

An assessment of the perceived Socioeconomic impacts of Climate Change on the community of Faza island, Lamu East district, Kenya.

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LIST OF ACRONYMS AND ABBREVIATIONS

DFID	Department for International Development
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
GLOSS	Global Sea level Observing System
IPCC	Intergovernmental Panel on Climate Change
KARI	Kenya Agricultural Research Institute
KCDP	Kenya Coastal Development Project
KMD	Kenya Meteorological Department
KMFRI	Kenya Marine and Fisheries Research Institute
Ksh	Kenya Shillings (Kenyan currency)
MEMR	Ministry of Environment and Mineral Resources
SEI	Stockholm Environment Institute
TIK	Traditional Indigenous Knowledge
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

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CHAPTER ONE

1.1 Introduction

Climate change refers to a change in the state of the climate that can be identified by changes in the mean and or the variability of its properties and that persists for an extended period, typically decades or longer (IPCC, 2007). Vital natural resources all over the world on which millions of people (particularly rural communities) rely on for their existence, including land, agricultural crops, forests and rainfall are today being adversely affected by climate change.

In the coming decades, climate change is likely to alter temperatures and distribution of rainfall, contribute to sea-level rise and increase the frequency and intensity of extreme weather events in East Africa. In fact, many widespread climatic changes have already been observed in the region. Climate change will have both a direct impact on development of climate-dependent activities (such as infrastructure and agriculture) and indirect consequences for social systems (such as issues of poverty, conflict, health and education). As a result, climate change has the potential to undermine, and even undo, socio-economic development in East Africa (Orindi *et al*, 2005). According to the Intergovernmental Panel on Climate Change report (IPCC, 2007), extreme events such as floods, strong winds, droughts and tidal waves are the main threats to Africa from Climate Change. The daily dependence of Africa's impoverished, and mostly subsistence-based, rural communities on natural resources for their survival has meant that they are the worst affected by the ravages of climate change. The prevalent inadequacy of resources (including physical and financial assets) coupled with inherent poverty-related challenges call for coping mechanisms to counter the disruptions to their lives occasioned by the effects of climate change.

Climate change will affect coastal habitats, resources and populations to changes in physical variables, namely temperature, rainfall, relative humidity and winds, but in addition the coastal domain will be dramatically affected by changes in sea-level, groundwater level, salinity, wave climate, sediment budgets, storm events and erosion patterns. Physical changes will themselves

result in a wide variety of biological changes at the population, community and ecosystem levels, which in turn will affect the suitability of the coastal zone and its resources for use by the human populations (IUCN, 1992). It is very likely that subsistence and commercial agriculture on small islands will be adversely affected by climate change. Sea-level rises, inundation, seawater intrusion into freshwater lenses, soil salinisation, and decline in water supply are very likely to adversely impact coastal agriculture (IPCC, 2008). Global climate changes are expected to affect coastal communities around the world, many of which are already considered vulnerable to ongoing climatic variability. Of these changes, accelerated sea-level rise has received much attention and may entail elevated tidal inundation, increased flood frequency, accelerated erosion, rising water tables, increased saltwater intrusion, and a suite of ecological changes. These biophysical changes are expected to cause various socio-economic impacts including loss of land infrastructure and coastal resources as well as declines in associated economic, ecological, cultural and subsistence values (Dolan and Walker, 2003).

While there is overwhelming evidence the world over to support the occurrence of climate change, different regions around the globe by virtue of their unique and varied characteristics (including environmental, social and economic), are impacted in diverse ways by this phenomenon. No two regions anywhere in the world can be said to suffer the exact same effects of their environment and communities as a result of climatic change. In order to effectively address the resultant impacts (social and other) of climate change on a community, it is necessary to firstly determine the nature of these impacts. This study intended to reveal the exact nature of the social and economic repercussions that have befallen the community of Faza due to changes in climate. Climate change is having disastrous effects on the lives and resources of impoverished rural communities all over the world. Their very survival which is dependent on their access to life's basic needs - water, food, shelter, and security (Adger *et al*, 2005) is being threatened by this silent but globally pervasive process. Climate change is an all encompassing threat, directly affecting the environment, the economy, health and safety. The inhabitants of Kenya's Faza island are a predominantly fishing community, and this livelihood coupled with small-scale, mainly subsistence, agriculture make up the island's main socio-economic livelihoods. Alternative livelihoods that are not natural-resource based are very few. Fishing

and agriculture are however totally reliant on suitable climatic conditions for them to be productive. This in fact means that for the community in Faza, climate change is a threat to their very existence: it is literally a matter of life-and-death.

This study's main objective was to determine the perceived socio-economic impacts on households in Faza related to climate change – i.e. with regard to four key impact parameters: Rainfall (water resources), Agriculture, Weather-related disease and Fisheries. Methods of mitigating the effects of climate change, coping strategies and forms of adaptation practiced by the local communities were also considered. Faza island (Latitude 2.067, Longitude 41.106°), also known as Rasini, is an island village of approximately 9,500 people. Faza is situated in the northern part of Kenya's territorial Indian Ocean waters. It is administratively classified under Faza location, within Faza division of Lamu East constituency. The island is located approximately 36 kilometres north-east of Lamu island, Lamu county.

This was a Descriptive study which took place over a ten month period – between April 2010 to February 2011. The methodology utilized in the study comprised of several research instruments: *Semi-structured questionnaires* were administered to 61 household targeting heads of households (or their spouses if they were unavailable). These respondents were purposively selected on the basis of being above 35 years of age and having lived on the island for the past ten consecutive years. The household survey obtained socio-economic data on the homesteads, as well as quantitative data on household perceptions regarding the four impact parameters under consideration. *In-depth Interviews* with selected Key Informants provided substantive qualitative data on the impact of climate change on the community. The informants were selected purposively, based on their institutional affiliation as pertaining to any of the four impact parameters in question. *Direct Observation* (done through Transect walks) allowed for the acquisition of visual data (photographs) of both the physical manifestation of climate change, as well as the government-funded mitigation measures that have so far been implemented on the island

This paper is structured into four main sections. It begins with the introductory segment which attempts to put this research endeavor into context, and includes a statement of the research problem. The methodology employed in the study is also given mention. The paper's second

section deals with theoretical, conceptual and empirical literature, and highlights the variables related to this study. In section three an empirical discussion of the study's results is presented. The concluding section provides a synthesis of this research work's findings, including the contributions of the study.

CHAPTER TWO

2.1 Literature Review

The *impacts* of a specified weather or climate event are the changes it induces in matters of human concern. A specified climate change may have multiple impacts. Impacts may be beneficial or harmful, with most climate scenarios bringing mixed effects: benefits to some people and sectors, and harm to others. A system is more or less *sensitive* to climate depending on whether a specified change in climate brings large or small impacts. The simplest framework for assessing climate impacts involves specifying the climate change and climate baseline, and attempting to infer impacts directly. Climate variability and change occur in a social and economic context that contributes to determining impacts. In some cases, socioeconomic conditions may mediate or alter even first-order biophysical impacts, and thus socioeconomic information will be necessary to describe and assess even these impacts. (Parson *et al*, 2000). The impacts of observed and future climate change are and will be clearly spatially and socially differentiated. The impacts of future change will be felt on resource dependent communities and in a multitude of primary and secondary effects cascading through natural and social systems (Adger, 2001).

Climate change means long-term change. But the people in the poor coastal villages are more focused on how to cope with tomorrow than the situation in five years' time, according to Julius Francis of WIOMSA (www.sida.se, 2011). The community-based or 'bottom-up' approach, yields important insights into local responses to climate change. At the community level, perceptions and experiences with climate extremes can identify inherent characteristics that enable or constrain a community to respond, recover and adapt. As such, local and traditional knowledge is key to climate change research and should be incorporated into research design and implementation (Dolan and Walker, 2003). The impacts of climate change that matter to people are not limited to direct biophysical impacts, but can also include many indirect effects on such factors as health, income and employment; the price, availability, and quality of goods and services; property values and losses; recreational opportunities; the character of the landscape; and the political, social, and economic character of their community – as well as the direct

effects of weather and climate on people's experience. Such impacts are not exclusively caused by weather or climate, but are mediated by many characteristics of the economy and society. They can only be meaningfully defined relative to specified individual and collective perceptions, interests, and values, which in turn may themselves be subject to change (Parson *et al*, 2000).

A wealth of research has been undertaken on the impacts of climate change in East Africa. Some of the expected repercussions of climate change for the region include rising sea waters along the coastlines, increased rainfall and incidence of disease in wetter areas, extinction of species, worsening droughts and crop failures (Orindi and Murray, 2005). The Kenya Agricultural Research Institute (KARI) has been conducting climate change research in Kenya for the past several years. The institute recently concluded a research study assessing the vulnerabilities and coping strategies to climate change in the agricultural farming systems of the coastal lowlands of Kenya. The study included as one of its objectives the documentation of indigenous coping mechanism/strategies to climate change as practiced by farmers in the region (www.cenafrika.net, 2010). However, the study was limited to subsistence farmers in the region and did not involve fishing any communities. A study commissioned by the Heinrich Boll Stiftung Foundation's Regional office in Nairobi, Kenya, on Climate Change Vulnerability and Preparedness in Kenya gives an overview of the country's efforts to address the challenges of climate change adaptation so far. This study's methodology consisted of literature review, desk review and analysis of secondary data. Sources of information included the Government of Kenya reports (development plans, policies, MTEF etc.), international reports (UN, World Bank, and International NGOs) and other relevant documents and scientific reports. While it does include a section on Coastal and Marine ecosystems, which gives some mention coral reefs and the peri-urban mangrove community in the Mwache area of Mombasa, as well as observed salt-water intrusion into groundwater in Lamu no information is provided on socio-economic impacts of climate change (in Faza or any in other of the country's coastal islands). KARI, through its Climate Change Unit, is conducting research to assess the vulnerabilities in agricultural farming systems in the coastal lowland of Kenya. The study has one of its objectives the documentation of the indigenous coping strategies/mechanisms as practiced by farmers in the

region. The study does not involve and fishing communities, neither does it cover on site on any of Kenya's Indian Ocean islands. KMFRI has an on-going MASMA-funded research project that is focusing on the resilience and adaptations of mangroves and dependent communities in the WIO region, to the impacts of climate change. While this project does include a significant socio-economic component its study sites are limited to the Mwache area (Kwale district) of the coast province.

