledge of the effects and mitigation measures for climate change, it would be critical to integrate this into the education systems at all levels.

The use of alternative sources of energy should also be promoted. The utilization of renewable sources of energy e.g. solar and wind energy should be embraced by all in both rural and urban areas. This will not only ensure the preservation of the depletable resources but also conservation of the environment, creating a future for the planet. If people are made more conscious of the importance and benefits of switching to clean energy, the problem of climate change will be half solved.

The utilization of energy efficient appliances should be encouraged, not just as a way of reducing cost but also as a means of conserving the environment. From this study, it is evident that the motivation behind the use of energy saving bulbs for lighting is to save on cost. In fact, a large number of respondents cited their continued use was because the bulbs were provided free of charge by the Kenya Power Company. One of the main reasons for promoting energy saving bulbs is to reduce on emissions responsible for climate change. This should be clearly communicated to encourage the use of these bulbs and other appliances with similar benefits.

A majority of respondents cited planting of trees as the most popular way of curbing climate change. Indeed, this is a leading way of tackling this problem but trees alone cannot provide the total solution to climate change. People need to come up and be open to other ways of reducing their contribution to climate change. Though most are willing to plant trees, they are faced with the challenge of not having the land in which to actualize this wish. A majority of city dwellers live in rented residences with no spare land for planting trees. Property developers on the other hand use up any available space to put up buildings in an effort to maximize their profits. This challenge among others should make people think outside the box and come up with alternative ways of curbing the problem of climate change.

From the study findings, respondents are in agreement that the problem of climate change is brought about by human activities. Therefore, to reduce the negative effects of climate change, people need to change the way in which they engage in activities that result in climate change. If the battle for a clean and sustainable environment is to be won, people have to embrace environmentally friendly means of survival. This will be achieved by embracing changes in the way we produce goods and services and our lifestyles in general.

The attention given to global climatic change by leaders world-wide and organisations needs to be actualized from mere talk to action. The frequent summits, talks and conferences need to come up and be committed to supporting real action plans that will have long term and practical impacts on our environment.

If individuals are personally committed to do at least one thing that would contribute towards the improvement of the environment, the magnitude of this problem will eventually be manageable. The late Nobel prize winner Professor Wangari Maathai did her 'small thing' of planting trees, it is now our turn to do our 'small thing' to make a difference.

5.4 Conclusions

Climate change and its effects is a reality that can no longer be ignored. In the recent past, we have seen the world recognize the magnitude of this problem and measures towards the reduction of the effects of climate change have been suggested some of which have been adopted. Governments all over the world have come to accept the importance of curbing the effects of climate change and most, if not all have even passed legislation that will help in the recognition and prioritization of this issue.

This is a most serious issue and a major challenge for the international community. The Kyoto protocol of the United Nations Framework Convention on Climate Change (UNFCCC) of 1997 was negotiated with the aim of making developed countries commit to targets set to reduce their carbon emissions into the atmosphere by 2012.

The recently concluded climate change talks in Durban, South Africa, however cast a shadow on this commitment as most rich countries declined to renew their commitment to the targets of the protocol. The U.S, the biggest emitter of greenhouse gases had not ratified the protocol.

Although there seems to be a general lack of political will to support this cause, individuals can make a difference by making adjustments in the way they live and this will go a long way in reducing the effects of climate change globally. From this study, it is clear that a majority of people are aware of the magnitude of the problem. However, there seems to be little that is being done to reverse or lessen the effects of the problem.

The study also paints a grim picture when it comes to the conscious effort to reduce the effects of climate change by individuals. It is clear that most people are being pushed by economic factors to take measures that reduce their contribution to climate change rather than them making a conscious decision to make changes that will reduce their contribution to the effects of climate change.

As earlier emphasized, the level of awareness of the problem of climate change needs to be integrated in the school curriculum at all levels if individuals are to make a difference.

All in all, the final and most practical solution lies in the commitment by every human being to do their bit in alleviating the problem. If individual effort is missing, no amount of corporate or government intervention can achieve much. People need to start believing that they can make a difference in their own small ways by doing the small things they engage in a more environmentally sustainable way.

5.5 Recommendations

From the question of the level of awareness, it is clear from this study that the level of education has a strong correlation to the level of awareness of climate change. Thus, it is imperative that the issue of climate change be made a part of the curriculum at all levels to enhance people's awareness of this critical issue.

In line with this, the researcher would recommend media campaigns to sensitize the populace of the problem of climate change and the measures they can take to reduce their contribution to this problem.

Investment in renewable energy needs to be taken to a higher level. The government's commitment in this area is needed in order to not only create awareness of the benefits of alternative energy sources but also enhance cost saving and the conservation benefits associated with it. In this area, development agencies and donors can also be partners to drive and sponsor renewable energy projects.