The goal of improved safe access to drinking water will be harder to achieve in regions where runoff and/or groundwater recharge decreases as a result of climate change. In addition, climate change leads to additional costs for the water supply sector, e.g. due to changing water levels affecting water supply infrastructure, which might hamper the extension of water supply services to more people. This leads, in turn, to higher socio-economic impacts and follow-up costs, especially in areas where the prevalence of water stress has also increased as a result of climate change. Human health, incorporating physical, social and psychological well-being, depends on adequate supply of potable water. Human beings are exposed to climate change indirectly through changes in water and food quality and quantity. Due to the very large number of people that may be affected, malnutrition and water scarcity may be the most important health consequences of climate change. Sea-level rise has been observed causing the salinization of coastal aquifers. Water is a multi-sectoral resource that links to all facets of life and livelihood. There is strong evidence that, under most climate change scenarios, water resources in small islands are *likely* to be seriously compromised. Most islands have a limited water supply, and water resources in these islands are especially vulnerable to future changes and distribution of rainfall. Projected impacts of climate change in Africa are *likely* to be greatest where they occur with a range of other stresses, such population growth, unequal access to resources and inadequate access to water and sanitation. Climate-change induced effects on water pose a threat to human health through changes in water quality and availability. In some populations climate change is expected to exacerbate problems of access to water at the household level (Bates *et al*, 2008).

Food security is a function of several interacting factors, including food production as well as food purchasing power. Climate change could worsen the prevalence of hunger through direct negative effects on production and indirect impacts on purchasing powers. Changes in

temperature, precipitation, and climatic extremes will add to the stress on agricultural resources in many developing country regions and reduce the quality of land areas for agricultural production. Low-lying coastal communities will have to deal with sea level rise and the impact of climate change on marine resources. Sea level rise may lead to salinization and render agriculture areas unproductive. In areas where fish constitute a significant source of protein for poor people, declining and migration of fish stocks due to climate change and associated changes in the marine environment will lead to further deterioration of health amongst communities. This scenario may not have come about in Faza as yet as a majority of respondents claimed to consume fish more than five times per week. Poor people are often directly dependent on goods and services from ecosystems, either as a primary or supplementary source of food. . This makes them highly vulnerable to ecosystem degradation. Climate change will alter the quality and functioning of ecosystems, reducing their capacity to perform their role as important life support systems. Essential ecosystem services include breaking down wastes and pollutants, purifying water, and maintaining soil fertility. This will have important impacts on key economic sectors such as agriculture (www.unpei.org, 2003). Climate extremes have direct impacts on food crops and can indirectly influence food supply by altering the ecology of plant pathogens, and higher soil temperatures can promote fungal growth that kills seedlings. Increased risk of loss of property, death, injury, water-borne, respiratory and skin diseases would result from rising incidences of heavy precipitation events, cyclones and storm surges and sea-level rises. Climate Change would worsen current water stress caused by population growth and economic and land-use change. Frequent cases of Drought would cause water shortages for settlements (UNEP, 2009).

Coastal fisheries include wetlands, estuarine, inshore, coral reef and open sea resources and support poor coastal communities around the world. Two-thirds of the world's coral reefs occur in the territorial waters of developing nations, together with many other coastal fisheries resources, all of which are potentially vulnerable to impacts of climate variability (Goreau et al, 2000). Subsistence activities of coastal populations (including fishing, farming and wood collection) are impacting on critical ecosystem services provided by mangrove swamps, dune systems and coral reefs. These ecosystem services, however, are critical in providing provide resilience against SLR (Sea level rise) and destructive maritime hazards (such as storm surges,

tsunamis and tropical cyclones). Predicted climate change impacts threaten the livelihoods of rural populations, food security, economic development and infrastructure. Changes in fish populations and ecosystems from climate change are likely to have resulting impacts on the fisheries sector. Climate change may also directly affect fishing operations and fishing communities independently of impacts on fish and ecosystems (e.g. through sea level rises and increased storm severity affecting fishing and fish-farming people's homes and productive assets). Impacts within the sector will affect the incomes, assets, and livelihoods of individual fishers, fish farmers, processors, and those engaged in marketing and the providers of inputs to the sector (Macfadyen and Allison, 2009). Coastal fishing communities face a double exposure of reduces fisheries resources and increased risks of coastal flooding and storm surges (Adger *et al*, 2005). A number of ecosystems in developing countries, such as rivers, wetlands and coastal zones, may already be experiencing effects of climate changes that could reduce livelihood opportunities for dependent communities (Njaya and Howard, 2006). Greater understanding of how people cope with and adapt to fisheries with extreme natural variations would assist in developing adaptation strategies to the additional impacts of future climate change. The relative risk of climate change on fisheries sectors also need to be understood in the context of impacts on other natural resource sectors and on other hazards that result in high levels of poverty, including food insecurity, epidemic disease, conflict, political marginalization, inequity and poor governance. Fishing communities have often developed adaptation and coping strategies to deal with fluctuating environmental conditions (Allison and Ellis, 2001). In general, socio-economic costs will likely escalate as a result of climate change. But benefits have also been identified, including reduced cold-water mortalities of many valuable fish and shellfish species, opportunities for increased use of fishing vessels and coastal shipping facilities and expansion of areas suitable for aquaculture. The consequences of sea-level rise will be far greater for developing countries, and protection costs will be higher, relative to those for developed countries. (Nicholls *et al*, 2007).

In an unfortunate twist of fate, the poorest countries, which have contributed least to global GHG emissions, are amongst the most vulnerable to climate change. Poor communities are not only located in high-risk areas, but their lack of economic and social resources mean they are ill-equipped to adjust to the long-term changes in climate (Orindi and Murray, 2005). Over time,

households and communities have developed a number of coping strategies in response to extreme climate events. Some of these coping measures can only assist families in the short-term and cannot deal with increased and more severe shocks. However, many traditional coping strategies do provide an important lesson for how East Africa can better prepare and adapt to climate change in the long-term. There is a need to strengthen these coping strategies to enable households to live with current climate variability as well help them to adapt to long-term climate change. And this is only possible if we first understand local people's vulnerabilities, capacities and risks. Local level coping strategies to shocks such as drought and floods differ among households and communities depending on the resources available and social capacity. They may include remittances from migrant household members, collecting wild fruits, switching to non-farming activities or, in extreme cases, selling assets. Eriksen *et al.* (2005) found in Saweni Village, Same District, Tanzania that households coping mechanisms during drought included casual labour, brick making, handicraft, collecting honey and charcoal burning. Indigenous fruits were also highly regarded because they could be harvested by any household member and did well in drought conditions. These activities provide an important source of cash to allow households to purchase food and cater for other necessities at such times. Remittances from migrant family members and relatives play an important role in household well-being during difficult periods. People who receive remittances tend to be less affected by shocks in terms of access to food, health services and school attendance (Eriksen *et al.*, 2002). Coping strategies should not be confused with adaptation, as they refer to actions taking place within existing structures. Adaptation frequently involves changing the framework within which coping takes place (Adger, 1996). In Faza, coping strategies amongst the community included

The Human Impact Report of Climate Change developed by the Global Humanitarian Forum, titled *Anatomy of a Silent Crisis* (2009), testifies to the human face of this phenomenon with alarming statistics. The findings of the report indicate that every year climate change leaves over 300,000 people dead, 325 million people seriously affected, and economic losses of US\$125 billion. Four billion people are vulnerable, and 500 million people are at extreme risk. Currently over 2.8 billion people live in areas of the world prone to more than one type of the physical

manifestations of climate change: floods, storms, droughts, sea level rise. The region at most immediate risk of droughts and floods is sub-Saharan Africa. The most storm-prone areas include the coasts of East Africa (Mozambique, Madagascar). In 2008, the Food and Agriculture Organization of the United Nations estimated that more than 900 million are afflicted with hunger, or about 13 percent⁷⁰ of the global population. Of those suffering from hunger, 94 percent⁷² live in developing nations. Most are subsistence farmers, landless families or people working in fishery or forestry. The report adds that in some parts of Africa climate change is expected to reduce yield up to 50 percent by 2020. Historical evidence shows that higher food prices cause an immediate and direct jump in hunger levels. During the 2008 food crisis, the number of hungry people in the world increased by 40 million, primarily due to increased food prices. Every year the health of 235 million people is likely to be seriously affected by gradual environmental degradation due to climate change. Malnutrition is the biggest burden in terms of deaths. Climate change is projected to cause over 150,000 deaths annually and almost 45 million people are estimated to be malnourished because of climate change, especially due to reduced food supply and decreased income from agriculture, livestock and fisheries. Climate change-related diarrhoea incidences are projected to amount to over 180 million cases annually, resulting in almost 95,000 fatalities, particularly due to sanitation issues linked to water quality and quantity. Climate change-triggered malaria outbreaks are estimated to affect over 10 million people and kill approximately 55,000.

Average temperatures in Kenya have risen by 1.0° since 1960, a rate of increase which is very likely to continue. Rising temperatures will also extend the potential mosquito habitat to higher altitudes where a significant proportion of the Kenyan population lives. This could expose an additional 5.8 million people to significant risk of malaria by 2050, according to a “conservative estimate” by the Stockholm Environment Institute. In Kenya, the economic costs of droughts affect the whole economy. The 1998-2000 drought was estimated to have economic costs of \$2.8 billion from the loss of crops and livestock, forest fires, damage to fisheries, reduced hydro-power generation, reduced industrial production and reduced water supply. These La Nina droughts left approximately 4.7 million Kenyans facing starvation (NCCRS, 2010). The 2004 and 2005 droughts affected millions of people and the recent 2009 drought has led to major

economic costs from restrictions on water and energy. The 1997/98 floods affected almost 1 million people and were estimated to have total economic costs of \$0.8 to \$1.2 billion arising from damage to infrastructure (roads buildings and communications), public health effects (including fatalities) and loss of crops. The more recent 2006 event affected over 723,000 people in Kenya (www.sei-international.org, 2009). According to Awuor *et al* (2008), Mombasa, Kenya's second largest city, with a population of 700,000 inhabitants, has a history of disasters related to climate extremes - including floods, which cause serious damage nearly every year and, often, loss of life. The floods in October 2006 were particularly serious, affecting some 60,000 people in the city and the wider province. In addition, around 17 per cent of Mombasa's area could be submerged by a sea-level rise of 0.3 metres, with a larger area rendered uninhabitable or unusable for agriculture because of water logging and salt stress. Three factors contribute to Mombasa's high level of vulnerability to climate change: low altitude, and high temperatures and humidity levels. Regarding the first of these, Mombasa is on the coastal plain, which is 4–6 kilometres wide and lies between sea level and about 45 metres above sea level. Parts of the city and its surroundings are likely to be submerged with a rise in sea level, and this would consequently disrupt ecosystem functions and balance, disrupt agricultural and industrial activities, cause the destruction of human settlements and interfere with the water supply. The high average temperatures (26.4°C) and humidity (65 per cent at noon) are already approaching intolerable limits and can be uncomfortable at times. In addition to the low altitude and high average temperatures and humidity, socioeconomic factors, particularly unplanned settlements and structures, are also contributing to the city population's increased level of vulnerability to climate change impacts. A 2010 study by the Tyndall Centre estimates that 190,000 people and \$470 million of assets in the city are currently at risk of an extreme storm surge.

The human impact is still difficult to assess with great accuracy because it results from a complex interplay of factors. It is challenging to isolate the human impact of climate change definitively from other factors such as natural variability, population growth, land use and governance (GHF, 2009). Each community knows its capabilities, its endowments and its deficiencies best. The research project sought to use a community perception survey to investigate the impact climate change had generated on the residents of Faza island. A

community-based approach focusing on the four selected parameters using respondent perceptions was chosen as a means to obtain an adequate subjective indication (in terms of significance) as to how climate change had affected different households in Faza.

2.2 Conceptual Framework

The link between natural ecosystems (resources) and the existence of the Faza community is very strong. These natural resources are however bearing the brunt of the effects of climate change and the community is facing a heavy burden due to the resultant scarcity of these essential resources. Climate change will invariably have a profound effect on the socio-economic status of communities the world over, more so the rural poor living in developing countries. These communities are the worst affected by the manifestations of climate change, particularly given their dire lack of resources (physical, financial or technical) and often remote location. The Conceptual Framework used in the study was a Community-based approach. The study used a community-centred analysis of climate change by obtaining the Faza community's climate perceptions (comparisons and interpretations) between the climate ten years ago and that being experienced currently. The community's perceptions on the Social and Economic impacts of climate change based on four key impact parameters - *Rainfall, Agriculture, Weather-related diseases and Fisheries*, were investigated. Community adaptations were also considered.

Community impacts of climate change are manifested in the form of various hazards including lack of rainfall (drought), the associated poor or absent harvests and water-related diseases. These hazards adversely affect communities in terms of their subsistence, and also their commercial welfare.

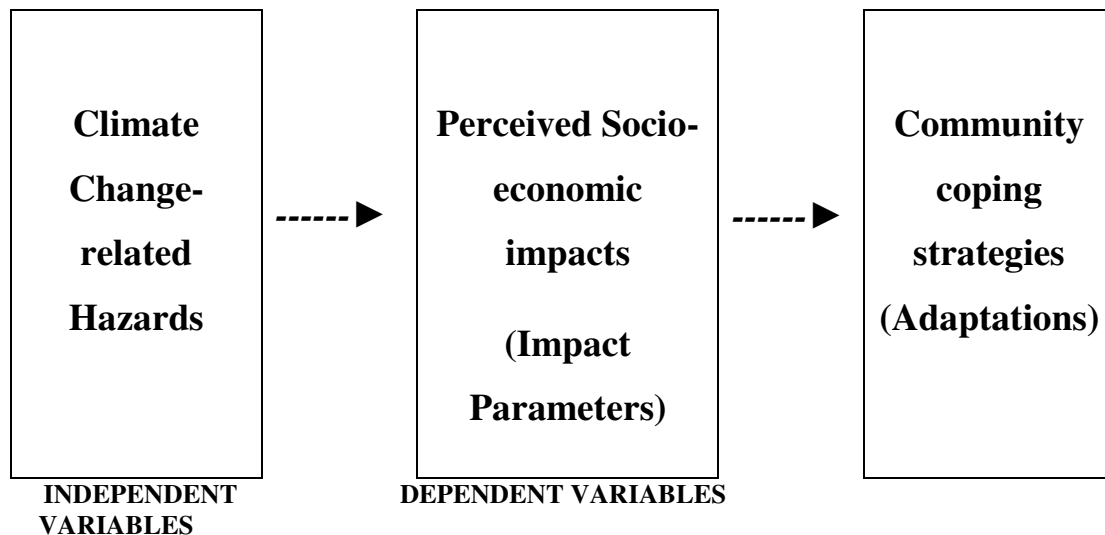


Figure 1: Basic Conceptual framework of climate change impacts on the community

The operationalization of the constructs regarding climate change impacts on the Faza community, using the stated parameters, was as follows:-

1. **Rainfall** (Water resources) – information on sources of water and seasonal rainfall trends provided an idea of current water availability, as well as the climate-related effects on water availability on the island. Data was obtained from several Key Informants (including the area District Officer I and a local prominent member of the community) and corroborated through household responses and through rainfall statistics obtained from the Kenya Meteorological Department. Water scarcity was a key socio-economic impact considered in the study, as it had implications on all other impacts considered.
2. **Agriculture** – Information on types of agricultural outputs in Faza, and the impact of climate change on harvests on the island was provided through an interview with the District Agricultural Officer, and supplemented through household responses. Diminished agricultural output has major implications on Food security and due to the observed climatic variability, it was considered an important social impact of climate change in the study. Issues relating to the consequent food insecurity were considered herein.
3. **Weather-related diseases** - the Faza District Sub-hospital Officer-in-Charge was the Key Informant who provided information on the climate-related illness being experienced by the island's residents. Household responses provided additional information on the health (a social impact) consequences of the changes in climate and allowed for some degree of quantification of this impact.
4. **Fisheries** – information on fisheries landings and incomes was provided firstly by three Key Informants: the Lamu District Fisheries Officer, the Faza Fisheries Officer and the Chairman of the Rasini Fishermen's Co-operative Society. A Focus-Group discussion involving twelve local fishermen was instrumental in availing information on the (social) impact of climate change on the island's main livelihood. Household interviews supplemented this information with data on the trends in fish consumption, and adaptations in consumption necessitated by the changes in climate. This aspect of the

study had both social and economic implications given that the island is a predominantly fishing village.

Examples of important technologies to collect data on coastal risks and adaptation to climate change are provided by Sterr *et al* (2003), who states that in seeking data on socio-economic aspects of coastal risks and adaptation Mapping and Survey methods could be utilized. Information on Legal and Institutional arrangements can be obtained through the use of Interviews and Questionnaires. Quantitative data was obtained through household questionnaires. Information on Adaptations made by the community in response to the climate change-related impacts was obtained through the questionnaires administered to individual households.

Fisheries provide employment for up to 10 million people in Africa and provide a vital source of protein to 200 million people. Protein may be particularly limited to these countries resulting in high dependency on wild caught fish. A number of ecosystems in developing countries, such as rivers, wetlands and coastal zones, may already be experiencing effects of climate changes that could reduce livelihood opportunities for dependent communities. Coastal fisheries support poor coastal communities around the world. Fisheries and Poverty-reduction are tightly-linked in many developing countries. The sector and its related activities are important for economic output and growth. Fishing-based livelihoods are subject to a range of climate-related variability from extreme weather events, floods and droughts, through changes in aquatic ecosystem structure and productivity, to changing patterns and abundance of fish stocks (FAO, 2007).

2.3 Analytical framework

The majority of the coastal populations living in developing nations rely on extractive natural resource-based activities for their livelihoods. These include fisheries, fisheries-related occupations (such as fish processing or distribution, net-making) and subsistence agriculture. Faza is one such community.

Using a community-based approach, this study aimed to obtain data on local (Faza) community perceptions on the concept of climate change, with regard to four key impact parameters: Rainfall (Water, resources), Agricultural output, Weather-related diseases and Fisheries. Local populations in most cases have a wealth of local knowledge regarding their environment, seasonality and even locally-developed adaptations and mitigations which they use as coping strategies in times of climatic change. This was the information sought from the households through the perception survey. The survey used the household as the basic unit of analysis. Household questionnaires were administered to local homesteads and provided Quantitative data on the study's impact parameters as well as on a general socio-economic profile of the household. This data was triangulated using qualitative data obtained from Key Informant Interviews and Direct observation (through Transect walks). Basic descriptive analysis was conducted on the data using Excel software.

The following section deals with the findings of the research study conducted in Faza island.

CHAPTER 3

3.1 DISCUSSION

The island of Faza is a typical fishing community where fishing activity (income) is the backbone of all other economic activity on the island. A total of 61 household heads were interviewed, which was equivalent to 12% of the total number of households in the island village of Faza. Faza island (Latitude 2.067, Longitude 41.106°) (also known as Rasini) is administratively classified under Faza location within Faza division of Lamu East constituency, and is located approximately 36 kilometres north-east of Lamu island in Kenya's Lamu county (Fig. 1). Faza is situated in the northern part of Kenya's Indian Ocean waters, about 60 kilometres from the border with Somalia, to the north. It is one of the 65 islands that make up the Lamu archipelago. It is unofficially classified under the group of islands known as Pate.