Investment in transport systems that are friendlier to the environment needs to be given more attention by both the government and private sector investors. Motorized transport is a major contributor to emissions responsible for climate change and any measures taken to reduce this

contribution would go a long way in alleviating the effects of climate change. In addition, proper planning of routes used by public vehicles need to be done to make it more convenient which may attract people using private means.

5.6 Suggestions for Further Research

Some gaps were identified in the course of this study but they were not addressed since they were out of the scope of the study. It will therefore be important to suggest that further research be carried out to address the areas noted which include but are not limited to establishment of a most efficient system of demystifying the subject of climate change and localize it so that people at all levels and social classes can identify with the issues and their contribution.

This will go hand in hand with education for the population on the effect of their habits especially their purchasing and consumption habits that add up to aggravating the problem of climate change.

Further research into how businesses are coping with with the problem of climate change and the effectiveness of their investments in conservation efforts will also go into addressing the challenge of climate change.

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APPENDICES

Appendix I: Letter of Introduction

GEORGE GICHEHA
UNIVERSITY OF NAIROBI
P.O BOX 30197- 00100
NAIROBI

TO WHOM IT MAY CONCERN:

Dear Sir/ Madam

**RE: AN INVESTIGATION INTO THE MEASURES BEING TAKEN BY STAFF AT
THE MINISTRY OF ENVIRONMENT AND MINERAL RESOURCES
HEADQUARTERS TO REDUCE THEIR CONTRIBUTION TO THE EFFECTS OF
CLIMATE CHANGE**

I am a student pursuing a Masters of Arts Degree in Project Planning and Management at the University of Nairobi.

My research area is based on the above mentioned subject. I hereby kindly request you to fill in this questionnaire that will enable me obtain important information for the research. The findings of the study will enable the policy makers as well as individuals become more conscious of the measures they can take to reduce their contribution to the effects of climate change.

All information provided will be kept confidential.

Your contribution to the research will be highly appreciated.

Yours faithfully,



George Gicheha

Appendix II: Questionnaire

Introduction

This questionnaire is part of a research being conducted to investigate the measures being taken by staff at the Ministry of Environment and Mineral Resources Headquarters to reduce their contribution to climate change.

I request that you kindly contribute to my research which will contribute in understanding the problem of climate change. Please answer the questions honestly and simply by either ticking (✓) or providing comments/suggestions on the spaces provided. The information provided will be treated with utmost confidentiality and for academic purposes only. Thank you.

Please tick (✓) on the option that represents your answer.

1. Gender male female

2. Level of education

a) Secondary b) Bachelors Degree c) Masters degree PhD

Others (please specify).....

3. Age 18-26 b) 27-34 c) 35-42 d) 43-50 e) above 50

4. Are you aware of the problem of climate change?

a) Yes b) No

5. If the answer to 4 above is (a), how familiar are you with the phenomena of climate change.

a) Very familiar

b) Familiar

c) Not too familiar

d) Not familiar at all

6. How did you first learn about climate change?

a) Print media

b) Electronic media

c.) Government policy papers

d) The internet

e) others (please specify).....

7. Climate change is being aggravated by human activities.

a) Strongly agree

b) Agree

c) Disagree

d) Strongly disagree

8. Do you agree that it is important to know about your contribution to climate change?

a) Strongly agree

b) Agree

c) Moderately agree

d) Disagree

e) Strongly disagree

9. Do you know how you contribute to climate change?

a) Yes

b) No

10. Are you aware of the measures you can take to reduce your contribution to the problem of climate change?

a) Yes

b) No

11. What mode of transport do you use most often?

a) Bus/matatu (public transport)

b) Personal/private car

c) Motorcycle

d) Bicycle

e) Walking

12. Why do you prefer the chosen mode of transportation in 11 above? (You can choose more than one reason).

a) Affordability

b) Convenience

c) To curb emissions that contributes to climate change

13. If your answer to 11 above is (b) would you be willing to pool transportation to mitigate against your contribution to climate change?

a) Yes

b) No

14. What do you use for lighting in your house?

a) Ordinary Bulbs

b) Fluorescent tube

c) Energy saving bulbs (CFL's)

d) Kerosene lamps

15. If your answer to 14 above is (c) why do you use energy saving bulbs?

a) Save on cost (pay less on energy bills)

b) Save the environment (reduce your contribution to climate change)

c) Free bulbs provided by Kenya Power Company

16. Do you use any other type of energy source apart from electricity? Tick as appropriate.

a) Yes

b) No

17. If answer to 10 above is (yes) which energy source do you use?

(Tick all that apply)

a) Bio-gas

b) Wind energy

c) Solar energy

d) None of the above.

d) Others (please specify).....

18. Would you be willing to switch from utilizing hydro electricity that contributes to emissions responsible for climate change to using renewable energy sources that does not contribute to climate change?

Yes

No

19. Do you think utilizing renewable energy contributes to the reduction of emissions responsible for climate change?

a) Yes

b) No

c) Don't know

20. Please indicate any other measures you are adopting to reduce your contribution to climate change.

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