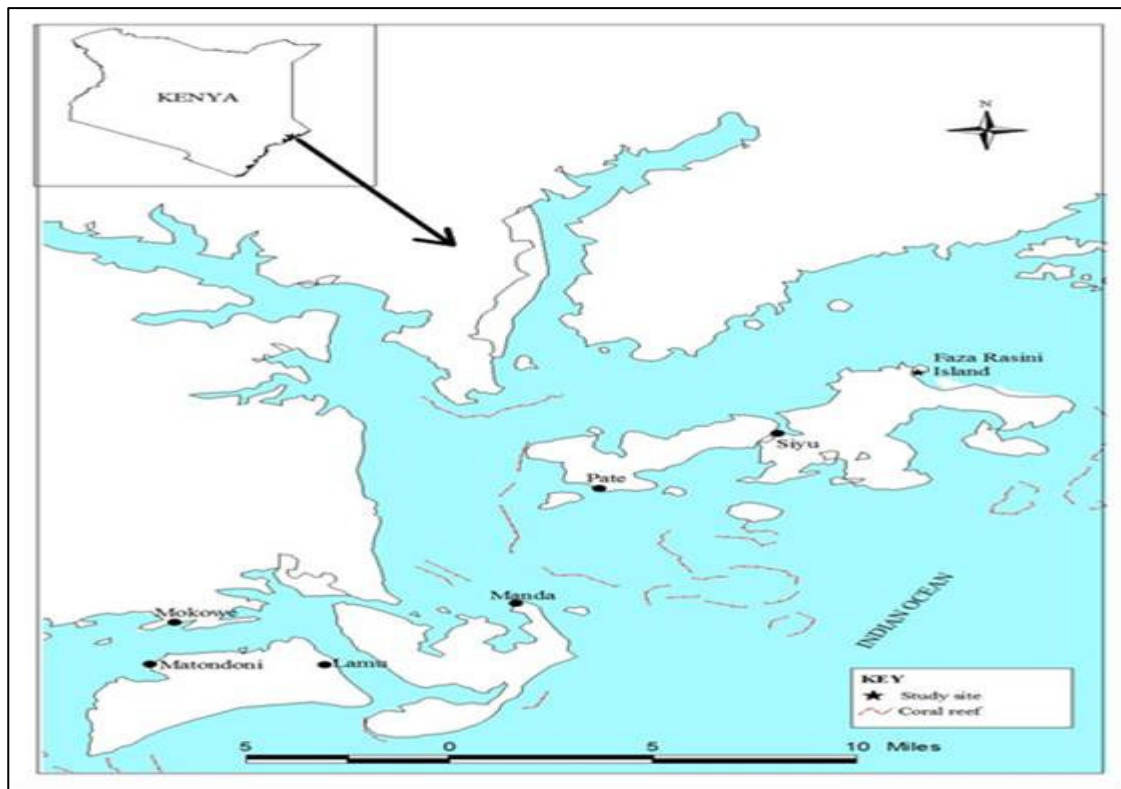


Figure 2: Location of Faza island (Source: KMFRI, 2007)

In this study 62% of the respondents were female and 38 % were male. The mean age of respondents was found to be 42 years. The higher number of female respondents could be attributed to the fact the Faza being a typical fishing village, most men-folk were out at sea fishing during the time that the questionnaire was being administered.

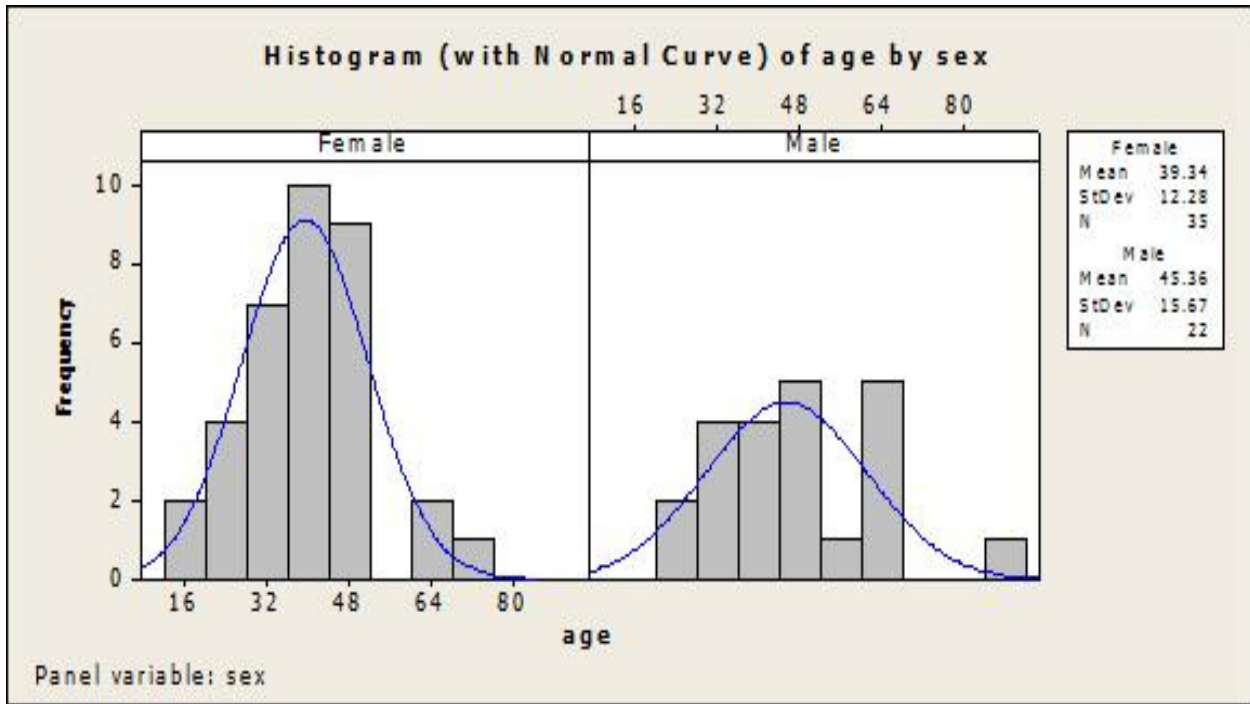


Figure 3: Age and Sex of respondents

From the onset of this study it became apparent that even though most respondents did not clearly grasp the concept of climate change, over 90% claimed to have experienced some sort of climatic change over the past ten years. This clearly showed the need to create awareness about climate change amongst the population of Faza. According to respondents in the study increased temperatures, prolonged spells of drought, an increase in health complications, erratic and intense episodes of rain, reduced fish catch and ever-rising food prices were the major consequences of climate change. Almost one-third of the respondents in this study stated that they did not take any measures to adapt to the effects of climate change simply because they lacked the resources to do so – evidence of the poverty within the community.

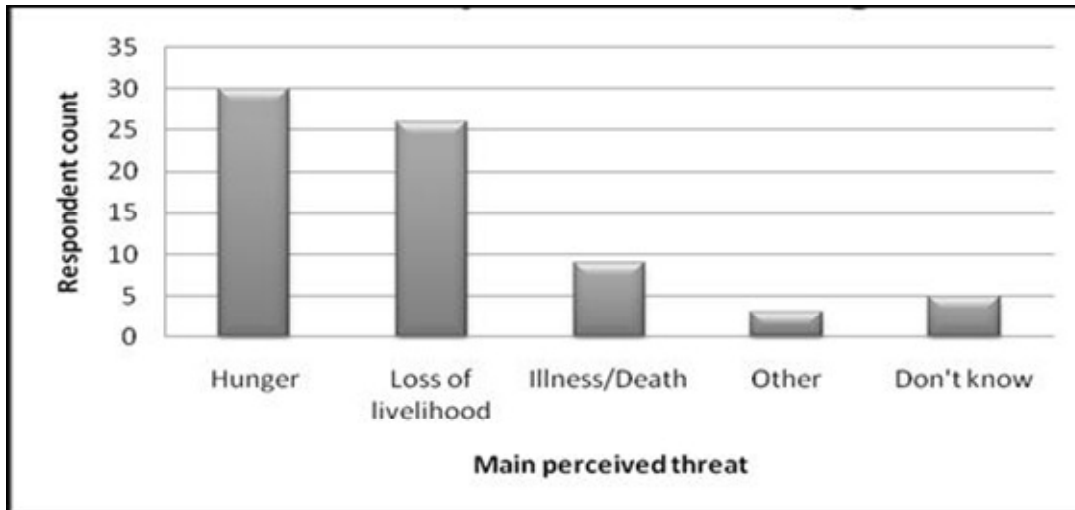


Figure 4: Perceived vulnerability of the Faza community to the most serious effects of climate change

3. 1. RAINFALL (Water resources)

Potable water is a critical problem in Faza island. The island does not have any piped water. Local residents rely primarily on rain water for their domestic needs. 93% of respondents were of the view that over the past ten years the level of rainfall had decreased. Climate change has exacerbated an already existing water problem in Faza. When it rains, water is usually collected and drained into concrete storage tanks, “*Djabias*”. This water is then sold commercially at between Ksh 15-30 per 20 litre container, depending on the state of availability. The “*Djabia*”s in Faza are owned by Women Self-Help groups, the County Council and by private individuals. There are some benefactors who provide water free for any residents to use. For the poorest residents in Faza this is their only source of water, and once it is depleted they are forced to beg for it. The elderly citizens in Faza suffer greatly if they have no one to fetch water for them. Contamination of water collected in “*Djabias*” is common. Consumption of rain water has had some negative social impacts on the residents with regard to health. Rain water does not contain sufficient minerals and Faza residents suffer from reduced calcium deposits in the enamel of their teeth. Numerous cases of people experiencing tooth decay (even children less than five years old) have been reported. Residents are sometimes forced to travel long distances to fetch

water (sometimes even as far as Lamu by boat to purchase water and ferry it back to Faza - which is an additional burden on their limited finances and very time consuming). The effects of Climate change on water resources in Faza are impacting significantly on the residents particularly in terms of their health, the loss of livestock and reduced agricultural output. With the majority of Faza’s residents relying on “*Djabias*” and local Boreholes for their water needs, it is imperative that the Ministry of Health ensures that sanitary conditions are in place with regard to water handling practices on the island, as any contamination of this stored water can have serious social and economic effects on the locals.

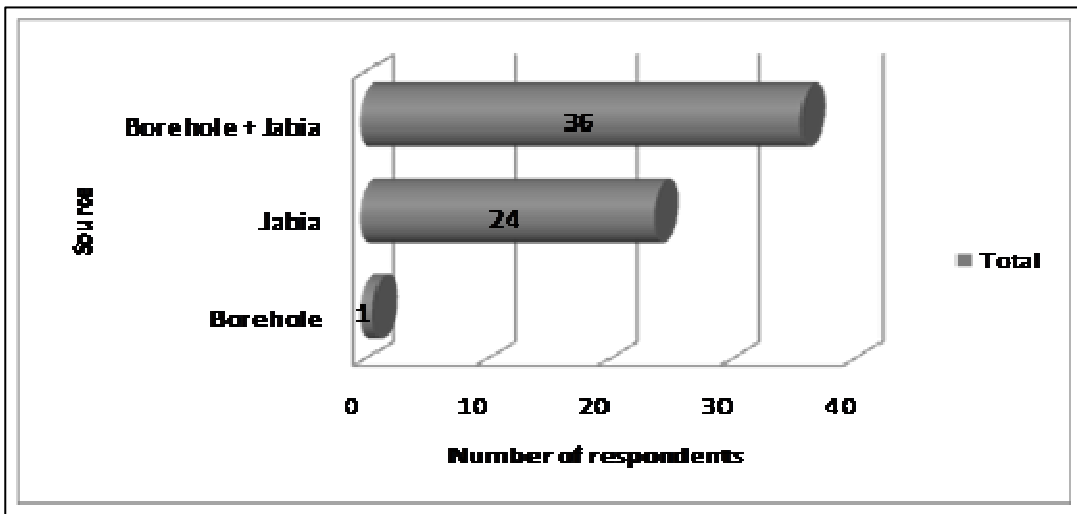


Figure 5: Sources of water

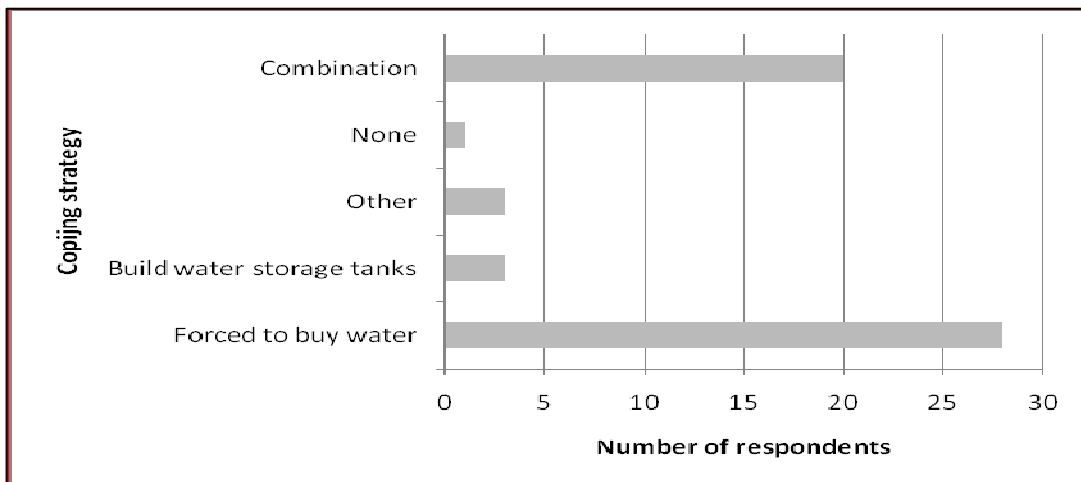


Figure 6: Main coping strategies employed by respondents when water is scarce

63% of those who acknowledged the occurrence of drought said the most significant effect of the drought was the Starvation they experienced. Fear of hunger was sighted by the majority of respondents as the most serious threat arising from the occurrence of climate change. 16% of respondents stated that reduced agricultural yields were the most important consequence of the drought. Other outcomes resulting from drought included difficulty in accessing water, death of livestock and increased incidences of disease (Figure 4).

For the poorer residents of Faza the only option they have is to rely on the government (e.g. through the neighbouring Kenya Navy barracks) for supply of fresh water. Some financially able residents have resorted to building their own “*Djabias*”. One respondent said they had absolutely no option but to rely on God to provide water for his consumption. Those most afflicted by this problem are the elderly who are not physically able to fetch water and may not have anyone to fetch it for them. Purchase of water was a practice common to most of Faza’s inhabitants. Assistance received by local residents in addressing the scarcity of water on the island has been several forms, and from several benefactors – including the French Government, the Kenyan government and the Kenya Red Cross Society. 20% of respondents claim to have received water storage containers. Almost half of all the respondents had received assistance in various forms.

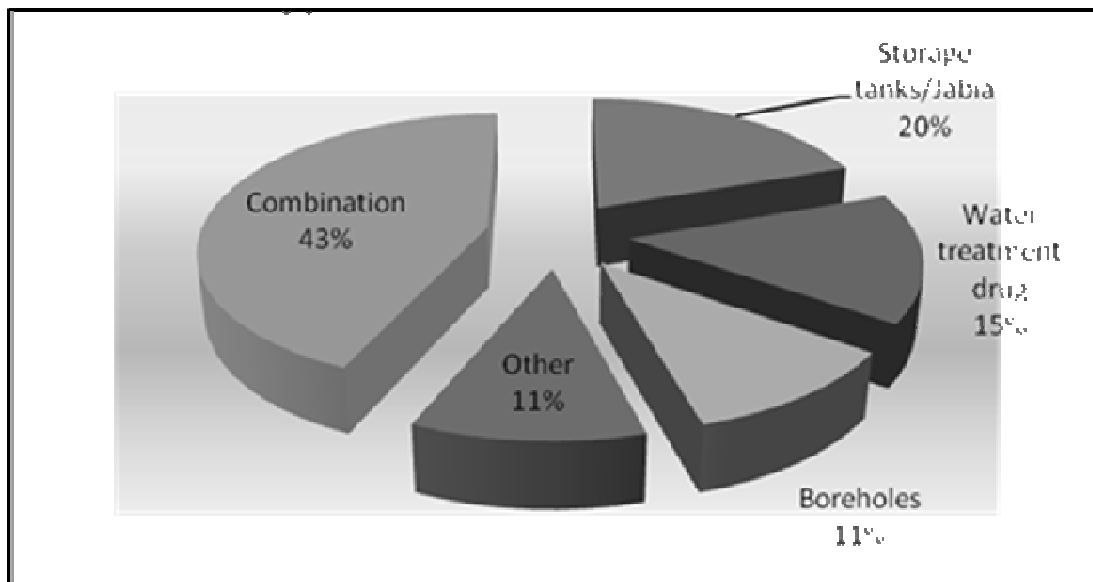


Figure 7: External assistance received by residents to address water scarcity

Water is a life-giving resource and the onus is certainly on the government to devise measures by which the Faza residents can have access to constant, safe water, more so with the advent of the climate change phenomenon. Efforts to contact Ministry of Water staff were unsuccessful. As the climate situation intensifies (as it is expected) locals will no doubt be forced into acts of desperation should no government assistance be forthcoming. Given that the very survival of the locals is at stake the government should take immediate and concerted action to tackle the water crisis situation in Faza.

3.2 AGRICULTURAL PRODUCTION

A variety of food and cash crops are grown by Faza residents. Food crops grown on the island are Maize, Sorghum, Finger Millet, Cow Peas, Green grams, Cassava, Coconuts and Mangoes. Major cash crops grown in Faza according to the respondents are Coconuts, Mangoes, Sim Sim and Cashew nuts. Other food crops grown in Faza include Cassava, Sorghum, Green grams, Cow Peas and Mangoes. Vegetables grown by the interviewees comprised of Pulses, Tomatoes, Potatoes and Spinach. Cotton is now only being introduced to the area. Trees are also planted as a source of Timber, which is in great demand. 84% of respondents stated that they were still planting the same crops they used to plant ten years ago. 7% said they planted only some of the crops they used to planted ten years ago, while 9% said they now planted different crops. This scenario calls for increased extension work from the Ministry of Agriculture, particularly with regard to informing and availing to the Faza residents available and appropriate climate resilient crop varieties and planting techniques.

74% of interviewees claimed that climate change had negatively affected the productivity of their farming land, meaning that agricultural output on the island had significantly fallen. Drought was overwhelmingly cited by respondents as being the most significant effect of the change in climate on agricultural land. Loss of Biodiversity on the island (failure and disappearance of some crop species) was mentioned as a result of this change. Over 50% of respondents claimed that the frequency of Droughts in Faza was between one to two years. One very significant outcome of the continued fall in agricultural productivity would be the reduced supply of food commodities to the local market. Food prices would rise - which most of the financially constrained local residents would be unable to afford. This would have serious

implications in terms of food security. The possibility of social unrest from a starving population cannot be ignored. 47% of the respondents claimed to have made some form of adaptation in their farming practices with the occurrence of climate change. Other adaptive action taken by respondents due to poor agricultural output included switching occupations, engaging in fishing, cutting down trees to sell for Timber and opting to simply buy food.

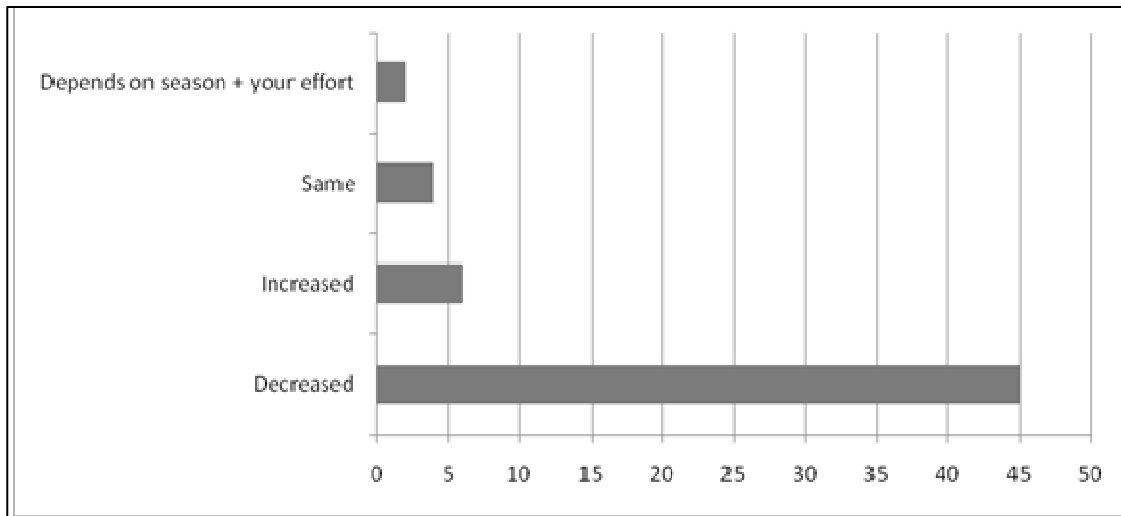


Figure 8: Respondents’ perceived effect of climate change on agricultural output

A point to note, however, is that climate change has had at least one benefit to the residents of Faza: following the unusually heavy rains in 2009, the island recorded a bumper maize harvest.

3.3 WEATHER-RELATED DISEASES AND AILMENTS

Forty respondents in the study stated that over the past ten years there had been an increase in the occurrence of certain diseases within Faza, in particular Malaria, Bilharzia and Typhoid. Generally warmer temperatures might explain the increase in cases of Malaria, as the mosquitoes have ideal conditions to breed, whilst the erratic floods being experienced might explain the occurrence of water-borne diseases. 43% of respondents were of the opinion that new ailments had also emerged with onset of climate change, such as Toothaches, Stomach Ulcers, High Blood Pressure, Cancer and Diabetes. Skin rash, Toothaches, Headaches and Flu were other climate-related ailments mentioned as occurring. Contamination of stored water could account for increased incidences of water-borne diseases such as Typhoid, Bilharzia and Diarrhea. 48%

of respondents claimed to have suffered, at one time within the past ten years, from one of the mentioned diseases.

Two-thirds of respondents were of the view that climate change had resulted in an increased number of deaths among Faza inhabitants. The causes they attributed this mortality to were Malaria, Heat-stroke and Dehydration. 48% of respondents claimed to have suffered in terms of their health due to Climate Change. Another health effect on respondents included dehydration. One respondent claimed to have suffered mental stress from the financial losses brought about by poor fish catches.

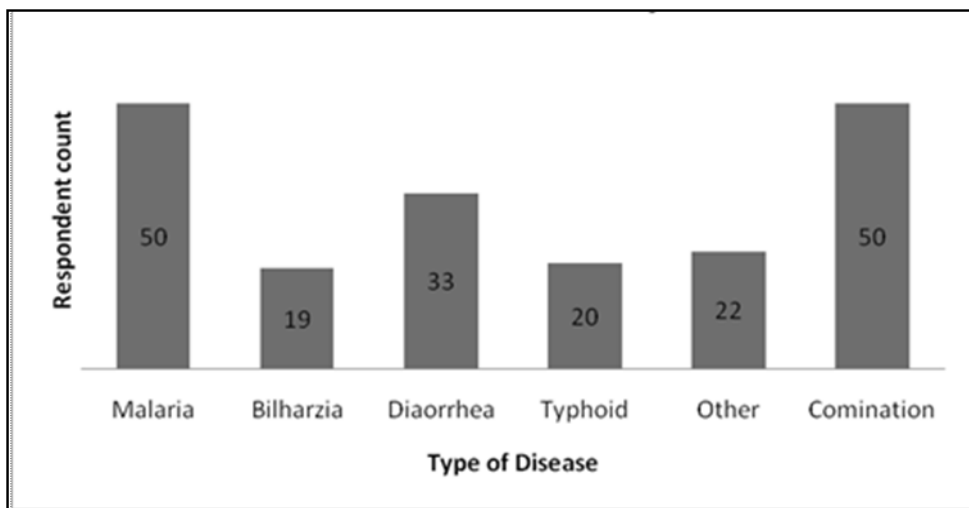


Figure 9: Climate-related diseases experienced by the respondents in Faza

The high level of poverty experienced on the island was reflected in one respondent's claim that they did (could) not seek any medical attention when faced with a climate-related health condition. The use of herbal treatments (gathered at no cost from the local environment) was also mentioned as one response to climate-related afflictions.

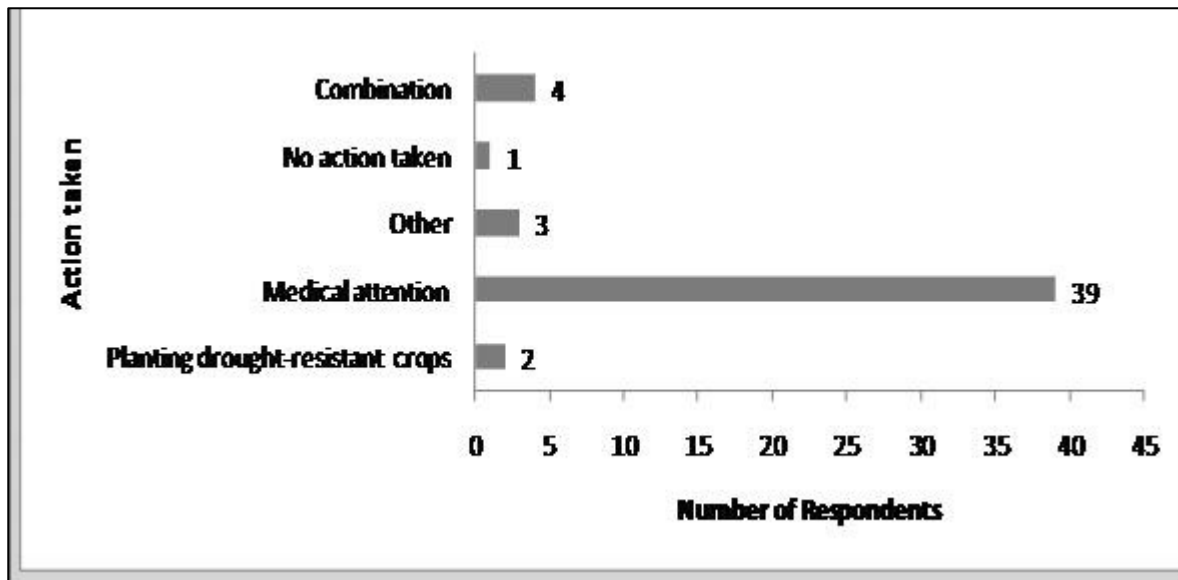


Figure 10: Action taken by respondents to combat effects of climate change on health

The implications of deteriorating health amongst the island’s population are very serious indeed. Villagers would be unable to engage in any form of productive activity, and as result food supply would be greatly compromised (as fishing and agricultural livelihoods cease). Physical conditions among the villagers associated with poor nutrition, and possibly death, would result. As the potential health implications that can arise from the effects of climate change on the residents of Faza can be fatal, such a scenario could threaten to the entire social and economic system of the island. An interview with the Medical Officer-in-Charge of Faza Sub-District hospital, Festus Mboti, revealed that the facility is severely under-staffed and often lacks an adequate supply of drugs. In order to effectively combat the health consequences of climate change on the residents of the island, the government’s Ministry of Health has to take the necessary measures to correct this situation. Without this happening the hospital will be unable to cope with the rising climate-related medical cases in Faza. The remoteness and distance of the island from the nearest major port of call (Lamu) would also exacerbate the situation – with regard to the provision of relief assistance.

3.4 FISHERIES

Fishing activity is crucial to the survival of Faza's residents. Fishing income accounts for most of the local residents' expenditure on food, education, health, transportation and other development activities taking place on the island. Unfortunately, being a natural resource the area's fisheries have not been spared from the ravages of climate change.

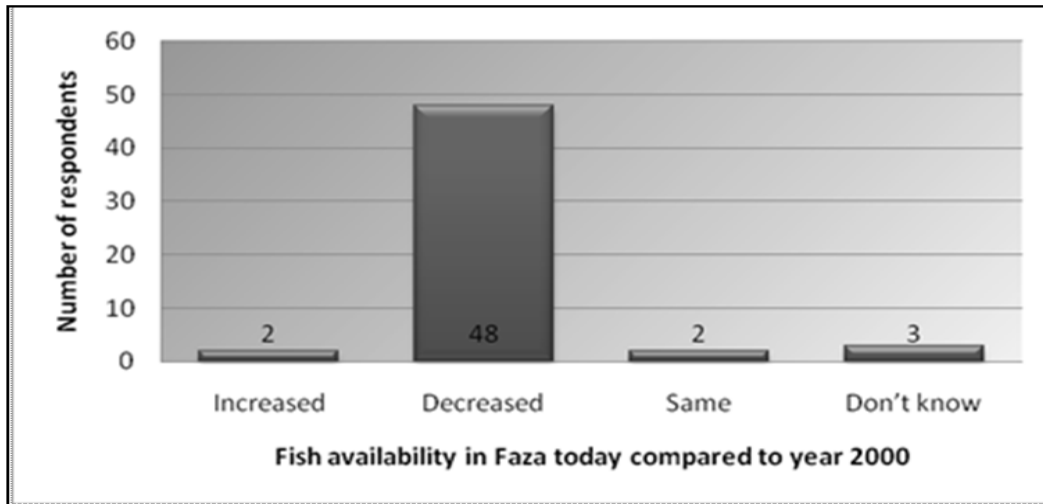


Figure 11: Faza respondents' perceptions on Fish availability given the change in climate

Per capita fish landings in Faza have been on a steady decline in the recent past. While this occurrence can arguably be attributed to climate change, the increase in number of local fishermen - most of whom are concentrated in Faza's inshore waters, plying their trade, might be a possible cause of this reduction.

Consumption of fish by households had similarly been affected by climate change, as reflected by the greater proportion of respondents claiming to currently consume less quantity than they did ten years ago. For Faza residents, climate change has meant an increase in the price of fish. Despite this, 79% of respondents claimed to eat fish more than five times each week. This might imply a cultural significance attached to fish by the community, which would see them striving to maintain consumption of the product in spite of a rise in its price. The increased cost of fish

has forced villagers to adapt their diets in various ways, including increased consumption of vegetables and alternative sources of protein, such as beans.

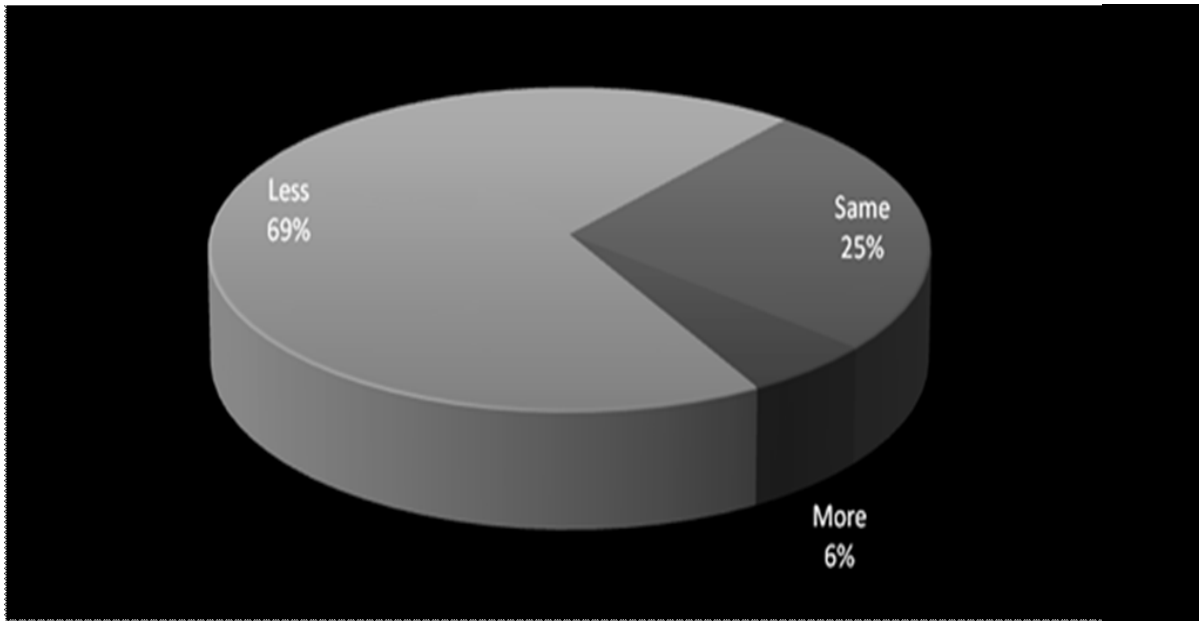


Figure 12: Quantity of Fish consumed by respondents today, as compared to ten years ago

Villagers in Faza had been affected by reduced fish catches, firstly because with today's high cost of living the fishermen's reduced earnings (on average they earn between 150-200 Ksh per day) has meant that they were unable to meet the domestic needs of their families. The loss of fishing livelihoods has resulted in an increase in the number of unemployed and idle persons in Faza – particularly the youth [as many fishermen (parents) were unable to afford to pay school fees]. A negative social impact of this has been the proliferation and increased use of illegal narcotics on the island of Faza in recent years. This would imply somewhat of deterioration in the social fabric of the community, as well as a rise in insecurity.

In an interview with the Rasini (Faza) Fishermen's Co-operative Society chairman, Mohammed Ali Mohammed, was certain that there had been climatic changes in Faza over the past ten years. Access to many fishing grounds that were previously used was today not possible for several reasons. According to him the water levels at sea had reduced and the sea bed had risen thus depriving local fishermen of fishing grounds. This was possibly a result of increased siltation. Seagrass beds, which are an important source of food and habitat for fish, had gradually

disappeared. This had inevitably caused a reduction in fish numbers. Ever since the occurrence of the *Tsunami* tidal waves in 2004, he explained, the sea had never been the same. Tides had become irregular and there had been an increase in the episodes of violent, turbulent sea currents causing the water to turn brackish and so making it harder for the fishermen to catch any fish. Furthermore, given that the local Faza fishermen go to sea in simple, wind or manually-propelled vessels such conditions at sea were life-threatening. Fish catches in general had fallen, with a 7-8 metre dhow only catching 300-400kg per trip, as opposed to the 800-1000kg they used to land even five years ago. Fish, he stated, is usually plentiful when there are rains. If rainfall is high during a particular period the fish catch in the coming '*Kusi*' season will be high. Rainfall over the last decade had reduced drastically (climate change); formerly the '*Kusi*' season was characterized by intense rainfall for a period of ten to twelve days continuously, whereas today this season only has heavy rain for two days, followed by sporadic spells of rain. There was need for fishermen to be given the capacity to access Kenya's deeper marine waters which were virtually unexploited by locals, Mr. Mohammed mentioned. He added that though in general catches (as recorded by the Fisheries department) may indicate a rise, due to the increased concentration of fishermen in the in-shore waters surrounding Faza, catch per fisherman had actually severely declined over the past decade.

Reduced or steadily falling catches may have adverse implications on the Faza fishery. Being the sole source of livelihood for over 200 fishermen on the island, some of the fishermen may resort to illegal and destructive fishing practices (such as the Beach Seining) in an effort to ensure that they obtain some catch from which to earn an income to enable them to feed their families. Such a situation would in the long-term have a detrimental impact on the marine fisheries ecosystem as critical habitats in the fishery (such as the Seagrass beds where fish spawn) would be destroyed and so eventually force the fish to migrate. Other fishermen have opted to alter their livelihoods and tried their hands at small-scale retailing enterprise or small-scale farming. Women-folk in Faza's homesteads have been forced to contribute to household incomes by engaging in income-generating ventures, such as mat weaving or becoming food vendors. Falling fish catches would have negative multiplier effects on the Faza community as businesses providing ancillary services to the sector (such as net makers and traders, fish processors, distributors and others) would too suffer loss of business.

This raises the perennial question about the inability of Kenya’s coastal artisanal fishermen to access to modern fishing gears and skills to venture into deep-sea fishing. The recently launched KCDP (Kenya Coastal Development Project) might offer an opportunity for some of these fishermen to up-lift their skill and capital (equipment) levels. The Community leaders (both Political and Civic) in Faza should seek to establish links with the Kenya Coast Development Project (KCDP), through implementing agencies such as the Fisheries Department. This project focuses on promoting growth and reducing poverty in one of the poorest provinces in Kenya, the Coast Province. The project focuses on the marine and the in-shore and coastal environment and promotes policy, legislative and institutional reform geared at increasing revenue, productivity, incomes and quality of life for the poor. The project also has a strong focus on the 200 nautical mile Exclusive Economic Zone (EEZ) of Kenya,.

The nearly completed government-funded Fish Cold Storage unit would be beneficial mitigation measure for local fishermen as this would increase their market (bargaining) power. They will now not have to sell fish at throw-away prices due to lack of preservation facilities for their catch. This would transform them from price-takers into price-makers (with more influence on the selling price of fish they have).

3.5 Sea Level Rise

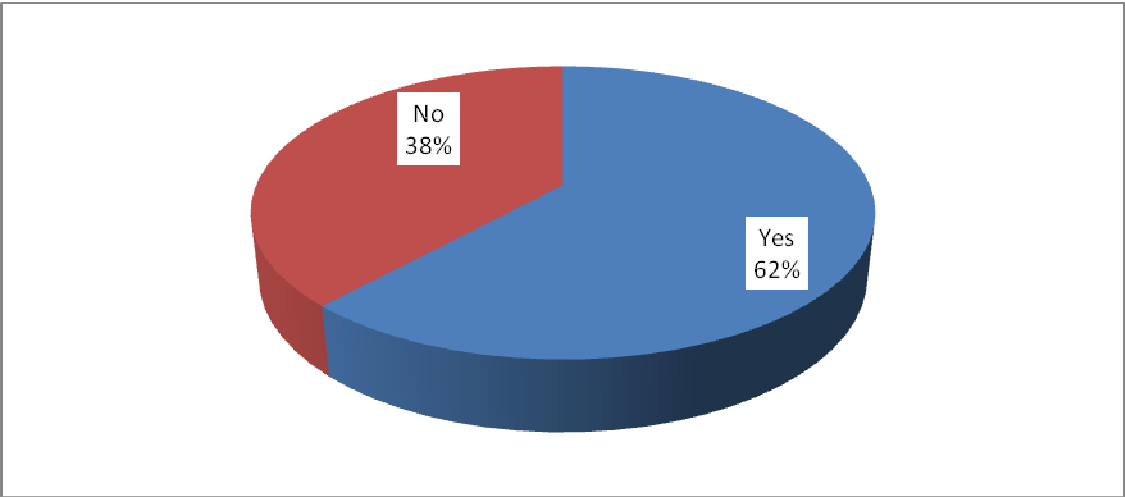


Figure 13: Perception of observed Sea level rise amongst respondents

In Faza, 62% of respondents claimed to have experienced a rise in the sea level at Faza. The respondents who stated that the sea level had not risen indicated that construction of the Faza Sea wall was the reason why sea-level rises have not affected residents. Flooding and destruction of houses and property, disruption of fishing activity (loss of boats and fishing nets), loss of farmland through inundation and increased coastal erosion were mentioned as some of the observed effects of rising sea levels. Research however, clearly indicates (see table below) that sea levels in Lamu district have been rising over the past decade. Most respondents recalled the Tsunami event six years ago, during which the sea levels in Faza rose significantly causing destruction of homes and other property, fishing boats and nets. Research shows that sea levels in Lamu district over the past fifteen years have risen by about half a centimeter. While this may not seem significant now the long-term implications of this trend are certainly worth very serious consideration.

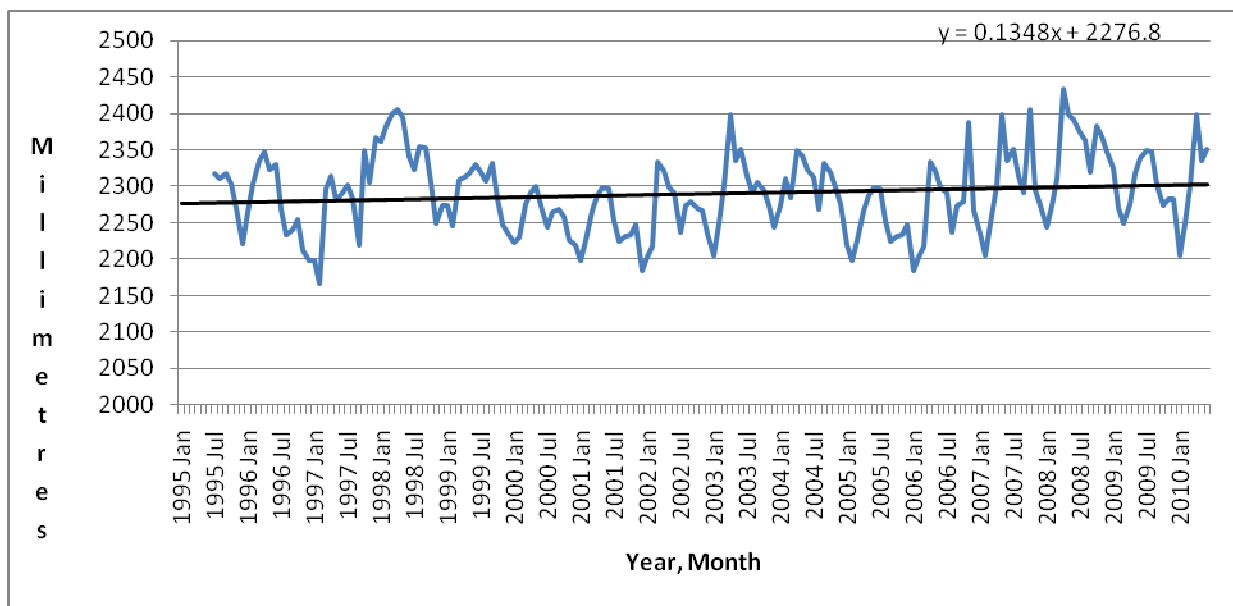


Figure 14: Average bi-annual sea levels (past 15 years) in Lamu, Kenya. Source: (KMFRI, 2010)

The government-funded construction of the Faza Sea wall as a mitigation measure to address the effects of climate change, has been very effective in protecting locals and their property from the encroaching waters of the Indian ocean. However, some residents still lament that the wall does not protect all of those living on the island. Some villagers are still experiencing damage to and a loss of property due rising sea levels.

3.6 Theory of adaptation

According to a UNFCCC 2007 publication Adaptation is a process through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes. There are many options and opportunities to adapt. These range from technological options such as increased sea defenses or flood-proof houses on stilts, to behaviour change at the individual level, such as reducing water use in times of drought and using insecticide-sprayed mosquito nets. Because of the speed at which change is happening due to global temperature rise, it is urgent that the vulnerability of developing countries to climate change is reduced and their capacity to adapt is increased and national adaptation plans are implemented. To avert the worst outcomes of climate change, adaptation efforts need to be scaled up by a factor of more than 100 in developing countries. The only way to reduce the present human impact is through adaptation (GHF, 2009).

3.6.1 ADAPTATION TO CLIMATE CHANGE KENYA

Adaptation in the coastal region of Kenya has had an unusual head start as a consequence of the 2004 Indonesian tsunami whose effects were felt as far away as the East African coast. There is already resolve within Kenya to restore the natural defences of the coastline through reforestation. More difficult will be the introduction of environmental regulations designed to protect settlements and industrial development in Mombasa against the threat of flooding (www.uk.oneworld.net, 2010). Adaptation can reduce the economic costs of climate change but it has a cost. In research done on the Economics of Climate Change in Kenya (2009) by the Stockholm Environment Institute (SEI), the key finding was that existing climate variability has significant economic costs in Kenya. The costs of Adaptation are however still emerging. A number of categories of adaptation have been identified that relate to the balance between development and climate change. An initial estimate of immediate needs for addressing current climate as well as preparing for future climate change for Kenya is \$500 million / year (for

2012). The cost of adaptation by 2030 will increase: an upper estimate of the cost is likely to be in the range of \$1 to 2 billion / year. According to the study, two national development-related activities have been identified that relate to the large economic costs of current variability: 1) Accelerating development to cope with existing impacts, e.g. integrated water management, electricity sector diversity, natural resources and environmental management, and 2) Increasing social protection, e.g. cash transfers to the most vulnerable following disasters, safety nets for the most vulnerable. The study derived top-down aggregate estimates of the cost of adaptation (for East Africa but scaled down to Kenya) and the immediate needs (for 2012) for building adaptive capacity and starting to enhance resilience (immediate priorities) are estimated at \$100 – 150 million/year. However, a much higher value of \$500 million/year or more is warranted if the categories of social protection and accelerated development (to address the current adaptation needs) are included. As highlighted above these categories are associated with current climate variability – such as the existing vulnerability to droughts and floods - and are therefore associated with development. In reference to the coastal region, the study has assessed the costs of adaptation and finds that the potential impacts and economic costs in this sector can be significantly reduced. Adaptation has large potential benefits in reducing coastal erosion and inundation and the number of people potentially flooded could be dramatically reduced. (www.sei-international.org, 2009).

People need not merely suffer the climate conditions they face, but can change their practices, institutions, or technology to take maximum advantage of the opportunities the climate presents and to limit the harms they suffer from it. Through such *adaptations*, people and societies (like ecosystems) adjust to the average climate conditions, and the variability of conditions they have experienced in the recent past. When habits, livelihoods, capital stock, and management practices are finely tuned to current climate conditions, the direct effect of many types of change in these conditions, particularly if the change occurs rapidly, is more likely to be harmful and disruptive than beneficial. But just as societies adapt to the present climate, they can also adapt to changes in it. Adaptation can be intentional or not, and can be undertaken either in anticipation of projected changes or in reaction to observed changes. Society's capacity to adapt to future climate change is a crucial uncertainty in determining what the actual consequences of climate

change will be. Societies and economies are *vulnerable* to climate change if they face substantial unfavorable impacts, and have limited ability to adapt. Like impacts themselves, the set of options and resources available to adapt to change, and the ability of particular individuals', communities' and societies' to adopt them depend on complex sets of linked social and economic conditions. Such factors as wealth, economic structure, settlement patterns, and technology play strong roles in determining vulnerability to specified climate conditions (Downing et al., 2000).

3.6.2 ADAPTATION TO CLIMATE CHANGE IN FAZA

Many of Faza island's residents suffer from a very poor socio-economic status. Education levels are low and income-generating activities are limited. Earnings from available livelihoods are minimal, and the situation is further complicated by the rising price levels of food commodities. The locals in Faza are forced to cope (adapt) the best they can with the effects of climate change using the severely limited resources at their disposal, as noted by Orindi and Murray (2006).

Some local fishermen have opted to engage in small-scale agriculture (for example of maize, cassava) as fishing incomes have become insufficient to cater for their domestic needs. One common step taken by many households is that of cultivating credit relations with local shopkeepers, which allows families to obtain needed provisions even without ready cash. The bills are settled after some duration, at which time the buyer has managed to mobilize the necessary finances. Households try to diversify their income-earnings activities: one way this is done is by the women-folk engaging in various forms of commercial activity, such as the weaving of mats or selling of foodstuffs. Some of the more enterprising women-folk have joined together to form co-operative self-help groups, many of which are involved in the construction of concrete water-storage tanks, from which water is sold commercially to local villagers. Diets have been altered in line with the weaker financial position of many households, with a rise in consumption of vegetables (at the expense of the increasingly more expensive fish). When water is scarce within the island it must be bought (via boats) all the way from Lamu; this puts an additional financial strain on household budgets. This being a descriptive study, the focus of the

adaptation data collected was to basically obtain information on how the community has been forced to alter their lifestyles so as to accommodate the climate change impacts.

CHAPTER FOUR

4.1 CONCLUSION

Climate change is plunging the poverty-stricken residents of Faza into deeper social and economic difficulty. The effect climate change is having on the local environment (both land and sea) is significantly hindering the residents' efforts to secure their subsistence needs, as well as returns from their commercial activity. Responses on the whole indicated that the island's major livelihood (fishing) was not as profitable as it used to be. This being the key income-generating activity on the island, the repercussions of this decline in fishing income was having widespread social and economic effects amongst the community. However, the first step the residents of Faza should focus on is trying to ensure that they *maximize* returns (i.e. they should optimize utilization) from whatever resources they do have access to at this time, be it the fisheries resources, agricultural production or water use. Existing Traditional Local Knowledge must be tapped and incorporated into modern methods of climate adaptation and mitigation. Any assistance to the Faza (and any other) community must be formulated and implemented with direct participation by the local community. The community must be consulted as to what it requires in terms of assistance.

High poverty levels on the island have been a major impediment to adaptation to climate change. Coping strategies by the locals were hampered by a severe lack of resources (financial, physical and technical) amongst the population, leading to widespread poverty and a marginal existence amongst the residents. The government must ensure that the residents of Faza are empowered in terms of gaining easier access to clean water, fishing equipment and climate-appropriate varieties of crops for planting. In seeking to develop ways to assist local communities combat the climate change problem, the government's policies must be focused on two major issues. Firstly, they need to concentrate on building and strengthening the adaptive capacity of the local communities – climate change *must* be incorporated into local community-based development agendas. Appropriate information and capacity-building (e.g. in monitoring climate impacts, in resource management and in fostering co-operation through dialogue) must be provided to the community. Access to appropriate technology can ease flow of information to and between

members of the Faza community. Government policy must impress on communities that Co-management with them is the right approach to addressing this problem. The importance of local community input must be emphasized in government policy. Secondly, focus must be aimed at reducing the vulnerability of the local community – through the strengthening of their asset (natural, physical, social, financial and human) base. Climate change brings with it a myriad risks that threaten the resources essential for the survival of poor and marginalized communities. Skills on Risk management must be provided to the vulnerable communities.

The community of Faza is ready to co-operate in any efforts to combat climate change, but it need assistance: both material and technical. Current Adaptation practices are not effective primarily because of the “layman”, non-skilled approach employed by the villagers. More education and awareness creation, coupled with an injection of material resources and technical know-how, will certainly assist the locals more in their endeavours to combat climate change. This would imply an increased role of government, primarily, and other aid agencies in strengthening the adaptive capacity of the Faza community. As mentioned in Kenya’s National Climate Change Response Strategy, all stakeholders should mainstream climate-proofing and climate change responsive activities in their programmes and projects. Adherence to the document’s Action Plan and Recommendations would be a move in the right direction.

This was a Descriptive study intended to determine how exactly climate change was affecting the residents of Faza island at the time, and secondly how they were coping with the consequences of this change. By highlighting *how* the community was being impacted I believe we are in a better position to devise the most appropriate mitigations and adaptations for the residents. I would sincerely hope that this study, while it may not solve the problems the people of Faza have to contend with as a result of climate change, will bring to the fore the plight of the villagers of Faza island at the hands of this alarmingly destructive phenomenon.

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ANNEX I: MITIGATION MEASURES TO FIGHT CLIMATE CHANGE IN FAZA

1. Faza Sea wall



2. Concrete Water storage tanks, 'Djabias'



3. Fish Cold Storage Unit, Faza

